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SAFETY SUPPLEMENT

TECHNICAL MANUAL
MAINTENANCE INSTRUCTIONS
ORGANIZATIONAL
GENERAL INFORMATION AND AIRFRAME GROUP
A-7D

F34601-86-C-3689

THIS PUBLICATION FORMALIZES INTERIM SAFETY SUPPLEMENT T.O. 1A-7D-2-1SS-17, DATED 2 JUNE 1988, WHICH WILL BE REMOVED FROM ACTIVE FILES.

THIS PUBLICATION SUPPLEMENTS T.O. 1A-7D-2-1, DATED 1 MARCH 1981, CHANGED 15 APRIL 1988. Reference to this supplement will be made on the title page of the basic manual by personnel responsible for maintaining the publication in current status.

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2 JUNE 1988

1. PURPOSE.

The purpose of this supplement is to restrict hot refueling with external fuel tanks installed until such time as a known fuel plumbing deficiency can be corrected.

2. GENERAL.

Hot refueling with external fuel tanks installed is prohibited until further notice.

3. INSTRUCTIONS.

PAGE 3-60.1

a. Section III, Paragraph 3-71., is CHANGED to read as follows:

3-71. FUEL SERVICING WITH ENGINE OPERATING (HOT REFUELING). (See figure 3-23.) Hot refueling with external fuel tanks installed is prohibited.

b. Section III, is amended to CHANGE the heading of Paragraph 3-72., to read as follows:

3-72. PRECAUTIONS. Hot refueling with external fuel tanks installed is prohibited.

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c. Section III, is amended to CHANGE the heading of Paragrah 3-73., to read as follows:

3-73. PROCEDURES. Hot refueling with external fuel tanks installed is prohibited.

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d. Section III, is amended to CHANGE the heading of Paragraph 3-74., to read as follows:

3-74. EMERGENCY PROCEDURES. Hot refueling with external fuel tanks installed is prohibited.

THE END

See SS-17

TECHNICAL MANUAL

MAINTENANCE INSTRUCTIONS

ORGANIZATIONAL

GENERAL INFORMATION AND AIRFRAME GROUP

A-7D

VOUGHT CORPORATION
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This change incorporates T.O. 1A-7D-2-1TP-8 dated 18 July 1990.

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1 MARCH 1981
Change 47 — 1 May 1991

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INTRODUCTION

The organizational maintenance manual for the A-7D airplane is divided into several separate technical manuals which collectively provide the information necessary for organizational maintenance of the airplane. A table of contents is included in the first section of each manual.

The General Information and Airframe Group technical manual (T.O. 1A-7D-2-1) is arranged to give a general knowledge of the airplane and its systems, instructions for ground handling, servicing, and maintenance of airframe and wing group components.

Technical manuals T.O. 1A-7D-2-2 through T.O. 1A-7D-2-15 are written and illustrated to provide the system specialist with information required to maintain each complete system. Information is arranged to provide a functional description of each system, operation, location and function of system components, operational checkout and trouble-shooting, and removal, installation, and adjustment instructions for major system components. General wiring data are provided in T.O. 1A-7D-2-16, and wiring diagrams are provided in T.O. 1A-7D-2-17. Integration of the airplane avionic systems is discussed and explained in T.O. 1A-7D-2-18. To assist in locating information, each technical manual contains an alphabetical index in addition to the table of contents. The technical order number and title of other organizational maintenance manuals, including section numbers and contents, are also listed in the front of each manual.

A-7D ORGANIZATIONAL MAINTENANCE MANUALS

T.O. 1A-7D-2-1	General Information and Airframe Group
T.O. 1A-7D-2-1CL-1	General Information and Airframe Group – Ground Handling Checklist
T.O. 1A-7D-2-1CL-2	General Information and Airframe Group – Servicing Checklist
T.O. 1A-7D-2-2	Egress and Survival Systems
T.O. 1A-7D-2-2CL-1	Egress and Survival Systems Seat Removal and Installation Checklist

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T.O. 1A-7D-2-18-9	Integrated Avionic Systems, Grooming
T.O. 1A-7D-2-18-11	Integrated Avionic Systems, Theory of Operation (Airplanes Using Operational Flight Program AF-5A After T.O. 1A-7-530)
T.O. 1A-7D-2-18-12	Integrated Avionic Systems Troubleshooting, Operational Test Program (Airplanes After T.O. 1A-7-562)

A-7D ORGANIZATIONAL MAINTENANCE MANUALS (continued)

T.O. 1A-7D-2-19	Cross Servicing Guide for A-7D Aircraft
T.O. 1A-7D-2-20	Testing and Troubleshooting Transmission Lines, Coaxial Cables, and Antennas

THIS MANUAL.

This manual provides organizational maintenance personnel with information required for general familiarization with the A-7D Corsair II airplane and information for airplane servicing and ground handling. In addition, the manual provides organizational level maintenance instructions for the wingfold system and the airframe. The manual is divided into 25 separate sections which include airplane general information, ground handling, servicing, systems familiarization, airframe maintenance, wingfold system maintenance, and engine control system maintenance. Illustrations and tables are used to clarify the information contained in the text. A table of contents, a listing of all other A-7D organizational maintenance manuals, and an introduction to the manuals are provided herein. Checklists T.O. 1A-7D-2-1CL-1 and T.O. 1A-7D-2-1CL-2 present abbreviated ground handling and servicing procedures for use by organizational maintenance personnel.

ARRANGEMENT.

Airplane description, handling, servicing, systems descriptions, airframe maintenance, and wingfold system maintenance are provided in separate sections of the manual.

Section I provides an overall summary of the airplane, including airplane dimensions, station numbers, access panel locations, and identification of possible hazards.

Section II provides the necessary information and procedures for airplane ground handling. Procedures are given in this section for towing, parking, mooring, jacking, hoisting, and leveling the airplane. Procedures for installing ground safety locks, pins, protective covers and plugs, engine ground operation procedures, and description of ground handling dollies are also provided in Section II.

Section III provides servicing instructions for airplane systems. Detailed procedures for servicing fuel, engine oil, air-conditioning turbine oil, hydraulic systems, landing gear shock struts, accumulators, tires, and oxygen system are included.

Sections IV through XVIII provide brief descriptions of each system installed in the airplane. The material contained in these sections is intended to familiarize maintenance personnel with the airplane's mechanical, hydraulic, and electronic systems. Maintenance procedures for the airplane systems may be found in the technical manual for the applicable system.

Sections XIX through XXIII provide airframe maintenance instructions. Maintenance Procedures for the fuselage forward section, fuselage midsection, fuselage aft section, empennage, and wings are included in these sections.

Sections XXIV provides operational procedures, troubleshooting, and detailed maintenance procedures for the wingfold system.

Section XXV provides operational procedures, troubleshooting, and detailed maintenance procedures for the engine control system.

TOOLS AND EQUIPMENT REQUIRED.

Tools and test equipment required for a particular maintenance procedure are listed at the beginning of the procedure. The list does not include tools and equipment needed for access or common hand tools. Support equipment, such as voltmeters and multimeters, are included in the list.

REFERENCE PUBLICATIONS.

Publications generally related to subject matter contained in this manual or specifically referenced in the manual are listed in the table of reference publications.

TIME COMPLIANCE TECHNICAL ORDERS.

Time compliance technical orders for the systems covered in this manual are listed in a table. The listing, in technical order numerical sequence, includes the basic date, title, ECP number, and date of the change or revision.

THIS REVISION.

This manual has been revised to incorporate changes resulting from formalization and to incorporate airplane design changes.

REFERENCE PUBLICATIONS

T.O. 00-110N-11	Handling, Storage, and Disposal of Krypton 85 Radioactive Source
T.O. 00-25-172	Ground Servicing of Aircraft and Static Grounding/Bonding
T.O. 00-25-186	Local Manufacture of Nonsource Coded Items
T.O. 1-1-1	Cleaning of Aerospace Equipment
T.O. 1-1-2	Corrosion Prevention and Control for Aerospace Equipment
T.O. 1-1-17	Storage of Aircraft and Missile Systems
T.O. 1-1-19	Inspection, Test, and Replacement of Vibration Isolators on Equipment in Aircraft
T.O. 1-1-24	Maintenance, Repair, and Electrical Requirements for Fiberglass Airborne Radomes
T.O. 1-1-300	Acceptance/Functional Check Flights and Maintenance Operational Checks

REFERENCE PUBLICATIONS (continued)

T.O. 1-1A-1	Engineering Handbook Series for Aircraft Repair – General Manual for Structural Repair
T.O. 1-1A-8	Engineering Manual Series, Aircraft and Missile Repair, Structural Hardware
T.O. 1-1B-40	Weight and Balance Data
T.O. 1A-7D-06	Work Unit Code Manual
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T.O. 1A-7D-2-2CL-1	Checklist, Egress and Survival System, Seat Removal and Installation
T.O. 1A-7D-3	Structural Repair Instructions
T.O. 1A-7D-4-1	Illustrated Parts Breakdown Introduction
T.O. 1A-7D-4-2	Illustrated Parts Breakdown Numerical Index
T.O. 1A-7D-4-3	Reference Designation Index
T.O. 1A-7D-4-4	Pneudraulic Systems
T.O. 1A-7D-4-5	Powerplant Systems
T.O. 1A-7D-4-6	Fuel Systems
T.O. 1A-7D-4-7	Landing Gear Systems
T.O. 1A-7D-4-8	Flight Control Systems
T.O. 1A-7D-4-9	Automatic Flight Control Systems
T.O. 1A-7D-4-10	Instrument Systems
T.O. 1A-7D-4-11	Electrical Power and Lighting Systems
T.O. 1A-7D-4-12	Radio Communication, Navigation and Radar Systems
T.O. 1A-7D-4-13	Armament Systems
T.O. 1A-7D-4-14	Weapon Control Systems
T.O. 1A-7D-4-15	Electronic Countermeasure Systems
T.O. 1A-7D-4-16	Wiring Harnesses and Wiring Protective Devices
T.O. 1A-7D-4-17	Airframe
T.O. 1A-7D-4-18	Egress and Survival Systems
T.O. 1A-7D-4-19	Air-Conditioning and Oxygen Systems

REFERENCE PUBLICATIONS (continued)

T.O. 1A-7D-4-20	Support Equipment
T.O. 1A-7D-5	Basic Weight Checklist and Loading Data
T.O. 1A-7D-6	Inspection Instructions Aircraft Scheduled Inspection and Maintenance Requirements
T.O. 1A-7D-6WC-1	Preflight/Thruflight – Handling – Postflight Inspection Workcards
T.O. 1A-7D-6WC-2	Phased Inspection Workcards
T.O. 1A-7D-35	Nonmunitions Accessories Installation, Checkout, and Removal Procedures – A-7D and A-7K Aircraft
T.O. 1A-7D-35CL-1	Checklist, Nonmunitions Accessories Installation, Checkout, and Removal Procedures – A-7D and A-7K Aircraft – External Fuel Tanks
T.O. 4T-1-3	Inspection, Maintenance Instructions, Storage and Disposition of Aircraft Tires and Inner Tubes
T.O. 11A-1-33	Handling and Maintenance of Explosives Loaded Aircraft
T.O. 15X-1-1	Maintenance Instructions, Oxygen Equipment
T.O. 32B14-3-1-101	Operation and Service Instructions, Torque Indicating Tools
T.O. 33A1-12-2-1	Operation Multimeter AN/PSM-6, AN/PSM-6A, AN/PSM-6B
T.O. 33A2-2-24-11, -21 or -31	Operation and Maintenance Instructions – Gasoline Engine Driven Hydraulic System Portable Test Stand, Type MJ-2A
T.O. 33A4-4-8-1	Operation and Service Instructions – Portable Gasoline Engine Driven Pressurized Cabin Leakage Tester, Type MB-1
T.O. 33D2-5-36-1, -11, -21, or -31	Operation and Maintenance Instruction – Gasoline Engine Driven Hydraulic System Portable Test Stand, TTU-228/E or TTU-228/E-1A
T.O. 33D2-5-39-1 or -11	Operation and Maintenance Instructions – Electric Motor Driven Hydraulic System Portable Test Stand, A/M27T-2
T.O. 34Y1-87-11	Operation and Service Instructions – Engine Driven Air Compressor, Type MC-2A
T.O. 35A2-2-54-1	Operation and Service Instructions – Jack, Hydraulic, Tripod, 20-Ton Capacity, Type MMU-59/E
T.O. 35A2-2-76-1	Operation, Maintenance, and Inspection, Instructions with Parts Breakdown – Jack, Hydraulic, Tripod, 17-Ton Part No. 3961
T.O. 35C2-3-372-1	Operation and Service Instructions – Generator Set, Gas Turbine, Wheel Mounted, Type A/M32A-60
T.O. 35E9-90-1	Operation and Service Instructions – Air Conditioner, Air Cycle, Aircraft Ground Support, Type A/M32C-10

REFERENCE PUBLICATIONS (continued)

T.O. 37A-1-101	General Instructions – Fuel, Water, and Lubricant Dispensing Equipment
T.O. 37A6-2-43	Operating and Overhaul Instructions with Parts Breakdown – Pressure Fuel Servicing Locking Nozzle
T.O. 37C2-8-2-1	Operation and Service Instructions – 50-Gallon Liquid Oxygen Storage and Transfer Tank
T.O. 42B-1-1	Quality Control of Fuels and Lubricants
T.O. 42B2-1-1	Use and Grades of Aircraft Engine Lubrication Oils
T.O. 42C-1-2	Anti-Icing, De-Icing, and Defrosting of Parked Aircraft

RECORD OF TIME COMPLIANCE TECHNICAL ORDERS

T.O. Number	Date	Title	Change/Revision Date
1A-7-502	1 Nov 87	Replacement of Radar Altimeter AN/APN-194 with Altimeter Set, Electronic AN/APN-232(V) in A-7 Aircraft	
1A-7-505	3 Jul 87	Modification of A-7D/K Nose Wheel Steering System	1 Aug 85
1A-7-530	15 Mar 88	Installation of Forward Looking Infrared System on A-7 Aircraft (ECP 622)	15 Nov 86
1A-7-539		Removal/Installation of Have Quick RT-1145C/ARC-164(V) with Modified RT-1504/ARC-164(V) in A-7 Aircraft	
1A-7-551	15 Feb 89	Installation of Starter Battery System in A-7 Aircraft	
1A-7-562		Installation of Ring Laser Gyro Inertial Navigation System on A-7D/K Aircraft	15 Feb 90
1A-7-596	18 Mar 89	Replacement of A-7 Nucleonic Oil Quantity Indicating System (NOQIS)	1 Dec 89
1A-7-631		Installation of AIM-9L IR Coolant Switch in A-7 Aircraft	1 Apr 90

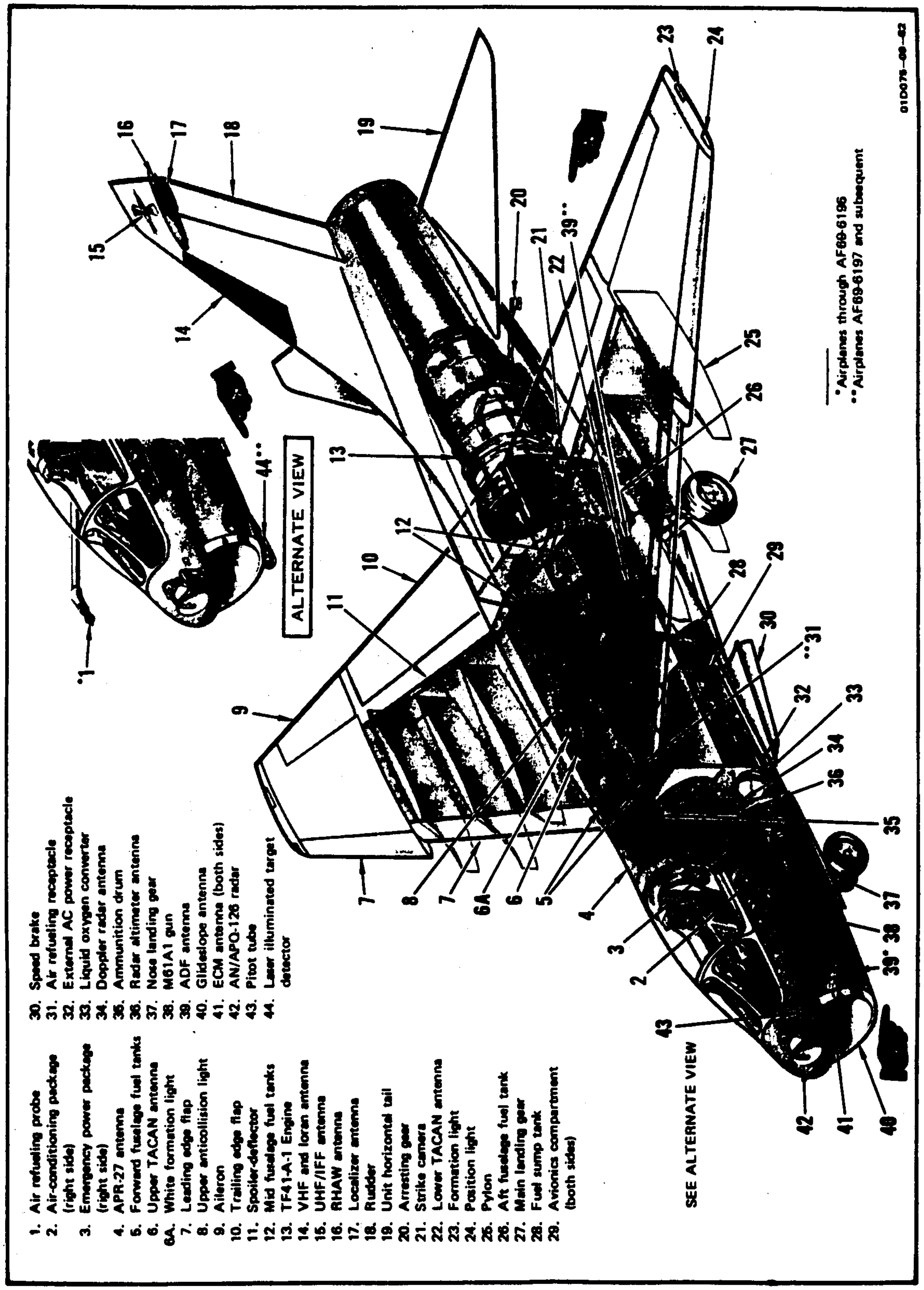

Figure 1-1. Airplane Arrangement

RECORD OF TIME COMPLIANCE TECHNICAL ORDERS

T.O. Number	Date	Title	Change/Revision Date
1A-7-502	1 Nov 1987	Replacement of Radar Altimeter AN/APN-194 with Altimeter Set, Electronic AN/APN-232(V) in A-7 Aircraft	1 Oct 1987
1A-7-505	3 Jul 1987	Modification of A-7D/K Nose Wheel Steering System	1 Aug 1985
1A-7-508	15 Sep 1983	Replacement of AN/ARC-164(V) Receiver-Transmitter RT-1145A (Have Quick) with Modified RT-1145C, 25 KHZ Baseband, A-7D/K Aircraft	15 May 1990
1A-7-530	15 Mar 1988	Installation of Forward Looking Infrared System on A-7 Aircraft (ECP 622)	15 Nov 1986
1A-7-539		Removal/Installation of Have Quick RT-1145C/ARC-164(V) with Modified RT-1504/ARC-164(V) in A-7 Aircraft	1 Dec 1987
1A-7-551	15 Feb 1989	Installation of Starter Battery System in A-7 Aircraft	1 Jan 1989
1A-7-562		Installation of Ring Laser Gyro Inertial Navigation System on A-7D/K Aircraft	15 Feb 1990
1A-7-577		Removal/Installation of Have Quick Control C-9682A/ARC-164(V), PN 706963-804, with Modified C-11721/ARC-164(V), PN 900116-807, A-7D/K Aircraft	15 May 1990
1A-7-596	18 Mar 1989	Replacement of A-7 Nucleonic Oil Quantity Indicating System (NOQIS)	1 Dec 1989
1A-7-606		Installation of KY-58 (Vinson) Secure Voice on A-7D/K Aircraft	15 May 1990
1A-7-631		Installation of AIM-9L IR Coolant Switch in A-7 Aircraft	1 Apr 1990
1A-7D-857	15 Feb 1987	Installation of AN/ARC-186(V) VHF AM/FM Radio in A-7D Aircraft	15 May 1990

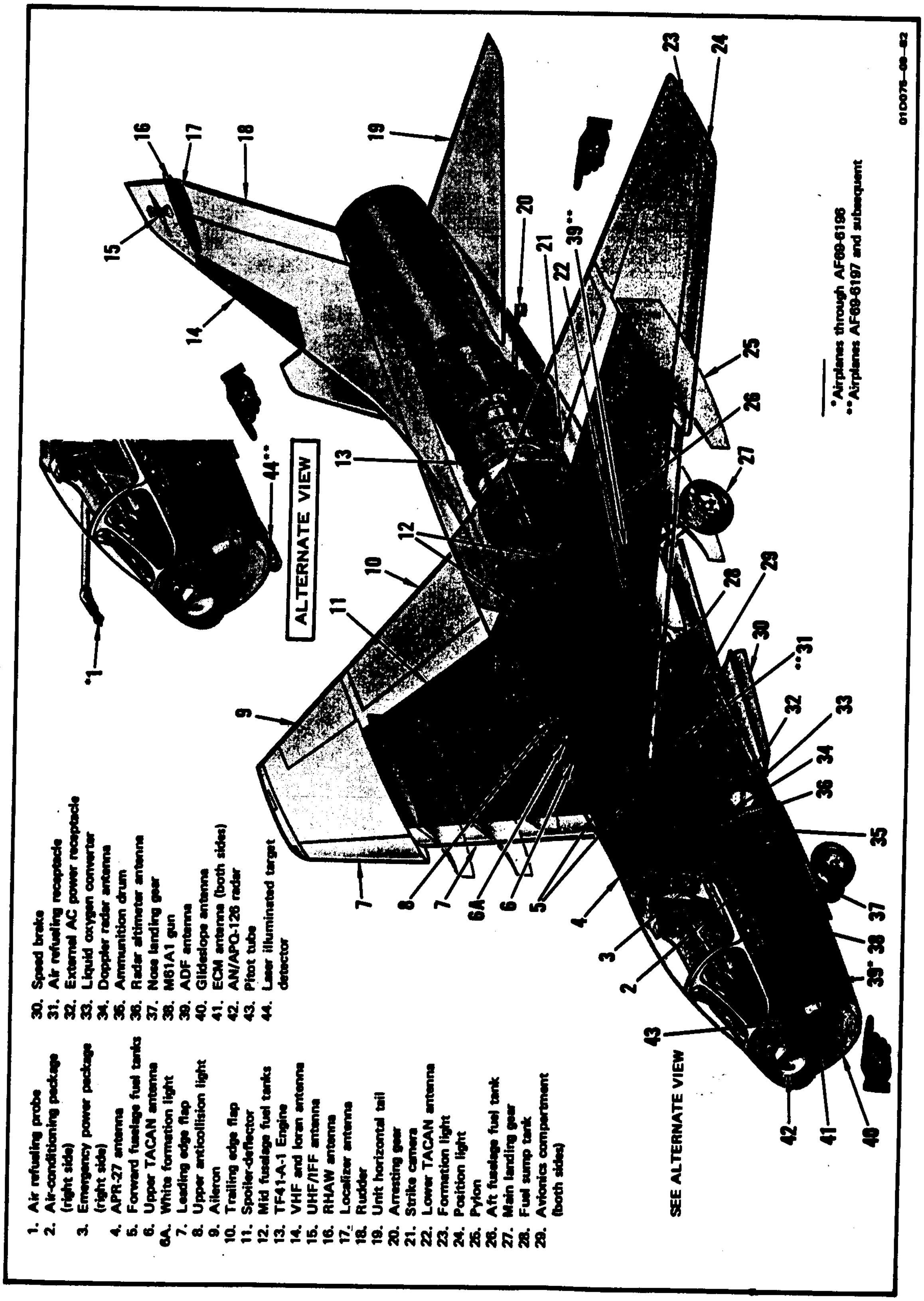

Figure 1-1. Airplane Arrangement

SECTION I

GENERAL INFORMATION

1-1. DESCRIPTION.

1-2. The A-7D is a single-place, light-attack, all-weather airplane incorporating advanced radar, navigation, and weapons systems. Principal recognition features are the sweptback, shoulder-mounted wing with a marked degree of negative dihedral, unit horizontal tail, low profile fuselage, and retractable tricycle landing gear with steerable nosewheels. Foldable wing outer panels are installed on the right and left side of the wing to facilitate close-quarter parking. A retractable arresting gear is installed on the fuselage aft section. The powerplant, installed in the fuselage aft section, is a TF41-A-1 turbofan engine capable of developing 14,250 pounds of thrust. Fuel tanks are installed in the fuselage midsection and an integral fuel tank is provided in the wing center section. External fuel tanks may be mounted on wing pylon stations 1, 3, 6, and 8.

1-3. Armament consists of an M61A1 gun and eight ordnance stations. Three ordnance stations on each side of the wing center section and one station on each side of the fuselage are provided for mounting weapons. Flight controls consist of leading and trailing edge flaps, ailerons, and spoiler/deflectors attached to the wing; a speed brake attached to the bottom of the fuselage midsection; and a unit horizontal tail, and rudder attached to the empennage.

1-4. ARRANGEMENT. (See figure 1-1.)

1-5. The A-7D fuselage is divided into three major sections: the fuselage forward section, the fuselage midsection, and the fuselage aft section. The wing is attached to the fuselage midsection. A unit horizontal tail is attached to the fuselage aft section, and the vertical stabilizer, forming an integral part of the fuselage, is mounted on the upper portions of the fuselage aft section. Major components of the fuselage forward section are the nose radome, laser target detector pod (airplanes AF69-6197 and subsequent), nose landing gear, M61A1 gun, liquid oxygen converter, ammunition drum, air-conditioning package, air refueling probe (airplanes through AF69-6196), emergency power package, and cockpit. Major components of the fuselage midsection are avionic compartments, main landing gear, speed brake, air refueling receptacle (airplanes AF69-6197 and subsequent), and fuselage fuel tanks. Major components of the fuselage aft section are the powerplant, battery, arresting gear, strike camera, unit horizontal tail control installation, and bleed air manifold. Major components of the vertical stabilizer are the rudder, UHF-IFF antenna, ECM antenna, ILS antenna, and rudder power control package. The wing consists of a center section and two foldable outer panels. Major components of the wing center section are leading and trailing edge flaps, spoiler/deflectors, and an integral fuel tank. Ailerons and leading edge flaps are attached to each wing outer panel, and the remote indicating compass transmitter is located in the right wing outer panel.

1-6. PRINCIPAL DIMENSIONS. (See figure 1-2.)

1-7. Principal airplane dimensions are taken with airplane in level flight position and nosewheel on the ground.

1-8. AIRPLANE STATIONS AND FRAMES. (See figure 1-3.)

1-9. The zero reference station for the fuselage is 181.90 inches forward of the nose radome. To determine the true location in inches from the nose of the airplane, subtract 181.90 inches from the fuselage station reference number. Wing stations are measured from the center of the fuselage, which is wing station 0, to the outer limits of each outer panel. Unit horizontal tail stations are measured from the fuselage attaching point to the outer limits of the UHT. Vertical fuselage reference stations are indicated by waterline stations. Waterline station 100 is an imaginary line through the center of the fuselage.

1-10. AIRPLANE WALKWAYS. (See figure 1-4.)

1-11. Designated areas of the wing center section, top of the fuselage midsection and aft section, and unit horizontal tail (UHT) may be used as walkways. The UHT may be used to climb on top of the aft fuselage. On airplanes AF69-6244 and subsequent, the UHT walkway is coated with MIL-W-5044, Type II walkway material for skin surface protection. In all other areas, place clean rubber mats on walkways to prevent damage to skin surface. If mats are not available, wear rubber sole shoes that are free of foreign materials when walking on walkways. Refer to T.O. 1A-7D-3 for application of walkway material on UHT.

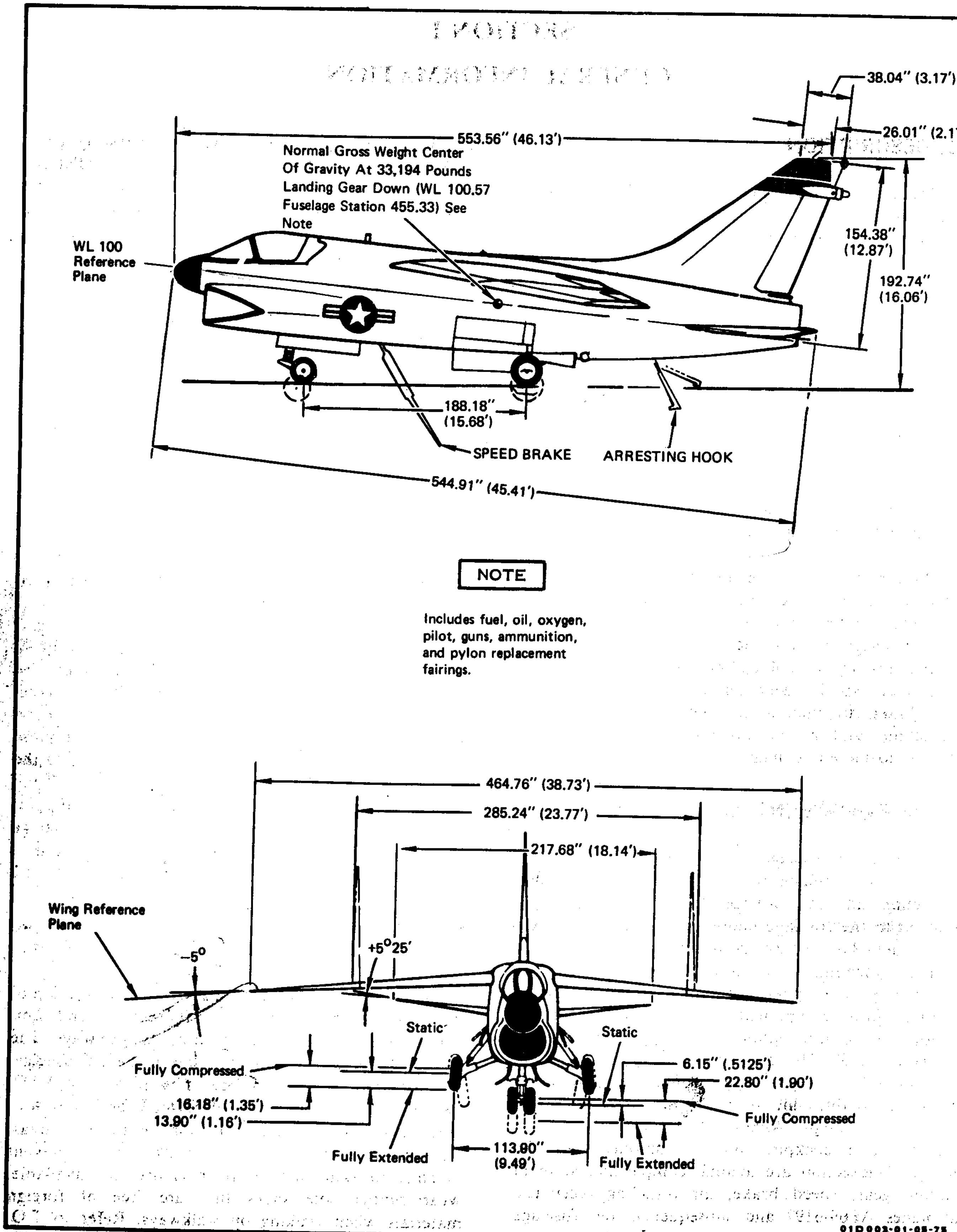

Figure 1-2. Airplane Dimensions (Sheet 1)

GENERAL

Wingspan	38.73 Ft.
Wingspan, folded	23.77 Ft.
Length, overall	46.13 Ft
Main wheel thread	9.49 Ft
Airplane gross weight	33,194*
Tire size	
Main wheels	28 X 9.0 – 14
Nose wheels	22 X 5.5 – 12

FUSELAGE

Height, basic outside	7.20 Ft
Width, basic outside	4.88 Ft
Length	44.18 Ft

WING

Type	High
Airfoil section at root	NACA 65A007
Airfoil section at tip	NACA 65A007
Chord at root	15.49 Ft
Chord at tip	3.86 Ft,
Incidence	-1°
Dihedral	-5°
Aspect ratio 0.25	4.0
Sweepback of 0.25 chord line	35°

AILERONS

Type	Plain, sealed
Span	6.24 Ft
Chord, percent wing chord/Ft	
Inboard end	25/2.14
Outboard end	25/1.26
Maximum deflection	±25

UNIT HORIZONTAL TAIL

Span	18.14 Ft
Chord (MGC) at 3.40 Ft from Centerline	6.12 Ft
Airfoil section	
Root	NACA 65A006
Tip	NACA 65A004
Maximum deflection	
Leading edge up	6° 45′
Leading edge down	26° 30′
Sweepback of 0.25 chord line	45°
Dihedral	5° 25′

TAIL (VERTICAL)

Span	12.86 Ft
Chord (MGC)	10.20 Ft
Airfoil section	
Root	NACA 65A005.2 (Mod)
Tip	NACA 65A004 (Mod)
Sweepback of 0.25 chord line	44.28°

*Includes fuel, oil, oxygen, pilot, guns, ammunition, and pylon replacement fairings

**Airplanes through AF73-998

†Airplanes AF73-999 and subsequent

RUDDER

Type	Plain, sealed
Chord, average	2.12 Ft
Maximum deflection	
Clean condition	±6°
Takeoff and landing	±24°

HIGH LIFT AND DRAG INCREASING DEVICES

Wing trailing edge flap	
Type	Single, slotted
Span	9.20 Ft
Chord, percent of wing chord	22.55
Maximum deflection	40°

LEADING EDGE FLAP

Span	
Inboard	11.99 Ft
Outboard	10.55 Ft
Chord, percent of wing chord	
Inboard	12
Outboard	12
Maximum deflection	**35° †26°

SPOILER–DEFLECTOR

Location, Percent of semispan	
Inboard end	28.94
Outboard end	43.46
Spoiler chord, percent of Wing chord	
Inboard end	6.92
Outboard end	7.71
Maximum deflection	60°
Deflector, percent of wing Chord	
Inboard end	5.07
Outboard end	5.88
Maximum deflection	30°

SPEED BRAKE

Maximum deflection	60°

AREAS

Wing	375 Sq Ft
Wing, trailing edge flap, each	21.74 Sq Ft
Leading edge flap	
Inboard section	18.36 Sq Ft
Outboard section	18.88 Sq Ft
Ailerons	19.94 Sq Ft
Spoiler	4.60 Sq Ft
Deflector	3.44 Sq Ft
Vertical stabilizer	111.20 Sq Ft
Rudder	15.04 Sq Ft
Unit horizontal tail	56.39 Sq Ft
Speed brake	25.00 Sq Ft

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Figure 1-2. Airplane Dimensions (Sheet 2)

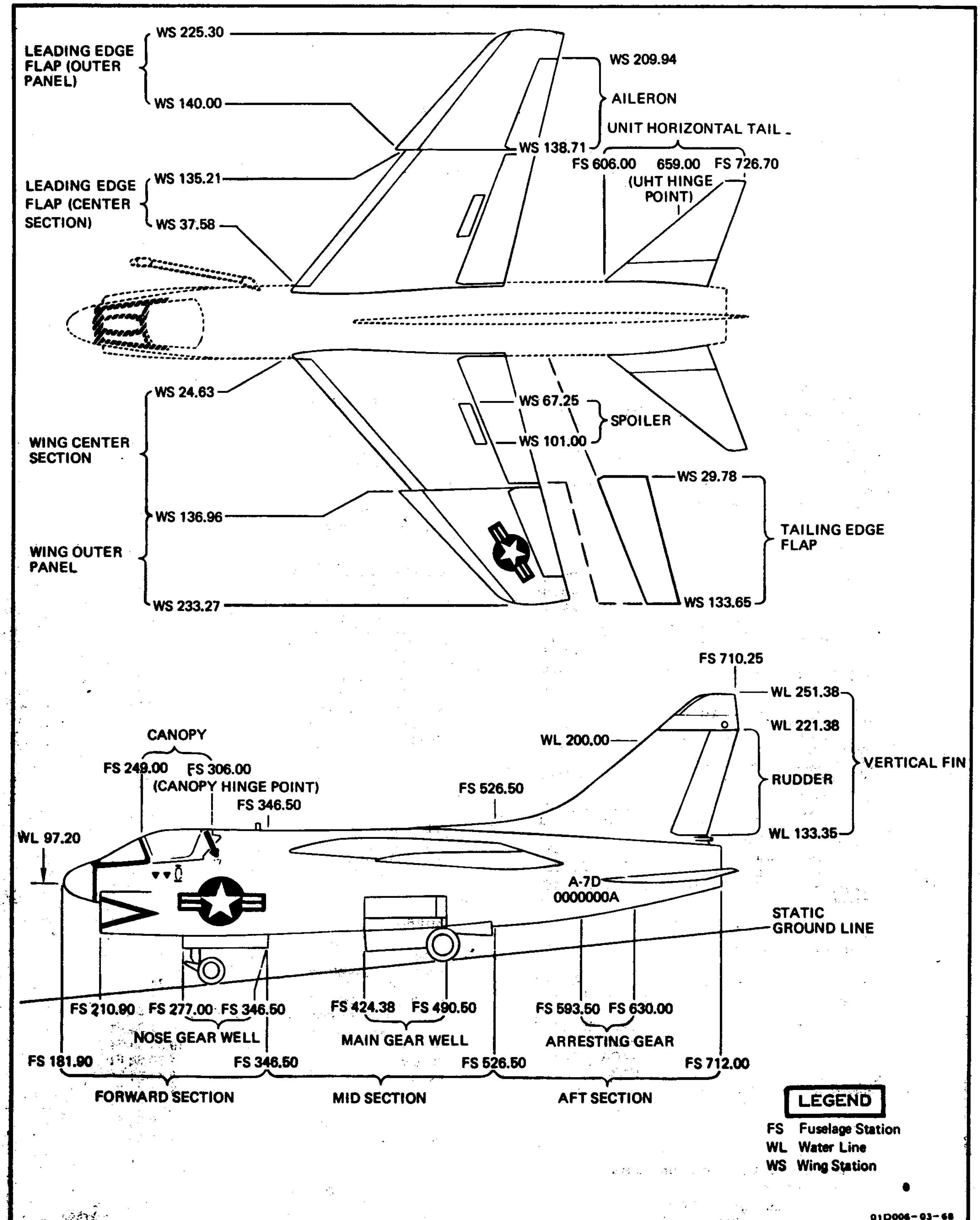


Figure 1-3. Airplane Stations and Frames

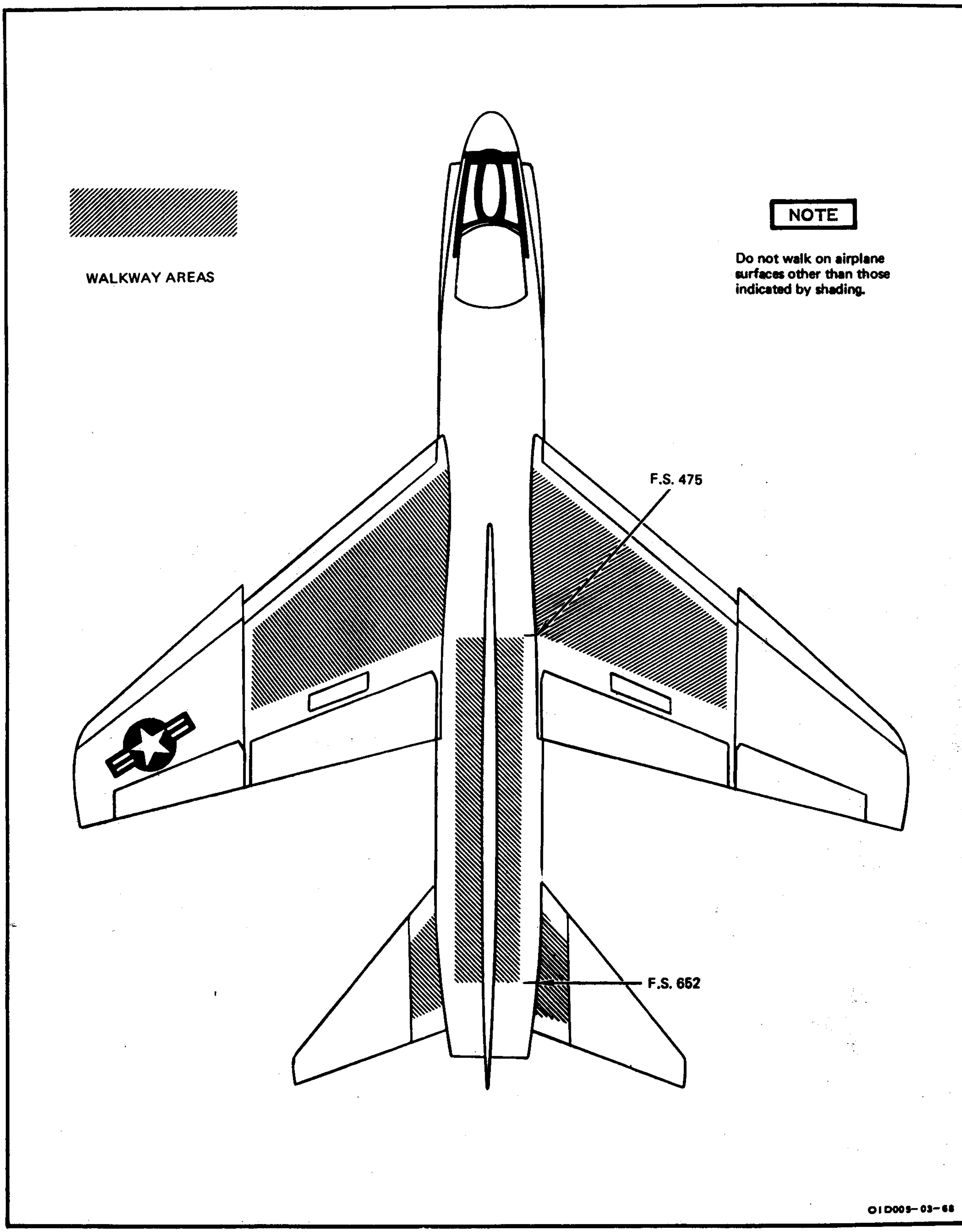


Figure 1-4. Airplane Walkways

1-12. ACCESS PANELS. (See figures 1-5 through 1-14 and 1-14A.)

1-13. Access panels are designated numerically, depending on location of the panel on the airplane (figure 1-5). Certain access panels must be installed to prevent structural damage to the airplane when performing various maintenance or ground handling tasks. Figures 1-6 through 1-14 and 1-14A locate and identify all panels, including those that are subject to removal restrictions. Table 1-1 provides a listing, by panel number, of all restricted panels and conditions when they must be installed. Access panels which have armor plate attached are also identified and must be removed with care to prevent damage to the panel and armor plate or possible injury to personnel.

Table 1-1. Access Panel Restrictions

General

When the following access panel is removed, screws must be installed in the same holes from which they were removed to ensure normal magnetic environment. Failure to do this may result in compass errors.

4131-1

CAUTION

To prevent structural damage to airplane, the following access panels shall be installed (with all fasteners) during applicable operation or condition.

Static Condition

1222-5 1222-6 1222-6-1 1222-6-3	or	2212-6 2212-10

5122-3 or 5122-4 or 5122-5

6122-3 or 6122-4 or 6122-5

6222-1	or	6222-3

Table 1-1. Access Panel Restrictions (continued)

If 6122-2 is to be removed, 5122-6[2] and any two of 6122-3, -4, or -5 panels must be installed.

If 5122-6[2] is to be removed, 6122-2 and any two of 5122-3, -4, or -5 panels must be installed.

Canopy Counterbalance Cylinder

The following access panels shall be installed whenever the cylinder is pressurized.

1122-3	or	1121-4[1] 1121-9[2] and 1121-3 or 2121-3

Airplane Outdoors

The following access panels shall be installed if airplane may be subjected to winds of 15 knots or greater.

1123-1	or	2123-4[1] 2123-9[2] 2123-11[1]
1222-8 1222-8-1 1222-9 1222-10	or	1222-5 1222-6 1222-6-1 1222-6-3 1222-11
2212-6 2212-10	or	2222-4
6222-1	or	6222-3

5122-4
5122-5
5122-6[2]
5132-1
5133-1
6122-4
6122-5
6132-1
6133-1

Table 1-1. Access Panel Restrictions (continued)

Wingfold Operation

3112-3
4111-3

Taxiing

Same restrictions apply as for engine operation except 2212-6 must be installed.

M61A1 Gun Firing

1123-1
1123-3
1123-4[1]
1212-3
1213-4
1213-6
1213-8
1221-1
1222-4
1222-5
1222-8
1222-8-1
1222-9
1222-10
1222-11
2212-6
2212-10
5122-4
5122-5
5122-6[2]
5132-1
5133-1
6122-4
6122-5
6132-1
6133-1
6222-1 or 6222-3

Towing

Refer to table 2-1.

Jacking

Refer to table 2-3.

Hoisting

Refer to table 2-7.

Engine Operation

Refer to table 2-9.

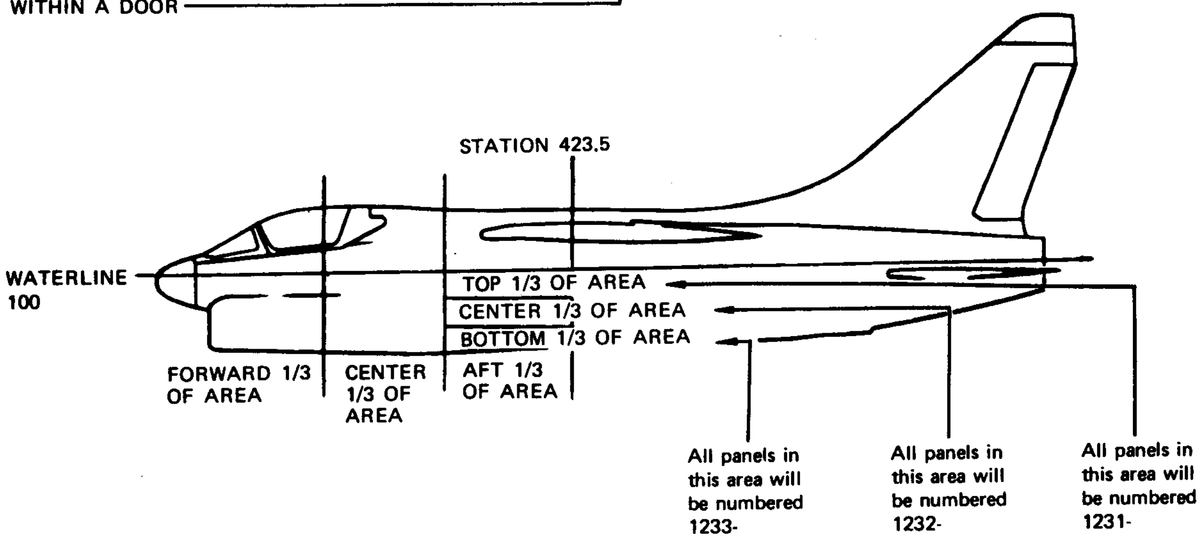
[1]Airplanes through AF69-6196.
[2]Airplanes AF69-6197 and subsequent.

ACCESS DOOR AND PANEL IDENTIFICATION

The numbers assigned to access doors and panels are significant in determining the location of panels and doors. The following code is used.

EXAMPLE: 1 2 2 2–2–1

- LOCATION REFERENCE
- WATERLINE REFERENCE
- HORIZONTAL LOCATION REFERENCE
- VERTICAL LOCATION REFERENCE
- NUMBER OF DOOR IN WORK AREA
- DOOR WITHIN A DOOR



	GENERAL LOCATION
FIRST DIGIT	
1	LEFT FUSELAGE (NOSE TO STATION 423.5)
2	RIGHT FUSELAGE (NOSE TO STATION 423.5)
3	LEFT WING
4	RIGHT WING
5	LEFT FUSELAGE (STATION 423.5 TO TAIL)
6	RIGHT FUSELAGE (STATION 423.5 TO TAIL)
7	LEFT UHT
8	RIGHT UHT
9	VERTICAL STABILIZER
10	PROTRUSION (PRECEDED BY L&R FOR LEFT AND RIGHT OR T&B FOR TOP AND BOTTOM, OR F&A FOR FORWARD AND AFT, WHEN REQUIRED)
SECOND DIGIT	
1	ABOVE WATERLINE 100 (AIRPLANE CENTERLINE) AND TOP OF WING
2	BELOW WATERLINE 100 (AIRPLANE CENTERLINE) AND BOTTOM OF WING
THIRD DIGIT	
1	FORWARD 1/3 OF AREA
2	CENTER 1/3 OF AREA
3	AFT 1/3 OF AREA
FOURTH DIGIT	
1	TOP 1/3 OF AREA OR RIGHT WING
2	CENTER 1/3 OF AREA OR LEFT WING
3	BOTTOM 1/3 OF AREA OR CENTER WING

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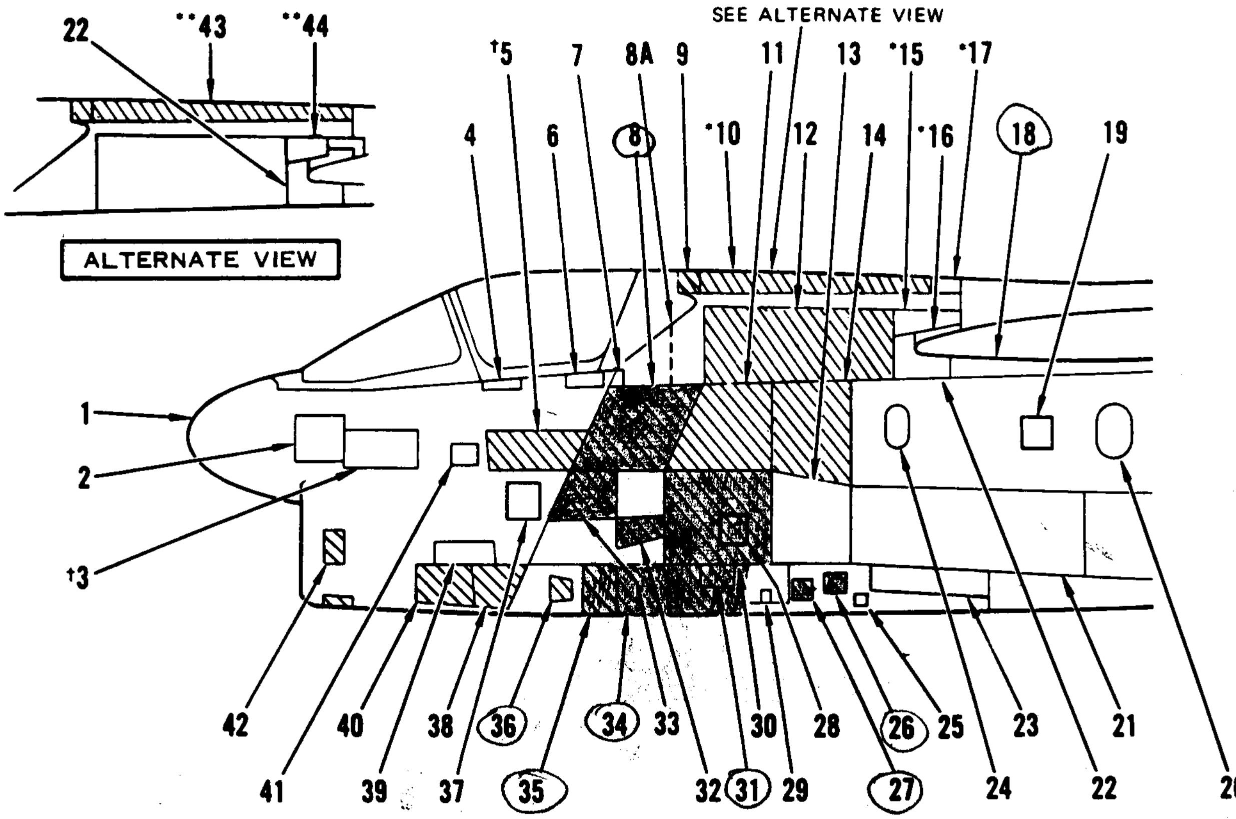
Figure 1-5. Access Doors and Panels Identification

* black pencil is towing restricted panels



NOTE

Shaded areas indicate panels that are subject to removal restrictions. Refer to table 1-1 for applicable restrictions.

*Airplanes through AF69-6196

**Airplanes AF69-6197 and subsequent

†These access panels have armor plate attached. Be prepared for added weight when removing.

INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE	INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE
1	F10211-1	Nose Radome	23	1233-1	Cheek Bay Access
2	1211-1	Radar Receiver Access	24	1133-1	Forward Tank Access
†3	1211-2	Rudder Pedal Access	25	1233-5	External AC Electrical Receptacle
4	1113-1	Canopy Lock Access	26	1222-11	Hydraulic Filter Access
†5	1221-1	Console Access	27	1222-6-3	Ammo Loading Access
6	1122-1	Canopy Lock Access	28	1222-8-1	Gun Clearing Sector Access
7	1122-4	Canopy Access	29	1222-6-2	Gun Drive Access
8	1123-1	Controls Access	30	1222-8	Gun Access
8A	1112-1	Radar Fault Isolator	31	1222-6-1	Gun Drive Access
9	1122-3	Canopy Counterbalance Access	32	1222-9	Gun Mount Access
*10	1121-4	Ammo Drum Access	33	1222-10	Systems Access
11	1123-4	Equipment Access	34	1222-6	Gun Removal Access
12	1121-3	Ammo Drum Access	35	1222-5	Gun Removal Access
13	1222-3	Lox Access	36	1222-4	Gun Barrel Access
14	1123-3	Equipment Access	37	1222-12	Step Access
*15	1121-6	Systems Access	38	1213-6	Gun Access
*16	1121-7	Systems Access	39	1213-14	Step Access
*17	1121-5	Systems Access	40	1213-8	Barrel Removal Access
18	1132-1	Controls Access	41	1211-4	Step Access
19	1133-3	Fuselage Pylon Access	42	1212-3	Antenna Access
20	1133-2	Forward Tank Access	**43	1121-9	Ammo Drum Access
21	1232-1	Avionics Access	**44	1121-10	Systems Access
22	1121-8	Systems Access			

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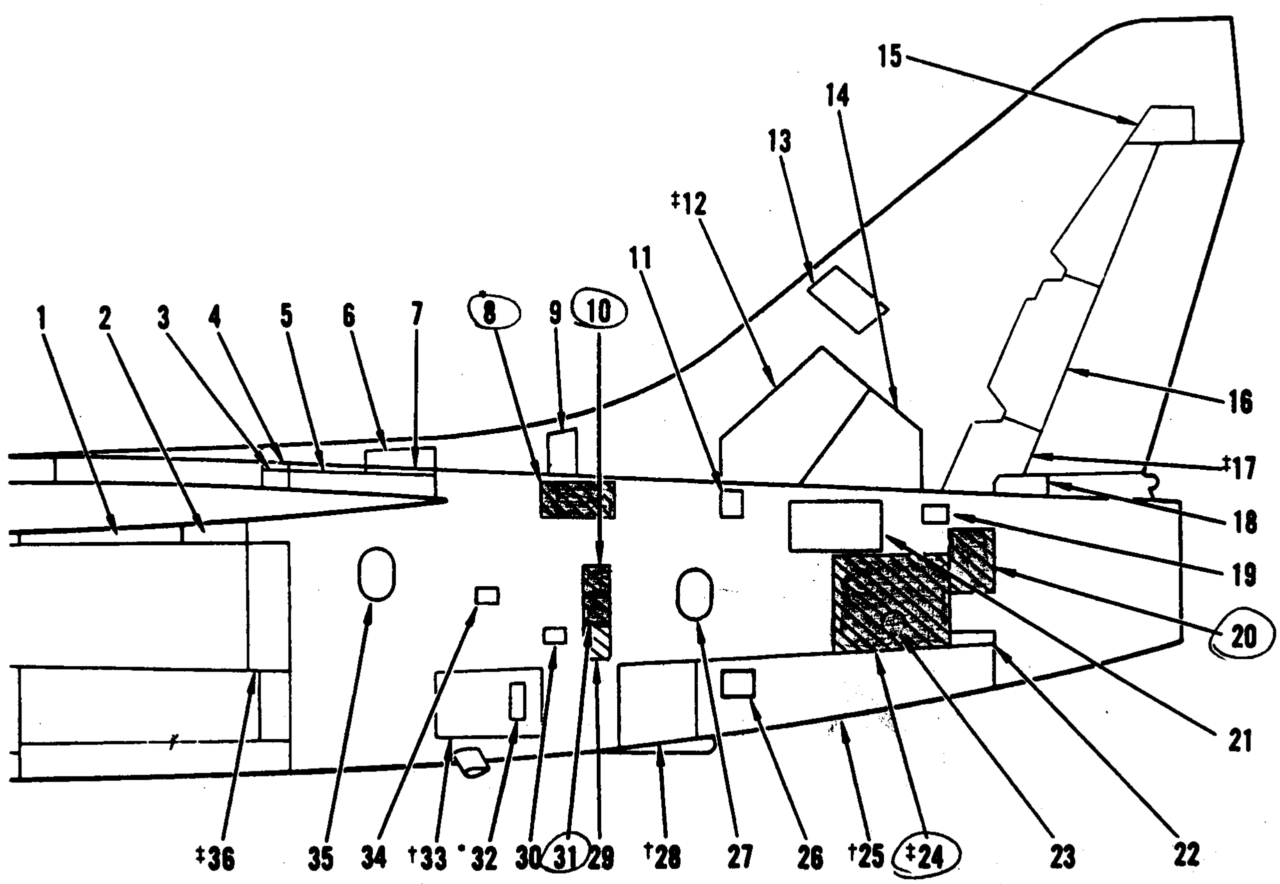
Figure 1-6. Left Forward Fuselage Access Panels



INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE	INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE
1	5112-1	Controls Access	•19	5131-2	UHT Yoke Pivot Pin Access
2	5112-2	Controls Access	20	5132-1	UHT Removal Access
3	5111-4	Controls Access	21	5131-1	Engine Removal Access
4	5111-1	Controls Access	22	5231-1	UHT Removal Access
5	5111-2	Systems Access	23	5133-1-1	Electrical Servo Access
6	5111-3	Controls Access	‡24	5133-1	Elevator Servo Access
7	5111-5	Systems Access	†25	5222-3	Engine Removal Access
•8	5122-6	PC No. 3 Reservoir Access	26	5222-3-3	Engine Oil Inspection Access
9	5121-2	Controls Access	27	5222-4	Engine Oil Filler Access
10	5122-5	Engine Access	†28	5222-2	Engine Access
11	5121-1	Controls Access	29	5122-3	Engine Access
‡12	9113-2	Controls Access	30	– – –	PC No. 3 Hyd Filter (Boost Pump)
13	9112-1	Antenna Coupling Access	31	5122-4	Engine Access
14	9123-1	Controls Access	•32	5222-1-1	Fuel Filter Inspection Access
15	9131-1	Formation Light Access	†33	5222-1	Engine Access
16	9132-1	Controls Access	34	– – –	PC No. 3 Hyd Filter (System)
‡17	9133-1	Controls Access	35	5113-2	Aft Fuel Tank Access
18	A105 133-1-1	Electrical Disconnect Access	‡36	5113-4	Roll Control Access

•Airplanes AF69-6197 and subsequent

†These access panels have armor plate attached. Be prepared for added weight when removing.

‡On airplanes AF69-6197 and subsequent these access panels have armor plate attached. Be prepared for added weight when removing.

NOTE

Shaded areas indicate panels that are subject to removal restrictions. Refer to table 1-1 for applicable restrictions.

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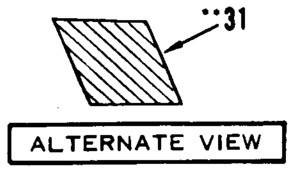
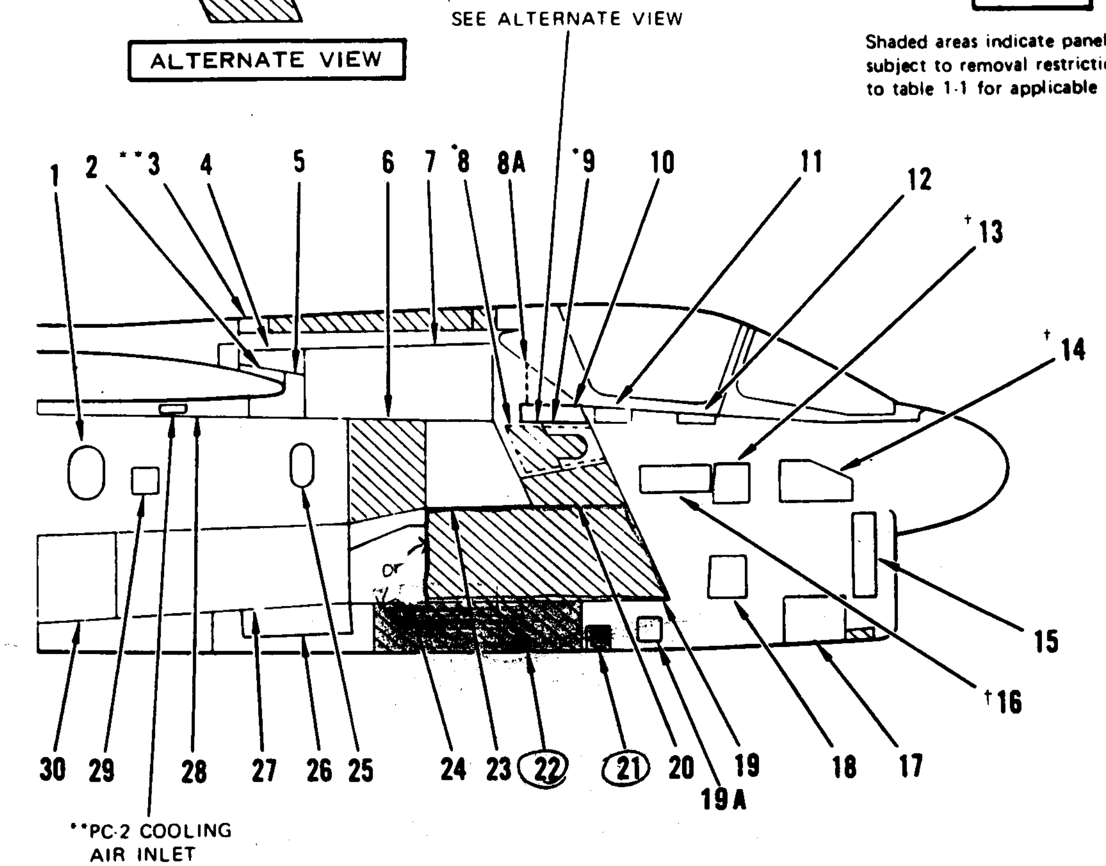
Figure 1-7. Left Aft Fuselage Access Panels



NOTE

Shaded areas indicate panels that are subject to removal restrictions. Refer to table 1-1 for applicable restrictions.



RIGHT FORWARD FUSELAGE

INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE	INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE
1	2133-2	Forward Fuel Tank Access	17	2212-8	Systems Access
2	2121-7	Wing Removal Access	18	2212-5	Systems Access
**3	2121-9	Systems Access	19	2222-4	Air-Conditioner Installation Access
4	2121-6	Systems Access	19A	2212-7	Probe/Hydraulic Access
5	211-8	Systems Access	*20	2123-4	A/R Probe Actuator Access
6	2123-3	Equipment Access	21	2212-10	Nose Gear Trunnion Access
7	2121-3	Electrical Access	22	2212-6	Air-Conditioner Access
*8	2123-11	Hydraulic Access	23	2123-6	Equipment Access
8A	2112-1	Instrument Lights Dimming Panel	24	2222-5	Ram Air Turbine Access
*9	2123-1	Hydraulic Equipment Access	25	2133-1	Forward Fuel Tank Access
10	2122-5	Electrical Access	26	2233-1	Cheek Bay Access
11	2122-1	Canopy Lock Access	27	2232-1	Avionics Access
12	2113-2	Canopy Lock Access	28	2132-1	Controls Access
†13	2211-3	Controls Access	29	2133-3	Fuselage Pylon Access
†14	2211-2	Rudder Pedal Access	30	2232-2	Sump Fuel Tank Access
15	2212-4	Antenna Access	**31	2123-9	Controls and Equipment Access
†16	2221-1	Console Access			

* Airplanes through AF69-6196
** Airplanes AF69-9197 and subsequent
† These access panels have armor plate attached. Be prepared for added weight when removing.

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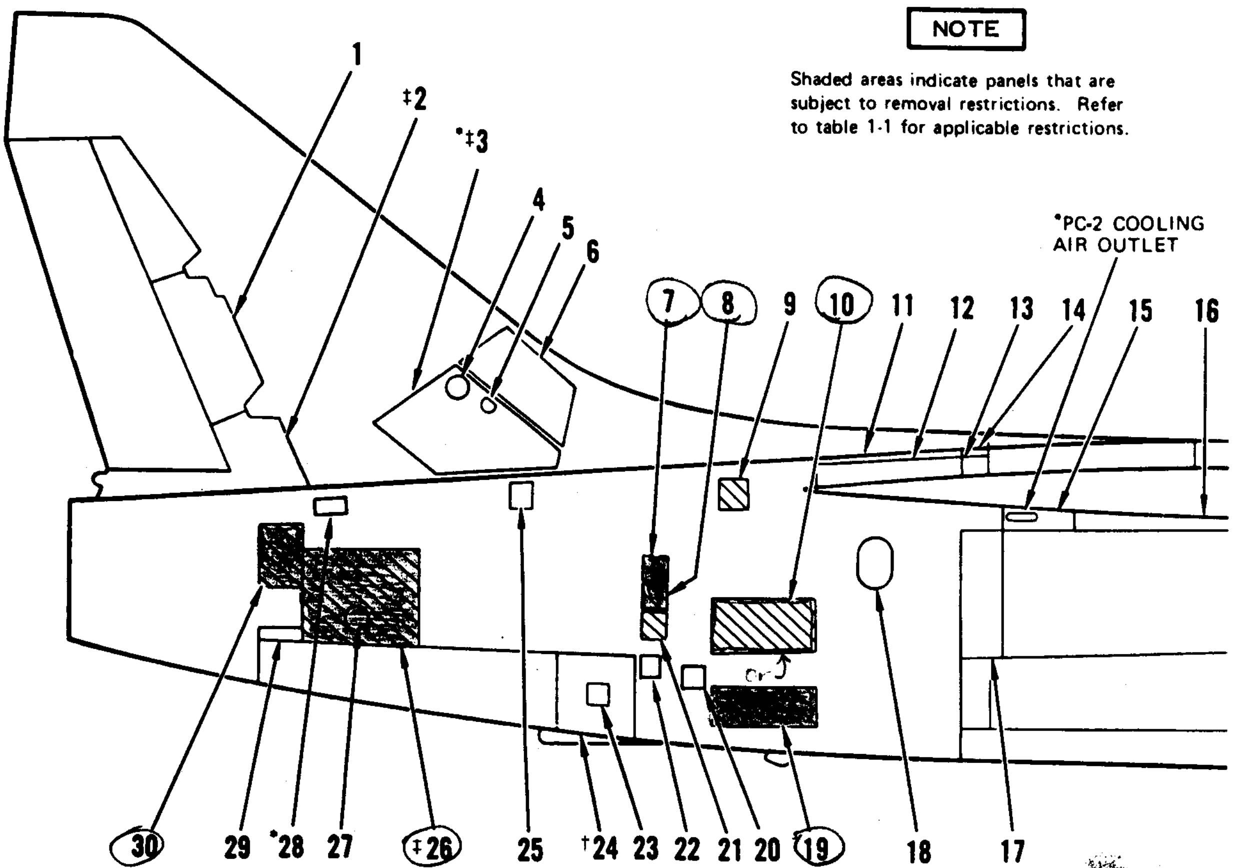
Figure 1-8. Right Forward Fuselage Access Panels



INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE	INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE
1	9132-2	Controls Access	17	6113-1	Tubing Access
‡2	9133-2	Controls Access	18	6113-2	Aft Fuel Tank Access
*‡3	9113-5	Controls Access	†19	6222-1	Engine Access
**4	9113-3	Damper Servicing Access	20	6221-2	CSD Oil Level Inspection Access
*4	9113-5-1	Damper Servicing Access			
5	9113-4	Damper Inspection Access	21	6122-3	Engine Access
6	9113-1	Controls Access	22	-- --	28 Volts DC External Power Access
7	6122-5	Engine Access			
8	6122-4	Engine Removal Access	23	6222-2-1	Starter Oil Filler Access
9	6122-2	Engine Access	†24	6222-2	Engine Access
10	6222-3	Battery Access	25	6121-1	Controls Access
11	6111-4	Systems Access	‡26	6133-1	Elevator Servo Access
12	6111-2	Controls Access	*27	6133-1-1	Electrical Servo Access
13	6111-3	Systems Access	*28	6131-1	UHT Yoke Pivot Pin Access
14	6111-1	Controls Access	29	6231-1	Horizontal Tail Access
15	6112-2	Controls Access	30	6132-1	Horizontal Tail Access
16	6112-1	Controls Access			

*Airplanes AF69-6197 and subsequent.

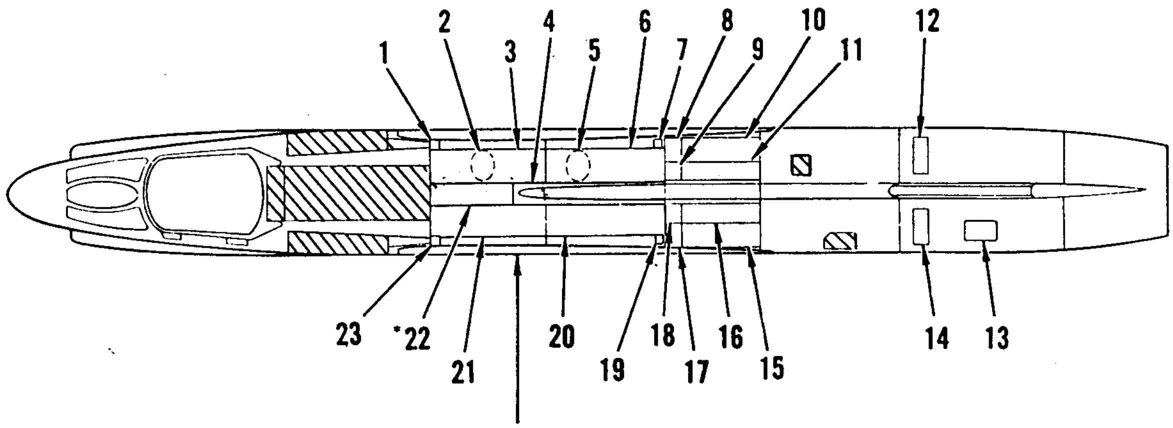
**Airplanes through AF69-6196.

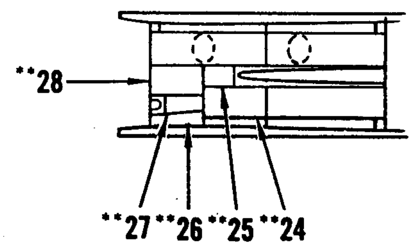
†These access panels have armor plate attached. Be prepared for added weight when removing.

‡On airplanes AF69-6197 and subsequent these access panels have armor plate attached. Be prepared for added weight when removing.

01D095-11-77

Figure 1-9. Right Aft Fuselage Access Panels





ALTERNATE VIEW

TOP OF FUSELAGE

INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE	INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE
1	4113-10	Right Forward Hoist Access	15	5111-2	Systems Access
2	4113-11-1	Fuel Tank Access	16	5111-5	Systems Access
3	4113-11	Air Conditioning Lines Access	17	5111-4	Controls Access
4	10123-1	Controls Access	18	5111-1	Controls Access
5	4123-1-1	Fuel Tank Access	19	3133-5	Left Rear Hoist Access
6	4123-1	Air Conditioning Lines Access	20	3123-1	Fuel Tank Access
7	4133-5	Right Rear Hoist Access	21	3113-11	Fuel Tank Access
8	6111-3	Controls Access	*22	10113-1	Controls Access
9	6111-1	Controls Access	23	3113-10	Left Forward Hoist Access
10	6111-2	Controls Access	**24	3113-11	Fuel Tank Access
11	6111-4	Systems Access	**25	10113-2	Controls Access
12	6121-1	Controls Access	**26	3113-12	IFR Receptacle Access
13	5131-1	Engine Removal Access	**27	3113-13	IFR Receptacle Access
14	5121-1	Controls Access	**28	10113-1	Controls Access

*Airplanes through AF69-6196

**Airplanes AF69 6197 and subsequent

NOTE

Shaded areas indicate panels that are subject to removal restrictions. Refer to table 1-1 for applicable restrictions.

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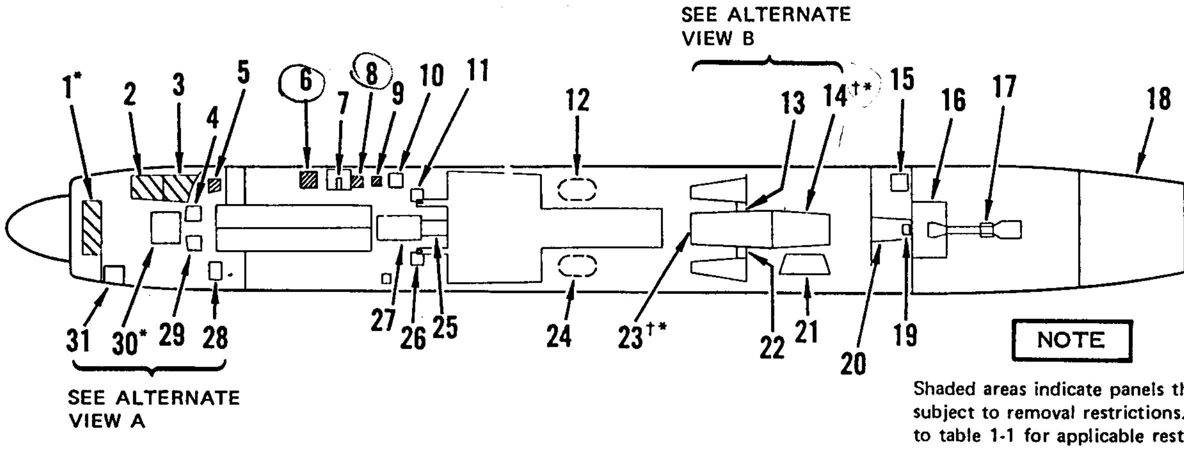
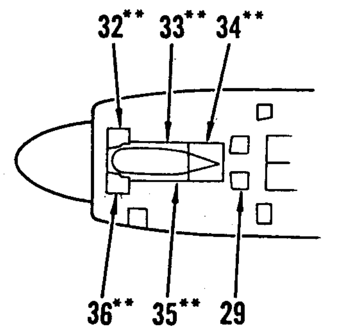
Figure 1-10. Top Fuselage Access Panels



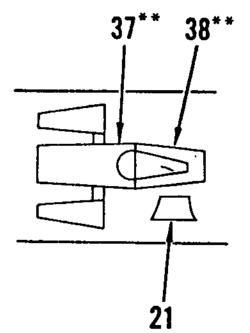
NOTE

Shaded areas indicate panels that are subject to removal restrictions. Refer to table 1-1 for applicable restrictions.

BOTTOM OF FUSELAGE



ALTERNATE VIEW A



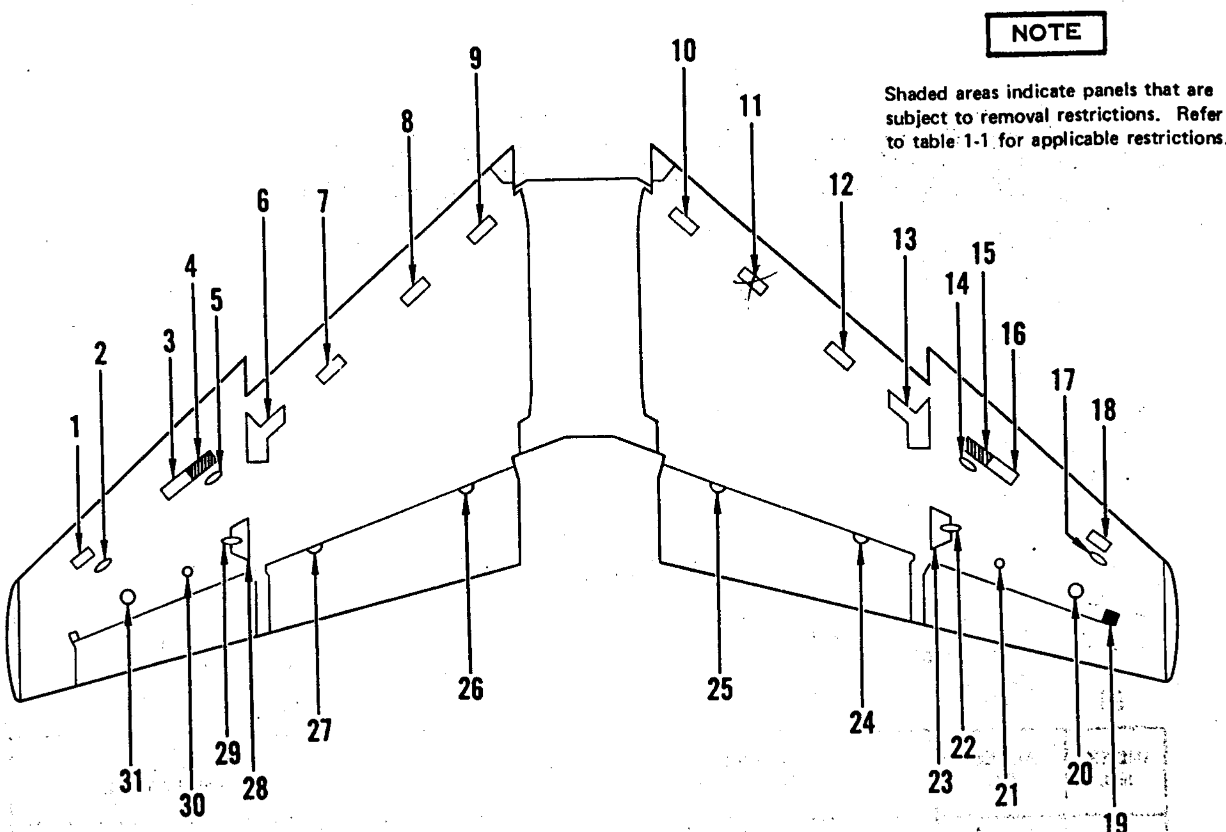
ALTERNATE VIEW B

INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE	INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE
1*	1213-4	Antenna Access	20	5223-2	Engine Access
2	1213-8	Gun Access	21	6223-1	Camera Compartment Access
3	1213-6	Gun Access	22	6213-2	Lug Pin Access
4	1213-9	Antenna Access	23†*	5213-3	Fuel Tank Access
5	1222-4	Gun Barrel Access	24	6211-1	Fuel Cell Access
6	1222-6-1	Gun Drive Access	25	1233-4	Anticollision Light Access
7	1222-6-2	Gun Drive Access	26	2233-3	Speed Brake Hinge Access
8	1222-6-3	Ammo Loading Access	27	1233-2	Radome Access
9	1222-11	Hydraulic Filter Access	28	2212-7	Hydraulic Access
10	1233-5	External AC Electrical Receptacle	29	2213-9	Hydraulic Access
11	1233-3	Speed Brake Hinge Access	30*	1213-7	Antenna Access
12	5211-1	Fuel Cell Access	31	2212-8	Systems Access
13	5213-2	Strut Pin Access	32**	1213-1	Preamplifier, Antenna Access
14†*	5223-1	Engine Access	33**	1213-2	Detector Pod Access
15	5222-2-1	Oil Sampling Access	34**	1213-3	Detector Adapter Access
16	5222-3-1	Oil Filter Access	35**	2213-2	Detector Pod Access
17	5222-3-2	Drain Installation Access	36**	2213-1	Antenna Access
18	A105133-1	Tail Cone	37**	5213-1	Antenna Access
19	5223-2-1	Accumulator Access	38**	5223-3	Engine Access

†These access panels have armor plate attached. Be prepared for added weight when removing.
*Airplanes through AF69-6196
**Airplanes AF69-6197 and subsequent.

01D127–09–82

Figure 1-11. Bottom Fuselage Access Panels



INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE	INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE
1	3112-1	Actuator Access	18	4111-1	Actuator Access
2	3112-4	Actuator Bolt Access	19	4131-1	Compass Transmitter Access
3	3112-2	Actuator Access	20	4131-3	Outer Panel Access
4	3112-3	Actuator Access	21	4131-4	Outer Panel Access
5	3112-5	Actuator Bolt Access	22	4131-5-1	Aileron Rigging Access
6	3113-1	Electrical Access	23	4131-5	Aileron Rigging Access
7	3113-4	Actuator Access	24	4133-7	Actuator Access
8	3113-6	Hydraulic Access	25	4133-10	Actuator Access
9	3113-9	Actuator Access	26	3133-10	Actuator Access
10	4113-9	Actuator Access	27	3133-7	Actuator Access
11	4113-6	Hydraulic Access	28	3132-4	Aileron Rigging Access
12	4113-4	Actuator Access	29	3132-4-1	Aileron Rigging Access
13	4113-1	Electrical Access	30	3132-3	Outer Panel Access
14	4111-5	Actuator Bolt Access	31	3132-2	Outer Panel Access
15	4111-3	Actuator Access			
16	4111-2	Actuator Access			
17	4111-4	Actuator Bolt Access			

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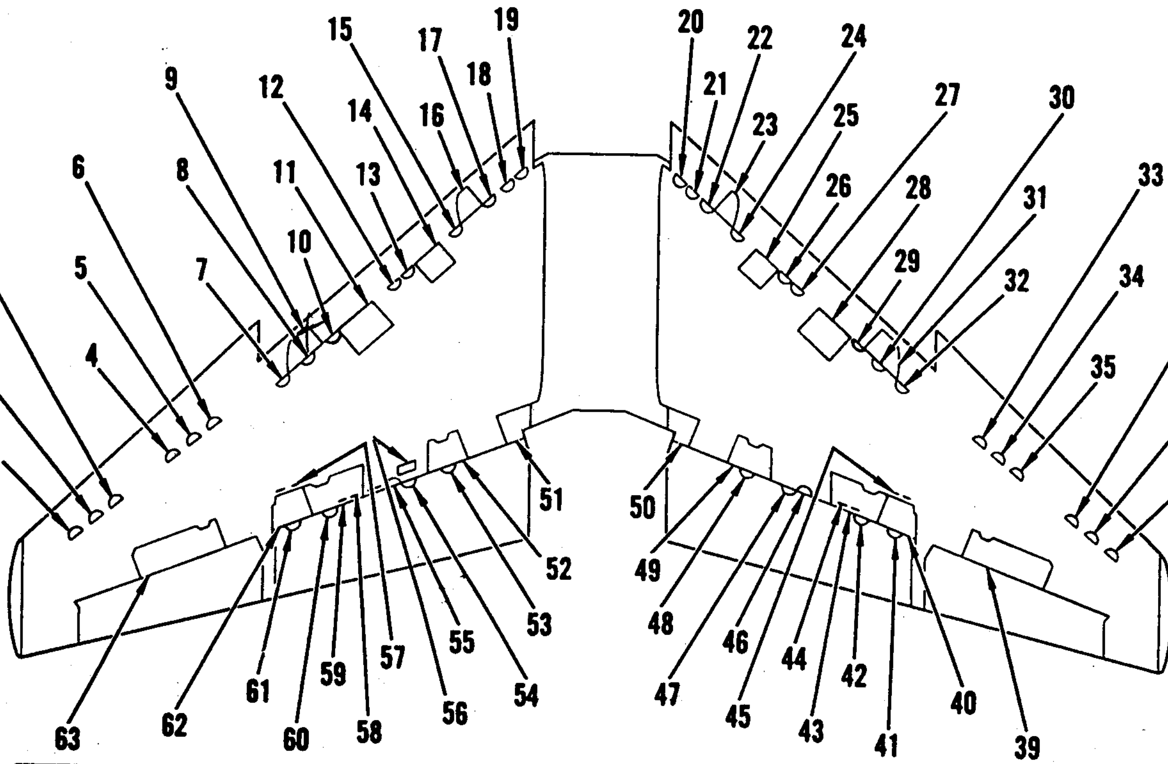
Figure 1-12. Top Wing Access Panels



INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE	INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE
1	4211-4	Leading Edge Flap Hinge Pin Access	33	3212-9	Leading Edge Flap Hinge Pin Access
2	4211-5	Leading Edge Flap Hinge Pin Access	34	3212-8	Leading Edge Flap Hinge Pin Access
3	4211-6	Leading Edge Flap Hinge Pin Access	35	3212-7	Leading Edge Flap Hinge Pin Access
4	4211-7	Leading Edge Flap Hinge Pin Access	36	3212-6	Leading Edge Flap Hinge Pin Access
5	4211-8	Leading Edge Flap Hinge Pin Access	37	3212-5	Leading Edge Flap Hinge Pin Access
6	4211-9	Leading Edge Flap Hinge Pin Access	38	3212-4	Leading Edge Flap Hinge Pin Access
7	4213-12	Leading Edge Flap Hinge Pin Access	39	3232-1	Aileron Control Access
8	4213-13	Leading Edge Hinge Pin Access	40	3233-1	Aileron Control Access
9	4213-3	Actuator Access	41	3233-6	Outboard Hinge Pin Access
10	4213-14	Leading Edge Hinge Pin Access	42	3233-8	Inboard Hinge Pin Access
11	4213-5	Electrical Access	43	3233-2	Actuator Access
12	4213-15	Leading Edge Hinge Pin Access	44	3233-12	Actuator Access
13	4213-16	Leading Edge Hinge Pin Access	45	3233-2-1	Ejector Pump Access
14	4213-7	Electrical Access	46	3233-13	Actuator Access
15	4213-17	Leading Edge Hinge Pin Access	47	3233-9	Outboard Hinge Pin Access
16	4213-8	Actuator Access	48	3233-11	Inboard Hinge Pin Access
17	4213-18	Leading Edge Hinge Pin Access	49	3233-3	Actuator Access
18	4213-19	Leading Edge Hinge Pin Access	50	3233-4	Aileron Control Access
19	4213-20	Leading Edge Hinge Pin Access	51	4233-4	Aileron Control Access
20	3213-20	Leading Edge Hinge Pin Access	52	4233-3	Actuator Access
21	3213-19	Leading Edge Hinge Pin Access	53	4233-11	Inboard Hinge Pin Access
22	3213-18	Leading Edge Hinge Pin Access	54	4233-9	Outboard Hinge Pin Access
23	3213-8	Actuator Access	55	4233-6-11	Outboard Hinge Pin Access
24	3213-17	Leading Edge Hinge Pin Access	56	4233-13	Actuator Access
25	3213-7	Electrical Access	57	4233-2-1	Ejector Pump Access
26	3213-16	Leading Edge Hinge Pin Access	58	4233-12	Actuator Access
27	3213-15	Leading Edge Hinge Pin Access	59	4233-2	Actuator Access
28	3213-5	Electrical Access	60	4233-8	Inboard Hinge Pin Access
29	3213-14	Leading Edge Hinge Pin Access	61	4233-6	Outboard Hinge Pin Access
30	3213-13	Leading Edge Hinge Pin Access	62	4233-1	Aileron Control Access
31	3213-3	Actuator Access	63	4231-2	Aileron Power Control Access
32	3213-12	Leading Edge Hinge Pin Access			

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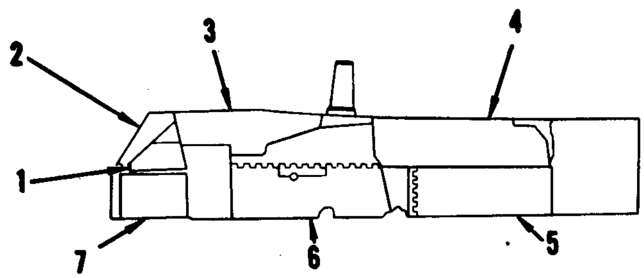
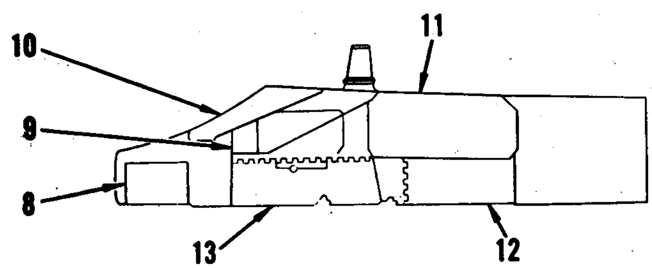
Figure 1-13. Bottom Wing Access Panels

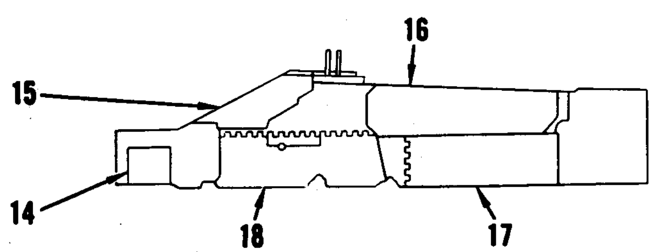
PYLON STATIONS



STATIONS 3 AND 6



STATIONS 2 AND 7



STATIONS 1 AND 8

STATIONS 3 AND 6

INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE
1	B10213-3	Electrical Receptacle Access (Left Side)
2	B10212-1	Pylon Electrical Disconnect Access
3	B10211-1	MAU-12 Access (Inboard)
3	B10213-2	MAU-12 Access (Outboard)
4	B10231-1	Main Aft Disconnect Access (Inboard)
4	B10233-1	Main Aft Disconnect Access (Outboard)
5	B10231-2	Electrical Access Stores (Inboard)
5	B10233-2	Electrical Access Stores (Outboard)
6	B10223-1	MAU-12 Access (Outboard)
6	B10221-1	MAU-12 Access (Inboard)
7	B10213-1	Electrical Access Stores (Outboard)

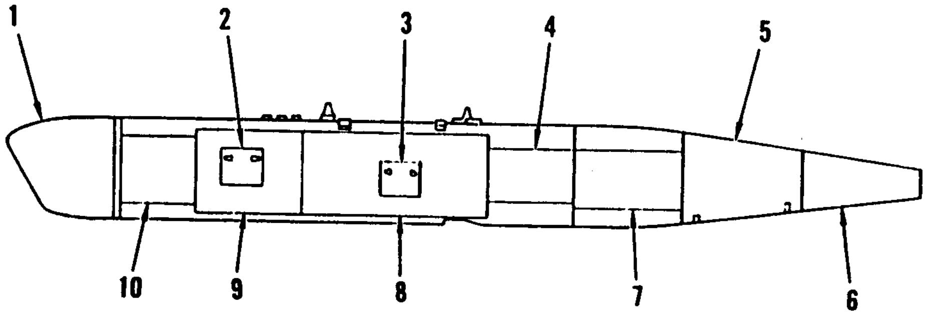
STATIONS 2 AND 7

8	B10213-1	Electrical Access Stores (Outboard)
9	B10213-2	MAU-12 Access (Outboard)
9	B10211-1	MAU-12 Access (Inboard)
10	B10212-1	Pylon Electrical Disconnect Access
11	B10233-1	Main Aft Disconnect Access (Outboard)
11	B10231-1	Main Aft Disconnect Access (Inboard)
12	B10233-2	Electrical Access Stores (Outboard)
12	B10231-2	Electrical Access Stores (Inboard)
13	B10223-1	MAU-12 Access (Outboard)
13	B10221-1	MAU-12 Access (Inboard)

STATIONS 1 AND 8

14	B10213-1	Electrical Access Stores (Outboard)
15	B10212-1	Pylon Electrical Disconnect Access
16	B10231-1	Main Aft Disconnect Access (Inboard)
16	B10233-1	Main Aft Disconnect Access (Outboard)
17	B10233-2	Electrical Access Stores (Outboard)
17	B10231-2	Electrical Access Stores (Inboard)
18	B10223-1	MAU-12 Access (Outboard)
18	B10221-1	MAU-12 Access (Inboard)

Figure 1-14. Pylon Access Panels



INDEX NO.	ACCESS NO.	ACCESS NOMENCLATURE
1	10212-1	Optics/Receiver Access
2	10212-31	Circuit Breakers and Status Indicators Access
3	10222-11	Inspection Access
4	10222-2	Video Mixer Access
5	10232-1	Video Recorder Access
6	10232-2	Tail Cone
7	10222-3	Servo Control Access
8	10222-1	ARU Access
9	10212-3	Cooling Lines and Electrical Access
10	10212-2	Electronics Access

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Figure 1-14A. FLIR Pod Access Panels (Airplanes After T.O. 1A-7-530)

1-14. ARMOR PLATE ARRANGEMENT. (See figure 1-15.)

1-15. Armor plate is provided for protection of the pilot and vital flight sustaining systems. Both ceramic composite and dual hardness steel material are used for armor plate. Ceramic armor plates are installed in the cockpit, fuselage midsection, and engine bay areas. Steel armor plates are installed on the forward pilot's compartment bulkhead, fuselage midsection and aft section, and vertical stabilizer. A functional description of armor plate is provided in the applicable maintenance sections.

1-16. MOVABLE SURFACE HAZARDS. (See figure 1-16.)

1-17. Flight control surfaces, air refueling probe, emergency power package, landing gear, and speed brake areas are potential danger areas when hydraulic power is applied to the airplane. During landing gear operational checkout, only the minimum personnel required to perform the operation shall be in the immediate area of the airplane.

1-18. DANGER AREAS. (See figures 1-17 and 1-18.)

1-19. ENGINE OPERATION HAZARDS. During engine starting, potential danger exists in the area of the starter turbine plane of rotation and adjacent to the starter exhaust. During engine operation, potential engine inlet danger exists in a conical area starting from 5 feet aft of the airplane nose and extending forward at angles of 45° left and right of the airplane centerline, to 25 feet forward of the engine air inlet duct. Engine exhaust danger exists in an area starting at the tailpipe outlet and aft to approximately 100 feet. The exact exhaust temperature range and blast area will vary according to prevailing winds. While the engine is operating, the area in line with the engine turbine wheel plane of rotation and the area adjacent to the bypass air exhaust on the bottom of the engine should be avoided. Ear protection devices are necessary in the immediate area adjacent to the airplane during engine operation. For information related to engine operation danger areas and personnel safety requirements, see figure 1-17.

1-20. RADIATION HAZARDS. For information regarding radiation hazards during ground operation of the AN/APQ-126(V)8 or AN/APQ-126(V)11 radar, see figure 1-18.

1-21. AVIONIC EQUIPMENT COOLING REQUIREMENTS.

NOTE

Ambient temperature for avionic equipment operation is defined as the temperature of the air immediately surrounding the exterior of the airplane, not the equipment.

1-22. Operation of airplane avionic equipment heats up the air immediately surrounding the equipment. To prevent the equipment environment from becoming too hot and causing eventual equipment failure, ground operation of all avionic equipment is limited in duration when ambient temperature exceeds a certain range, unless cooling air is provided. A list of airplane avionic equipment with location and method of control is provided in table 1-2. Ground operation of this equipment shall not exceed operating time limits specified for corresponding ambient temperatures and cooling requirements listed in tables 1-3 and 1-4. Table 1-3 is applicable for operation of all avionic equipment except forward looking radar (FLR). Table 1-4 is applicable for operation of the FLR. For connecting ground air-conditioner to airplane, refer to paragraph 1-51.

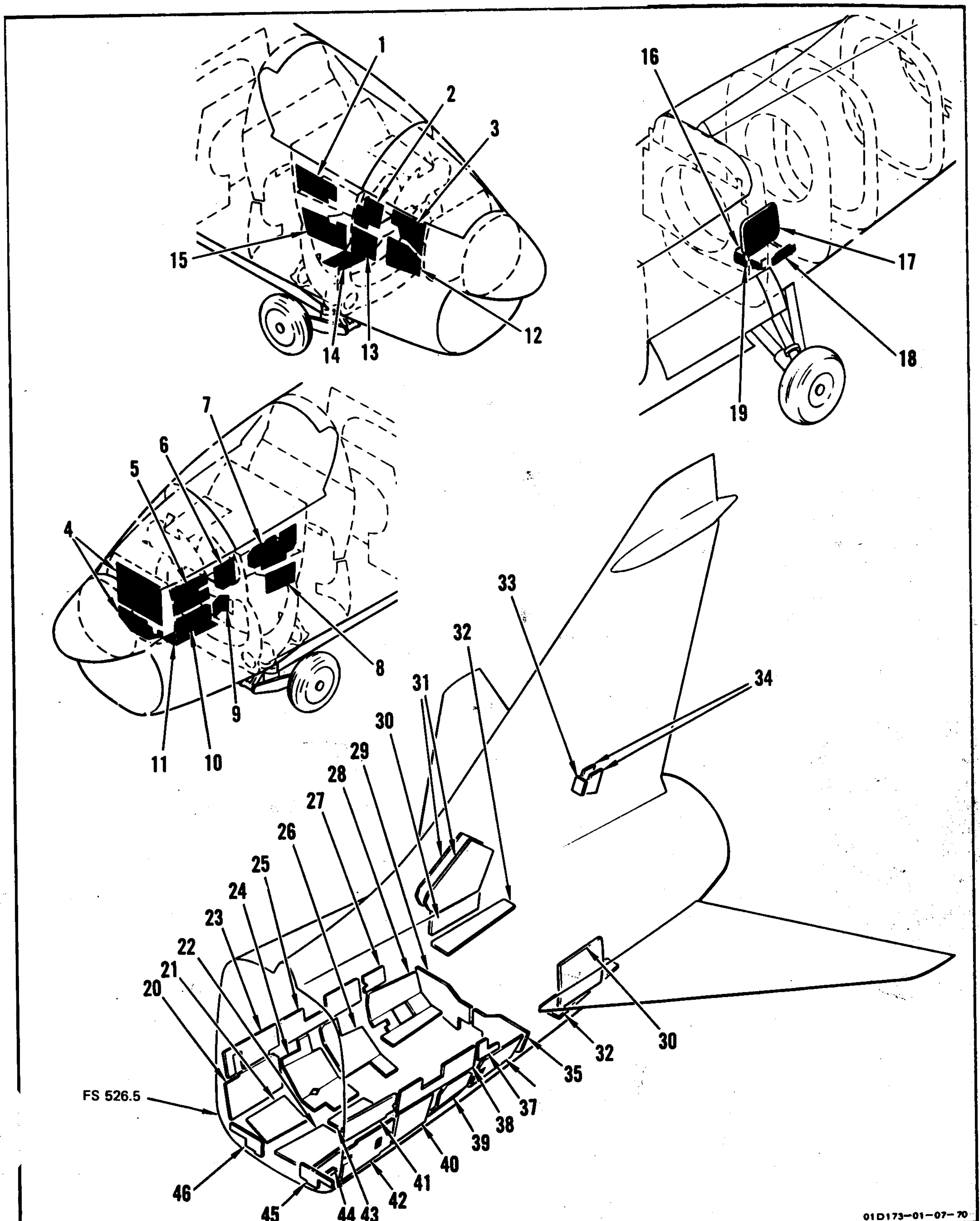

Figure 1-15. Armor Plate Arrangement (Sheet 1)

INDEX NO.	COMPONENT	INDEX NO.	COMPONENT
1	Cockpit upper right side armor plate (FS 260 to 285)	22	Access panel mounted armor plate (Access 5223-1)
2	Cockpit upper right side armor plate (FS 240 to 250)	23	Upper right armor plate (FS 526 to 552)
3	Cockpit upper right side armor plate (FS 221 to 240)	24	Mid right armor plate (FS 552 to 570)
4	Forward looking radar compartment bulkhead armor plate	25	Upper right armor plate (FS 532 to 590)
5	Cockpit upper left side armor plate (FS 221 to 240)	26	Access panel mounted armor plate (Access 6222-2)
6	Cockpit upper left side armor plate (FS 240 to 250)	27	Upper right armor plate (FS 590 to 600)
7	Cockpit upper left side armor plate (FS 254 to 275)	28	Engine removal door right side armor plate
8	Access panel mounted armor plate (Access 1221-1)	29	Engine removal door right aft armor plate
9	Cockpit lower left side armor plate (FS 240 to 247)	30	Unit horizontal tail (UHT) side armor plate (Accesses 5133-1 and 6133-1)
10	Access panel mounted armor plate (Access 1211-2)	31	Rudder power control armor plate (Access 9113-2 and 9113-5)
11	Cockpit floor armor plate	32	Unit horizontal tail (UHT) lower armor plate
12	Access panel mounted armor plate (Access 2211-2)	33	Rudder actuator servo valve forward armor plate
13	Access panel mounted armor plate (Access 2211-3)	34	Rudder actuator servo valve side armor plate (Access 9133-1 and 9133-2)
14	Pilot's ejection seat armor plate	35	Engine removal door left aft armor plate
15	Access panel mounted armor plate (Access 2221-1)	36	Engine removal door left side armor plate
16	Fuel system right side armor plate	37	Upper left armor plate (FS 590 to 600)
17	Roll feel isolation actuator armor plate	38	Upper left armor plate (FS 552 to 590)
18	Fuel system left side armor plate	39	Access panel mounted armor plate (Access 5222-2)
19	Fuel system access panel mounted armor plate (Access 5213-3)	40	Mid left armor plate (FS 552 to 570)
20	Access panel mounted armor plate (Access 6222-1)	41	Upper left armor plate (FS 526 to 552)
21	Camera compartment armor plate	42	Access panel mounted armor plate (Access 5222-1)
		43	Lower armor plate (FS 552 to 570)
		44	Lower armor plate (FS 526 to 552)
		45	Lower left armor plate (FS 526.5)
		46	Lower right armor plate (FS 526.5)

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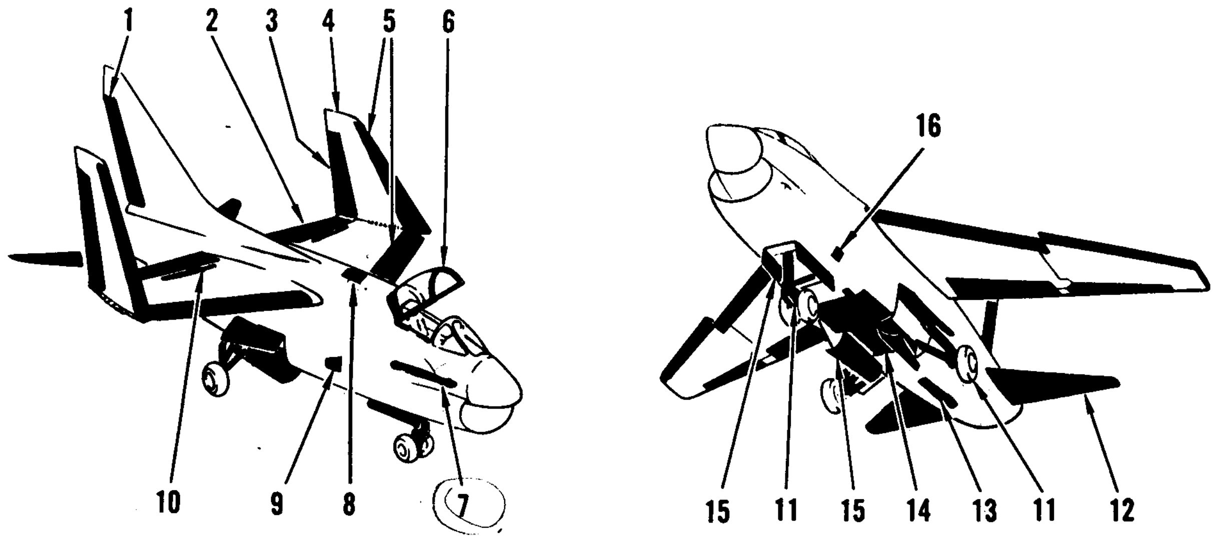
Figure 1-15. Armor Plate Arrangement (Sheet 2)



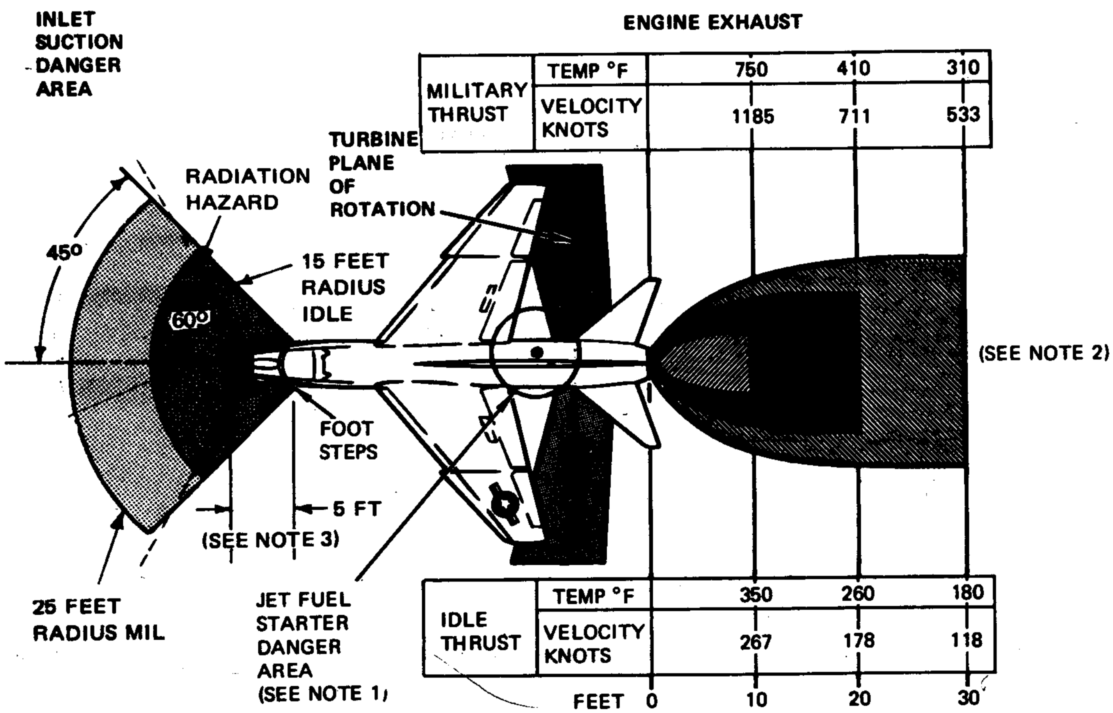
INDEX NO.	NOMENCLATURE	INDEX NO.	NOMENCLATURE

1. RUDDER
   - Hazard – Movement
   - Precaution – Stand clear
2. WING TRAILING EDGE FLAP
   - Hazard – Movement
   - Precaution – Stand clear
3. AILERON
   - Hazard – Movement
   - Precaution – Stand clear
4. WING OUTER PANEL
   - Hazard – Folding and spreading
   - Precaution – Stand clear
5. WING LEADING EDGE FLAP
   - Hazard – Movement
   - Precaution – Stand clear
6. CANOPY
   - Hazard – Closing
   - Precaution – Install jury strut
7. AIR REFUELING PROBE*
   - Hazard – Extension/retraction
   - Precaution – Stand clear
8. AIR REFUELING RECEPTACLE DOOR**
   - Hazard – Opening and closing
   - Precaution – Stand clear, install release handle safety clamp when door is open
9. EMERGENCY POWER PACKAGE
   - Hazard – Extension/ retraction
   - Precaution – Stand clear
10. SPOILER–DEFLECTOR
    - Hazard – Movement
    - Precaution – Stand clear
11. NOSE AND MAIN LANDING GEAR
    - Hazard – Extension/retraction on jacks or retraction on ground.
    - Precaution – Stand clear, install downlocks
12. UHT
    - Hazard – Movement
    - Precaution – Stand clear
13. ARRESTING GEAR
    - Hazard – Extension/retraction
    - Precaution – Stand clear
14. SPEED BRAKE
    - Hazard – Extension/retraction
    - Precaution – Stand clear
15. MAIN AND NOSE LANDING GEAR DOOR
    - Hazard – Opening and closing with airplane on jacks
    - Precaution – Stand clear
16. GUN GAS PURGE DOOR
    - Hazard – Open/Close
    - Precaution – Stand clear

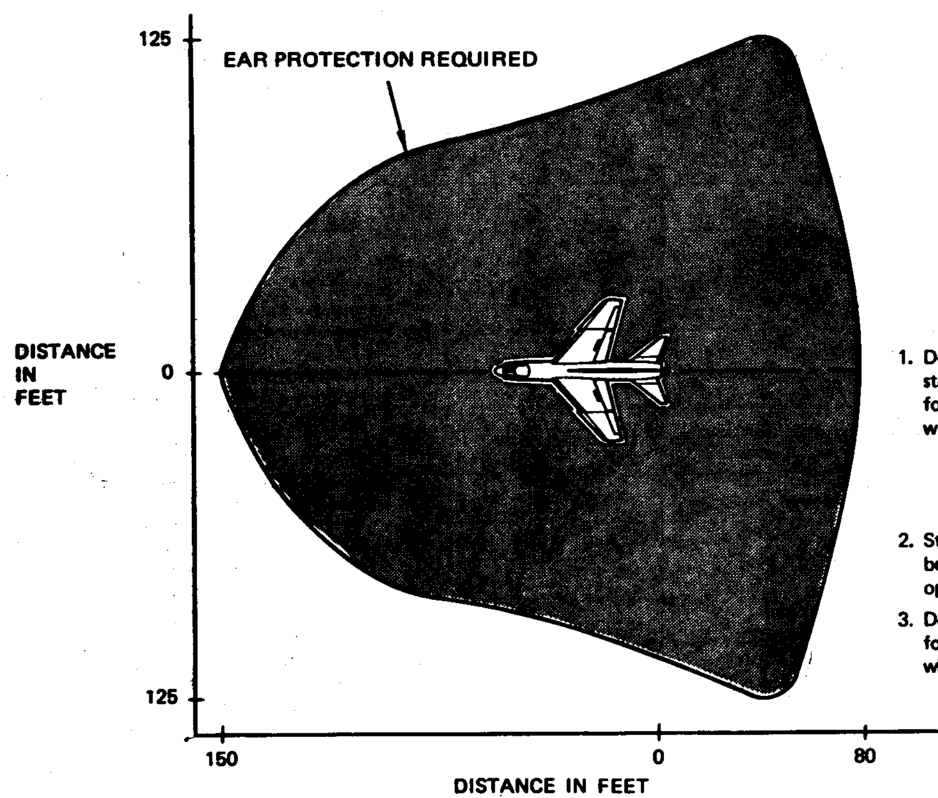
*Airplanes through AF69-6196
**Airplanes AF69-6197 and subsequent

01D004–07–77

Figure 1-16. Movable Surface Hazards



INLET, STARTER, TURBINE, AND EXHAUST DANGER AREAS



ENGINE NOISE DANGER AREA AT IDLE

NOTE

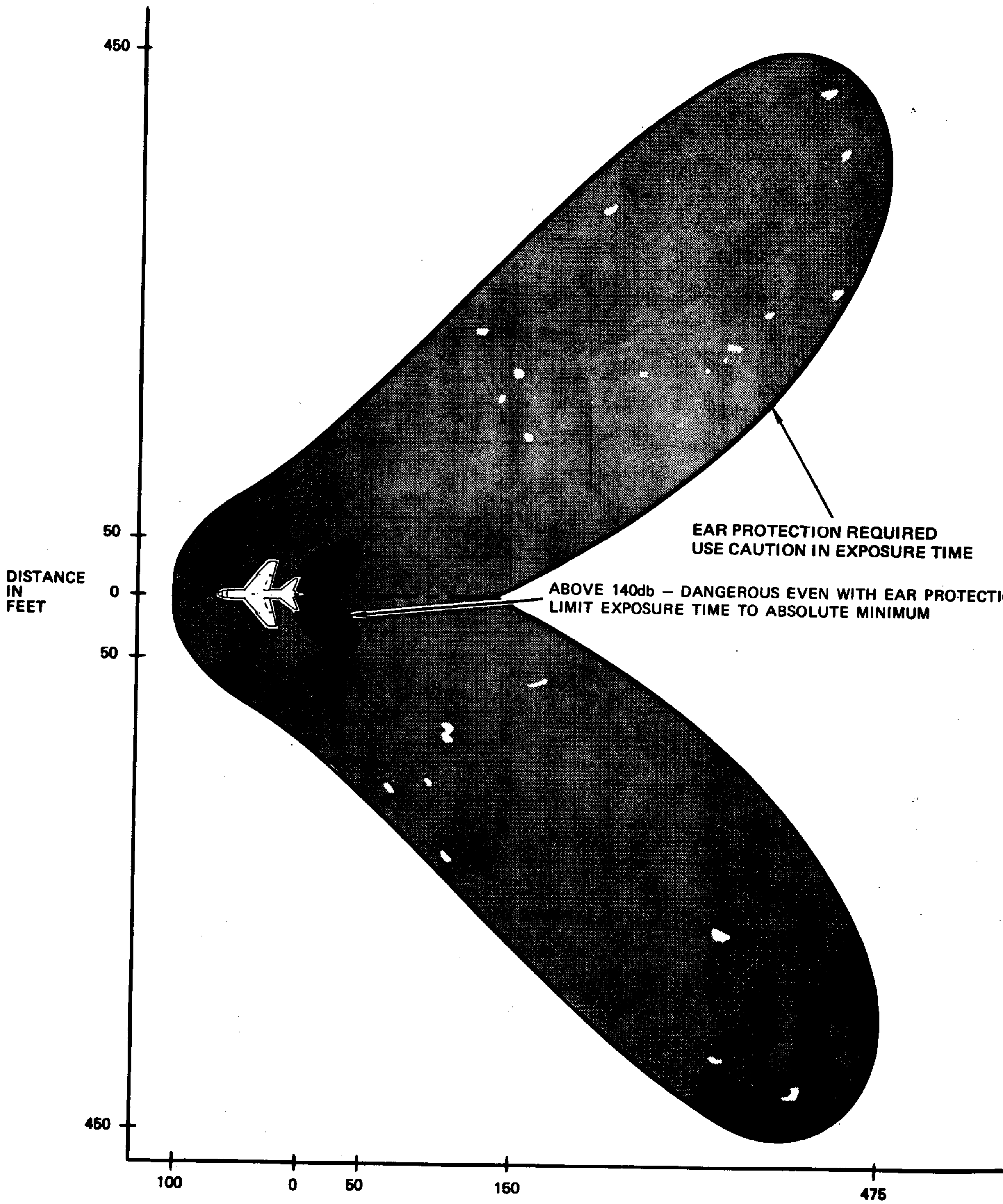
1. Do not stand within 6 feet of the jet fuel starter exhaust during engine start. The following temperatures will be encountered within 6 feet of the starter exhaust

6 inches	1,200°F
3 feet	500°F
6 feet	120°F

2. Stay clear of area within 100 feet directly behind the aircraft when the engine is operating at MIL power.
3. Do not cross under aircraft forward of nose landing gear when engine is operating.

U1D103-01-03-73

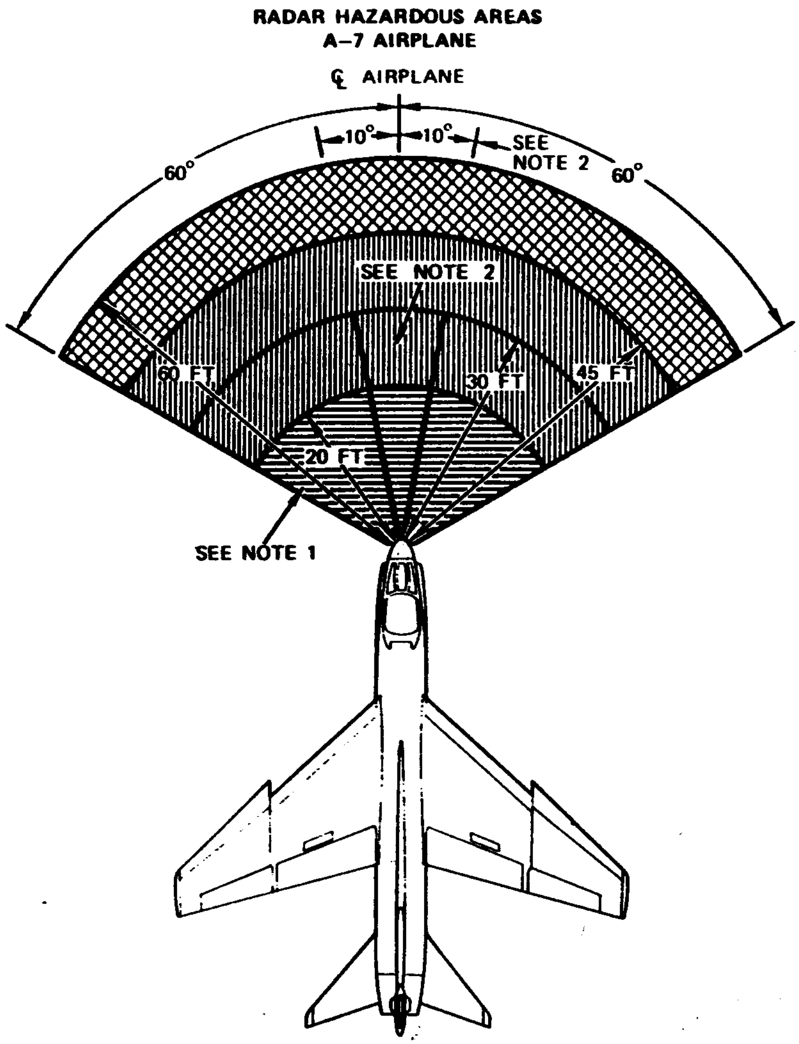
Figure 1-17. Engine Operation Danger Areas (Sheet 1)



ENGINE NOISE AT MILITARY RATED THRUST

01D103-02-09-74

Figure 1-17. Engine Operation Danger Areas (Sheet 2)



LEGEND

- EXPLOSIVES RF HAZARD
- FUEL HANDLING RF HAZARD
- PERSONNEL RF HAZARD

NOTE

1. POWER DENSITY LEVELS PERMITTED FOR PERSONNEL: 10 MILLIWATTS/CENTIMETER SQUARE (AVERAGED OVER 0.1 HOUR)
2. WHEN OPERATING IN AGR MODE (MANUAL OR SLAVED), AND IN OTHER RADIATING, NONSCANNING OPERATIONS, PERSONNEL HAZARD EXISTS IN AREA ±10° OF AIRPLANE CENTERLINE AND EXTENDS TO 30 FEET IN FRONT OF AIRPLANE.
3. DURING RADAR TRANSMISSION, RF RADIATION WARNING SIGNS WILL BE POSTED IAW AFOSH STANDARD 161-9.

01D183–01–78

Figure 1-18. Radar Hazard Areas

Table 1-2. Location and Control for Avionic Equipment

System	Avionic Compartment	Energized By
Air data computer	Right	Applying power to airplane
AN/AAR-48 forward looking infrared	FLIR pod	Cockpit control
AN/APN-154(V) radar beacon set	Access 2212-8	Cockpit control
AN/APN-190(V) radar navigation set	Right	Cockpit control
AN/APN-194(V) radar set (Airplanes before T.O. 1A-7-502)	Right	Cockpit control
AN/APN-232(V) radar set (Airplanes after T.O. 1A-7-502)	Access 1233-1	Cockpit control
AN/APQ-126(V)8 and AN/APQ-126(V)11 forward looking radar set	Nose radome	Cockpit control
AN/APR-36/37 radar homing and warning system	Left	Cockpit control
AN/APX-72(V) IFF set	Left	Cockpit control
AN/ARA-50 automatic direction finder set	Left	Cockpit control
AN/ARC-51BX UHF radio set	Right	Cockpit control
AN/ARN-52(V) Tacan set	Right	Cockpit control
AN/ARN-58(V) instrument landing set	Right	Cockpit control
AN/ARW-77 Bullpup control set	Left	Cockpit control
AN/ASN-90(V) inertial measurement set (Airplanes before T.O. 1A-7-562)	Left	Cockpit control
AN/ASW-30(V)2 and AN/ASW-30A(V)2 AFCS	Left	Cockpit control
AN/AVQ-29 and AN/AVQ-31 head-up display set	Right	Cockpit control
Antiskid control valve	Right	Cockpit control
Armament station control unit	Left	Cockpit control
AN/ARC-186(V) VHF radio set	Right	Cockpit control
Heading mode system	Right and left	Applying power to airplane
Inertial navigation unit (Airplanes after T.O. 1A-7-562)	Left	Cockpit control
Photographic system	Right	Cockpit control
RF blanking system	Right	Applying power to airplane
Roll and pitch trim amplifier	Left	Applying power to airplane
Speech security set	Right	Cockpit control
Standby attitude indicating system	Right	Applying power to airplane
Tactical computer set	Left	Cockpit control

Table 1-3. Cooling Requirements for All Avionic Equipment (Except FLR)

Ambient Temperature	Operating Time	Cooling Requirement
Below 90°F	No limit	No requirement
From 90° to 110°F	Less than 30 minutes	No requirement
From 90° to 110°F	Longer than 30 minutes	All applicable avionic accesses open
Above 110°F	Less than 30 minutes	All applicable avionic accesses open
Avobe 100°F	More than 30 minutes	Airplane air-conditioning on or ground cart connected

Table 1-4. Cooling Requirements for Forward Looking Radar (FLR)

Ambient Temperature	Operating Time	Cooling Requirement
Below 90°F	Less than 30 minutes	No requirement
Below 90°F	No limit	Forward radome open
From 90°F	Less than 30 minutes	Forward radome open
Above 90°F	More than 30 minutes[1]	Airplane air-conditioning on or ground cart connected and canopy closed

NOTE

Operation with radar extended from airplane or with antenna scan power supply-programmer cover removed shall be limited to 5 minutes maximum.

1. For prolonged testing of the AN/APQ-126(V)8 or AN/APQ-126(V)11, refer to paragraph 1-51.

1-22A. FORWARD LOOKING INFRARED (FLIR) POD AIRBORNE REFRIGERATION UNIT (ARU) WARMUP REQUIREMENT.

(Airplanes After T.O. 1A-7-530.)

CAUTION

Do not turn on AIR COND MAN OPR switch before allowing 30-minute warmup. Starting ARU before the proper warmup may damage or destroy ARU compressor.

1-22B. The FLIR pod ARU can be started with the AIR COND MAN OPR switch (COMPRESSOR-ON BYPASS switch). The switch overrides some ARU control circuitry to allow starting the ARU for checkout and servicing. It is located on the FLIR pod built-in test equipment (BITE) maintenance panel. Before using this switch to start the ARU, be sure electrical power has been connected to the airplane for at least 30 minutes. This ensures the ARU compressor crankcase heater has had time to heat the compressor oil for good lubrication.

1-23. AIRPLANE CLEANING. (Refer to T.O. 1A-7D-23, Section VIII.)

1-23A. For de-icing and snow removal information, refer to T.O. 1-1-1 and T.O. 42C-1-2.

1-24. AIRPLANE EXTERNAL VENTS AND DRAINS.

1-25. For the location of airplane external vents and drains, see figure 1-19.

1-26. ELECTRICAL (STATIC) GROUNDING OF AIRPLANE AND SUPPORT EQUIPMENT.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	7527543-10 (Oklahoma City ALC)	Nose radome shorting rod	Relieve static charge buildup from radome.

1-27. To prevent external sparking due to static or stray electricity, all airplanes shall be effectively grounded at one or more points during all servicing and maintenance operations and when hangared, moored, or parked as specified in the applicable servicing or maintenance procedures. Static ground receptacles (figure 1-20) are provided for convenient and effective grounding of airplane. The airplane shall be grounded to an approved low resistance earth ground (T.O. 00-25-172) using an approved low resistance cable(s) connected to the airplane receptacle(s) and to the earth ground and airplane receptacle(s). The airplane end of the ground cables must be equipped with an MS25384-2, or equivalent, plug. Support equipment shall be statically grounded as specified in T.O. 00-25-172, AFM 127-101, or applicable systems maintenance instructions. To prevent creating a spark at the airplane or support equipment, the static ground cable(s) shall always be connected to the earth ground before connecting to the airplane or support equipment. For static grounding of the airplane and support equipment for fuel servicing, refer to paragraph 3-60.

WARNING

To prevent possible severe electrical shock to personnel by static charge buildup on nose radome, a shorting rod will be applied to the radome after every flight.

1-27A. After static grounding the airplane, connect ground wire of shorting rod to an approved static ground and apply rod to the AN/APQ-126 radome to relieve possible static charge buildup before performing work in vicinity of radome. Move rod over entire radome surface to ensure charge is relieved.

1-28. CONNECTING AND DISCONNECTING EXTERNAL ELECTRICAL POWER.

NOTE

- FOR DEPOT USE ONLY; when A/M32A-60 external power unit is not available, MD-3, MD-3A, MD-3M, or MD-4 may be used, provided modified adapter, MBE72076, is installed on the external power cable prior to connecting cable to aircraft. When disconnecting, remove the adapter with the cable. Do not pull cable from adapter. At no time will an alternate unit be connected directly to the external power receptacle.
- Instructions specified in paragraph 1-30 will be followed when connecting AC power to aircraft.
- Avionic equipment cooling requirements will be maintained with a suitable ground air conditioner.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
1-21	A/M32A-60	External power unit	Apply external electrical power to airplane.

1-29. Ground airplane by connecting a low impedance ground wire from an approved ground connection on the ramp to one of the static ground receptacles shown in figure 1-20.

1-30. CONNECTING AC POWER. (See figure 1-21.) The following instructions are provided for connecting ac electrical power.

WARNING

- To prevent possible injury to personnel or damage to equipment, ensure ECM pod power circuit breakers CB3255, CB3256, CB3262, CB3263, CB3264, CB3265, CB3266, and CB3267 are open before connecting electrical power. This will prevent inadvertent activation of ECM pod(s).
- On airplanes after T.O. 1A-7-530, to prevent possible injury to personnel or damage to equipment, ensure FLIR pod circuit breakers CB306, CB340, CB3059, CB3060, and CB3061 are open before connecting electrical power.
- To prevent dumping fuel on ramp and endangering airplane and personnel by fire hazard, ensure fuel dump switch is in OFF (cover down) position before applying external electrical power or starting engine.
- Ensure that fuel is not evident underneath aircraft before applying external electrical power or starting engine.
- To prevent possible serious injury or death to personnel, ensure that the requirements of T.O. 11A-1-33 are complied with before connecting external electrical power.

CAUTION

- To prevent damage to battery charger if battery is removed or disconnected, ensure CB401 and CB402 (airplanes before T.O. 1A-7-551), or CB406 (airplanes after T.O. 1A-7-551) are open before connecting electrical power.
- Prior to connecting external electrical power for routine airplane systems tests, open circuit breakers CB396, CB3008, and CB3213 for the emergency accumulator heater blankets. This will prevent prolonged exposure of accumulators to heat and reduce possibility of O-ring damage.

NOTE

- Normal dc electrical power requirements are provided by connecting external ac power to the airplane except for starting engine. Battery power only shall be used for engine starts. If external electrical power is required for engine starts. If external electrical power is required for engine start, a booster battery may be used (paragraph 1-31).
- On airplanes before T.O. 1A-7-551, if airplane has been setting idle for a prolonged period (not to exceed 15 days) without charging battery and battery voltage has dropped below 23.8 open circuit volts, the battery may be partially recharged by connecting external ac electrical power. The battery cannot be fully recharged except in the battery shop.
- On airplanes after 1A-7-551, if indication on dc voltmeter M403 drops below +24.4 volts, the battery may be recharged by connecting external ac electrical power.

a. Check that master generator switch is in OFF-RESET and that other cockpit switches and controls are in off, normal, or safe condition.

b. Open ac external power receptacle access 1233-5 and connect power cable from A/M32A-60 power unit to external power receptacle.

c. Start and operate power unit (T.O. 35C2-3-372-1).

NOTE

External power unit ac and dc generator control switches shall be closed before applying power to airplane.

d. Press remote control switch and release; then place master generator switch in TEST.

internal locking devices, may result in damage to the actuator. Maintain pressures and flow rates specified in maintenance or checkout procedures during all operations. If pressure and flow requirements are not specified in the maintenance or checkout procedure being performed, operate test stand at normal system pressure and flow. To prevent damage to hydraulic cylinders with internal locking mechanisms, hand pump operation must be limited to the following:

a. Speed brake cycling.

b. Folding/spreading of the wings.

c. Charging of the utility brake and emergency accumulators.

d. Static pressurization of the system for leak detection.

1-41. Differential pressure across hydraulic system filter assemblies, which cause a backflow of fluid through filter elements, may cause damage to the element. To prevent excessive back pressure across filter elements when reducing or removing external hydraulic pressure from a system, reduce test stand output gradually to allow the system surge damper accumulator pressure to drop simultaneously. To shut down the test stand, reduce pressure gradually to 750 psi or below before opening test stand bypass valve or shutting off pressure output.

1-42. Before applying external hydraulic power with speed brake in extended position, ensure that open accesses 1232-1 and 2232-1 are supported by stay assemblies attached to aft bulkhead of each panel. Otherwise, retraction of the speed brake will result in damaged equipment from interference with unsupported access doors.

1-43. Ensure that wingfold support strut handle is unlatched before applying external hydraulic power. Otherwise, handle may become jammed in a latched position.

1-44. Unless required by operational checkout, do not cycle flight controls without all PC systems pressurized.

1-45. CONNECTING. (See figure 1-22.)

NOTE

The TTU-228/E-1A, A/M27T-2, or MJ-2A test stand must be used when requirement is for open system operation (system bleeding, draining, or flushing procedures). These stands are capable of open or closed system operation. In open system operation, return fluid from the airplane is directed through the test stand reservoir and to the test stand pumps. In closed system operation, return fluid does not flow into the test stand reservoir but is recirculated to the airplane by the test stand pumps.

a. For test stand TTU-228/E-1A, perform the preoperational checkout, bleed, and purge procedures outlined in paragraphs 1-46 through 1-49. For all other test stands, ensure that test stand lines are purged of air by performing the following:

1. Using 7425132 adapter, connect test stand pressure and return lines together.

2. Place test stand reservoir selector valve in position for open system operation.

3. Start test stand in accordance with applicable manual and operate at low pressure/flow to purge air from lines.

4. Shut down test stand and disconnect lines from adapter.

b. Connect external electrical power (paragraph 1-28).

WARNING

When the emergency accumulators are dumped, resulting surge pressures to the return line may cause inadvertent retraction of the nose landing gear or actuation of the flaps if accumulator return line restrictor has been removed for any reason. To prevent injury to personnel and possible damage to the airplane, ensure that the nose gear downlock is installed and that the flap area is cleared.

CAUTION

If the emergency brake accumulator (station 7) is dumped and the utility wheel brake accumulator (station 5) is depleted, wheel brakes will not be available until engine has been started, external hydraulic power has been applied to PC No. 2 system, or utility brake accumulator has been replenished to a minimum of 2,300 psi by hand pump.

1-33. Deleted.

1-34. CONNECTING AND DISCONNECTING EXTERNAL HYDRAULIC POWER.

NOTE

Hydraulic Fluid Specifications

USAF	NATO
*MIL-H-83282	*H-537
*MIL-H-5606B	*H-515

*Specified fluids can be mixed.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Connect electrical power
1-22	TTU-228/E	Hydraulic test stand, engine driven	Apply external hydraulic power to airplane
	or		
	TTU-228/E-1A	Hydraulic test stand, engine driven	
	or		
	A/M27T-2	Hydraulic test stand, electric motor driven	
	or		
	MJ-2A	Hydraulic test stand, engine driven	
	7425131-100 (Oklahoma City ALC)	Hose assembly	Connect hydraulic test stand to airplane PC systems
	7425132	Adapter, flushing (part of -100 hose assy)	Connect pressure and return hoses together for flushing
	7425133-10	Pressure hose (part of -100 hose assy)	Connect MJ-2A test stand to airplane
	7425134-10	Return hose (part of -100 hose assy)	Connect MJ-2A test stand to airplane
	7425146	Adapter, return (part of -100 hose assy)	Prevent pressure surge in airplane return system during stand shutdown

1-35. **PRECAUTIONS.** Airplane engine shall not be operating when connecting external hydraulic power. To pressurize the entire PC No. 2 hydraulic system, place flap handle in FLAP UP, open the emergency accumulator shutoff valve, and operate hydraulic test stand.

1-36. Personnel should be thoroughly familiar with operating requirements and procedures given in applicable test stand manual. Refer to List of Reference Publications for applicable manual on test stand.

1-37. When connecting external hydraulic power, leave enough slack in hoses to prevent weight of hose from pulling against airplane hydraulic system plumbing. Keep hoses uniformly bent when they are routed around structure or equipment. The hydraulic test stand return hose shall be kept as short as possible to minimize buildup of back pressure in return line. Hoses should be thoroughly flushed before connecting to airplane.

1-38. Ensure that all hydraulic connections are secure, rigging pins are removed, and all hydraulic system controls are positioned in same relative position as activated system before applying external hydraulic power. Clear personnel from range of movable surface hazards (figure 1-16). Ensure that hydraulic test stand is free from contamination.

1-39. Avoid kinking and damaging hydraulic hoses. Maintain the following minimum inside bend radii; 1/2-inch pressure hose, 5.75 inches; 5/8-inch pressure hose, 6.50 inches; 3/4-inch pressure hose, 7.75 inches; and 1-inch return hose, 9.62 inches.

1-40. Slow application of external hydraulic pressure, when operating systems with actuators equipped with

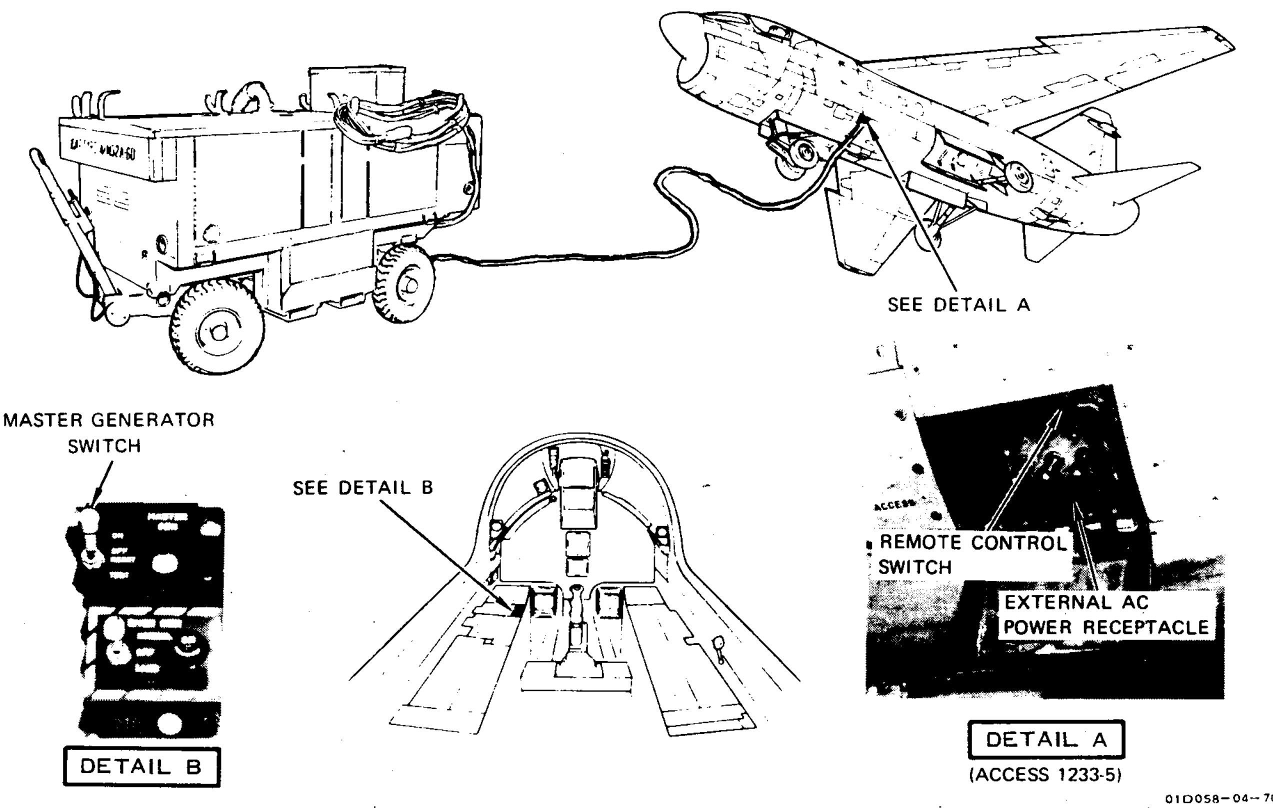


Figure 1-21. Connecting and Disconnecting External Electrical Power

1-31. Deleted.

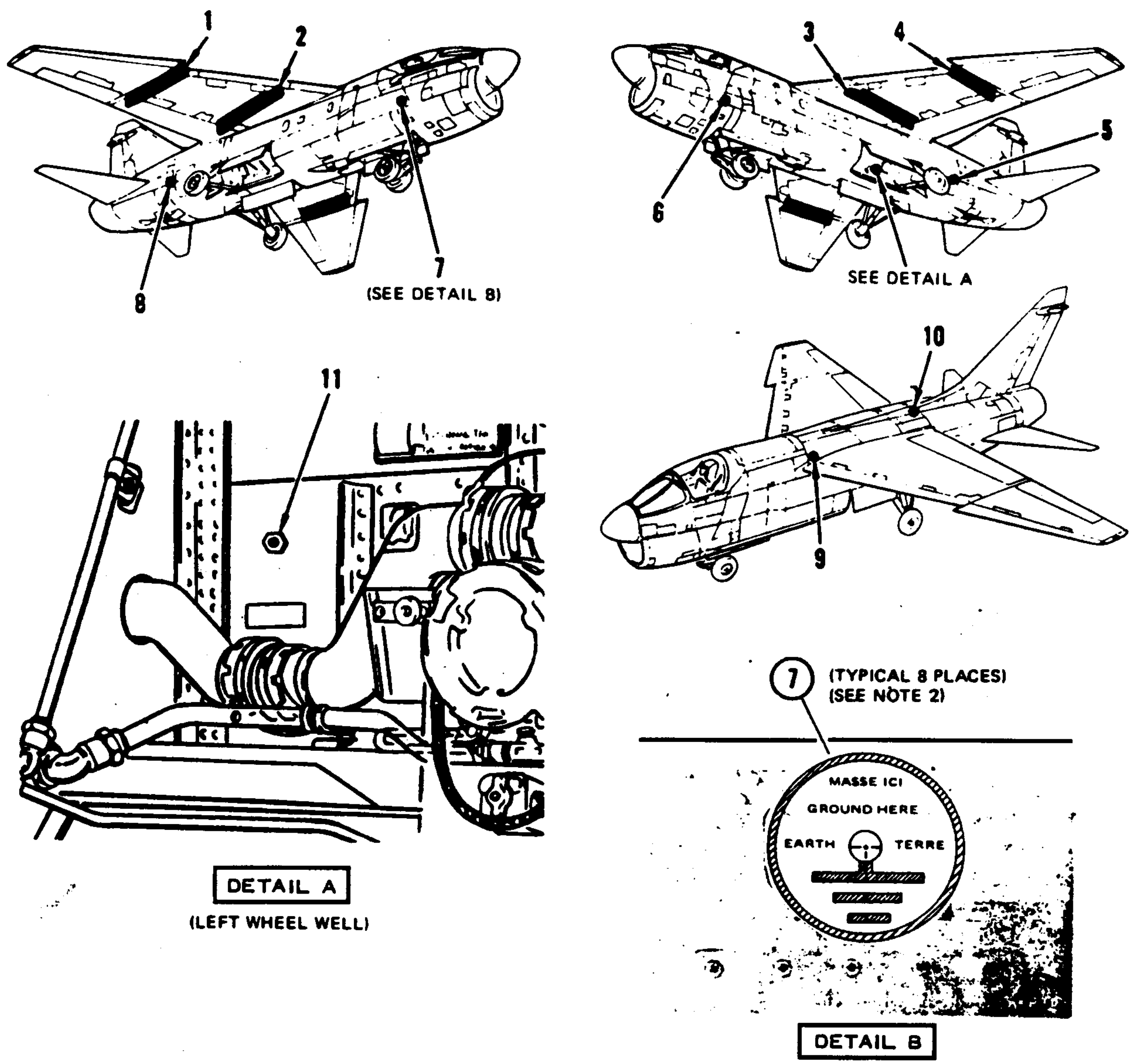
1-32. DISCONNECTING AC POWER. The following instructions are provided for disconnecting ac electrical power.

a. Place master generator switch in OFF-RESET.

b. Shut down A/M32A-60 power unit.

c. Disconnect external power cables.

d. Close ac external power receptacle access, 1233-5.



NOTES

1. Use MS25384 type grounding plug, or equivalent, on static ground wire.
2. Wing station pylons 1, 3, 6 and 8 static ground receptacles are approved airplane static ground points regardless of markings.

INDEX NO.	STATIC GROUND RECEPTACLE LOCATION
1	Wing Station No. 8 Pylon
2	Wing Station No. 6 Pylon
3	Wing Station No. 3 Pylon
4	Wing Station No. 1 Pylon
5	Fuselage (FS 563)
6	Fuselage (FS 275)
7	Fuselage (FS 275)
8	Fuselage (FS 563)
9	Fuselage (3113-10# or 4113-10■)
10	Fuselage (5111-3)
11	Left Wheel Well

#Airplanes through AF69-6196
■Airplanes AF69-6197 and subsequent

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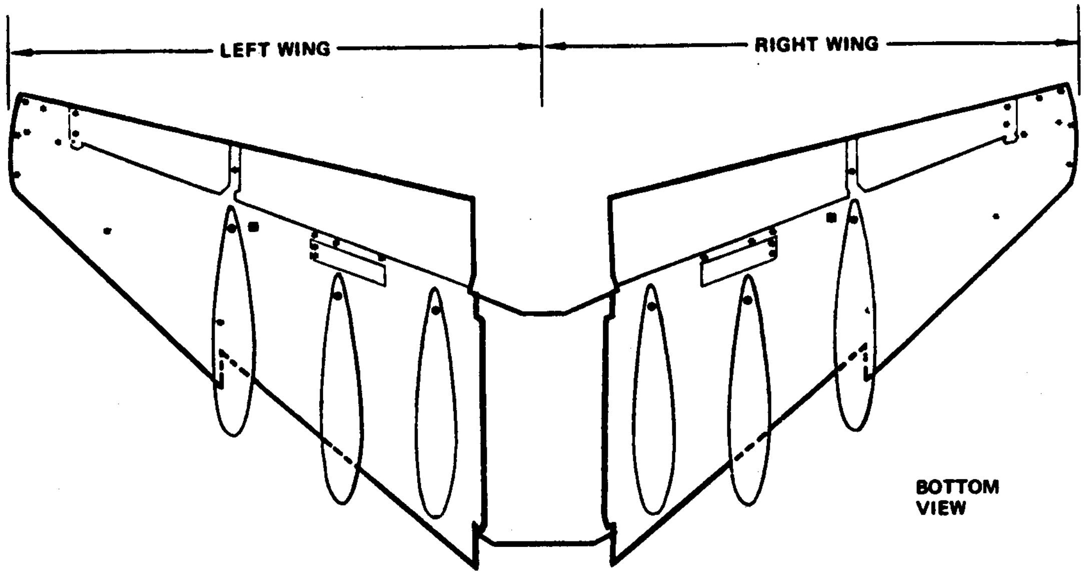
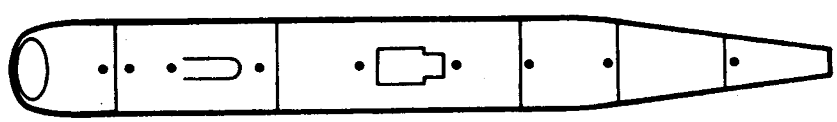
Figure 1-20. Airplane Static Ground Locations





FLIR POD ††
BOTTOM VIEW

LEGEND

- Condensation drains in wing panels
- Condensation drains in pylons and FLIR pod
- Fuel drains (tank sump drains)

†† Airplanes After T.O. 1A-7-530

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Figure 1-19. Airplane External Vents and Drains (Sheet 3)

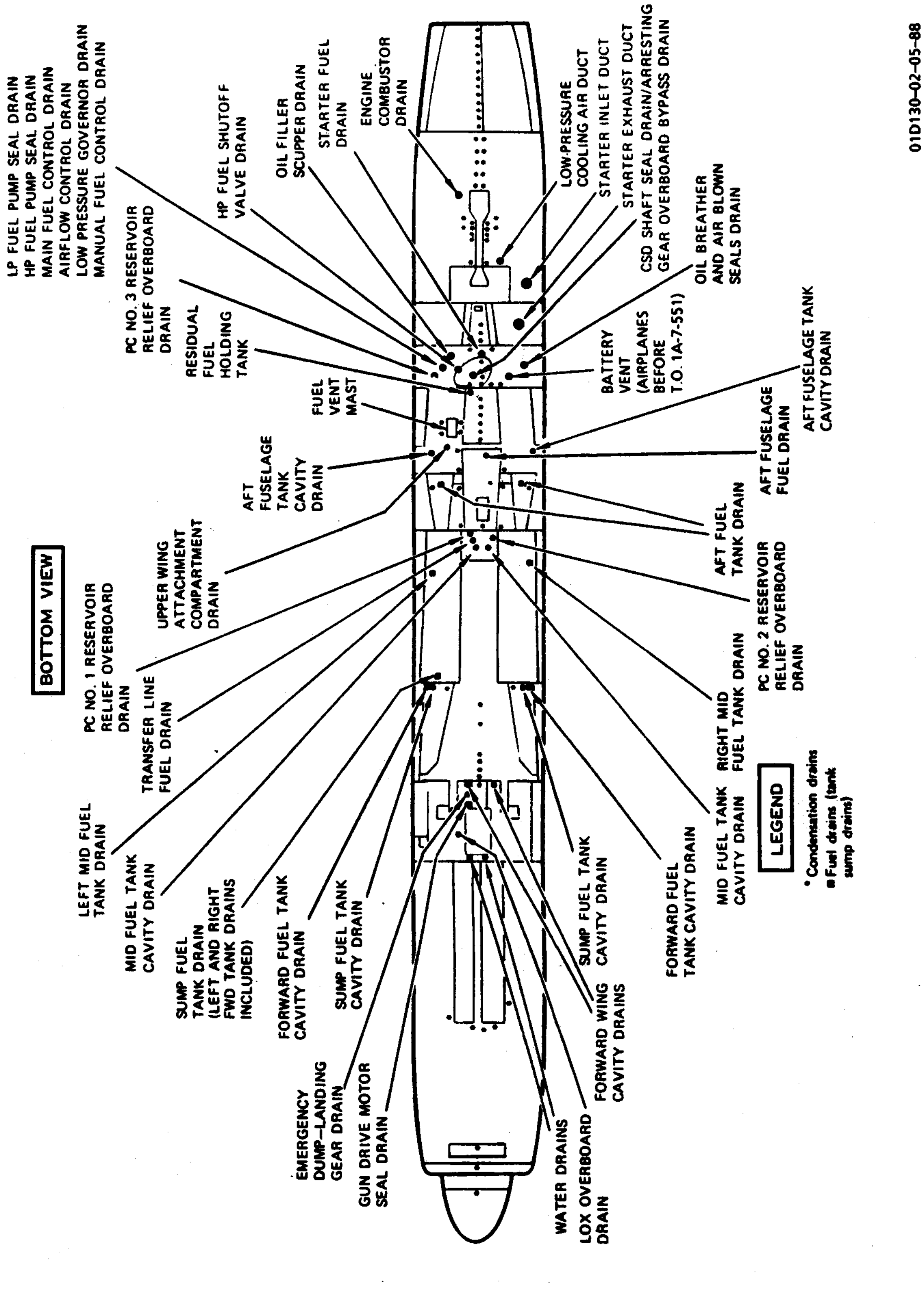


Figure 1-19. Airplane External Vents and Drains (Sheet 2)

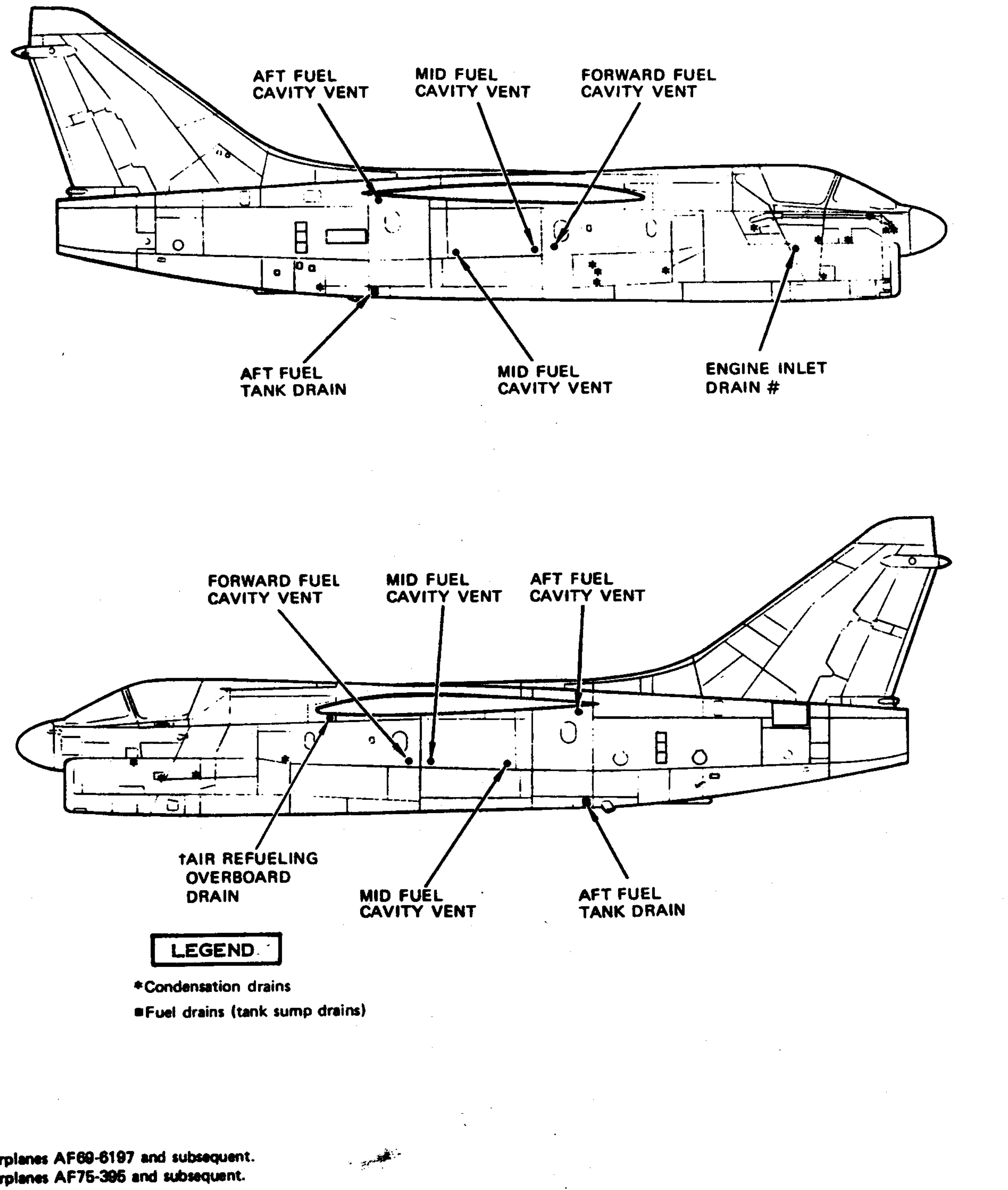


Figure 1-19. Airplane External Vents and Drains (Sheet 1)

c. Place emergency accumulator test switch in DUMP and hold for approximately 1 minute. Place switch in PRESS and check accumulators for proper precharge pressure (table 3-6).

CAUTION

To prevent damage caused by hydraulic fluid contamination to KB-18A camera, ensure that camera compartment cover is installed before connecting or disconnecting external hydraulic power to PC No. 2 system.

d. Open access 6222-1 when connecting hydraulic power to PC No. 2 system and access 5222-1 when connecting to PC No. 3 system. PC No. 1 system quick-disconnects are located in left wheel well.

NOTE

The test stand should be set for closed system operation except for hydraulic system bleeding, draining, or flushing procedures. When test stand is set for open system operation, the airplane reservoir will empty into the test stand reservoir when hydraulic power is applied and servicing of airplane reservoir will be necessary after maintenance is completed.

To prevent excessive reservoir servicing, test stand can be set for closed system operation for component bleeding where only a small amount of fluid will be bled. However, reservoir should be closely monitored to prevent depletion of fluid.

e. Place reservoir selector valve for closed system operation for all operations except bleeding, draining, or flushing. Place valve for open system operation when performing bleeding, draining, or flushing procedures.

f. When performing bleeding procedures, ensure test stand reservoir is vented to atmosphere.

g. Remove airplane pressure and return line quick-disconnect caps.

h. Connect hydraulic test stand pressure and return lines to airplane as shown in figure 1-22.

CAUTION

If external hydraulic power is applied to PC No. 3 with engine fuel boost pump shutoff valve open, damage to the boost pump and hydraulic motor can result.

i. On airplanes AF69-6197 and subsequent, when connecting external hydraulic power to PC No. 3, place engine fuel boost pump shutoff valve in closed position. Shutoff valve is in access 5122-5.

NOTE

Set test stand for airplane system pressure unless otherwise specified in maintenance or checkout procedure being performed.

If engine motors during application of external hydraulic power, check for defective hydraulic pump pressure line check valve.

j. Start hydraulic test stand in accordance with applicable manual for test stand according to table 1-5 and set for 3,000 psig pressure and 20 gpm flow or as specified in applicable maintenance procedure (for TTU-228/E-1A test stand, refer to paragraph 1-50).

k. Apply pressure to airplane system by opening test stand flow control valve and slowly closing test stand high pressure bypass valve.

Table 1-5. Operation Manuals for Hydraulic Test Stands

Part Number	Nomenclature	Operation Manual Number
TTU-228/E, TTU-228/E-1A	Hydraulic test stand, engine driven	T.O. 33D2-5-36-31
A/M27T-2	Hydraulic test stand, electric motor driven	T.O. 33D2-5-39-1 and T.O. 33D2-5-70-1
MJ-2A	Hydraulic test stand, engine driven	T.O. 33A2-2-24-21

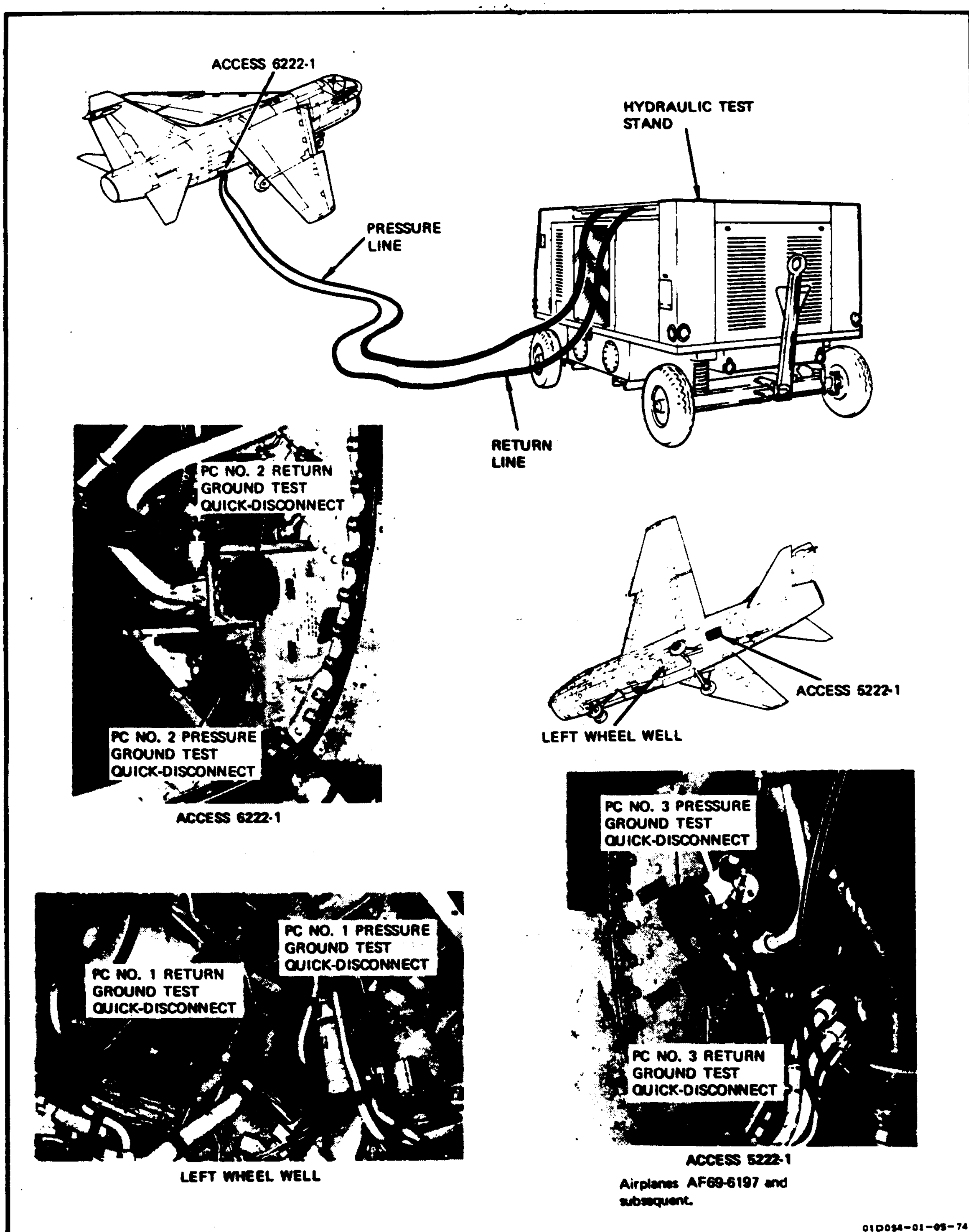


Figure 1-22. Connecting and Disconnecting External Hydraulic Power (Sheet 1)

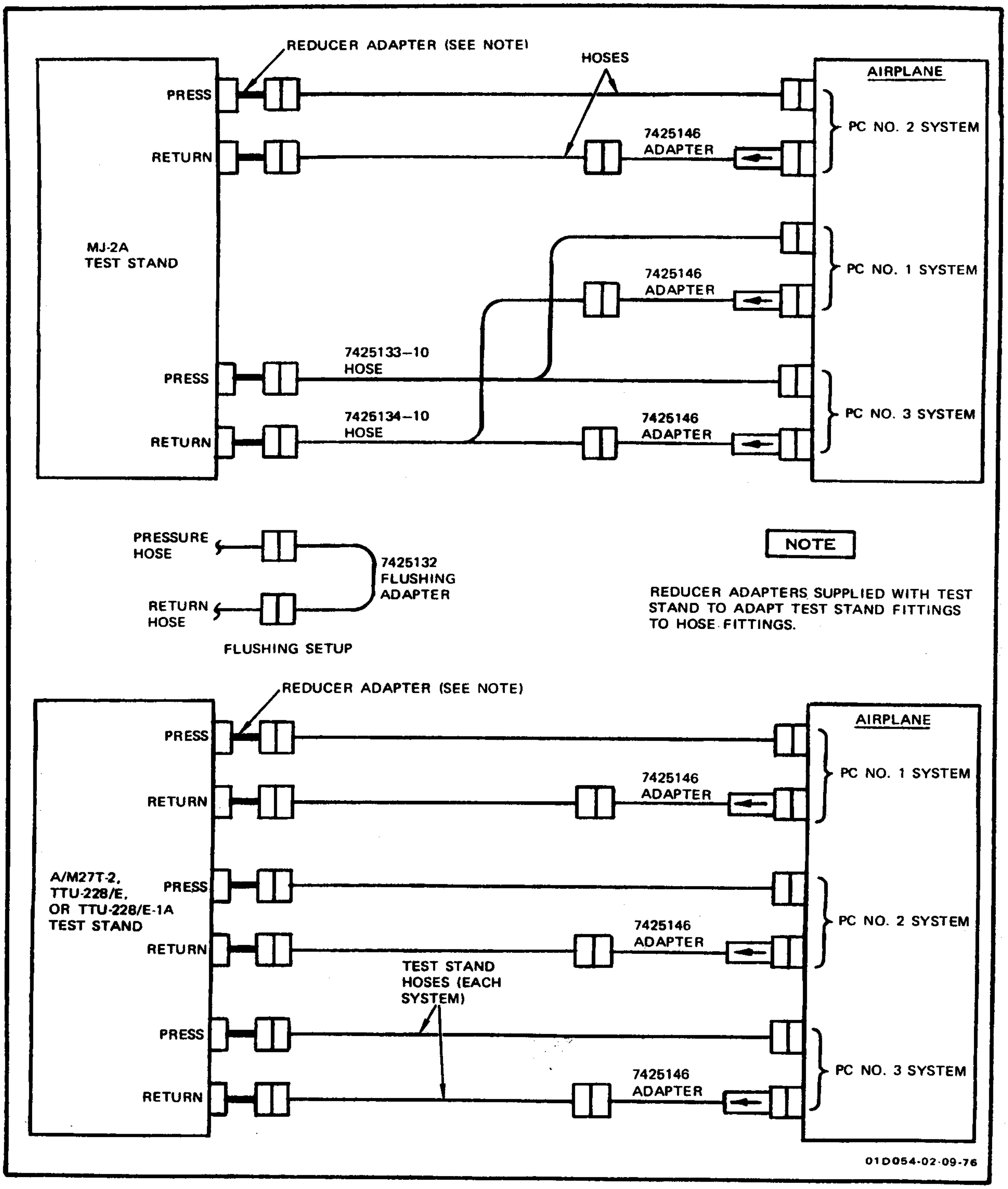


Figure 1-22. Connecting and Disconnecting External Hydraulic Power (Sheet 2)

1-46. **DISCONNECTING.** (See figure 1-22.)

a. Deleted.

CAUTION

When a reduction in pressure is required, do not reduce test stand pressure to zero in less than 30 seconds. Rapid reduction of test stand pressure will cause backflow in system and damage to airplane hydraulic filters.

b. Slowly open PC No. 2 and PC No. 3 test stand high pressure bypass valve to reduce system pressure to zero.

c. Dump emergency and reservoir accumulators hydraulic pressure in accordance with paragraph 3-46.

d. If required, hydraulically charge emergency accumulators (paragraph 3-45) to ensure emergency brakes will be available.

e. Slowly open PC No. 2 test stand high pressure bypass valve to reduce system pressure to zero.

f. Shut down PC No. 2 test stand in accordance with applicable manual for test stand. Leave test stand pump pressure and volume controls set. Place reservoir selector valve to closed system position.

g. Disconnect external electrical power.

h. Disconnect hydraulic test stand pressure and return lines from airplane quick-disconnects.

i. Install quick-disconnect caps.

j. Install dust covers on hydraulic test stand hoses.

k. Check left wheel well or access 6222-1 or 5222-1 for cleanness and freedom from foreign objects.

l. Place engine fuel boost pump manual shutoff valve in open position.

m. Close accesses and check for security.

1-47. **OPERATION.**

1-48. **PREOPERATIONAL CHECKOUT.**

a. Place test stand controls in the following settings:

Control	Setting
FLOW CONTROL valve	CLOSED
FLUID BYPASS valve	OPEN
RESERVOIR SELECTOR valve	Closed system position (knob pushed fully in)
Return flow control valve	OPEN
H.P. GAGE SHUTOFF valve	Open 1/4 turn
PRESSURE SELECTOR valve	BOOST INLET
High pressure relief valve	Minimum setting
Pump compensator control	Minimum setting
Pump volume control	Zero flow
SYSTEM FILL valves	OFF(closed)
OVERRIDE switches	OFF (for closed system) ON (for open system)
FILL PUMP switch	OFF
PANEL LIGHTS switch	OFF
IGNITION switch	OFF
START switch	OFF
THROTTLE control	Off (pushed fully in)
CHOKE control	Off (pushed fully in)

b. Place IGNITION switch in ON.

c. Check engine fuel level.

d. Check test stand hydraulic reservoir fluid level indicator (OIL GAGE) for a minimum reading of 1/2 full (approximately 17 gallons).

e. Place IGNITION switch in OFF.

f. Check engine oil level using dipstick on engine.

g. Check that gearbox oil level is at center of sight glass.

1-48. PREOPERATIONAL FILL AND BLEED PROCEDURE.

a. Check that controls are in positions specified in paragraph 1-47.

CAUTION

At fluid temperature below 80°F, high viscosity of hydraulic fluid can rupture high pressure filter elements. To avoid filter damage, do not change high pressure relief valve setting from minimum until fluid temperature exceeds 80°F.

b. Place FILL PUMP switch in ON.

c. Open blue (No. 3) SYSTEM FILL valve.

d. Press and hold FILTER BLEED valve control until fluid in sight glass and FLOWMETER is free of air bubbles. Release FILTER BLEED valve control.

e. Close blue (No. 3) SYSTEM FILL valve.

f. Repeat steps c through e for green (No. 2) and red (No. 1) systems.

g. Place FILL PUMP switch in OFF.

1-49. TEST STAND HOSE PURGING PROCEDURE.

a. Set RESERVOIR SELECTOR valve for open system operation (knob pulled fully out).

NOTE

Any system not required for aircraft servicing operation may remain set for closed system operation. Test stand hoses should not be connected to unused aircraft system.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	7425132	Adapter, flushing (part of 7425131-100 hose assembly)	Connect pressure and return hoses together for flushing.

WARNING

Solvent P-D-680, Type II, is flammable and toxic. Skin and eye protection is required; good general ventilation or respiratory protection is required.

b. Check that connector fittings on hoses and return and outlet fittings on top of test stand are clean. Wash dirty fittings with Federal Specification P-D-680 solvent.

c. Connect hoses to test stand outlet and return fittings. Using one 7425132 flushing adapter for each system, connect outlet hose from each system to corresponding return hose.

d. Start test stand in accordance with T.O. 33D2-5-36-31 and adjust THROTTLE to obtain 2,400 rpm on tachometer (ENGINE RPM/HOURS).

NOTE

Flow rate should be 20 gpm for optimum efficiency and speed in hose purging procedure. If flow rate of less than 20 gpm is required for servicing operation, flow rate should be readjusted upon completion of hose purging procedure.

e. Perform pressure and volume setting adjustment procedure (paragraph 1-50).

f. Perform the following steps individually for each system to be used:

1. Open FLOW CONTROL valve.

2. Slowly close FLUID BYPASS valve. When fully closed, reopen valve one full turn to ensure proper purging.

3. Periodically press FILTER BLEED valve control to bleed air from low pressure filter assembly.

4. Monitor FLOWMETER until fluid is free of air.

5. Slowly open FLUID BYPASS valve.

6. Close FLOW CONTROL valve.

g. Adjust THROTTLE to obtain 1,500 rpm on tachometer. Operate test stand engine at this speed for 2 minutes to allow engine to cool.

h. Shut down test stand in accordance with T.O. 33D2-5-36-31.

1-50. PRESSURE AND VOLUME SETTING ADJUSTMENT PROCEDURE.

a. Perform preoperational procedures (paragraphs 1-47 and 1-48) and set RESERVOIR SELECTOR valve for open system operation (knob fully out).

b. Start test stand engine in accordance with T.O. 33D2-5-36-31 and adjust THROTTLE to obtain 2,400 rpm on tachometer.

c. Adjust pump volume control to obtain desired flow rate.

d. Slowly close FLUID BYPASS valve.

e. Raise high pressure relief valve setting by turning knurled knob on valve.

f. Increase pump compensator control setting on high pressure pump to obtain pressure 20% above desired setting as indicated on SYSTEM PRESSURE gage. Vary high pressure relief valve setting to ensure that output pressure indicated on SYSTEM PRESSURE gage is not regulated by high pressure relief valve.

g. Decrease high pressure relief valve setting to obtain pressure 10% above desired setting as indicated on SYSTEM PRESSURE gage.

h. Decrease pump compensator control to obtain desired output pressure as indicated on SYSTEM PRESSURE gage.

i. Slowly open FLUID BYPASS valve.

j. Shut down test stand in accordance with T.O. 33D2-5-36-31.

1-51. CONNECTING AND DISCONNECTING AIR-CONDITIONING GROUND COOLING UNIT.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
1-23	A/M32C-10 or A/M32C-10A	Ground air-conditioner	Apply conditioned air to airplane for ground operation.
	216-01482-1	Ground air-conditioner adapter	Adapt air-conditioner to airplane.
1-23	A/M32A-60	Power unit	Supply air to ground air-conditioner for operation.
1-23	218-00817-1	Adapter, radome cooling	Adapt air-conditioner to airplane.

1-52. CONNECTING. (See figure 1-23).

a. Connect hose, with 216-01482-1 adapter installed, from ground air-conditioner to airplane by inserting adapter fully into airplane ground cooling socket.

b. To supply cooling air for prolonged testing of AN/APQ-126(V)8 or AN/APQ-126(V)11 forward looking radar system, with radome closed, perform the following:

1. Open access 1211-1.

2. Attach 218-00817-1 radome cooling adapter to upper left corner of access 1211-1 using Dzus fasteners for attachment.

3. Connect hose with 216-01482-1 adapter installed from ground air-conditioner to radome cooling adapter. Rotate nut on adapter clockwise until connection is secured.

4. Open canopy.

c. Connect air hose from external power unit to ground air-conditioner.

d. Start and operate external power unit (T.O. 35C2-3-372-1).

e. Start and operate ground air-conditioner in accordance with table 1-6.

1-53. DISCONNECTING. (See figure 1-23.)

a. Shut down ground air-conditioner.

b. Shut down external power unit.

c. Disconnect external power unit.

d. Disconnect ground air-conditioner.

e. If radome cooling was utilized, remove 218-00817-1 radome cooling adapter and close access 1211-1.

1-54. RADOMES AND FIBERGLASS COMPONENTS CLEANING. (Refer to T.O. 1-1-1 and/or T.O. 1-1-24.)

1-55. ANTENNA LOCATIONS. (See figure 1-24.)

Table 1-6. Air-Conditioner Control Settings

Control	A/M32C-10 T.O. 35E9-90-1 (P/N 104700)	A/M32C-10 T.O. 35E9-90-1 (P/N 105520 and 105900)	A/M32C-10 T.O. 35E9-90-11 (P/N UA532888-1)	A/M32C-10 T.O. 35E9-90-21 (P/N 929802-101)	A/M32C-10 T.O. 35E9-90-11 (P/N VA53288-2)
1. Economy control valve	PART FLOW	PART FLOW	Full out	ON	Full out
2. Conditioned airflow control valve	17.5 psig on AUTOMATIC SET PRESSURE gage	15 (±2) lb/min on FLOW gage	15 (±2) lb/min on AIRFLOW gage	15 (±2) lb/min on CONDITIONED AIRFLOW CONTROL gage	15 (±2) lb/min on AIRFLOW gage
3. Relief pressure control valve	3 psig on RELIEF PRESSURE gage	3 psig on RELIEF PRESSURE gage	3 psig on RELIEF PRESSURE gage	3 psig on RELIEF PRESSURE gage	3 psig on RELIEF PRESSURE gage
4. Conditioned air temperature control valve	50°F on DISCHARGE TEMPERATURE gage	50°F on DISCHARGE TEMPERATURE gage	50°F on DISCHARGE AIR TEMPERATURE gage	50°F on CONDITIONED AIR TEMPERATURE gage	50°F on DISCHARGE AIR TEMPERATURE gage
5. Airflow control 3-way valve	AUTOMATIC	N/A	N/A	N/A	N/A
6. Auto airflow control valve	15 (±2) lb/min on FLOW gage	N/A	N/A	N/A	N/A

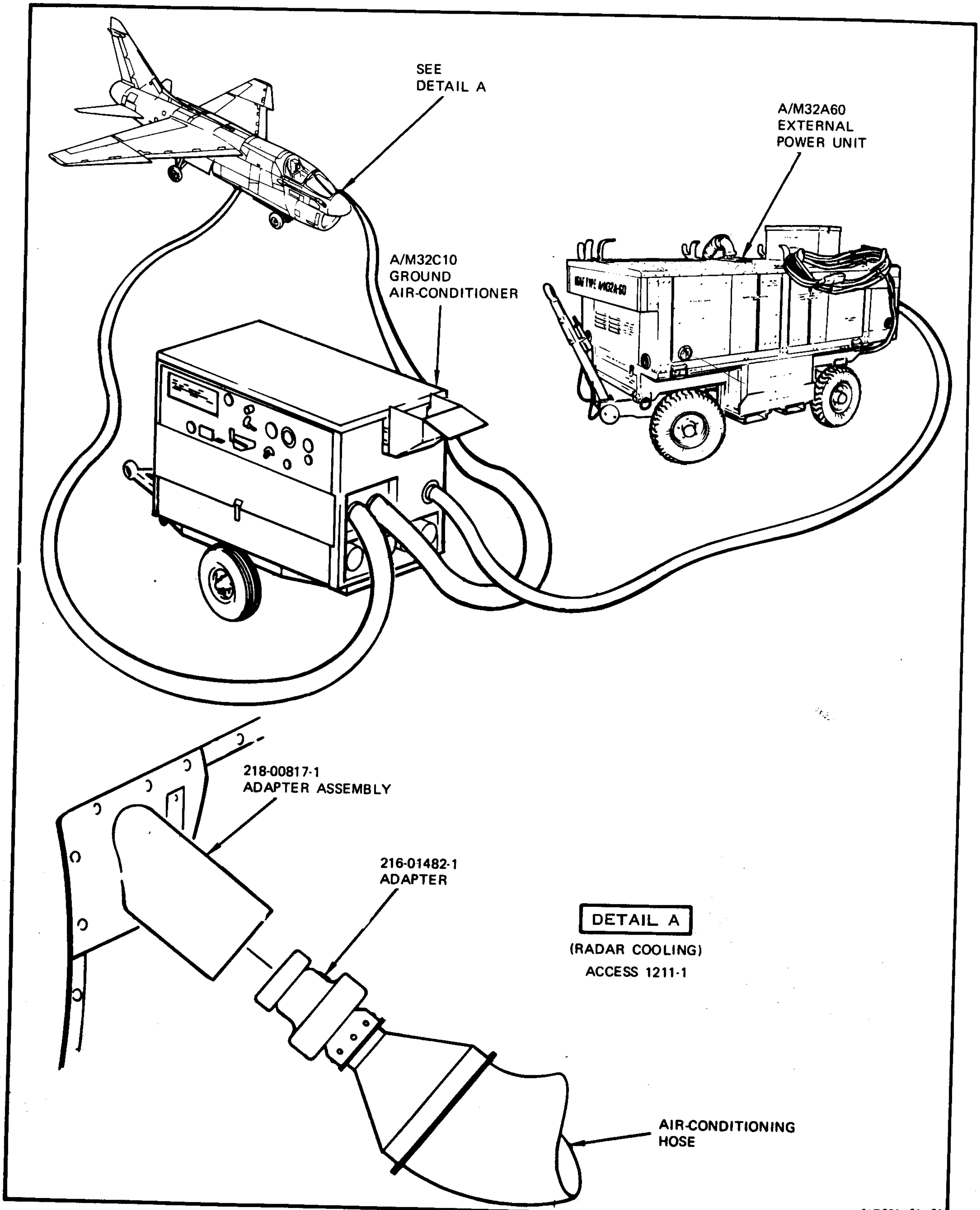
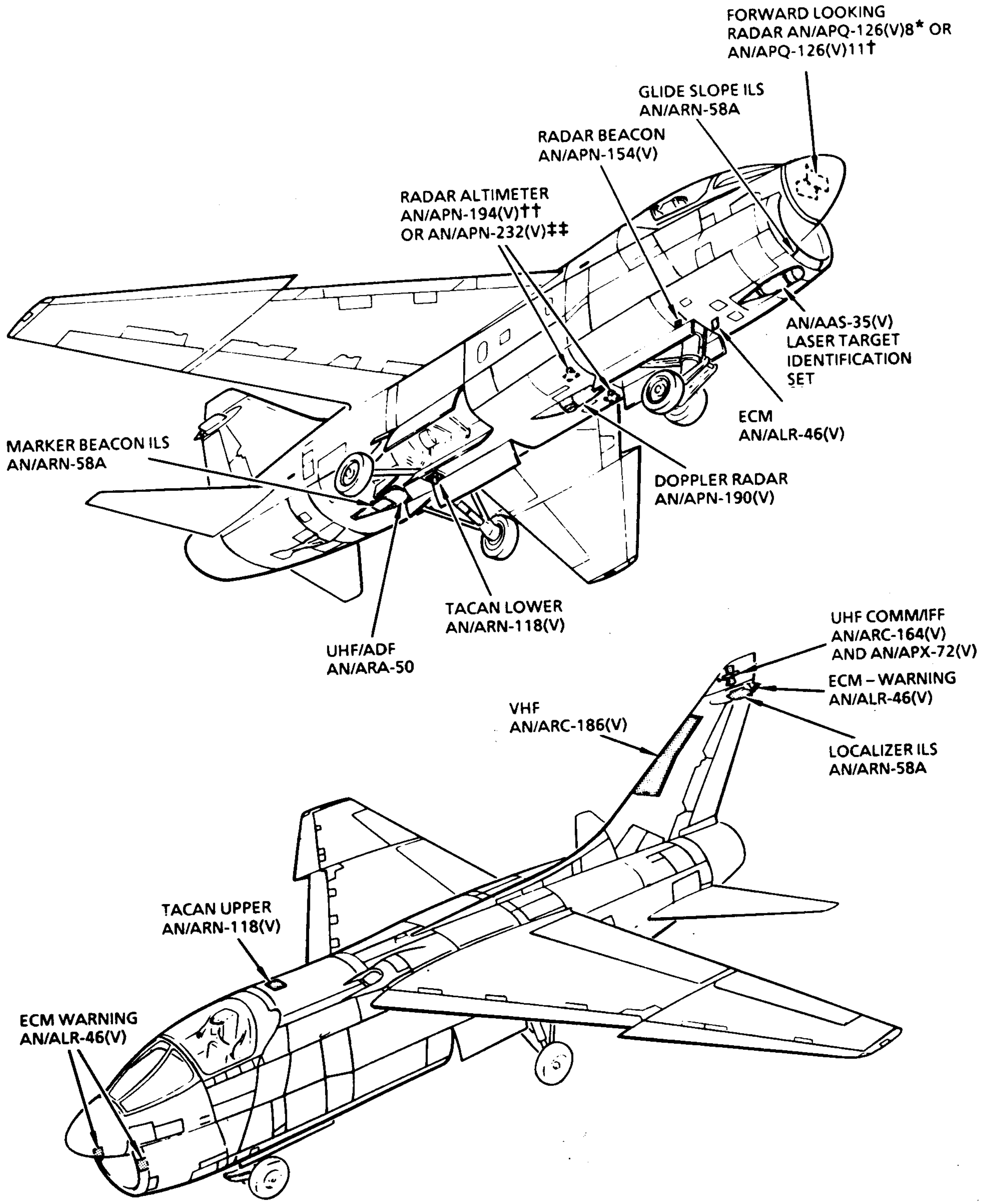


Figure 1-23. Connecting and Disconnecting External Air-Conditioning Ground Cooling Unit



* Airplanes before T.O. 1A-7-530.
† Airplanes after T.O. 1A-7-530.
†† Airplanes before T.O. 1A-7-502.
‡‡ Airplanes after T.O. 1A-7-502.

01D212-10-89

Figure 1-24. Antenna Locations

SECTION II

GROUND HANDLING

2-1. GENERAL.

2-2. Ground handling consists of towing, parking, mooring, jacking, hoisting, leveling the airplane, and engine operation. Equipment necessary to perform the ground handling functions are ground handling dollies, protective covers and air plugs, towbar, and ground safety locks and pins. During ground handling operations, caution shall be observed to eliminate all safety hazards. Aerospace ground equipment (AGE) required to perform the task is listed in the table following the title of the task to be performed.

2-3. GROUND HANDLING SAFETY EQUIPMENT. (See figures 2-1 and 2-2.)

2-4. Ground handling safety equipment is provided for personnel safety and to prevent damage to equipment during ground operation of the airplane. All ground handling safety equipment will have a red streamer attached and shall be removed before flight. Improper use of ground handling safety equipment may result in injuries to personnel or damage to equipment. The following ground handling safety equipment is required during ground operation or to safety applicable system: nose and main gear downlock pins, wingfold support strut, canopy support strut, wheel chocks, interior canopy jettison initiator safety pin, initiator safety cap, ejection seat prime initiator safety pin, gun clearing sector clamp, emergency power package extended position safety lock, Munition Electrical Safety Pin, and engine air duct screen. Storage provisions are provided on the airplane for the nose and main landing gear downlocks. All other equipment must be stored on base when not installed.

2-5. PROTECTIVE COVERS. (See Figures 2-2 and 2-3.)

2-6. Protective covers are provided to protect various systems and components from damage. Maximum use of protective covers will decrease the maintenance required. The engine cooling hole covers, air-conditioning shield, air inlet shield, fuselage tail cone shield, pitot tube cover, engine tailpipe shield, and engine air inlet duct shield prevent water, dust, or other foreign matter from entering the system and causing damage. The canopy cover and ejection seat protective cover protect components from sunlight, abrasion, soiling, weather, or other damage. The angle-of-attack vane cover protects the vane and transducer from damage while the airplane is on the ground. The forward looking infrared (FLIR) window cover keeps the window clean and protects against physical damage and optical deterioration. All protective covers shall be identified by red streamers and shall be removed before flight. Storage on the airplane is provided for the pitot tube cover and angle-of-attack vane cover. On base storage must be provided for all other protective covers when not installed.

2-7. COCKPIT ENTRY AND SAFETY CHECK. (See figure 2-4.)

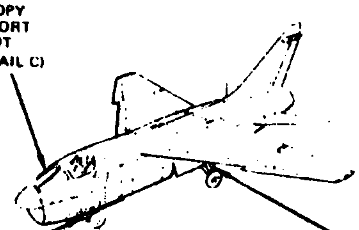
2-8. The airplane is provided with steps which, when not in use, are folded into the left side of the fuselage below the canopy. When open, the center and top steps provide convenient handholds to facilitate cockpit entry. Cockpit entry is started with the left foot on the lower extension step.

2-9. The cockpit is opened by an exterior canopy release handle located on the left side of the fuselage below the canopy frame. The canopy counterbalance cylinder assists in raising and will hold the canopy in the open position. After the canopy is opened, the exterior canopy release handle must be returned to the stowed position (flush with airplane skin).

CAUTION

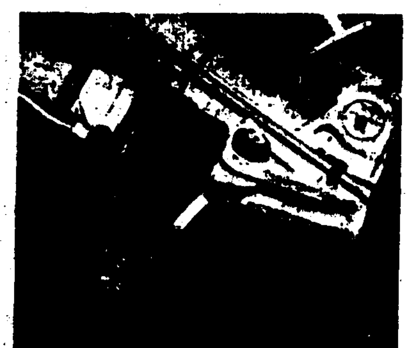
Ensure that lap belts are in the seat and not hanging over edge of seat, as damage to seat and/or console may result.

2-10. The cockpit is provided with several safety devices which are installed to protect personnel from possible injury and to prevent damage to the airplane. Before entering cockpit, a safety check shall be made to ensure that the cockpit is in a safe condition. If there is any doubt regarding safety of the seat and canopy system, ensure that the systems are checked by a qualified technician before entering cockpit.



DETAIL A

215-00260-1 Nose gear downlock pin Prevents nose landing gear from being inadvertently retracted while the airplane is parked.



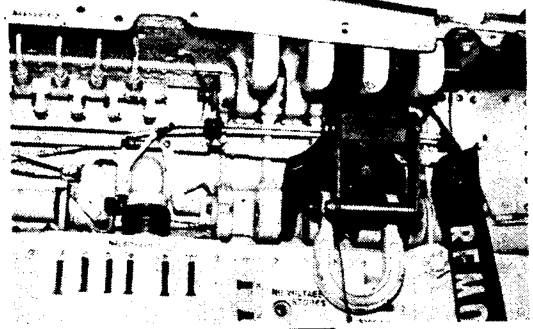
DETAIL B

215-00266-5 Main gear downlock assembly. Prevents inadvertent main gear retraction while the airplane is parked.

DETAIL C

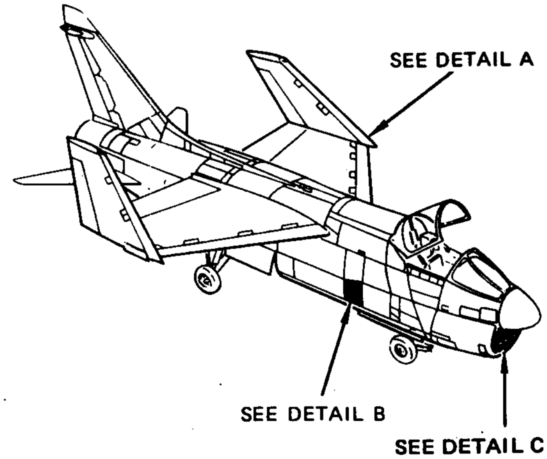
215-00280-1 Canopy support strut. Supports canopy in a 40° open position.
215-00280-2 Canopy support strut (not shown). Supports canopy in a 73° open position to permit ejection seat removal and installation.

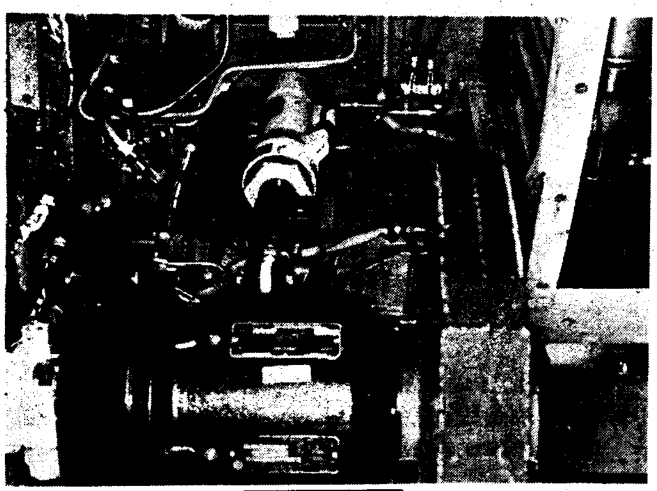
Figure 2-1. Ground Handling Safety Equipment (Sheet 1)



DETAIL A

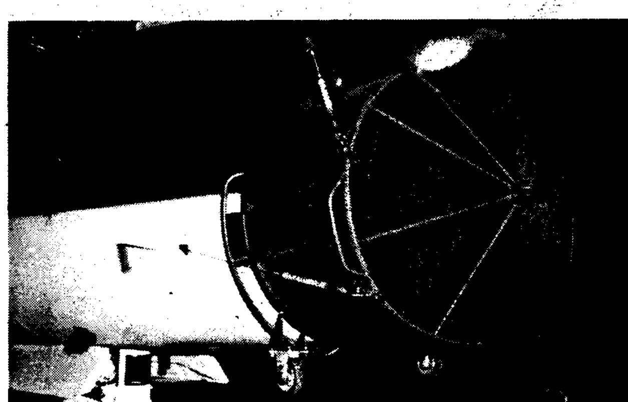
215-00255-12 Wingfold support strut assembly. Provides wingfold support against high winds or inadvertent spreading, and provides a tiedown point for mooring the airplane.





DETAIL B

215-00268-1 Emergency power package extended position safety lock. The lock assembly is installed around the actuating cylinder piston rod to prevent inadvertent cylinder retraction.

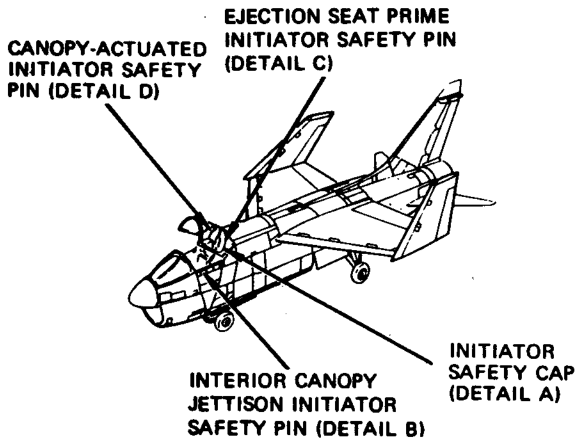


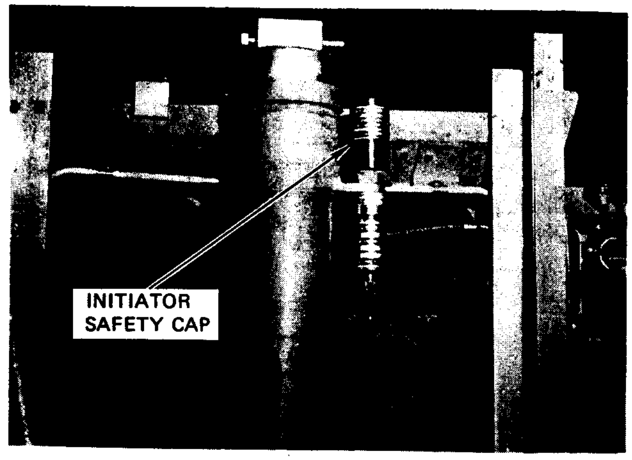
DETAIL C

215-00138-42# Engine air inlet duct screen. Prevents foreign objects from being drawn into engine air intake duct during engine ground operation.

01D035-02-05-75

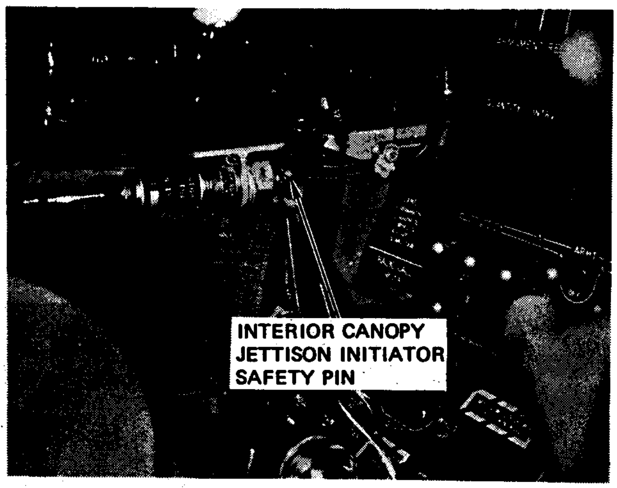
Figure 2-1. Ground Handling Safety Equipment (Sheet 2)





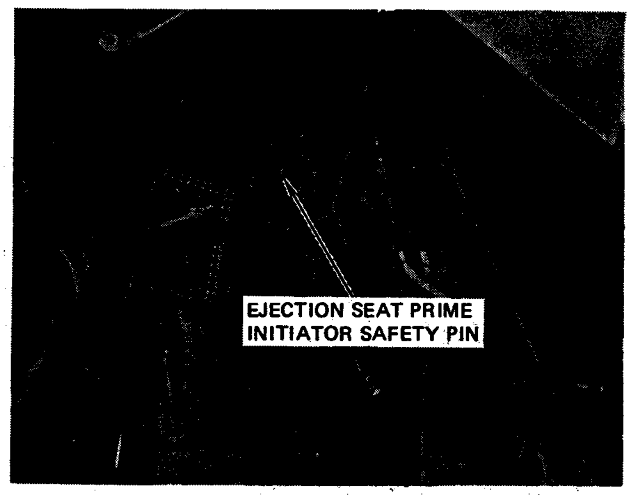
DETAIL A

215-00267-4 Initiator safety cap. Used in place of 215-00261-1 initiator safety pin to prevent inadvertent firing of rocket catapult during seat removal or installation.



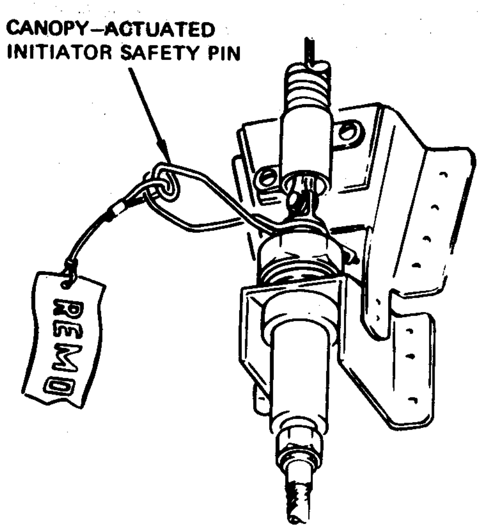
DETAIL B

215-00261-1 Interior canopy jettison initiator safety pin (left side of cockpit). Prevents firing of interior canopy jettison initiator.



DETAIL C

215-00261-1 Ejection seat prime initiator safety pin. Prevents inadvertent firing of ejection seat.

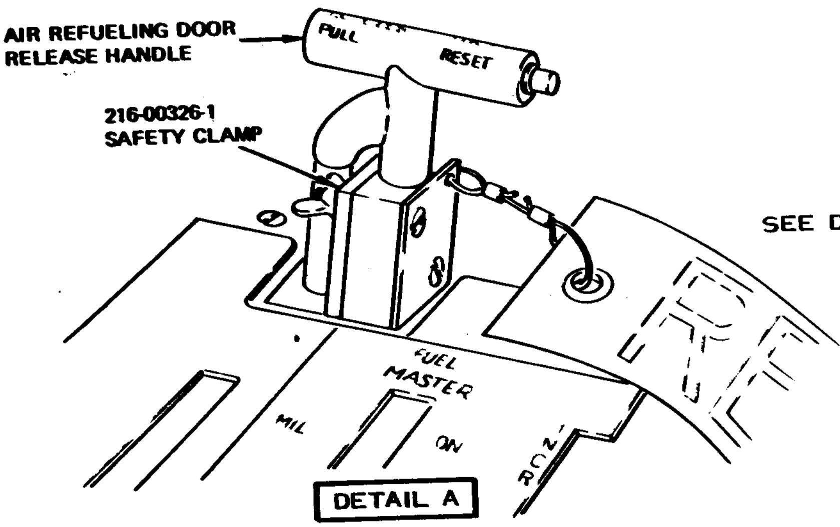


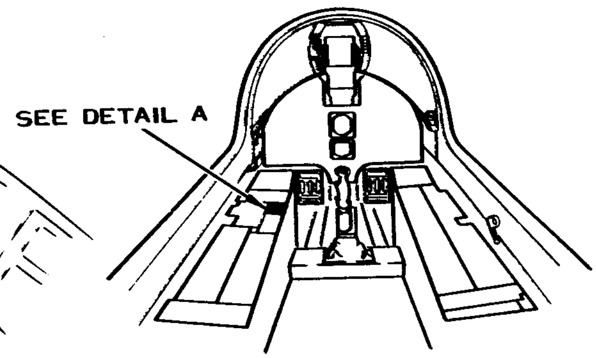
DETAIL D

215-00261-1 Canopy-actuated initiator safety pin. Used to prevent inadvertent firing of M99 canopy-actuated initiator and resulting contamination of canopy jettison system lines when maintenance is being performed on ejection system or in vicinity of initiator.

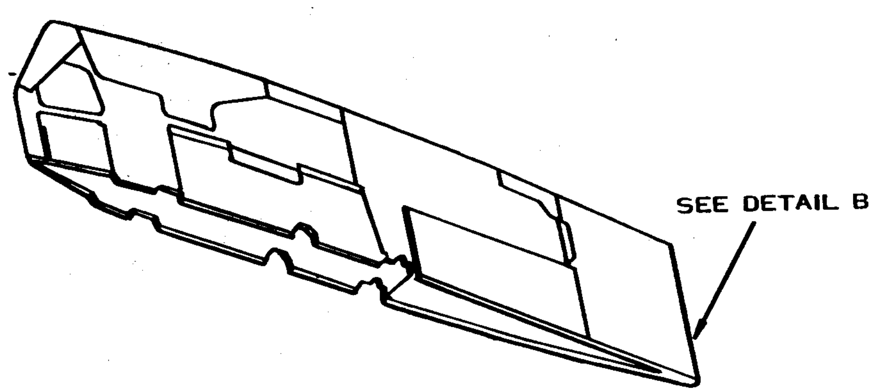
01D035-03-10-74

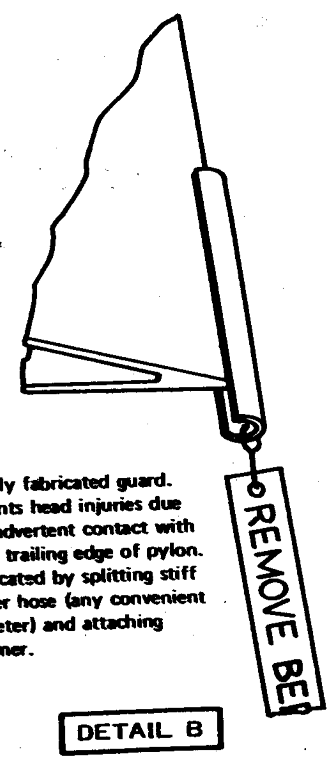
Figure 2-1. Ground Handling Safety Equipment (Sheet 3)





216-00326-1 air refueling receptacle door safety clamp. Prevents inadvertent closing of door while personnel are working in air refueling receptacle area.

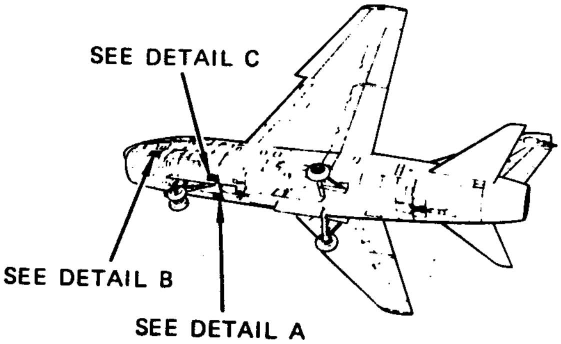


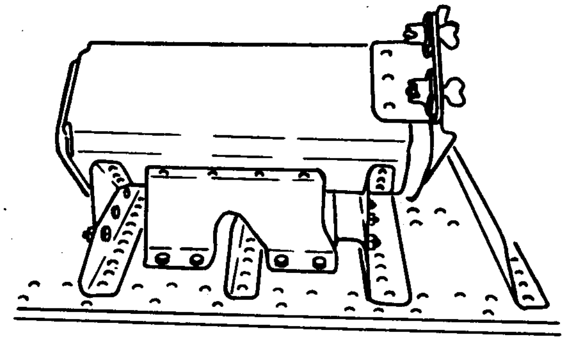


Locally fabricated guard. Prevents head injuries due to inadvertent contact with sharp trailing edge of pylon. Fabricated by splitting stiff rubber hose (any convenient diameter) and attaching streamer.

01D035-04-07-77

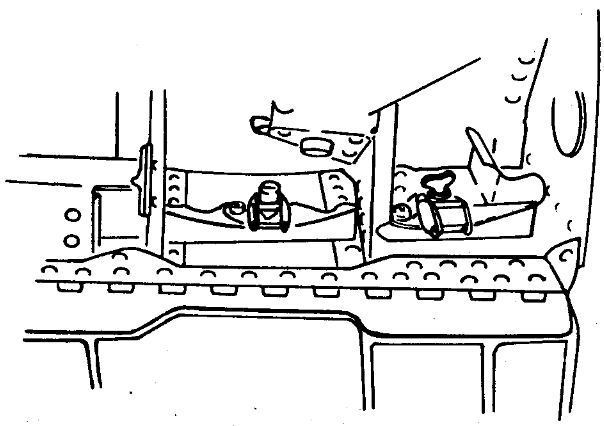
Figure 2-1. Ground Handling Safety Equipment (Sheet 4)





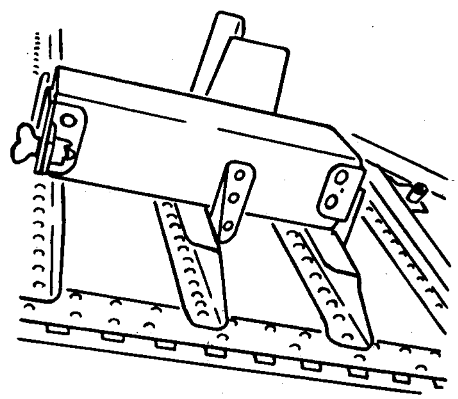
DETAIL A

Storage container for Main Gear Downlock assemblies—located in right side of nose wheel well



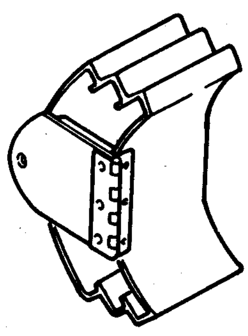
DETAIL B

Storage clamps for Nose Gear Downlock pin—located in lower step access 1213-14.



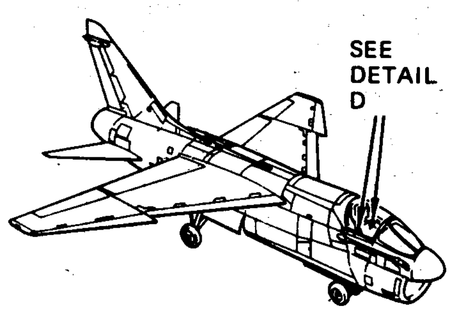
DETAIL C

Storage container for Angle-of-Attack Vane Cover and Pitot Tube Cover—located in left side of nose wheel well



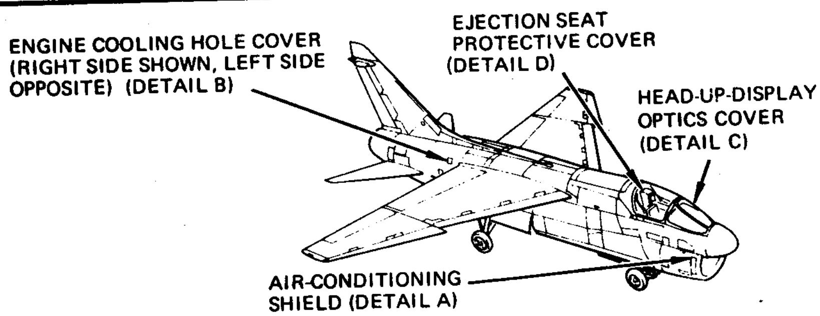
DETAIL D

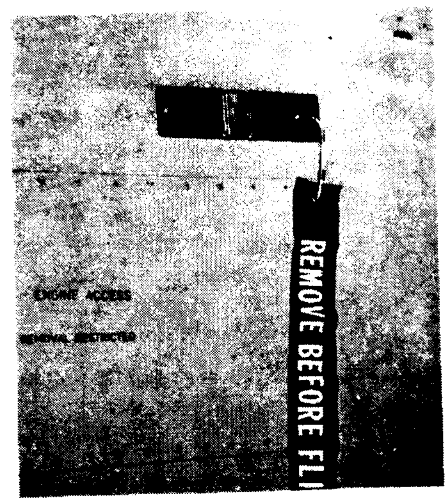
Cockpit stowage box for initiator safety pins.



01D143-09-75

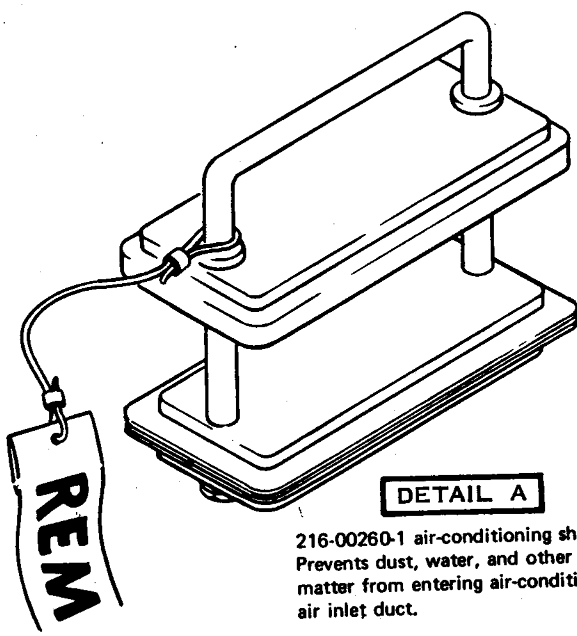
Figure 2-2. Storage of Ground Handling Safety Equipment and Protective Covers





DETAIL B

215-00266-4 engine cooling hole cover. Prevents foreign objects from entering engine compartment cooling holes.



DETAIL A

216-00260-1 air-conditioning shield. Prevents dust, water, and other foreign matter from entering air-conditioning air inlet duct.

DETAIL C

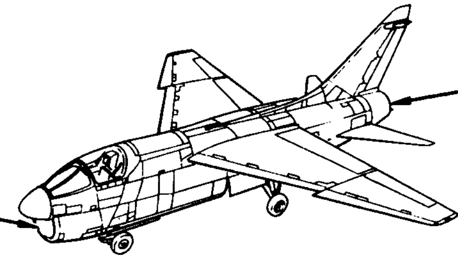
216-01937-1 Head-up-display optics cover. Used to protect the combiner glass of the head-up display when airplane is parked and inoperative.

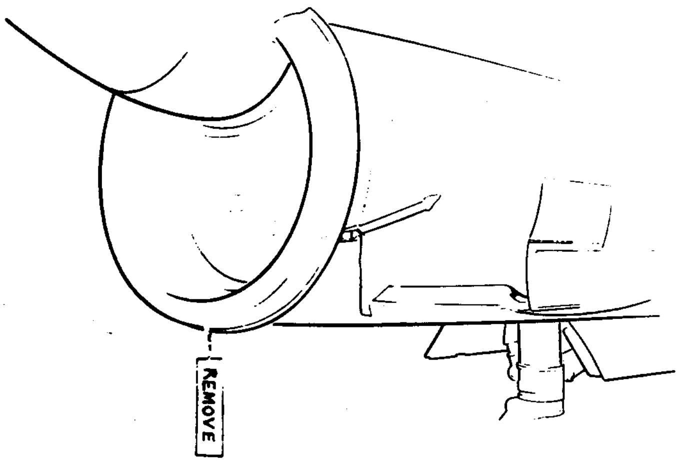
DETAIL D

215-00256-16 ejection seat protective cover. Protects the ejection seat and parachute from weather and prevents soiling or damage during maintenance.

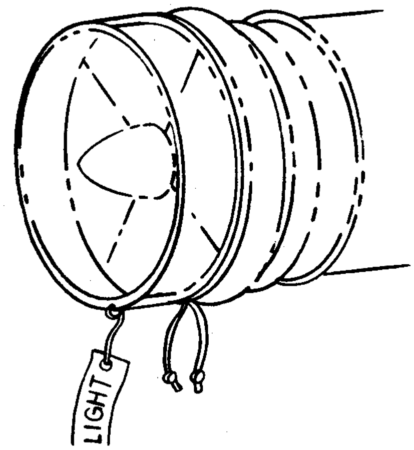
01D014-01-12-71

Figure 2-3. Protective Covers (Sheet 1)



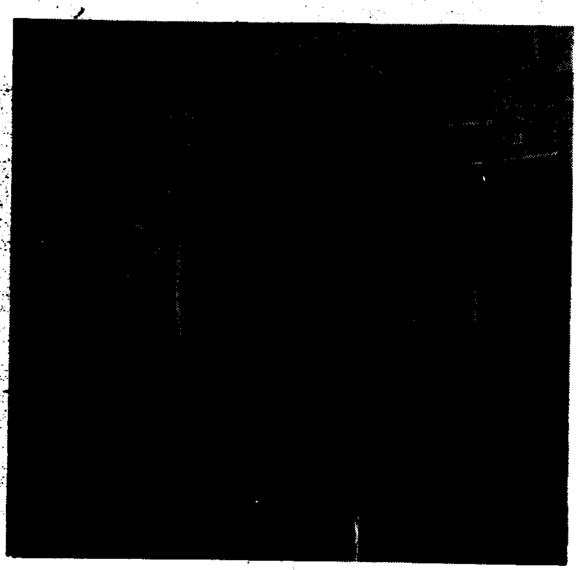


215-00254-15 or 7425025-10 engine air inlet duct shield. Prevents rain, snow, sleet, and other foreign matter from entering air intake duct when airplane is parked.

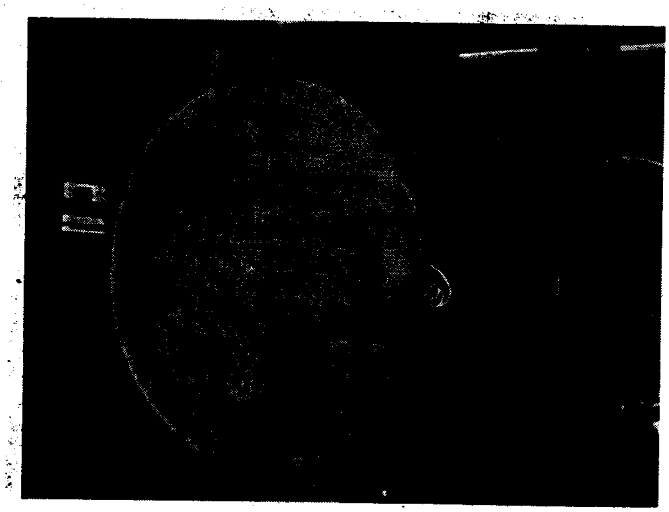


216-00263-1 air inlet shield. Protects engine air inlet duct when engine is removed from airplane.

DETAIL E



215-00258-3 fuselage tail cone shield. Prevents entry of foreign matter into fuselage tail cone and exhaust pipe.

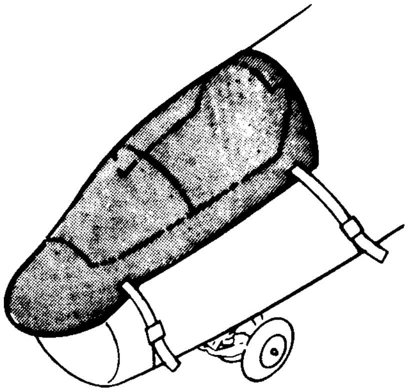


216-00253-5 engine exhaust pipe shield. Protects engine exhaust pipe when engine is removed from airplane.

DETAIL F

01D014-02-12-7

Figure 2-3. Protective Covers (Sheet 2)

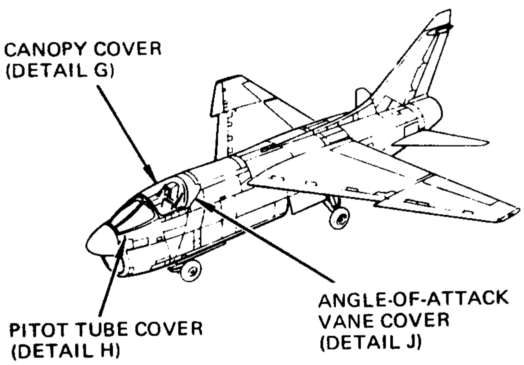


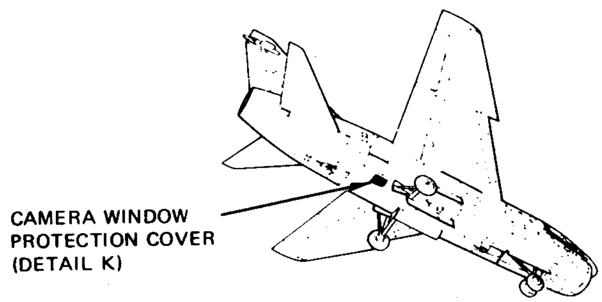
DETAIL G

7325205-10 CANOPY COVER. Protects the canopy and cockpit enclosure from direct sunlight exposure.

DETAIL H

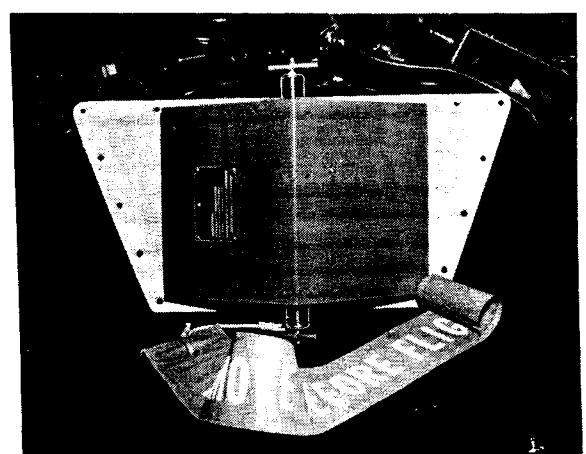
7325272-10 PITOT TUBE COVER (2 REQUIRED). Prevents water and foreign matter from entering pitot tube.





DETAIL J

215-00264-1 ANGLE-OF-ATTACK VANE COVER. Protects angle-of-attack vane and transducer from damage while airplane is on the ground.

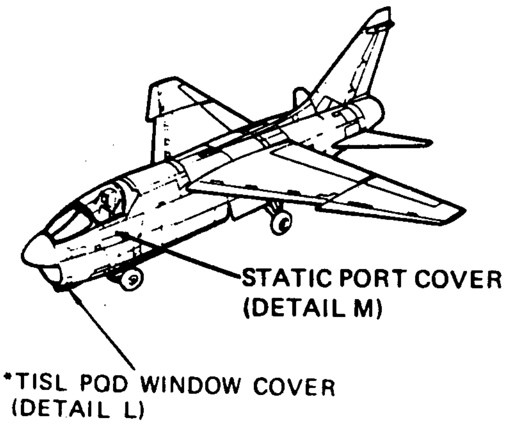


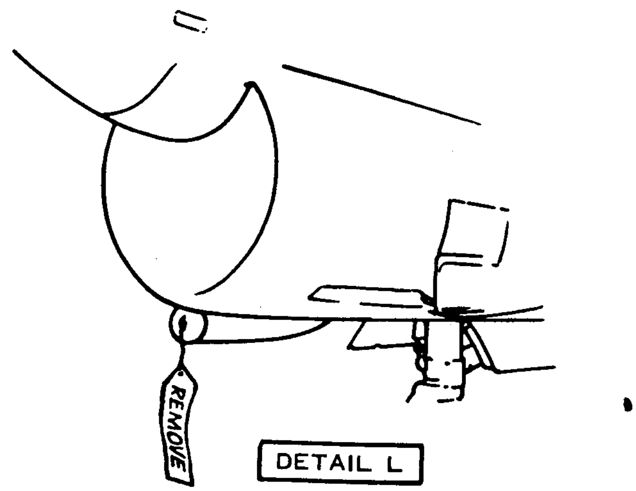
DETAIL K

216-01599-1 Camera window protection cover. Protects the camera window from damage by maintenance personnel and weather.

01D014-03-10-74

Figure 2-3. Protective Covers (Sheet 3)





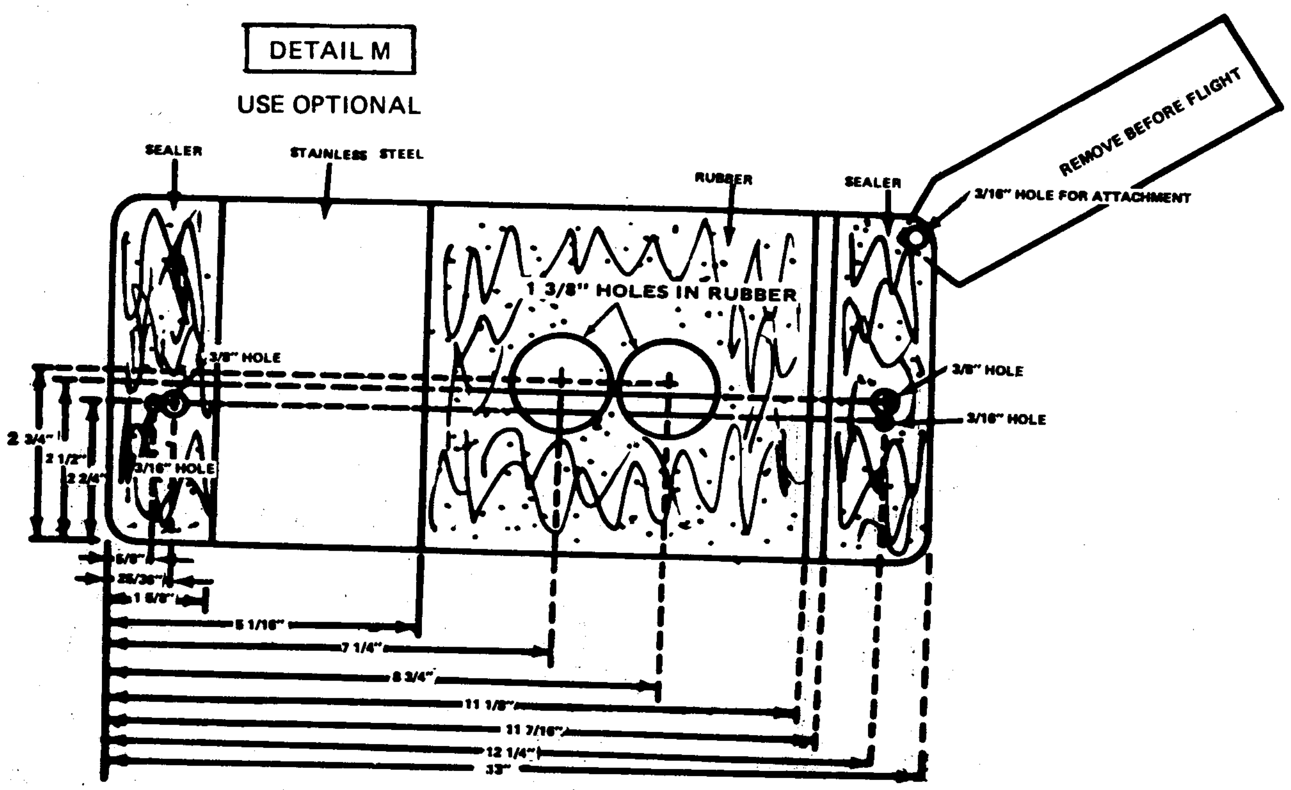
DETAIL L

627223100--029 TISL POD WINDOW COVER. Protects pod window from contamination and damage while airplane is on the ground.

** Airplanes AF69-6197 and subsequent.

DETAIL M

USE OPTIONAL



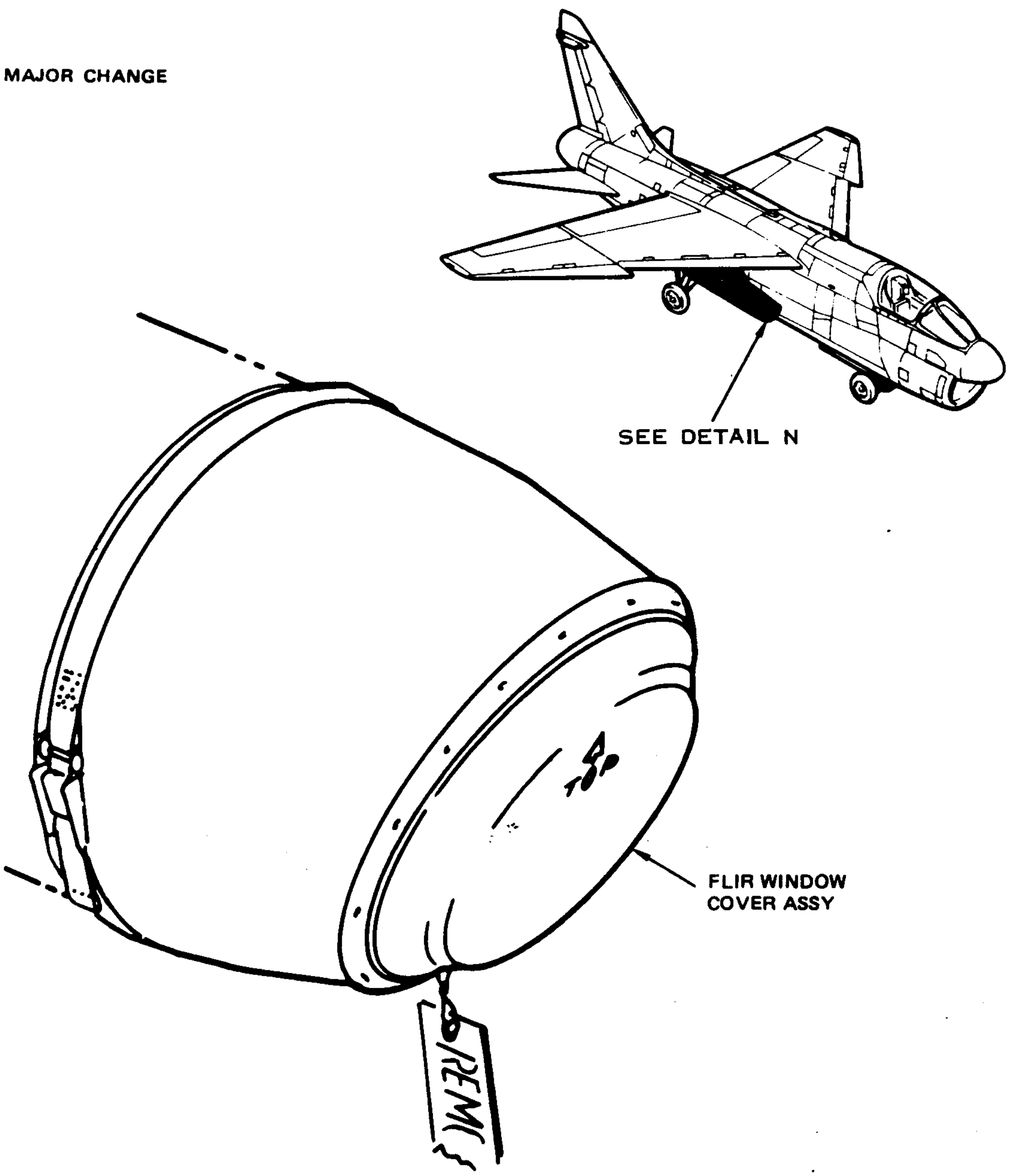
FOR LOCAL FABRICATION

A-7D STATIC PORT COVER		
NOUN	SPECIFICATION	QUANTITY
1. Stainless Steel	CRES, Type 301, Annealed in accordance with MIL-S-6050 or equivalent	13" x 6 1/2" x 0.050"
2. Rubber	MIL-R-6130, Type II, Grade A, Condition Soft	6 1/16" x 6 1/2" x 1/8"
3. Sealant	MIL-S-81733 or equivalent	2 oz.
4. Adhesive	MMM-A-1617, Type I or equivalent	2 oz.
5. Streamer	67D34391-1 or equivalent	1 ea.
General Instructions: Cut stainless steel and rubber sheets to dimensions shown. Round corners and break all sharp edges on stainless steel sheet. Apply 1/32 inch thick layer of sealant to areas shown. After curing, sand smooth as required. Locate and drill all holes in stainless steel and rubber sheets. Bond rubber sheet to stainless steel sheet and let cure. Paint stainless steel sheet with gloss acrylic nitrocellulose lacquer in accordance with MIL-L-19537, Color Bright Red, Fed Std. 595 Color No. 11136. Attach streamer with suitable screw or rivet.		

01D014--04--09--82

Figure 2-3. Protective Covers (Sheet 4)

MAJOR CHANGE



218-09960-103 FLIR window cover. Protects FLIR window when airplane is parked.

DETAIL N

(Airplanes After T.O. 1A-7-530)

01D014—05—06—86

Figure 2-3. Protective Covers (Sheet 5)

WARNING

To prevent possible injury to personnel and damage to airplane, personnel entering the cockpit shall comply with cockpit entry and safety check procedures as illustrated below.

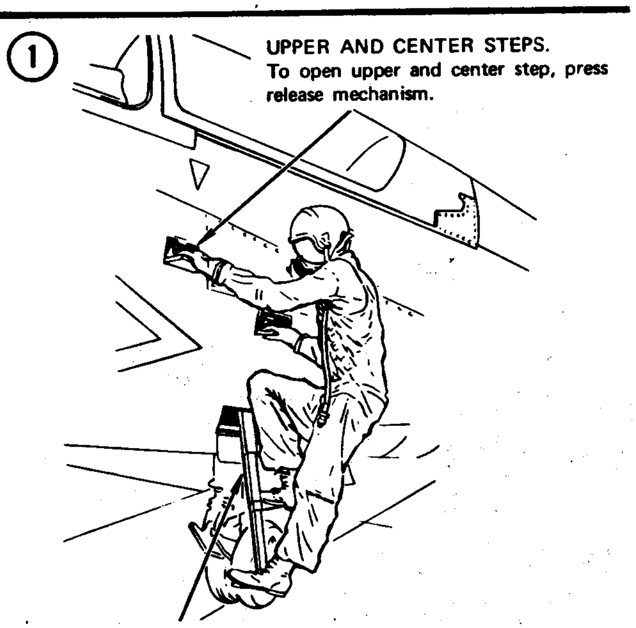
CAUTION

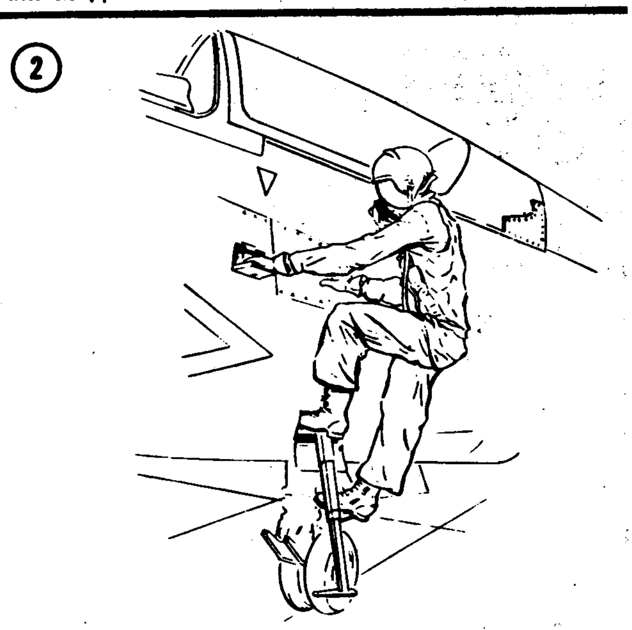
To prevent shearing of extension step rivets, do not allow steps to free-fall to the fully extended position or load the steps before full extensions.

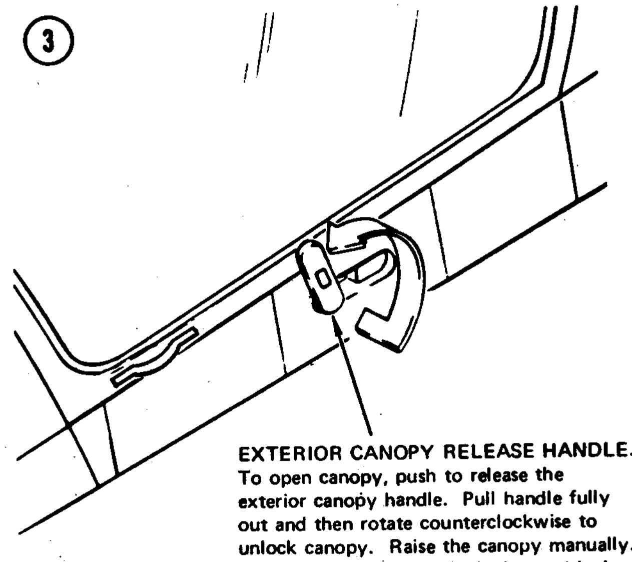
CAUTION

To prevent damage to the exterior canopy release handle, ensure that handle is locked in the stowed position after opening canopy and before operating the interior canopy release handle.

When opening canopy in strong headwinds, manually restrain canopy to prevent airloads from lifting canopy beyond actuator travel limits and shearing actuator shear pin and canopy pivot bolts.







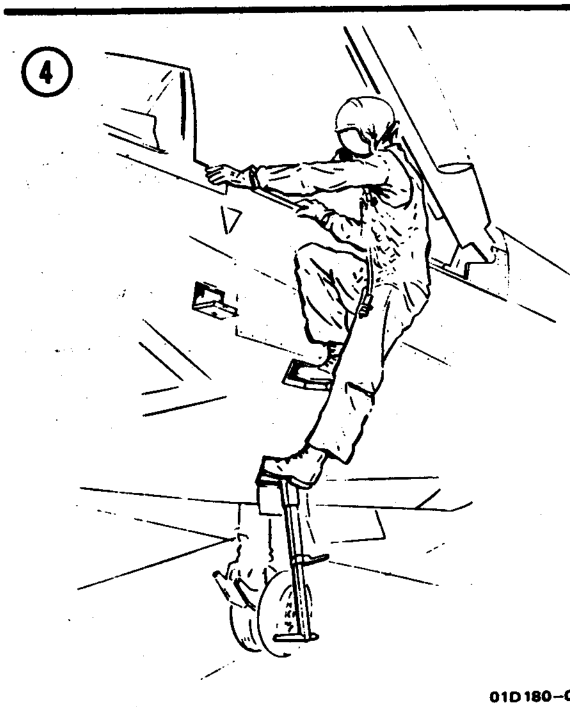


Figure 2-4. Cockpit Entry and Safety Check (Sheet 1)

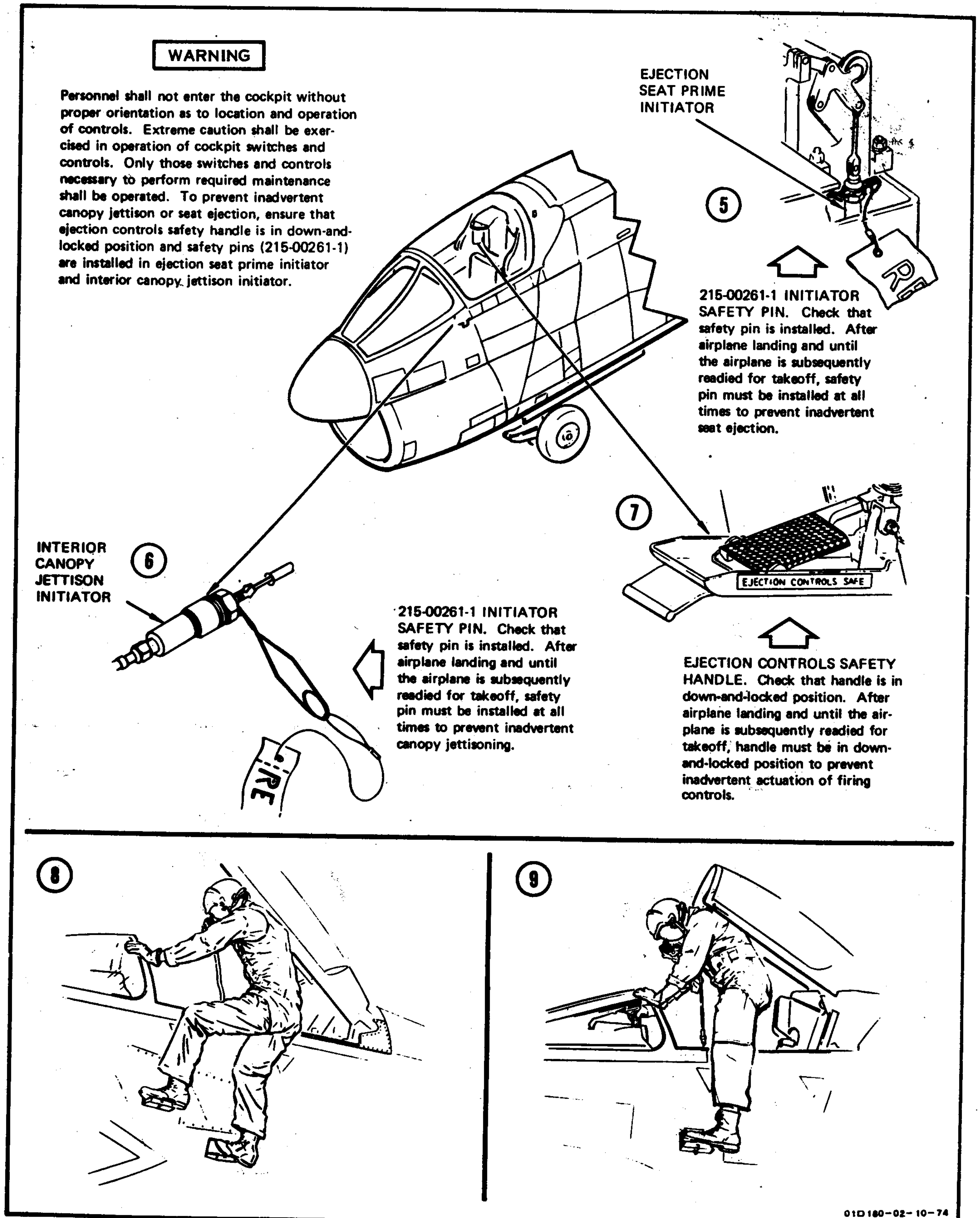


Figure 2-4. Cockpit Entry and Safety Check (Sheet 2)

2-11. PARKING AND PRETAXI.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
2-1	215-00250-1	Nose gear downlock pin	Ensure positive lock of nose gear in down position.
2-3	215-00254-15	Engine air inlet duct shield (plastic)	Prevent entry of foreign objects into engine air inlet duct.
	7425025-10 (Oklahoma City ALC)	Engine air inlet duct shield (cloth)	Prevent entry of foreign objects into engine air inlet duct.
2-1	215-00255-12	Wingfold support struts (2)	Support wing outer panel when folded.
2-3	215-00258-3	Tail cone shield	Prevent entry of foreign objects into tail cone.
2-3	7325272-10	Pitot tube cover (2)	Prevent entry of foreign objects into pitot tube.
2-3	216-00260-1	Air-conditioner duct cover	Prevent entry of foreign objects into air-conditioner inlet duct.
2-1	215-00261-1	Safety pins (2)	Prevent accidental canopy jettison or seat ejection.
2-3	215-00264-1	Angle-of-attack vane cover	Prevent damage to angle-of-attack vane when airplane is parked.
2-3	215-00266-4	Engine cooling hole covers (2)	Prevent entry of foreign objects into engine cooling holes.
2-3	216-01599-1	Camera window cover	Protect camera window while airplane is on the ground.
2-1	215-00265-5	Main gear downlocks (2)	Ensure positive lock of main landing gears in down position.
	42D6594-2	Wheel chock sets (2)	Prevent airplane from moving while parked.
	NWC2[1]	Wheel chocks, metal (2)	Prevent airplane from moving while parked.
2-3	215-00256-16	Ejection seat protective cover	Protect ejection seat from sun and heat while airplane is parked and canopy cover is not installed.
2-3	7325205-10	Canopy cover	Protect canopy from weather elements.
	216-01937-1	Head-up display optics cover	Protect head-up display from sun rays and dust.
	627223100-029[2]	TISL pod window protective cover	Protect pod window.
2-3	218-09960-103[3]	FLIR window cover	Protect FLIR window from dirt and damage.

[1]Metal chocks optional.
[2]Airplanes AF69-6197 and subsequent.
[3]Airplanes after T.O. 1A-7-530.

2-12. PRECAUTIONS. The following precautions shall be observed during parking operations to avoid injury to personnel and damage to airplane:

a. Stay clear of airplane 45 to 60 minutes if a hot-brake condition exists.

b. Ensure that ejection controls safety handle is pulled down prior to entering cockpit.

c. If airplane contains ammunition or has external stores installed, refer to T.O. 11A-1-33 for additional ground handling precautions.

d. Ensure that required ground handling safety equipment and protective covers and air plugs are installed while airplane is parked and removed and stored before applicable operations.

e. Canopy shall be closed any time wind velocity exceeds 40 knots. When opening canopy in strong headwinds, manually restrain canopy to prevent airloads from lifting canopy beyond travel limits and shearing canopy pivot bolts.

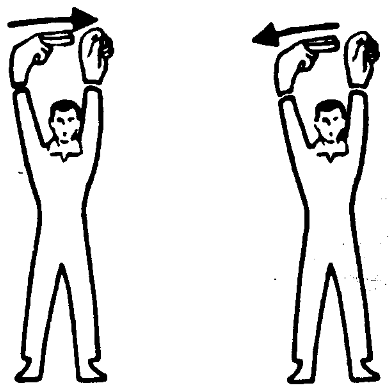
f. Ensure that exterior canopy release handle is locked in stowed position after opening or closing canopy from cockpit exterior and before operating interior canopy release handle.

g. Proper hand signals should be used during airplane parking (figure 2-5).

h. To prevent shearing of extension step rivets when lowering steps, do not allow steps to free-fall to fully extended position or load steps before full extension.

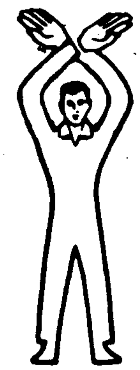
i. Additional precautions are required when wind velocities in excess of 45 knots are expected under normal ramp conditions or wind velocities in excess of 25 knots are expected under icy ramp conditions (paragraph 2-25).

1



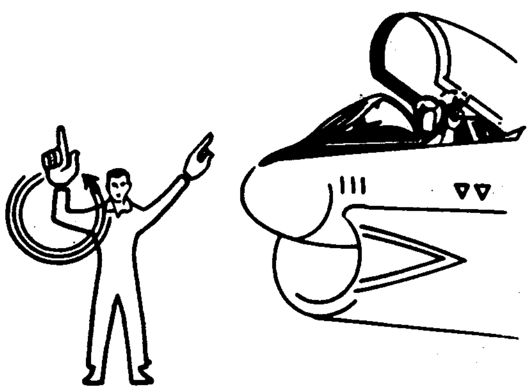
CONNECT EXTERNAL ELECTRICAL POWER - Hold extended index finger of right hand against the flat palm of vertical left hand. Crew chief connects power source and repeats signal. External electrical power is not normally required for starting.

2



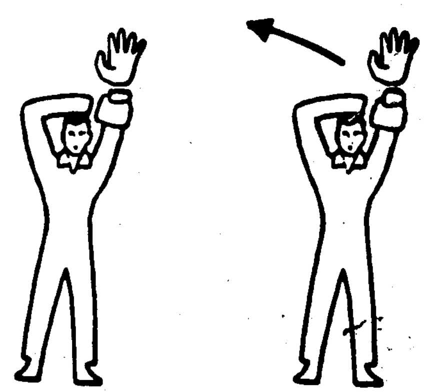
STOP - Arms crossed above the head, palms facing forward.

3



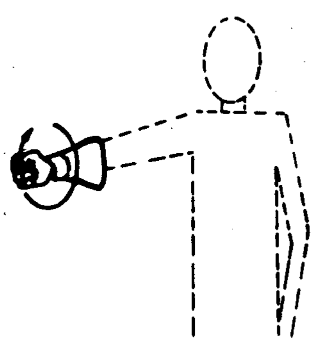
ENGINE START SIGNAL - Pilot rotates two fingers in circular motion. Crew chief ensures intake and tailpipe areas are clear, and will return signal when ready for start.

4



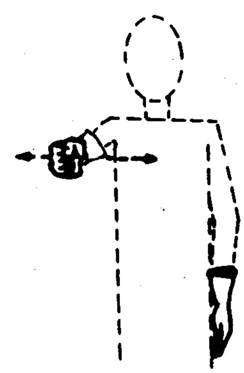
DOWNLOCKS REMOVED - Crew chief points three fingers to removed downlocks. Pilot observes.

5



EMERGENCY ACCUMULATOR SHUTOFF VALVE - Pilot closes right hand into fist and rotates in counter-clockwise direction to close valve. Crew chief checks for proper pressure, closes valve and repeats signal.

6

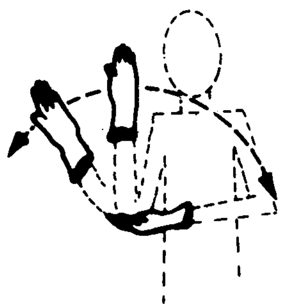


RUDDER TRIM - Arm forward from shoulder, palm open. Move arm right or left indicating direction of rudder movement.

01D047-01-10-74

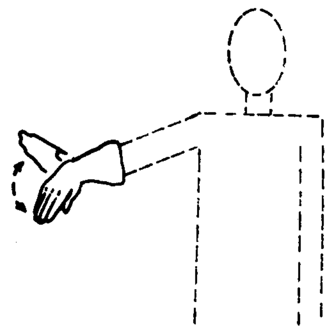
Figure 2-5. Hand Signals (Sheet 1)

7



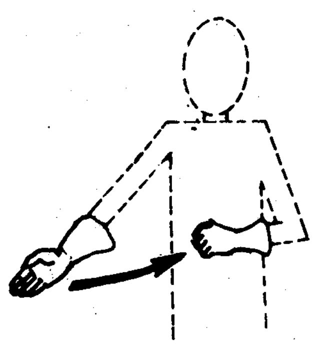
AILERON TRIM CHECK – Crew chief holds right forearm vertical and grasps elbow with left hand. Swings forearm left, then right to indicate desired aileron trim change. Pilot actuates trim on signal.

8



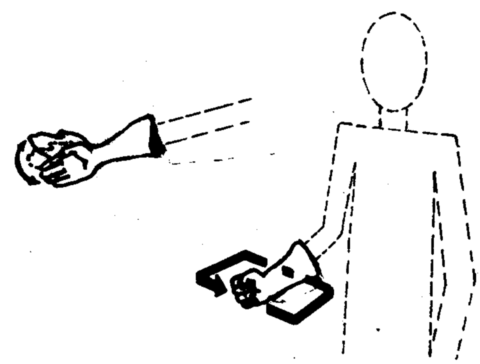
UHT TRIM – Crew chief extends one arm in front with hand held vertically. Moves hand up and down for elevator trim. Pilot moves beep trim switch full throw forward and aft and monitors pitch trim indicator. Crew chief checks both surfaces of UHT for proper movement.

9



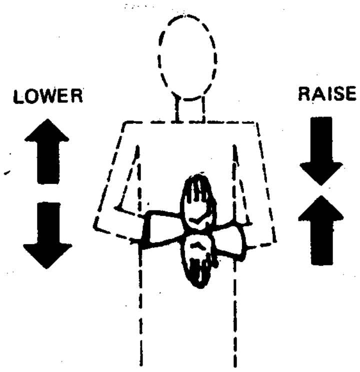
VISCOUS DAMPER CHECK – With opened right hand, strike clenched left fist, held near stomach, two sharp blows. Pilot executes damper check.

10



CONTROL SURFACES – CYCLE Crew chief moves right hand, with fist clenched, in a rectangular pattern at waist level. Indicates rudder trailing edge motion with open right hand. Pilot moves stick in a rectangular pattern, making sure stick contacts all stick stops. Crew chief checks all control surfaces for proper movement.

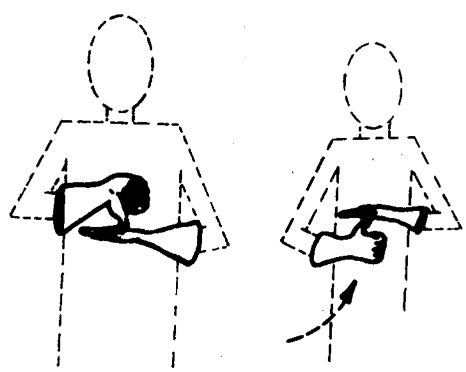
11



LOWER WING FLAPS – Hands in front, palms together horizontally, then open from wrists alligator-mouth fashion.

RAISE WING FLAPS – Hands in front, palms open from wrists, then suddenly closed.

12



HOOK DOWN – Right fist, thumb extended downward into horizontal palm of left hand.

HOOK UP – Right fist, thumb extended upward, raised suddenly to meet horizontal palm of left hand.

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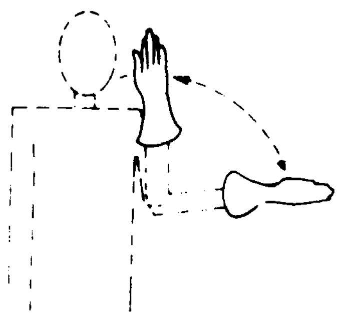
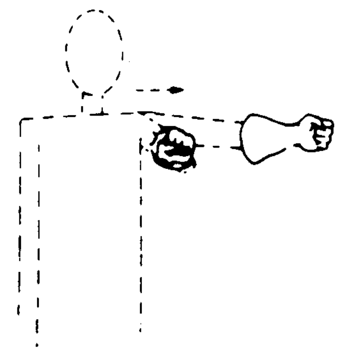
Figure 2-5. Hand Signals (Sheet 2)

13



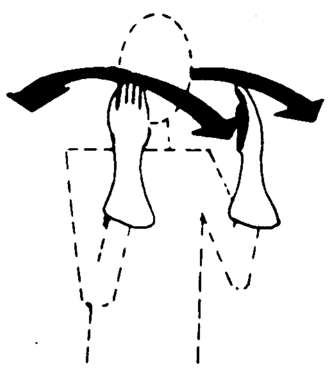
EPP CYCLE - Left arm forward, elbow at waist, palm open and about at-shoulder level. Crew chief swings forearm 90° down and outward to bring palm about waist level, indicating EPP is out. Signal is reversed to retract EPP after check.

14



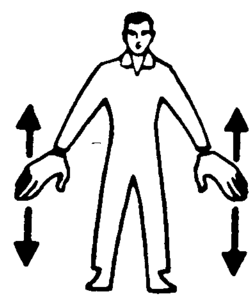
AIR REFUELING PROBE CYCLE - Crew chief positions arm forward from shoulder, fist clenched. Movement to left 90° indicates probe is out. Reverse movement to indicate probe retraction.

15



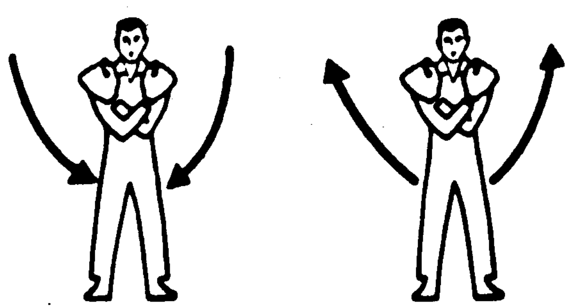
MOVE FORWARD - Crew chief, with hands at head level and palms toward face, makes upward-backward motion repeatedly.

16



SLOW DOWN - Crew chief raises arms to waist level, palms down. Makes a downward patting motion.

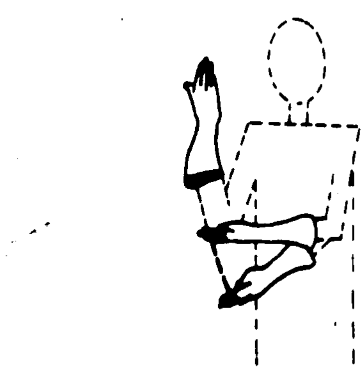
17



FOLD WINGS - Arms straight out at sides, then swept forward and hugged around the shoulders.

SPREAD WINGS - Reverse fold wings procedure.

18



WING LOCK CHECK - Crew chief hits right elbow with palm of left hand to indicate that wingfold warning flags are retracted and wings are locked.

01D047-03-03-68

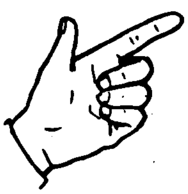
Figure 2-5. Hand Signals (Sheet 3)

19

"AIR DATA COMPUTER TEST – Pilot makes 'T' with index fingers. Crew chief selects and runs ADC self test 1, both check for proper indications. After completion of test, signal is repeated followed by thumbs up or down, as appropriate."

CHECK PRIMARY

20



PRIMARY VALVE CHECK (HOT REFUELING) – Refueling Supervisor extends arm between waist and head with forefinger extended and thumb in up position. Remaining fingers closed against palm of hand.

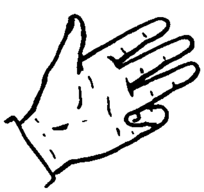
CHECK SECONDARY

21

SECONDARY VALVE CHECK (HOT REFUELING) – Refueling Supervisor extends arm between waist and head with forefinger and middlefinger extended forward and thumb in up position. Remaining fingers closed against palm of hand.

EXTERNAL TANK CHECK

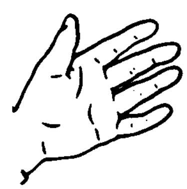
22



EXTERNAL TANK CHECK (HOT REFUELING) – Refueling Supervisor extends arm between waist and head with all fingers extended except little finger which will be closed against palm of hand. Thumb will be pointed up.

ADD FUEL

23



ADD FUEL (HOT REFUELING) – Refueling Supervisor extends arm between waist and head with thumb and ALL fingers extended (palm open).

STOP FUEL

24

STOP FUEL (HOT REFUELING) – Refueling Supervisor extends arm between waist and head with palm open and rapid waving of arm.

01D047-04-01-89

Figure 2-5. Hand Signals (Sheet 4)

2-13. PARKING.

a. Ensure that ejection controls safety handle is in down-and-locked position.

b. Position airplane with nose headed into wind when practicable.

NOTE

Additional chocking or mooring is required when wind velocity of 45 knots or more is forecast under normal ramp conditions or wind velocity of 25 knots or more is forecast under icy ramp conditions (paragraph 2-25).

c. Install wheel chocks (both main landing gear wheels, forward and aft) prior to engine shutdown.

CAUTION

To prevent inadvertent retraction of nose gear, visually inspect after installation of nose gear downlock pin to ensure proper engagement through pawl assembly.

If any of the downlocks cannot be installed, jacks should be placed under the aircraft prior to engine shutdown to prevent possible collapse of landing gear.

d. Install main and nose gear downlocks prior to engine shutdown.

e. If wings are folded, install wingfold support struts (paragraph 2-47).

f. Shut down engine, ensuring that all cockpit switches and controls are positioned properly (T.O. 1A-7D-1).

g. Install interior canopy jettison initiator safety pin and ejection seat prime initiator safety pin (figure 2-1).

h. Ensure that lap belts are in the seat and not hanging over edge of seat, as damage to seat and/or console may result.

i. Install static grounding wire to prevent buildup of static electricity in the airplane (paragraph 1-26).

CAUTION

To prevent damage to angle-of-attack transducer and vane, ensure that cover is installed at all times except during flight. Extra precautions shall be taken when cleaning airplane to prevent wash solution from entering transducer and causing corrosion (T.O. 1A-7D-3).

j. Install pitot and angle-of-attack vane covers (figure 2-3).

k. Install air-conditioning duct shield (figure 2-3).

l. On airplanes AF69-6197 and subsequent, install TISL pod window cover (figure 2-3).

m. Install head-up display optics cover.

n. Install ejection seat protective cover (figure 2-3). Failure to protect ejection seat and parachute from direct sunlight will result in bleaching and rapid deterioration of fabric.

CAUTION

Be careful when installing canopy cover to prevent scratching canopy and windshield surfaces.

o. Close canopy and lock exterior canopy release handle in stowed position. If ambient, temperature is 100°F or more, canopy shall remain open, canopy shall be shaded, or canopy cover shall be installed to prevent damage to equipment in the cockpit.

CAUTION

Tail cone shield, engine air inlet duct shield, and engine compartment cooling hole covers must not be installed until engine has been given sufficient time for cooling. Shields and covers will be damaged by heat.

p. After engine has cooled, installed tail cone shield, engine air inlet duct shield, and engine compartment cooling hole covers (figure 2-3).

q. Install camera window cover.

r. On airplanes after T.O. 1A-7-530, install FLIR window cover (figure 2-3).

2-14. PROLONGED PARKING. The following procedure shall be accomplished when parking airplanes non-hangared for a prolonged period.

a. Perform parking procedure as outlined in paragraph 2-13.

CAUTION

Use caution when installing canopy cover to prevent scratching canopy and windshield surfaces.

b. Install canopy cover.

NOTE

When forecasted wind velocities exceed 45 knots or 25 knots or more with icy ramps refer to paragraph 2-25 for mooring procedures.

2-15. PRETAXI.

a. Remove canopy cover if installed.

b. Remove tiedowns and mooring equipment.

c. Remove installed protective support equipment. Stow pitot tube cover and angle-of-attack cover (figure 2-2).

CAUTION

To prevent damage to exterior canopy release handle, ensure that handle is locked in stowed position after unlocking canopy.

d. Unlock canopy, open canopy, and stow exterior canopy release handle. Ensure that lap belts are in the seat and not hanging over edge of seat, as damage to seat and/or console may result.

e. Remove interior canopy jettison initiator and ejection seat prime initiator safety pins.

f. If wings are folded, ensure wingfold support struts are unlatched.

g. Start engine (T.O. 1A-7D-1).

CAUTION

Ensure that main gear downlocks rotate freely before removing. A binding downlock may indicate on unlocked main gear even with a safe cockpit indication.

h. Check main gear downlocks for freedom of rotation. Remove main gear downlock assemblies and nose gear downlock pin. Stow main gear downlocks in nose wheel well or in wing pylon stations 2, 3, 6, or 7, electrical access B10213-1. Stow nose gear downlock pin in lower step access 1222-12.

i. Hydraulically charge emergency accumulator packages (paragraph 3-45).

j. Remove wheel chocks.

2-16. FOLDING AND SPREADING WING OUTER PANELS.

CAUTION

To prevent structural damage to airplane, ensure that access panels 3112-3 and 4111-3 are installed before operating wingfold.

2-17. NORMAL WING FOLDING.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Apply electrical power.
		Equipment required for connecting external hydraulic power	Apply hydraulic power.
2-1	215-00255-12	Wingfold support struts (2)	Support outer wing panel when folded.

a. Connect external electrical power (paragraph 1-28).

b. Connect external hydraulic power (paragraph 1-34).

c. Place wing hinge pin lock lever in up-and-locked position and check that warning flags are fully extended on top and bottom of both wing surfaces.

d. Place wingfold control switch in FOLD.

NOTE

If wings cannot be folded using normal procedure, refer to Section XXIV for troubleshooting and repair.

e. When wings are folded, install wingfold support struts (paragraph 2-47). Do not pull support strut handles down to latched position until hydraulic power is removed.

WARNING

Do not remove wingfold support struts unless hydraulic power is applied to airplane. Failure to apply hydraulic power before removing support struts may result in serious injury to personnel.

f. Disconnect external hydraulic power (paragraph 1-34). Pull wingfold support strut handles down until latches are engaged.

g. Disconnect external electrical power (paragraph 1-28).

2-18. NORMAL WING SPREADING.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Apply electrical power.

Tools Required (continued)

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Apply hydraulic power.

WARNING

Unlatch wingfold support strut handle and push handle up, but do not remove support strut before hydraulic power is applied to airplane. Removal of support strut before applying hydraulic power may result in serious injury to personnel.

a. Manually depress spring loaded safety plungers (4) and check that they extend freely without binding or sticking.

b. Unlatch wingfold support struts (paragraph 2-47).

c. Connect external hydraulic power (paragraph 1-34).

d. Connect external electrical power (paragraph 1-28).

e. Remove wingfold support struts (paragraph 2-47).

f. Place wingfold control switch in SPREAD.

CAUTION

Do not force wing hinge pin lock lever into down and locked position. Excessive force may damage hinge pin lock mechanism.

g. When wings are fully spread, place wing hinge pin lock lever in down-and-locked position.

h. Check that warning flags are fully retracted (in accordance with Figure 24-7) and wingfold advisory light is out.

i. Visually confirm that all four (4) wingfold hinge pins are extended (after accomplishment of TCTO 1A-7D-901).

j. Disconnect external hydraulic power (paragraph 1-34).

k. Disconnect external electrical power (paragraph 1-28).

2-19. FOLDING WINGS USING HYDRAULIC HAND PUMP.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
2-1	215-00255-12	Wingfold support struts (2)	Support outer wing panel when folded.
2-6	Hydraulic hand pump handle	Local fabrication	To operate hand pump.

a. Place wing hinge pin lock lever in up-and-locked position and check that warning flags are fully extended on top and bottom of both wing surfaces.

b. On airplanes through AF69-6196, cut lockwire and rotate wingfold manual hydraulic selector valve handle up.

c. On airplanes AF69-6197 and subsequent, cut lockwire and rotate wingfold manual hydraulic selector valve handle outboard.

NOTE

If wings cannot be folded using this procedure, refer to Section XXIV for troubleshooting and repair.

d. Operate hydraulic hand pump until wing outer panels fold completely (paragraph 2-21).

e. Install wingfold support struts (paragraph 2-47).

f. Return manual hydraulic selector valve handle to original position and secure to stop with MS20995C32 lockwire.

2-20. SPREADING WINGS USING HYDRAULIC HAND PUMP.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Apply electrical power.
2-6	Hydraulic hand pump handle	Local fabrication	To operate hand pump.

a. Manually depress spring loaded safety plungers (4) and check that they extend freely without binding or sticking.

b. Connect external electrical power (paragraph 1-28).

c. Place flap handle in position corresponding to flaps.

WARNING

Unlatch wingfold support strut handles and push handles up, but do not remove support struts before hydraulic pressure is applied to system. Removal of support struts before applying hydraulic pressure may result in serious injury to personnel.

d. Unlatch wingfold support strut handles (paragraph 2-47).

e. Place wingfold control switch in FOLD, and operate hand pump to build up system pressure (paragraph 2-21).

f. Remove wingfold support struts (paragraph 2-47).

CAUTION

To prevent damage to wing hinge pins and upper wing lugs, visual check should be made before wings are fully spread to ensure hinge pins are retracted.

g. Place wingfold control switch in SPREAD.

h. Continue to operate hand pump while wings are lowering to spread position.

i. When wings reach full SPREAD position, ensure wing hinge pins are fully extended by operating hand pump until pressure builds up.

CAUTION

Do not attempt to force wing hinge pin lock lever into down–and–locked position. Excessive force may damage hinge pin lock mechanism.

j. Place wing hinge pin lock lever in down–and–locked position.

k. Visually confirm that all four (4) wingfold hinge pins are extended (after accomplishment of TCTO 1A–7D–901).

l. Check that warning flags are fully retracted (flush with upper and lower wing surfaces) and wingfold advisory light is out.

m. Disconnect external electrical power.

2-21. HYDRAULIC HAND PUMP OPERATION.

CAUTION

To prevent damage to hydraulic actuating cylinders with internal locking mechanisms, unless otherwise specifically required in the maintenace instruction technical manuals of the affected system, hand pump operation must be limited to the following:

1. Speed brake cycling.
2. Folding/spreading of the wings.
3. Charging of the utility brake and emergency accumulators.
4. Static pressurization of the system for leak detection.

a. Place flap handle in position corresponding to flaps.

CAUTION

Do not operate pump with any instrument other than fitted handle (figure 2–6). Damage to pump can result from use of screwdrivers, wrench extensions, hammer handles, etc.

b. Insert handle in pump. If folding/spreading wings, rotate wingfold manual selector valve handle up (airplanes through AF69–6196) or outboard (airplanes AF69–6197 and subsequent). If perfoming other authorized operations, rotate valve handle down (airplanes through AF69–6196) or inboard (airplanes AF69–6197 and subsequent).

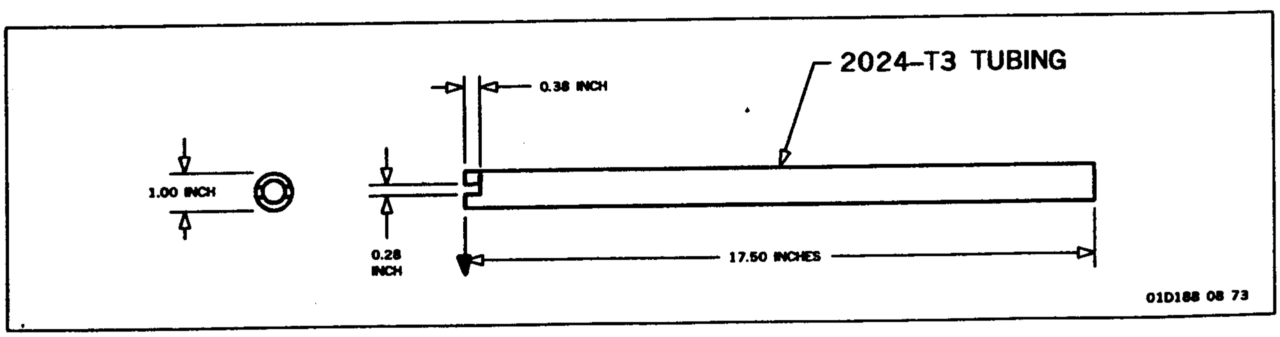


Figure 2-6. Hydraulic Hand Pump Handle Fabrication

c. Stroke pump handle for required pressure.

d. When maintenance task is completed, remove pump handle from pump and wheel well.

2-22. TOWING.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MB-4	Tow tractor	Tow airplane.
2-1	215-00250-1	Nose gear downlock pin	Ensure positive lock of nose gear in down position.
2-1	215-00255-12	Wingfold support struts (2)	Support wing outer panel when folded.
2-1	215-00265-5	Main gear downlocks (2)	Ensure positive lock of main gears in down position.
2-8	62A122J1	Towbar NT-4	Connect airplane to tow tractor.
2-7	Local fabrication	Arresting hook support assembly	Support arresting gear hook when engine removal access (5222-3) is removed.

2-23. PRECAUTIONS. To prevent injury to personnel and damage to airplane or equipment, the following precautions shall be observed during all towing operations:

a. After extensive taxiing, brakes and wheels may be extremely hot. Hot brakes and wheels are dangerous. Stay clear of airplane for 45 to 60 minutes if a hot-brake condition is suspected.

b. Do not tow airplane without a qualified person in cockpit to operate brakes.

c. Ensure that brake system is operational.

d. Never tow airplane with engine operating.

e. Do not tow airplane faster than normal walk (3 to 5 miles per hour). Avoid quick stops and starts.

f. Check main and nose gear downlocks for proper installation before towing.

g. Ensure that exterior canopy release handle is locked in stowed position before closing canopy.

h. Close canopy if high surface winds are prevalent.

i. If wings are folded, ensure wingfold support struts are installed (paragraph 2-47).

j. Ensure that access panels in table 2-1 are installed prior to towing.

k. Do not tow airplane if sump tank support truss is removed.

l. Personnel shall stay clear of wheel wells of moving airplane.

m. Ensure arresting gear hook is retracted before towing airplane. Install arresting gear hook support assembly (local fabrication, figure 2-7) if engine removal access 5222-3 is removed.

n. Personnel shall not ride on the outside of the airplane.

o. Ensure applicable ground handling safety equipment, protective covers, and air plugs are properly installed (figures 2-1 and 2-3).

p. Check that ejection controls safety handle is in down – locked position and that ejection seat prime initiator and interior canopy jettison initiator safety pins are installed.

q. Prior to towing airplane, visually check nose and main landing gear struts and tires for obvious incorrect inflation.

r. Ensure boardline steps are open and extended to allow emergency egress.

WARNING

Ensure all personnel are familiar with safety precautions outlined in T.O. 00-25-172, AFOSH Standard 127-66, and AFR 60-11.

2-24. TOWING PROCEDURE.

a. Disconnect towbar from tow tractor before connecting towbar to airplane.

b. Connect towbar to nosewheel tow fittings (figure 2-8).

CAUTION

Towing team supervisor shall ensure that tow tractor operator is fully qualified and understands the requirement to approach towbar very slowly, exercising extreme caution not to bump towbar.

c. Carefully connect towbar to tractor.

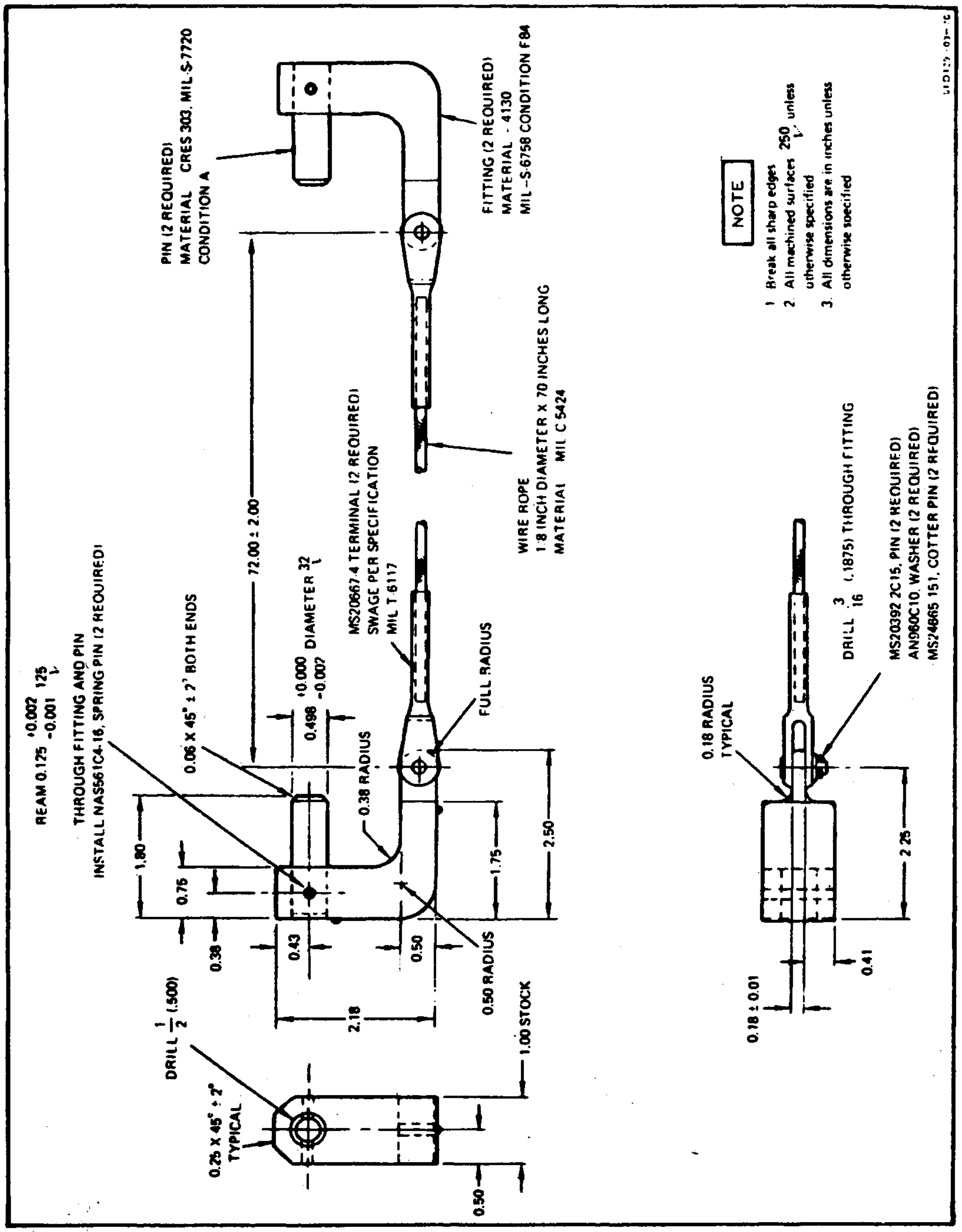


Figure 2-7. Arresting Gear Hook Support Assembly Fabrication

d. Check that brake hydraulic pressure is available as follows:

(1) Check that utility accumulator page (Station 5) indicates a minimum of 2,300 psi. If pressure indication is less than 2,300 psi, hydraulically charge accumulator using hydraulic hand pump. Connect static ground wire in accordance with T.O. 00-25-172.

CAUTION

If the emergency brake accumulator (Station 7) is dumped, emergency brake will not be available until an engine start or external hydraulic power is applied to PC-2 hydraulic system.

NOTE

The utility brake accumulator may be hydraulically charged separate from other system accumulators by dumping emergency and reservoir accumulators hydraulic pressure in accordance with paragraph 3-46 and then holding the accumulator test switch in the DUMP position while operating the hand pump.

e. Remove tiedowns and disconnect static ground wire.

CAUTION

Ensure that lap belts are in the seat and not hanging over edge of seat, as damage to seat and/or console may result.

f. Before moving airplane, station a qualified person in cockpit to operate brakes. Station observer where best able to observe complete towing operation. If moving airplane in congested area, additional observers shall be stationed at each wingtip and at tail section area.

g. Ensure that brake anti-skid switch is in BRAKE ACCUM and battery switch is in OFF.

h. Remove wheel chocks and place on tow tractor.

CAUTION

Never operate airplane brakes during towing operation except on command of tow tractor operator or observers. Brake pressure is limited to approximately four brake applications from the utility brake system. A shutoff valve is installed downstream of the utility brake accumulator to prevent bleed down of hydraulic pressure. To use utility brake accumulator pressure, the valve must be opened by placing anti-skid switch in BRAKE ACCUM and battery switch in BATT.

i. If required during towing, operate emergency brake system by pulling aft and holding EMERG BRAKE handle located on left console.

j. If required during towing, operate utility brake system as follows:

CAUTION

To preserve battery power and prevent loss of utility brake accumulator pressure, leave battery switch in OFF except when brakes are required.

With brake anti-skid switch in BRAKE ACCUM, place battery switch in BATT and depress and hold left and right brake pedals.

NOTE

The arresting gear hook may be used for emergency rearward towing in snow, sand, or mud. Any safe means of attaching chain or cable between hook and tractor may be used. Towbar may be installed and used to steer airplane.

k. Tow airplane to new location. Stop airplane approximately 1 foot from desired parking location and perform the inspection in accordance with T.O. 4T-1-3. Move airplane to parking location and complete inspection.

l. Park and secure airplane (paragraph 2-11).

m. If airplane is not to be flown within 1 hour, dump emergency accumulators.

n. Place brake anti-skid and battery switches in OFF.

ag. Service airplane with fuel (paragraph 3-66).

ah. Start and operate engine (paragraph 2-51). Check the following during engine operation:

1. Fuel and hydraulic leaks

2. Hydraulic pressure

3. Fuel quantity

4. Engine fuel controls

5. Operation of systems listed in step ag.

6. Control (bleed) air system pressure in accordance with T.O. 1A-7D-2-3.

ai. Shut down engine.

aj. Close all opened accesses.

22-25. WING FORWARD ATTACH LINK REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	215-00211-1	Sling assembly, wing hoisting	Relieve load on wing forward attach links.
	215-00835-1	Guide, wing forward attach bolt	Align holes in forward wing attach lugs with mating holes in attach links.
		Hoist, overhead or crane, 5,000-pound capacity	Use in conjunction with sling assembly to relieve load on wing attach links.

NOTE

This procedure is applicable for removal and installation of both left and right wing forward attach links.

22-26. REMOVAL. (See figure 22-6.)

a. Open access 3113-10 for removal of left attach link and access 4113-10 for removal of right attach link.

NOTE

Identify washer(s) removed from upper and lower link attach bolts for reinstallation in same location.

b. Remove nut (1) and washers (2) from bolt (3). Do not remove bolt.

c. Open aft hoist accesses 3133-5 and 4133-5.

d. Connect wing hoisting sling to overhead hoist and attach sling to forward and aft wing hoisting lugs as shown in figure 2-11.

e. Adjust sling for proper center of gravity by placing sixth link (painted black) from aft swivel in the top of the adjuster.

CAUTION

To prevent damage to airframe structure and systems components, do not remove both forward wing attach links at the same time (one link shall be installed at all times).

f. Take up slack in hoist sling sufficiently to relieve load on wing attach link and remove bolt (3). Maintain the no load condition with hoist.

g. Open access 1132-1 for removal of left attach link and access 2132-1 for removal of right attach link.

h. Remove nut (4), washers (5), and bolt (6).

i. Remove link (7) from airplane.

22-27. INSTALLATION. (See figure 22-6.) Inspect link for bearing displacement and freedom of movement. If bearing is displaced/or movement restricted.

a. Remove displaced bearings.

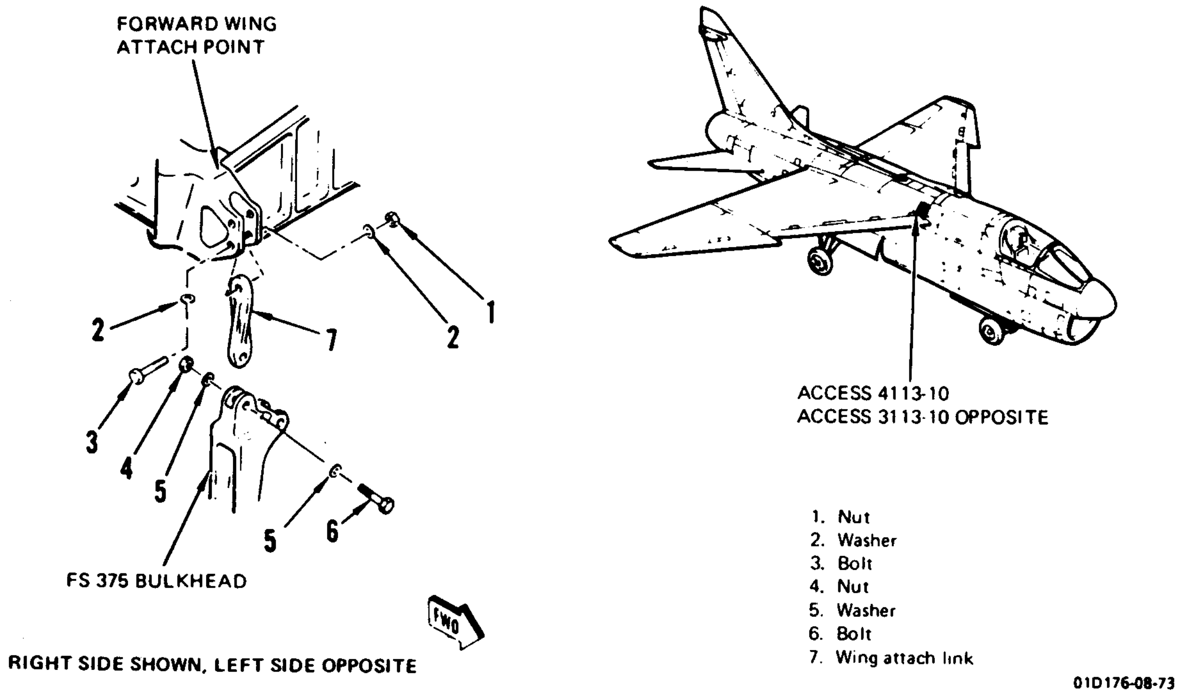


Figure 22-6. Wing Forward Attach Link Removal and Installation

b. Inspect bearing hole in link for corrosion, cracks, or damage using dye penetrant or eddy current NDI methods in accordance with T.O. 1A-7D-36. Minor abrasions and scouring can be removed using a crocus cloth.

c. Inspect bearings for corrosion, galling/scoring, excessive looseness, or binding (Reference T.O. 44B-2-2). Stiff/frozen bearings may be loosened by using a light penetrating oil in accordance with VV-P-216B, Type 1, or equivalent. Bearings that do not pass this inspection or cannot be worked free must be replaced.

d. Reinstall old bearing or install a new bearing, Heim Part No. NAG-9, using MIL-R-46082A, Type 1, retaining compound to provide a press fit. Insure mating surfaces are cleaned prior to installing bearing.

e. Groove stake bearing using tool in accordance with T.O. 1A-7D-3, Appendix F. Insure proper staking forces/torque valves are used during the staking operation.

f. Seal outside of bearing race/link interface with MIL-S-8802 or MIL-S-81733 sealing compound.

g. Refinish link in accordance with T.O. 1A-7D-23.

h. Place link (7) in position for installation.

i. Wipe shank of bolt (6) with a thin coat of MIL-C-16173 Grade 2 corrosion-preventive compound. Install bolt, washers (5), and nut (4) and secure with cotter pin.

j. Using bolt guide, install bolt (3), washers (2), and nut (1) and secure with cotter pin.

k. Remove wing hoisting sling and hoist as required.

l. Close accesses 1132-1, 2132-1, 3113-10, 3133-5, 4113-10, and 4133-5 as applicable.

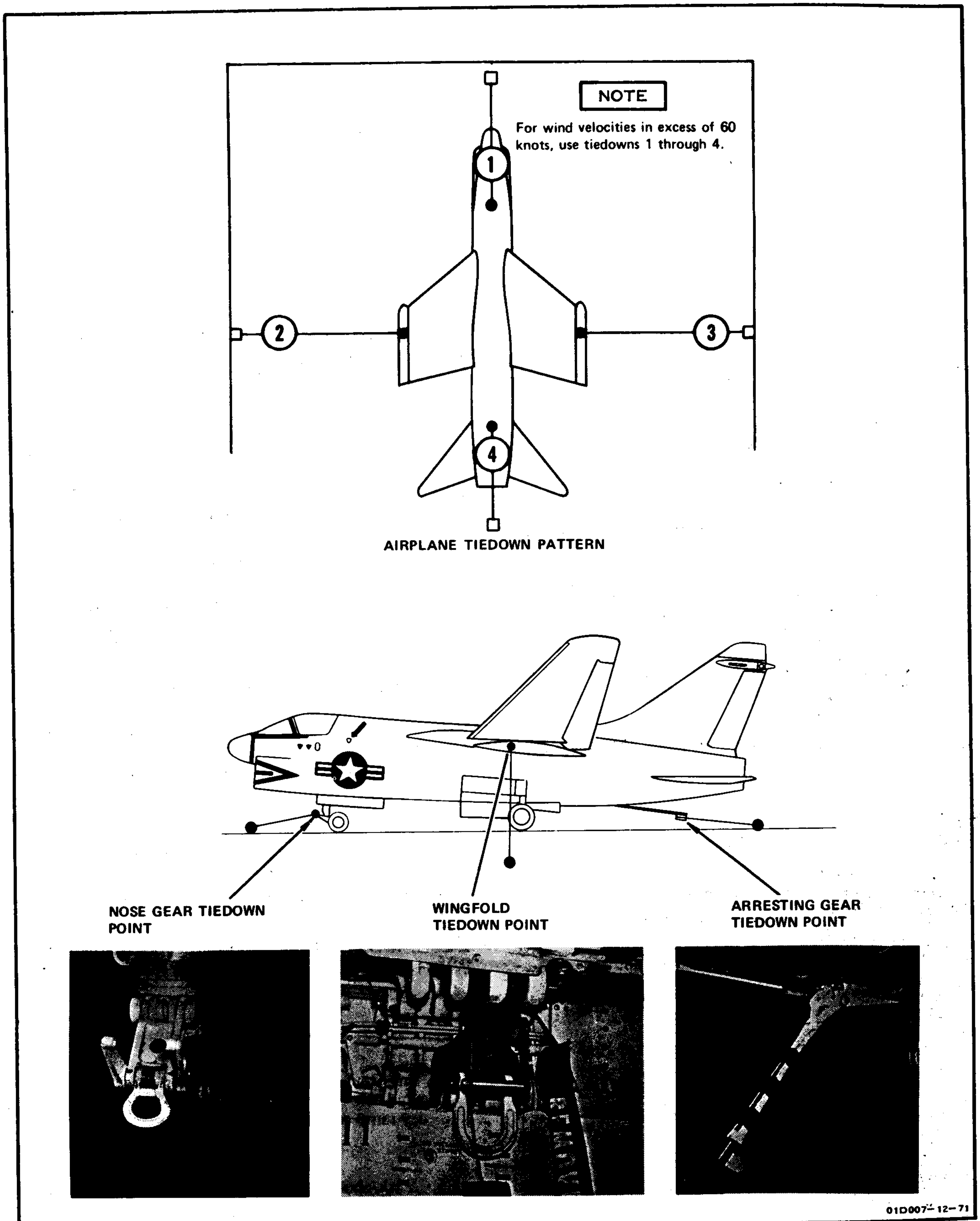


Figure 2-9. Mooring Points

2-27. MOORING (WIND 45 TO 59 KNOTS).

NOTE

This procedure is applicable when forecasted wind velocity is from 45 to 59 knots under normal ramp conditions.

a. Ensure that airplane has full internal fuel load.

b. Ensure that airplane is properly parked and that protective covers and static ground are installed (paragraph 2-11).

c. Chock nose and both main gear wheels and interconnect chocks from front to rear of wheels.

NOTE

The following procedures is an authorized alternate method for wind 45 to 59 knots.

d. Ensure that airplane has full internal fuel load.

e. Position airplane to utilize existing tiedown facilities. Head airplane into wind if possible.

f. Ensure that airplane is properly parked and that protective covers and static ground are installed (paragraph 2-11).

g. Check nose and main gear wheels and interconnect chocks from front to rear of each wheel.

2-28. MOORING (WIND 60 KNOTS OR ABOVE).

NOTE

Normally the airplane should be hangared or evacuated when winds above 60 knots are forecast. This procedure is applicable when wind velocity of 60 knots or more is forecast and operating conditions prevent hangaring or evacuation of the airplane.

a. Ensure that airplane has full internal fuel load.

b. Position airplane to utilize existing tiedown facilities. Head airplane into wind if possible.

c. Ensure that airplane is properly parked and that protective covers and static ground are installed (paragraph 2-11).

d. Check nose and main gear wheels and interconnect chocks from front to rear of each wheel.

e. Fold wings and install wingfold support struts (paragraph 2-47). Maximum crosswind with wings folded and support struts installed is 100 knots.

f. Attach tiedowns between each (left and right) wingfold tiedown ring, nose gear tiedown ring, and arresting gear and ramp mooring points (figure 2-9).

g. Tighten and secure tiedowns.

2-29. MOORING (WIND 25 KNOTS OR MORE WITH ICY RAMPS).

a. Park/chock and moor the airplane in accordance with instructions in paragraph 2-28.

2-29A. MOORING (WIND UP TO 75 KNOTS, ALTERNATE PROCEDURE).

NOTE

This procedure is applicable when forecasted wind velocity is from 0 to 75 knots under normal ramp conditions.

a. Insure airplane has full internal fuel load.

b. Insure that airplane is properly parked and that protective covers and static ground are installed (paragraph 2-11).

c. Insure wings are spread.

d. Attach tiedown at nose gear tiedown ring.

e. Chock both main gear wheels and interconnect chocks from front to rear of wheels.

2-29B. MOORING (WINDS UP TO 25 KNOTS WITH ICY RAMPS, ALTERNATE PROCEDURE).

NOTE

This procedure is applicable when forecasted wind velocity is from 0 to 25 knots under icy ramp conditions.

a. Park/chock and moor the airplane in accordance with instructions in paragraph 2-29A.

Table 2-2. Airplane Tiedown Materials

Type of Material	Diameter Size	Tensile Strength
Stainless steel cable, 6 X 19	7/16 inch	16,300 pounds
Manila rope	1-1/2 inches	18,500 pounds
Nylon rope	1 inch	18,300 pounds
TD-1A tiedown chain assembly		16,000 pounds

2-30. JACKING.

WARNING

The maximum safe wind velocity for outside jacking of A-7D aircraft (with empty or full fuel loads) is 15 mph.

2-31. PRECAUTIONS.

a. Do not walk or climb on tail sections while airplane is on jacks unless nose section has been tied down.

b. If external hydraulic and electrical power are to be applied, open speed brake control circuit breaker CB307 in right avionic compartment.

c. Do not jack airplane or landing gear at any point except wind and fuselage jack points on main and nose landing gear jack points.

d. Ensure that access panel restrictions are observed (table 2-3).

e. If necessary to jack airplane with external stores installed, stores will be loaded symmetrically or lightly loaded side of airplane shall be tied down.

f. To ensure a mechanical lock in event of jack hydraulic failure, turn locking collar by hand and keep just above locked position as airplane is raised and lowered.

CAUTION

To prevent possible damage to airplane, ensure arresting gear hook is retracted or arresting gear hook support assembly is installed before jacking or lowering airplane.

g. Install arresting gear hook support assembly (local fabrication, figure 2-7) if engine removal access 5222-3 is removed.

WARNING

If landing gear handle is moved while airplane is supported jacks, gear may unlock and collapse when airplane is lowered and downlocks removed. Gear must be completely cycled before lowering airplane to ensure it is locked in down position.

h. When jacking airplane for operational checkout of landing gear, the entire airplane shall be jacked clear of the parking surface. Partial jacking to cycle one gear may result in unlocking gears which contact parking surface (even though downlocks are installed) and subsequent collapse of unlocked gears when downlocks are removed.

i. Observe ground clearances (table 2-4) and ensure that jack point limit load for each jacking operation does not exceed maximum limits (table 2-5). Determine jack point reactions from weight and c.g. data in weight and balance handbook T.O. 1-1B-40 or from table 2-6.

j. If airplane is to be leveled, refer to specific jacking procedures for leveling (paragraph 2-35).

k. Ensure that main gear wheel chocks are in position during nose gear and nose section jacking.

WARNING

To prevent catastrophic failure and damage to airplane, do not unscrew (extend) jack extension screw more than 4 inches on the 17-ton Regent fuselage nose jack or more than 18 inches on the 20-ton Columbus wing jack. (Refer to T.O. 35A2-2-76-1 and T.O. 35A2-2-54-1, respectively).

l. Do not exceed jackscrew extension limits specified in applicable 35A2 series technical manual.

Table 2-3. Access Panel Restrictions During Jacking Operation

CAUTION

To prevent structural damage to airplane, the following access panels shall be installed (with all fasteners) before jacking airplane.

Jacking Nose Gear

These access panel restrictions apply when jacking at nose gear shock strut jack point.

1123		2123-4[1]
	or	2123-9[2]
		2123-11[1]
1222-5		
1222-6		
1222-6-1		

Table 2-3. Access Panel Restrictions During Jacking Operation - Continued

1222-6-3		
1222-11		
2212-6		
2212-10		
5122-4		
5122-6[2]		
5132-1		
5133-1		
6122-4		
6122-5		
6132-1		
6133-1		
6222-1	or	6222-3

Jacking Nose Section or Complete Airplane

These access panel restrictions apply when jacking at forward fuselage or wing jack points.

1123-1	or	2123-4[1]
		2123-9[2]
		2123-11[1]
2212-6	or	2222-4
2212-10		
5122-4		
5122-6[2]		
5132-1		
5133-1		
6122-4		
6122-5		
6132-1		
6133-1		
6222-1	or	6222-3

Table 2-3. Access Panel Restrictions During Jacking Operation - Continued

1222-8		1222-5
1222-8-1		1222-6
1222-9	or	1222-6-1
1222-10		1222-6-3
		1222-11

If nose gear is installed, the following panels must be installed:

2212-6		1222-5
2212-10	or	1222-6
		1222-6-1
		1222-6-3
		1222-11

NOTE

Access panels 1222-6 and 1222-8 may be removed simultaneously while airplane is on jacks if 2212-6, 2212-10, and 2222-4 are installed.

30MM Gun Pod Boresight

1123-1	6132-1
2123-9	6133-1
2212-6	6222-1
2212-10	6222-3
2222-4	1222-8-1
5122-4	1222-9
5122-6	1222-5
5132-1	1222-6
5133-1	1222-6-1
6122-4	1222-11
6122-5	A1051033-1 (Tail Cone)

[1]Airplanes through AF69-6196

[2]Airplanes AF69-6197 and subsequent

Table 2-4. Airplane Jacking Clearances

Jack Points	Ground Clearance (Inches) Minimum	Maximum	Shock Strut Condition	Jack Part Number
Forward fuselage	27.5	51.6	Fully compressed and fully extended	3961
Wing	76.7	95.0	Fully compressed and fully extended	64J35484
Main landing gear	8.9	14.2	Normal static strut extension	374D1001
Nose landing gear	6.2	10.6	Normal static strut extension	53D220-20

Table 2-5. Jack Load Configurations

Nose Gear	Main Gear (Each)	Forward Fuselage	Wings (Each)
Jack Point Limit Load (Pounds)			
23,552	18,000	12,945	11,120

CAUTION

These are structural limit loads for jack points and must not be exceeded.

2-32. JACKING MAIN GEAR (See figure 2-10.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
2-10	374D1001	15-ton jack	Raise main gear.
	42D6594-2	Wheel chocks (2 sets)	Prevent airplane from moving during jacking.

CAUTION

Do not jack main gear if jack point reaction exceeds 18,000 pounds per wheel. If jacking airplane with external stores installed, stores shall be loaded symmetrically or the lightly loaded side shall be tied down.

a. Determine jack point reaction from table 2-6 or T.O. 1-1B-40.

b. Install chocks fore and aft of opposite main gear and nose gear.

c. Position axle jack under main gear jack pad.

d. Rotate screw jack until it seats against jack pad.

e. Tighten jack hydraulic shutoff valve.

f. Apply jacking pressure until wheel clears the ground. Ensure that jack remains level throughout jacking operation.

g. Perform necessary maintenance.

h. Loosen jack hydraulic shutoff valve and lower airplane slowly.

i. Remove jack.

j. Install main gear wheel chocks.

2-33. JACKING NOSE GEAR. (See figure 2-10.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	42D6594-2	Wheel chocks (2 sets)	Prevent airplane from moving during jacking.
2-10	53D22020	5-ton jack	Raise nose gear.

CAUTION

Ensure that required structural access panels are installed (table 2-3).

Ensure main gear wheel chocks are in position during nose gear jacking.

Do not jack nose gear if jack point reaction exceeds 23,552 pounds. If jacking airplane with external stores installed, stores shall be loaded symmetrically or lightly loaded side shall be tied down.

a. Determine jack point reaction from table 2-6 or T.O. 1-1B-40.

b. Install main gear wheel chocks.

c. Position nose gear jack under axle jack point and seat screw jack on jack point.

d. Tighten jack hydraulic shutoff valve.

e. Apply jacking pressure until wheel clears the ground. Ensure that jack remains level throughout jacking operation.

f. Accomplish required maintenance.

g. Loosen jack hydraulic shutoff valve and slowly lower airplane.

h. Remove jack.

2-34. JACKING NOSE SECTION. (See figure 2-10.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
2-10	7225123-10 (Oklahoma City ALC)	Airplane jacking pad	Adapt jack to airplane.
2-10	3961 (Regent Mfg. Co.)	17-ton jack	Raise airplane nose section.
	42D6594-2	Wheel chocks (2 sets)	Prevent airplane from moving during jacking.

CAUTION

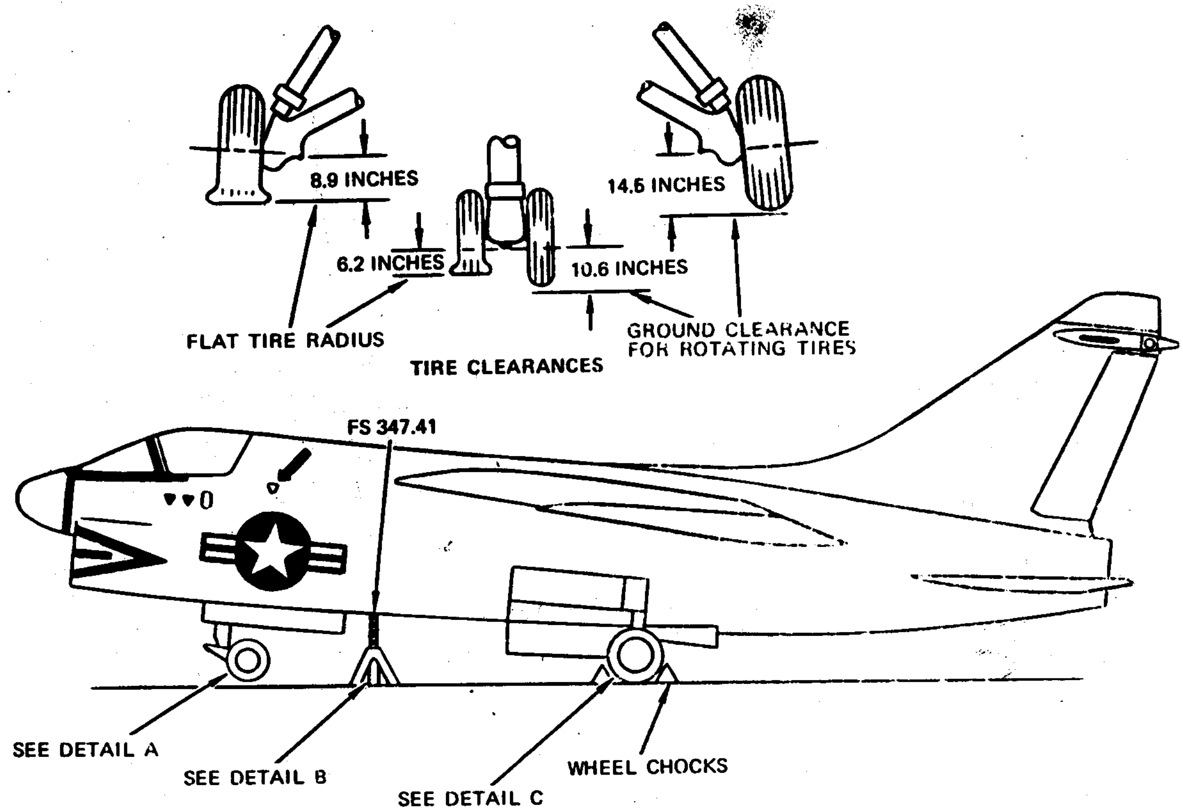
Ensure that required structural access panels are installed (table 2-3).

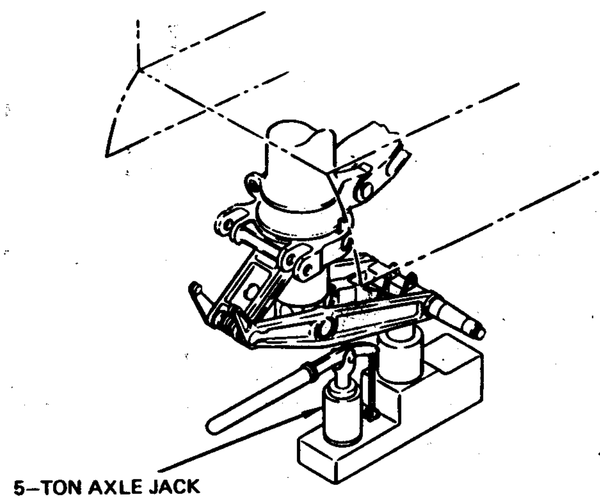
Ensure main gear wheel chocks are in position during nose section jacking.

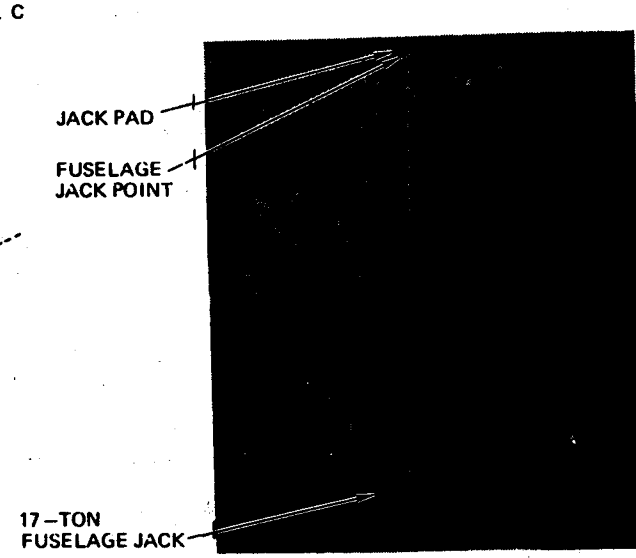
Do not jack nose section if forward fuselage jack point reaction exceeds 12,945 pounds. If external stores are installed, stores shall be loaded symmetrically or lightly loaded side shall be tied down.

a. Determine jack point reaction from table 2-6 or T.O. 1-1B-40.

b. Position main gear wheel chocks to allow forward and AFT rotation of main gear wheels during jacking and lowering of aircraft nose section.







DETAIL A

NOSE GEAR JACKING

Position 5-ton axle jack under nose gear integral jack pad and jack airplane until nose gear tires clear the ground.

DETAIL B

NOSE SECTION JACKING

Install jack pad on fuselage jack point, position 17-ton jack under jack pad, and jack airplane until nose gear tires clear the ground.

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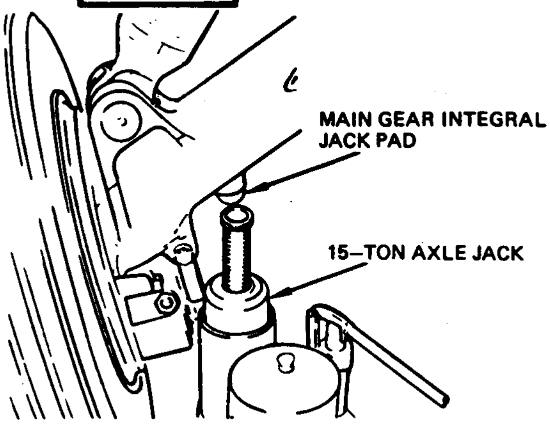
Figure 2-10. Airplane Jacking (Sheet 1)

DETAIL C

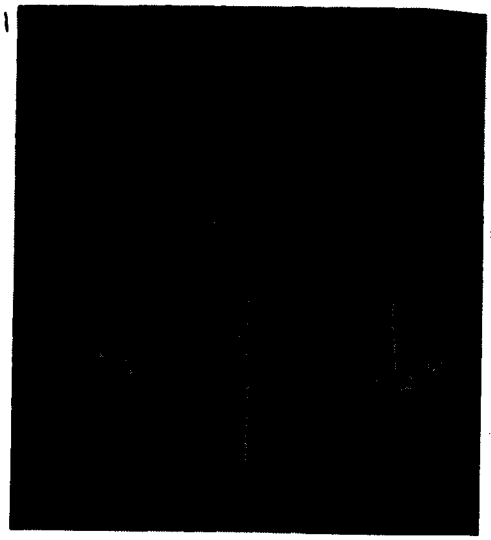


MAIN GEAR JACKING

CAUTION

Ensure that opposite main gear is chocked to prevent airplane rolling.

Position 15–ton axle jack under main gear integral jack pad and jack airplane until tire clears the ground.



WING JACKING POINT

AIRPLANE JACKING

Install jack pads on wing jack points and position 20–ton wing jacks under jack pads. Install nose section jacking equipment (detail B), and jack airplane evenly until nose and main gear tires clear the ground.

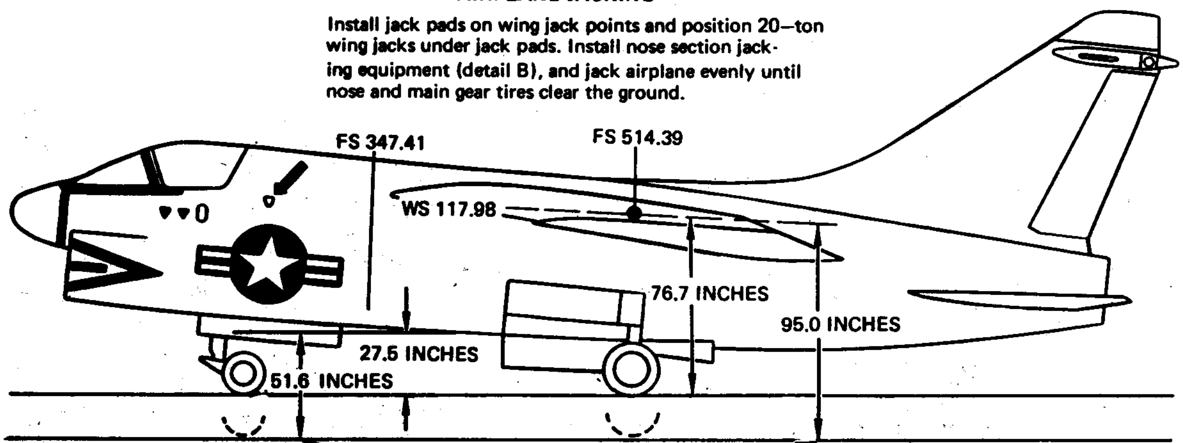


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Figure 2-10. Airplane Jacking (Sheet 2)

c. Install fuselage jack pad.

WARNING

To prevent catastrophic jack failure and damage to airplane, do not unscrew (extend) jack extension screw more than 4 inches.

d. Position 17-ton jack under jack pad with tripod leg forward and adjust screw jack until seated on jack pad.

e. Tighten jack hydraulic shutoff valve.

f. Apply jacking pressure and simultaneously tighten locking collar. When spring-loaded casters of jack are depressed, ensure that all three legs of jack are level.

g. Apply jacking pressure until nosewheels clear the ground and are free to rotate.

h. Perform necessary maintenance.

CAUTION

Rate of airplane descent is proportional to shutoff valve opening. To prevent excessive rate of descent, do not open shutoff valve more than two full turns.

Do not remove locking collar from hydraulic ram.

i. To lower airplane, apply jacking pressure to slightly raise jack and loosen locking collar. Loosen jack hydraulic shutoff valve to slowly lower airplane. Keep locking collar just above locked position during lowering.

j. Remove jack.

k. Remove jack pad.

2-35. JACKING AIRPLANE. (See figure 2-10.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
2-10	7225123-10 (Oklahoma City ALC)	Jack pads (3)	Adapt jack to airplane
2-10	3961 (Regent Mfg. Co.	17-ton jack	Raise airplane
2-10	64J35484	20-ton jack (2)	Raise airplane
	Local fabrication or 7727552 (Oklahoma City ALC)	Skid plates (4)	Allow main landing gear to assume normal position when airplane is lowered

2-36. To jack airplane using fuselage and wing jack points, proceed as follows.

CAUTION

Do not jack airplane if jack point reaction exceeds 12,945 pounds for fuselage jack point or 11,120 pounds for a wing jack point. If jacking with external stores installed, stores shall be loaded symmetrically.

Ensure that required structural access panels are installed (table 2-3).

Ensure speed brake circuit breaker CB307 is open to avoid inadvertent extension of speed brake.

a. Determine jack point reactions from table 2-6 per T.O. 1-1B-40.

Table 2-6. Jack Point Reactions for Various Airplane Load Configurations

Configuration	Gross Weight (Pounds)	CG (In.)	Load on Each Wing Jack (Pounds)	Load on Fuselage Jack (Pounds)	Load on Each Main Gear Jack (Pounds)	Load on Nose Gear Jack (Pounds)
1. Clean - Full Fuel	29,607	459.85	9,967	9,674	12,599	4,409
2. Clean - Zero Fuel	20,344	463.72	7,084	6,176	8,868	2,609
3. 8 Pylons - Full Fuel	31,357	459.44	10,517[1]	10,323	13,309	4,739
4. 8 Pylons - Zero Fuel	22,094	462.82	7,634	6,826	9,577	2,940
5. Clean - Full fuel - Engine out	26,095	443.35	7,495	11,105	9,953	6,189
6. Clean - Zero fuel - Engine out	16,832	438.95	4,613	7,606	6,222	4,388
7. 8 Pylons - Full fuel - Engine out	27,845	443.92	8,045	11,755	10,663	6,519
8. 8 Pylons - Zero fuel - Engine out	18,582	443.92	5,163	8,256	7,116	4,350
9. 8 Pylons - Full fuel - Fwd radar out	31,183	460.82	10,588[1]	10,008	13,351	4,482
10. 8 Pylons - Full fuel - Gun out	31,106	460.72	10,552[1]	10,002	13,309	4,488
11. 8 Pylons - Full fuel - Gun and radar out	30,931	462.14	10,624[1]	9,682	13,352	4,228
12. 8 Pylons - Full fuel - Gun and ammo drum out	30,865	462.68	10,559[1]	9,747	13,368	4,130
13. 8 Pylons - Full fuel - Gun, ammo drum, and radar out	30,690	463.11	10,630[1]	9,429	13,327	4,036
14. 8 Pylons - Full fuel - 4 MERS, Ctr and Obd 2 Ext. Tanks, Empty, Inb.	32,403	458.55	10,782[1]	10,840	13,676	5,051
15. 8 Pylons - Full fuel - 4 MERS, Inb and Ctr 2 Ext. Tanks Empty, Obd.	32,403	458.57	10,784[1]	10,836	13,678	5,047
Maximum permissible load per jack point			11,120	12,945	18,000	23,552

[1]Configuration No. 3 and 9 through 15 are very marginal, approaching maximum wing jack load. Unless airplane is jacked level, each wing jack point could exceed maximum weight of 11,120 pounds.

NOTE-Full fuel loadings for the configurations shown above result in worst case jack point reactions. Therefore, jacking of aircraft with partial internal fuel is authorized as long as no fuel transfer problem is suspected.

b. Open access 2232-1 and open speed brake circuit breaker CB307.

c. Install wing and fuselage jack pads.

d. If airplane is to be jacked for leveling, proceed to step e. If leveling is not required, jack airplane as follows:

WARNING

To prevent catastrophic jack failure and damage to airplane, do not unscrew (extend) the jack extension screw more than 4 inches on the 17-ton Regent fuselage nose jack or more than 18 inches on the 20-ton Columbus wing jack.

1. Position jack under fuselage jack pad with tripod leg forward. Seat jack on jack pad.

NOTE

Depending on shock strut extension, fuselage jack point must normally be raised 4 to 6 inches before seating wing jacks to ensure that all wheels clear the ground simultaneously.

2. Raise fuselage jack until fuselage jack point is approximately 44 inches below wing jack points. Ensure that jack legs are firmly positioned.

3. Position wing jacks under wing jack pads. Seat jacks on jack pads.

WARNING

It is imperative that the airplane remain in the same longitudinal and lateral attitude during jacking. Attitude change after all three jacks are seated will cause the fuselage jack to lean or fall, resulting in damage to airplane and/or injury to personnel.

4. Raise all 3 jacks equally, tightening locking collars while jacking. Ensure that jack legs are firmly positioned throughout jacking operation. Jack until lowest wheel clears ground 2 or 3 inches.

e. Jack airplane for leveling as follows:

WARNING

To prevent catastrophic jack failure and damage to airplane, do not unscrew (extend) the jack extension screw more than 4 inches on the 17-ton Regent fuselage nose jack or more than 18 inches on the 20-ton Columbus wing jack.

NOTE

Use spirit level indications to determine airplane attitude.

1. Position wing jack under low side wing jack pad. Seat jack on jack pad.

2. Jack low wing until airplane is level laterally.

3. Position wing jack under opposite wing jack pad. Seat jack on jack pad.

4. Raise wing jacks evenly until airplane is level laterally and longitudinally. Tighten locking collars while jacking and ensure that jack legs remain firmly seated on ground.

5. If further jacking is not required, accomplish required maintenance. If airplane must be jacked clear of ground, continue with substep 6.

6. Using suitable rope, tie up nose gear to prevent strut extension when airplane is jacked.

7. Position fuselage jack under jack pad with tripod leg forward. Seat jack on jack pad.

WARNING

It is imperative that the airplane remain in the same longitudinal and lateral attitude during jacking. Attitude change after all three jacks are seated will cause the fuselage jack to lean or fall, resulting in damage to airplane and/or injury to personnel.

8. Raise all three jacks equally, tightening locking collars while jacking. Ensure jack legs are

firmly seated and level condition is maintained. Raise airplane until wheels clear ground approximately 2 or 3 inches, or until applicable maintenance can be accomplished.

f. Accomplished required maintenance.

WARNING

If landing gear handle is moved while airplane is supported by jacks, gear may unlock and collapse when airplane is lowered and downlocks removed. Gear must be cycled before lowering airplane to ensure it is locked in down position.

g. To ensure gear is locked in down position, perform the following;

1. Connect external electrical power (paragraph 1-28).

2. Connect external hydraulic power (paragraph 1-34).

3. Remove downlocks and cycle gear by performing hydraulic flow requirement for landing gear retraction (T.O. 1A-7D-2-7).

4. Ensure that down-and-locked indication exists for all gears and gear handle is in WHLS DOWN.

5. Install main and nose gear downlocks.

6. Disconnect external electrical power (paragraph 1-28).

7. Disconnect external hydraulic power (paragraph 1-34).

h. Before lowering airplane, check that main and nose gear downlocks are properly installed.

i. Position skid plates (paragraph 2-50) under main gear wheels before lowering airplane.

WARNING

It is imperative that the airplane remain in the same longitudinal and lateral attitude when lowering from jacks. Attitude change will cause the fuselage jack to lean or fall, resulting in damage to airplane and/or injury to personnel.

CAUTION

Rate of airplane descent is proportional to shutoff valve opening. To prevent excessive rate of descent, do not open shutoff valve more than two full turns.

Do not remove locking collar from hydraulic ram.

j. To lower airplane, apply jacking pressure to loosen locking collars, open jack hydraulic shutoff valves, and lower airplane slowly and evenly. Keep locking collars just above locked position during lowering.

k. Remove jacks and jack pads.

l. If installed, remove rope restraint from nose gear strut.

m. Close speed brake circuit breaker CB307.

n. Close access 2232-1.

o. Roll airplane off skid plates and remove skid plates.

p. Install main gear wheel chocks.

2-37. JACKING AIRPLANE FOR WEIGHING.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
2-10	7225123-10 (Oklahoma City ALC)	Jack pads (3)	Adapt weighing kit load cells to airplane jack points.
2-10	3961 (Regent Mfg. Co.)	17-ton jack	Raise airplane at fuselage jack point.
2-10	64J35484	20-ton jack (2)	Raise airplane at wing jack points.
	Local fabrication or 7727552 (Oklahoma City ALC)	Skid plates (4)	Allow main landing gear to remain in normal position during shock strut servicing and lowering airplane.
2-12	628 (Millers Falls Co.)	Level and plumb set	Level airplane.
	Type C-1	Electronic weighing kit	Weigh airplane.

CAUTION

Ensure that required structural access panels are installed (table 2-3).

a. Prepare airplane for weighing in accordance with T.O. 1-1B-40 (for airplane being weighed) and T.O. 1A-7D-5.

NOTE

To minimize the possible development of an unstable condition during jacking, the airplane should be positioned in the most level hangar area available.

b. Position airplane in hangar for weighing.

c. Observe airplane jacking safety precautions (paragraph 2-31) as applicable.

WARNING

To prevent possible structural damage to airplane and injury to personnel and to ensure accurate weighing results, the airplane must be level when lifting begins and remain level throughout the entire jacking and lowering operations.

NOTE

To check airplane longitudinal levelness, place a spirit level or inclinometer on the longitudinal leveling lugs. To check airplane lateral levelness, place a spirit level or inclinometer on the lateral leveling lugs. For leveling lug locations, see figure 2-12.

d. Open access 2232-1 (right avionic compartment) and open speed brake circuit breaker CB307.

NOTE

Leveling of the airplane before jacking may be accomplished by either one of two methods: The airplane may be leveled on wheels by inflating/deflating the main and nose gear struts or leveled with wing jacks before jacking entire airplane. To level airplane on wheels for weighing on jacks, perform step e. To level airplane with wing jacks for weighing on jacks, perform step f.

e. Level airplane on wheels for weighing on jacks as follows:

1. Position skid plates under main gear wheels.

2. Fully extend main gear shock struts. Refer to paragraph 3-13 for strut inflation.

3. Check airplane lateral levelness. If required, deflate the appropriate main gear strut to level airplane laterally.

4. Check airplane longitudinal levelness. If required, deflate/inflate nose gear strut to level airplane longitudinally.

5. Using a suitable rope, tie up nose gear to prevent strut extension when airplane is jacked.

NOTE

When using GEC scale, FSN 6670-01-226-1097, to weigh airplane, use locally manufactured fuselage jack pad to preclude removal of Doppler radome.

6. Install wing and fuselage jack pads.

CAUTION

To prevent possible damage to airplane and load cells, ensure that load cells are properly mated with jacks using adapters supplied with weighing kit.

7. Install electronic load cells on wing and fuselage jacks.

CAUTION

To prevent possible damage to airplane and to ensure proper operation of load cells, ensure that each jack pad is centered in the load cell cup and that each jack leg is seated evenly and firmly on hangar floor before, during, and after jacking.

8. Position jacks under jack pads and jack until each pad is seated in load cell cup. Reposition jacks as required to center jack pads in load cell cups and seat jack legs evenly on floor.

9. Check levelness of airplane. Airplane should still be level.

CAUTION

To prevent induced side loads on load cells and possible damage to airplane resulting from an unevenly seated jack, it is imperative that the airplane remain completely level during all jacking, weighing, and lowering operations.

10. Jack airplane evenly, maintaining level attitude, until main and nose gear tires are clear of floor.

11. Weigh airplane in accordance with T.O. 1-1B-40 (for airplane being weighed) and T.O. 1A-7D-5.

12. Lower airplane evenly, maintaining level attitude, until load cells are clear of jack pads.

13. Remove jack pads from airplane and load cells from jacks.

14. Remove rope from nose gear and service landing gear struts as required.

15. Close speed brake circuit breaker CB307.

16. Close access 2232-1.

f. Level airplane with wing jacks for weighing on jacks as follows.

NOTE

The greater the distance an airplane must be lifted with jacks, the more unstable the condition becomes. Therefore, the leveling and jacking procedure contained in step e is preferred due to the minimum distance the airplane must be lifted for the wheels to clear the floor. However, the same weighing results can be obtained using the following procedure but the airplane must be lifted a greater distance for the wheels to clear the floor.

1. Install wing and fuselage jack pads.

CAUTION

To prevent possible damage to airplane and load cells, ensure that load cells are properly mated with jacks using adapters supplied with weighing kit.

2. Install electronic load cells on wing jacks only at this time.

3. Check airplane lateral levelness. If airplane is not laterally level, perform steps 4, 5, 7 and subsequent. If airplane is laterally level, omit steps 4 and 5 and perform step 6 and subsequent.

CAUTION

To prevent possible damage to airplane and to ensure proper operation of load cells, ensure that each jack pad is centered in the load cell cup and that each jack leg is seated evenly and firmly on hangar floor before, during, and after jacking.

4. Position a wing jack under low side wing jack pad and jack until pad is seated in load cell cup. Reposition wing jack as required to center jack pad in load cell cup and seat jack legs evenly on floor. Jack wing jack until airplane is level laterally.

5. Position other wing jack under opposite wing jack pad and jack until pad is seated in load cell cup. Reposition jack as required to center jack pad in load cell cup and seat jack legs evenly on floor.

6. Position wing jacks under wing jack pads and jack until each pad is seated in load cell cup. Reposition wing jacks as required to center jack pads in load cell cups and seat jack legs evenly on floor.

7. Jack wing jacks until airplane is level laterally and longitudinally. If required, deflate/inflate nose gear strut to level airplane longitudinally.

8. Install electronic load cell on fuselage jack.

9. Position fuselage jack under fuselage jack pad and jack until jack pad is seated in load cell cup. Reposition fuselage jack as required to center jack pad in load cell cup and seat jack legs evenly on floor.

10. Using a suitable rope, tie up nose gear to prevent strut extension when airplane is jacked.

11. Check levelness of airplane. Airplane should still be level.

CAUTION

To prevent induced side loads on load cells and possible damage to airplane resulting from an unevenly seated jack, it is imperative that the airplane remain completely level during all jacking, weighing, and lowering operations.

12. Jack airplane evenly, maintaining level attitutde, until main and nose gear tires are clear of floor.

13. Weigh airplane in accordance with T.O. 1-1B-40 (for airplane being weighed) and T.O. 1A-7D-5.

14. Lower airplane evenly, maintaining level attitude, until load cells are clear of jack pads.

15. Remove jack pads from airplane and load cells from jacks.

16. Remove rope from nose gear and close speed brake circuit breaker CB307.

17. Close access 2232-1.

2-37.1. JACKING AND LEVELING FOR GPU-5/A GUN POD BORESIGHT.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
2-10	7225123-10	Jack pads (2)	Adapt jack to airplane
2-10	64J35484	20-ton jack (2)	Raise airplane
2-12	GGG-L-211	Level (24-inch)	Laterally level airplane

2-37.2. PRECAUTIONS.

a. Do not walk or climb on airplane, while airplane is on jacks.

b. Do not apply external hydraulic and electrical power while airplane is on jacks.

c. Do not jack airplane or landing gear at any point except wing jack points.

d. Check that access panel restrictions are observed (table 2-3).

e. Do not jack airplane or boresight with external stores installed, except for captive carriage on fuselage stations 4 and/or 5 and gun pods on wing stations 3 and/or 6.

f. To ensure a mechanical lock in event of jack hydraulic failure, turn locking collar by hand and keep just above locked position as airplane is raised and lowered.

g. Do not jack airplane for boresight with engine removed.

h. If wind is gusting above 8 knots jacking and boresight must be accomplished indoors.

2-37.3. JACKING/LEVELING PROCEDURES.

CAUTION

To prevent possible damage to airplane, check that arresting gear hook is retracted.

a. Check that main landing gear chocks are in position.

NOTE

Omit steps b. and c. if deflation of nose landing gear shock strut is not required to align aircraft with boresight board.

b. Very slowly deflate nose landing gear shock strut (paragraph 3-14).

c. Check that nose landing gear shock strut has bottomed out, after deflating.

d. Open access 2232-1.

e. Place lateral spirit level on inboard and outboard leveling pad (figure 2-12).

f. Check that airplane is level laterally.

NOTE

If airplane is laterally level, omit steps g. through k.

g. Install wing jack pad(s).

WARNING

If landing gear handle is moved while airplane is supported by jack(s), landing gear may unlock and collapse when airplane is lowered and downlocks removed. Gear must be completely cycled before lowering airplane to ensure it is locked in down position.

Do not extend 20 ton jack extension more than 18 inches (refer to T.O. 35A2-2-76-1 and T.O. 35A2-254-1 respectively).

h. Position wing jack(s) under wing jack pad(s). Seat wing jack(s) on jack pad(s) with one tripod leg positioned forward.

i. Check that jack(s) are positioned.

WARNING

To prevent structural damage to airplane do not jack main landing gear clear of ground for leveling.

j. Raise one or both jacks equally until airplane is laterally level.

k. Check that jack(s) locking collar(s) is firmly seated.

l. Proceed with boresight procedure (refer to T.O. 1A-7D-2-13).

NOTE

Accomplish steps m. through q. after completion of boresight.

m. Check that panel restriction has been maintained.

n. Lower airplane, lower jack(s) until jack(s) clear jack(s) pad.

o. Remove jack pad(s) from airplane.

p. Remove spirit level from right avionics bay.

q. (If applicable) service nose landing gear shock strut (see paragraph 3-14).

2-38. HOISTING.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MIL-M-7404	Maintenance stand B4-A	Gain access to top of airplane.
2-11	216-00210-28 or 216-00210-1[1]	Airplane hoisting sling	Adapt hoist to airplane.
		20-ton hoist	Raise airplane.
	Local fabrication or 7727552 (Oklahoma City ALC)	Skid plates (4)	Allow main landing gear to assume normal position when airplane is lowered.

[1]Airplanes through AF69-6196 except AF69-6189

2-39. Attach points are readily accessible through center wing accesses. The airplane hoisting sling is attached by quick-release pins and is capable of lifting 36,000 pounds.

2-40. HOISTING AIRPLANE. (Refer to table 2-7 and see figure 2-11.)

CAUTION

Maximum safe hoisting weight of the airplane is 36,000 pounds.

Ensure that required structural access panels are installed (table 2-7).

a. Open access 3133-5, 4133-5, 3113-10, and 4113-10.

b. Attach sling assembly to overhead hoist or portable crane with a lifting capacity of 20 tons.

c. Hoist sling assembly into position above wing and secure quick-release pins to wing lift lugs. Ensure flathead pin is installed from aft side on forward sling link assemblies.

d. Attach guy lines to each main gear and to nose gear tiedown shackle to guide and stabilize airplane during suspension.

CAUTION

The airplane has a normal noseup attitude when suspended. Care shall be taken to avoid bumping tail cone during hoisting. Extension of arresting gear may prevent tail cone damage.

e. With a person stationed at each guy line, carefully hoist airplane.

f. Accomplish required maintenance.

g. Position skid plates under main landing gear wheels before wheels touch the ground.

h. With a person stationed at each guy line, carefully lower the airplane to the ground.

i. Remove quick-release pins from wing lift lugs and swing hoist assembly clear of airplane.

j. Close accesses 3133-5, 4133-5, 3113-10, and 4113-10.

k. Remove guy lines from nose and each main landing gear.

Table 2-7. Access Panel Restrictions During Hoisting Operation

CAUTION

To prevent structural damage to airplane, the following access panels shall be installed (with all fasteners) before hoisting airplane.

1123-1	or	2123-4[1] 2123-9[2] 2123-11[1]
2212-6 2212-10	or	2222-4
5122-4		
5122-5		
5122-6[2]		
5132-1		
5133-1		
6122-4		
6122-5		
6132-1		
6133-1		
6222-1	or	6222-3
1222-8 1222-8-1 1222-9 1222-10	or	1222-5 1222-6 1222-6-1 1222-6-3 1222-11

If nose gear is installed, the following panels must be installed:

2212-6 2212-10	or	1222-5 1222-6 1222-6-1 1222-6-3 1222-11

[1]Airplanes through AF69-6196

[2]Airplanes AF69-6197 and subsequent

Table 2-8. Engine Component Drainage Limits

Components Drained	Fluid	Allowable Leakage

NOTE

If the fuel master lever is left in ON, static fuel leakage may occur from the main fuel control drive seal through the engine accessory seal overboard drain. This condition is considered normal provided leakage is within limits with engine running as indicated. If leakage exceeds allowable limits, refer to T.O. 1A-7D-2-5 for troubleshooting and corrective action.

Components Drained	Fluid	Allowable Leakage
Oil breather	Oil	Oil vapor and wetness is permissible provided oil consumption is within limits.
CSD shaft seal drain/arresting gear overboard bypass drain	Oil	From CSD: 4 cc per hour
LP fuel pump drain	Fuel	Combined leakage[1]
HP fuel pump drain	Oil Fuel	From engine: none From pump: Combined leakage[1]
Manual fuel control drain	Fuel	Combined leakage[1]
Airflow control drain	Fuel	Combined leakage[1]
Main fuel control drain[2]	Oil Fuel	From engine: none From control: 3 cc per minute
Low-pressure governor drain[2]	Oil Fuel	From engine: none From governor: 3 cc per minute
Starter combustor drain	Oil	None
Starter combustor drain	Fuel	Starter running: none Shutdown: 25 cc
Engine combustor drain	Fuel	Engine running: none Normal shutdown: none Wet shutdown: 675 cc
Low-pressure cooling air duct	Oil	Oil vapor or drops are permissible provided oil consumption is within limits. After extended operation at idle, oil vapor or drops out of the low pressure cooling air duct is a characteristic of some engines and is not considered cause for rejection.
Rear bypass duct and No. 1 bearing arcs	Oil	Oil puddling is permissible if oil consumption limit is not exceeded.

[1]Combined leakage from these components not to exceed 7 cc per minute.
[2]Components share common manifold and must be isolated individually.

damage, excessive dirt contamination, corrosion, and evidence of oil leakage.

7. While rotating compressor rotor, check compressor vanes for damage, corrosion, and excess dirt contamination.

8. Spinner for dents, cracks, corrosion, and security.

o. If ambient temperature is 41°F or below, perform the following:

1. Obtain wet or dew point and dry bulb temperatures from aerology.

CAUTION

Engine operation without air inlet screen installed must be authorized by the chief of maintenance or his designated representative.

2. Using figure 2-16, determine if engine run can be accomplished with air inlet screen installed.

3. Remove any water standing on ramp in area around nose of airplane.

4. If engine operation is required with screen removed on engine before T.O. 2J-TF41-532, pull pitot-heat circuit breaker and place switch in PITOT-ENG.

5. Monitor ambient air conditioning during engine operation to insure that engine is not operated in a screen icing environment with screen installed.

p. Install engine air inlet duct screen (figure 2-1).

CAUTION

To prevent damage to engine and airframe, ensure inlet duct screen is free of damage. If damaged, refer to paragraph 2-60 for allowable repair criteria.

CAUTION

Care should be taken to avoid damage to radome and lip of air inlet duct.

q. Check that gun gas purge door actuating cylinder is connected to purge door.

r. Check that LOX access door is clear of gun gas purge door.

s. Check and open circuit breakers in the left avionic compartment as follows:

1. M61 gun control circuit breaker CB3111.

2. LG ACCUM HTR circuit breaker CB3213.

t. Check PC No. 1 hydraulic reservoir for quantity and service, if required (paragraph 3-42).

u. Check PC No. 1 hydraulic filter for bypass popout indicator.

CAUTION

If engine is started with wingfold support strut handle in the latched position, the handle may become jammed. If engine is started with handle in the latched position, insure landing gear handle is in WHLS DOWN position before placing flap handle in ISO to unlatch handle.

v. Ensure wingfold support strut handle is unlatched.

w. Check PC No. 3 hydraulic filter for bypass popout indicator.

CAUTION

The transfer motive flow quick-disconnect coupling must be connected before any engine start, or fuel system damage may occur.

x. Check transfer motive flow quick-disconnect coupling for proper installation.

y. Check the main low pressure fuel filter for bypass popout indicator.

WARNING

To prevent dumping fuel on ramp and endangering airplane and personnel by fire hazard, insure residual fuel holding tank is empty, before starting the engine.

Ensure that fuel is not evident underneath aircraft prior to applying external electrical power or starting engine.

z. Check engine drain lines, static ports, and engine compartment cooling holes for excessive leakage (table 2-8), obstructions, and foreign material.

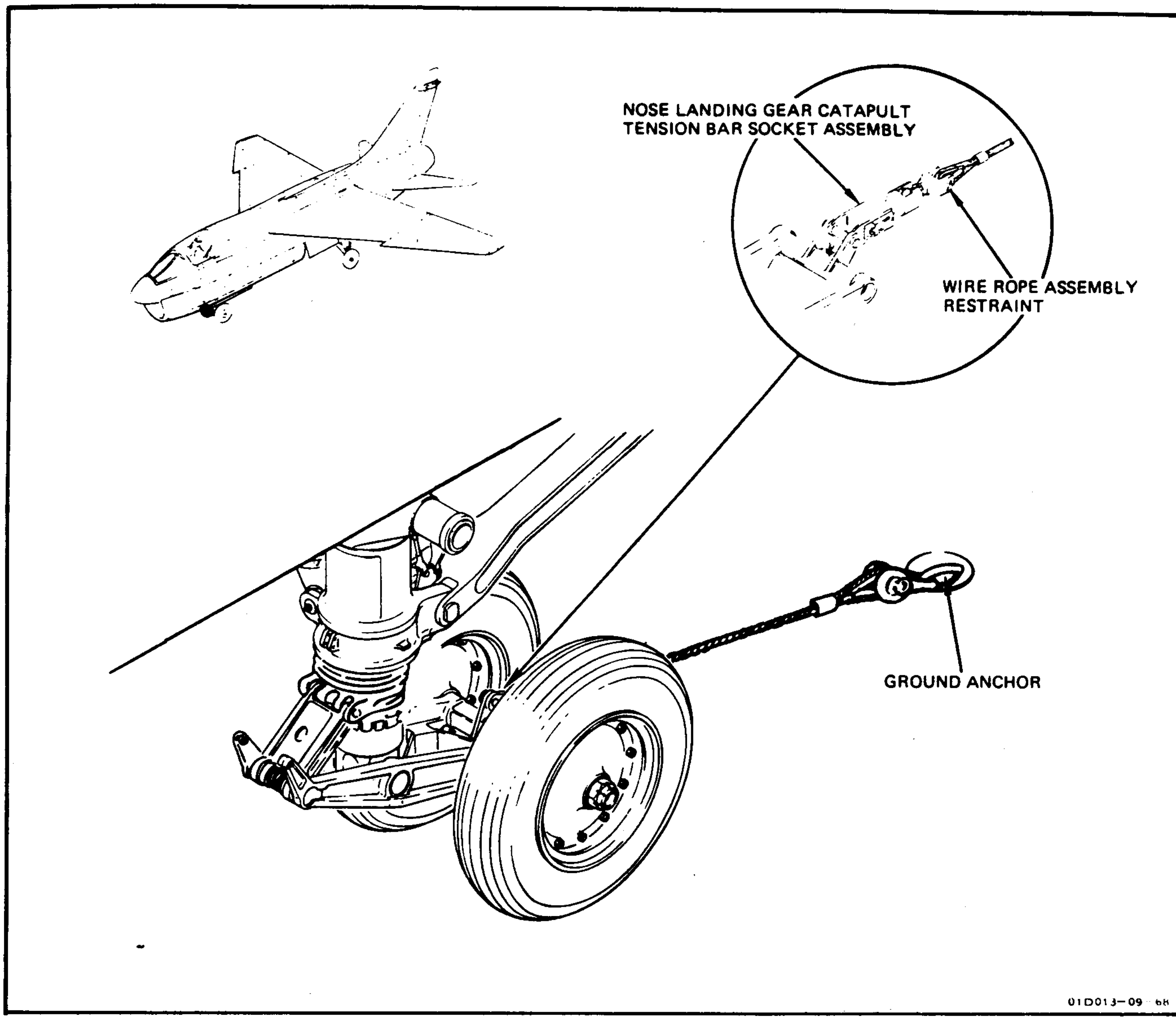


Figure 2-15. Engine Runup Restraint

2-55. PREPARATION.

WARNING

To prevent damage to equipment and injury to personnel, steps a, d, e, f, g, h, j, k, and l, must be complied with prior to performing any maintenance on the aircraft.

a. Check the aircraft forms (AFTO Forms 781) for discrepancies that may prevent the operation of the engine or other systems.

NOTE

Check fuel quantity and service if required. Keep engine ground runs and engine runtime to a minimum. Maintenance checks requiring engine operation should be consolidated.

b. Tow aircraft to designated runup area (paragraph 2-22). When using AF32-19 sound suppressor, ensure the aircraft is secure in accordance with T.O. 33D4-6-387-21.

c. Install engine runup tiedown restraint (figure 2-15) as follows:

1. Place catapult tension bar socket assembly retainer in open position by pressing release on side of socket.

2. Insert forward end of cable assembly into socket.

3. Release socket release mechanism to close socket retainer.

4. Secure aircraft end of cable assembly to ground anchor within 5° of fuselage centerline.

5. Move aircraft forward to remove slack from tiedown restraint.

6. Install wheel chocks.

d. Check nose gear downlock for proper installation (paragraph 2-3).

e. Check that left main gear up-and-locked switch is open.

f. Check left main gear downlock for proper installation.

g. Check that the left main gear chock is installed.

h. Check that right main gear up-and-locked switch is open.

i. Check right main gear downlock for proper installation.

j. Check that the right main gear chock is installed.

CAUTION

Ensure that lap belts are in the seat and not hanging over edge of seat, as damage to seat and/or console may result.

k. Ensure ejection controls safety handle is in down-and-locked position.

l. Check interior canopy jettison and ejection seat prime initiator safety pins for proper installation.

m. A fire guard and fire extinguishment capability must be present before engine start.

n. Using light source of sufficient intensity, check engine air inlet for the following:

1. Air inlet duct for structural integrity, with special attention to loose rivets and cracks, and foreign objects.

2. Engine-to-airframe seal for distortion or deterioration.

3. Engine inlet extension for cracks.

4. T1 thermocouple for condition and security.

5. Engine inlet for foreign objects, oil leaks, and evidence of foreign object damage.

6. Manually rotate low pressure compressor rotor and check for freedom of movement, blade tip rub, rotor blade

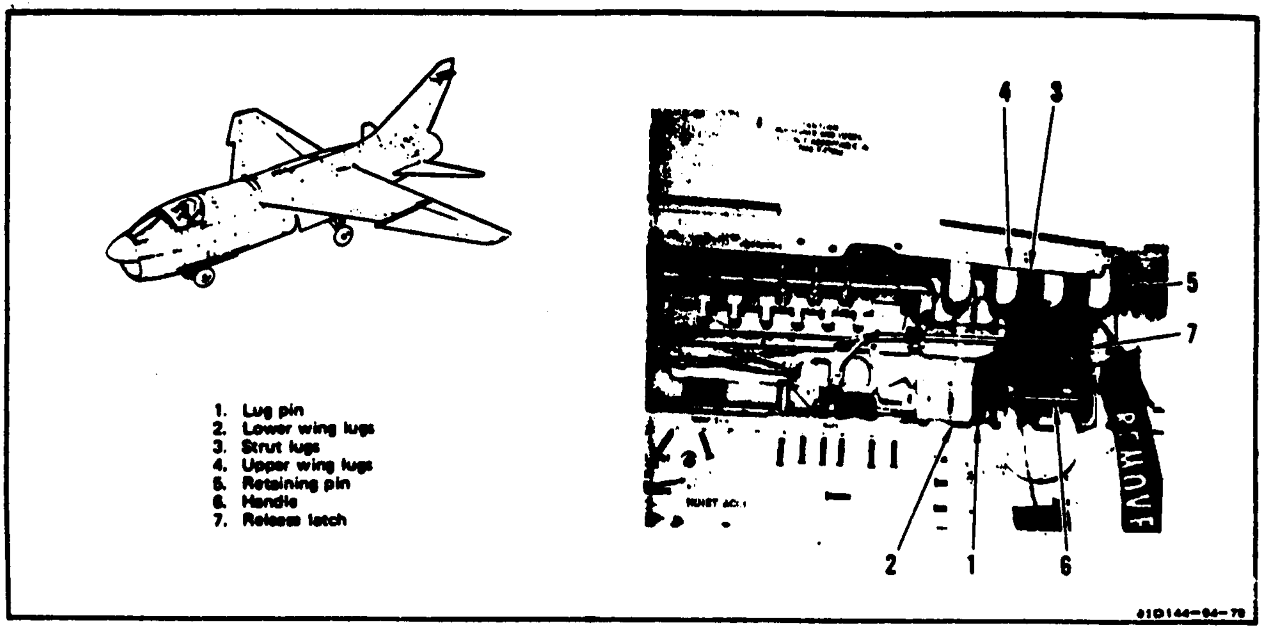


Figure 2-14. Wingfold Support Strut Installation and Removal

2-52. When ambient temperature is 41°F or below, icing conditions will prevail, and precautions must be taken to prevent damage to engine and airplane. During ground engine operation in adverse weather conditions in sheltered areas, ensure engine air inlet duct screen is clean and in serviceable condition, remove any standing water in vicinity of air inlet duct, station a ground crew member to observe screen for ice accumulation, and keep engine operation to a minimum.

WARNING

Do not enter engine inlet danger zone (figure 1-17).

NOTE

On engines after T.O. 2J-TF41-532 (engine serial No. 141159 and subsequent), the anti-ice system is removed from the engine and pitot heat only is available with anti-ice switch in the PITOT ENG position.

2-53. If situation requires engine operation in unsheltered areas during adverse weather conditions, accomplish with screen removed and engine anti-ice system operating; open circuit breaker CB3030 (right circuit breaker panel) For pitot heat to prevent overheating pitot head. This operation must be authorized by local organizational authority.

2-54. Engine runup shall be accomplished in a designated area. Only qualified and selected personnel shall be authorized to operate the engine. Safety precaution stated in AFOSH 127-66 shall be observed at all times during engine ground operation and a single qualified and selected maintenance technician or instructor shall stand on the boarding ladder during instruction or maintenance. Engine runup tiedown restraint shall be stretched according to paragraph 2-56 before operating engine at high rpm settings or MIL power.

2-54A. Personnel shall be allowed access to external portions of the airplane when directed by airplane technical orders to perform operational checkout of affected system.

2-47. WINGFOLD SUPPORT STRUT INSTALLATION AND REMOVAL.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
2-1	215-00255-12	Wingfold support strut (2)	Support outer wing panel when folded.

2-48. INSTALLATION. (See figure 2-14.)

a. Position wingfold support strut lug pins (1) between aft lower wing lugs (2). Slide wingfold support lug pins into wing lugs until bottomed.

b. Align holes of wingfold support strut lugs (3) with holes in upper wing lugs (4). Install retaining pin (5).

CAUTION

Handle (6) shall not be latched with engine operating or while external hydraulic power is applied. Handle may become jammed in latched position. If engine is inadvertently started with handle latched, flap handle should be placed in ISO UTILITY and support handle (6) unlatched. Handle should be latched during towing or mooring operations.

c. Check that spring-loaded ball locks in retaining pin are through last wing lug. Pull handle (6) down until latch (7) is engaged.

2-49. REMOVAL. (See figure 2-14.)

WARNING

Unlatch wingfold support strut handle and push handle up, but do not remove support strut before hydraulic pressure is applied to wingfold system. Removal of support strut before applying hydraulic pressure may result in serious injury to personnel.

a. Release latch (7), push handle (6) up and apply hydraulic pressure.

b. Depress button in retaining pin handle to disengage ball locks and remove retaining pin (5).

c. Move wingfold support strut upper lugs (3) out of upper wing lugs (4).

d. Slide wingfold support strut lug pins (1) out of after lower wing lugs (2) and remove wingfold support strut from airplane.

2-50. SKID PLATE FABRICATION.

a. Cut four 18-inch squares from 0.125 stock aluminum.

b. Smooth all edges.

c. Before using skid plates, spread a light coat of MIL-L-7870 oil on one side of each plate.

d. Assemble two plates together by mating the oil-coated sides.

e. A roller type skid plate may be locally fabricated using Oklahoma City ALC drawing 7727552. This skid plate may be used in place of the above described plate.

f. Plastic bags (20 inches by 38 inches) may be used in place of the above described roller type and oil-coated skid plate.

2-51. ENGINE GROUND OPERATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
2-7	Local Fabrication[1]	Arresting gear hook support assembly	Support arresting hook when engine removal access (5222-3) is removed.
2-1	215-00251-17, 215-00138-27, 215-00138-42, or 7839425	Engine air inlet duct screen	Prevent foreign object damage to engine during ground runup.
2-15	216-00342-1	Engine runup restraint	Prevent airplane movement during engine runup.
	42D6594-2	Wheel chocks (2 sets)	Prevent airplane movement during engine runup.

[1]Airplanes after T.O. 1A-7D-760.

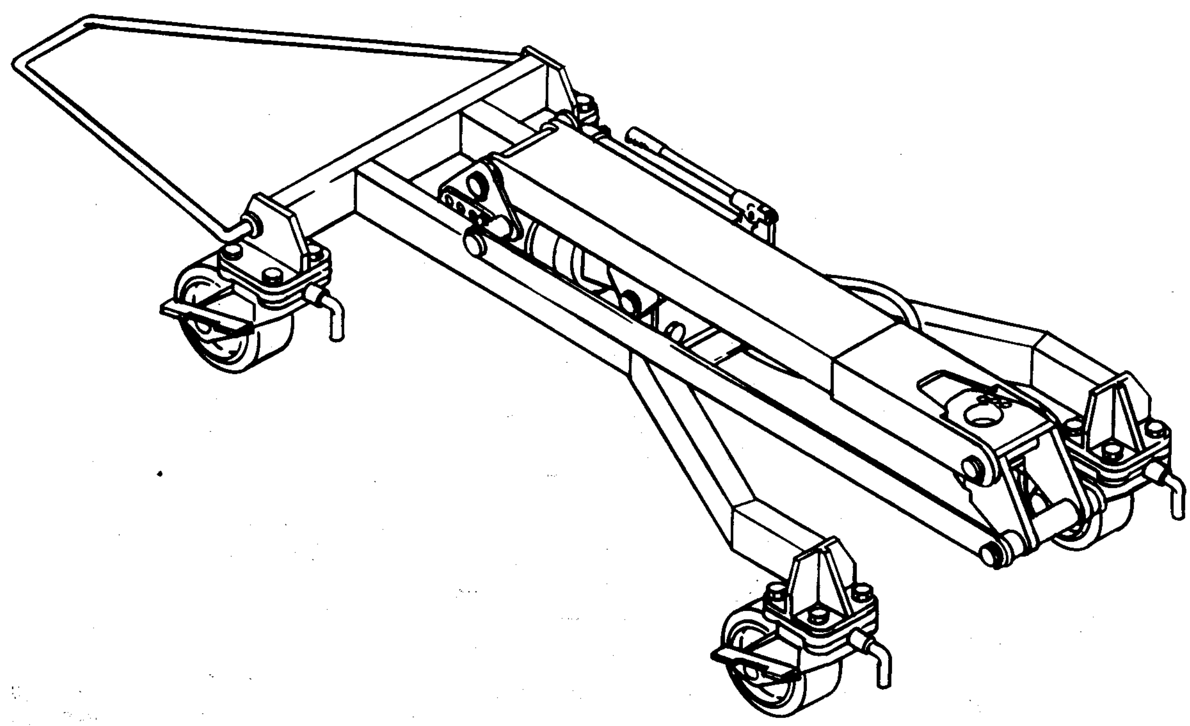


Figure 2-13. Multipurpose Dolly

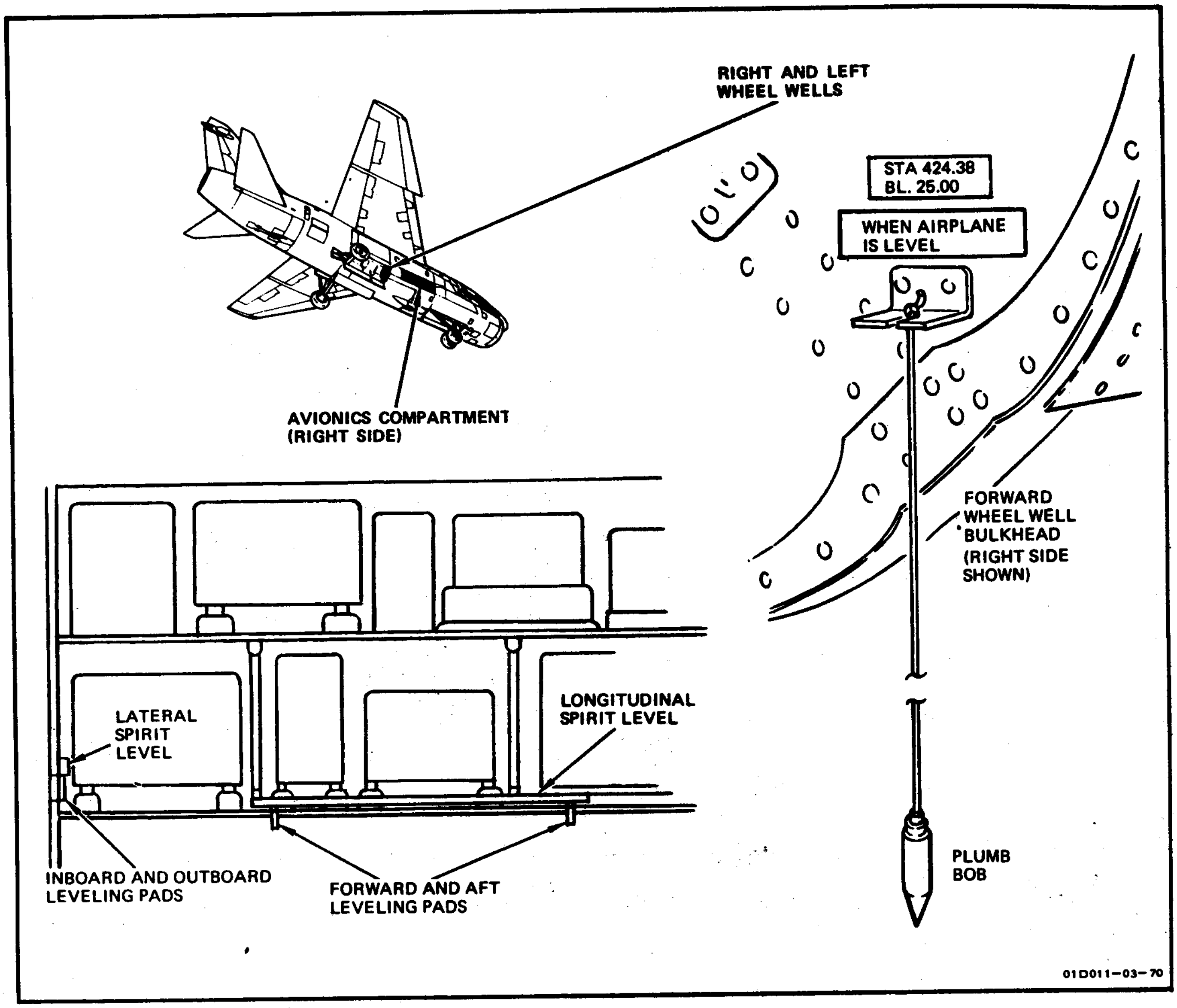


Figure 2-12. Airplane Leveling

2-41. LEVELING. (See figure 2-12.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for jacking airplane	Raise airplane for leveling.
2-12	628 (Millers Falls Co.)	Level and plumb set (2)	Level airplane.

a. Open access 2232-1.

b. Place lateral spirit level on inboard and outboard leveling pad.

c. Place longitudinal spirit level on forward and aft leveling pad.

CAUTION

Ensure that required structural access panels are installed (table 2-3).

d. Jack airplane as directed in paragraph 2-35, centering each spirit level. When bubbles are centered, airplane will be level and required maintenance may be performed.

e. To obtain a measurement reference line for locating airplane stations and frames after the airplane is level, suspend a plumb bob from bracket located on forward end of each main gear well. Suspended plumb bob string can then be used as reference line (FS 424.38) for locating airplane stations and frames.

f. Lower airplane as directed in paragraph 2-35.

g. Remove level and plumb sets.

h. Close access 2232-1.

2-42. GROUND HANDLING DOLLIES.

2-43. Ground handling dollies are provided to aid in removing and installing heavy equipment installed on the airplane. Ground handling dollies provided for aid in performing organizational maintenance are the 215-00303-41 multipurpose dolly, model 4000A jet engine positioning trailer, and model 3000A jet engine transportation trailer.

2-44. MULTIPURPOSE DOLLY. (See figure 2-13.) The 215-00303-41 multipurpose dolly may be used to aid in removing and installing the engine removal door, M61A1 gun housing, speed brake assembly, and nose gear shock strut. Adapters for each of the above components are provided and are designed to be used with the multipurpose dolly. In addition, an M61A1 gun barrel rack adapter is provided for use with the multipurpose dolly for holding the gun barrels during gun removal and installation. The dolly will support 600 pounds, is mobile in any direction, and contains a hydraulic system to facilitate raising or lowering a component. Lifting heights of the dolly are from 12.5 to 35 inches from the floor. A stable center of gravity can be maintained with the dolly which allows for local transportation of the component. Stabilization of the dolly is ensured by locking all four wheels.

2-45. MODEL 4000A JET ENGINE POSITIONING TRAILER. The model 4000A jet engine positioning trailer is used to transport the TF41-A-1 engine in the immediate area and to facilitate removal and installation of the engine. Engine removal and installation adapters are provided for supporting the TF41-A-1 engine on the trailer. An integral hydraulic system provides the capability of lifting the engine to facilitate removal or installation of the engine. Brakes are provided on all four wheels for stabilization and a traveling bar is included for moving the engine forward and aft. Detailed instructions for use of the trailer are contained in T.O. 1A-7D-2-5.

2-46. MODEL 3000A JET ENGINE TRANSPORTATION TRAILER. Unlike other jet engines, the TF41-A-1 engine is not delivered in a shipping can, but is transported on the model 3000A transportation trailer. A shipping adapter is provided to mount the engine on the trailer to facilitate either air or surface shipment. Tiedown rings and wheel brakes are provided for stabilizing the trailer. Buildup of engine accessories may be accomplished while the engine is installed on the model 3000A trailer. The trailer is designed to mate with the model 4000A jet engine positioning trailer to facilitate moving the engine from one trailer to the other. Detailed instructions for use of the model 3000A trailer may be found in T.O. 1A-7D-2-5.

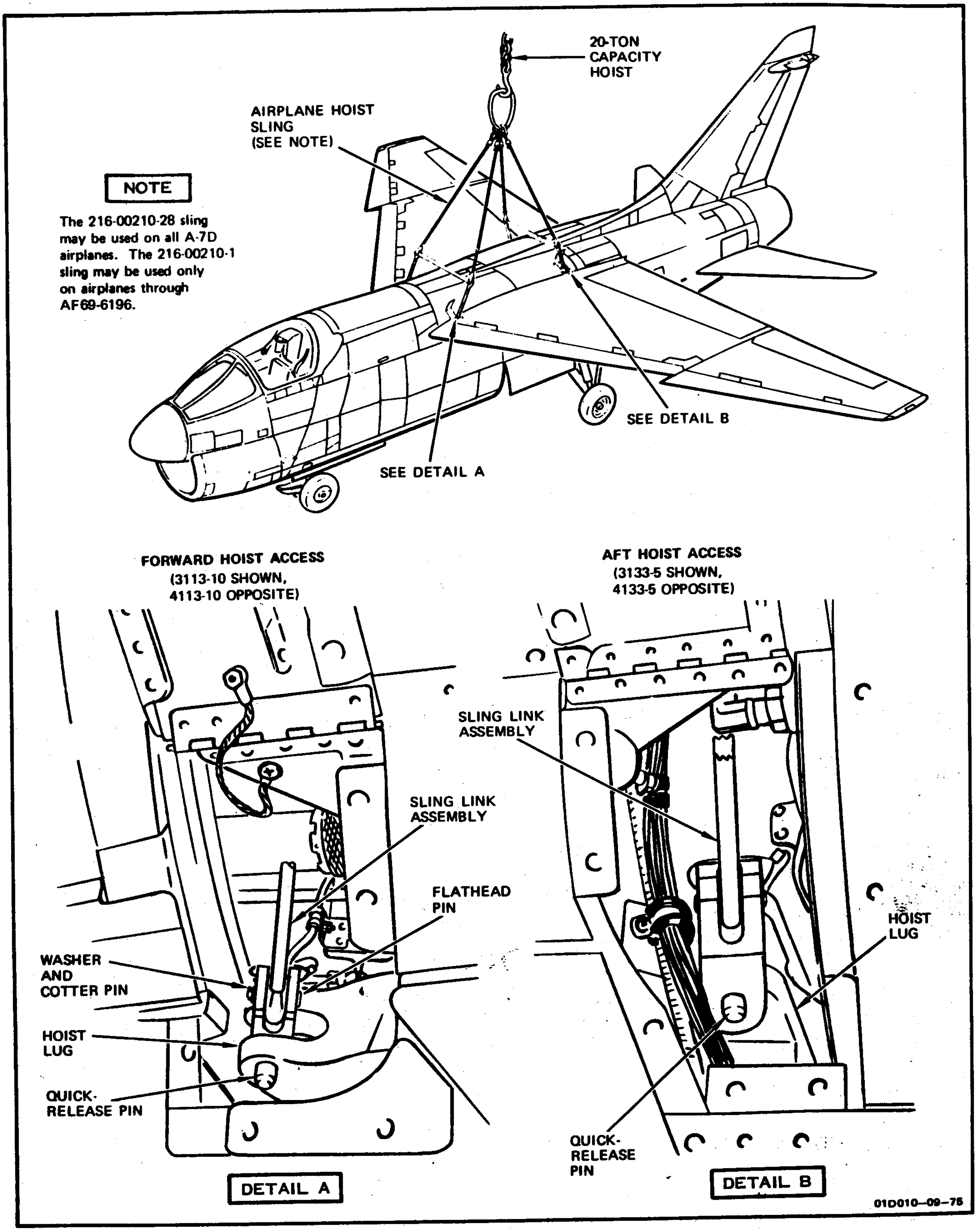


Figure 2-11. Airplane Hoisting

aa. On airplanes AF69-6197 and subsequent, check that fuel boost pump manual shutoff valve is open.

ab. Check engine oil level and add oil, if oil is not visible on sight gage.

ac. On airplanes after T.O. 2J-TF41-587, check that engine oil filter indicator is not popped. (Refer to T.O. 1A-7D-2-5 if indicator is popped.)

NOTE

On airplanes with engine after T.O. 2J-TF41-532 (engine serial no. 141159 and subsequent), the engine anti-ice system has been removed.

On starter serial no. P240 and subsequent, the starter failure indicator is not operative.

ad. Check anti-icing and starter failure indicators for failure indication.

ae. Circuit breakers closed during engine operation.

1. BAT power circuit breaker CB401.

2. BAT charger circuit breaker CB402.

af. Check PC No. 3 hydraulic system reservoir for quantity and service, if required (paragraph 3-42).

ag. Check for proper installation of engine runup tie-down restraint (subparagraph 2-55.c. above).

ah. Using light source of sufficient intensity, check engine exhaust areas for the following:

1. Engine exhaust for evidence of blade or vane damage and oil leaks; temperature sensing probe for condition and security; and bypass duct for fuel accumulation and oil puddling (table 2-8).

2. Check tailpipe for cracks, distortion, burns, excessive oil, foreign material, and evidence of foreign object damage.

ai. Using light source of sufficient intensity, check starter for the following:

1. Oil leakage. If leakage is detected, check oil quantity and add oil if required (paragraph 3-35).

2. Starter intake and exhaust for evidence of damage and overtemperature.

CAUTION

To prevent damage to constant speed drive (CSD), do not operate engine with CSD oil level in upper yellow hand (or upper black hand).

aj. Check constant speed drive oil quantity and add or drain oil, if required (paragraph 3-39).

ak. If panel is removed, check CSD oil cooler fuel quick-disconnect.

al. Check PC No. 2 hydraulic filters for bypass popout indication.

am. Check PC No. 2 hydraulic system reservoir for quantity, and service, if required.

CAUTION

To prevent possible hydraulic pump damage during low temperature conditions, voids in the systems shall be removed before starting engine by dumping the accumulators. If PC No. 1 pressure is not within limits during the hydraulic pressure check after engine start, cycle the control stick slowly between neutral and full forward to expedite a rise in pressure.

Check accumulators for correct precharge pressure and service, if required.

an. Place emergency accumulator shutoff valve in OPEN.

CAUTION

If engine is started with wingfold support strut handle in the latched position, the handle may become jammed. If engine is started with handle in the latched position, ensure landing gear handle is in WHLS DOWN position before placing flap handle in ISO to unlatch handle.

ao. Ensure right wingfold support strut handle is unlatched.

AIRPLANE: A–7D

HOW TO USE CHART:

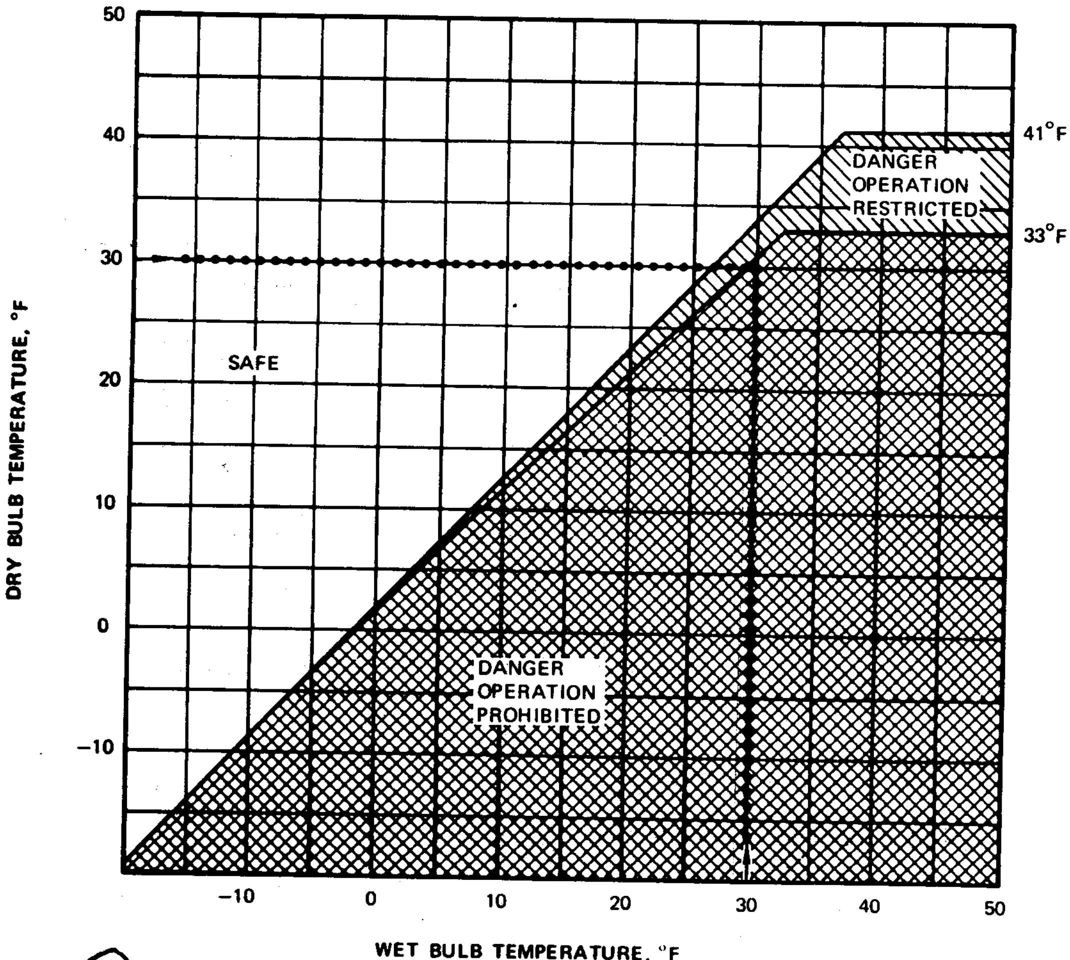
Enter chart with dry and wet bulb temperature and find intersect point.

CAUTION

This chart assumes no standing water on ramp in vicinity of air inlet.

EXAMPLE

Dry bulb temperature 30°F. Wet bulb temperature 30°F. Intersects in danger area, do not use air inlet screen.



Do not operate engine in this region with air inlet screen Part Nos. 215-00251-17, 215-00138-27, or 215-00138-42 installed. Safe for operation with air inlet screen Part No. 7839425 installed.

Do not operate engine over 75% rpm in this region with air inlet screen Part Nos. 215-00251-17, 215-00138-27 or 215-00138-42 installed. Safe for operation with air inlet screen Part No. 7839425 installed.

Safe for operation with any air inlet screen installed.

010182 01 09 75

Figure 2-16. Air Inlet Screen Icing Conditions (Sheet 1)

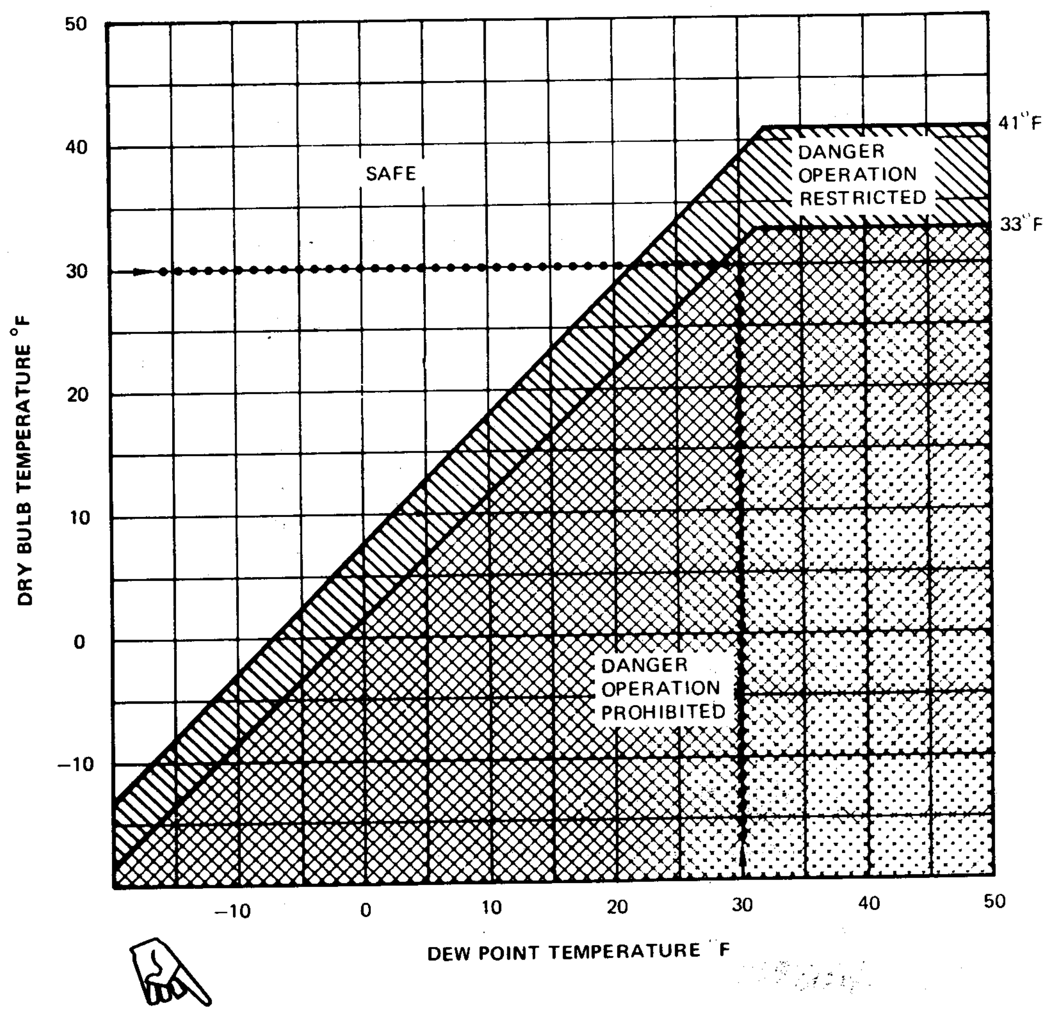
AIRPLANE: A–7D

HOW TO USE CHART:
Enter chart with dry bulb and dew point temperature °F; find intersect point.

EXAMPLE:
Dry bulb temperature 30°F. Dew point 30°F. Intersects in danger area, do not use air inlet screen.

CAUTION

This chart assumes no standing water on ramp in vicinity of air inlet.



Do not operate engine in this region with air inlet screen Part Nos. 215-00251-17, 215-00138-27, or 215-00138-42 installed. Safe for operation with air inlet screen Part No. 7839425 installed.

Do not operate engine over 75% rpm in this region with air inlet screen Part Nos. 215-00251-17, 215-00138-27, or 215-00138-42 installed. Safe for operation with air inlet screen Part No. 7839425 installed.

Safe for operation with any air inlet screen installed.

01D182 02 09 75

Figure 2-16. Air Inlet Screen Icing Conditions (Sheet 2)

WARNING

To prevent possible damage to equipment and injury to personnel, if engine removal access 5222-3 is removed, ensure arresting gear actuator circuit breaker CB318 is opened before starting engine.

ap. Check and open circuit breakers in the right avionic compartment.

1. HIR-Flap ACCUM circuit breaker CB396

2. HTR-EPP ACCUM circuit breaker CB3008

aq. Check avionic compartment cooling duct screens for structural integrity and foreign material.

CAUTION

To prevent damage to equipment, all ground handling protective covers and air plugs shall be removed before engine runup.

ar. Remove all ground handling protective covers (paragraph 2-5).

as. Ensure that required structural access panels are installed (table 2-8 and figure 2-17).

at. Check immediate area around airplane for objects that may enter engine air inlet duct or be moved by engine exhaust during engine operation.

au. Inventory CTK and/or individual tool kits to ensure all tools are in place.

WARNING

To prevent dumping fuel on ramp and endangering airplane and personnel by fire hazard, insure fuel dump switch is in OFF (cover down) position.

av. Ensure that switches and controls are in proper position (table 2-10).

Table 2-9. Access Panel Restrictions During Engine Operation

CAUTION

To prevent structural damage to airplane, the following access panels shall be installed before operating engine.

1123-1	or	2123-4[1] 2123-9[2] 2123-11[1]
1222-5		
1222-6		
1222-6-1		
1222-6-3		
1222-11		
2212-10		
5122-4		
5122-6[2]		
5132-1		
5133-1		
6122-4		
6132-1		
6133-1		

[1]Airplanes through AF69-6196.
[2]Airplanes AF69-6197 and subsequent.

Table 2-10. Switch and Control Positions for Engine Start

Switch or Control	Position
Battery switch	OFF
Double datum switch	OFF
Auxiliary UHF function selector switch	OFF
FLIR control switch[3]	OFF
UHF radio	Set and on
IFF master switch	OFF
Emergency flap control	Cover down
Flap control	UP
AMF switch	OFF
Yaw stabilization	OFF
APQ-126 radar power switch	OFF
Throttle	OFF
Fuel master control	ON
Throttle friction lever	As desired
Starter switch	NORM
Anti-ice selector switch	OFF
Antiskid switch	BRAKE ACCUM
Fuel dump switch	Cover down
A/R probe switch[1]	OFF
Alternate fuel feed handle	NORM
Wing transfer switch	AUTO
Fuel control	NORM
Emergency brakes control	OFF
A/R door release handle[2]	Down
AMF test switch	OFF
Emergency generator switch	OFF

Table 2-10. Switch and Control Positions for Engine Start (continued)

Switch or Control	Position
Master generator switch	ON
Landing gear control	WHLS DOWN
Pitch and roll trim switch	OFF
Landing and taxi light switch	OFF
AFCS test switch	OFF
EPP handle	Matched with EPP Position
Armament panel switches	OFF or SAFE
Master function switches	Deselected
HUD control switch	OFF
Radar altimeter switch	OFF
Standby reticle switch	OFF
Heading mode switch	MAN
Arresting hook control	Matched with hook Position
Doppler radar mode switch	OFF
Oxygen supply lever	OFF
ECM pod panel switch	OFF
NAV WD COMPUTER switch[4]	OFF
Control display unit power switch[5]	OFF
Interior lights	As required
Exterior light switches	As required
LORAN power switch	OFF
TACAN control switch	OFF
ILS power switch	OFF
IMS selector switch[4]	OFF

Table 2-10. Switch and Control Positions for Engine Start (continued)

Switch or Control	Position
Air temperature control	AUTO
Cockpit temperature control	As desired
Cabin pressure switch	CABIN DUMP
Rain removal switch	OFF
Defog switch	OFF
Radar beacon power switch	OFF
Wingfold control	Matched with position of wing outer panels
Emergency vent air knob	Full open
TISL cage switch[2]	OFF

[1]Airplanes through AF69-6196.

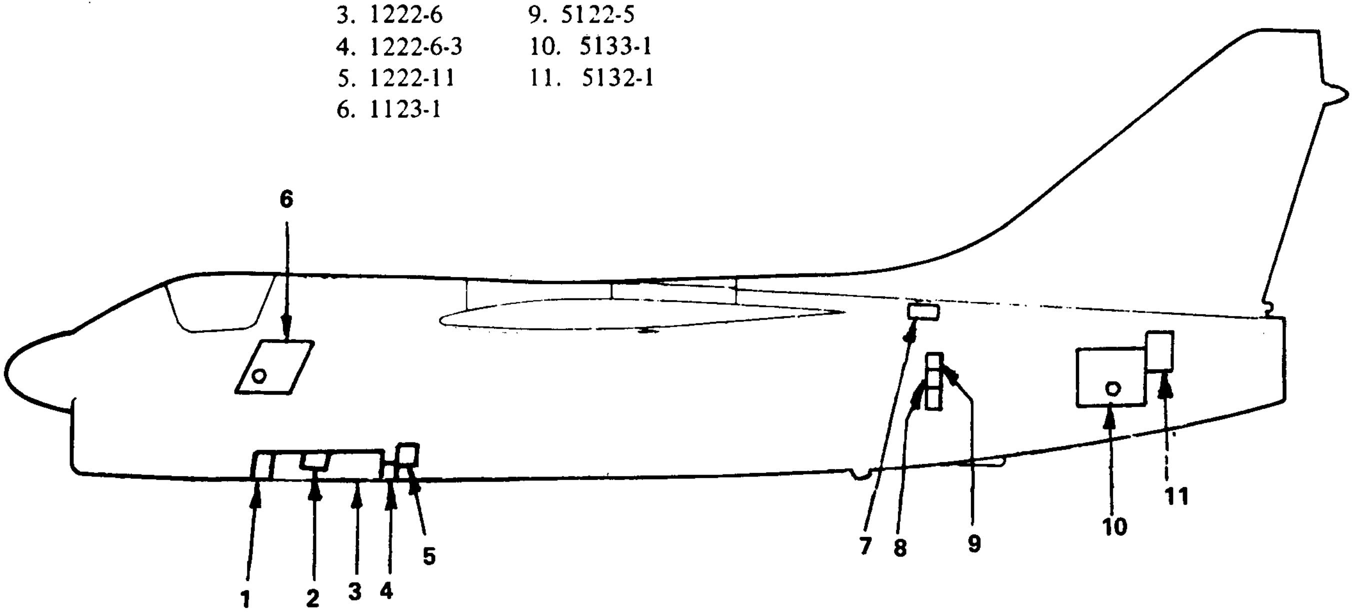
[2]Airplanes AF69-6197 and subsequent.

[3]Airplanes after T.O. 1A-7-530.

[4]Airplanes before T.O. 1A-7-562.

[5]Airplanes after T.O. 1A-7-562.

1. 1222-5
2. 1222-6-1
3. 1222-6
4. 1222-6-3
5. 1222-11
6. 1123-1
7. 5122-6[2]
8. 5122-4
9. 5122-5
10. 5133-1
11. 5132-1

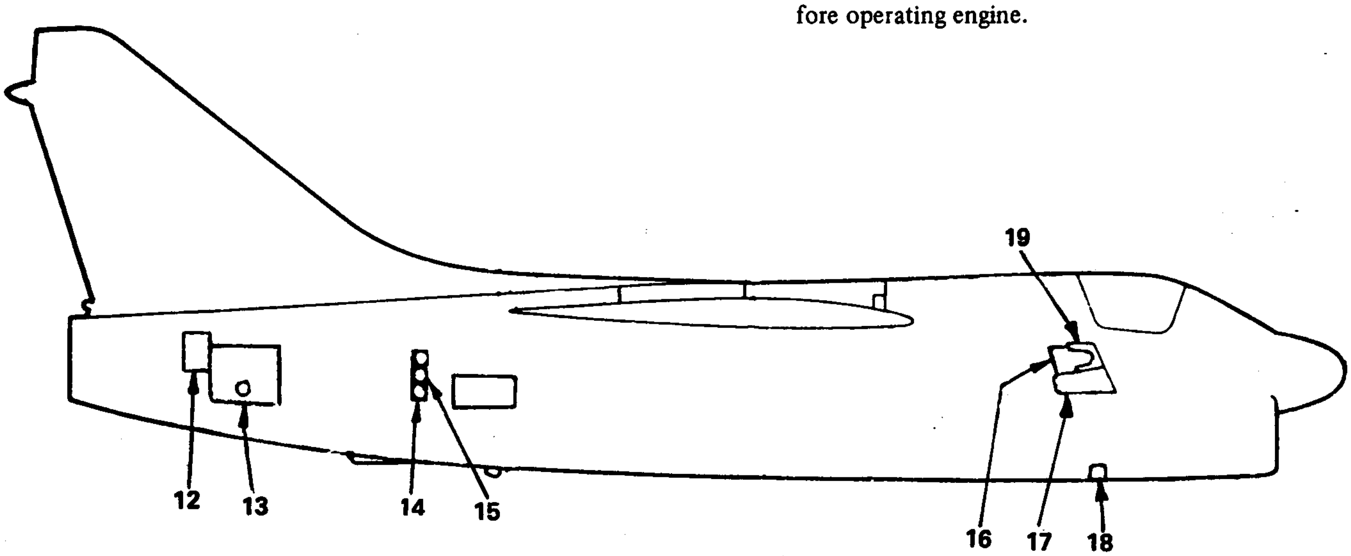


LEFT SIDE OF AIRCRAFT

12. 6132-1
13. 6133-1
14. 6122-3
15. 6122-4
16. 2123-11[1]
17. 2123-4[1]
18. 2212-10
19. 2123-9[2]

CAUTION

To prevent structural damage to airplane, access panels shown in this figure shall be installed before operating engine.



RIGHT SIDE OF AIRCRAFT

[1] Airplanes through AF69-6196.
[2] Airplanes AF69-6197 and subsequent.

Figure 2-17. Access Panel Restrictions During Engine Operation

2-56. ENGINE STARTING.

CAUTION

Before starting engine with speed brake in extended position, ensure that open access doors 1232-1 and 2232-1 are supported by stay assemblies attached to aft bulkhead of each panel. Otherwise, retraction of the speed brake will result in damaged equipment from interference with unspported access doors.

a. Perform preparation of airplane for engine ground operation (paragraph 2-55).

NOTE

If airplane battery does not contain sufficient power (23.8 open circuit volts) to start the engine and replacement of battery is not feasible, a booster battery may be connected to the external dc power receptacle to accomplish engine start (paragraph 1-31).

Apply external power to aircraft, to check warning light(s) circuits for main fuel pump, 1 and 2 fuel boost pumps and engine oil. This check need not be done prior to every engine run - only prior to an initial - (Green Run) engine run.

b. Place battery switch in BATT.

c. Press fire warning test switch and check that fire warning light comes on. Release test switch and check that light goes off. If fire warning light operation is unsatisfactory, refer to T.O. 1A-7D-2-11.

d. Place starter switch in NORM.

e. Check that turbine outlet temperature indicator indicates ±10°C of ambient temperature (cold engine). The POWER OFF flag should not be visible.

f. Open access 1222-3.

g. Place and hold the turbine outlet temperature switch in ON and check that turbine outlet temperature indicator pointer rotates to 845° (±30°)C. ENG HOT caution light should come on as indicator pointer passes through 620° to 625°C. Release switch. Check that indicator returns to ambient temperature and light goes off.

h. Close access 1222-3.

WARNING

To avoid injury or loss of life, ensure that personnel are clear of engine air inlet, engine exhaust duct, and jet fuel starter exhaust.

CAUTION

The jet fuel turbine starter should abort the start automatically if no engine rotation occurs within 7 (±1) seconds. If no engine rotation has occured within 10 seconds, manually abort start by placing start switch in ABORT.

Abort start, if over temperature light illumination exceeds 2 seconds. Do not exceed 2 starts cycle within 30 minutes. Allow 30 minutes cooling before another start is attempted. If a second overtemperature light is observed, abort the start. (Ref T.O. 1A-7D-2-5 for corrective action).

NOTE

If a start is attempted with the start switch in ABORT, the starter electric motor will rotate but the starter will not light off.

i. Place throttle in CRANK and hold. Check that tachometer indicator pointer begins to rise within 7 seconds.

WARNING

To prevent a fire which could result in injury or loss of life, allow 90 seconds for fuel drain between engine shutdown and restart or between attempted starts. If an accumulation of fuel is suspected following an unsatisfactory start, the time allowed for fuel drainage before another start attempt is 3 minutes. Check exhaust duct for fuel accumulation before another start attempt. Drain residual fuel holding tank asfter third consecutive start or attempted start. After second consecutive attempted start failure, motor the engine 30 seconds without fuel and ignition, and check exhaust duct for fuel accumulation. After 2 minutes of starter operation within a 30-minute period, allow starter to cool for 30 minutes before attempting another start. Ensure that any accumulation of fuel drained from starter is removed before each engine start.

NOTE

If starter is engaged with fuel master lever in OFF or if engine is shut down with fuel master lever, an entry recording this fact is required on high pressure fuel pump accessory card.

Fuel purge switch is provided under access 6222-2. If an accumulation of air is suspected following an unsatisfactory start, the fuel supply line can be purged without disconnecting the fuel line.

j. When tachometer indicator indicates 5% rpm, place throttle in IGNITE and hold. Check that rpm increases.

k. When tachometer indicator indicates 15% rpm, maintain outboard pressure on throttle and advance throttle to outboard IDLE.

CAUTION

If hung start is encountered, visually inspect turbine for overtemperature damage through tailpipe with a strong light. Pay close attention to low pressure second stage turbine blade tips.

NOTE

During engine operation after initial start, oil pressure may peg at 60 psig but after 5 minutes of operation shall be 15 psig minimum at idle or 27 to 53 psig at 80% and above.

l. Check that engine lights off within 15 seconds after throttle is placed in outboard IDLE. Engine idle speed must be reached within 1 minute maximum after selecting IDLE. If TOT indication does not continue to rise, or engine rpm stagnates and TOT indication climbs above 583°C, abort start. A TOT indication between 583°C and 620°C is allowabled on engine acceleration, provided temperature returns to 583°C or below within 3 seconds.

m. Check that tachometer indicator continues to increase in rpm.

CAUTION

To prevent damage to starter if automatic cutoff does not occur, do not advance throttle above IDLE until starter is shut down.

NOTE

Starter cutoff should occur at 42.5% (±1.5%) rpm and may be detected by an audible starter disengagement and observance of starter exhaust cutoff.

n. By listening for starter disengagement and observing tachometer indicator, check that starter disengages at 42.5% (±1.5%) rpm. If starter does not disengage at 42.5% (±1.5%) rpm, check for disengagement at 46.5% (±1.5%) rpm. If starter shutdown has not occurred by 54% (±2%) rpm, abort start by placing throttle in OFF and starter switch to ABORT.

o. When tachometer indicator indicates 48% rpm, move throttle to inboard IDLE.

CAUTION

To prevent possible damage to engine, place throttle in OFF immediately if rpm drops below 48% rpm.

NOTE

After prolonged shutdown, idle rpm may be less than normal immediately following engine start. The reduction in rpm varies between engines and will be lower as ambient temperature decreases. Minimum acceptable cold idle is 48% rpm. Move throttle as required to maintain 55% (±2%) rpm, until rpm is stabilized.

p. Check that engine start has been accomplished and tachometer indicator stabilizes at 55% (±2%) rpm.

q. Place starter switch in ABORT.

WARNING

Shut down the engine if main fuel pump, fuel boost 1, fuel boost 2, or engine oil caution lights stay on. Failure to comply with this warning may cause a fire which could result in injury or loss of life.

NOTE

On engines with HP fuel pump before T.O. 6J10-4-71-501, the MAIN FUEL PUMP caution light may stay on after engine start and during acceleration without an actual pump failure as a result of flow imbalance between the two pump elements. This condition is acceptable provided the caution light goes off during any throttle manipulation, acceleration, or deceleration, at any percent rpm in either main or manual fuel control. If the caution light stays on continually during throttle manipulations, treat as an HP fuel pump failure. On engines with HP fuel pump after T.O. 6J10-4-71-501, if the main fuel pump caution light stays on or comes on after engine start, treat as an HP fuel pump failure.

r. Check that main fuel pump, fuel boost 1, fuel boost 2, and engine oil caution lights are off. Shut down engine by placing throttle in OFF if any of these lights except main fuel pump light are on.

NOTE

On airplanes with engine after T.O. 2J-TF41-532 (engine serial No. 141159 and subsequent), the engine anti-ice system has been removed and the anti-ice advisory light is inoperative.

s. Check that anti-ice advisory light is not on.

t. Check indicators as follows:

1. Check that oil pressure indicator indicates a minimum of 15 psi.

2. Check that oil quantity indicator corresponds to known tank quantity.

3. Check that turbine outlet temperature indicator indicates below 620°C. Temperature of 620°C is maximum for idle and is not normally approached.

4. Check that fuel flow indicator does not fluctuate.

5. Check that tachometer indicator indicates 55% (±2%) rpm.

CAUTION

To prevent damage to engine, do not operate engine at high power without main generator power. If electrical power loss occurs, retard throttle to IDLE immediately. If generator does not reset after one attempt, shut down engine by placing throttle in OFF.

6. Check that master generator indicator shows V, demonstrating that the generator output has reached specified voltage and frequency tolerances. If barberpole shows on indicator, one attempt should be made to bring generator on the line by placing master generator switch momentarily in OFF-RESET and back to ON. If barberpole continues to show, shut down engine and perform operational checkout of ac power supply system (T.O. 1A-7D-2-11).

u. Check that hydraulic system pressure indicators indicate 3,100 (± 150) psi.

v. Check that fuel flow, turbine outlet temperature, and tachometer indicators are not fluctuating simultaneously.

w. Place emergency accumulator shutoff valve in CLOSE.

CAUTION

To prevent overheating of air-conditioning system, verify that ram air flow starts immediately from ram air exhaust duct after placing cockpit pressure switch in CABIN PRESS. If no flow occurs, place switch in CABIN DUMP, and troubleshoot air-conditioning supply system.

x. If air conditioning is required, place cabin pressure switch in CABIN PRESS.

CAUTION

To prevent airplane damage from excessive heat, ensure that gun gas purge air is not present at purge door vents after engine start. If purge air is present, shut down engine and troubleshoot purge air system (T.O. 1A-7D-2-3).

y. Check that gun gas purge air is not present at purge door vents.

CAUTION

To prevent airplane movement at high engine rpm settings, ensure tiedown restraint cable is stretched tight.

z. Stretch engine run tiedown restraint cable as follows:

1. Remove wheel chocks and allow airplane to move forward.

2. Advance throttle to obtain 70% to 75% rpm.

3. With cable stretched, install wheel chock forward and aft of each main landing gear.

4. Reposition throttle as required for engine run checks.

2-57. ENGINE SHUTDOWN.

a. Advance throttle to obtain 70% to 75% rpm and move aft wheel chocks sufficiently to allow tiedown restraint cable to relax after engine shutdown.

b. Place throttle in IDLE.

WARNING

To prevent possible loss of canopy and injury to personnel, the emergency vent air knob should be in fully open position to ensure that the cockpit is not pressurized when the canopy is opened. Restrain the canopy until it is full open to prevent excessive opening speeds.

c. Place emergency vent air knob in open position and open canopy if it has been closed during engine run.

d. Place master generator switch in OFF-RESET.

CAUTION

To prevent engine damage in the event engine will not shut down with throttle in OFF, place fuel master control lever in OFF (causing engine shutdown due to fuel starvation) and troubleshoot engine control system and fuel master control as necessary (T.O. 1A-7D-2-5).

e. When engine TOT has stabilized at idle for 2 minutes, move throttle to OFF.

f. Ensure that compressors run down freely.

g. Place fuel master control lever in OFF when engine stops rotating.

h. Close circuit breakers CB396, CB3008, CB3111, and CB3213.

2-58. EMERGENCY PROCEDURES.

a. If an engine tailpipe fire should occur, the following steps shall be performed:

1. Move throttle lever to OFF.

CAUTION

To avoid damage to equipment and to supply fuel to the starter for motoring, fuel master control shall be in ON.

2. Place throttle in CRANK and motor engine until fire is extinguished.

3. If fire does not go out, place starter switch in ABORT, fuel master control in OFF, battery switch in OFF, and evacuate the airplane.

2-59. POST SHUTDOWN.

a. Place battery switch in OFF.

b. Place emergency vent air knob in closed position.

c. Remove engine air inlet duct screen.

d. Check oil quantity (paragraph 3-29 or 3-30).

e. Using light source of sufficient intensity, check engine, engine air inlet, engine compartment, and engine exhaust areas for the following:

1. Air inlet duct for structural integrity, with special attention to loose rivets and cracks, and foreign objects.

2. Engine-to-airframe seal for distortion or deterioration.

3. Engine inlet extension for cracks.

4. T1 thermocouple for condition and security.

5. Engine inlet for foreign objects, oil leaks, and evidence of foreign object damage.

WARNING

To prevent injury to personnel, do not place hand in compressor section when low pressure compressor rotor is rotating.

6. Manually rotate low pressure compressor rotor and check for freedom of movement, blade tip rub, rotor blade damage, excessive dirt contamination, corrosion, and evidence of oil leakage.

7. While rotting compressor rotor, check compressor vanes for damage, corrosion, and excess dirt contamination.

8. Spinner for dents, cracks, corrosion, and security.

9. Engine drain lines, static ports, starter inlet and exhaust, and engine compartment cooling holes for excessive leakage (table 2-8), obstructions, and foreign material.

10. Engine exhaust for evidence of blade or vane damage and oil leaks; temperature sensing probe for condition and security; and bypass duct for fuel accumulation and oil puddling (table 2-8).

11. Tailpipe for cracks, distortions, burns, excessive oil, foreign material, and evidence of foreign object damage.

f. Remove engine runup tiedown restraint.

g. Attach tow bar and tug, then remove chocks.

h. Tow airplane from runup area (paragraph 2-22).

i. Install chocks.

j. Install ground handing protective covers (paragraph 2-5).

2-60. ENGINE AIR INLET DUCT SCREEN REPAIR.

NOTE

Procedures apply to 215-00138-27, 215-00138-42, and 215-00251-17 screens. Repairs are to be made by field level activities, based on the following criteria.

Minor damage to screen mesh may be repaired by welding the damaged area. Patching of damaged screen is not permitted, the entire section must be replaced.

a. Repair cracks in major frame members (4130 steel) as follows:

1. Remove protective coating prior to repair.

2. Weld repair using fusion welding process.

3. Fluorescent penetrant inspect repair.

4. Coat repaired area with protective coating (step h).

NOTE

Repair of breaks in screen mesh or patching of damaged screen is not permitted. If screen is damaged, the entire section must be replaced.

Use No. 4 mesh, 0.063-inch, commercial grade steel AISI IOO8 wire for replacement of screen. Screen is available from Ludlow-Saylor Wire Cloth Co., St. Louis, Missouri.

b. Replace damaged screen as follows:

1. Remove Plastisol coating as required.

2. Remove damaged screen section from frame members.

3. Remove old weld material.

4. Cut replacement screen and place into position.

5. Tack weld each cut wire of screen to frame structure by fusion weld process.

6. Deleted.

7. Coat repaired area with protective coating (step h).

c. Repair loose wires at frame members by fusion welding process.

d. For 215-00251-17 screens, repair defective or broken attaching straps as follows:

1. Remove strap in sequence as shown in figure 2-18.

2. Cut old strap from buckle and hook or rod.

3. Cut a length of nylon webbing to the required length and heat-fuse raw ends.

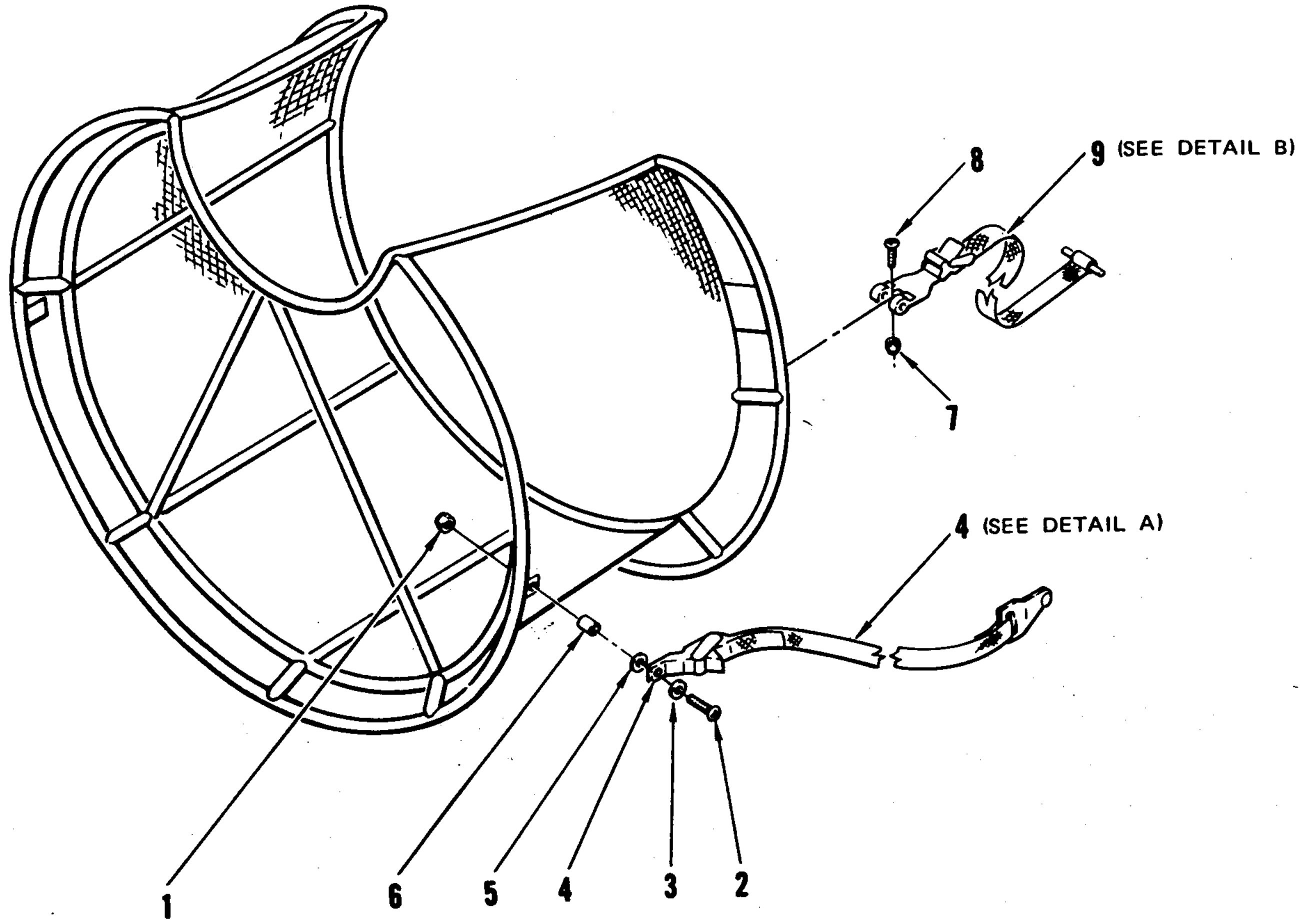
4. With one end of strap, make a loop around hook or rod and stitch as shown.

5. Feed opposite end of strap through buckle as shown.

6. Fold end of strap and stitch as shown.

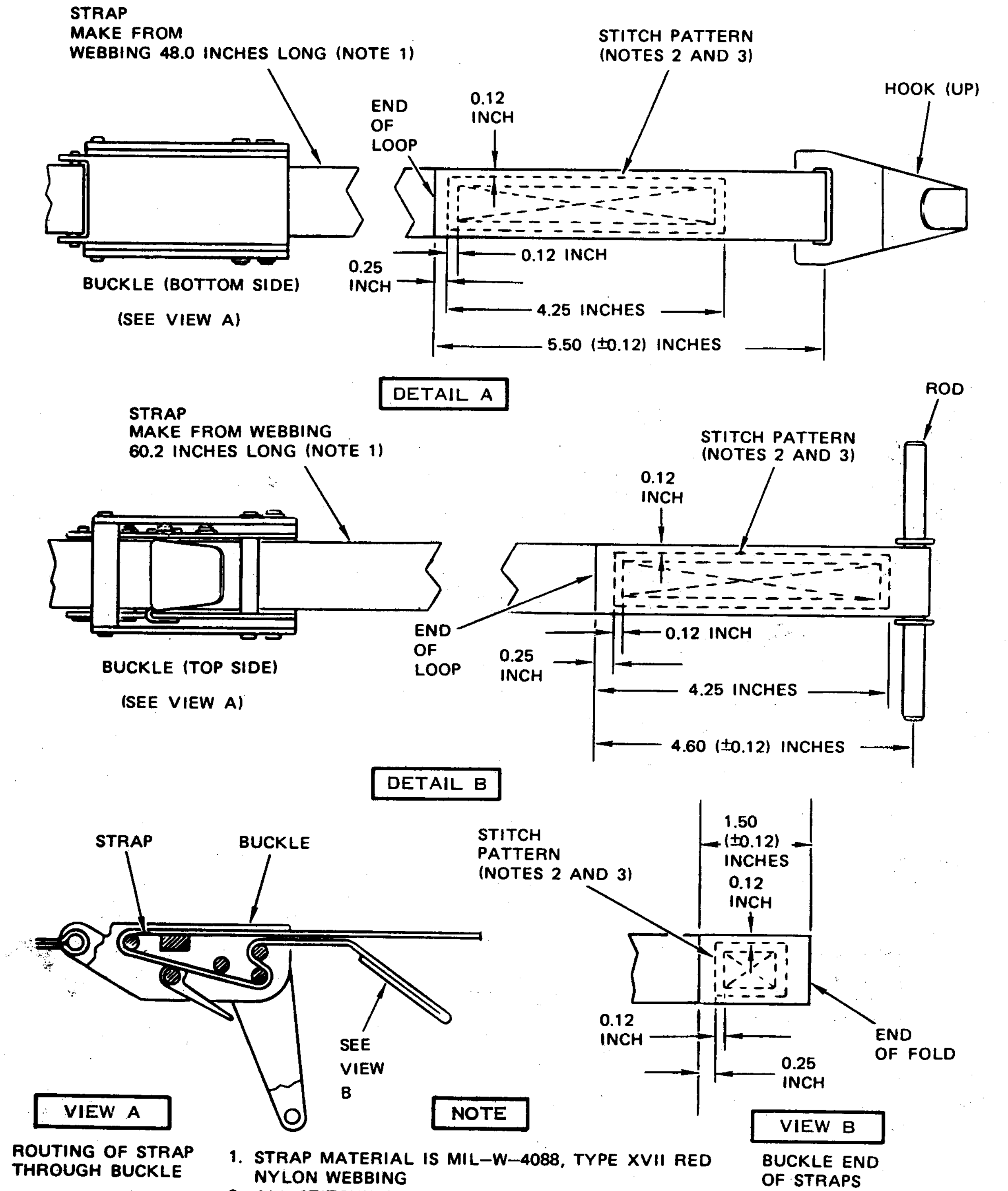
7. Install strap in reverse sequence.

8. Stake self-locking nut (7).



1. SELF-LOCKING NUT
2. SCREW
3. WASHER
4. STRAP
5. WASHER
6. SPACER
7. SELF-LOCKING NUT
8. SCREW
9. STRAP

Figure 2-18. Repair of 215-00251-17 Engine Air Duct Runup Screen Straps (Sheet 1)



NOTE

1. STRAP MATERIAL IS MIL–W–4088, TYPE XVII RED NYLON WEBBING
2. ALL STITCHING IS VT295, TYPE I, CL1, SIZE FF RED NYLON THREAD
3. STITCH SPACING: 7 STITCHES PER INCH MINIMUM, 10 STITCHES PER INCH MAXIMUM. BACKSTITCH BEGINNING AND END OF STITCHING 0.5 INCH.

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Figure 2-18. Repair of 215-00251-17 Engine Air Duct Runup Screen Straps (Sheet 2)

e. For 215-00138-27 or 215-00138-42 screens, replace damaged restraint assemblies in sequence shown in figure 2-19, observing the following:

1. Install bolts with head inside screen.

2. Install washer under nut only.

3. Secure boltheads with MS20995C32 lockwire.

f. For 215-00138-27 or 215-00138-42 screens, replace damaged casters in sequence shown in figure 2-19.

g. For 215-00138-27 or 215-00138-42 screens, replace damaged cover plate in sequence shown in figure 2-19.

h. Repair or replace plastic (Plastisol) coating on frame members as follows:

1. Remove coating by sand blasting or hand sanding to bare metal.

2. Mix one part MIL-P-16232, Type II, phosphate coating with two parts distilled water.

3. Treat exposed metal surfaces by swabbing for 5 minutes with cloths saturated in phosphate solution.

4. Flush treated surfaces with distilled or deionized water and dry.

5. Mask around areas being repaired to prevent removal of adjacent painted areas.

WARNING

Wear plastic or rubber gloves when using trichloroethane solvent. Avoid prolonged or repeated breathing of vapor. Never use trichloroethane in a confined area without mechanical ventilation or respiratory protection. Do not use in an area where there is a possibility of solvent coming into contact with open flame.

6. Wipe any soiled areas with clean rag wetted with MIL-T-81533 trichloroethane and wipe dry.

NOTE

Vinyl Plastisol red 509 spray, part No. 370-X-67526, and Plastisol primer, part No. A-1104-B, are available from B. F. Goodrich Industrial Product Company, Akron, Ohio.

7. Mix two parts of Plastisol primer with one part TT-T-548 toluene.

8. Brush or spray one coat of Plastisol primer to bare metal and allow to dry for 30 minutes at room temperature or 5 minutes at 340° (±10°) F.

NOTE

Ircogel 901 is available from Lubrizol Corporation, Cleveland, Ohio.

9. If brush application is required, mix 2.5 ounces of Ircogel 901 to 1 gallon vinyl Plastisol.

10. Brush or spray thin coating of Plastisol to area being repaired.

11. Partially cure coating for 5 minutes at 235° (+15, −10°) F.

12. Repeat substeps 10 and 11 until thickness reaches 0.06 (±0.02) inch.

NOTE

Apply final two coats of Plastisol without adding thickener to promote smooth, finished appearance.

13. Remove masking.

14. Cure coating for 30 minutes at 355° (+10°, −5°) F.

2-61. FIRE DEPARTMENT EGRESS TRAINING.

2-62. These instructions are provided to serve as a guide in preparing the airplane for egress system training of base fire department personnel.

a. Airplane being utilized for training shall be entered in red cross status prior to training commencement.

b. Verify that airplane is properly parked and that applicable ground handling safety devices are installed (paragraph 2-11 and figure 2-1).

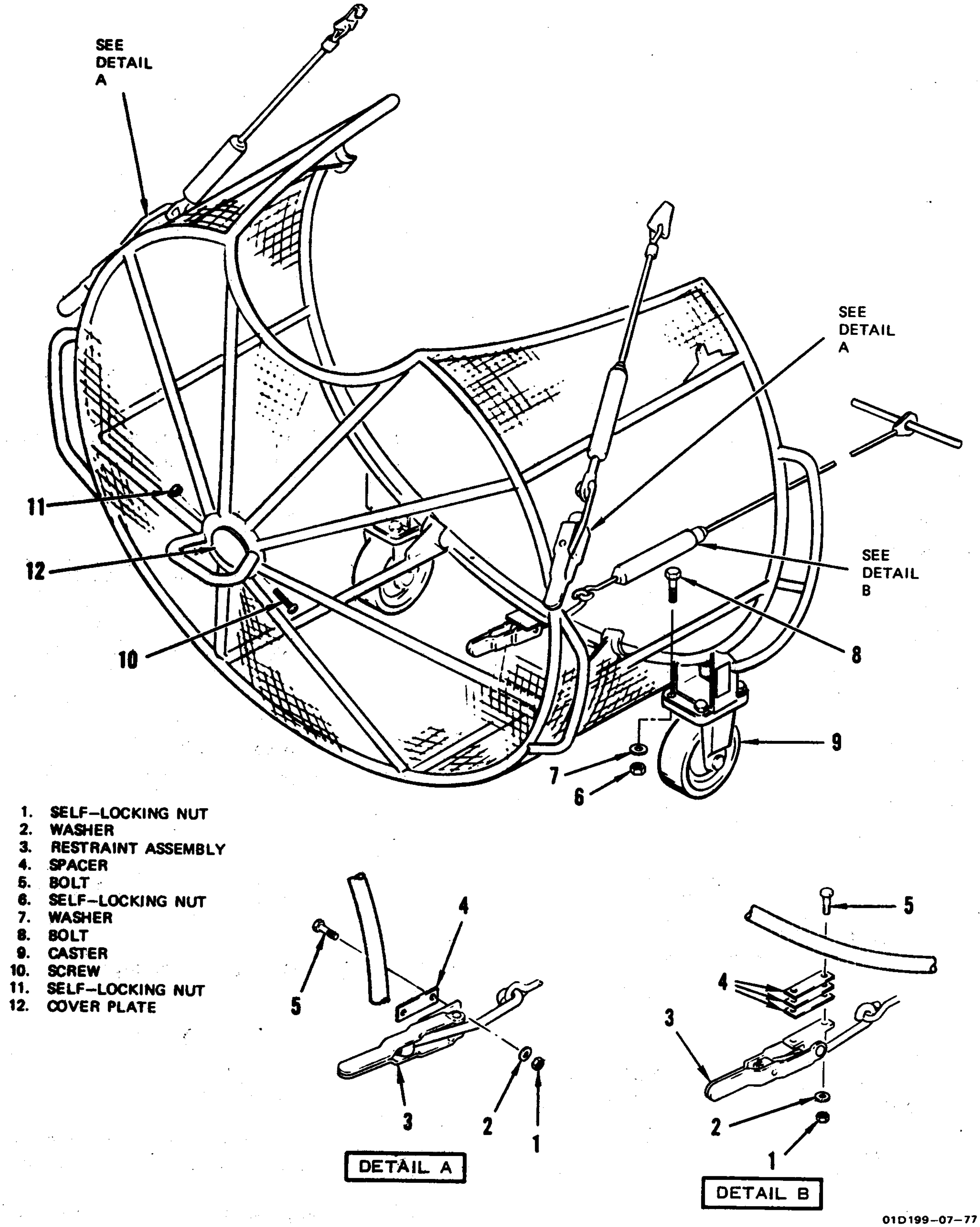


Figure 2-19. Repair of 215-00138-27 and 215-00138-42 Engine Air Duct Runup Screen Straps

c. Egress system instructor shall ensure that proper procedures are followed for safe entry into cockpit (paragraph 2-7 and figure 2-4). Canopy support strut shall be installed.

d. Verify that cockpit controls are in safe (normal) positions.

e. Ensure that adequate facilities (workstands, platforms, etc) are provided for cockpit area observance for trainees.

f. Trainees are not to be permitted in vicinity of cockpit unless accompanied by egress system specialist.

g. Instructor will caution trainees of hazards related to operation of the following:

1. Ejection controls safety handle.

2. Primary ejection control handle.

3. Interior canopy jettison control handle.

4. Manual harness release handle.

5. Mk 86 delay initiator seat, zero-delay lanyard, and parachute arming lanyard.

6. Survival kit release handle.

7. Landing gear control handle.

8. Arresting gear control handle.

9. EPP control handle.

10. Canopy counterbalance cylinder operation and purpose for canopy support strut.

h. After completion of training, egress system specialist shall perform Egress System Final Inspection (T.O. 1A-7D-2-2) before removing airplane from red cross status.

SECTION III
SERVICING

3-1. GENERAL. (See figure 3-1.)

3-2. Airplane servicing should be accomplished as directed herein. Units that require frequent servicing are easily accessible and adapted for minimum servicing time. Components that may require servicing are the canopy actuator and counterbalance cylinder, main and nose gear shock struts; tires; arresting gear actuator; forward, aft and lateral flight control system viscous dampers; engine oil tank; engine starter; air-conditioning turbine; constant speed drive; PC No. 1, PC No. 2, and PC No. 3 hydraulic system reservoirs; accumulators; fuel tanks; and oxygen system converter. For fluid types and capacity, see table 3-1 or 3-2.

3-3. All hydraulic units are serviced with MIL-H-83282 hydraulic fluid. Hydraulic power control systems can be serviced while pressurized or unpressurized. Precautions shall be taken to eliminate the possibility of system contamination by foreign particles entering the hydraulic system or component.

3-4. The entire fuel system may be fully serviced through a single point receptacle without using external electrical power. In event partial fuel servicing is required, external electrical power will be required to supply power to the fuel quantity indicator to indicate the amount of fuel in each tank. All tanks may be serviced by the gravity method through a fuel cap provided on the aft fuselage fuel tank, wing fuel tank, and each external tank. Defueling may be accomplished without the aid of external electrical power through the single point receptacle.

3-5. The oxygen converter may be serviced with the converter installed or removed from the airplane.

Table 3-1. Servicing Capacities and Fluids (Airplanes Through AF69-6196)

System or Component	Fluid	Capacities Pounds	Capacities U. S. Gal.	Capacities Imp. Gal.	Capacities Liters
Nose gear shock strut	MIL-H-83282 or (See Note 7)		1.20	1.00	4.56
Main gear shock strut	MIL-H-83282 or (See Note 7)		0.60	0.50	2.28
Arresting gear actuator	MIL-H-83282 or (See Note 7)		0.25	0.21	0.95
Lateral viscous damper	MIL-H-83282 or (See Note 7)		0.018	0.016	0.07
Aft viscous damper	MIL-H-83282 or (See Note 7)		0.015	0.013	0.06
Forward viscous damper	MIL-H-83282 or (See Note 7)		0.018	0.016	0.07
Canopy actuator	MIL-H-83282 or (See Note 7)		0.030	0.025	0.115
PC No. 1 hydraulic system	MIL-H-83282 or (See Note 7)		3.74	3.11	14.16
PC No. 1 reservoir	MIL-H-83282 or (See Note 7)		0.77	0.64	2.93
PC No. 2 hydraulic system	MIL-H-83282 or (See Note 7)		11.6	9.63	44.08
PC No. 2 reservoir	MIL-H-83282 or (See Note 7)		3.97	3.30	15.09

Table 3-1. Servicing Capacities and Fluids (Airplanes Through AF69-6196) (continued)

System or Component	Fluid	Capacities Pounds	Capacities U. S. Gal.	Capacities Imp. Gal.	Capacities Liters
Engine oil system	MIL-L-7808 or MIL-L-23699[6]		1.80	1.50	6.84
Unusable engine oil	MIL-L-7808 or MIL-L-23699[6]		0.60	0.50	2.28
Constant speed drive	MIL-L-7808 or MIL-L-23699[6]		1.58	1.32	6.00
Starter	MIL-L-7808 or MIL-L-23699[6]		0.08	0.07	0.30
Air-conditioning turbine	MIL-L-23699		0.03	0.03	0.11
Liquid oxygen system	MIL-O-27210				10.0
Fuel system (refer to notes)					
Left forward fuselage tank	MIL-T-5624 JP-4	591.5	91	75.8	344.5
Right forward fuselage tank	JP-4	591.5	91	75.8	344.5
Left midfuselage tank	JP-4	500.5	77	64.1	291.5
Right midfuselage tank	JP-4	500.5	77	64.1	291.5
Sump tank	JP-4	520.0	80	66.6	304.0
Aft fuselage tank	JP-4	2,119.0	326	271.5	1,234.4
Wing integral tank	JP-4	4,927.0	758	631.5	2,869.3
Total internal fuel		9,750.0	1,500	1,249.4	5,679.7
Auxiliary wing tanks (four 300-gallon tanks on wing stations 1, 3, 6, and 8)	JP-4	7,800.0	1,200	1,000.0	4,560.0
Total fuel		17,550.0	2,700	2,249.4	10,239.7

NOTE

1. Fuel (Type 1 Specifications)
   Normal Fuel – JP–4
   Alternate Fuel – JP–5, JP–8, Jet A, Jet A-1 or Jet B.
   Emergency Fuel – Aviation gasoline

2. To avoid exceeding engine operating limits when changing to or from JP-4 fuel, perform manual fuel control idle check. If aircraft exceeds idle limitations, perform manual fuel control check (T.O. 1A-7D-2-5).

Table 3-1. Servicing Capacities and Fluids (Airplanes Through AF69-6196) (continued)

System or Component	Fluid	Capacities Pounds	Capacities U. S. Gal.	Capacities Imp. Gal.	Capacities Liters

3. After using aviation gasoline, completely defuel entire fuel system before refueling with jet fuel.

4. The fuel quantity indicating system may vary as much as 100 pounds +4% of indicated quantity in main (M) and transfer (T) systems and 400 pounds +4% of indicated quantity on digital counter (totalizer).

5. JP-4 weighs approximately 6.5 pounds per gallon at 60°F.

6. The TF-41 engine may be operated in an emergency situation with a mixture of MIL-L-7808 or MIL-L-23699. But the oil mixture must be changed at the earliest opportunity to one type of oil. At temperature of -40 degrees Fahrenheit and below, use MIL-L-7808. MIL-L-23699 is prime – MIL-L-7808 is alternate.

7. MIL-H-5606 hydraulic fluid may be utilized if MIL-H-83282 hydraulic fluid is not available. MIL-H-83282 the preferred hydraulic fluid will be used whenever possible, however aircraft will not be grounded if listed alternate fluid (MIL-H-5606) is used in any concentration. Aircraft records will be annotated to reflect aircraft servicing with alternate fluid, identifying the fluid type (MIL-H-5606) and quantity added. To retain hydraulic system fire resistant properties as soon as practical the MIL-H-5606 will be replaced with not less than 90% concentration of MIL-H-83282.

Table 3-2. Servicing Capacities and Fluids (Airplanes AF69-6197 and Subsequent) Orange Foam

System or Component	Fluid	Capacities Pounds	Capacities U. S. Gal.	Capacities Imp. Gal.	Capacities Liters
Nose gear shock strut	MIL-H-83282 or (See Note 7)		1.20	1.00	4.56
Main gear shock strut	MIL-H-83282 or (See Note 7)		0.60	0.50	2.28
Arresting gear actuator	MIL-H-83282 or (See Note 7)		0.25	0.21	0.95
Lateral viscous damper	MIL-H-83282 or (See Note 7)		0.018	0.016	0.07
Aft viscous damper	MIL-H-83282 or (See Note 7)		0.015	0.013	0.06
Forward viscous damper	MIL-H-83282 or (See Note 7)		0.018	0.016	0.07
Canopy actuator	MIL-H-83282 or (See Note 7)		0.030	0.025	0.115
PC No. 1 hydraulic system	MIL-H-83282 or (See Note 7)		3.74	3.11	14.16
PC No. 1 reservoir	MIL-H-83282 or (See Note 7)		0.77	0.64	2.93
PC No. 2 hydraulic system	MIL-H-83282 or (See Note 7)		11.6	9.63	44.08
PC No. 2 reservoir	MIL-H-83282 or (See Note 7)		3.97	3.30	15.09
PC No. 3 hydraulic system	MIL-H-83282 or (See Note 7)		3.36	2.79	12.77
PC No. 3 reservoir	MIL-H-83282 or (See Note 7)		0.76	0.63	2.28
Engine oil system	MIL-L-23699 or MIL-L-7808 or (See Note 6)		1.80	1.50	6.84
Unusable engine oil	MIL-L-23699 or MIL-L-7808 or (See Note 6)		0.60	0.50	2.28
Constant speed drive	MIL-L-23699 or MIL-L-7808 or (See Note 6)		1.58	1.32	6.00
Starter	MIL-L-23699 or MIL-L-7808 or (See Note 6)		0.08	0.07	0.30
Air-conditioning turbine	MIL-L-23699		0.03	0.03	0.11
Liquid oxygen system	MIL-O-27210				10.0
Fuel system (refer to notes)					
Left forward fuselage tank	MIL-T-5624 JP-4	562.25	86.5	72.0	327.4

Table 3-2. Servicing Capacities and Fluids (Airplanes AF69-6197 and Subsequent) Orange Foam - (continued)

System or Component	Fluid	Capacities Pounds	Capacities U. S. Gal.	Capacities Imp. Gal.	Capacities Liters
Right forward fuselage tank	JP-4	562.25	86.5	72.0	327.4
Left midfuselage tank	JP-4	474.5	73.0	60.8	276.3
Right midfuselage tank	JP-4	474.5	73.0	60.8	276.3
Sump tank	JP-4	494.0	76.0	63.3	287.7
Aft fuselage tank	JP-4	2,015.0	310.0	258.1	1,173.3
Wing integral tank	JP-4	9262 4,680.0 4582	720.0	599.6	2,725.2
Total internal fuel		9,262.50	1,425.0	1,186.6	5,393.6
*Auxiliary wing tanks (four 300-gallon tanks on wing stations 1, 3, 6, and 8)	JP-4 * No foam installed	7,800.00	1,200.0	999.2	4,542.0
Total fuel		17,062.50	2,625.0	2,185.8	9,935.6

NOTE

1. Fuel (Type/Specification)
   Normal fuel — JP-4
   Alternate fuel — JP-5, Jet A, Jet A-1, or Jet B
   Emergency fuel — Aviation gasoline

2. To avoid exceeding engine operating limits when changing to or from JP-4 fuel, perform manual fuel control check (T.O. 1A-7D-2-5).

3. After using aviation gasoline, completely defuel entire fuel system before refueling with jet fuel.

4. The fuel quantity indicating system may vary as much as 100 pounds +4% of indicated quantity in main (M) and transfer (T) systems and 400 pounds +4% of indicated quantity on the digital counter (totalizer).

5. JP-4 weighs approximately 6.5 pounds per gallon at 60°F.

6. The TF-41 engine may be operated in an emergency situation with a mixture of MIL-L-7808 or MIL-L-23699. But the oil mixture must be changed at the earliest opportunity to one type of oil. At temperature of -40° F and below, use MIL-L-7808. MIL-L-23699 is prime – MIL-L-7808 is alternate.

7. MIL-H-5606 hydraulic fluid may be utilized if MIL-H-83282 hydraulic fluid is not available. MIL-H-83282 the preferred hydraulic fluid will be used whenever possible, however aircraft will not be grounded if listed alternate fluid (MIL-H-5606) is used in any concentration. Aircraft records will be annotated to reflect aircraft servicing with alternate fluid, identifying the fluid type (MIL-H-5606) and quantity added. To retain hydraulic system fire resistant properties as soon as practical the MIL-H-5606 will be replaced with not less than 90% concentration of MIL-H-83282.

Table 3-3. Servicing Capacities and Fluids (Airplanes AF69-6197 and Subsequent) Blue Foam

System or Component	Fluid	Capacities Pounds	Capacities U. S. Gal.	Capacities Imp. Gal.	Capacities Liters
Nose gear shock strut	MIL-H-83282 or (See Note 7)		1.20	1.00	4.56
Main gear shock strut	MIL-H-83282 or (See Note 7)		0.60	0.50	2.28
Arresting gear actuator	MIL-H-83282 or (See Note 7)		0.25	0.21	0.95
Lateral viscous damper	MIL-H-83282 or (See Note 7)		0.018	0.016	0.07
Aft viscous damper	MIL-H-83282 or (See Note 7)		0.015	0.013	0.06
Forward viscous damper	MIL-H-83282 or (See Note 7)		0.018	0.016	0.07
Canopy actuator	MIL-H-83282 or (See Note 7)		0.030	0.025	0.115
PC No. 1 hydraulic system	MIL-H-83282 or (See Note 7)		3.74	3.11	14.16
PC No. 1 reservoir	MIL-H-83282 or (See Note 7)		0.77	0.64	2.93
PC No. 2 hydraulic system	MIL-H-83282 or (See Note 7)		11.6	9.63	44.08
PC No. 2 reservoir	MIL-H-83282 or (See Note 7)		3.97	3.30	15.09
PC No. 3 hydraulic system	MIL-H-83282 or (See Note 7)		3.36	2.79	12.77
PC No. 3 reservoir	MIL-H-83282 or (See Note 7)		0.76	0.63	2.28
Engine oil system	MIL-L-23699 or MIL-L-7808 or (See Note 6)		1.80	1.50	6.84
Unusable engine oil	MIL-L-23699 or MIL-L-7808 or (See Note 6)		0.60	0.50	2.28
Constant speed drive	MIL-L-23699 or MIL-L-7808 or (See Note 6)		1.58	1.32	6.00
Starter	MIL-L-23699 or MIL-L-7808 or (See Note 6)		0.08	0.07	0.30
Air-conditioning turbine	MIL-L-23699		0.03	0.03	0.11
Liquid oxygen system	MIL-O-27210				10.0
Fuel system (refer to notes)					
Left forward fuselage tank	MIL-T-5624 JP-4	565.5	87.0	72.4	329.3

Table 3-3. Servicing Capacities and Fluids (Airplanes AF69-6197 and Subsequent) Blue Foam - (continued)

System or Component	Fluid	Capacities Pounds	Capacities U. S. Gal.	Capacities Imp. Gal.	Capacities Liters
Right forward fuselage tank	JP-4	565.5	87.0	72.4	329.3
Left midfuselage tank	JP-4	477.75	73.5	61.2	278.2
Right midfuselage tank	JP-4	477.75	73.5	61.2	278.2
Sump tank	JP-4	500.5	77.0	64.1	291.4
Aft fuselage tank	JP-4	2,037.75	313.5	261.1	1,186.6
Wing integral tank	JP-4	4,702.75	723.5	602.5	2,738.4
Total internal fuel		9,327.5	1,435.0	1,194.9	5,431.4
*Auxiliary wing tanks (four 300-gallon tanks on wing stations 1, 3, 6, and 8)	JP-4 * No foam installed	7,800.00	1,200.0	999.2	4,542.0
Total fuel		17,127.5	2,635.0	2,194.1	9,973.4

NOTE

1. Fuel (Type/Specification)
   Normal fuel — JP-4
   Alternate fuel — JP-5, Jet A, Jet A-1, or Jet B
   Emergency fuel — Aviation gasoline

2. To avoid exceeding engine operating limits when changing to or from JP-4 fuel, perform manual fuel control check (T.O. 1A-7D-2-5).

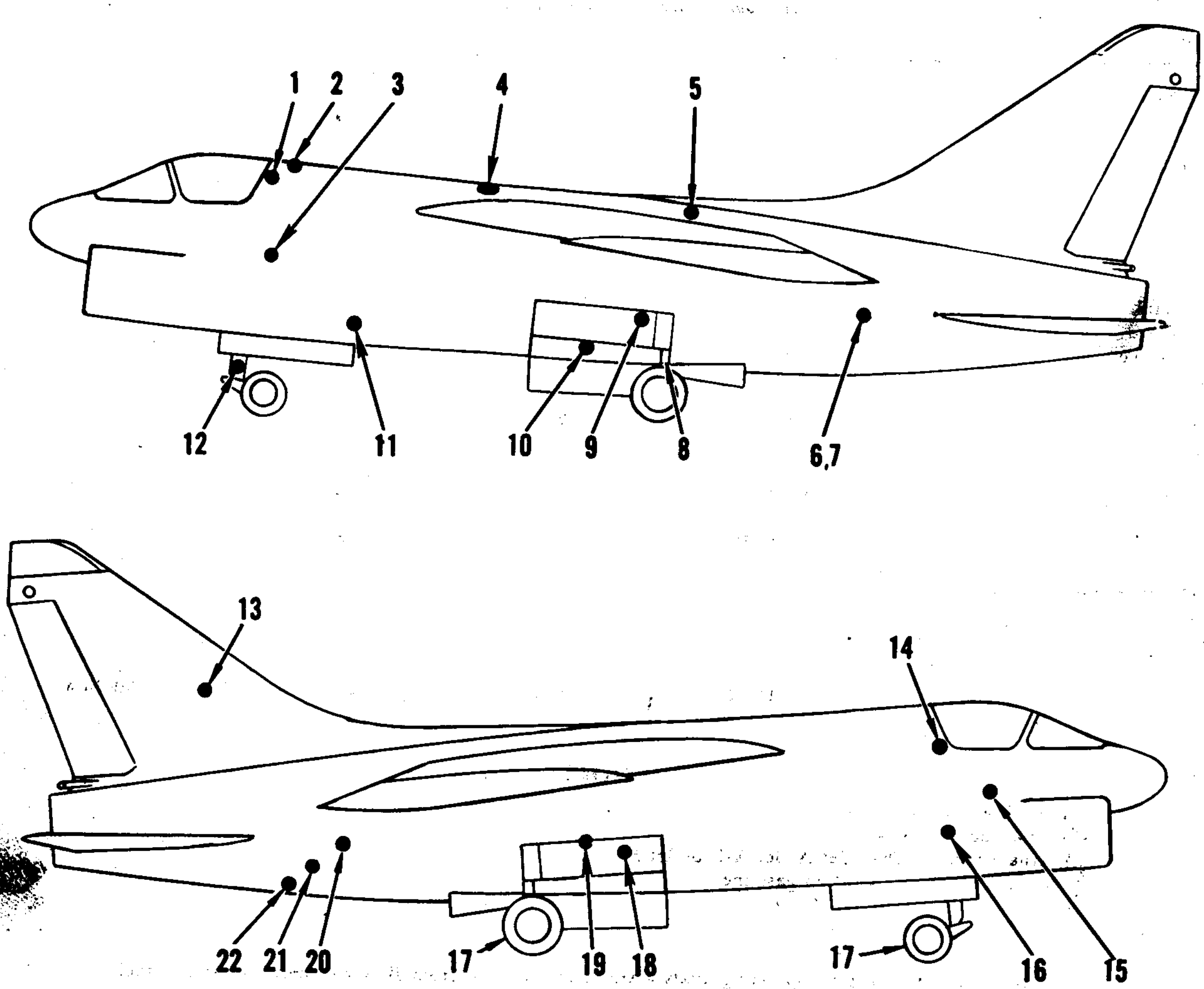
3. After using aviation gasoline, completely defuel entire fuel system before refueling with jet fuel.

4. The fuel quantity indicating system may vary as much as 100 pounds +4% of indicated quantity in main (M) and transfer (T) systems and 400 pounds +4% of indicated quantity on the digital counter (totalizer).

5. JP-4 weighs approximately 6.5 pounds per gallon at 60°F.

6. The TF-41 engine may be operated in an emergency situation with a mixture of MIL-L-7808 or MIL-L-23699. But the oil mixture must be changed at the earliest opportunity to one type of oil. At temperature of -40° F and below, use MIL-L-7808. MIL-L-23699 is prime – MIL-L-7808 is alternate.

7. MIL-H-5606 hydraulic fluid may be utilized if MIL-H-83282 hydraulic fluid is not available. MIL-H-83282 the preferred hydraulic fluid will be used whenever possible, however aircraft will not be grounded if listed alternate fluid (MIL-H-5606) is used in any concentration. Aircraft records will be annotated to reflect aircraft servicing with alternate fluid, identifying the fluid type (MIL-H-5606) and quantity added. To retain hydraulic system fire resistant properties as soon as practical the MIL-H-5606 will be replaced with not less than 90% concentration of MIL-H-83282.



INDEX NO.	SERVICING POINT	INDEX NO.	SERVICING POINT	INDEX NO.	SERVICING POINT
1.	Canopy actuator	8.	Main gear shock struts	17.	Tires
2.	Canopy counterbalance cylinder	9.	PC No. 1 filler valve	18.	Single-point filler (accumulator servicing)
3.	Lateral viscous damper	10.	Fueling manifold	19.	PC No. 2 filler valve
4.	Wing tank gravity fueling receptacle	11.	Liquid oxygen converter	20.	Constant speed drive (CSD)
5.	Fuselage tanks gravity fueling receptacle	12.	Nose gear shock strut	21.	Starter
6.	Engine oil	13.	Aft viscous damper	22.	Arresting gear actuator
7.	PC No. 3 filler valve (Airplanes AF69-6189, AF69-6197 and subsequent)	14.	Emergency oxygen bottle		
		15.	Forward viscous damper		
		16.	Air-conditioning turbine		

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Figure 3-1. Airplane Servicing Points

3-6. CANOPY SYSTEM.

3-7. Periodic cleaning and servicing of the canopy and components are required to prolong the life and ensure positive operation of the system. The canopy jettison and ejection seat systems are equipped with explosive devices which jettison the canopy and eject the seat during emergency egress.

WARNING

To prevent possible seat ejection or canopy jettison, ensure that ejection controls safety handle is in down-and-locked position and safety pins are installed in ejection seat prime initiator and interior canopy jettison initiator. On airplanes AF68-8225 and subsequent, an additional safety pin shall be installed in the canopy-actuated initiator when working in immediate area of initiator.

CAUTION

Do not open the canopy when wind velocity exceeds 40 knots. When opening, restrain the canopy to prevent damage to the canopy pivot bolts and actuator. The canopy actuator rod end and pivot bolts will shear if normal canopy travel is exceeded.

3-8. Direct sunlight may distort acrylic plastic at temperatures above 100°F. The canopy shall be opened to allow air circulation at temperatures above 100°F and shall be shaded and opened at temperatures exceeding 120°F.

3-9. The canopy shall be opened when the airplane is moved from one extreme temperature condition to another to allow an even circulation of air on both sides of the plastic surface. Ice, snow, and frost shall be removed by applying warm air to the canopy surface. Care shall be taken to avoid scraping the plastic surface as scratching or etching will cause an optical distortion and weaken the canopy structure.

3-10. When cleaning the canopy, use a solution of castile soap and clean water and blot dry with a chamois or soft cotton cloth.

3-11. CANOPY ACTUATOR SERVICING. (See figure 3-2.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
2-1	215-00280-1	40° canopy support strut	Lock canopy in open position.
3-2	216-01828-1	Canopy actuator servicing adapter	Facilitate servicing canopy actuator.
	E10385	Hydraulic servicing cart	Service canopy actuator with hydraulic fluid.

WARNING

Ensure that ejection controls safety handle is in down-and-locked position and safety pins (215-00261-1) are installed in ejection seat prime initiator, interior canopy jettison initiator, and canopy-actuated initiator. This will prevent inadvertent canopy jettison or seat ejection.

NOTE

To extend indicator rod, close canopy halfway and open rapidly. Servicing tool may then be installed before indicator rod retracts.

a. Retract canopy actuator until groove on indicator rod is visible. Install canopy actuator servicing adapter in groove with phenolic side up. Install pin in canopy actuator servicing adapter.

b. Remove bleed and filler port plug and install reducer.

c. To eliminate air in servicing cart hose, operate hand pump to fill hose with hydraulic fluid before connecting.

d. Install 40° canopy support strut (T.O. 1A-7D-2-2).

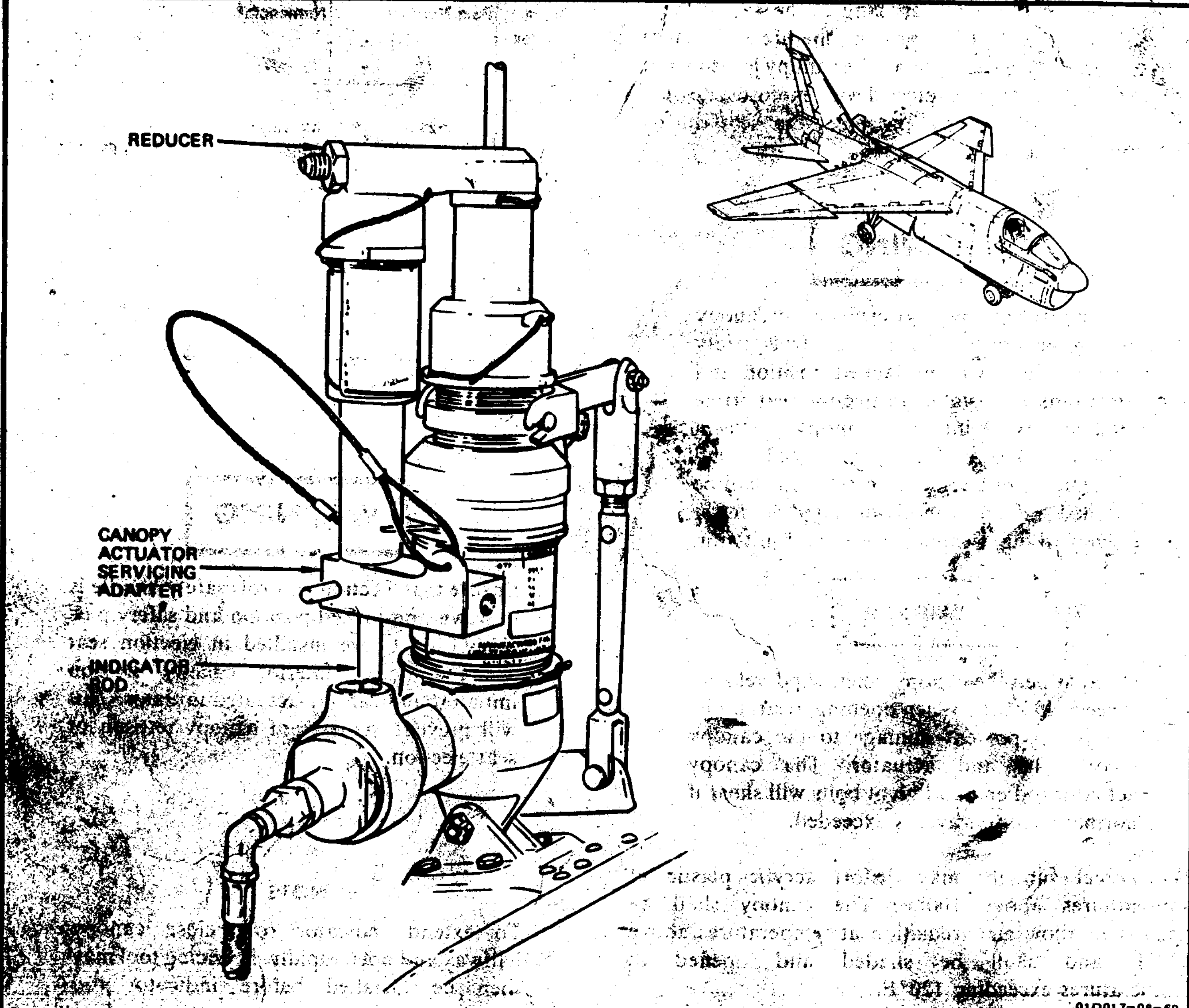


Figure 3-2. Canopy Actuator Servicing

3-13. MAIN GEAR SHOCK STRUT SERVICING.

(See Figure 3-4.)

[illegible] Required

Figure & Index No	Part Number	Nomenclature	Use and Application
	E10385	Hydraulic servicing cart	Service shock strut with hydraulic fluid.
	MB-1	Air compressor	Service shock strut with nitrogen.
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten high-pressure pneumatic valve.
	MIL-T-26772	Nitrogen servicing trailer	Service shock strut with nitrogen.
	Local fabrication	Skid plates (2)	Allow main landing gear to remain in normal position during shock strut servicing.
	9-891695	Air gage assembly	Check strut for proper inflation.
	8246250 (Optional)	Adapter (Local Fabrication)	Use with Multi Purpose Dolly, Part No. 21500303, to collapse strut when aircraft is on jacks.

WARNING

Use approved personal protective equipment (goggles/face shield/gloves) when using compressed air or nitrogen.

NOTE

To determine if shock strut requires servicing, connect pressure gage to high-pressure pneumatic valve and check that pressure gage indication corresponds to table pressure and dimension X (table 3-4).

a. Position two skid plates under wheel.

CAUTION

To prevent damage to actuator, do not exceed 250 psi filling pressure.

e. Fill actuator with hydraulic fluid until indicator rod is fully extended.

NOTE

The servicing adapter holds the indicator rod extended at proper refill level of 2.00 (±0.10) inches, measured from bottom of housing to end of indicator rod.

f. Allow fluid to bleed back to servicing cart until servicing adapter is seated on canopy actuator housing.

g. Remove filler hose and reducer. Install new O-ring on bleed and filler port plug. Install bleed and filler port plug.

h. Remove pin from servicing adapter and remove servicing adapter from indicator rod.

i. Remove canopy support strut.

j. With canopy open, check that groove on indicator rod is visible. If groove on indicator rod is not visible, repeat entire servicing procedure.

3-12. CANOPY COUNTERBALANCE CYLINDER SERVICING. (See figure 3-3.)

Tools Required

Figure & Index No	Part Number	Nomenclature	Use and Application
	MIL-T-26772	Nitrogen servicing trailer	Service canopy counterbalance cylinder with nitrogen.
2-1	215-00280-1	40° canopy support strut	Lock canopy in open position.

WARNING

Ensure that ejection controls safety handle is in down-and-locked position and safety pins (215-00261-1) are installed in ejection seat Prime initiator, interior canopy jettison initiator, and canopy-actuated initiator. This will prevent inadvertent canopy jettison or seat ejection.

Install canopy support strut prior to pressurizing or depressurizing canopy counterbalance cylinder. Failure to install strut will allow the canopy to fall and may injure personnel or damage equipment.

a. Open canopy and install 40° canopy support strut (T.O. 1A-7D-2-2).

WARNING

Use approved personal protective equipment (goggles/face shield/gloves) when using compressed air or nitrogen.

b. Remove filler cap and connect nitrogen hose from nitrogen trailer to filler valve.

CAUTION

To prevent structural damage, ensure that required access panels are installed (table 1-1).

c. Inflate cylinder with nitrogen to applicable pressure as follows:

Ambient Temperature	Pneumatic Pressure
20°F	225 psi
60°F	250 psi
100°F	275 psi

d. Disconnect nitrogen hose.

WARNING

If filler valve leaks, canopy will fall when canopy support strut is removed and may cause injury to personnel or damage to equipment.

e. Using a soap and water solution, check filler valve for possible leaks. Install filler cap.

f. Remove canopy support strut.

g. Close and open canopy several times to check counterbalance cylinder operation.

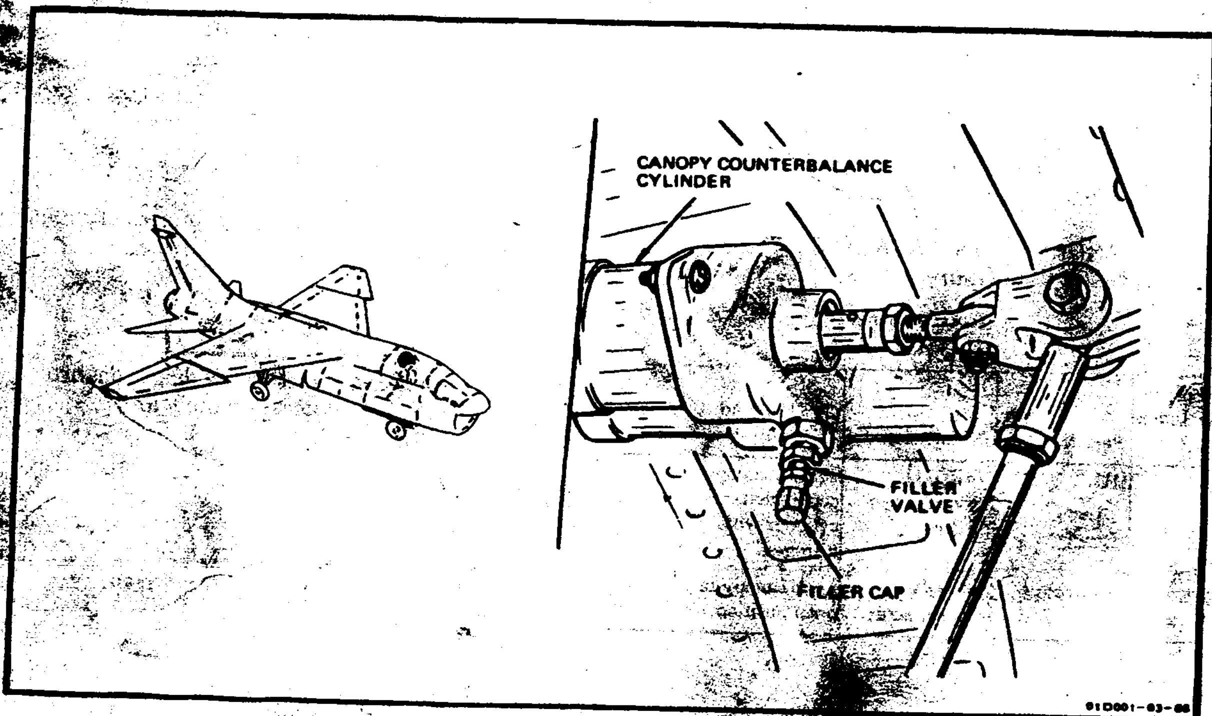


Figure 3-3. Canopy Counterbalance Cylinder Servicing

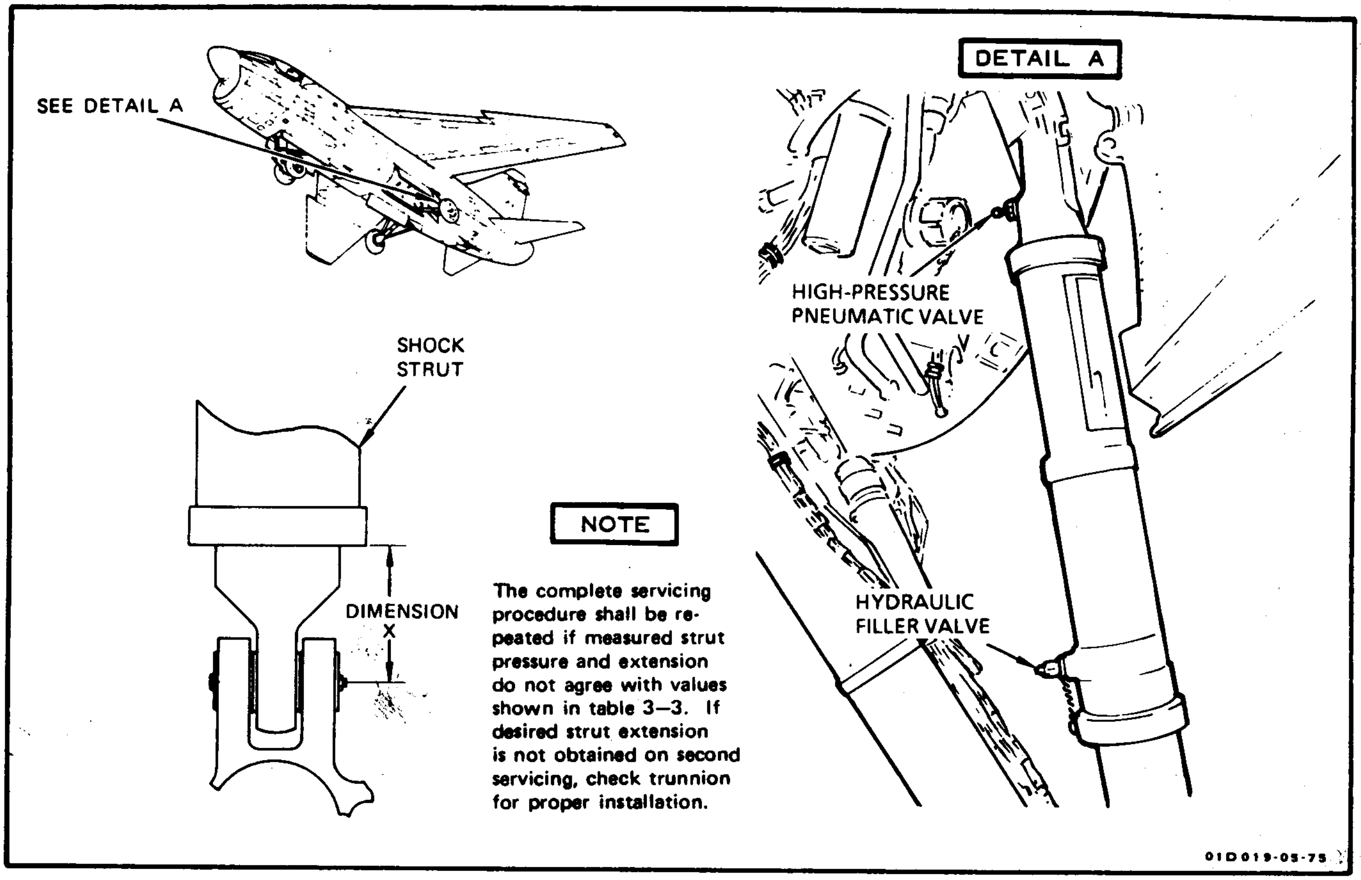


Figure 3-4. Main Gear Shock Strut Servicing

b. Remove high-pressure pneumatic valve cap and attach bleed line to valve. Place other end of bleed line in waste container.

c. Open high pressure pneumatic valve by turning 3/4-inch hex swivel nut slowly counterclockwise approximately 3 turns to depressurize shock strut. Valve mounting nut should be held with wrench to prevent loosening and possible ejection of valve from shock strut.

NOTE

To facilitate connection of hydraulic servicing cart, an elbow assembly consisting of one AN939-4 elbow and one AN815-4 union may be attached to the hydraulic filler valve.

d. Remove hydraulic filler valve cap and connect hydraulic servicing cart to filler valve and collapse shock struts.

e. If servicing through pressure operated valve (548400-101), pump hydraulic fluid into shock strut until clean (air-free) fluid flows from bleed line.

f. If servicing through MS28889-1 valve, used on airplanes AF71-223 and subsequent and as a preferred spare for the 548400-101 valve, open valve by turning 3/4-inch hex swivel nut counterclockwise. Hold valve mounting nut with wrench to prevent loosening nut from valve seat. Pump hydraulic fluid into shock strut until clean (air-free) fluid flows from bleed line.

g. If applicable, close valve (MS28889-1) and tighten to 60 (± 10) pound-inches torque.

h. Disconnect hydraulic servicing cart. Install valve cap finger-tight.

i. Remove bleed line from pneumatic valve and install valve cap.

j. Remove high pressure pneumatic valve. Allow fluid to drain from valve port. When fluid is level with bottom of port, strut is properly serviced with fluid.

k. Place new O-ring seal on high-pressure pneumatic valve, install valve in shock strut, and tighten to 105 (± 5) pound-inches torque. Secure with MS20995C32 lockwire.

l. Fillet-seal pneumatic valve with MIL-S-8802 sealant.

NOTE

If nitrogen pressure is not sufficient to service strut on ground according to table 3-4, the MB-1 compressor may be used to transfer nitrogen from trailer to strut, or aircraft may be jacked to fully extend strut.

Aircraft that weigh 17,000 pounds or less will have the main gear struts serviced to 1,500 psi and the nose gear strut serviced to 450 psi prior to down jacking.

m. Connect nitrogen servicing trailer to high-pressure pneumatic valve.

n. Close nitrogen servicing bleed valve and open nitrogen pressure shutoff valve.

NOTE

After pressure and dimension is obtained, rock airplane and check that gage indication and strut extension measurement did not change.

o. Inflate shock strut with nitrogen to dimension X (table 3-4) and pressure shown in table. Tighten high-pressure pneumatic valve 3/4-inch hex swivel nut to 60 (± 10) pound-inches torque.

p. Close shutoff valve and open bleed valve on nitrogen service trailer.

q. Disconnect nitrogen hose from pneumatic valve.

r. Check pneumatic filler valve for leaks.

s. Install valve cap and remove skid-plates.

Table 3-4. Main Gear Shock Strut Servicing

Strut Extension Dim X (Inches)	Gage Pressure (Psi)
4 (Fully compressed)	6,650 (± 132)
4 1/2	4,770 (± 93)
5	3,750 (± 73)
5 1/4	3,380 (± 67)
5 1/2	3,050 (± 61)
5 3/4	2,800 (± 55)
6	2,540 (± 50)
6 1/4	2,380 (± 47)
6 1/2	2,200 (± 44)
7	1,935 (± 38)
7 1/2	1, 700 (± 34)
8	1,535 (± 31)
9	1,290 (± 25)
10	1,095 (± 22)
11	970 (± 19)
12 (Fully extended)	870 (± 17)

3-14. NOSE GEAR SHOCK STRUT SERVICING. (See Figure 3-5 and refer to table 3-5.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	E10385	Hydraulic servicing cart	Service shock strut with hydraulic fluid.
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten high-pressure pneumatic valve.
	MIL-T-26772	Nitrogen servicing trailer	Service shock strut with nitrogen.
	9-891695	Air gage assembly	Check strut for proper inflation

WARNING

Use approved personal protective equipment (goggles/face shield/gloves) when using compressed air or nitrogen.

NOTE

To determine if shock strut requires servicing, connect pressure gage to high-pressure pneumatic valve and check that pneumatic gage indication and linear indication correspond to pressure specified in table 3-5.

a. Remove high-pressure pneumatic valve cap and attach bleed line to valve. Place other end of line in waste container.

b. Using box end wrench, loosen high-pressure pneumatic valve 3/4-inch hex swivel nut and turn counterclockwise to depressurize shock strut.

c. Remove hydraulic filler valve cap, connect hydraulic servicing cart to hydraulic filler valve, loosen filler valve, and pump hydraulic fluid into shock strut until clear (air-free) fluid flows from bleed line.

d. Disconnect hydraulic servicing cart. Tighten filler valve 60 (± 10) pound-inches torque and install valve cap.

e. Remove bleed line from high-pressure pneumatic valve and connect nitrogen servicing trailer to valve.

f. Close nitrogen servicing bleed valve and open nitrogen pressure shutoff valve.

g. Inflate shock strut with nitrogen. Measure dimension X on shock strut. When linear measurement and pneumatic gage indication correspond, shock strut is properly serviced.

h. Tighten high-pressure pneumatic valve swivel nut to 60 (± 10) pound-inches torque.

i. Close shutoff valve, open nitrogen [illegible] bleed valve, and disconnect nitrogen hose.

j. Install valve cap.

Table 3-5. Nose Gear Shock Strut Servicing

Strut Extension Dim X (inches)	Gage Pressure
1/4 (Fully compressed)	3,945 (±80)
3/4	2,[illegible]
1 1/4	[illegible]
1 3/4	[illegible]
2 1/4	721 [illegible]
2 3/4	581 (±12)
3 1/4	485 (±10)
4 1/4	363 [illegible]
5 1/4	[illegible]
6 1/4	[illegible]
7 1/4	[illegible] (±4)
8 1/4	[illegible]
9 1/4	[illegible]
10 1/4	137 (±3)
11 1/4 (Fully extended)	128 (±2)

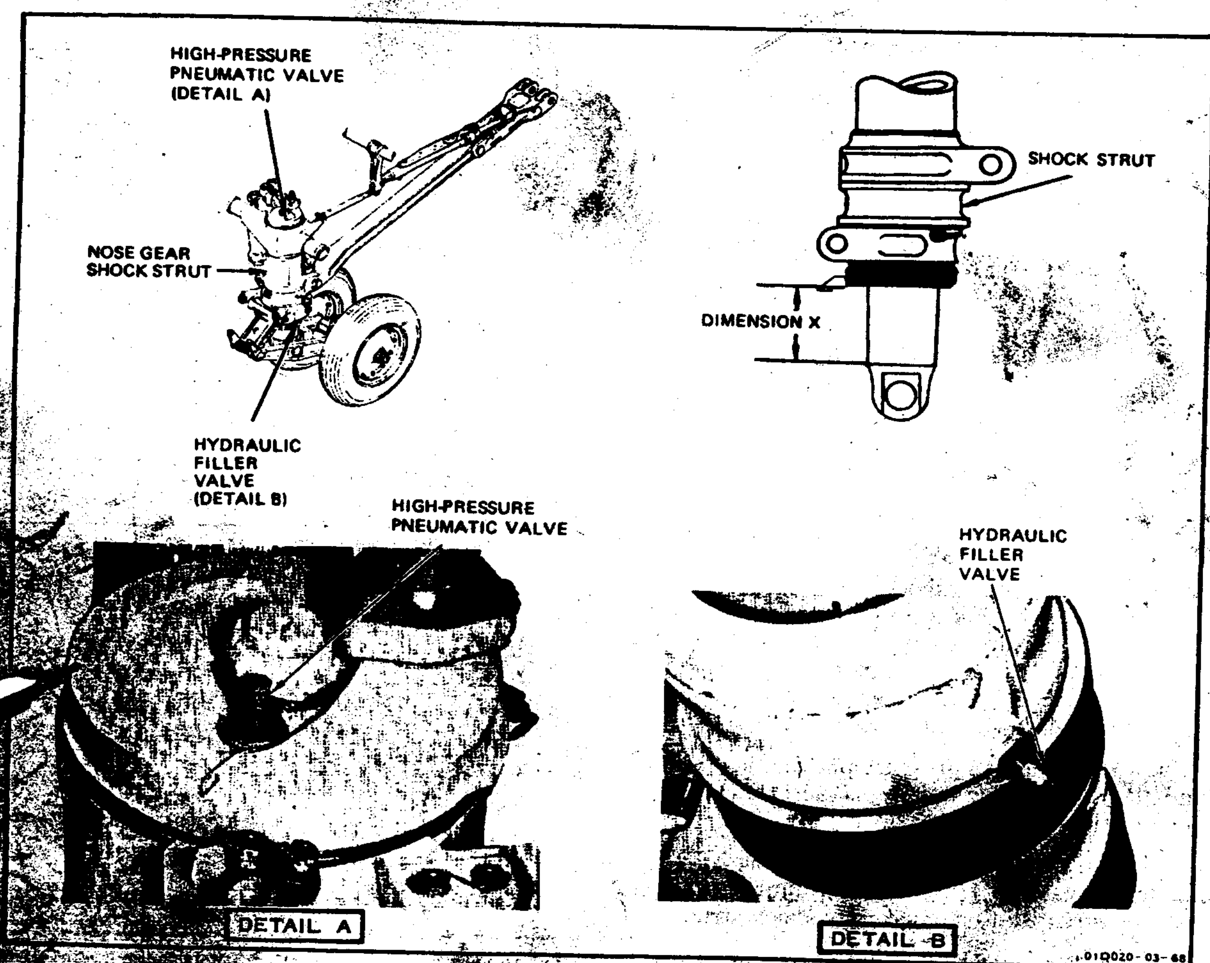


Figure 3-5. Nose Gear Shock Strut Servicing

3-15. LANDING GEAR TIRE SERVICING.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MC-1A	Power driven reciprocating compressor	Service tire with dry air.
	MIL-T-26772	Nitrogen servicing trailer	Service tire with nitrogen.
	M85352/1	Inflator kit assembly	Inflate tire.
	6739	Chuck assembly	Adapt to hose on inflator kit.
	7742A	1 3/8 inch adapter to 95.5 degree adapter	Screw onto tire filler valve to adapt chuck assembly.
	M85352/4-1 or equivalent	Dual chuck stem gauge kit size 1 50-600 psi	Check tire pressure.

a. Remove tire filler valve cap.

b. Using air gage, check tire for proper inflation.

WARNING

Use approved personal protective equipment (goggles/face shield/gloves) when using compressed air or nitrogen.

When inflating tire, stand forward or aft of wheel to prevent injury in event wheel ruptures.

c. If tire requires servicing, use nitrogen servicing trailer or compressor and connect air gage and servicing hose to tire filler valve as follows:

Install 95.5 degree adapter on the tire filler valve and use chuck Part No. 6739 installed on hose of inflator gage assembly.

d. Inflate main gear tires to the following pressures:

Airplane Gross Weight Pounds		Psi
Below 30,000	190	(+10, -0)
30,000 to 35,999	250	(+10, -0)
36,000 to 42,000	300	(+10, -0)

NOTE

When operating conditions dictate, main landing gear tires may be inflated to 300 (plus 10, minus 0) PSI for all aircraft gross weights to obtain optimum tire performance and reliability.

e. Inflate nose gear tires to 100 (+10, -0) psi.

f. Disconnect air gage and servicing hose from tire filler valve.

g. Install tire filler valve cap.

3-16. ARRESTING GEAR ACTUATOR SERVICING. (See figure 3-6.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten arresting gear bleed valve.
	E10385	Hydraulic servicing cart	Service actuating cylinder with hydraulic fluid.

3-17. The arresting gear actuator is a combination hydraulic cylinder and accumulator which is filled with hydraulic fluid and precharged with nitrogen.

3-18. Service arresting gear actuator as follows:

CAUTION

To prevent possible damage to arresting gear actuator, the actuator shall be serviced with arresting gear in the retracted position. If the system requires frequent servicing or excessive bleeding, troubleshoot accumulator and actuator for internal leakage (T.O. 1A-7D-2-7).

NOTE

To obtain a correct hydraulic fluid level indication during servicing, the accumulator piston must be preloaded with approximately 300 psi nitrogen precharge pressure.

a. At accumulator filler valve package in right wheel well, depressurize arresting gear accumulator (station No. 1) until station gage indicates 300 psi.

b. Open access 5223-2.

c. Remove cap and connect hydraulic servicing cart hose to filler valve.

d. Cut lockwire on bleed valve. Connect one end of bleed line to bleed valve, and place other end of bleed line in waste container.

e. Open bleed valve 1 1/2 to 2 turns and pump hydraulic fluid into actuator until stream of clean (air-free) fluid flows from bleed line.

f. Ensure arresting gear actuator indicating rod is fully retracted, close bleed valve, and remove bleed line.

NOTE

The indicator plate has identifiable degree markings at 0°F and 120°F positions only and will require interpolation for intermediate temperature conditions. To ensure correct fluid level service, use care when interpolating temperature position on the fluid level indicator plate.

g. Continue pumping hydraulic fluid into actuator until indicator rod extends to the temperature mark corresponding to ambient temperature on indicator plate.

NOTE

If actuator is overfilled, open bleed valve to bleed off excess fluid.

h. Tighten bleed valve to 10 (±5) pound-inches torque and secure with MS20995C32 lockwire.

i. Disconnect hydraulic servicing cart hose from filler valve and install cap.

CAUTION

To ensure proper arresting gear operation, it is extremely important that the actuator is serviced to the correct hydraulic fluid level and pneumatic precharge pressure and contains air-free fluid. After pneumatic servicing, the fluid level indicator reading should be approximately the same as in step g. A significant change in the fluid level indicator position after pneumatic servicing is an indication of air in the fluid. Repeat steps c thru j until the actuator is properly serviced and hydraulic fluid is completely free of air.

j. Pneumatically service arresting gear accumulator (paragraph 3-48).

k. Connect external electrical power (paragraph 1-28).

l. Connect external hydraulic power to PC No. 2 system (paragraph 1-34).

m. Place arresting gear handle in DOWN and check that arresting gear hook fully extends and hook down caution light comes on.

n. Place arresting gear handle in UP and check that arresting gear hook fully retracts and hook down caution light goes off.

o. Disconnect external hydraulic power (paragraph 1-34).

p. Disconnect external electrical power (paragraph 1-28).

q. Close access 5223-2.

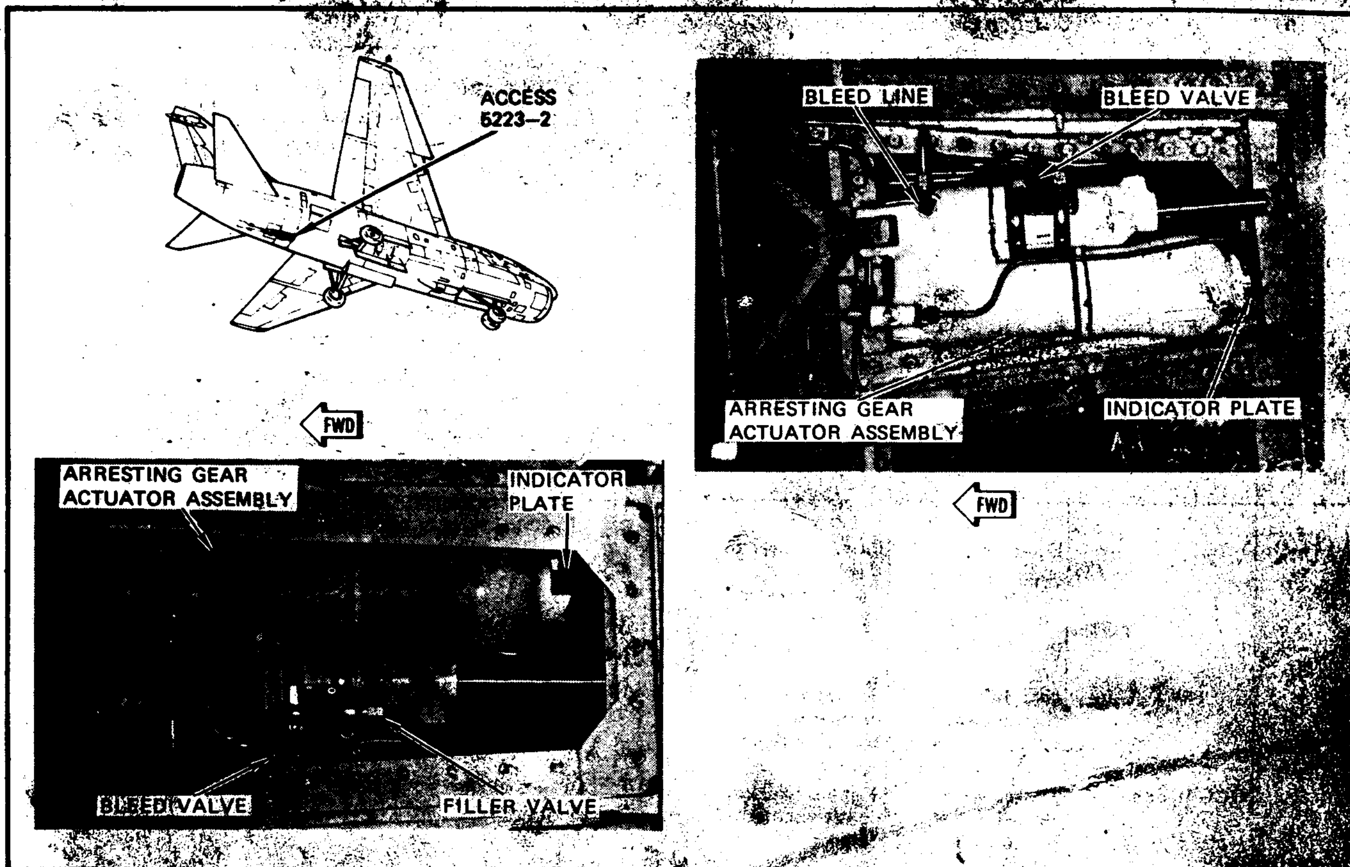


Figure 3-6. Arresting Gear Actuator Servicing

3-19. FORWARD AND AFT VISCOUS DAMPER SERVICING. (See figures 3-7 and 3-8.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Provide power to check out viscous damper.
	E10385	Hydraulic servicing cart	Service viscous damper with hydraulic fluid.
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten filler cap on aft viscous damper.

CAUTION

To prevent internal damage to viscous dampers, service with MIL-H-83282 hydraulic fluid at a pressure not exceeding 50 psi.

NOTE

Viscous dampers are properly serviced when green color band is visible through the viscous damper inspection window and stick response has no stickiness, snap-back, sponginess, or sloppiness.

3-20. Viscous damper indicators have color bands that are visible through inspection windows to indicate serviced condition. The bands are as follows:

a. Any red color band: damper is overserviced.

b. Green color band only or gray with green, black with green, or gold with green colors showing: damper is properly serviced and acceptable for flight.

c. All gray, all black, all gold, or these colors with part of damper spring showing: damper is underserviced.

d. Spring only (no piston): damper is empty.

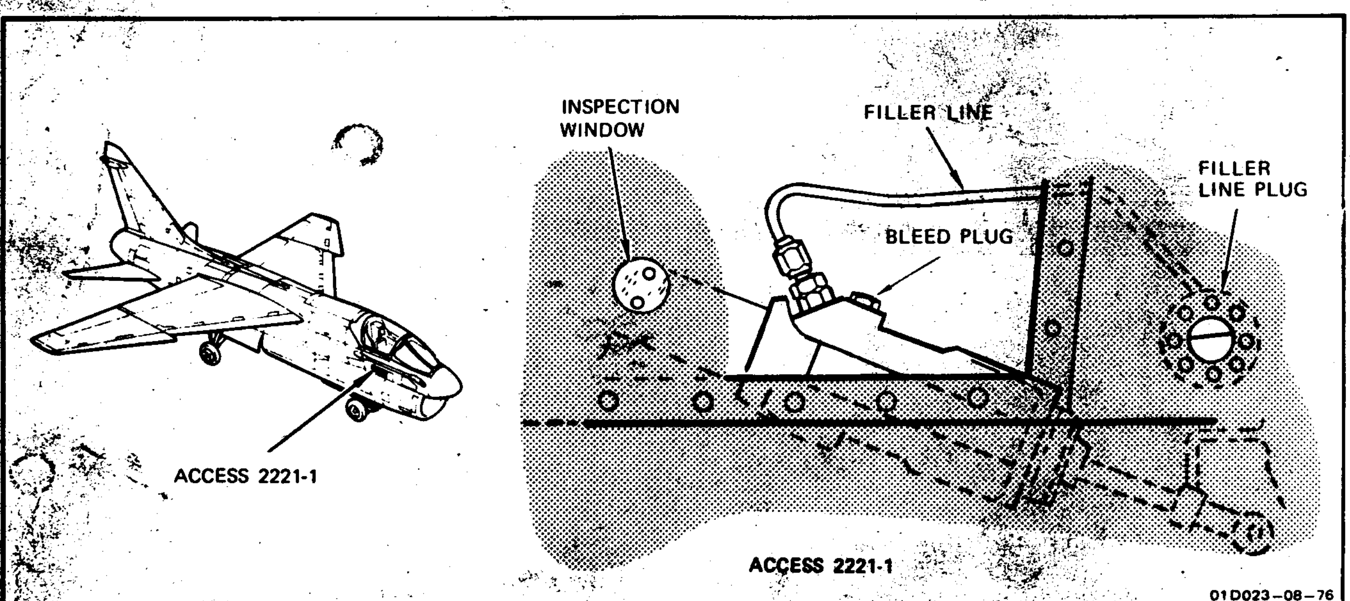


Figure 3-7. Forward Viscous Damper Servicing

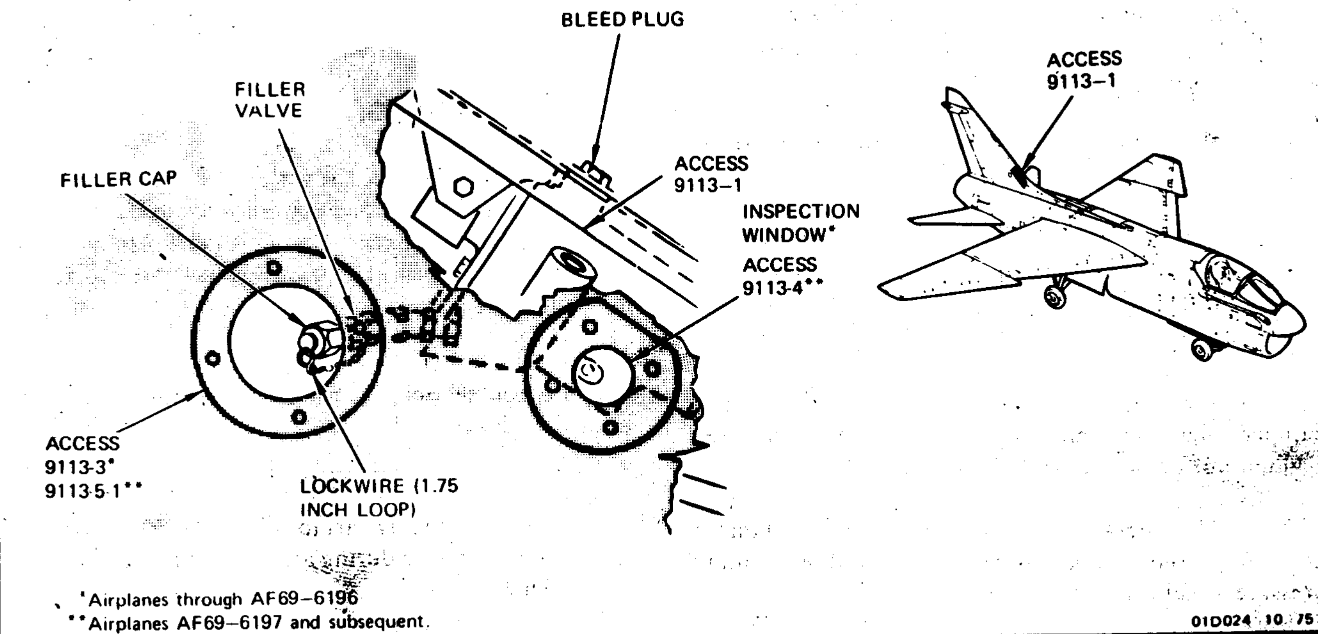


Figure 3-8. Aft Viscous Damper Servicing

3-21. FILLING UNDERSERVICED DAMPER.

a. For forward damper, remove filler line plug located above access 2221-1 and install adapter fitting for connecting servicing cart. For aft damper, open damper service access 9113-3 or 9113-5-1 and remove filler cap.

b. Loosen hydraulic servicing cart hose nut to bleed air from hose.

NOTE

Operate servicing cart to completely bleed filler hose during attachment to filler line.

c. Attach servicing cart filler hose to viscous damper filler line and tighten hose nut.

WARNING

If damper is overfilled (any of red color band showing), it shall be bled (paragraph 3-24) to prevent improper response of flight controls.

d. Slowly operate servicing cart handle and carefully fill damper with MIL-H-83282 hydraulic fluid until green appears in inspection window. The edge of the piston showing gray, black, or gold with the green band is acceptable.

e. When damper is properly serviced, disconnect servicing cart hose.

WARNING

Ensure that aft damper filler cap is properly tightened and retained with lockwire. If filler cap comes loose in flight, it could jam flight controls.

f. On forward damper, remove adapter fitting from filler line and install filler line plug. On aft damper, install filler line cap, tighten cap 50 (±10) pound-inches torque, and close access. If required, install MS20995C32 lockwire to retain cap. Leave approximately 1.75-inch loop in lockwire to allow removal/installation of cap.

g. Perform servicing operational checkout (paragraph 3-25).

3-22. FILLING EMPTY DAMPER.

CAUTION

If filling pressure exceeds 50 psi, internal damage to viscous damper may result.

a. For forward damper, remove filler line plug located above access 2221-1, and install adapter fitting for connecting servicing cart. Open access 2221-1. For aft damper, open access 9113-1 and damper service access and remove filler cap.

b. Loosen servicing cart filler hose nut to bleed air from filler hose.

NOTE

Operate servicing cart to completely bleed air from filler hose during attachment to damper filler line.

c. Attach servicing cart filler hose to viscous damper filler line while bleeding air from filler hose. Tighten nut on servicing cart filler hose.

d. Slowly operate servicing cart and fill damper until red color band appears in window. Filling pressure should not exceed 50 psi.

e. Bleed air from viscous damper (paragraph 3-23).

f. If red color band is still visible, viscous damper is overserviced and excess fluid shall be bled (paragraph 3-24).

g. Disconnect servicing cart hose from filler line.

WARNING

Ensure that aft damper filler cap is properly tightened and retained with lockwire. If filler cap comes loose in flight, it could jam flight controls.

h. On forward damper, remove adapter fitting from filler line and install filler line plug. On aft damper, install filler cap and tighten cap 50 (± 10) pound-inches torque. If required, install MS20995C32 lockwire to retain cap. Leave approximately 1.75-inch loop in lockwire to allow removal/installation of cap.

i. Perform servicing operational checkout (paragraph 3-25).

j. Close damper service access, and accesses 2221-1 and 9113-1, if opened.

3-23. AIR BLEEDING.

a. For forward damper, remove filler line plug located above access 2221-1 and install adapter fitting for connecting servicing cart. Open access 2221-1. For aft damper, open access 9113-1 and damper service access and remove filler cap.

b. Loosen servicing cart filler hose nut to bleed air from filler hose.

NOTE

Operate servicing cart to completely bleed air from filler hose during attachment to damper filler line.

c. Attach servicing cart filler hose to damper filler line while bleeding hose. Tighten servicing cart filler hose nut.

d. Connect external hydraulic power to all PC systems and pressurize each system to 3,000 psi (paragraph 1-34).

CAUTION

Avoid rapid movement of control stick during bleeding of damper. Excessive stick force may break forward damper rod end shear pin. If filling pressure exceeds 50 psi, internal damage to viscous damper may result.

e. Loosen viscous damper bleed plug and bleed air and fluid from damper as control stick is cycled fore and aft with quick, smooth strokes. Maintain positive pressure with viscous damper servicing unit during bleeding operations (maximum 50 psi) until fluid is free of air and sponginess or snap-back in control stick is eliminated.

f. Tighten bleed plug.

g. Observe color band showing through inspection window and service if required (paragraph 3-21).

h. Disconnect servicing line hose from filler line.

WARNING

Ensure that aft damper filler cap is properly tightened and retained with lockwire. If filler cap comes loose in flight, it could jam flight controls.

i. On forward damper, remove adapter fitting from filler line and install filler line plug. On aft damper, install filler cap and tighten cap 50 (±10) pound-inches torque. If required, install MS20995C32 lockwire to retain cap. Leave approximately 1.75-inch loop in lockwire to allow removal/installation of cap.

j. Perform servicing operational checkout (paragraph 3-25).

k. Shut down and disconnect external hydraulic power (paragraph 1-34).

l. Close damper service access and accesses 2221-1 and 9113-1, if opened.

3-24. FLUID BLEEDING.

a. For forward damper, open access 2221-1. For aft damper, open access 9113-1.

NOTE

Do not move control stick during viscous damper bleeding.

b. Carefully loosen bleed plug and allow fluid to escape until green color band shows. Edge of piston (gray, black, or gold anodize) showing with green is acceptable.

c. Tighten bleed plug.

d. Perform servicing operational checkout (paragraph 3-25).

e. Close access 2221-1 or 9113-1.

3-25. SERVICING OPERATIONAL CHECKOUT.

a. Connect external hydraulic power to all PC systems (paragraph 1-34).

b. Check control stick response by moving control stick forward about 3 inches, then releasing. Stick should return to neutral position slowly and steadily. Any snap-back indicates air must be bled from dampers. Excessive play or sloppiness in the area of neutral indicates underservicing and viscous dampers must be filled. Excessively slow return to neutral indicates that viscous dampers are possibly overserviced and excess fluid must be bled.

NOTE

If servicing operational checkout is unsatisfactory, refer to defective viscous damper cylinder isolation procedure (T.O. 1A-7D-2-8).

c. Shut down and disconnect external hydraulic power (paragraph 1-34).

3-26. LATERAL VISCOUS DAMPER SERVICING. (See figure 3-9.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	E10385	Hydraulic servicing cart	Service viscous damper with hydraulic fluid.
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten servicing cap on viscous damper.

CAUTION

To prevent internal damage to viscous dampers, service with MIL-H-83282 hydraulic fluid at a pressure not exceeding 35 psi.

NOTE

Viscous damper is properly serviced when green color band is visible through the viscous damper inspection window and control stick operates smoothly with no snap-back or sponginess.

3-27. Viscous damper indicators have color bands visible through the inspection windows to indicate service condition as follows:

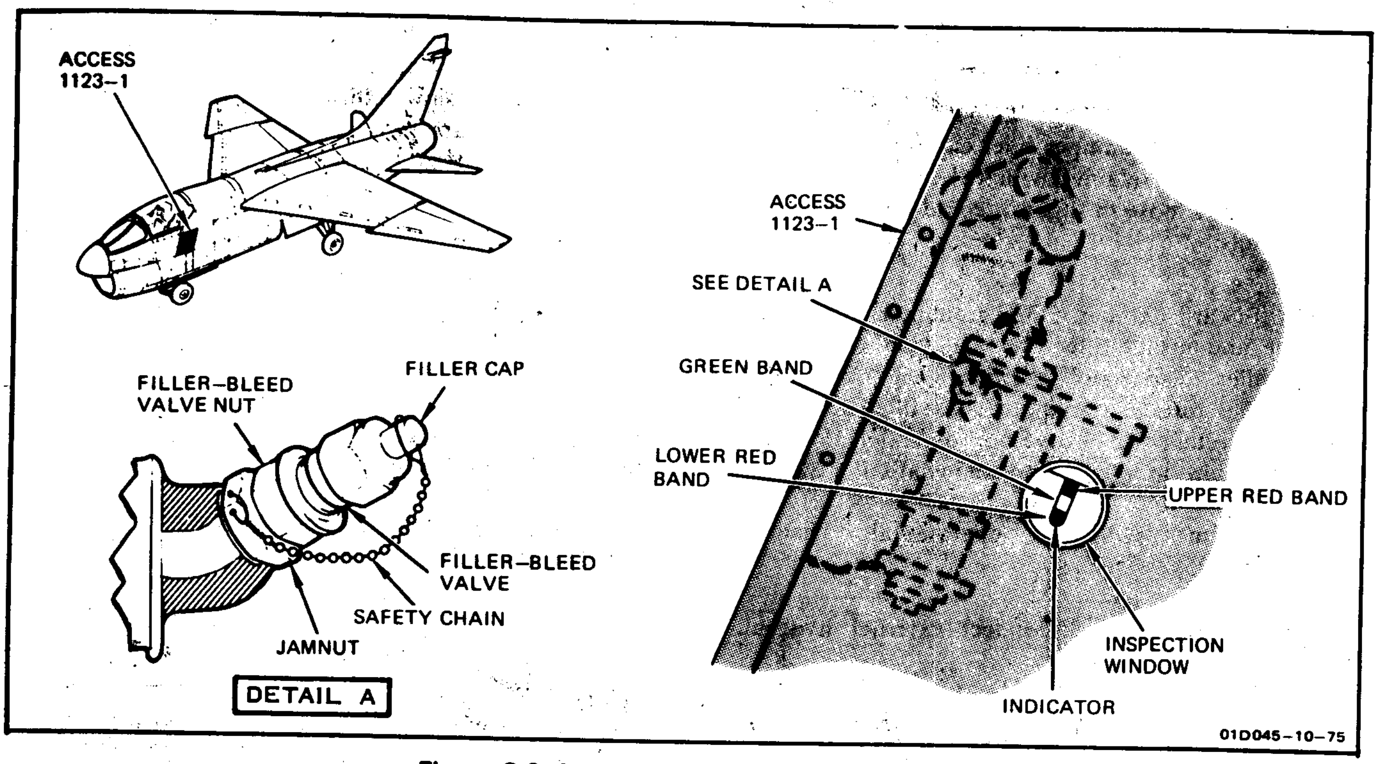


Figure 3-9. Lateral Viscous Damper Servicing

a. If lower red band only is visible, damper is underserviced.

b. If green band and lower red band are visible, damper is properly serviced.

c. If lower red, green, and upper red bands are visible, damper is overserviced.

3-28. FILLING UNDERSERVICED DAMPER.

a. Open access 1123-1. Remove filler cap.

b. Loosen hydraulic servicing cart hose nut to bleed air from filler line hose.

NOTE

Operate hydraulic servicing cart and continue bleeding filler hose during attachment to eliminate all air from filler line.

c. Attach hose to viscous damper filler valve and tighten hose nut.

d. Open filler-bleed valve nut by turning counterclockwise.

CAUTION

To avoid damage to viscous damper, do not exceed 35 psi filling pressure.

e. Slowly operate hydraulic servicing cart to apply 30 (±5) psi pressure and carefully fill damper with hydraulic fluid until upper red band is visible (damper overserviced). Close filler-bleed valve but do not tighten.

f. Disconnect filler line.

g. Loosen filler-bleed valve nut and carefully bleed until green band is visible, indicating damper is properly serviced. If air bubbles are evident while bleeding damper fluid, repeat steps b through g until clean (air-free) fluid is evident.

h. Tighten filler-bleed valve nut to 50 (±10) pound-inches torque.

WARNING

- Ensure that filler cap is properly tightened and retained with safety chain or lockwire. If cap comes loose in flight, it may jam the flight controls.

i. Install filler cap and tighten to 17 (+3, −2) pound-inches torque. If safety chain is missing or broken, install MS20995C32 lockwire to retain cap. Leave slack in lockwire to allow removal/installation of cap.

j. Close access 1123-1.

3-29. ENGINE OIL SERVICING. (See figure 3-10.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MIL-T-38266	Tank and pump unit jet oil servicing	Service engine oil tank with oil.

WARNING

Do not service engine oil tank above full mark on sight glass. Overservicing can cause catastrophic engine failure, possible injury to personnel or loss of airplane.

CAUTION

Do not mix MIL-L-23699 and MIL-L-7808 lubricating oils except in an emergency situation. After mixing, the oil mixture shall be changed at the earliest opportunity to one type of oil. At temperature of −40°F and below, use only MIL-L-7808 oil.

NOTE

Service and maintain oil level at full mark on sight glass of airplanes modified by T.O. 1A-7-596.

3-30. INITIAL OIL SERVICING.

NOTE

This procedure is to be used when engine is installed and must be accomplished without interruption.

a. Open access 5222-2.

b. Remove high speed gearbox magnetic chip detector and allow oil to drain.

c. Install chip detector.

CAUTION

To prevent damage to drain valve and loss of engine oil, do not use tools on drain valve handle. Use fingers only.

d. Drain oil from engine oil tank using the oil sampling drain valve until oil level is at the 2-quart low mark on sight glass. Install cap on oil sampling drain valve and tighten (approximately 75 inch-pounds).

e. Start engine (paragraph 2-51) and operate as follows:

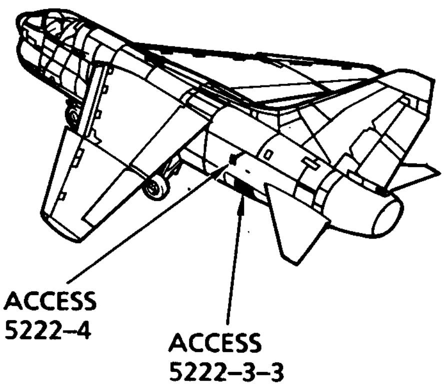
1. Idle for 3 minutes.
2. 75% rpm for 20 minutes.
3. Idle for 2 minutes.

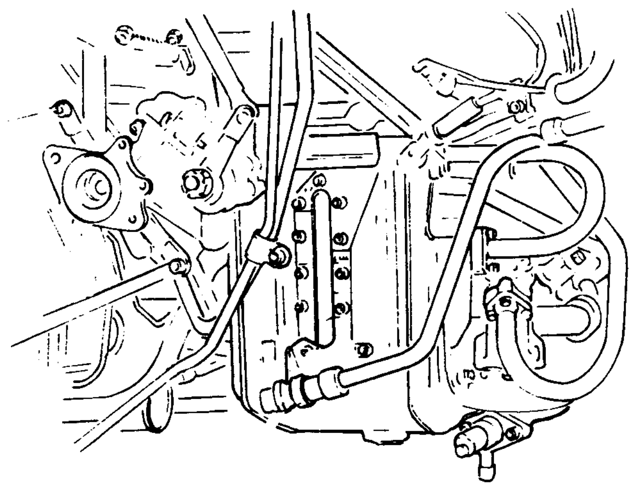
f. Shut down engine.

g. Check oil level in sight glass 10 minutes after shutdown.

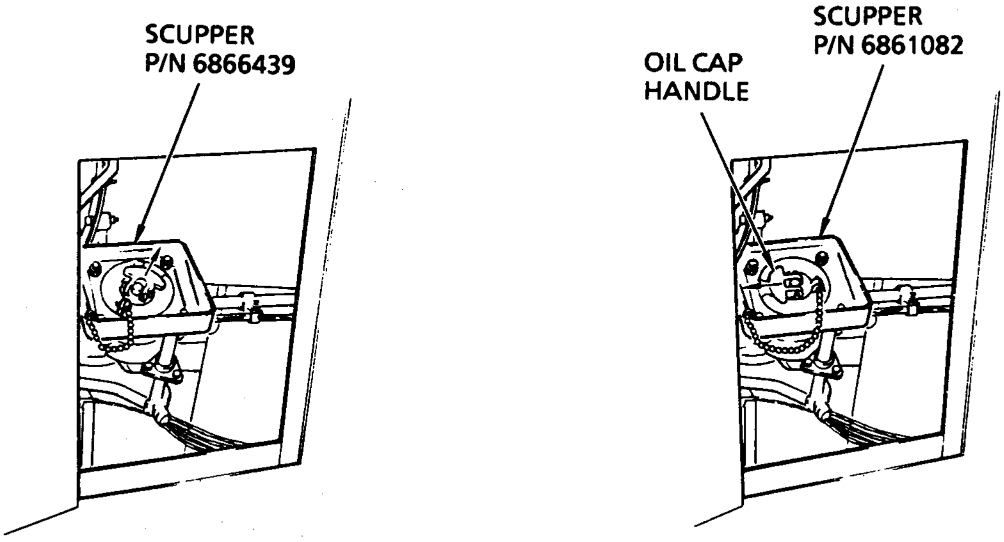
h. If oil level is above 2-quart low mark, repeat steps d through g.

i. If oil level is below 2-quart low mark, add agitated MIL-L-7808 or MIL-L-23699 oil, whichever airplane is to be serviced with. Bring oil level to 1-pint low mark on sight glass.





OIL TANK SIGHT GAGE



OIL TANK FILLER

01D101-07-77

Figure 3-10. Engine Oil Servicing

WARNING

Do not service engine oil tank above full mark on sight glass. Overservicing can cause catastrophic engine failure, possible injury to personnel or loss of airplane.

NOTE

Service and maintain oil level at full mark on sight glass of airplanes modified by T.O. 1A-7-596.

3-31. OIL SERVICING. On airplanes before T.O. 1A-7-596, the nucleonic oil quantity indicating system is a mass measuring function which measures the approximate amount of usable oil in the tank. On airplanes after T.O. 1A-7-596, the General Electric oil quantity indicating system is a volume measuring function which measures the amount of usable oil in the tank. When the engine is started, the oil distribution system forces approximately 1.2 quarts of oil from the tank to fill bearing lubricating lines, bearing cavities, etc. Since the scavenge system will have no oil to return to the tank, the cockpit indicator will drop no lower than 5/8 before slowly rising to a normal of 11/16 to 13/16 (nucleonic system) or 3/4 to 7/8 (G.E. system).

NOTE

Because of the temperature effect on oil level, the level in the tank when the oil is cold will be less than that observed immediately after engine shutdown. Do not add oil to compensate for this drop in oil level as overservicing may result.

The following procedures must be accomplished without interruption.

a. Open access 5222-3-3.

b. Check oil level on sight glass after each flight. Checking and servicing must be made no sooner than 5 minutes nor later than 15 minutes following engine shutdown.

WARNING

Do not service engine oil tank above full mark on sight glass. Overservicing can cause catastrophic engine failure, possible injury to personnel or loss of airplane.

NOTE

Service and maintain oil level at full mark on sight glass of airplanes modified by T.O. 1A-7-596.

Whenever a transmitter assembly is removed from an engine oil tank, or is installed in a replacement engine, perform an operational check of oil quantity low light in accordance with T O. 1A-7-596.

c. If oil level is above the 2-pint low mark on sight glass, no servicing is required. Close access 5222-3-3.

d. If oil level is at or below the 2-pint low mark on sight glass in accordance with check performed in step b, proceed as follows:

1. Open access 5222-4 and remove oil filler cap.

CAUTION

Oil filler area must be kept absolutely clean during oil servicing.

To prevent oil contamination from metal particles or dirt, make sure top of can is clean; then open can with clean, sharp center-punch type tool (T.O. 42B2-1-1, Section IV).

NOTE

The TF-41 engine may be operated in an emergency situation with a mixture of MIL-L-7808 and MIL-L-23699. But the oil mixture must be changed at the earliest opportunity to one type of oil.

2. Open can and service with oil, MIL-L-7808 or MIL-L-23699.

3. While observing sight glass, add required amount to raise oil level to between 1- and 2- pint low mark on sight glass. Do not service above the 1- pint low mark.

WARNING

To prevent engine failure in flight due to loss of oil, ensure oil filler cap is properly installed.

4. Install oil filler cap. Pull upward on cap retaining chain to ensure cap is tightly secured in place. Check that cap locking tab is properly oriented and that cap is seated flush with edge of scupper.

5. Close accesses 5222-4 and 5222-3-3.

6. Record oil quantity added on AFTO Form 781H.

NOTE

If more than one flight occurs between oil additions, oil consumption must be calculated using the total flight time since last oil addition.

7. Calculate oil consumption based on oil quantity recorded in substep 6 and total flight time since last oil addition, and record on AFTO Form 781H.

8. If oil consumption exceeds 1-pint per flight hour but does not exceed 3-pints per flight hour, troubleshoot engine (T.O. 1A-7D-2-5) excluding check run for oil consumption. If cause of problem is corrected, return engine to normal maintenance; otherwise, place engine on special monitoring for oil consumption (paragraph 3-34).

9. If oil consumption exceeds 3-pints per flight hour, troubleshoot engine (T.O. 1A-7D-2-5). If cause of problem is not found, reject engine.

3-32. OIL CONTAMINATION AND SPECTROMETRIC OIL ANALYSIS PROGRAM (SOAP) SAMPLING.

3-33. Perform the following to obtain oil sample:

NOTE

All samples shall be taken before servicing the lubricating system with additional oil.

a. Open access 5222-2-1.

b. Remove oil sampling drain valve cap.

CAUTION

To prevent damage to drain valve and subsequent loss of engine oil, do not use tools on drain valve handle.

c. Remove cap from oil sampling bottle and place bottle below drain valve outlet. Open valve and drain oil until bottle is at least half full. Release valve to closed position.

d. Place cap on sampling bottle and tighten securely.

e. Install cap on oil sampling drain valve and tighten to 75 (±5) pound inches torque.

f. Close access 5222-2-1.

3-34. SPECIAL MONITORING FOR OIL CONSUMPTION.

NOTE

Accurate recording of total engine running time (i.e., time from engine start to engine shutdown and all associated ground time between oil additions) must be accomplished.

a. Service engine and record oil quantity added (paragraph 3-31).

NOTE

If more than one flight occurs between oil additions, oil consumption must be calculated using the total engine running time since last oil addition.

b. Calculate oil consumption based on oil quantity recorded (step a), total engine running time since last oil addition, and record on AFTO Form 781H and AFTO Form 119A.

c. If oil consumption exceeds 1-pint per hour, troubleshoot engine (T.O. 1A-7D-2-5) excluding oil consumption check run. If corrective action for high oil consumption is not found, reject engine.

d. If oil consumption does not exceed 1-pint per hour, continue monitoring engine.

3-35. STARTER OIL SERVICING. (See figure 3-11.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten oil dipstick, filler plug, and drain plug.
		Fluid servicing syringe (locally procured) 1/2-pint capacity, bulb type	Service starter with oil.

3-36. OIL CHECK.

a. Open access 6222-2-1.

b. Check and service starter power turbine as follows:

1. Cut lockwire and remove oil dipstick.

2. Wipe dipstick clean, install, and remove again.

3. If oil is indicated on dipstick, oil level is satisfactory.

4. If no oil is indicated on dipstick, add MIL-L-7808 or MIL-L-23699 oil through dipstick opening until oil overflows.

5. Using new dipstick gasket, install dipstick and tighten to 95 (±5) pound-inches torque. Secure dipstick with MS20995C20 lockwire.

c. Check and service starter accessory gearcase as follows:

1. Cut lockwire and remove oil filler plug.

2. If oil level is at bottom of filler port threads, oil level is satisfactory.

3. If oil is required, add MIL-L-7808 or MIL-L-23699 oil through filler plug opening until oil overflows.

4. Using new oil filler plug gasket, install filler plug and tighten to 95 (±5) pound-inches torque. Secure filler plug with MS20995C20 lockwire.

d. Close access 6222-2-1.

3-37. OIL DRAIN AND FILL.

a. Open access 6222-2.

b. Place suitable container under starter power turbine oil drain plug.

c. Cut lockwire, remove drain plug, and drain oil.

d. Using new drain plug gasket, install drain plug, tighten to 95 (±5) pound-inches torque, secure plug with MS20995C20 lockwire, and remove container.

e. Place suitable container under starter accessory gearcase oil drain plug.

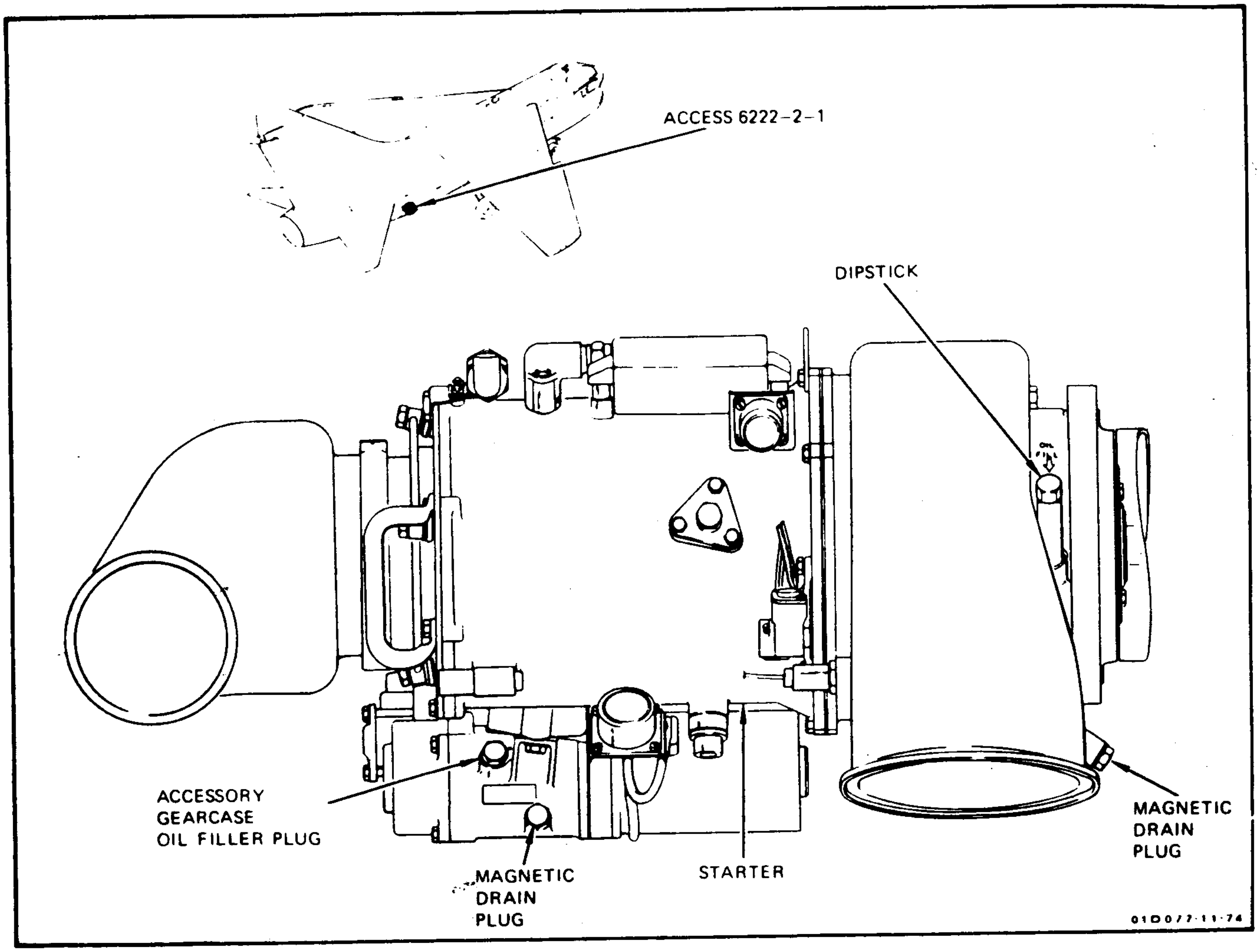


Figure 3-11. Starter Oil Servicing

f. Cut lockwire, remove drain plug, and drain oil.

g. Using new drain plug gasket, install drain plug and tighten to 95 (±5) pound-inches torque. Secure drain plug with MS20995C20 lockwire.

h. Cut lockwire and remove turbine oil dipstick and accessory gearcase oil filler plug.

CAUTION

At temperature of -40°F and below, use MIL-L-7808 oil.

i. Fill to top of filler neck of turbine sump and accessory gearcase sump with MIL-L-7808 or MIL-L-23699 oil.

j. Using new dipstick gasket, install dipstick and tighten to 95 (±5) pound-inches torque. Secure dipstick with MS20995C20 lockwire.

k. Using new oil filler plug gasket, install accessory gearcase filler plug and tighten to 95 (±5) pound-inches torque. Secure filler plug with MS20995C20 lockwire.

l. Close access 6222-2.

3-38. AIR-CONDITIONING TURBINE SERVICING. (See figure 3-12.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Fluid servicing syringe (locally procured) 1/2-pint capacity, bulb type	Service air-conditioning turbine with oil.
	413-900-020 (American Tool and Engineering Co.)	Torque wrench, 100 to 750 pound-inches	Tighten filler and drain plugs on air-conditioning turbine.

CAUTION

When installing a new or overhauled cooling turbine, remove oil fill plug. This is accomplished by removing drain plug and inserting the erasure end of a pencil into the drain plug hole. Touch the cotton pack; if the erasure shows evidence of oil, turbine can be considered serviced and ready for installation. Do not add oil if turbine shows evidence of previous service.

NOTE

To facilitate removal of fasteners securing access 2212-6, disconnect actuating link from right nose landing gear door (T.O. 1A-7D-2-7).

a. Open access 2212-6.

b. Clean area around drain and filler plugs.

c. Place drip pan under drain plug.

d. Cut lockwire and remove drain plug. Allow free oil to drain from sump.

e. Install drain plug.

f. Cut lockwire and remove filler plug.

NOTE

MIL-L-23699 oil has been approved for turbine servicing in lieu of MIL-L-6085 oil. Since these oils are compatible, turbine flushing is not required.

g. Using fluid servicing syringe, fill with 100 cc of MIL-L-23699 oil and install filler plug.

h. Allow cotton packing in oil sump to saturate for a minimum of 15 minutes.

i. Remove drain plug and allow excess oil to drain.

j. Remove side filler plug and install new O-rings on filler and drain plugs.

k. Install plugs and tighten to 150 (±20) pound-inches torque. Secure with MS20995C32 lockwire.

l. Close access 2212-6.

m. Connect actuating link to right nose landing gear door, if disconnected (T.O. 1A-7D-2-7).

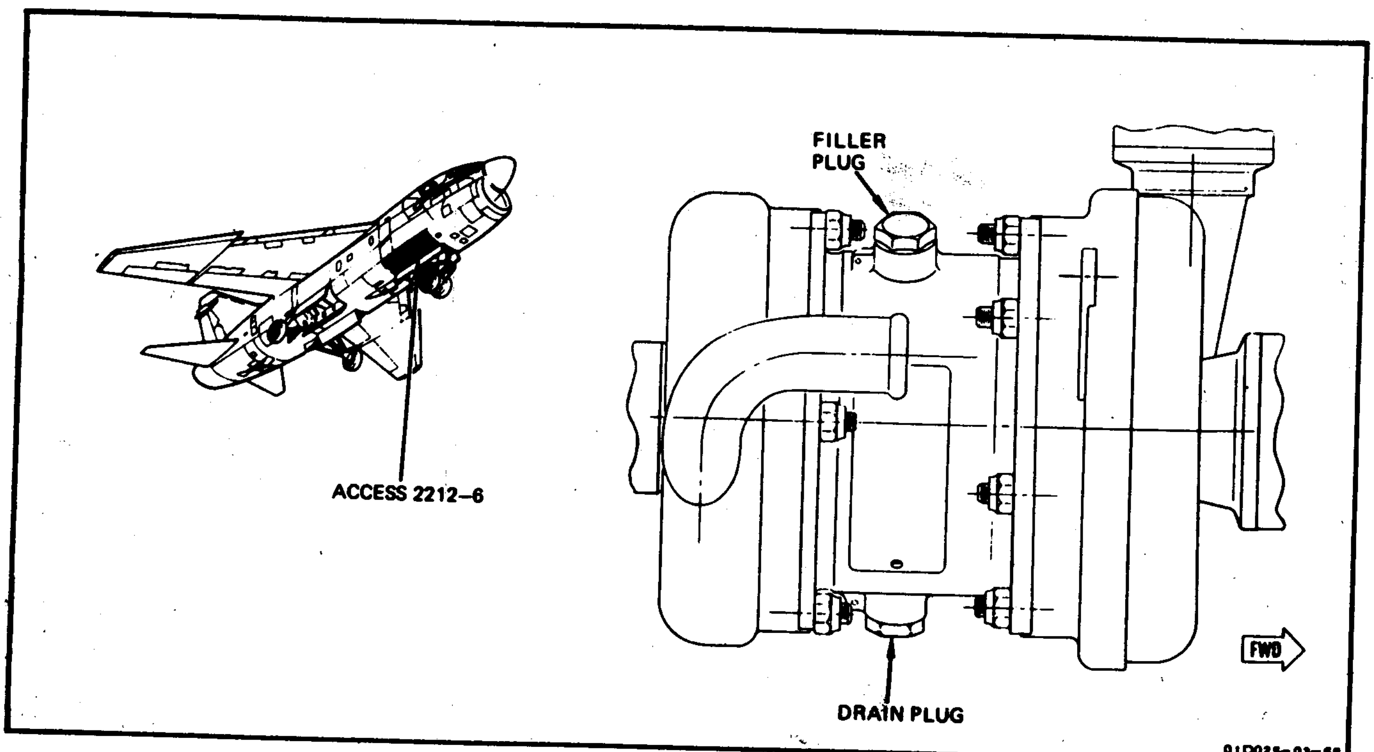


Figure 3-12. Air-Conditioning Turbine Servicing

3-39. CONSTANT SPEED DRIVE SERVICING.
(See figure 3-13.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	413-900-020 (American Tool and Engineering Co.)	Torque wrench 100 to 750 pound-inches	Tighten constant speed drive filler plug.

CAUTION

To prevent inaccurate checks, do not check constant speed drive (CSD) oil level until 5 minutes after engine shutdown. Overservicing may occur.

NOTE

CSD sight gage may be coded either red/yellow/green or silver/black. Servicing instructions are provided for both configurations.

a. Open access 6221-2 to check oil level.

CAUTION

To prevent damage to CSD, do not operate engine with oil level in upper yellow band (or upper black band).

b. Check that CSD oil level is within the green band (or silver band) on the sight gage. If CSD or CSD oil cooler has been drained, service CSD to the top of the green band (or silver band) on sight gage to allow for filling oil cooler and lines. If oil servicing is required, add MIL-L-7808 or MIL-L-23699 oil as follows:

1. Open access 6222-1.

CAUTION

To prevent CSD oil contamination, clean area around filler plug before removing.

2. Cut lockwire and remove filler plug.

CAUTION

At temperature of $-40°F$ and below use MIL-L-7808 oil.

3. Add MIL-L-7808 or MIL-L-23699 oil until oil level is in green band (or silver band) on sight gage.

4. Install new O-ring (P/N M83248/1-015) on filler plug and install filler plug in CSD housing.

5. Tighten filler plug to 150 (+25, −10) pound-inches torque and secure with MS20995C32 lockwire.

6. Close access 6222-1.

c. Close access 6221-2.

3-40. HYDRAULIC SYSTEM AIR CHECK.
(See figure 3-14.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use of Application
	Equipment required for engine operation		Supply hydraulic power for air check

NOTE

This check is required during preflight inspection/launch of the first flight of the day and following all maintenance where hydraulic systems have been opened or when flight controls have been operated without all PC systems pressurized. This check is performed to determine whether aircraft hydraulic systems are sufficiently free of air.

Ensure all accumulators are dumped before checking reservoirs.

Hydraulic fluid must be at ambient temperature.

a. With zero hydraulic system pressure, check that airplane reservoir is properly serviced by observing the NO PRESS side of indicator corresponding to ambient (fluid) temperature for proper indication (figure 3-14).

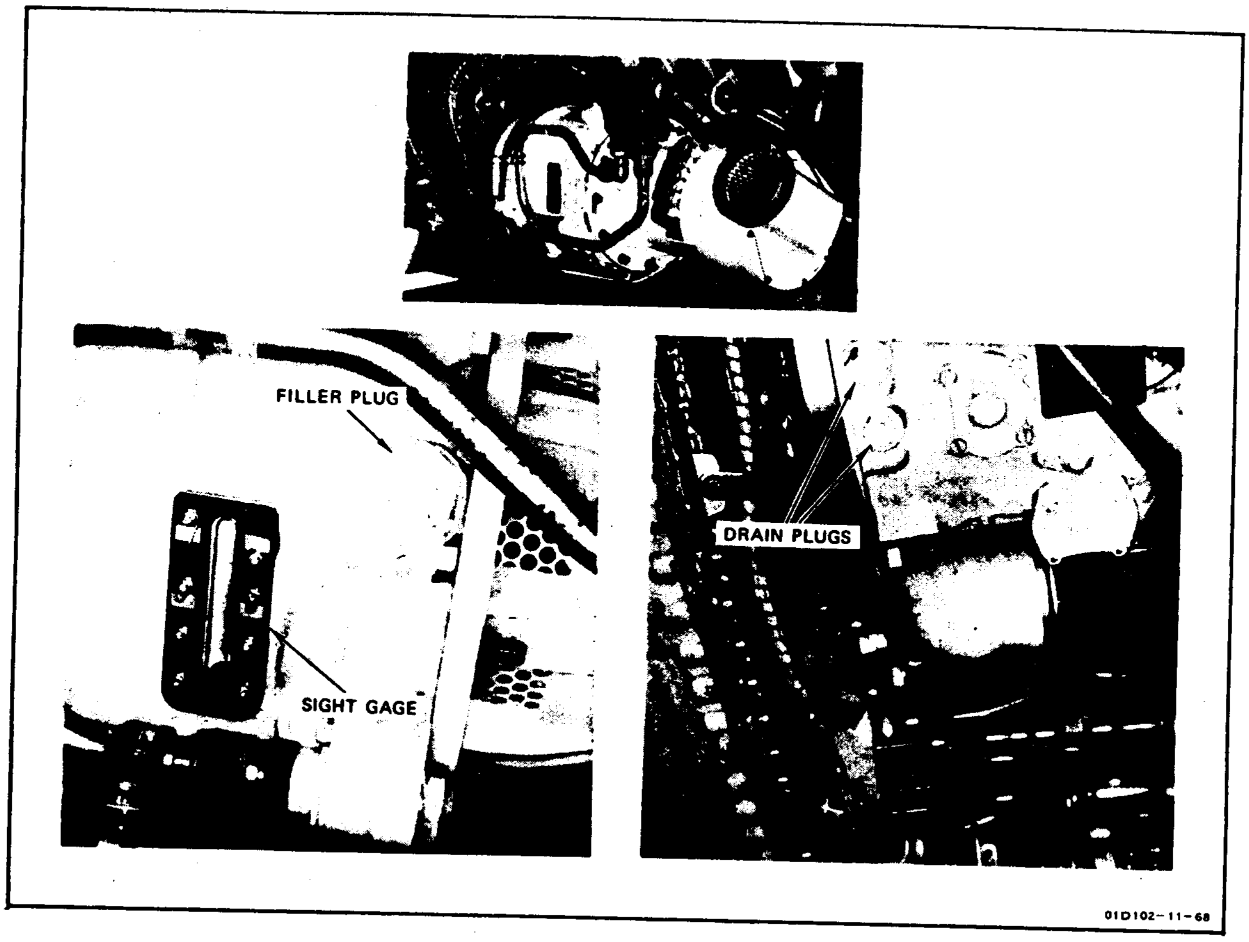


Figure 3-13. Constant Speed Drive Servicing

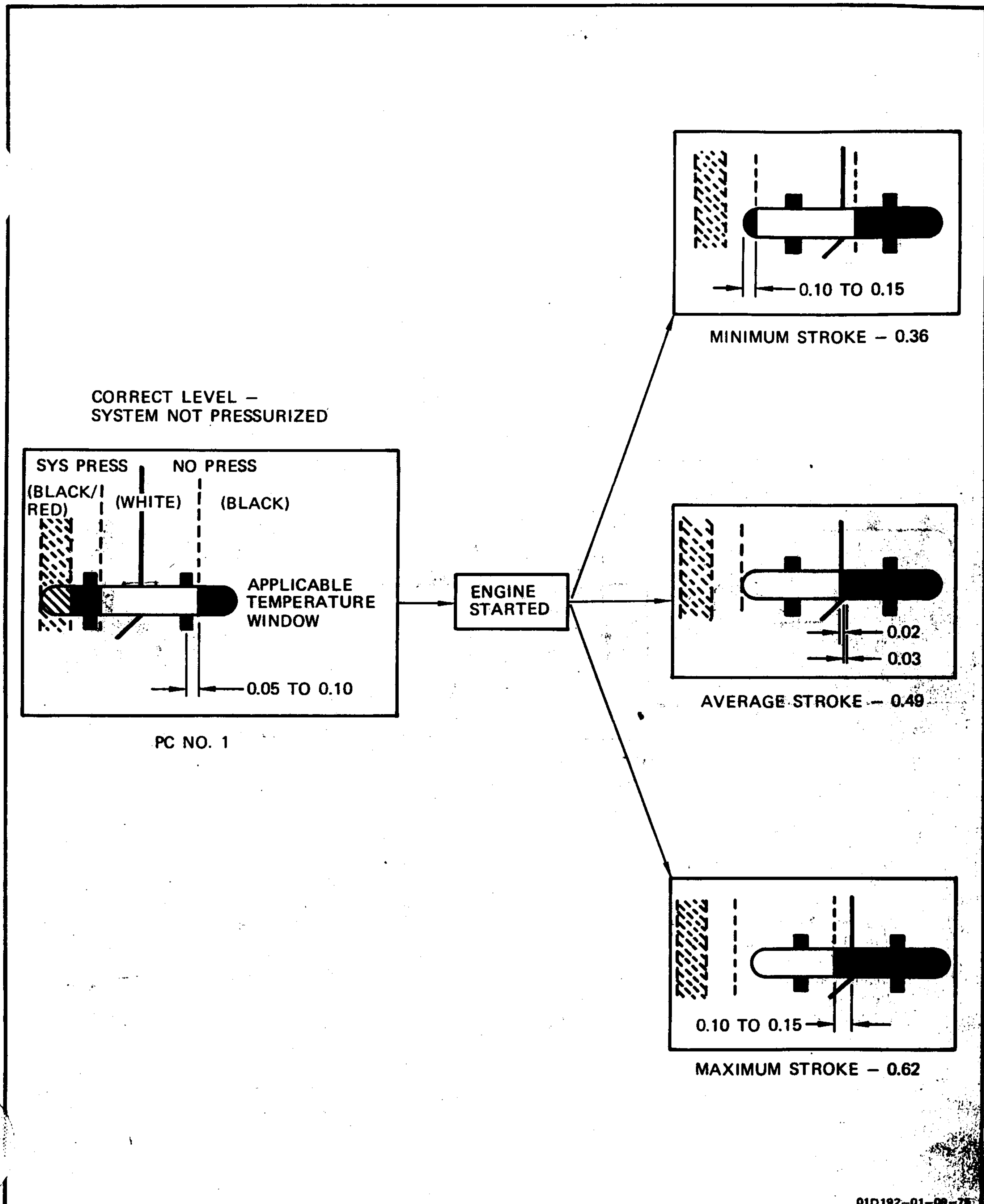


Figure 3-14. Hydraulic System Air Check (Sheet 1)

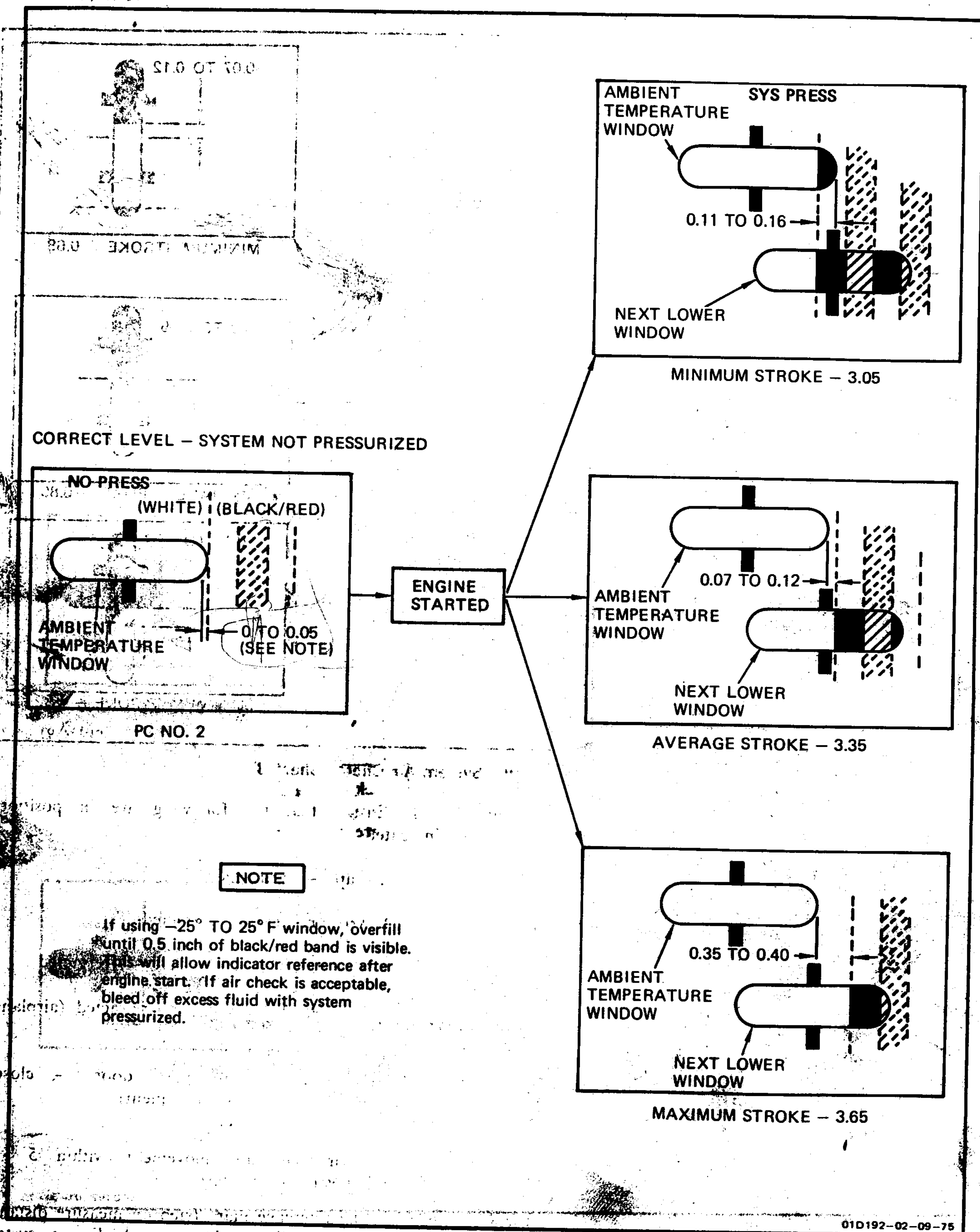


Figure 3-14. Hydraulic System Air Check (Sheet 2)

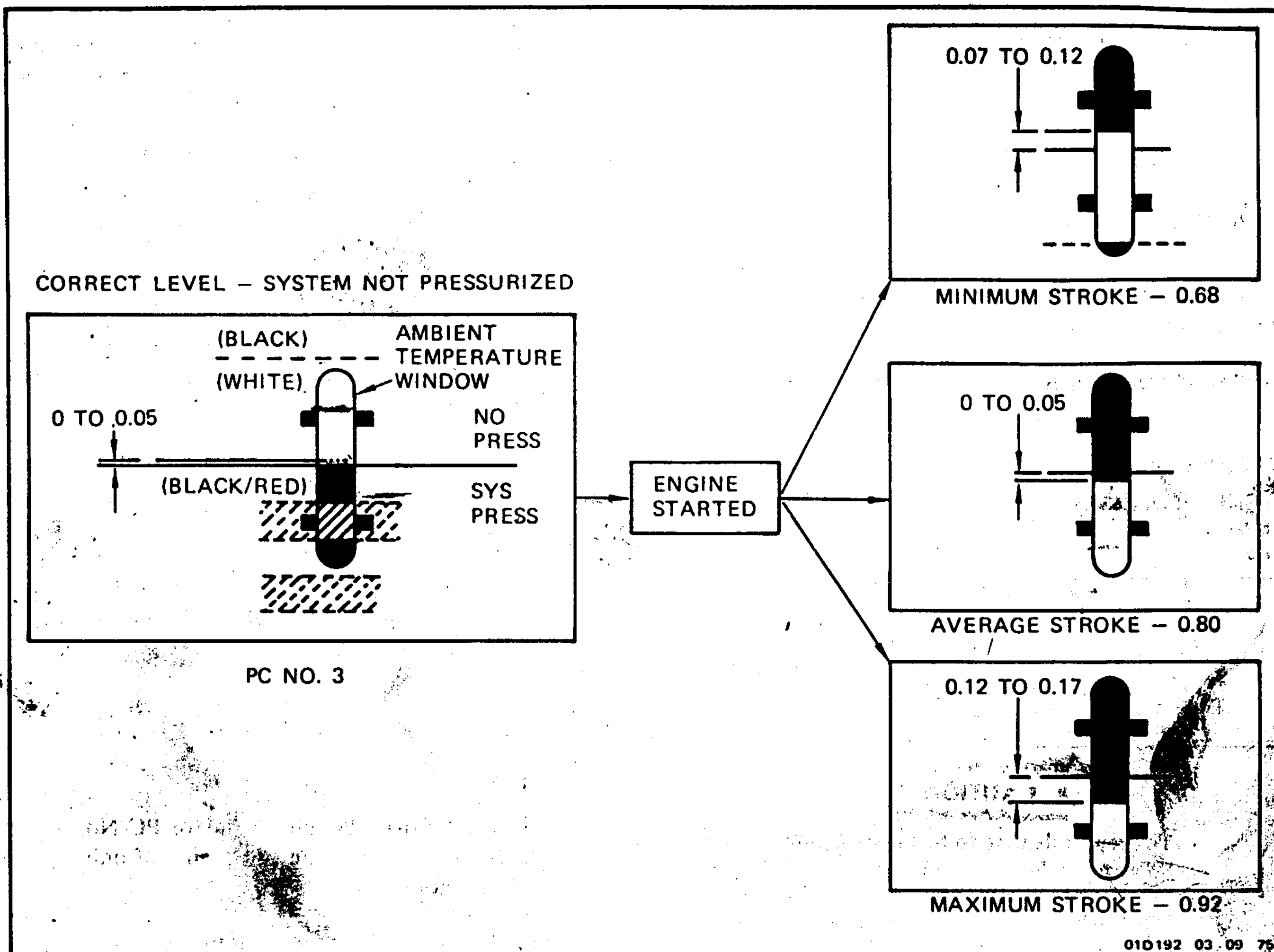


Figure 3-14. Hydraulic System Air Check (Sheet 3)

b. If reservoir level is low, service reservoir (paragraph 3-42) before continuing air check. If reservoir is overserviced, drain reservoir (paragraph 3-44) to proper level.

c. Place reference mark on indicator housing so that indicator movement can be measured after engine start.

NOTE

Do not move flight controls after reservoirs are properly serviced. Moving controls will displace fluid and cause erroneous indication.

d. Start engine (paragraph 2-51).

e. For PC No. 2 system, hydraulically charge emergency accumulators by placing emergency accumulator shutoff valve in OPEN for approximately 1 minute. Place valve in CLOSE.

f. Ensure that the following are in positions indicated:

1. Flaps — retracted

2. Arresting gear — retracted

3. Emergency power package — retracted

4. Air refueling probe — retracted (airplanes through AF69-6196)

5. Air refueling receptacle door — closed (airplanes AF69-6197 and subsequent)

NOTE

Measure indicator movement within 5 minutes of engine start.

g. Using reference mark (step c), measure distance the reservoir indicator has moved. For a system sufficiently free of air, movement shall not exceed

1. PC No. 1 — 0.62 inch

2. PC No. 2 — 3.65 inches

3. PC No. 3 — 0.92 inch

h. Shut down engine (paragraph 2-51).

i. If indicator movement is excessive, bleeding must be accomplished (paragraph 3-41).

3-41. HYDRAULIC SYSTEM BLEEDING.

Tools Required

Figure & Index No.	[illegible] Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Provide hydraulic power for hydraulic system bleeding.

CAUTION

To prevent damage to fuel boost pump and boost pump hydraulic motor, ensure that fuel boost pump shutoff valve is closed before applying external hydraulic power to PC No. 3 system.

a. Connect external hydraulic power to all hydraulic PC systems (paragraph 1-34). Do not apply hydraulic system pressure to systems at this time. Check that flow rate is 20 gpm and, if test stand has capability, adjust return backpressure to zero.

NOTE

Test stand connected to PC system not having air may be set for closed system operation. This will prevent reservoirs from dumping and eliminate need for reservoir servicing of those systems.

b. Ensure that test stand reservoir selector valve for each PC system is set for open system operation except as noted above.

CAUTION

A test stand reservoir less than 1/2 full may ingest air into airplane system at high flow rates.

[illegible] ensure test stand reservoir is capable [illegible] airplane reservoir volume (table [illegible]) [illegible]

d. Ensure flap [illegible] handle, wingfold handle, and arresting [illegible] position of surface or component [illegible]

NOTE

With test stand set for open system operation, airplane reservoir will empty when hydraulic pressure is applied.

e. Slowly apply minimum pressure to each system. Monitor test stand reservoir fluid level as pressure is applied. Drain test stand reservoir as required to prevent overfilling.

f. Allow fluid to flow through system for 5 to 7 minutes. Do not cycle any components.

NOTE

Periodically during bleeding, open and close test stand bypass valve to flush out air trapped in test stand return [illegible]

g. Using test stand pump pressure compensator, increase pressure to 1,500 psi.

NOTE

Bleeding air from PC No. [illegible] and PC No. 3 hydraulic systems [illegible] cycling of only the flight controls.

h. Cycle leading [illegible] flaps up and down. With flaps down, [illegible] edge flaps up and down [illegible] 10 [illegible] operation or asymmetrical positioning [illegible] the circuit and flap system [illegible] performed (T.O. 1A-7D-2-8).

i. Place [illegible] STAB and place [illegible] CONTROL AUG [illegible]

NOTE

Do not allow cockpit [illegible] below 500 psig [illegible]

j. Slowly cycle [illegible] UHT indicator [illegible] free [illegible] do not allow cockpit pressure indicator to drop below 500 psig.

k. Place [illegible]

l. Cycle [illegible] times and until [illegible] free of bubbles [illegible]

m. Increase pressure to 3,000 psig. Cycle wingfold system a minimum of five times and until return line sight glass is free of bubbles.

n. Hydraulically charge all emergency accumulators by placing emergency accumulator shutoff valve in OPEN for approximately 1 minute. Place valve in CLOSE. Dump [illegible] by placing accumulator test switch [illegible] for approximately 1 minute.

o. Charge and dump emergency accumulators a minimum of five times and until return line sight glass is free of bubbles. Leave emergency accumulators charged and emergency accumulator shutoff valve closed.

p. Place accumulator test switch in PRESS and check that accumulator pressures are as follows:

1. Station 1 — Precharge pressure

2. Stations 2, 3, 8, and 10 — System pressure of 3,000 psig

3. Station 6 — Greater than 2,000 psig

4. Stations 4, 5, 7, and 9 — Greater than 2,300 psig

q. Bleed utility brake system as follows:

1. R[illegible] hydraulic test stand pressure from the aircraft.

2. [illegible] switch in BRAKE ACCUM.

[illegible]

3. Actuate [illegible] utility brake accumulator is depleted.

4. Apply 3000 psig hydraulic pressure to the aircraft to recharge utility brake accumulator.

5. Remove hydraulic test stand pressure from the aircraft.

6. Repeat substep 3, observing return line sight glass for air bubbles.

7. If air bubbles [illegible] during final application [illegible] to substep 4.

r. Bleed emergency flap system as follows:

1. Check that emergency accumulator shutoff valve is closed.

2. Place flap handle in ISO UTILITY.

3. Place emergency flap switch in EMERG DN. Flaps shall extend.

NOTE

To properly reset flap system shuttle valves, flap handle must match flap position before reapplying hydraulic pressure.

4. Place flap handle in DN.

5. Place emergency flap switch in NORM.

6. Place flap handle in UP.

7. Recharge emergency flap accumulator [illegible] emergency accumulator shutoff valve [illegible] approximately 1 minute; then place valve [illegible]

8. Place flap handle in ISO UTIL[illegible]

9. Place emergency flap switch in [illegible] Flaps shall extend.

NOTE

To properly reset flap system [illegible] flap handle must match flap position [illegible] reapplying hydraulic pressure.

10. Place flap handle in DN.

11. Place emergency flap switch [illegible]

12. Place flap handle in UP [illegible] line sight glass for air bubbles.

13. If air bubbles appeared [illegible] glass during flap retraction, (su[illegible] substep 8.

14. Place emergency accum[illegible] in OPEN for approximately 1 minu[illegible]

s. Bleed emergency brake system [illegible]

1. Actuate emergency [illegible] brake accumulator is depleted.

2. Place flap handle in UP.

3. Recharge emergency brake accumulator. (Place emergency accumulator shutoff valve in OPEN approximately 1 minute; then place valve in CLOSE.)

4. Actuate emergency brake until emergency brake accumulator is depleted.

5. If air bubbles appeared in return line sight glass during final application of brakes (substep 4), return to substep 2. If no bubbles appeared, recharge emergency brake accumulator.

t. Bleed emergency power package (EPP) system as follows:

1. Place flap handle in ISO UTILITY.

WARNING

Ensure area around EPP is clear to prevent equipment damage and possible injury to personnel.

2. Extend EPP by pulling emergency power handle. After extension, check that actuator is locked by pulling up on EPP door.

3. Place flap handle in UP.

4. Depress handle release lock and stow emergency power handle. EPP shall retract.

5. Place flap handle in ISO UTILITY.

6. Extend EPP by pulling emergency power handle, observing return line sight glass for bubbles.

7. If bubbles appeared in return line sight glass during EPP extension (substep 6), return to substep 3. If no bubbles appeared, recharge EPP accumulator, and retract emergency power package.

u. Place flap control handle in UP detent. Flaps will retract.

v. Slowly vary pressure on each system from 3,000 psig to 1,000 psig and back to 3,000 psig to purge air from surge dampers. Repeat pressure cycle a minimum of five times and until return line sight glass is free of bubbles.

NOTE

To prevent fluid draining from airplane, set test stand for closed system operation immediately after shutdown.

w. Slowly reduce flow and pressure to zero on all systems by opening test stand bypass valve. Shut down test stand in accordance with applicable test stand manual, and position reservoir selector valve for closed system operation.

x. Using test stand fill system, service reservoirs in sequence (PC-1, PC-2, and PC-3) in accordance with paragraph 3-42, except fill to slightly overfilled condition.

y. Place a reference mark on indicator housing so that indicator movement can be measured after engine start.

z. Disconnect external electrical and hydraulic power (paragraphs 1-28 and 1-34).

aa. Start engine (paragraph 2-51).

ab. Ensure emergency accumulator shutoff valve is OPEN.

NOTE

Measure indicator movement within 5 minutes of engine start.

ac. Measure distance reservoir indicator has moved. For a properly bled system, indicator movement shall not exceed:

1. PC No. 1 — 0.62 inch

2. PC No. 2 — [illegible]

3. PC No. 3 — [illegible]2 inch

ad. If indicator movement is acceptable, bleed reservoir until white band is in proper SYS PRESS window. Excessive indicator movement indicates air still in system.

ae. If PC No. 1 and/or PC No. 3 system reservoir indicator movement indicates air, repeat above bleeding procedure as applicable. If PC No. 2 indicates air, proceed to [illegible].

af. Shut down engine (paragraph 2-51).

NOTE

The following steps are required only for those airplanes which have been bled using above procedures and in which air is still indicated in PC No. 2 system.

ag. Jack airplane (paragraph 2-30).

ah. Connect external electrical and hydraulic power (paragraphs 1-28 and 1-34). Ensure test stand reservoir selector valve is set for open system operation.

ai. Purge air from gun drive hydraulic system as follows:

1. Perform gun safing procedures and disconnect flexible shaft and gun drive quick-disconnect coupling from gun drive unit (T.O. 1A-7D-2-13).

2. Adjust test stand pump pressure compensator to supply 1,250 psig. Cycle gun drive hydraulic motor for 30 seconds by actuating manual control on motor. Repeat cycling until return line sight glass is free of bubbles.

3. Connect flexible shaft and gun drive quick-disconnect coupling to gun drive unit.

aj. Leave pressure at 1,250 psig and cycle speed brake actuator as specified in operational checkout (T.O. 1A-7D-2-8) until return line sight glass is free of bubbles.

ak. Increase pressure to 3,000 psig and cycle landing gear using normal hydraulic system until return line sight glass is free of bubbles. Leave landing gear retracted. Observe precautions in landing gear operational checkout (T.O. 1A-7D-2-7).

al. Bleed emergency landing gear system as follows:

1. Position container under hydraulic overboard drain.

2. Place flap handle in ISO UTILITY.

3. Place landing gear handle in WHLS DOWN, push handle in, and turn handle clockwise to extend landing gear.

4. Open access 1123-1.

5. Reset landing gear emergency selector valve (depress leaf spring and move valve arm to closed position).

6. Place flap handle in UP.

7. Recharge emergency landing gear accumulator. (Place shutoff valve in OPEN approximately 1 minute; then place valve in CLOSE.)

8. Place landing gear handle in WHLS UP.

9. Place flap handle in ISO UTILITY.

10. Place landing gear handle in WHLS DOWN, push handle in, turn handle clockwise and pull handle full (approximately 2 inches) to extend landing gear.

11. Reset landing gear emergency selector valve (substep 5).

12. Place flap handle in UP.

13. Place landing gear handle in UP, observing return line sight glass for bubbles as landing gear retracts.

14. If bubbles appeared in return line sight glass (substep 13), return to substep 8. If no bubbles appeared, extend landing gear, and recharge landing gear emergency accumulator.

am. Cycle nose gear steering five times observing precautions in nose gear steering operational checkout (T.O. 1A-7D-2-7).

an. Lower airplane (paragraph 2-30).

ao. Repeat bleeding procedure, steps e through [illegible].

ap. Accomplish steps aa through af.

aq. Disconnect external electrical and hydraulic power (paragraphs 1-28 and 1-34).

3-42. RESERVOIR SERVICING (NO SYSTEM PRESSURE). (See figures 3-15, 3-16, and 3-17.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	E10385	Hydraulic servicing cart	Service hydraulic system [illegible] reservoir

Tools Required (continued)

Figure & Index No.	Part Number	Nomenclature	Use and Application
	or		
	TTU-228/E-1A	Hydraulic test stand, engine driven	
	GGG-W-686	Torque wrench, 0 to 15 pound-inches	Tighten reservoir bleed valve.

NOTE

To determine reservoir capacity and fluid type required, refer to table 3-1 or 3-2.

a. Ensure accumulators for system being serviced are dumped and properly precharged (paragraph 3-48).

1. PC No. 1 system

(a) Station 2 — Reservoir accumulator (airplanes through AF69-6196).

(b) Station 3 — Surge damper.

2. PC No. 2 system

(a) Station 1 — Arresting gear

(b) Stations 4, 6, 7, and 9 — Emergency accumulators.

(c) Station 5 — Utility brake.

(d) Station 8 — Surge damper.

3. PC No. 3 system

(a) Station 2 — Reservoir accumulator.

(b) Station 10 — Surge damper.

b. For PC No. 3 system, open access 5222-4.

c. Check that all control surfaces are positioned to neutral (UHT may be full trailing edge down).

d. For PC No. 2 system, ensure that the following are in positions indicated:

1. Flaps retracted and flap handle in UP.

2. Landing gear extended.

3. Arresting gear retracted.

4. Speed brake retracted.

5. Emergency power package retracted.

6. Air refueling probe retracted (airplanes through AF69-6196).

7. Air refueling door closed (airplanes AF69-6197 and subsequent).

e. Check reservoir indication in NO PRESS window corresponding to fluid temperature (figure 3-15, 3-16, or 3-17).

f. If correct fluid level is indicated, proceed to step i.

g. If proper window shows excessive black and red (overfilled), drain fluid from reservoir (paragraph 3-44) until level is correct. Proceed to step i.

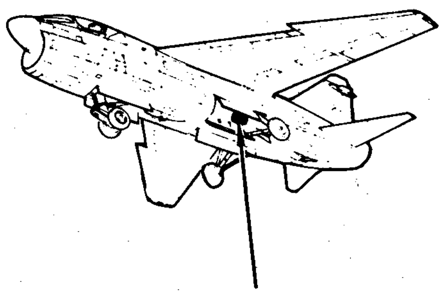
h. If proper window shows excessive black (depleted), add fluid as follows:

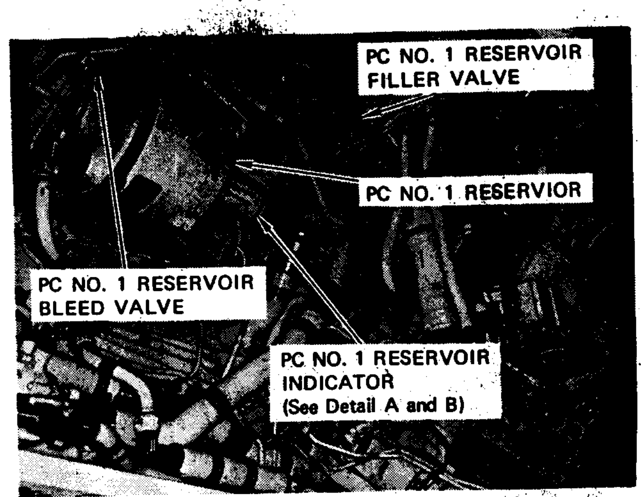
1. If using E10385 hydraulic servicing cart, remove cap from reservoir filler valve. Bleed air from hydraulic servicing hose and connect hose to valve.

2. If using TTU-228/E-1A hydraulic test stand, set applicable RESERVOIR SELECTOR knob for closed system operation. Perform preoperational procedures (paragraphs 1-47 through 1-49) leaving RESERVOIR SELECTOR knob set for closed system operation. Connect test stand hoses to system requiring reservoir servicing.

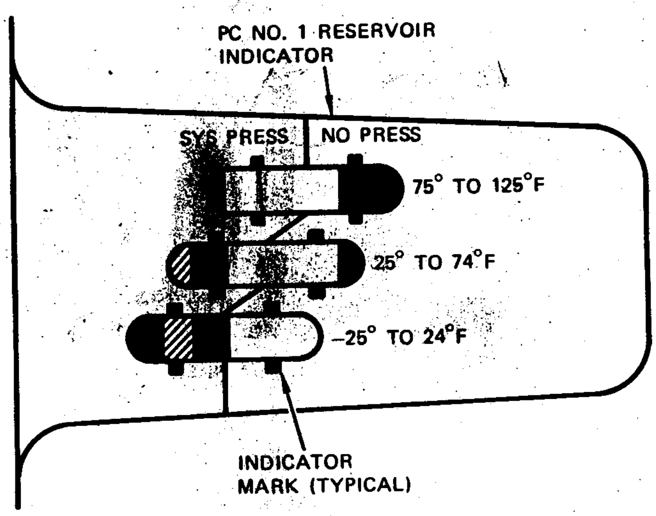
3. Connect transparent bleed hose to reservoir bleed valve. Place other end of hose in waste container.

4. If using TTU-228/E-1A hydraulic test stand, open SYSTEM FILL valve for system to be serviced.





LEFT WHEEL WELL



DETAIL A

RESERVOIR SHOWN PROPERLY SERVICED FOR 25° TO 74°F TEMP AND NO SYSTEM PRESSURE (NOTE 2)

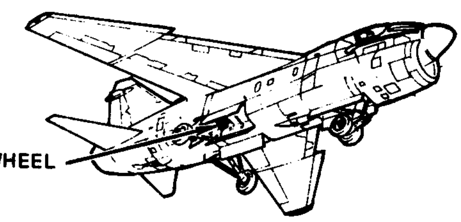
NOTE

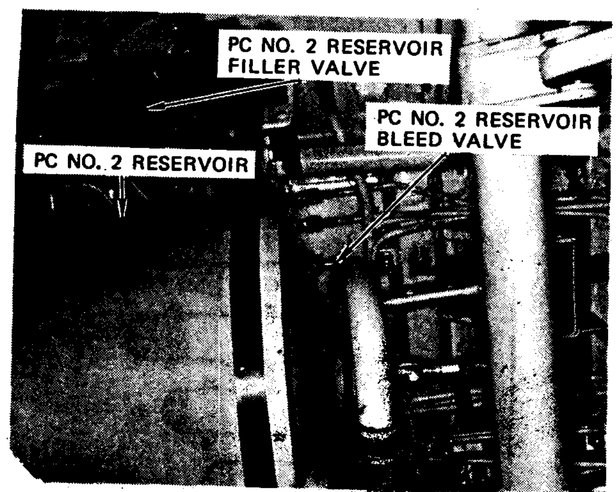
1. Fluid must be at ambient temperature before servicing.
2. Correct full level is white under indicator mark of applicable ambient temperature window with black band just to right of mark.
3. An overfilled indication is normal during check of reservoir level where engine has just been shut down (i.e., thru flight inspection).

01D124-09-76

Figure 3-15. PC No. 1 Hydraulic System Servicing - No Pressure

RIGHT WHEEL WELL

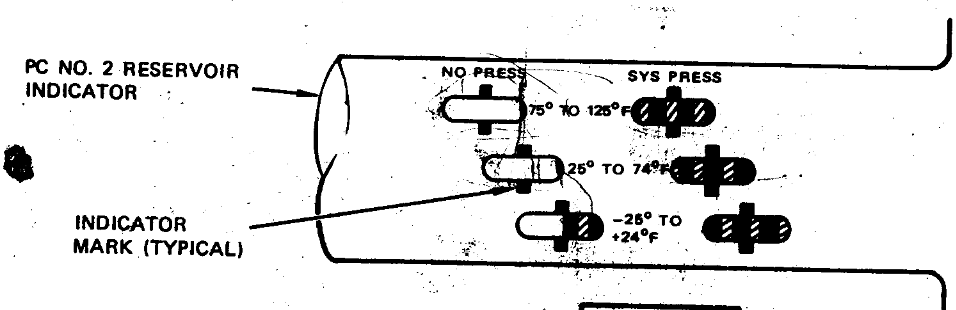




RIGHT WHEEL WELL

NOTE

1. Fluid must be at ambient temperature before servicing.
2. Correct full level is all white in applicable ambient temperature window with black/red band just at the edge of the window.
3. An overfilled indication is normal during check of reservoir level where engine has just been shut down (i.e., thru flight inspection).

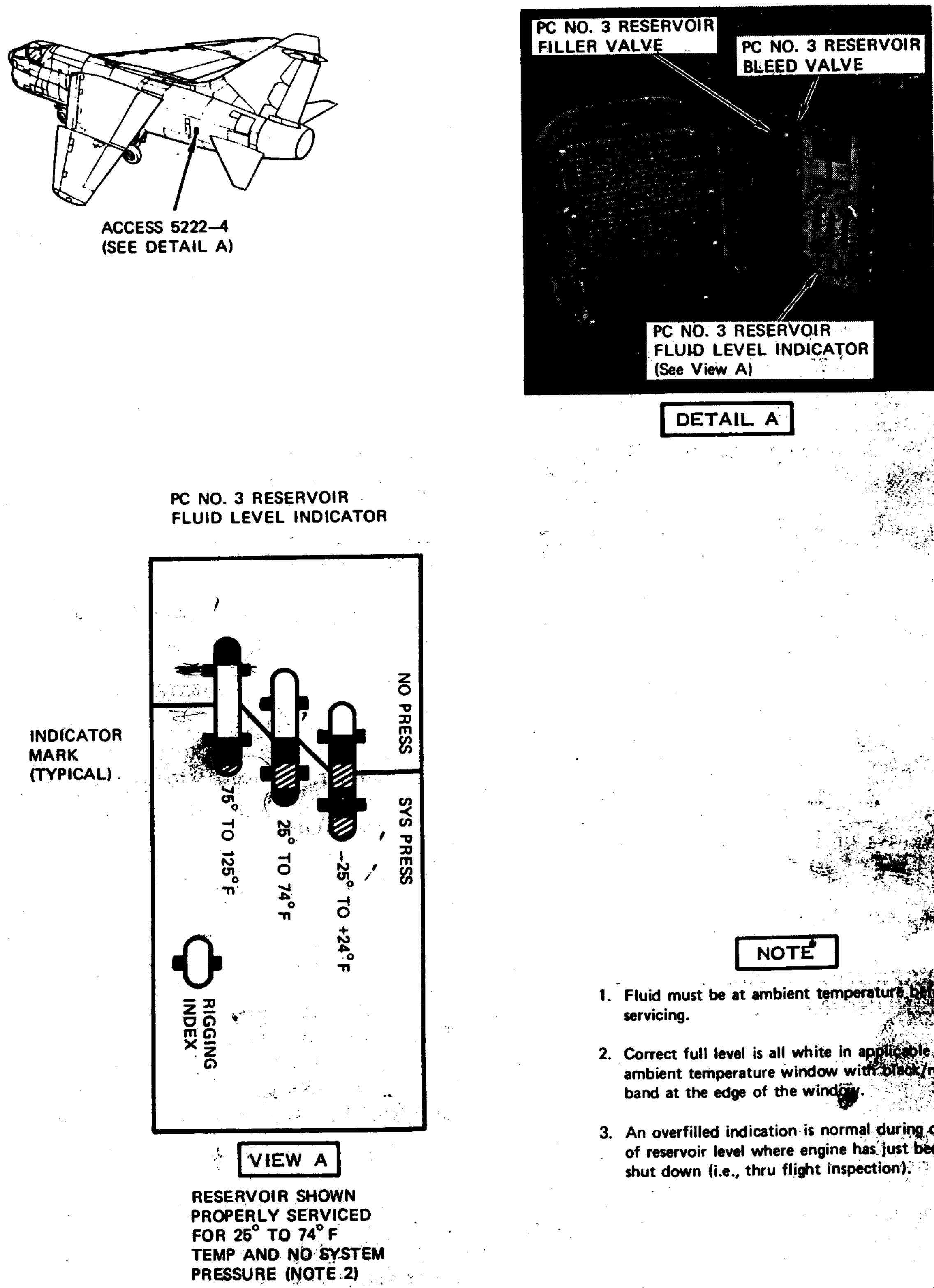


DETAIL A

RESERVOIR SHOWN PROPERLY SERVICED FOR 25° TO 74° F TEMP AND NO SYSTEM PRESSURE (NOTE 2)

01D125-09-75

Figure 3-16. PC No. 2 Hydraulic System Servicing - No Pressure



NOTE

1. Fluid must be at ambient temperature before servicing.
2. Correct full level is all white in applicable ambient temperature window with black/red band at the edge of the window.
3. An overfilled indication is normal during check of reservoir level where engine has just been shut down (i.e., thru flight inspection).

01D126–09–75

Figure 3-17. PC No. 3 Hydraulic System Servicing - No Pressure (Airplanes AF69-6197 and Subsequent)

5. Depress and hold bleed valve button.

NOTE

Filling rate of PC No. 3 reservoir may be increased by holding emergency accumulator test switch in DUMP.

6. If using TTU-228/E-1A hydraulic test stand, place FILL PUMP switch in ON, or if using E10385 hydraulic servicing cart, manually actuate cart pump. Continue to pump hydraulic fluid into reservoir until fluid in reservoir bleed hose is free of air.

7. Close bleed valve.

8. Continue to pump fluid into reservoir until correct level is indicated in NO PRESS side of window corresponding to fluid temperature.

9. If using TTU-228/E-1A hydraulic test stand, close SYSTEM FILL valve and place FILL PUMP switch in OFF. Disconnect test stand hoses from aircraft.

10. If using E10385 hydraulic servicing cart, disconnect cart from filler valve and install cap on filler valve.

11. Remove bleed hose from reservoir bleed valve.

i. If excessive air in system is suspected, perform air check (paragraph 3-40).

j. Close access 5222-4.

3-43. RESERVOIR SERVICING CHECK (ENGINE RUNNING).

a. Perform accumulator pressure check (paragraph 3-56).

b. Ensure all control surfaces are positioned to neutral. Trim as necessary.

c. For PC No. 2 system, ensure that the following are in positions indicated:

1. Flaps retracted and flap handle in UP detent.

2. Arresting gear retracted.

3. Emergency power package retracted.

4. Air refueling probe retracted (airplanes through AF69-6196).

5. Air refueling receptacle door closed (airplanes AF69-6197 and subsequent).

d. For PC No. 3 system, open access 5222-4.

NOTE

The following check assumes that proper servicing (paragraph 3-42) was performed before engine start.

e. Check reservoir level in SYS PRESS window corresponding to estimated fluid temperature:

1. White or white under indicator mark is acceptable.

2. Black/red stripes (overfilled) under indicator mark is acceptable for a hot system (i.e. hot turnaround).

3. Black band (depleted) under indicator mark is not acceptable. Engine should be shut down.

NOTE

Reservoir may be serviced in accordance with following steps to prevent flight delay; however, servicing procedures (paragraph 3-42) should be performed at earliest opportunity.

f. No servicing is required for slightly overfilled condition (white with some black/red stripes showing), however, if desired, fluid may be bled from reservoir as follows:

1. Connect bleed hose to reservoir bleed valve. Place other end of bleed hose in waste container.

2. Depress bleed valve button. Bleed reservoir until white band is in proper SYS PRESS window.

3. Close bleed valve.

4. Remove bleed hose.

g. For slightly underserviced condition (white with some black), add fluid as follows:

1. Remove cap from reservoir filler valve.

2. Bleed air from hydraulic servicing cart hose and connect hose to filler valve.

3. Pump fluid into reservoir until white band is in proper SYS PRESS window.

4. Disconnect hydraulic servicing hose from filler valve and install cap on valve.

h. Close access 5222-4.

3-44. RESERVOIR DRAINING.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Provide hydraulic power to drain reservoir.

NOTE

Draining procedure is typical for each hydraulic system reservoir. Ensure test stand reservoir is capable of accepting airplane reservoir fluid volume.

a. Ensure test stand high pressure bypass valve is open.

b. Connect external hydraulic power (paragraph 1-34) with hydraulic test stand set for open system operation.

c. Gradually increase hydraulic pressure to force fluid from reservoir to test stand.

d. When reservoir is drained to desired level or has emptied, shut down hydraulic power.

3-45. HYDRAULICALLY CHARGING EMERGENCY ACCUMULATOR PACKAGES.

(See figure 3-18.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external hydraulic power	Apply hydraulic power.

NOTE

The PC No. 2 system shall be pressurized to 3,000 psi before proper emergency accumulator servicing can be accomplished. The emergency accumulator packages shall be properly precharged with nitrogen (paragraph 3-48) before they can be hydraulically charged.

a. Connect and apply 3,000 psi external hydraulic power to PC No. 2 system (paragraph 1-34) if engine is not operating.

NOTE

Emergency power package accumulator (station 6) will automatically charge with hydraulic power applied and isolation valve open.

b. Place flap handle in UP or DOWN to open system isolation valve.

c. To charge the emergency landing gear, brake, and flap accumulators, place emergency accumulator shutoff valve in OPEN and hold for approximately 60 seconds.

d. Place emergency accumulator shutoff valve in CLOSE.

e. Place emergency accumulator test switch (figure 3-19) in PRESS and verify accumulators are properly charged (paragraph 3-56). Release switch.

f. Shut down and disconnect external hydraulic power (paragraph 1-34).

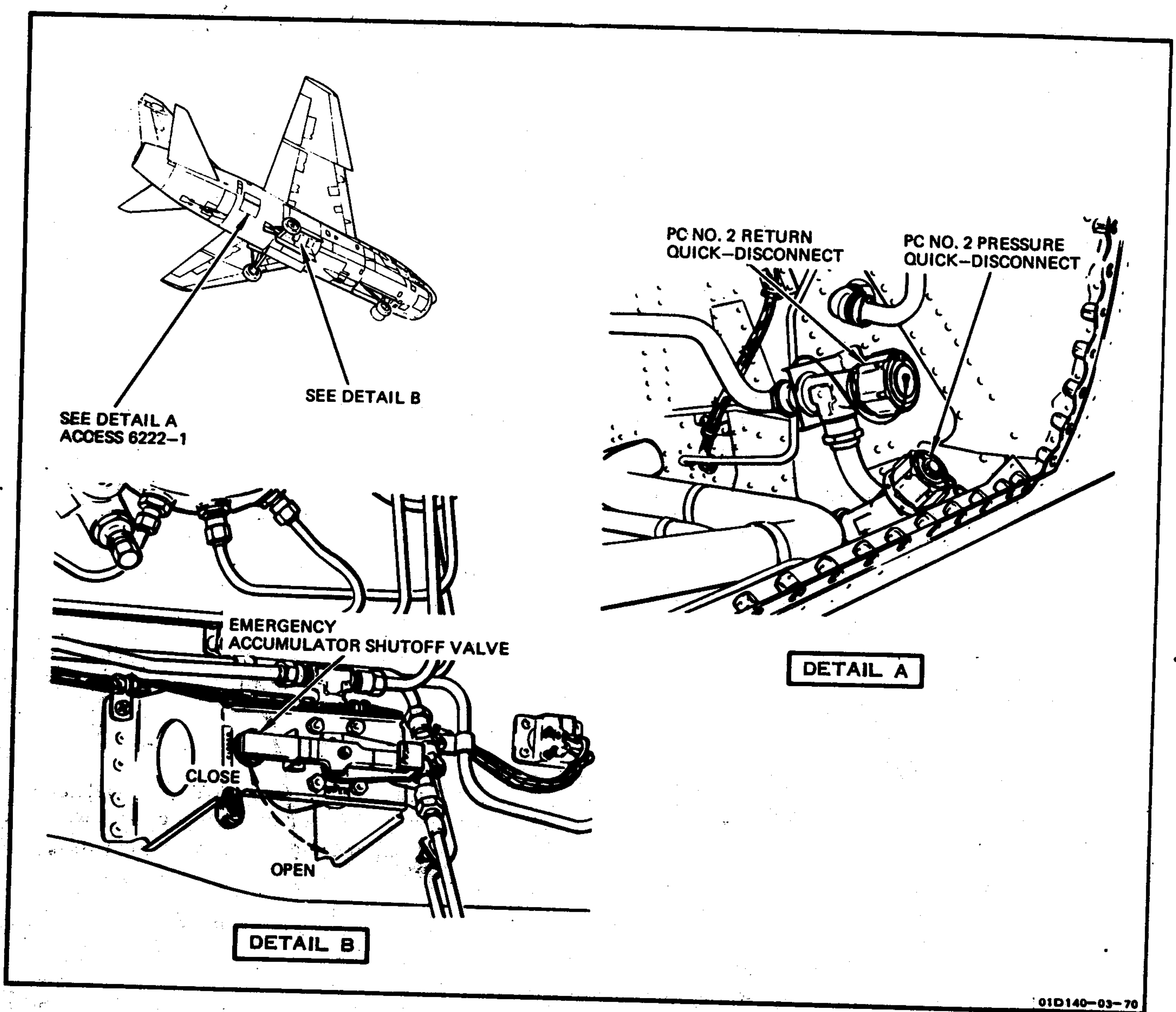


Figure 3-18. Hydraulic Charging Emergency Accumulator Packages

3-46. DUMPING EMERGENCY AND RESERVOIR ACCUMULATORS HYDRAULIC PRESSURE.

a. Shut down engine or disconnect external hydraulic power if applicable.

b. Place battery switch in BATT.

WARNING

When the emergency accumulators are dumped, resulting surge pressures to the return line may cause inadvertent retraction of the nose landing gear or actuation of the flaps if restrictors are removed from accumulator return lines. To prevent injury to personnel and possible damage to the airplane, ensure that the nose gear downlock pin is installed and that the flap area is cleared.

c. Ensure flap handle is in UP and nose gear downlock pin is installed.

CAUTION

If the emergency brake accumulator (station 7) is dumped and the utility wheel brake accumulator (station 5) is depleted, wheel brakes will not be available until engine is started, external hydraulic power is applied to PC No. 2 system, or utility brake accumulator is replenished to a minimum of 2,300 psi by hand pump.

d. Place emergency accumulator test switch in DUMP and hold for 1 minute to depressurize accumulators.

e. Release emergency accumulator test switch to OFF.

f. Place battery switch in OFF.

3-47. DUMPING UTILITY WHEEL BRAKE ACCUMULATOR HYDRAULIC PRESSURE.

a. Shut down engine or external hydraulic power from PC No. 2 hydraulic system if applicable.

b. Place battery switch in BATT.

c. Place antiskid switch in BRAKE ACCUM.

CAUTION

If the emergency brake accumulator (station 7) is dumped and utility wheel brake accumulator (station 5) is depleted, wheel brakes will not be available until engine is started, external hydraulic power is applied to PC No. 2 system, or utility brake accumulator is replenished to a minimum of 2,300 psi by hand pump.

d. Actuate both brake pedals until accumulator hydraulic pressure is depleted (approximately ten applications or until station 5 pressure gage indication ceases to drop during brake pedal actuation).

NOTE

After hydraulic pressure is completely depleted from brake accumulator, the remaining pressure indicated on station 5 pressure gage will be accumulator pneumatic precharge pressure.

e. Place antiskid and battery switches in OFF.

f. If accumulator servicing is required (pneumatic precharging or depressurization of accumulator pneumatic pressure), service in accordance with paragraph 3-48.

3-48. ACCUMULATOR SERVICING. (See figure 3-19.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Connect electrical power.
		Equipment required for engine operation	Operate engine.
		Equipment required for connecting external hydraulic power	Charge accumulators with hydraulic pressure.
	MIL-T-26772	Nitrogen servicing trailer	Service accumulators with nitrogen.
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten accumulator station filler valve.

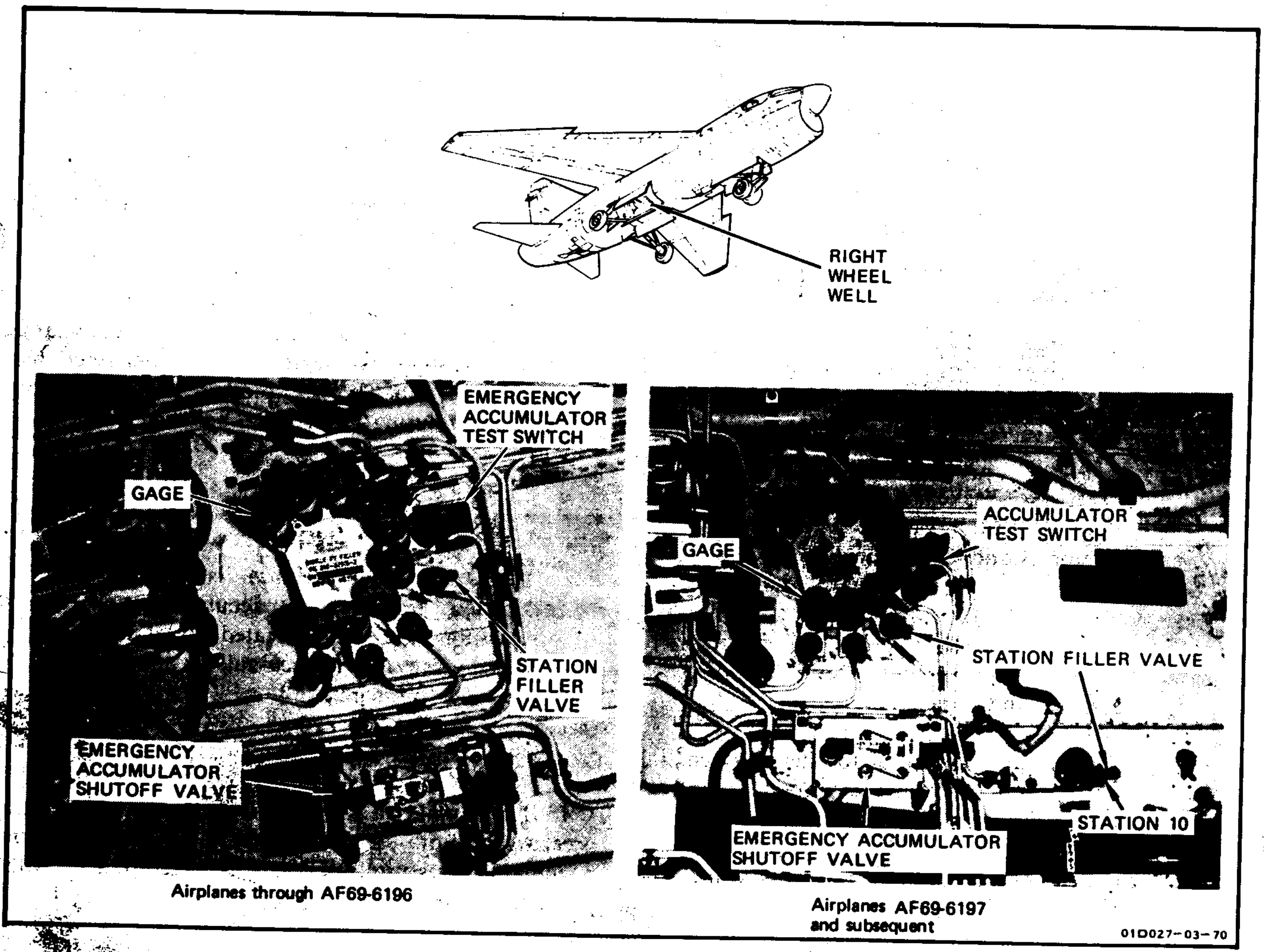


Figure 3-19. Accumulator Servicing

3-49. ACCUMULATOR PNEUMATIC PRECHARGING. (Refer to table 3-6 and see figure 3-19.)

WARNING

Use approved personal protective equipment (goggles/face shield/ gloves) when using compressed air or nitrogen.

Do not exceed precharge pressures listed in table 3-6. Overpressurization can cause failure of emergency systems. Variations in precharge pressures will also affect hydraulic reservoir fluid level indication.

CAUTION

Use dry nitrogen only for accumulator servicing. The use of compressed air will result in excessive corrosion damage to the accumulator and can result in a combustible mixture (dieseling) within the accumulator.

NOTE

If accumulator precharge pressure drop is excessive or same accumulator shows drop in excess of 50 psi (requiring daily servicing for 3 days or more) or if pneumatic leakage is otherwise evident, refer to T.O. 1A-7D-2-4 for accumulator precharge system troubleshooting.

3-50. A single location in the right wheel well is provided for pneumatic servicing of the airplane accumulators. Each accumulator station is equipped with a pneumatic pressure gage and filler valve for use in precharging, depressurizing, and pressure checking. Each accumulator station is serviced individually.

3-51. Precharge Check and Filling — Stations 2, 4, 6, 7, and 9.

NOTE

If external electrical or battery power is not available, the emergency accumulator dump valves and precharge shutoff valves may be operated manually. The landing gear accumulator valves are located in access 1123-3, wheel brake accumulator valves in access 2123-1, flap accumulator valves in access 2121-3, and emergency power package accumulator valves in access 2123-3. Station No. 2 accumulator is actuated electrically only.

a. Ensure hydraulic systems are depressurized.

b. Connect external electrical power (paragraph 1-28) or place battery switch in BATT.

WARNING

When the emergency accumulators are dumped, resulting surge pressures to the return line may cause inadvertent retraction of the nose landing gear or actuation of the flaps if restrictors are removed from accumulator return lines. To prevent injury to personnel and possible damage to the airplane, ensure that the nose gear downlock is installed and that the flap area is cleared.

CAUTION

If the emergency brake accumulator (station 7) is dumped and the utility wheel brake accumulator (station 5) is depleted, wheel brakes will not be available until engine is started, external hydraulic power is applied to PC No. 2 system, or utility brake accumulator is replenished to a minimum of 2,300 psi by hand pump.

c. Place emergency accumulator test switch in DUMP and hold 1 minute; then release.

d. Place emergency accumulator test switch in PRESS and hold (not required for station 2).

e. Read accumulator precharge pressure on pressure gages. If precharge pressure is not as shown table 3-6, accomplish steps f through m.

f. Release emergency accumulator test switch to OFF.

Table 3-6. Accumulator Pneumatic Precharging

Accumulator Station No.	Accumulator	Ambient Temperature °F	Gage Pressure (Psig)
1	Arresting gear	0	850 (±50)
		30	950 (±50)
		60	1,000 (±50)
		90	1,100 (±50)
		120	1,150 (±50)
2	PC No. 1 reservoir (airplanes through AF69-6196)		1,500 (±50)
2	PC No. 3 reservoir (airplanes AF69-6197 and subsequent)		1,500 (±50)
3	PC No. 1 surge damper		1,000 (±100)
4	Emergency landing gear	0	1,200 (±50)
		30	1,250 (±50)
		60	1,350 (±50)
		90	1,450 (±50)
		120	1,500 (±50)
5	Utility wheel brake		700 (±50)
6	Emergency power package	0	1,100 (±50)
		30	1,150 (±50)
		60	1,250 (±50)
		90	1,300 (±50)
		120	1,400 (±50)
7	Emergency wheel brake	0	1,150 (±50)
		30	1,200 (±50)
		60	1,300 (±50
		90	1,400 (±50)
		120	1,450 (±50)
8	PC No. 2 surge damper		1,000 (±100)
9	Emergency flaps	0	1,050 (±50)
		30	1,150 (±50)
		60	1,200 (±50)
		90	1,250 (±50)
		120	1350 (±50)
10	PC No. 3 surge damper (airplanes AF69-6197 and subsequent)		1,000 (±100)

NOTE

Stations 4, 6, and 9 are equipped with electrical heater blankets. Electrical power to blankets shall be off 1 hour prior to pressure checking accumulators to eliminate erroneous indications.

g. Remove cap from station filler valve to be serviced and connect nitrogen cart hose to filler valve.

NOTE

Never loosen valve body assembly to service accumulators. To prevent loosening or overtightening filler valve, the lower (valve body) hex nut shall be held with a wrench when opening and closing the valve.

h. Hold lower nut of filler valve with wrench and loosen upper nut counterclockwise to open internal valve seat.

i. For stations 4, 6, 7, and 9, place emergency accumulator test switch in PRESS and hold.

j. Read accumulator precharge pressure on pressure gage. If precharge pressure is not as shown in table 3-6, fill accumulator to correct pressure with dry nitrogen. Allow pressure to stabilize and recheck.

k. Release accumulator test switch to OFF, hold lower nut of station filler valve with a wrench, and tighten upper nut clockwise to 60 (± 10) pound-inches torque.

l. Disconnect nitrogen cart and install cap on station filler valve.

m. When desired stations have been checked and precharged, disconnect electrical power or place battery switch in OFF.

3-52. Precharge Check and Filling — Stations 1, 3, 5, and 8 and on Airplanes AF69-6197 and Subsequent, Station 10.

a. Ensure that hydraulic systems are depressurized.

CAUTION

If the emergency brake accumulator (station 7) is dumped and the utility wheel brake accumulator (station 5) is depleted, wheel brakes will not be available until engine is started, external hydraulic power is applied to PC No. 2 system, or utility brake accumulator is replenished to a minimum of 2,300 psi by hand pump.

b. If utility brake accumulator (station 5) is to be checked or precharged, dump accumulator hydraulic pressure in accordance with paragraph 3-47.

c. Read accumulator precharge pressure on pressure gages. If precharge pressure is not as shown in table 3-6, accomplish steps d through g.

d. Remove cap from station filler valve and connect nitrogen cart hose to filler valve.

NOTE

Never loosen valve body assembly to service accumulators. To prevent loosening or overtightening filler valve, the lower (valve body) hex nut shall be held with a wrench when opening and closing the valve.

e. Hold lower nut of filler valve with wrench and turn upper nut counterclockwise to open internal valve seal.

NOTE

The arresting gear shall be retracted when the arresting gear accumulator (station 1) is precharged. Failure to do so may prevent the arresting gear from being retracted after accumulator is precharged.

f. Fill accumulator to proper precharge pressure, hold lower nut of station filler valve with wrench, and then tighten upper nut clockwise to 60 (± 10) pound-inches torque.

NOTE

After filling the accumulator to precharge pressure, ensure that hydraulic pressure is comletely dumped in accordance with paragraph 3-47, then recheck station being serviced for proper precharge.

g. Disconnect nitrogen cart and install cap on station filler valve.

h. Repeat steps a through h for other stations.

3-53. ACCUMULATOR HYDRAULIC PRESSURE CHECKS.

NOTE

The emergency accumulators and station 2 shall be hydraulically charged (paragraph 3-45) before a correct pressure check can be accomplished.

3-54. Pressure Check — Stations 4, 6, 7, and 9.

a. Connect external hydraulic power to each hydraulic system (paragraph 1-34) or start engine (paragraph 2-51).

b. Hydraulically charge emergency accumulators (paragraph 3-45) before checking stations 4, 6, 7, or 9.

c. If required, place battery switch in BATT.

d. Position emergency accumulator test switch to PRESS and read accumulator pressure gages. Indicated pressure must be greater than 2,300 psi for stations 4, 7, and 9 and greater than 2,000 psi for station 6. If pressure is not correct, check accumulator precharge pressure (paragraph 3-49).

e. Release accumulator test switch to OFF.

f. When all required stations have been checked, place battery switch in OFF.

g. Shut down engine (paragraph 2-51) or disconnect external hydraulic power (paragraph 1-34) as applicable.

3-55. Pressure Check — Stations 1, 2, 3, 5, and 8 and on Airplanes AF69-6197 and Subsequent, Station 10.

a. Connect external hydraulic power (paragraph 1-34) to each hydraulic system or start engine (paragraph 2-51).

b. Place flap handle in UP or DOWN to open isolation valve.

c. Check pressure gage indication. Gage for station 1 should indicate precharge pressure (table 3-6). Stations 2, 3, 8, and 10 should indicate system pressure of 3,000 psi. Pressure must be greater than 2,300 psi for station 5.

d. If pressure noted in step c is not as required, service accumulator in accordance with paragraph 3-49.

e. Shut down engine (paragraph 2-51) or disconnect external hydraulic power (paragraph 1-34) as applicable.

3-56. HOT TURNAROUND ACCUMULATOR PRESSURE CHECK (ENGINE RUNNING).

NOTE

Hydraulic system pressures must be 3,000 psi.

a. Ensure arresting gear is retracted.

b. Place emergency accumulator test switch in PRESS and hold.

c. Check accumulator pressure gages for minimum pressure as follows:

Station	*Pressure (Psi)*
1	Precharge
2	3,000
3	3,000
4	2,500
5	2,300
6	2,100
7	2,300
8	3,000
9	2,500
10 (Airplanes AF69-6197 and subsequent)	3,000

d. Release emergency accumulator test switch to OFF.

e. If a station(s) accumulator pressure indication is below the minimum specified in step c, refer to T.O. 1A-7D-2-4 for system checkout, troubleshooting, and repair.

3-57. DEPRESSURIZATION OF ACCUMULATOR PNEUMATIC PRESSURE.

CAUTION

If the emergency brake accumulator (station 7) has been dumped and the utility wheel brake accumulator (station 5) is depleted, wheel brakes will not be available until engine has been started, external hydraulic power is applied to PC No. 2 system, or brake accumulators are replenished to a minimum of 2,300 psi by hand pump.

3-58. Depressurization — Stations 2, 4, 6, 7, and 9.

a. Place battery switch in BATT.

b. Place emergency accumulator test switch in DUMP and hold for approximately 1 minute.

c. Remove cap from station filler valve.

NOTE

Never loosen valve body assembly to service accumulators. To prevent loosening or overtightening filler valve, the lower (valve body) hex nut shall be held with a wrench when opening and closing the valve.

d. Stand to one side, hold lower nut of station filler valve with a wrench, carefully loosen upper nut counterclockwise to open valve, and hold accumulator test switch in PRESS (not required for station 2) to release accumulator precharge.

e. When nitrogen ceases to flow from filler valve, release accumulator test switch, tighten upper nut on filler valve, and install cap on filler valve.

f. When all required stations have been depressurized, place battery switch in OFF.

3-59. Depressurization — Stations 1, 3, 5, and 8 and on Airplanes AF69-6197 and Subsequent, Station 10.

a. If utility brake accumulator (station 5) is to be depressurized, dump accumulator hydraulic pressure in accordance with paragraph 3-47.

b. Remove cap from station filler valve.

NOTE

Never loosen valve body assembly to service accumulators. To prevent loosening or overtightening filler valve, the lower (valve body) hex nut shall be held with a wrench when opening and closing the valve.

c. Stand to one side, hold lower nut of station filler valve with a wrench, and carefully loosen upper nut counterclockwise to open valve and release accumulator precharge.

d. When nitrogen ceases to flow from filler valve, tighten upper nut on filler valve and install cap on valve.

3-60. FUEL SERVICING. (See figures 3-20 and 3-21.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power for operating fuel indicator.
	MC-2A	Air compressor	Provide air for defueling external fuel tanks.
	MIL-M-7404	Maintenance stand	Gain access to top of wing and fuselage to accomplish gravity servicing.
	216-01906-4	Adapter, defueling aft tank	Adapt defueling hose to aft tank defueling receptacle.

Tools Required (continued)

Figure & Index No.	Part Number	Nomenclature	Use and Application
	42D6594-2	Wheel chock with 8-foot lanyard (2)	Prevent airplane from moving during hot refueling operation.
		Ear protectors (as recommended by director of base medical services)	Protect against hearing loss resulting from exposure to jet engine noise during hot refueling.
	H-157/AIC, or equivalent	Headset and microphone assembly	Communications between refueling supervisor and pilot during hot refueling operation.
	Local fabrication	Intercom ground cord, 50 feet with MS3106A16S-1P connector	Communications between refueling supervisor and pilot during hot refuel operation.
	215-00225-1	Adapter set, airhose-to-airplane	Adapt MC-2A, compressor airhose to airplane ground air connector.
3-23	Local fabrication	Defueling hose assembly	Adapt defueling hose to motive flow hose.
	64C13362-3	Pylon safety pin	Prevents inadvertent jettison of external fuel tanks.

3-61. The airplane fuel system stores and delivers fuel under pressure to the engine and includes complete air refueling capabilities. Internal fuel system arrangement consists of fuselage fuel tanks and integral wing tank. External fuel system consists of external tanks with pylon mounting provisions under the wings. All fuel tanks can be refueled by either single-point or gravity method.

WARNING

To prevent injury or death to personnel and damage to airplane caused by engine power failure, ensure that airplane is serviced with JP-4 fuel only or authorized alternate or emergency fuel (table 3-1, 3-2 or 3-3) when requested by the pilot.

To avoid exceeding engine operating limits when changing to or from JP-4 fuel, manual fuel control check must be performed (T.O. 1A-7D-2-5).

After using aviation gasoline, entire fuel system must be completely defueled before refueling with jet fuel.

Ensure that airplane and fueling unit are grounded. Fueling unit refueling nozzle will be grounded to airplane for gravity servicing. Serious fire or explosion may occur causing injury to personnel and damage to equipment if improper ground is used. Fire fighting equipment shall be present.

NOTE

Fuel servicing with engine operating (hot refueling) may be accomplished in accordance with paragraph 3-71.

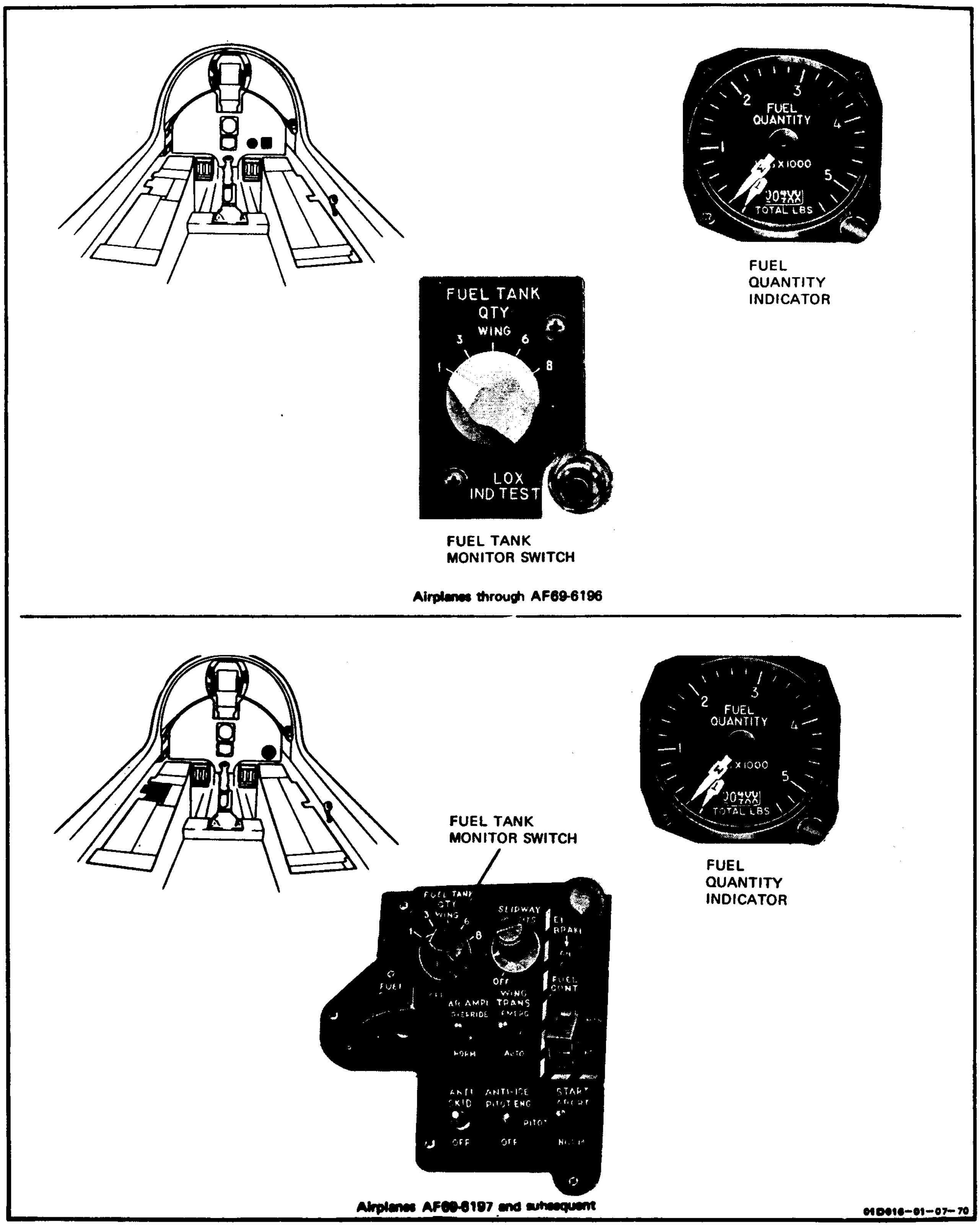
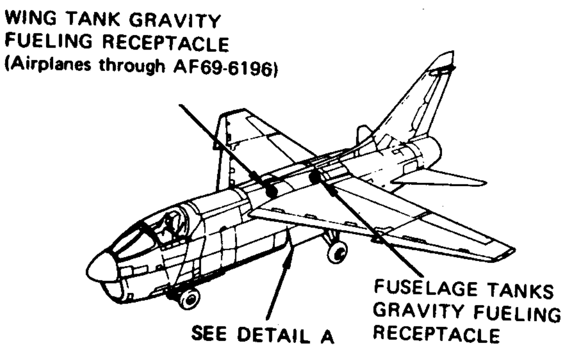
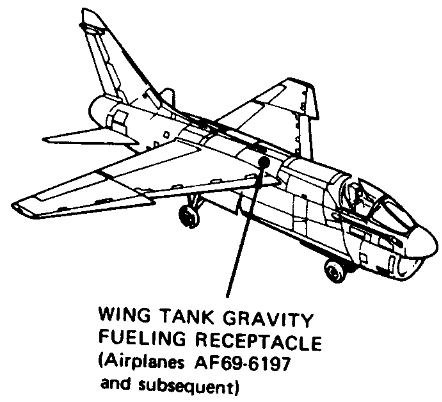
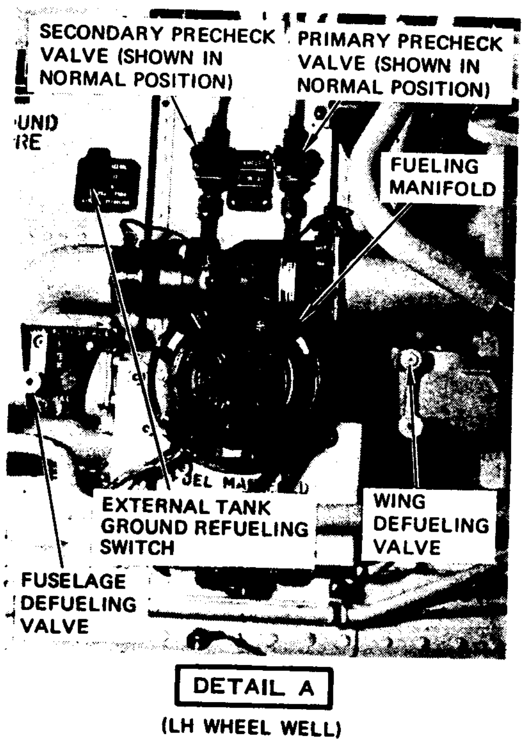
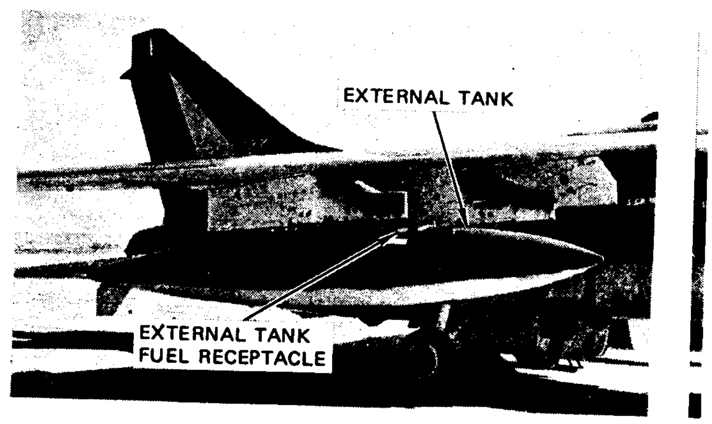


Figure 3-20. Fuel System Servicing (sheet 1)









NOTE

Fueling manifold cap replacement is new positive locking/positive indicating cap (P/N 488-19, NSN 1560-01-265-4758).

01D016-02-07-7C16

Figure 3-20. Fuel System Servicing (Sheet 2)

3-62. PRECAUTIONS.

a. Check airplane maintenance discrepancy/work record and ensure that fuel system is compete and operable before refueling aircraft.

b. Ensure that munition(s)/ordance and external fuel tank(s) (if installed), have safety devices installed.

c. Comply with all local fire regulations and stop all fueling operations if a fire hazard exists no matter how minor the hazard may seem.

d. Observe no smoking precautions.

e. Ensure that adequate fire fighting equipment is available. The 150-pound, Halon 1211 Fire Extinguisher is the primary Flightline Fire Extinguisher and is adequate for normal refueling procedures. If the 150-pound Halon 1211 extinguisher is not available it may be replaced with two 50-pound carbon dioxide extinguishers.

f. Remove any equipment from refueling area that could become a source of ignition.

g. Ensure serviceability of single point fuel servicing nozzle as follows:

1. Inspect valve locking handle for cracks, missing parts, or indication of fatigue around pivot point.

2. Inspect locking wedge on nozzle at point where locking handle cam rotates against wedge for damage that could prevent a positive locking condition.

3. Ensure that three nozzle aligning pins and three collar release pins are not broken or missing.

h. Ensure all personnel involved in refueling operation are familiar with information on equipment and operating procedures contained in T.O. 37A-1-101 and T.O. 37A6-2-43. See figure 3-21 for typical crew positions and duties.

i. Ensure refueling is not conducted within 300 feet of ground radar or within 100 feet of other aircraft with engine, airborne radio, or radar equipment operating, except other aircraft which are parked in adjacent approved refueling areas.

j. Ensure that airplane, refueling unit, and refueling nozzle are all properly grounded before fueling/defueling operation (figure 3-22).

k. Do not perform fueling operation during electrical storms or while servicing liquid oxygen system.

l. Do not allow unauthorized personnel near airplane during fueling/defueling operation.

m. Constantly watch for signs of fuel leakage, spillage, and overflow. If a fuel spill occurs, the supervisor will order operations to cease immediately and notify the base fire department. Special precautions will be taken until the safety hazard has been eliminated.

CAUTION

On initial refueling only of new, recently repaired internal fuel tanks and tanks with new foram installed, reduce fuel flow rate (25 psi maximum refueling pressure) to prevent internal flash fires caused by electrostatic ignition of fuel vapors.

When using without conductivity additive, refueling pressure must be limited to 25 psi to prevent internal flash fires caused by electrostatic ignition of fuel vapors.

n. Do not exceed fueling pressure of 55 psi.

o. Operate only those electrical switches required by the servicing procedure being performed.

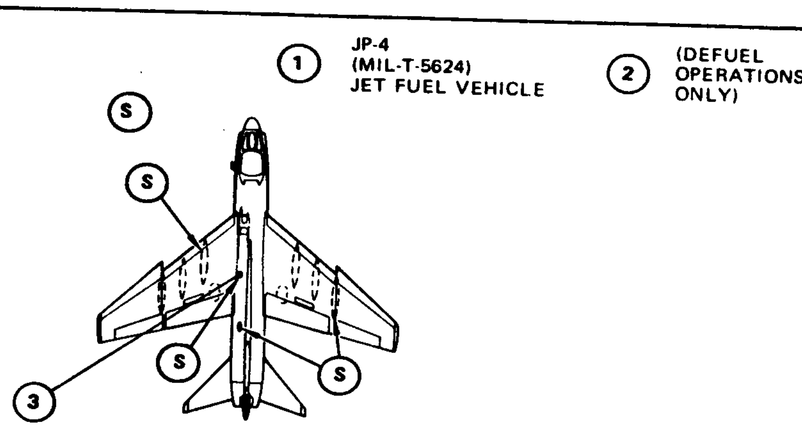
CAUTION

Ensure that lap belts are in the seat and not hanging over edge of seat, as damage to seat and/or console may result.

p. Station a person in the cockpit to monitor the fuel quantity indicator when partial fueling is required.

q. Ensure that vent mast is unobstructed and that air is venting from the fuselage vent mast throughout the fueling operation check.

r. Additional precautions in AFOSH STD 127-39 TO 00-25-172 shall be strickly followed during fueling and defueling operations.



TYPICAL AIRPLANE
AND CREW POSITIONS

NOTE

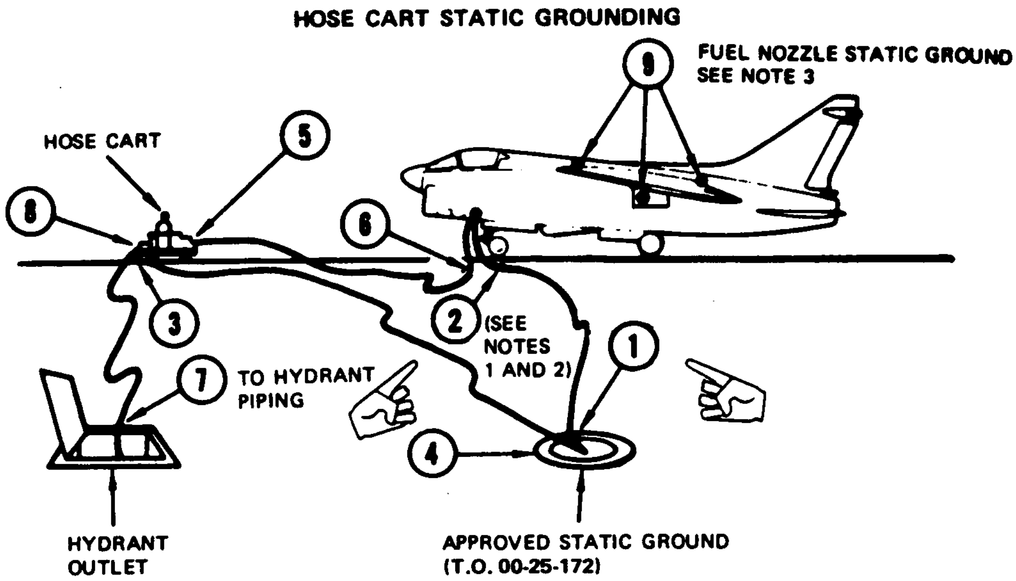
1. Crew members requirements are one AFSC 431X1 for internal fueling, two AFSC 431X1 for fueling external tanks and defueling, and one 631X0 personnel.

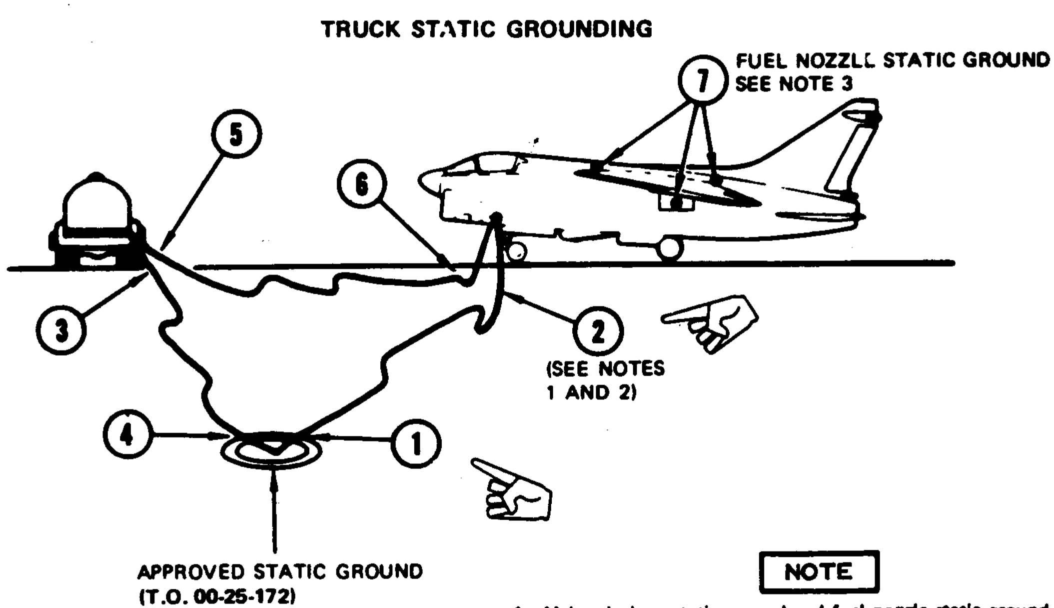
2. Crew memebers shall be famílar with fueling/defueling procedures, safety precautions, and hand signals. Fire extinguishers shall be readily available to all members.

POSITION	CREW MEMBER	DUTY
S	Fueling Supervisor/Vent Checker/ Nozzle Operator	Briefs fueling crew on all procedures. Directs all fueling activities. Ensures airplane and fueling area is safe for fueling. Inspects nozzle and receptacle for serviceability. Connects and disconnects static grounds and refueling nozzle. Complies with primary and secondary valve checks. Checks fuselage vents to ensure proper venting throughout fueling operation and checks that no air is venting from wing dump masts. Makes external tank check and returns to position in front of airplane in full view of complete operation. Acts as fire guard and controls electrical power source during defueling and partial internal service.
1	No. 1—Fueling Unit Operator	Operates fueling unit and monitors fuel flow. Maintains visual contact with fueling supervisor during entire operation.
2	No. 2—Defuel Unit Observer	Assumes a position atop fuel unit to observe fuel level and prevent overflow during defueling.
3	No. 3—External Fueling Assistant	Operates external tank ground refueling switch.

01D197-11-76

Figure 3-21. Typical Fueling/Defueling Crew Positions and Duties





NOTE

1. Make airplane static ground and fuel nozzle static ground connections in sequence indicated by circled numbers.
2. See figure 1-20 for location of airplane static grounds and single point fuel servicing static ground receptacles.
3. Fuselage, wing, and external tanks gravity servicing.

01D173-12-74

Figure 3-22. Airplane Static Grounding for Fuel Servicing

3-63. SINGLE-POINT SERVICING.

WARNING

Ensure that airplane and fueling unit are properly grounded. Fueling unit shall be grounded to the airplane. If improper grounding procedures are used, a serious fire or explosion may occur, causing injury to personnel or damage to equipment.

To prevent dumping fuel on ramp and endangering airplane and personnel by fire hazard, ensure fuel dump switch is in OFF **electrical power or starting engine. If dump valves are open ensure circuit breaker 3148 is engaged and apply external ac electrical power to cycle the valves to the closed position.**

3-64. Full Internal Service.

a. Ensure that fuel dump switch is in OFF, primary and secondary precheck valves are in NORMAL, and fuselage and wing defuel valves are in NORMAL.

b. Install static grounding cables (figure 3-22).

c. Remove cap from fueling manifold by turning counterclockwise.

NOTE

Ensure serviceability of airplane single point refueling receptacle and single point fuel servicing nozzle locking devices before connecting to airplane. After connection to the airplane and before opening nozzle, test strainer coupler quick-disconnect locking device for positive engagement by physically pushing down on the lockring ensuring it is properly seated. After opening the fuel nozzle and before applying fuel pressure, ensure that the nozzle cannot be rotated and disconnected.

d. Connect fuel nozzle to fueling manifold and start fuel flowing at 55-psi maximum pressure.

WARNING

If fuel flow does not shut off within 10 seconds when checking primary and secondary float valves, discontinue pressure fueling immediately. Complete fueling of airplane with faulty float valves or pressure shutoff valve will result in fuel overflow from vent mast and possible damage to bladder fuel tanks.

e. Rotate primary precheck valve handle to PRECHECK and hold. If fuel does not cease to flow within 10 seconds, stop fueling operation immediately and correct malfunction (T.O. 1A-7D-2-6).

f. If fuel flow stops during primary precheck operation, rotate primary precheck valve handle to NORMAL and continue fueling.

g. Repeat steps e and f using secondary precheck valve.

CAUTION

To prevent damage to airplane, check that air is venting from the fuselage vent mast, throughout the fueling operation.

To ensure wing dump valves are closed, check that no air is venting from wing dump masts during refueling.

h. Check for air venting from fuselage vent mast during fueling. Check that no air is venting from dump masts.

CAUTION

Install fueling manifold cap so that chain attachment point is within the 12 to 1 o'clock position and attaching chain length is 5 1/2 inches maximum. This is to reduce possibility of fuel cap from rotating, becoming disengaged, and flailing loose within the wheel well or from being lost during flight.

i. When airplane fuel system is fully serviced, disconnect fuel nozzle; replace cap on fueling manifold and rotate cap to fully locked position.

j. Disconnect static grounding cables.

3-65. Partial Internal Service.

a. Connect and apply external electrical power (paragraph 1-28). Ensure that power unit is located 50 feet, or length of electrical cable, upwind from airplane.

b. Press fuel quantity indicator press-to-test switch. Pointers should rotate counterclockwise to zero.

c. Release fuel quantity indicator press-to-test switch. Pointers should return to tank quantity indication.

d. Ensure that fuel dump switch is in OFF.

e. Ensure that primary and secondary precheck valves are in NORMAL.

f. Ensure that fuselage and wing defuel valves are in NORMAL.

g. Install static grounding cables (figure 3-22).

h. Remove cap from fueling manifold by turning counterclockwise.

NOTE

Ensure serviceability of airplane single point refueling receptacle and single point fuel servicing nozzle locking devices before connecting to airplane. After connection to airplane and before applying fuel pressure, turn valve on and ensure that the nozzle cannot be rotated and disconnected. Inspect coupling strainer to ensure quick-disconnect locking device is positively engaged. Notify refueling unit (POL) operator if serviceability of nozzle and locking devices is questionable.

i. Connect fuel nozzle to fueling manifold and start fuel flowing at 55-psi maximum pressure.

j. Rotate primary precheck valve handle to PRECHECK and hold. If fuel does not cease to flow within 10 seconds, stop fueling operation and correct malfunction (T.O. 1A-7D-2-6).

k. If fuel stops during primary precheck operation, rotate primary precheck valve handle to NORMAL and continue fueling.

l. Repeat steps j and k using secondary precheck valve.

CAUTION

To prevent damage to airplane, check that air is venting from the fuselage vent mast, throughout fueling operation.

To ensure wing dump valves are closed, check that no air is venting from wing dump masts during refueling.

m. During fueling operation, check that air is venting from fuselage vent mast. Check that no air is venting from wing dump masts.

WARNING

Partial fuselage fuel load (M pointer) must be 4,000 pounds minimum for flight to allow for normal fuel transfer. Less than minimum fuel load may cause a fuel state substantially lower than 1,000 (±200) pounds when fuel low level caution light comes on.

n. Monitor fuel quantity indicator during fueling operation. When desired fuel load is obtained, rotate primary precheck valve handle to PRECHECK and hold. Shut down fuel servicing unit and return primary precheck valve handle to NORMAL.

CAUTION

Install fueling manifold cap so that chain attachment point is within the 12 to 1 o'clock position and attaching chain length is 5 1/2 inches maximum. This is to reduce possibility of fuel cap from rotating, becoming disengaged, and flailing loose within the wheel well or from being lost during flight.

o. Replace fuel cap on manifold and rotate cap to fully locked position. Disconnect static grounding cables.

p. Disconnect external electrical power.

3-66. External Fuel Tank Servicing.

a. Install static grounding cables (figure 3-22).

b. Ensure pylon safety pins are installed.

c. Fuel airplane using single-point method. Fill to full internal fuel load. Leave fueling nozzle connected to fueling manifold.

d. Connect and apply external electrical power (paragraph 1-28) or place battery switch in BATT. Ensure that power unit is located 50 feet, or length of cable, upwind from airplane.

e. Place external tank ground refueling switch in REFUEL.

f. Ensure that fuselage and wing defuel valves are in NORMAL.

g. Start fuel flowing.

h. Place external tank ground refueling switch in OFF. If fuel flow does not stop within 10 seconds, discontinue fueling operation and correct malfunction (T.O. 1A-7D-2-6).

i. If fuel flow stops within 10 seconds, place external tank ground refueling switch in REFUEL and continue fueling operation.

CAUTION

To prevent damage to airplane, check that air is venting from the pylon overboard vent, throughout fueling operation.

j. Observe pylon overboard vent during fueling operation to ensure that air is venting from fuel system.

k. When external tanks are completely serviced, place external tank ground refueling switch in OFF.

CAUTION

Install fueling manifold cap so that chain attachment point is within the 12 to 1 o'clock position and attaching chain length is 5 1/2 inches maximum. This is to reduce possibility of fuel cap from rotating, becoming disengaged and flailing loose within the wheel well or from being lost during flight.

l. Disconnect fueling nozzle and replace cap on fueling manifold. Disconnect static grounding cables.

m. Disconnect external electrical power or place battery switch in OFF, as applicable.

3-67. GRAVITY SERVICING.

CAUTION

Gravity servicing of foam filled fuel tanks should be accomplished only under emergency conditions due to possible electrostatic ignitions of fuel vapors.

3-68. Fuselage Tanks.

a. Install static grounding cables (figure 3-22).

b. Remove gravity fueling cap from aft fuselage fuel tank receptacle.

c. Pull on cable connected to cap and insert metal ball on cable into groove on receptacle opening to open check valve, allowing fuel flow into all fuselage tanks.

d. Insert nozzle into gravity fueling receptacle.

WARNING

Partial fuselage fuel load (M pointer) must be 4,000 pounds minimum for flight to allow for normal fuel transfer. Less than minimum fuel load may cause a fuel state substantially lower than 1,000 (±200) pounds when fuel low level caution light comes on.

CAUTION

Reduce fuel flow rate (25 psi maximum refueling pressure) to prevent internal flash fires caused by electrostatic ignition of fuel vapors.

NOTE

Fuel will flow from aft tank to all other fuselage tanks. Indication of full fuselage tanks is when aft tank is full and fuel level remains constant.

e. Start fueling unit and pump fuel into receptacle until aft fuel tank is filled.

f. Stop fuel flow to airplane and remove fueling nozzle.

NOTE

Ensure that the gravity fueling check valve is closed before installing the fuel tank receptacle cap.

g. Lift swaged ball on check valve cable from groove in fuel tank receptacle and allow gravity fueling check valve to close.

h. Replace gravity fueling receptacle cap.

i. Disconnect static grounding cables.

3-69. Wing Tank.

a. Install static grounding cables (figure 3-22).

b. Remove gravity fuel cap from wing fuel tank.

c. Insert fueling nozzle into wing gravity fueling receptacle.

CAUTION

Reduce fuel flow rate (25 psi maximum refueling pressure) to prevent internal flash fires caused by electrostatic ignition of fuel vapors.

d. Start pumping fuel into tank until fuel is even with the bottom of the filler neck.

e. Stop fuel flow to airplane and remove nozzle.

f. Replace gravity fueling receptacle cap.

g. Disconnect static grounding cables.

3-70. EXTERNAL TANKS.

a. Install static grounding cables (figure 3-22).

b. Remove gravity fuel cap from external tank.

c. Insert fueling nozzle into external tank gravity fueling receptacle.

d. Start fuel flow into tank. Tank may be filled to lower edge of fueling receptacle.

e. Stop fuel flow to external tank and remove nozzle.

f. Replace gravity fueling receptacle cap and disconnect nozzle ground.

g. Disconnect static grounding cables.

3-71. FUEL SERVICING WITH ENGINE OPERATING (HOT REFUELING). (See figure 3-23.)

3-72. PRECAUTIONS.

WARNING

The following safety precautions must be strictly complied with to prevent possible injury to personnel and damage to aircraft or equipment.

a. Ensure that aircraft fuel system is complete and operable before refueling aircraft.

NOTE

If live ordnances are aboard, observe General Safety Requirements and Emergency Procedures of T.O. 1A-7D-33-1-2.

The only live munitions/ordnance permitted in a hot refueling area are BDU Series, MK106 Bombs, 20 and 30 MM ammunition, chuff, flares or simulators contained in a AN/ALE-40 system.

b. Ensure that munitions/ordnances and external tanks, (if installed) have safety devices installed.

c. Should a leak, unsafe condition, or refueling system malfunction occur during refueling, all operations will be immediately suspended and necessary safety precautions taken.

d. Observe NO SMOKING precautions.

e. Ensure that fire fighting equipment, as required in TO 00-25-172, is available.

f. Remove from refueling area all items that could become a source of ignition. No mechanical lighters, matches, or ferrous materials will be carried in pockets.

g. Ensure serviceability of single point refueling (SPR) nozzle locking device and SPR receptacle.

h. Ensure refuleing is not conducted within 300 feet of ground operating radar. During the fueling operation, radio transmissions will not be permitted within the aircraft 50-foot cordon safety zone.

i. Ensure that aircraft, pantograph, and refueling source are all properly grounded before fueling operation begins.

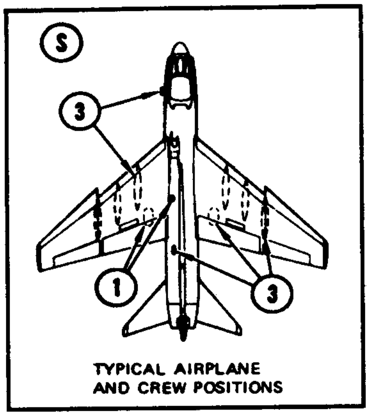
j. Do not perform refueling operation when electrical storms are within three miles.

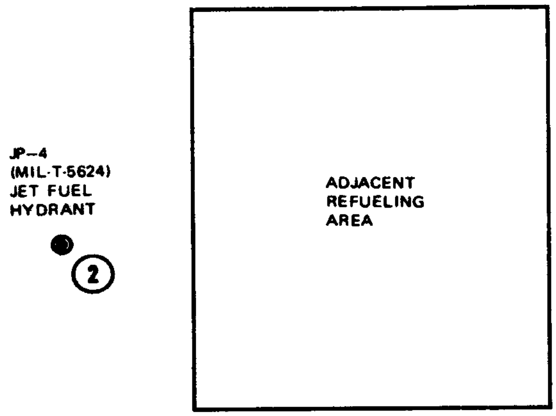
k. Do not allow unauthorized personnel in the 50-foot cordon safety zone during refueling operations.

l. Do not exceed refueling pressure of 55 psi.

m. Operate only those electrical switches required by the servicing procedure being performed.

n. Ensure that pre-inspection of pantograph has been conducted.





NOTE

1. Refueling Supervisor: The individual shall be at least a five level and trained and certified as required by MAJCOM directives.
2. Refueling Crew Members: Any hot refueling task qualified person in AFSC's 32XXX, 631X0, 42XXX, 43XXX, 462XX.
3. Pantograph/Crew Member: AFSC should be 631X0.
4. Crew members will be familiar with refueling procedures, safety precautions, hand signals (Reference AFR 60-11), and emergency procedures. Fire extinguishers shall be readily available to all members.

POSITION	CREW MEMBER	DUTY
S	Refueling Supervisor	Briefs refueling crew on all procedures and responsibilities. Directs movement of aircraft and all refueling activities. Maintains intercom communication with pilot and nozzle operator. Ensures aircraft and refueling area safe for refueling. Ensures munition safety devices are installed. Takes position in front of aircraft in full view of complete operation. Acts as fire guard and operates pantograph deadman control switch.
1	No. 1 – Nozzle Checker	Chocks and checks left main wheel for hot brakes. Extends and stows cockpit steps. Visually inspects left side of aircraft for leaks/damage. Pins left external tank fuel pylon. Inspects nozzle and receptacle. Connects and disconnects static grounds and refueling nozzle. Connects headset/microphone and maintains intercom communication with pilot and refueling supervisor. Complies with primary and secondary valve checks, and then takes position in left wheelwell area in full view of supervisor. Makes left external tank vent check and returns to position. Verifies that no air is being vented from left dump mast.
2	No. 2 – Pantograph/Hose Cart Operator	Performs pantograph preoperation check. Operates pantograph/refueling unit/hose cart and monitors fuel flow. Maintains visual contact with refueling supervisor during entire operation. Positions and bonds pantograph to aircraft.
3	No. 3 – Vent Checker	Chocks and checks right main wheel for hot brakes. Visually inspects right side of aircraft for leaks/damage. Pins right external tank fuel pylon. Checks right external tank vent to insure proper venting throughout refueling operation. Verifies that no air is being vented from right dump mast.

01D179-06-71

Figure 3-23. Typical Hot Refueling Crew Positions and Duties

o. Ensure that vent mast is unobstructed and that air is venting from the fuselage vent mast.

p. Ensure that no air is being displaced from the dump masts.

q. Ensure that aircraft positioning is such that existing winds will blow potential leakage from the SPR receptacle away from the aircraft's operating engine. Extreme care must be exercised to assure leakage from one aircraft SPR receptacle will not be blown into another aircraft's operating intake during dual (Type IV only) hot refueling.

r. Discontinue refuleing operation, if there is any doubt concerning the safety of the operation.

s. No aircraft, vehicles, or equipment will be parked or moved within the hot refueling 50-foot cordon safety zone during refueling.

t. Refueling supervisor must have verbal communications with pilot and nozzle operator, and maintain visual contact with the vent checker, and refueling unit operation (figure 3-23).

u. Ensure that FOD potential is removed.

v. Before starting refueling operations, all personnel will dissipate static potential by gripping the static ground line terminal clip.

3-73. PROCEDURES.

a. Observe refueling precautions.

b. Position aircraft as required.

WARNING

To perform hot brake inspections, approach main wheels from front or rear only, never from sides.

c. Check forward side of both main wheels and perform hot brake checks. Verify munition safety devices are installed. Inspect exterior of aircraft for obvious leaks or damage.

d. Install static grounding cables from ground to aircraft.

e. Position and bond pantograph to aircraft.

f. Open access 1222-3. Establish intercom communication between refueling supervisor, nozzle operator, and pilot.

CAUTION

Aircraft will not be hot refueled if fuel dump system has been activated during preceding flight.

g. Confirm with pilot that the fuel dump system was not activated during preceding flight. Also confirm that there are no known fuel system problems.

h. Extend cockpit steps. Install external tank pylon safety pins.

i. Inspect SPR receptacle for serviceability.

WARNING

The refueling nozzle must be locked to prevent fuel spillage, which could result in fire and/or explosion.

j. Connect refueling nozzle to aircraft receptacle, turn valve (handle) on, and ensure nozzle cannot be rotated and disconnected.

k. Ensure primary and secondary precheck valves and fuselage and wing defuel valves are in NORMAL position.

WARNING

If fuel spillage occurs, cease refueling and refer to emergency spillage procedures in paragraph 3-74 below.

If fuel flow does not shut off within 10 seconds when checking primary and secondary float valves, discontinue refueling immediately. Complete refueling of aircraft with faulty float valves or pressure shutoff valve will result in fuel overflow from vent mast and possible damage to bladder fuel tanks.

Partial fuselage fuel load (M pointer) must be 4,000 pounds minimum for flight to allow for normal fuel transfer. Less than minimum fuel load may cause a fuel state substantially lower than 1,000 (+) 200 pounds when fuel low level caution light comes on.

l. Start servicing equipment and fuel flow.

NOTE

Steps m. through p. should be performed within the first few minutes of refueling.

m. Rotate primary precheck valve handle to PRECHECKand hold. If fuel does not cease to flow within 10 seconds, stop refueling operation immediately and correct malfunction in accordance with T.O. 1A-7D-2-6.

n. Verify with pantograph operator that fuel flow has completely stopped.

o. If fuel flow stops during primary precheck operation, rotate primary handle to NORMAL and continue refueling.

p. Repeat steps m. through o. using secondary precheck valve.

CAUTION

To prevent damage to aircraft or fuel spill, check that air is venting from fuselage vent mast and NO air is venting from dump masts.

q. Check fuselage fuel vent and dump masts for air venting.

r. Continue refueling until fuel flow stops automatically.

NOTE

Internal tanks must be full before external tanks can be serviced. If external tanks do not require servicing, omit steps r. through u. and continue with step v. when wing and fuselage tanks are full.

s. If external tanks require servicing, place external tank ground refueling switch in REFUEL position and start fuel flowing. Place switch in OFF position. If fuel flow does not cease within 10 seconds, stop fueling operation and correct malfunction in accordance with T.O. 1A-7D-2-6.

t. After fuel flow stops with external tank ground refuellng switch in OFF, advise pilot to activate air refueling system and continue refueling.

CAUTION

To prevent damage to aircraft, check that air is venting from pylon overboard vents.

u. Observe pylon external tank vents to ensure air is venting from fuel system.

v. Continue refueling until fuel flow stops automatically.

w. Check with pilot and if refueling has been completed, advise pilot to deactivate air refueling system.

x. Release grip on deadman switch and stop servicing equipment.

y. Close nozzle valve (handle).

CAUTION

Install refueling manifold cap so that chain attachment point is within the 12 to 1 o'clock position and attaching chain length is 5 1/2 inches maximum. This is to reduce possibility of fuel cap rotating, becoming disengaged, and flailing loose within the wheel well or from being lost during flight.

z. Wait 10 seconds. Disconnect nozzle from aircraft. Install fuel cap on manifold and rotate cap to the fully locked position.

aa. Disconnect pantograph bond wire from aircraft and position pantograph clear of aircraft taxiway.

ab. Stow cockpit steps.

ac. Inform pilot of fuel quantity serviced; obtain clearance from pilot to disconnect intercom communication. Close access 1222-3.

WARNING

To prevent static electricity arcing and causing a possible fire or explosion, disconnect static ground from aircraft last.

ad. Disconnect aircraft static ground.

ae. Remove chocks and direct aircraft from refueling area.

3-74. EMERGENCY PROCEDURES:

a. Fire in hot pit area.

(1) Stop fuel flow immediately.

(2) Direct pilot to shut down engine and evacuate aircraft.

(3) Notify fire department and activate fire protection equipment.

(4) Evacuate non-essential personnel.

b. Fire outside hot refueling area.

(1) Stop fuel flow immediately.

(2) Disconnect refueling nozzle and bond wire.

(3) Disconnect interphone cord, remove chocks and ground wire.

(4) Direct pilot to taxi from refueling area.

(5) Man fire protection equipment and notify fire department.

c. Fuel leak/spill.

(1) Stop fuel flow immediately.

(2) Direct pilot to shut down engine and evacuate aircraft.

(3) Evacuate non-essential personnel from area.

(4) Wash down area.

3-75. DEFUELING.

WARNING

Ensure that airplane and defueling unit are statically grounded. Defueling unit shall be grounded to airplane. Serious fire or explosion may occur as a result of improper grounding, causing injury to servicing personnel and damage to equipment.

NOTE

Due to the installation of foam material in the fuel tanks, some fuel will remain temporarily trapped in the foam and may require additional draining to remove all residual fuel.

3-76. All Internal Fuel — (Using Motive Flow). Procedures in this paragraph provide the most expeditious method for complete airplane defueling. Using this method, fuel will not be trapped in wing or aft tank and only a small amount of residual fuel will remain. However, this method requires one pressure fueling unit, one defueling unit, and application of external electrical power. If electrical power cannot be applied or only one fueling unit is available, refer to paragraph 3-77 for defueling.

WARNING

Do not use defueling procedure to obtain a partial fuselage fuel load for flight operations. If defueling is required to obtain a partial fuselage fuel load for flight, defuel airplane internal tanks and reservice according to paragraph 3-65; otherwise, abnormal fuel loading may result in the fuselage fuel system. Abnormal internal fuel loading can cause a fuel state substantially lower than 1,000 (±200) pounds when the fuel low level caution light comes on.

NOTE

To ensure complete defueling, airplane must be at normal attitude (3° to 5° nose high).

a. Inspect fuel vent mast for obstructions to ensure that fuel system will be vented during defueling.

b. Install static grounding cables (figure 3-22).

c. Open access 6222-1.

CAUTION

To prevent rupture of CSD fuel oil cooler by thermal expansion of fuel, do not leave motive flow coupling disconnected without draining some fuel from CSD cooler and do not crank engine with coupling disconnected.

d. Disconnect motive flow hose in access 6222-1 at engine quick-disconnect.

e. Connect locally fabricated defueling hose (figure 3-24) to motive flow hose.

f. Connect fuel pressure source to adapter hose.

g. Remove cap from fueling manifold.

h. Connect defueling nozzle to fueling manifold.

i. Ensure that fuselage defueling valve is in NORMAL.

NOTE

Ensure that valve internal components are not broken by rotating handle approximately 3/4 inch past defuel wing position. If handle moves further, internal components may be broken and repair/replacement is required.

j. Rotate wing defueling valve handle to DEFUEL WING.

k. Ensure master fuel control lever is OFF.

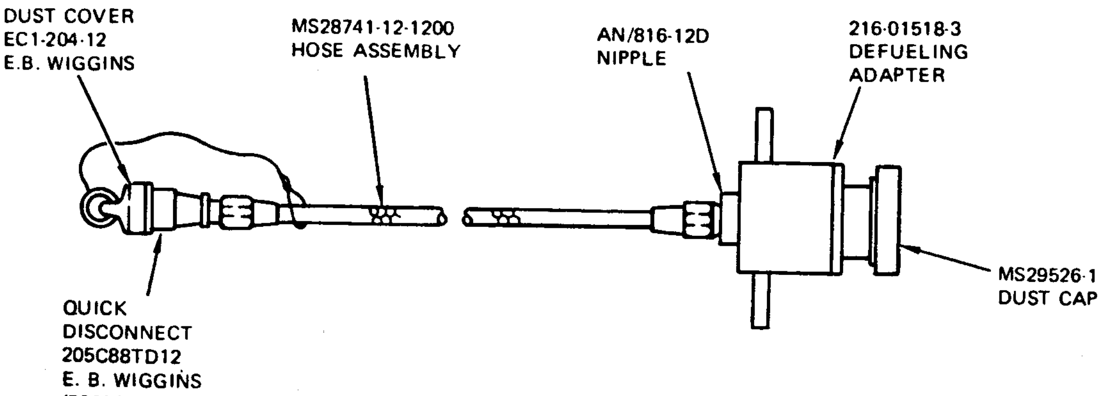
l. Connect and apply external electrical power (paragraph 1-28).

m. Start defueling pump and observe that transfer (T) pointer on fuel quantity indicator starts decreasing.

NOTE

Some fuel may be removed from main system during wing defueling.

n. When transfer (T) pointer reaches approximately 300 pounds, place fuselage defueling valve in DEFUEL FUSELAGE and wing defueling valve in NORMAL.



1. The 216-01518-3 defueling adapter may be removed from 216-01906-4 hose assembly or obtained from spares. Retain the AN/816-12D nipple when the adapter is detached from the rest of the assembly.
2. Attach a 120-inch hose (MS28741-12-1200) to the defueling adapter.
3. On the opposite end attach a quick disconnect. If this item not in stock, it may be procured from E. B. Wiggins, Los Angeles, California, (Mfg Code 79326).
4. The addition of dust covers for each end of the assembly completes the fabrication.

01D186–09–75

Figure 3-24. Defueling Hose Assembly

o. Using an auxiliary pressure source, apply 50 to 60 psig fuel pressure to motive flow system through adapter hose.

p. Place wing fuel transfer switch in EMERG. When transfer (T) pointer indicates zero, return switch to AUTO. Repeat switch cycle as necessary during defueling if transfer (T) pointer indicates other than zero.

q. Continue defueling until main (M) pointer indicates zero.

NOTE

Shut off auxiliary motive flow pressure source first.

r. Shut off motive flow pressure and stop defueling pump.

s. Rotate fuselage defueling valve handle to NORMAL.

t. Disconnect pressure source from adapter hose.

u. Disconnect adapter hose from motive flow hose.

v. Connect motive flow hose to engine quick disconnect.

NOTE

Do not grasp or hold sliding collar when checking coupling. Force required to unlock coupling is small and disconnect could result.

w. Check that coupling is properly locked by pulling and pushing on 90° elbow attached to female coupling half.

CAUTION

Install fueling manifold cap so that chain attachment point is within the 12 to 1 o'clock position and attaching chain length is 5 1/2 inches maximum. This is to reduce possibility of fuel cap from rotating, becoming disengaged, and flailing loose within the wheel well or from being lost during flight.

x. Disconnect defueling nozzle, replace cap on fueling manifold, and rotate cap to fully locked position.

y. If complete draining is required, place safety approved container (TO 00-25-172) under each wing dump mast and place fuel dump switch in dump. When fuel stops draining, place switch in OFF.

z. Disconnect electrical power (paragraph 1-28).

aa. Drain fuel from all water drains into a safety approved container (TO 00-25-172) (figure 1-19).

ab. Disconnect static grounding cables.

ac. Close access 6222-1.

3-77. All Internal Fuel (Using Defueling Pump Only).

CAUTION

Do not use defueling procedure to obtain a partial fuel load for flight operations. If defueling is required to obtain a partial fuel load for flight, defuel airplane internal tanks and reservice according to paragraph 3-65; otherwise, abnormal fuel loading may result in the fuselage fuel system. Abnormal internal fuel loading can cause a fuel state substantially lower than 1,000 (±200) pounds when the fuel low level caution light comes on.

a. Inspect fuel vent mast for obstructions to ensure that fuel system will be vented during defueling.

NOTE

Ensure that valve internal components are not broken by rotating handle approximately 3/4 inch past defuel wing position. If handle moves further, internal components may be broken and repair/replacement is required.

b. Rotate wing defueling valve handle to DEFUEL WING.

c. Ensure that fuselage defueling valve is in NORMAL.

d. Install static grounding cables (figure 3-22).

e. Remove cap from fueling manifold by turning counterclockwise.

f. Connect defueling nozzle to fueling manifold.

NOTE

Approximately 20 gallons of fuel may remain in each side of the wing fuel tank after single point defueling of a fully serviced airplane. For complete defueling, the residual fuel may be drained through wing tank fuel drains into a safety approved container (TO 00-25-172), or defuel airplane to 4,500 pounds total fuel remaining and disconnect defueling unit. Start engine, select wing emergency transfer, and monitor fuel transfer for 5 minutes. Shut down engine, reconnect defueling unit, and continue single point defueling.

g. Start defueling pump and continue until fuel ceases to flow.

h. Rotate fuselage defueling valve handle to DEFUEL-FUSE.

i. Rotate wing defueling valve handle to NORMAL.

NOTE

Approximately 60 gallons of fuel will remain in the aft fuselage tank when internal tanks are defueled. For complete defueling of aft fuselage tank, refer to paragraph 3-79.

j. When fuel ceases to flow, stop defueling pump and rotate fuselage defueling valve handle to NORMAL.

k. Disconnect defueling nozzle.

CAUTION

Install fueling manifold cap so that chain attachment point is within the 12 to 1 o'clock position and attaching chain length is 5 1/2 inches maximum. This is to reduce possibility of fuel cap from rotating, becoming disengaged, and flailing loose within the wheel well or from being lost during flight.

l. Replace cap on fueling manifold and rotate cap to fully locked position.

m. Disconnect static grounding cables.

3-78. Wing Fuel Tanks Only.

a. Inspect fuel vent for obstructions to ensure that fuel system will be vented during defueling.

NOTE

Ensure that valve internal components are not broken by rotating handle approximately 3/4 inch past defuel wing position. If handle moves further, internal components may be broken and repair/replacement is required.

b. Rotate wing defueling valve handle to DEFUEL WING.

c. Ensure that fuselage defueling valve handle is in NORMAL.

d. Install static grounding cables (figure 3-22).

e. Remove cap from fueling manifold.

f. Connect defueling nozzle to fueling manifold.

NOTE

Approximately 20 gallons of fuel will remain in each side of the wing fuel tank after single point defueling of a fully serviced airplane. For complete defueling, the residual fuel may be drained through wing tank fuel drains into a safety approved container (TO 00-25-172), or defuel airplane to 4,500 pounds total fuel remaining and disconnect defueling unit. Start engine, select wing emergency transfer and monitor fuel transfer for 5 minutes. Shut down engine, reconnect defueling unit and continue single point defueling.

g. Start defueling pump and continue operation until fuel flow stops.

h. When fuel flow ceases, stop defueling pump and disconnect defueling nozzle.

i. Rotate wing defueling valve handle to NORMAL.

CAUTION

Install fueling manifold cap so that chain attachment point is within the 12 to 1 o'clock position and attaching chain length is 5 1/2 inches maximum. This is to reduce possibility of fuel cap from rotating, becoming disengaged, and flailing loose within the wheel well or from being lost during flight.

j. Replace cap on fueling manifold and rotate cap to fully locked position.

k. Disconnect static grounding cables.

3-78A. WING FUEL TANKS ONLY (Using Defueling Truck Only).

a. Inspect fuel vent for obstructions to ensure that fuel system will be vented during defueling.

NOTE

Ensure that valve internal components are not broken by rotating handle approximately 3/4 inch past defuel wing position. If handle moves further, internal components may be broken and repair/replacement is required.

b. Rotate wing defueling valve handle to DEFUEL WING.

c. Ensure that fuselage defueling valve handle is in NORMAL.

d. Install static grounding cables (figure 3-22).

e. Remove cap from fueling manifold.

f. Connect defueling nozzle to fueling manifold.

g. Start defueling pump and continue operation until fuel flow stops.

h. Rotate fuselage defueling valve handle to DEFUEL FUSELAGE and continue to defuel additional 60 gallons of fuel, which will equal approximately 4200 pounds total fuel remaining, and stop defueling.

i. Rotate wing defueling valve handle to NORMAL.

j. Rotate fuselage defueling valve handle to NORMAL.

k. Disconnect defueling nozzle from aircraft.

CAUTION

Install fueling manifold cap so that chain attachment point is within the 12 to 1 o'clock position and attaching chain length is 5 1/2 inches maximum. This is to reduce possibility of fuel cap rotating, becoming disengaged and flailing loose within the wheel well, or from being lost during flight.

l. Replace cap on fueling manifold and rotate cap to fully locked position.

m. Disconnect static grounding cables.

NOTE

Approximately 20 gallons of fuel may remain in each side of the wing fuel tank after single point defueling.

n. Drain residual fuel from wing fuel tank through the wing fuel drains into a safety approved (TO 00-25-172) container. After all residual fuel has been drained, ensure wing fuel drains are closed.

o. Connect and apply external electrical power (paragraph 1-30) to verify total remaining fuel quantity is below 4200 pounds and T pointer on fuel quantity gage is pointing to zero.

p. Disconnect external electrical power (paragraph 1-30).

3-78B. WING FUEL TANKS ONLY (Optional Method–Using Defueling Truck and Engine Operation).

a. Inspect fuel vent for obstructions to ensure that fuel system will be vented during defueling.

NOTE

Ensure that valve internal components are not broken by rotating handle approximately 3/4 inch past defuel wing position. If handle moves further, internal components may be broken and repair/replacement is required.

b. Rotate wing defueling valve handle to DEFUEL WING.

c. Ensure that fuselage defueling valve handle is in NORMAL.

d. Install static grounding cables (figure 3-22).

e. Remove cap from fueling manifold.

f. Connect defueling nozzle to fueling manifold.

g. Start defueling pump and continue operation until fuel flow stops.

h. Rotate fuselage defueling valve handle to DEFUEL FUSELAGE and continue to defuel additional 60 gallons of fuel, which will equal approximately 4200 pounds total fuel remaining, and stop defueling.

i. Rotate wing defueling valve handle to NORMAL.

j. Rotate fuselage defueling valve handle to NORMAL.

k. Disconnect defueling nozzle from aircraft.

CAUTION

Install fueling manifold cap so that chain attachment point is within the 12 to 1 o'clock position and attaching chain length is 5 1/2 inches maximum. This is to reduce possibility of fuel cap rotating, becoming disengaged and flailing loose within the wheel well, or from being lost during flight.

l. Replace cap on fueling manifold and rotate cap to fully locked position.

m. Disconnect static grounding cables.

n. To remove most of the wing residual fuel, it is necessary to start engine (paragraph 2-51).

o. Select wing emergency fuel transfer and monitor fuel quantity gage until fuel level indicates below 4200 pounds total fuel remaining and T pointer is at zero indicating wings are empty.

p. Reposition wing emergency fuel transfer switch to AUTO and shut down engine (paragraph 2-51).

NOTE

Approximately 20 gallons of fuel may remain in each side of the wing fuel tank after single point defueling.

q. Drain residual fuel from wing fuel tank through the wing fuel drains into a safety approved (TO 00-25-172) container. After all residual fuel has been drained, ensure wing fuel drains are closed.

3-79. Aft Fuselage Tank.

NOTE

Approximately 60 gallons of fuel will remain in the aft fuselage tank when internal tanks are defueled using defueling pump only. This procedure removes residual fuel from aft fuselage tank.

a. Open access 5213-3.

b. Install static grounding cables (figure 3-22)

c. Remove protective cap from aft tank quick-disconnect and connect fuel drain hose adapter to airplane quick-disconnect.

d. Connect defueling nozzle to drain hose adapter.

e. Start defueling pump and continue operation until fuel ceases to flow.

f. Stop defueling pump and disconnect defueling nozzle.

g. Install protective cap on quick-disconnect and ensure that retaining cable is secured to nearest armorplate bracket with MS20995C32 lockwire.

h. Cycle alternate fuel feed controls and check for possible interference of retaining cable with selector valve lever and actuator rod.

i. Disconnect static grounding cables.

j. Close access 5213-3.

3-80. External Tanks.

NOTE

Defueling external tanks should be accomplished prior to defueling fuselage fuel tanks to achieve minimum defueling time.

a. Connect and apply external electrical power (paragraph 1-28). Ensure that power unit is located 50 feet, or length of electrical cable, upwind from airplane.

b. Press fuel quantity indicator press-to-test switch. Pointers should rotate counterclockwise to zero.

c. Release fuel quantity press-to-test switch. Pointers should return to tank quantity indication.

NOTE

Ensure that valve internal components are not broken by rotating handle approximately 3/4 inch past defuel wing position. If handle moves further, internal components may be broken and repair/replacement is required.

d. Rotate wing defueling valve to DEFUEL-WING.

e. Ensure that fuselage defueling valve is in NORMAL.

f. Install static grounding cables (figure 3-22).

g. Connect defueling nozzle to fueling manifold.

CAUTION

Do not use C-clamp to actuate gear up-and-locked switch. Excessive pressure will damage switch. An MS21919 clamp or equivalent, hand-formed to provide sufficient pressure, can be used to actuate switch.

h. Manually actuate landing gear up-and-locked switch in right wheel well to simulate gear up and locked.

i. Open access 2212-7. Connect external air pressure hose to hose adapter set and connect adapter set to ground air connector. Apply 30- to 100-psi air pressure.

j. Start defueling pump. Monitor fuel quantity indicator and stop operation when all stations indicate empty.

k. Return landing gear up-and-locked switch to normal position.

l. Disconnect defueling nozzle from fueling manifold.

CAUTION

Install fueling manifold cap so that chain attachment point is within the 12 to 1 o'clock position and attaching chain length is 5 1/2 inches maximum. This is to reduce possibility of fuel cap from rotating, becoming disengaged, and flailing loose within the wheel well or from being lost during flight.

m. Replace cap on fueling manifold and rotate cap to fully locked position. Disconnect static grounding cables.

n. Disconnect external electrical power.

o. Disconnect air pressure line.

p. Close access 2212-7.

3-81. FUEL SYSTEM CONTAMINATION CHECK.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		NOTE All sampling equipment will be obtained from Base Fuels Quality Control Laboratory.	
		Bottles, 1 quart clear glass	Container for fuel samples.
		Sump sampler	For draining fuel from sump into bottles.
		Solvent dispenser, plastic	For cleaning and rinsing equipment with solvent.
	P-D-680, Type II	Solvent, drycleaning	For cleaning and rinsing sampling equipment.
		Wiping cloths, disposable	For cleaning sampling equipment.
		Cans, 1 gallon capacity	For waste fuel containers.

3-82. GENERAL.

a. Samples must be taken from sumps of airplane fuel tanks (figure 1-19). Samples from other locations will not be used to determine cleanness levels within airplane.

NOTE

The left and right forward fuselage tanks are not equipped with sump drains. The tanks feed directly into the sump tank. Water and contaminants from the forward fuselage tanks will drain into the sump tank. Therefore, contaminants found in airplane sump tank fuel sampled may originate in one of the forward fuselage tanks.

If necessary to determine amount of water drained, one or two drops of water soluble food coloring placed in container before drainage will aid in distinguishing water from fuel.

b. If excessive free or entrained water is still present in fuel samples after performing draining and sampling procedures contained in paragraph 3-83, draining and sampling of fuel shall continue until fuel is free of water or until it is evident that complete defueling is necessary. Record estimated amount of water drained from sump tank.

c. If quantity of sample analyzed differs from 1 quart, the quantity must be reported along with total solids.

d. Microscopic analysis of solids can provide identification of contamination types and sources and is therefore recommended as a procedure to follow when contamination limits are exceeded.

3-83. FUEL SAMPLES.

NOTE

Qualified personnel per T.O. 42B-1-1 shall draw and process fuel samples.

a. Clean sample bottles by washing with a soap solution (laboratory glassware). Rinse bottles with tap water, then demineralize in distilled water and dry in oven.

WARNING

Solvent P-D-680, Type II, is flammable and toxic. Skin and eye protection is required; good general ventilation or respiratory protection is required.

b. Clean exterior of airplane fuel drains (figure 1-19) with clean, disposable wiping cloth wet with P-D-680 solvent.

NOTE

To test each sump fuel sample individually or as a composite sample may be base local option.

c. Drain 1 quart of fuel from sump by draining approximately 1/3 quart, stop for 5 seconds, drain another 1/3 quart, stop for 5 seconds, and then drain the remaining 1/3 quart. Discard this sample.

d. Clean interior and exterior of airplane sump sampler with clean wiping cloth and rinse with solvent.

e. Using clean, clear glass quart bottle, drain 1 quart fuel sample from sump. Visually determine if fuel sample contains water or solids exceeding following criteria:

1. Water – covers more than half of bottom surface of bottle or fuel sample is cloudy or hazy denoting entrained water.

2. Solids – more than 20 Particles.

f. If sample does not contain solids or water exceeding limits specified in step e, analyze sample in laboratory (paragraph 3-84) for solids content.

g. If excessive water or solids are noted, discard fuel sample. Drain an additional 1/2 gallon of fuel from sump and discard.

h. Clean interior and exterior of sump sampler with clean wiping cloth and rinse with solvent. Drain 1 quart sample into clean, clear glass bottle and analyze sample in laboratory for solids content.

3-84. LABORATORY ANALYSIS

NOTE

Solids shall be reported in milligrams. Do not convert weight to milligrams–per–gallon. If quantity of sample analyzed is less or greater than 1 quart, that quantity must be reported along with total solids.

a. Determine solids content contained in fuel sample. Use bottle method specified in base level quality assurance section of T.O. 42B-1-1 for aircraft sump samples.

b. If sample contains visual free water, in addition to requirements specified in bottle method analysis, wash membrane filter with 50 milliliters of distilled or demineralized water after final petroleum ether rinse.

3-85. CONTAMINATION LIMITS.

a. Contamination is considered excessive if solids content is more than 4.0 milligrams and appearance of membrane filter (when compared to particle assessment guide) is equal to or greater than G (T.O. 42B-1-1).

b. Both weight and quantity of solids on particle assessment guide must exceed limits to consider sample a failure. Stains or background color shall not be considered.

c. If contamination exceeds limits specified in step a, a one quart recheck sample shall be taken and analyzed to verify results.

3-86. EXCESSIVE CONTAMINATION.

a. Defuel airplane (paragraph 3-75).

b. Inspect engine fuel filters (T.O. 1A-7D-2-5) and clean or replace filter as necessary.

c. Refuel airplane (paragraph 3-63).

d. Draw new fuel samples from airplane and analyze.

e. Results of new fuel sample analysis shall be within limits specified in paragraph 3-85 before releasing airplane for flight.

f. Failure of samples to meet contamination limits shall require entry (T.O. 1A-7D-2-6) and cleaning of airplane fuel tanks.

3-87. OXYGEN SYSTEM SERVICING. (See figure 3-25.)

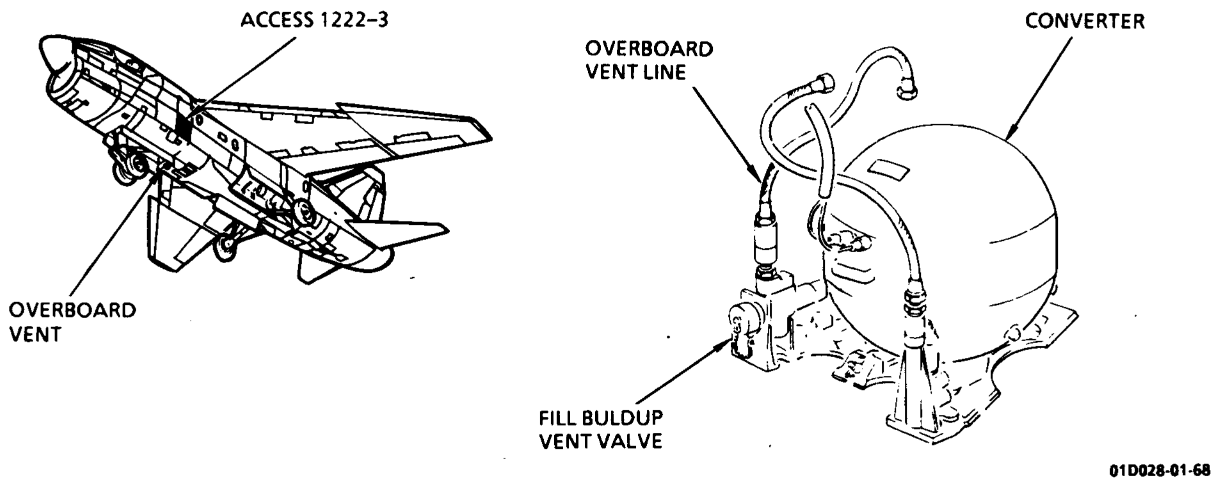


Figure 3-25. Oxygen System Servicing

3-88. GENERAL PRECAUTIONS.

WARNING

Serious fire or explosion may occur, causing injury to personnel or damage to aircraft and equipment. Insure availability of a serviceable class B fire extinguisher is in the immediate area.

a. Fire extinguishing equipment required in accordance with T.O. 00-25-172 shall be available during servicing.

b. Personnel not directly involved in the servicing operation shall be restricted from within 20 foot radius of the aircraft being serviced. This restriction includes personnel working on nearby aircraft.

c. The following protective clothing shall be worn when servicing oxygen system (T.O. 00-25-172 and AFM 127-101).

1. Face shield.
2. Hat.
3. Leather gloves with wool inserts.
4. Protective apron.
5. Trousers, cuffless.
6. Shirt or jacket with long sleeves.
7. Shoes or boots with rubber soles and heels.

NOTE

Shoes will be tightly laced and trouser legs will extend over shoe tops to prevent dangerous accumulation of any spillings.

d. LOX servicing shall be accomplished in an adequately ventilated area. Area shall be free of sparks, flame, and oil or fuel vapors.

e. External electrical power shall not be connected and battery switch shall be in OFF.

f. Airplane static grounding cables shall be installed. Statically ground aircraft and oxygen servicing cart to the same ground. Bases with ramps that have grid grounding systems where all grounding points are interconnected are considered the same approved static ground provided each meets the criteria outlined in AFM 85-16. The liquid oxygen cart servicing hose provides the bond between the cart and the aircraft. Servicing can then begin.

g. Refer to T.O. 00-25-172 for additional safety precautions.

NOTE

Following each purge sequence, a purge/servicing record form typical to that shown in T.O. 15X-1-1, or applicable aircraft manual, will be documented and attached to the specific converter. This record will remain with the assembly until such time as it is replaced with a new form at the next purge sequence.

3-89. SERVICING CONVERTER IN AIRCRAFT.

CAUTION

Statically ground the aircraft and the liquid oxygen servicing cart to a common ground before connecting the liquid oxygen service cart hose to the aircraft.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	TMU27M or MA 1	Lox servicing trailor	Service liquid oxygen converter.

a. Open access 1222-3.

NOTE

Care must be exercised when filling a liquid oxygen converter system that is 75 percent or more full. A false fill can easily be experienced during the servicing of an almost full converter.

b. Place clean container (drip pan) under overboard vent to catch overflow.

c. Remove cap from fill-build-up vent valve.

d. Inspect the filler valve for any type of contamination and remove, if present, with a clean lint free cloth and/or suitable dry, water pumped, compressed air.

NOTE

On converters equipped with type CRU-50A combination fill, build-up and vent valves, affix an Essex Vent Cap, part no. 50C-0020-1 or a spare CRU-59E female filler adaptor or equivalent accessory device to the CRU-50A fill valve and allow operating pressure to deplete (T.O. 15X-1-1-1, Section VI)

e. Build-up pressure on service cart to 30 (±5) psi and open valve on trailer.

f. Purge the service cart hose until liquid oxygen flows from the service cart hose female filler valve.

g. Remove the venting accessory cap and immediately connect the LOX service cart female filler connector to the aircraft filler valve using a two step procedure:

(1) Engage "J" slots

(2) Torque the mating mechanism into the final fill position.

CAUTION

If the converter fails to vent or frost patches appear on the upper portion of the container during servicing, discontinue servicing immediately. Drain and remove the converter from the aircraft and perform an open vented evaporation loss test in accordance with the applicable basic technical order for that particular converter, after the unit has been thoroughly hot purged and called to ambient temperature.

h. Slowly open valve on LOX trailer and fill converter with MIL-O-27210 LOX at 30 (±5) psi until a steady stream of LOX drains from overboard vent, interrupted by gaseous spurts.

NOTE

A pressure drop of a least 10 psi is experienced between the servicing cart and the converter. The pressure will drop 15 psi at cart servicing pressure of 50 psig.

WARNING

Do not, under any circumstances, allow the converter to build-up operating pressures immediately after filling. On converters equipped with type CRU-50A combination fill, build-up and vent valve, install a venting tool such as ESSEX part no. 50C-0020-1 or equivalent, immediately after disconnecting the fill supply connector.

Allow the converter to remain isolated and undisturbed for a minimum of two hours prior to moving or pressurizing. After the two hour stabilization period, remove the venting tool or place the valve selector in build-up and allow the converter to pressurize.

i. Close the fill drain valve on the servicing trailer and disconnect service cart hose "female filler valve" from aircraft filler valve. Install ESSEX Vent Cap, or spare CRU-59E female filler adapter. Allow to open vent 2 hours minimum.

j. Vent trailer oxygen service line.

NOTE

The fill build-up vent valve plunger may freeze and allow backflow from valve. If this occurs, allow ambient temperature to thaw valve.

k. Check system for leakage.

l. Close access 1222-3.

WARNING

Never pressurize the converter system immediately after filling. Allow as much time as can be afforded prior to placing the system in build-up. Liquid oxygen is very unstable and boils violently after being transferred. Failure to allow adequate time for stabilization by open venting after filling can result in valve blockage and subsequent explosion, where the system has been contaminated with moisture. On other occasions, pressurizing an unstable system will cause fill check leakage of the combination fill build-up and vent valve, continuous venting overboard and permanent damage to all valves and the container by vibration from erratic pressures testing should not be attemptedwithin two hours after filling due to the stated instability.

m. Permit the liquid oxygen converter system to stabilize before conducting any operational checks.

NOTE

To prevent erroneous low pressure warning during the first few minutes of flight following oxygen system servicing or maintenance, the system must be stabilized by free flowing oxygen.

n. Free flow oxygen for 30 to 40 seconds by positioning pilot's regulator supply valve to ON, pressure control to Emergency and diluter control to 100%. Hold oxygen hose dust cover open to allow free flow and check regulator flow indicator for operation while oxygen is flowing.

NOTE

Inspect for safety wire hole in ON/OFF leaver. If undrilled, it will be necessary to drill safety wire holes large enough for 0.020 copper wire.

o. Safety regulator supply valve in ON position with breakway copper wire (0.020 inch maximum).

Return pressure control and diluter control to normal.

3-90. SERVICING CONVERTER OUT OF AIRCRAFT.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and application
	TMU27M or MA 1	Lox servicing trailor	Service liquid oxygen converter.
	(Local fabrication)	Oxygen servicing vent tube	Vent liquid oxygen couverter

CAUTION

Statically ground the converter and the liquid oxygen servicing cart to a common ground before connecting the liquid oxygen service cart hose to converter fill valve.

NOTE

Care must be exercised when filling a liquid oxygen converter system that is 75 percent or more full. A false fill can easily be experienced during the servicing of an almost full converter.

a. Connect servicing vent tube (local fabrication, paragraph 3-91) to vent coupling of the converter. This will serve to direct the liquid overflow downward and away from servicing personnel. Place an oil and grease free container directly under vent drain line to prevent damage to flooring.

b. Remove cap from converter fill-build-up and vent valve.

c. Inspect the filler valve for any type of contamination and remove, if present, with a clean lint free cloth and/or suitable dry, water pumped, compressed air.

NOTE

On converters equipped with type CRU-50A combination fill, build-up and vent valves, affix an Essex Vent Cap, part no. 50C-0020-1 or a spare CRU-59E female filler adaptor or equivalent accessory device to the CRU-50A fill valve and allow operating pressure to deplete (T.O. 15X-1-1, Section XI).

d. Build-up pressure on service cart to 30 (±5) psi and open valve on trailor.

e. Purge the service cart transfer hose until liquid oxygen flows from the service cart hose female filler valve.

f. Remove the venting accessory cap and immediately connect the LOX service cart female filler connector to the converter filler valve using a two step procedure:

(1) Engage "J" slots

(2) Torque mating mechanism into the final fill position.

NOTE

A pressure drop of a least 10 psi is experienced between the servicing cart and the converter. The pressure will drop 15 psi at cart servicing pressure of 50 psig.

CAUTION

If the converter fails to vent or frost patches appear on the upper portion of the container during servicing, discontinue servicing immediately, drain the converter, hot purge the unit thoroughly, cool to ambient temperature and perform an open vented evaporation loss test in accordance with the applicable basic technical order for the particular converter.

g. Slowly open valve on LOX trailer and fill converter with MIL-O-27210 LOX at 30 (±5) psi until a steady stream of LOX drains from vent tube, uninterrupted by gaseous spurts.

h. Close the fill-drain valve on the servicing trailer, and disconnect the transfer hose from the converter. Install ESSEX Vent Cap, or spare CRU-59E female adapter. Allow to open vent 2 hour minimum.

h-1. Vent trailer oxygen service line.

WARNING

Do not, under any circumstances, allow the converter to build-up operating pressures immediately after filling. On converters equipped with type CRU-50A combination fill, build-up and vent valve, install a venting tool such as ESSEX part no. 50C-0020-1 or equivalent, immediately after disconnecting the fill supply connector.

Allow the converter to remain isolated and undisturbed for a minimum of two hours prior to moving or pressurizing. After the two hour stabilization period, remove the venting tool or place the valve selector in build-up and allow the converter to pressurize.

NOTE

The fill build-up vent plunger may freeze and allow backflow from the valve. If this occurs, allow ambient temperature to thaw the valve.

i. Disconnect vent tube from coupling.

j. Cap vent coupling and cap.

k. Allow vent tube to dry and cap vent tube.

3-91. OXYGEN SERVICING VENT TUBE FABRICATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	use and Application
	413-900-020 (American Tool and Engineering Co.)	Torque wrench, 100 to 750 pound – inches	Apply proper torque.

a. Assemble vent tube using one MS24548-8-18 hose assembly and one 256000-1 coupling (Essex Mfg. St. Louis, Mo.).

b. Attach hose to coupling and tighten nut 350 (±50) pound-inches torque.

WARNING

Ensure that vent tube is free of grease, oil, or any hydrocarbon to prevent possible explosion resulting in injury to personnel or loss of life.

c. Cap end of vent tube assembly.

3-92. **LUBRICATION.** (See figure 3-26.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	use and Application
	7225379-10 (Oklahoma City ALC)	Block assy, rigging	Support UHT for bearing lubrication.
	MIL-G-3859	Grease gun	Lubricate fittings.

3-93. **NOSE SHOCK STRUT LOWER BEARING LUBRICATION.**

a. Attach tow bar to nose landing gear.

b. Slowly rotate nose gear in small increments through an arc of approximately 90° while applying MIL-G-23827 grease to strut lubrication fitting (located on front of strut housing at lower end).

c. Check for appearance of grease at lower strut bearing. If grease does not appear at lower bearing, jack airplane nose section (paragraph 2-[illegible]) and repeat step b.

3-94. **UHT HOUSING BEARING LUBRICATION.**

a. Open accesses 5132-1 and 6132-1.

CAUTION

Do not use rigging block to move UHT. Excessive loads can cause damage to bulkhead.

b. Move UHT trailing edge fully up to provide access to housing bearing lubrication fittings. Support UHT with rigging block assembly.

c. Lubricate four Zerk fittings (T.O. 1A-7D-6WC-2).

d. Remove rigging block assembly.

e. Install accesses 5132-1 and 6132-1.

3-95. **AIRCRAFT CARGO POD ASSEMBLY, MXU-648/A.**

3-96. INSTALLATION. (Refer to T.O. 1A-7D-35.)

3-97. CARGO LOADING PROCEDURE.

3-98. METHOD OF LOCATING THE CENTER OF GRAVITY.

a. If the center of gravity, and weight of the empty MXU-648/A and each item of cargo are known, use the following procedure to determine the center of gravity of the loaded pod.

1. Determine the moment of each piece of cargo loaded in the MXU-648/A around the forward suspension lug. This is done by multiplying the weight of each item of cargo by the distance in inches from the center of gravity of each item to the forward lug. All distances forward of the forward lug are negative and therefore produce a negative moment. Add the sum of these moments to the moment of the empty MXU-648/A around the forward lug (see Table 3-8), and divide this sum by the total weight of the MXU-648/A and cargo. This gives the distance in inches that the center of gravity of the loaded MXU-648/A is located from the forward suspension lug. Check the results to ensure that it complies with the center-of-gravity limits of paragraph 3-9a. (3).

EXAMPLE: The MXU-648/A with removable tail cone is to be loaded with 125 lbs. of baggage. The baggage consists of 3 items; one 40-pound item to be located 10-inches forward of the forward lug, one 60-pound item to be located 6 inches aft of the forward lug and one 25-pound item to be located 28 inches aft of the forward lug.

(a) Determine the empty weight and moment of the MXU-648/A, removable tail cone configuration (see Table 3-8).

(b) Table 3-7 may be used for ease of computation.

(c) Divide the sum of the moments by the total weight to obtain the center-of-gravity location in inches aft of the forward lug.

$$\frac{2121}{250} = 8.5 \text{ inches}$$

(d) This will maintain the center of gravity limitations (plus or minus 3 inches from the midpoint of the lugs). The MXU-648/A cargo pod center-of-gravity (OG) limits are 4 to 10 inches aft of the forward lug.

3-99. CARGO LOADING.

NOTE

If pod is installed on aircraft perform steps b. thru f.

3-100. To load the MXU-648/A, use the following procedure:

a. If the pod is off the aircraft, position it horizontally in a cradle, cart, or on suitable chocks.

Table 3-7. Moment of Cargo

ITEM	WEIGHT (LBS.)	DISTANCE FROM FWD LUG (IN.)	MOMENT (IN.LBS.)
Empty MXU-648/A	125	11.69	1461
One	40	-10.00	-400
Two	60	6.0	360
Three	25	28.00	700
TOTALS	250		2121

Table 3-8. Leading Particulars

CONFIGURATION	EMPTY WEIGHT	C.G. * LOCATION	MOMENT	STORE LENGTH	STORE DIAMETER	DOOR OPENING SIZE
764077-10 (Removable Tailcone)	125	11.69	1461	130	18.75	12 X 22.6
764077-30 and -50 (Fixed Tailcone)	98	7.69	754	130	18.75	12 X 22.6

* Inches aft of forward lug.

b. Release the fasteners securing the door and the removable tail cone if available. Place the tail cone in a safe place since damage to the rim of the cone will make reinstallation difficult.

c. Weigh the intended cargo prior to loading.

NOTE

The total/cargo individual pod weight shall not exceed 300 pounds.

d. Locate the center of gravity of the cargo as near to the center of the floor as possible.

CAUTION

Concentrated point loading on the floor shall be avoided. Long narrow items such as skis may extend past the end of the floor if they are properly secured to insure that contact with the nose or tail cone does not occur.

Small cargo and/or equipment that cannot be properly tied down shall be placed in a well constructed box or container and packed with sufficient dunnage to prevent any shifting. This container shall then be securely strapped to the floor.

e. Close the door and secure the fasteners. It is recommended that the forward fastener be secured first followed by the aft fastener and finally the center fastener.

CAUTION

All push type fasteners must be securely fastened and the door must be flush with the pod skin. Replace the tail cone and secure all fasteners.

f. Load the MXU-648/A on the aircraft using the procedures in T.O. 1A-7D-35 (if applicable).

3-101. REMOVAL. (Refer to T.O. 1A-7D-35.)

Pages 3-77 and 3-78 are deleted.

3-102. INSTALLATION OF MAIN GEAR, TIRE AND WHEEL ASSEMBLY ON TIRE AND WHEEL ASSEMBLY CARRIER.

Table 3-9. TIRE AND WHEEL ASSEMBLY CARRIER

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MJ-1	Bomb Lift Truck	Used to handled accessories
	GGG-W-686	Torque wrench, 0 to 250 pound-feet	Apply proper torque
	GG-W-641	Torque wrench, adapter	Apply proper torque
	T1F69J	Fork Adapter	Used to adapt various items
	8427661	Tire and wheel assembly platform	Used to position the tire and wheel assembly carrier
	56D23588-3	Load binder assembly	Used to secure carrier to Bomb Lift Truck Table

WARNING

Do not slide main gear tire and wheel assembly on MJ-1 Bomb Lift Truck forklift adapter as damage to wheel will occur.

NOTE

A minimum of three personnel will be required to lift main gear tire and wheel assembly.

a. Position and secure forklift adapter, part number T1F69J, on Bomb Lift Truck Table.

b. Position main gear tire and wheel assembly on Bomb Lift Truck forklift adapter with inside of wheel facing up.

NOTE

A minimum of two personnel are required to lift tire and wheel assembly carrier, part number 8427661.

c. Lift tire and wheel assembly carrier and insert center shaft into wheel and lower.

d. Check that tire and wheel assembly carrier is firmly seated into wheel.

e. Install axle shaft nut, part number 215-34611-1, and securely hand tighten.

f. Position tire and wheel assembly platform, part number 8427661, on Bomb Lift Truck Table.

NOTE

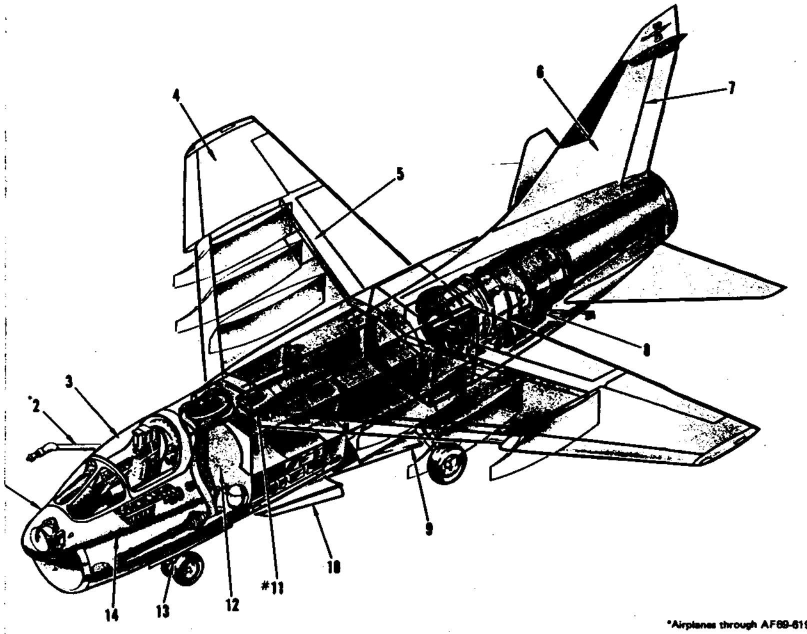
A minimum of five personnel are required to lift tire and wheel assembly carrier with tire and wheel assembly mounted on axle shaft.

g. Positon tire and wheel assembly carrier and tire and wheel assembly on tire and wheel assembly platform.

h. Secure carrier, tire and wheel assembly to MJ-1 Bomb Lift Truck with load binder assembly, part number 56D23588-3.

NOTE

Refer to T.O. 1A-7D-35 for procedures covering installation/removal of the wheel assembly carrier on the A-7D aircraft.



*Airplanes through AF69-6196

#Airplanes AF69-6197 and subsequent

AREA	ITEM LUBRICATED	LUBRICANT
1	Radome hinge and latches	MIL-G-23827
*2	Air refueling probe hinge points	MIL-L-7870
	Air refueling nozzle	MIL-G-23827
	Air refueling probe actuator felt wiper	MIL-H-83282
3	Arresting gear control pivot points	MIL-L-7870
	Landing gear control bushing and washer	MIL-L-7870
	Emergency vent air scoop control	MIL-L-7870
	Rudder pedal linkages, pivot points, cable sliding surfaces, and pedal adjust screw threads and fitting	MIL-G-23827
	Rudder pedal bellcrank pivot points	MIL-L-7870
	Canopy counterbalance cylinder hinge bolts and mating holes	MIL-L-7870
	Canopy actuator hinge bolts and mating holes	MIL-L-7870
	Canopy release mechanism pivot points, linkpins, hook bolts, mating holes, and strut	MIL-L-7870
	Ejection seat guide rails	MIL-M-7866
4	Wingfold hinge points, lockpins, and stop bolt	MIL-G-23827
	Wingfold hinge pin cylinders	MIL-H-83282
	Wingfold warning flag linkage pivot points	MIL-L-7870
	Wingfold actuator felt wiper	MIL-H-83282
	Aileron power control linkages and pivot points	MIL-G-23827
	Aileron hinges	MIL-L-7870
	Aileron actuator felt wiper	MIL-H-83282
5	Spoiler power control strut bearing rod end, adapter link, spoiler support and hinge support fitting	MIL-G-23827
	Spoiler power control actuator felt wiper	MIL-H-83282
	Leading and trailing edge flap and flap slot door hinges and pivot points	MIL-L-7870
	Leading and trailing edge flap actuator felt wipers	MIL-H-83282
	Aileron and spoiler load limit link	MIL-L-7870
6	Longitudinal control arm cam roller bolt	MIL-G-23827
	UHT housing bearings	MIL-G-81322
	UHT control unit bearings	MIL-G-23827 (FWD) MIL-G-81322 (AFT)
	UHT control linkages and sliding surfaces	MIL-L-7870
	UHT control strut end caps	MIL-H-83282
7	Rudder power control actuator rod ends, trunnion, bellcrank, and link fittings	MIL-G-23827
	Rudder hinge support mating surface	VV-L-800
8	Arresting gear drag link and rod end fittings	MIL-G-81322
	Arresting gear hinge points and pins	MIL-G-23827
	Arresting gear linkages, linkage pins, and pivot points	MIL-L-7870
	Arresting gear actuator	MIL-H-83282
	Arresting gear roller and cam surface	MIL-G-23827
	Engine trunnion mount supports and engine trunnions	MIL-L-7870
9	Main landing gear strut and bulkhead lug fittings	MIL-G-23827
	Main landing gear hinge points	MIL-G-23827
	Main landing gear uplock bolt and bushing and tiedown ring pivot points	MIL-L-7870
	Main landing gear door bellcrank and bearing fittings	MIL-G-23827
	Main landing gear door hinge pins, uplock mechanism, roller springs and hook throat	MIL-L-7870
	Main landing gear door actuators felt wipers	MIL-H-83282
	Main landing gear drag strut fairing turnbuckle pins	VV-L-800
	Main landing gear wheel bearings	MIL-G-81322
10	Speed brake hinges	MIL-G-23827
	Speed brake linkages and pivot points	MIL-G-23827
	Speed brake chine hinges	MIL-L-7870
#11	Air refueling receptacle rollers	MIL-G-23827
12	Emergency power package hinge points	MIL-L-7870
	Emergency power package actuator	MIL-H-83282
13	Nose landing gear drag link bolts and pins	MIL-G-23827
	Nose landing gear hinge points, strut fittings, and trunnion	MIL-G-23827
	Nose landing gear uplock roller and downlock pawl	MIL-G-23827
	Nose landing gear actuator rod end	MIL-G-23827
	Nosewheel steering actuator rod end	MIL-G-23827
	Nosewheel steering actuator felt wiper	MIL-H-83282
	Nose landing gear actuator	MIL-H-83282
	Nose landing gear door rod ends	MIL-G-23827
	Nose landing gear door springs and linkages	MIL-L-7870
	Nose landing gear door hinges	MIL-L-7870
	Nosewheel bearings	MIL-G-81322
14	Lower, middle, and upper step hinge points and linkage	MIL-L-7870
	Middle and upper step latch and cable attach points	MIL-G-23827

Figure 3-26. Lubrication

SECTION IV

EGRESS AND SURVIVAL SYSTEMS

4-1. DESCRIPTION.

4-2. Egress and survival systems provide the pilot with cockpit services, comfort, support and protection during normal flight, and safety and survival during and after seat ejection. Egress and survival systems consist of ejection seat and canopy systems, pilot's emergency equipment, and personnel equipment.

4-3. EJECTION SEAT SYSTEM. (See figure 4-1.)

4-4. The ejection seat is an upright, rocket-catapult type designed to support the pilot during normal flight conditions and provide a fully automatic and positive means of quick, safe escape from the airplane under emergency conditions. Ejection seat subsystems consist of the rocket catapult, ejection control, directional automatic realignment of trajectory (DART), harness release, pilot-seat separation, shoulder harness control, and seat adjustment systems. Explosive devices are employed to provide hot-gas ignition for automatic seat ejection.

4-5. The Mk 7 rocket catapult provides the necessary propulsion to eject the seat and pilot from the airplane. The performance capability of the rocket catapult at zero altitude and zero airspeed reduces the effects of high sink rate and nosedown attitudes encountered during critical approach and landing operations. Located along the center of the seat back, the rocket catapult is secured at the upper portion of the seat structure and supported at the base by the twin barrels of the seat adjustment actuator.

4-6. The ejection control system consists, essentially, of the primary ejection control handles, which the pilot may pull to initiate seat ejection. The system also includes spring-loaded flip-up canopy breakers which permit ejection through the canopy, if necessary. An ejection controls safety handle prevents inadvertent seat ejection during ground operations when placed in the down-and-locked position.

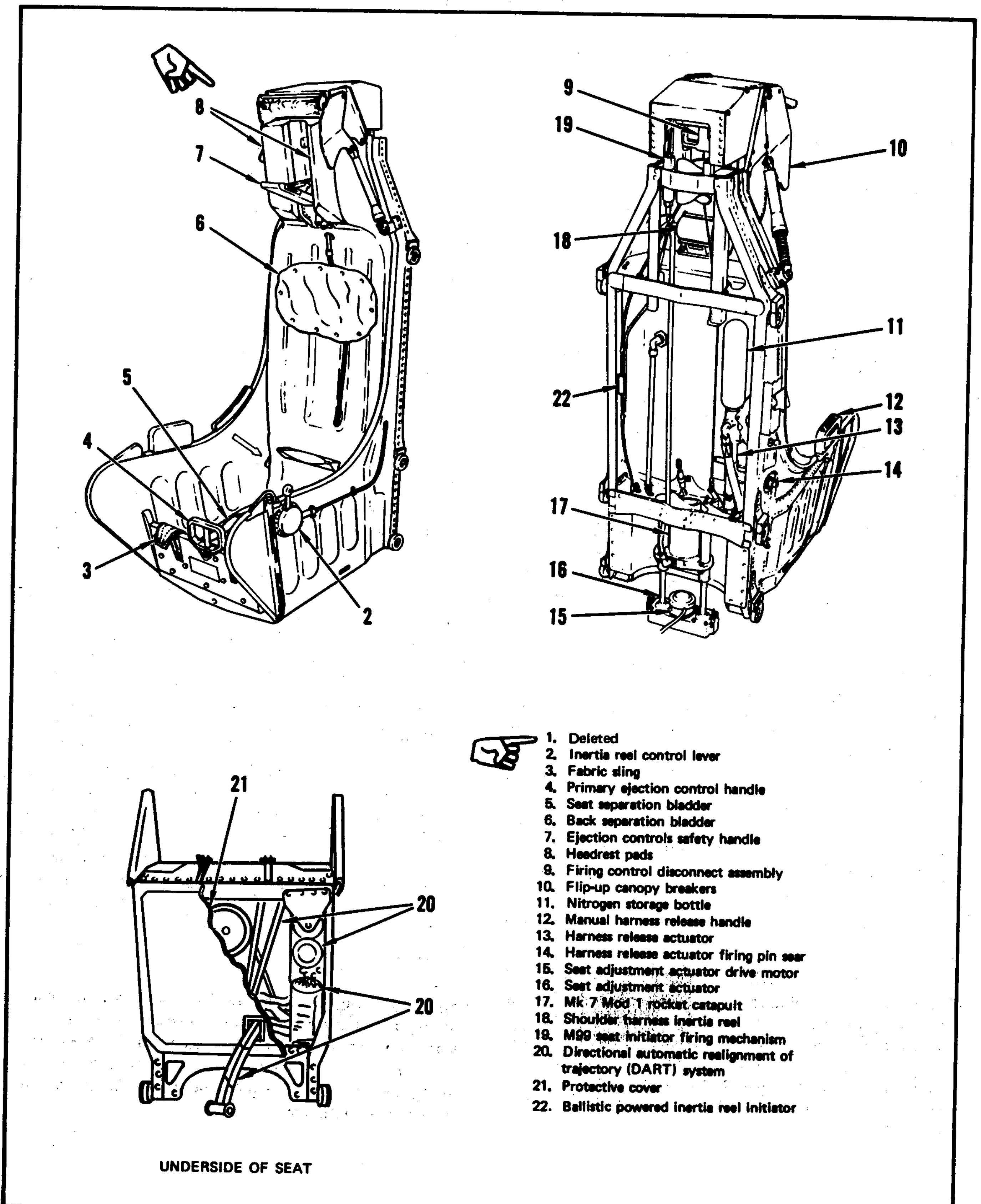
4-7. The DART system consists of a braking system, lanyard assembly, bridle, and bridle cable. A protective cover is attached to the bottom of the seat to provide protection for the DART system components. The DART system stabilizes the upright attitude of the seat after the seat leaves the airplane.

4-8. The harness release system normally restrains the pilot and his survival equipment in the seat and provides automatic release of the pilot's shoulder harness and lap belt assemblies after ejection. If the system should fail to function automatically, the pilot can pull the manual harness release handle to release himself from the seat.

4-9. The pilot-seat separation system provides rapid separation of the pilot from the seat after shoulder harness and lap belt assemblies have been released. The system consists of a nitrogen storage bottle, two inflatable separation bladders and a fabric sling (over the seat separation bladder).

4-10. The shoulder harness control system facilitates the voluntary forward movement of the pilot and functions as a self-compensating restraint against involuntary forward movement resulting from excessive g-forces or other airframe stresses. An inertia reel control lever on the left arm of the seat can be manually unlocked or locked to allow or prevent extension of the shoulder harness straps. Each time the pilot leans back in the seat, the spring-loaded shoulder harness inertia reel automatically rewinds any slack in the straps. Each time the reel senses forward g-forces, it automatically locks, regardless of the preselected position. Once automatic locking occurs, the locked condition can be released only by cycling the control lever to locked and back to unlocked.

4-11. The inertia reel is ballistically retracted and locked during ejection. An M53 boost initiator, mounted on the seat bulkhead, is fired by hot gas from the M99 prime initiator. The gas from the fired M53 initiator fires the inertia reel initiator. The gas from the inertia reel initiator retracts the inertia reel.



1. Deleted
2. Inertia reel control lever
3. Fabric sling
4. Primary ejection control handle
5. Seat separation bladder
6. Back separation bladder
7. Ejection controls safety handle
8. Headrest pads
9. Firing control disconnect assembly
10. Flip-up canopy breakers
11. Nitrogen storage bottle
12. Manual harness release handle
13. Harness release actuator
14. Harness release actuator firing pin sear
15. Seat adjustment actuator drive motor
16. Seat adjustment actuator
17. Mk 7 Mod 1 rocket catapult
18. Shoulder harness inertia reel
19. M99 seat initiator firing mechanism
20. Directional automatic realignment of trajectory (DART) system
21. Protective cover
22. Ballistic powered inertia reel initiator

Figure 4-1. Ejection Seat System Controls and Components

4-12. The seat adjustment system permits height adjustment of the seat before and during normal flight. Phase reversal of a three-phase ac power source permits raising or lowering of the seat, corresponding to the selected UP or DOWN position of the seat adjust switch, located on the exterior lights control panel (right console). The seat is raised or lowered by a seat adjustment actuator and actuator drive motor.

4-13. For ejection seat and canopy jettison systems ground handling safety devices, refer to figure 4-2. For location and use of ejection seat and canopy jettison systems safety devices used during maintenance, refer to figure 4-3.

4-14. CANOPY SYSTEM.

4-15. The canopy system consists of a clear, stretched, acrylic plastic panel in a metal frame, three rear-view mirrors, and components of the canopy release and canopy emergency jettison system. When the canopy is closed, a pressure seal on the canopy frame seals the cockpit, permitting pressurization.

4-16. The canopy release system consists of a canopy counterbalance cylinder, which aids in opening and closing the canopy; a canopy actuator, which dampens canopy movement; and four airframe-installed canopy release hooks, which engage rollers in the canopy frame. Interior and exterior canopy release handles facilitate locking and unlocking of the canopy release hooks. The system includes an overcenter spring to prevent the canopy from unlocking due to excessive g-loads. If the canopy release hooks are not fully engaged when the canopy is closed, a light on the caution panel comes on to warn the pilot of an unlocked canopy.

4-17. A hot-gas type canopy jettison system provides for canopy jettisoning in landing emergencies, in ditching, and during ground rescue. Exterior canopy jettison control handles are located on each side of the airplane. An interior canopy jettison control handle is located in the cockpit above the left console. Each handle connects directly to the firing link of an M99 canopy jettison initiator.

4-18. A canopy breaking tool is installed as a safety factor for cockpit evacuation in the event the canopy cannot be raised or jettisoned. The canopy breaker tool is located on the canopy rail in the front lower left corner and is secured in a retainer with a quick-release pin for easy access. During landing emergencies or ditching, the canopy breaking tool can be used by the pilot to break the canopy if other exit methods fail.

4-19. CANOPY JETTISON. (See figure 4-4.)

4-20. Pulling the interior canopy emergency jettison control handle or either of the exterior canopy jettison control handles fires an M99 initiator, causing high-pressure flow of hot gas to the Mk 14 canopy actuator impulse cartridge. Gas pressure produced by the Mk 14 canopy actuator impulse cartridge then produces energy to actuate the outer of three-telescoped canopy actuator pistons, forcing pushrods to unlock the four canopy release hooks. At the end of its travel, the outer piston mechanically sequences operation of the middle canopy actuator piston. The combined extension of both pistons forces the canopy open, past the normal open position, causing strikers on the canopy pivot bolts to contact stopbolts and shear off the canopy pivot bolts. Continued upward motion shears both the canopy counterbalance cylinder rod end and the shear pin through the canopy actuator rod end to free the canopy of all airframe attachments. Upward momentum carries the canopy clear of the airplane. In flight, canopy jettisoning is aided by airstream loads.

4-21. Canopy jettisoning also occurs as a part of normal seat ejection. On airplanes through AF68-8224, the pilot may prevent jettisoning of the canopy by pulling a canopy jettison override control handle. On airplanes AF68-8225 and subsequent, canopy jettison override features are not included.

4-22. SEAT EJECTION. (See figures 4-4 and 4-5.)

4-23. Pulling the primary ejection control handle actuates the firing controls disconnect assembly, causing release and rapid extension of spring-loaded, flip-up canopy breakers. Simultaneously, the firing link is pulled from the M99 prime initiator, routing hot gas to the Mk 14 canopy actuator impulse cartridge for canopy jettisoning and to the Mk 11 delay initiator for 0.4- to 0.75-second time-delay firing of the rocket catapult.

4-24. The inertia reel is ballistically retracted and locked during ejection. An M53 boost initiator, mounted on the seat bulkhead, is fired by hot gas from the M99 prime initiator. The gas from the fired M53 initiator fires the inertia reel initiator. The gas from the inertia reel initiator retracts the inertia reel.

4-25. For airplanes through AF68-8224, refer to paragraphs 4-27 through 4-31 for continuation of seat ejection sequence.

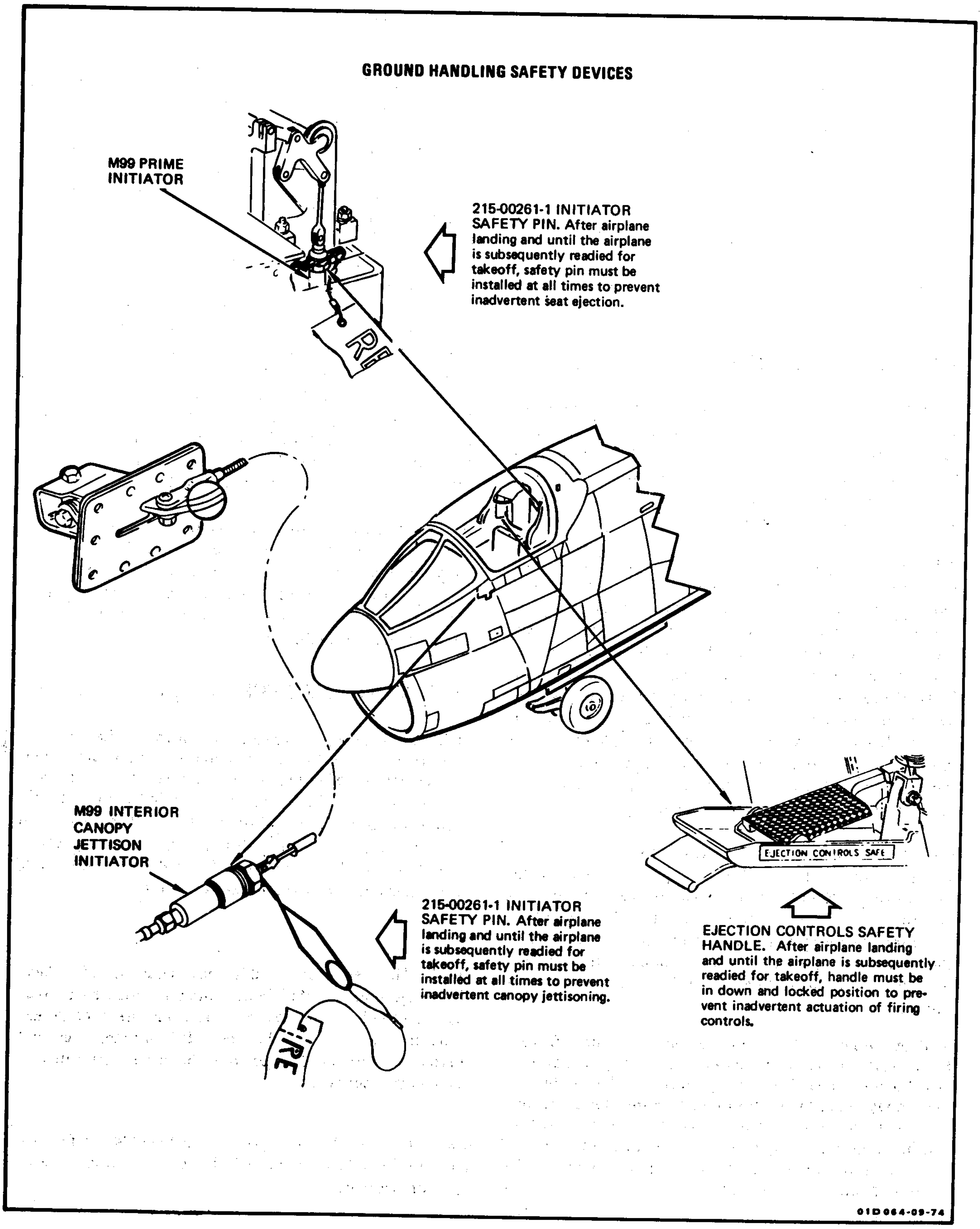


Figure 4-2. Egress System Ground Handling Safety Devices

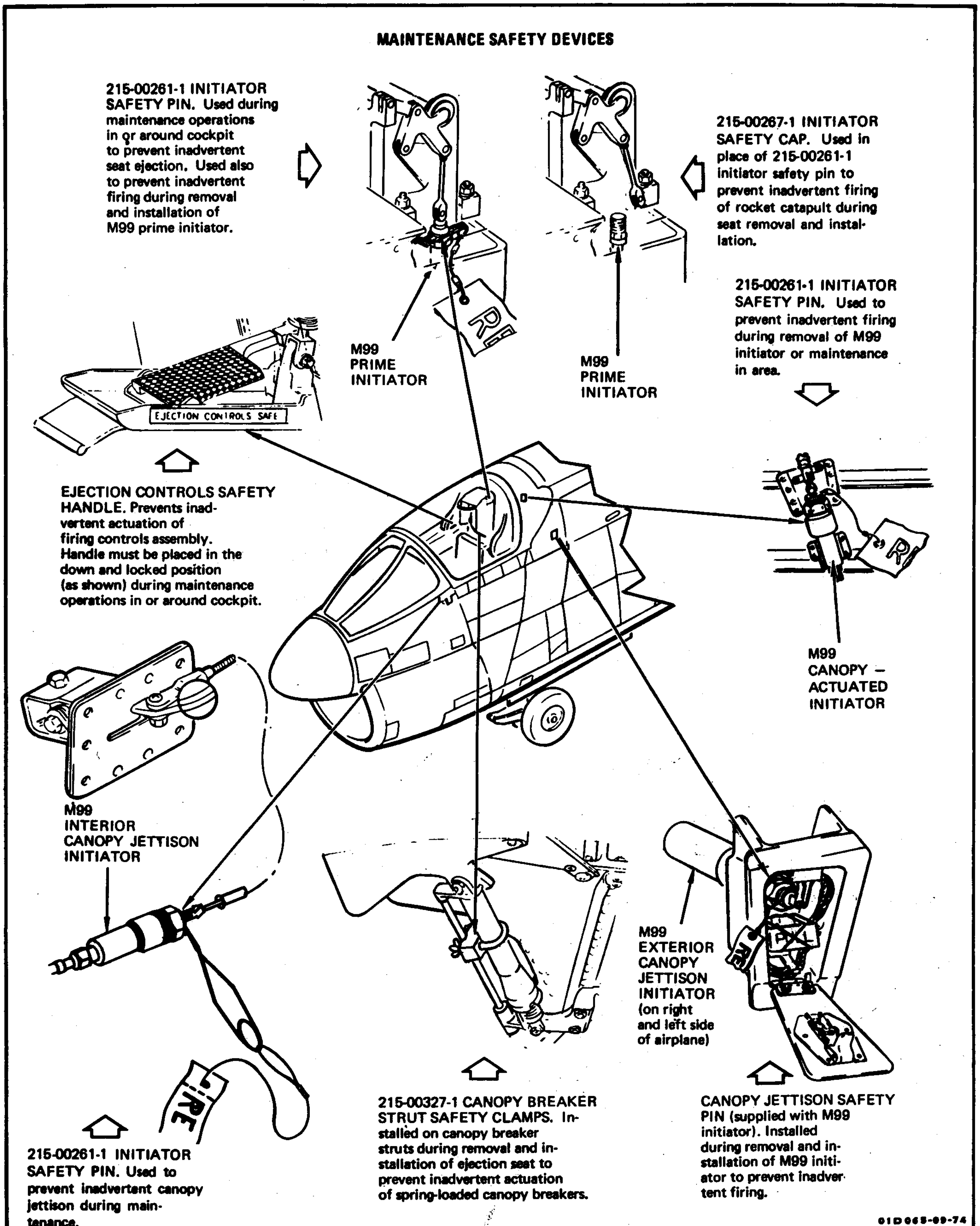


Figure 4-3. Egress System Maintenance Safety Devices

4-26. On airplanes AF68-8225 and subsequent, an M99 canopy-actuated initiator reduces the 0.4- to 0.75-second time delay between canopy jettisoning and the first movement of the seat. At the same time that hot gas pressure from the M99 prime initiator effects canopy jettisoning and time-delay firing of the rocket catapult, it also opens the ejection control bypass valve (normally closed) in series between the rocket catapult and the canopy-actuated initiator. As the canopy clears the path of seat ejection, an attached lanyard fires the airframe-mounted, canopy-actuated initiator. Resulting hot gas flows through the opened ejection control bypass valve to fire the rocket catapult before the 0.4-second time delay of the Mk 11 initiator has expired. If the canopy fails to jettison or the canopy-actuated initiator fails to fire, the Mk 11 delay initiator fires (after its time delay has expired) and through-the-canopy ejection follows. Canopy jettisoning or the loss of a canopy during normal flight cannot cause inadvertent firing of the rocket catapult since opening of the ejection control bypass valve is possible only if the pilot first pulls one of the two ejection control handles.

4-27. As first phase propulsion of the rocket catapult starts the seat up the guide rails, ECM and IFF switches are actuated, pilot's services are disconnected, harness release actuator firing pin sear is knocked off by the striker, and 1.0-second delay Mk 86 harness release actuator cartridge is fired. The parachute, Mk 5 2.0-second delay cartridge, is also actuated.

4-28. After the seat leaves the guide rails and as its altitude increases, a DART system lanyard is pulled from the underside of the seat. At the same time, braking devices provide continuous tension on the lanyard assembly to correct any adverse pitch or roll of the seat during the ascending portion of its trajectory. When the lanyards are completely payed out, seat attitude control is no longer required, and the lanyard falls free.

4-29. The 1.0-second delayed firing of the Mk 86 delay cartridge actuates the harness release actuator assembly which, in turn, releases the primary and alternate ejection control handles (one of which the pilot may still be holding onto), releases shoulder harness and lap belt restraints, and punctures the nitrogen storage bottle to cause inflation of the seat separation bladders.

4-30. The more rapidly expanding back separation bladder causes the pilot's body to roll forward, changing the center of gravity on the survival kit and allowing the seat separation bladder to inflate and complete pilot-seat separation.

4-31. If the pilot is above a preset altitude of 14,000 (±500) feet, an aneroid actuated deployment device in the parachute actuator delays parachute deployment until the pilot has descended to the correct pressure altitude. The Mk 5 2.0-second delay cartridge then fires, causing parachute deployment.

4-32. PILOT'S EMERGENCY EQUIPMENT.

4-33. The pilot's emergency equipment consists of a parachute and basic survival equipment. The parachute provides the pilot with the means of survival after being ejected from the airplane. Survival gear, stored in the seat-integrated survival kit, is included to sustain the pilot if ejection becomes necessary over water or unfamiliar or hazardous terrain.

4-34. PERSONNEL EQUIPMENT.

4-35. The personnel equipment provides airplane-to-pilot services, pilot comfort, and environmental protection during normal flight, as well as protection against emergency environmental conditions encountered during the ejection sequence and the survival period following ejection.

4-36. Personnel equipment consists of the following:

a. HGU-2/A helmet

b. MBU-5/P oxygen mask

c. CRU-60/P connector

d. CWU-3/P antiexposure suit

e. K-2B summer flight suit

f. CSU-3/P anti-g suit

g. Anti-g line

h. Vent air hose

i. MA-3 vent garment

j. LPU-3/P flotation vest

k. Pilot's relief system

l. PCU-3/P torso harness with URT-33 locator radio

m. Inflight sustenance system

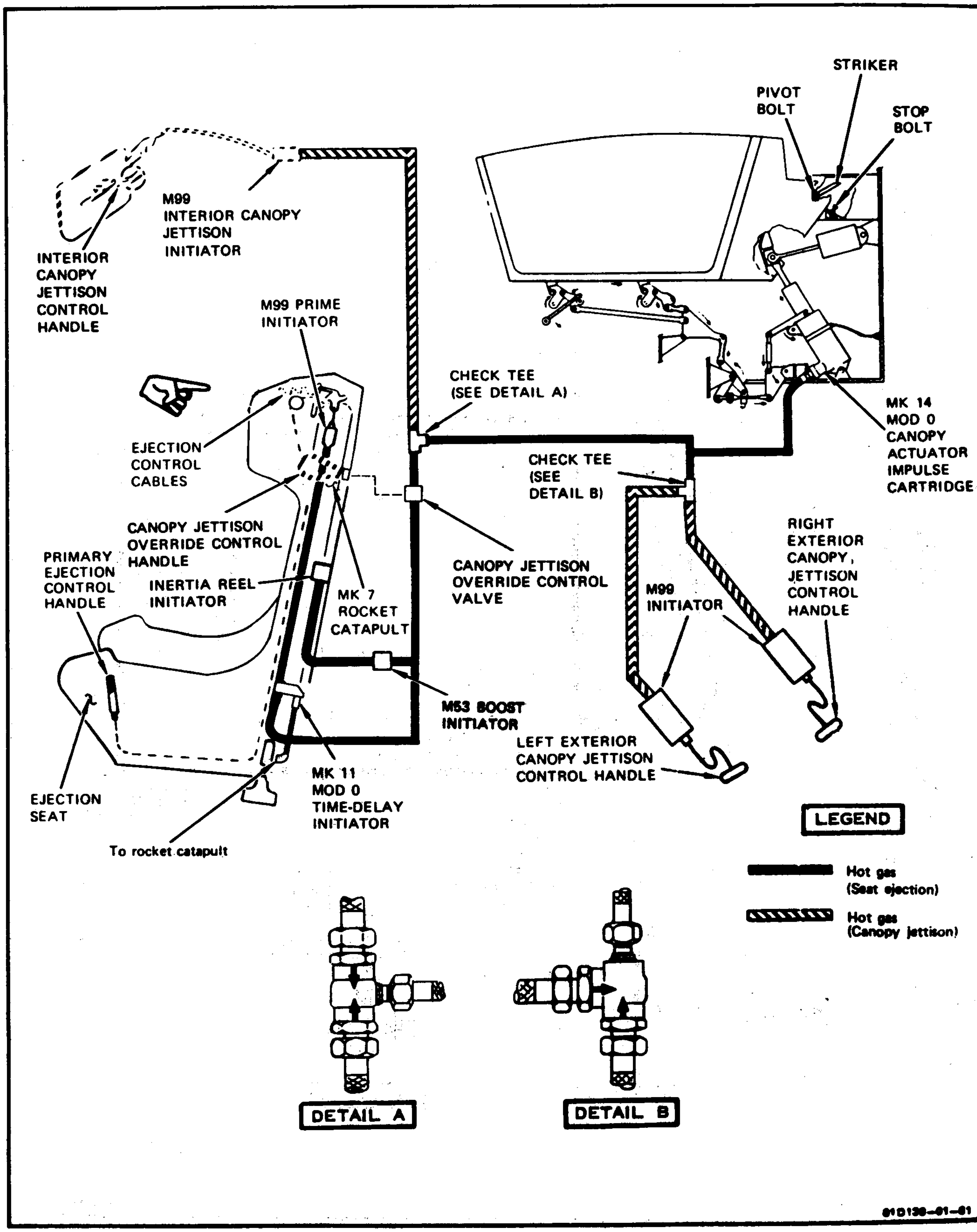


Figure 4-4. Egress System Schematic Diagram (Airplanes Through AF68-8224)

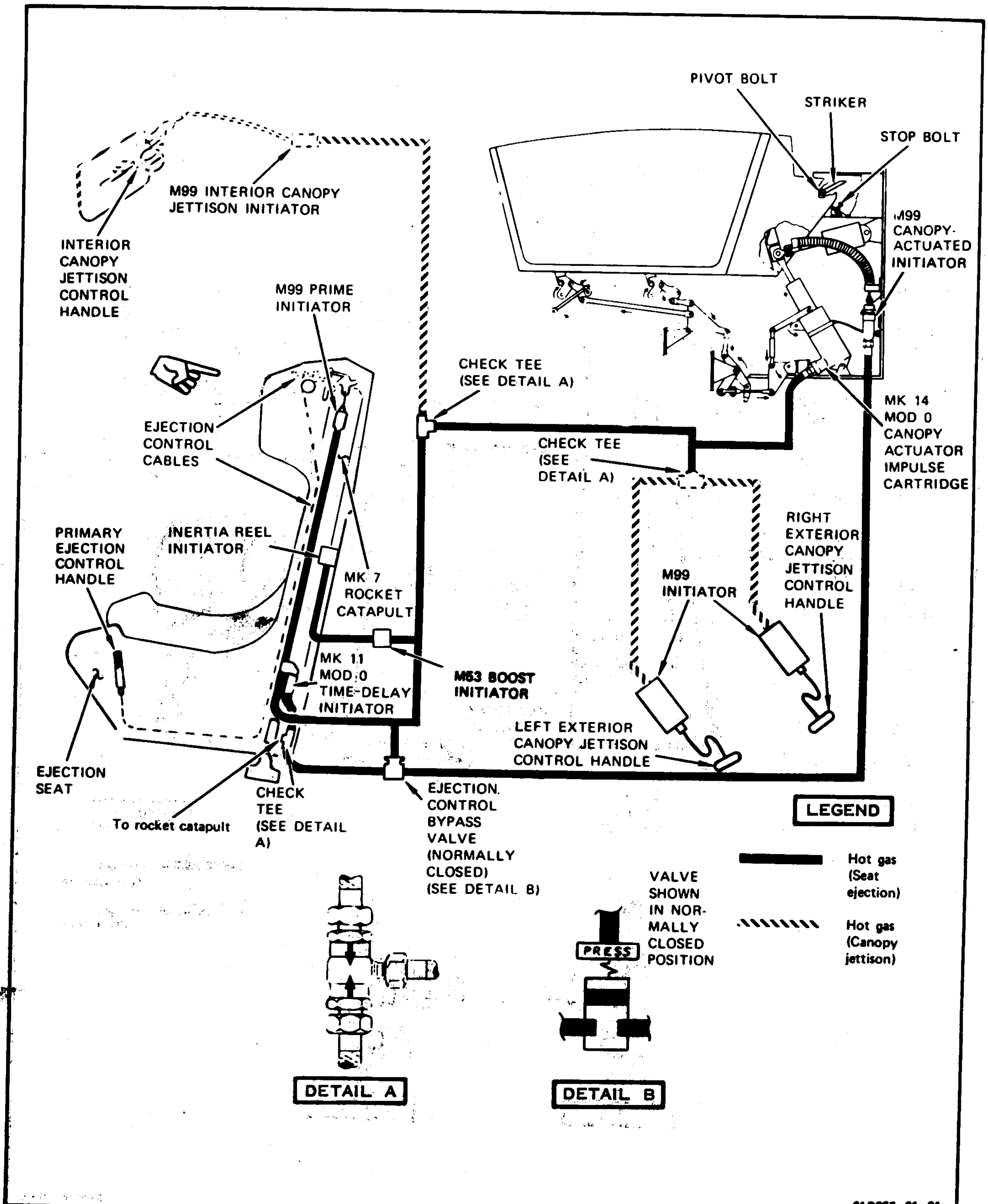


Figure 4-5. Egress System Schematic Diagram (Airplanes AF68-8225 and Subsequent)

SECTION V
MECHANICAL ACCESSORIES SYSTEMS

5-1. DESCRIPTION. (See figure 5-1.)

5-2. The mechanical accessories systems consists of an air-conditioning supply system, control air system, cockpit air temperature system, pilot suit cooling system, ground cooling system, and defog system. Also included are the electronic equipment and camera cooling system, radar pressurization system, antiblackout system, cockpit pressure regulator system, low-pressure engine bleed air system, rain removal and anti-ice system, oxygen system, and gun gas purge system.

5-3. AIR-CONDITIONING SUPPLY SYSTEM.

5-4. The air-conditioning supply system provides conditioned air for cooling, heating, ventilating, and pressurization. The supply system regulates and delivers the conditioned air to the cockpit, camera compartment, sweep generator, specific equipment in the avionic compartments, pilot suit cooling system, and defog system.

5-5. The air-conditioning supply system consists of an engine high pressure bleed air manifold, various ducts and couplings, pressure limiting and shutoff valve, air-conditioning package, and emergency vent air scoop. Supply system components which are part of the air-conditioning package include the flow control valve, low limit transmitter, water separator, water separator anti-ice valve, ejector air valve and nozzle, air-to-air heat exchanger, ejector dump valve, compressor inlet thermostat, and turbine-compressor.

5-6. The cockpit environmental control panel provides pilot control of the air-conditioning supply system and the following subsystems: cockpit temperature, cockpit pressure, rain repellent, rain removal and windshield anti-ice, and defog. Temperature is controlled by temperature control valves and temperature sensors located in the air-conditioning ducts and in the cockpit.

5-7. CONTROL AIR SYSTEM.

5-8. The control air system supplies pressurized air for operation of air-conditioning and pressurization subsystem control valves and for pressurization of the AN/APQ-126(V)8 (airplanes before T.O. 1A-7-530) or AN/APQ-126(V)11 (airplanes after T.O. 1A-7-530) radar waveguide and pilot's anti-g suit. High pressure engine bleed air is routed through a control air valve and into a control air manifold. From the manifold, the air is supplied to the appropriate pneumatically operated valves and actuation switches in the air-conditioning supply system. From the same manifold, air pressure is supplied to the radar waveguide through a desiccator and pressure regulator. The manifold also provides secondary air supply for the pilot's anti-g suit.

5-9. COCKPIT AIR TEMPERATURE SYSTEM.

5-10. The cockpit air temperature system regulates the temperature of air flowing into the cockpit. Conditioned air flows to the cockpit through ducts and enters the cockpit through two directional air outlets at the forward end of the canopy rail, through manifolds along the lower edge of the windshield panels, and through two floor outlets near the rudder pedals. Automatic or manual temperature control can be selected by a manual override switch on the environmental control panel. In the automatic mode, the system maintains cockpit air temperature as selected with the cockpit temperature control knob on the environmental control panel. If desired, or if any of the automatic components fail, inlet air temperature can be controlled manually. The cockpit air temperature system consists of the cockpit temperature control valve, cockpit temperature thermostatic valve, environmental control panel, cockpit temperature anticipator, and cockpit temperature sensor.

5-11. PILOT SUIT COOLING SYSTEM.

5-12. The pilot suit cooling system provides low pressure temperature controlled air to ventilate the pilot's antiexposure suit. The system automatically maintains suit inlet air temperature as selected by the suit air temperature selector knob on the suit vent air control panel. Suit inlet air temperature between 50° and 100°F can be selected and maintained under normal flight conditions. With the engine operating at idle, air temperatures that can be maintained are limited to approximately 70° to 100°F. The flow of air to the pilot's antiexposure suit is controlled by the suit flow control knob on suit vent air control panel. Airflow to the suit is adjustable from 0 to 14 cfm. The pilot suit cooling system consists of the suit temperature control valve, suit temperature sensor, suit flow control valve, electrical suit temperature control, and suit temperature control.

5-13. GROUND COOLING SYSTEM.

5-14. When the airplane engine is not operating, the ground cooling system provides cooling air from an external ground cooling unit. Cooling air from the external ground cooling unit is supplied to the cockpit, antiexposure suit, camera compartment, radar sweep generator, and specific equipment in the avionic compartments. Much of the ducting through which the cooling air is directed is common to other air-conditioning subsystems. Ground cooling system components consist of the ground cooling air socket, system check valve, and ducting.

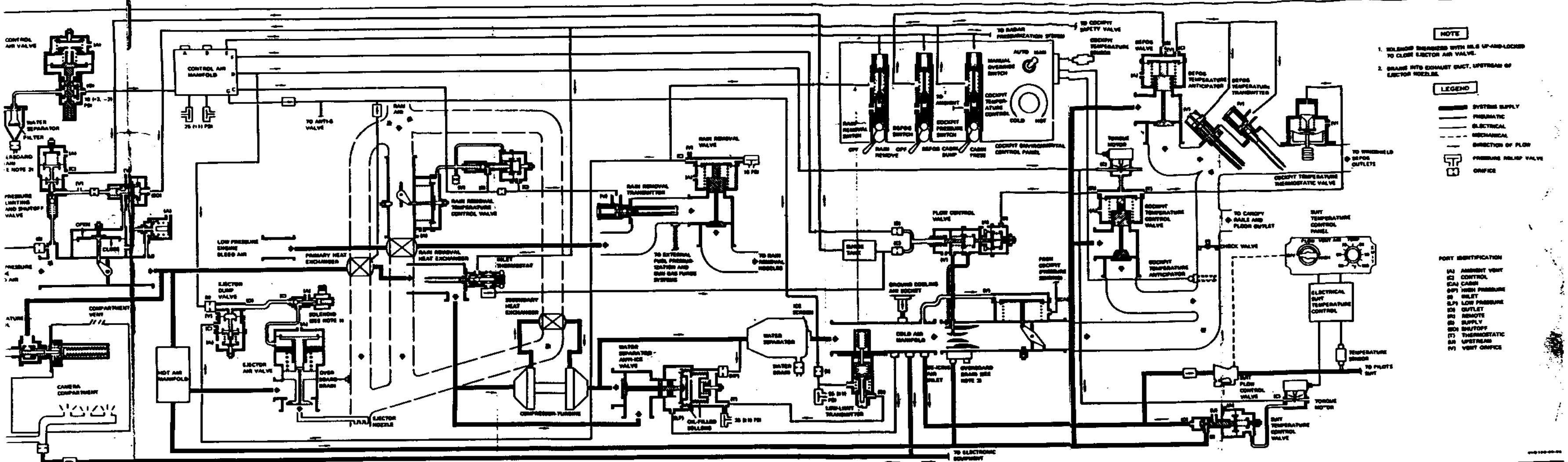


Figure 5-1. Integrated Air-Conditioning System Schematic Diagram

5-15. DEFOG SYSTEM.

5-16. The defog system provides hot air at a constant temperature to prevent or remove fog and frost from the interior surface of the windshield. The system is actuated by the defog switch. Hot air from the hot-air manifold flows through the defog valve, mixes with cooled air, and flows to the windshield defog vents. Operation of the defog valve is controlled by the defog temperature transmitter and anticipator. Defog system components are the defog valve, defog temperature transmitter, defog switch, temperature anticipator, and ducting.

5-17. ELECTRONIC EQUIPMENT AND CAMERA COMPARTMENT COOLING SYSTEM.

5-18. The electronic cooling system provides cooling for the electronic equipment in both right and left avionic compartments and the radar signal data converter in the midequipment compartment. Cooling air for the HUD signal data processor (airplanes before T.O. 1A-7-530), HUD display interface unit (airplanes after T.O. 1A-7-530), UHF radio receiver-transmitter, VHF radio receiver-transmitter, inertial measurement unit (airplanes before T.O. 1A-7-562), inertial navigation unit (airplanes after T.O. 1A-7-562), and the tactical computer is provided directly from the air-conditioning supply system to ensure adequate cooling at all times. On airplanes after T.O. 1A-7-562, a fan provides cooling air directly to the inertial navigation unit whenever the air-conditioning supply system is not operating. Cooling of other equipment in the avionic compartments is provided by a ram air system which is supplemented by vaneaxial compartment fans. Ground cooling of electronic equipment, except for the equipment cooled directly from the air-conditioning supply system, is accomplished by convection if the compartment doors are open. When the compartment doors are closed, the vaneaxial compartment fans provide cooling air.

5-19. Camera compartment cooling is provided by refrigerated air from the air-conditioning supply system mixed with hot engine bleed air and directed into the compartment. Temperature in the compartment is controlled by regulating the flow of hot air. The camera compartment consists of the camera temperature control valve, mixing manifold, and compartment nozzle.

5-20. RADAR PRESSURIZATION SYSTEM.

5-21. The radar pressurization system supplies air pressure for internal pressurization of the waveguide and transmitter of the AN/APQ-126(V)8 (airplanes before T.O. 1A-7-530) or AN/APQ-126(V)11 (airplanes after T.O. 1A-7-530) forward looking radar. Waveguide and transmitter pressure is maintained at 17 ($\pm$2) psia regardless of airplane altitude. Air used for pressurization is supplied through a desiccator and a pressure regulator to ensure delivery of dry air within the proper pressure limits. The radar pressurization system consists of a desiccator, depressurizing valve, and pressure regulator.

5-22. ANTIBLACKOUT SYSTEM.

5-23. The antiblackout system automatically controls air pressure to inflate the pilot's anti-g suit during maneuvers exceeding 1.5g to 2.0g. The system consists of a regulating anti-g valve with an integral system test (override) button and a pilot services disconnect panel on the left console, which provides anti-g and vent air quick-disconnect receptacles.

5-24. COCKPIT PRESSURE REGULATOR SYSTEM.

5-25. The cockpit pressure regulator system maintains a pressurized environment in the cockpit any time the air-conditioning system is operating and the canopy is closed. The cockpit pressure regulator system consists of an air pressure regulator, a safety valve, a pressure altimeter, and an emergency ram air scoop. Excessive positive and negative pressure differentials are prevented by controlling the amount of air leaving the cockpit. In event of system failure or contamination, ram air ventilation may be selected through the emergency vent air scoop.

5-26. LOW PRESSURE ENGINE BLEED AIR SUPPLY SYSTEM.

5-27. The low pressure engine bleed air supply system provides air from the engine for windshield rain and ice removal, dilution, and removal of explosive gases from the gun bay, and pressurization of the external fuel tanks for fuel transfer. The system consists of the low pressure bleed gimbal duct, linear motion compensator duct, and associated ducts and couplings.

5-28. RAIN REMOVAL AND ANTI-ICE SYSTEM.

5-29. The rain removal and anti-ice system is an air blast system, using warm air supplied by the low pressure engine bleed air supply system. The system is capable of keeping ice from forming, but less effective in removing ice. A rain removal valve controls the warm airflow to the center and left windshield panels. The valve is actuated by the rain removal switch. A caution light indicates RAIN REMOVE HOT when actuated by a thermal switch. The system consists of a temperature control valve, transmitter, rain removal valve, center and left windshield nozzles, and thermal switch.

5-30. OXYGEN SYSTEM.

5-31. The oxygen system consists of a liquid oxygen system, liquid oxygen quantity indicating system, and emergency oxygen system. Liquid oxygen is converted to a gaseous state and supplied to the pilot. The liquid oxygen indicating system measures quantity of oxygen in the converter. The emergency oxygen system provides a temporary supply of gaseous oxygen to the pilot if failure of the primary liquid oxygen system occurs.

5-32. The liquid oxygen system supplies 100% oxygen in a gaseous state to the regulator (mounted on the right console) from the converter. System liquid oxygen is stored in the converter at –297°F. The converter is designed for rapid replacement during fast turnaround operations. Liquid oxygen is converted to a gaseous state within the converter and delivered to a pressure-demand type oxygen regulator located in the right console. The rate at which liquid oxygen is converted to gas depends on system demand. Two types of liquid oxygen converters may be used in the system. One type of converter provides an economy feature in the system by incorporation of a pressure opening and closing valve and a converter check valve. The second type of converter has a pressure closing valve and does not use a converter check valve, thereby eliminating the economy feature. The pressure closing valve provided in both types of converter controls the rate of liquid evaporation during flow. Either type of converter is interchangeable in the airplane.

5-33. A capacitance type gaging and pressure indicating circuit continuously monitors the liquid oxygen system and indicates the quantity of liquid oxygen in the converter on an instrument panel indicator. The indicator dial is graduated from 0 to 10 liters in increments of 1/2 liter with numerals on even numbered increments. The indicating circuit also includes an oxygen low level caution light located on the caution light panel. The caution light will come on if converter level is 1 liter or less.

5-34. The emergency oxygen system consists of an oxygen cylinder, pressure gage mounted on the cylinder, filler and pressure reducer valve, quick-disconnect, oxygen hose, and cable lanyard used to activate the system. The shatterproof high pressure emergency oxygen cylinder is attached to the right side of the ejection seat support structure. The cylinder is charged with gaseous oxygen to a pressure of 1,800 to 2,200 psi. The duration of the oxygen in the cylinder is approximately 10 minutes. A quick-disconnect in the emergency oxygen supply hose provides a means of separation during seat ejection and the cylinder remains with the airplane. An extension hose from the quick-disconnect connects to the primary oxygen system hose at the pilot's oxygen mask. A retainer pin (with caution tag attached) is inserted through a hole on the filler and pressure reducer valve and renders the system inoperative. The caution tag and retainer pin is removed before flight.

5-35. GUN GAS PURGE SYSTEM.

5-36. The gun gas purge system purges the ammunition drum and forward barrel compartments of explosive gunfiring gases by automatically admitting ventilating air from the low pressure engine bleed air supply system when the gun is fired. Ventilating air is also admitted to the breech area in the gun compartment to purge explosive gases. The ventilating air and explosive gases are vented overboard. The system consists of gun gas purge valve, gun gas purge door, hydraulic selector valve, purge door switch, and vent nozzles in the compartments.

SECTION VI

PNEUDRAULIC SYSTEM

6-1. DESCRIPTION (See figure 6-1 or 6-2.)

6-2. The hydraulic system supplies power to operate the landing gear system, flight controls, wingfold system, automatic flight control system, gun drive motor, gun gas purge door, air refueling system, and on airplanes with PC No. 3 system, engine fuel boost pump motor.

6-3. The hydraulic and pneumatic systems consist of: PC No. 1 system, PC No. 2 system, PC No. 3 system (airplanes , AF69-6197 and subsequent), emergency power control system, utility system supplied from PC No. 2, emergency utility system supplied by pneumatic/hydraulic accumulators, hydraulic indicating system, and centralized pneumatic precharge servicing system for the accumulators.

6-4. The PC systems supply hydraulic pressure to selected tandem actuators in the flight control systems. One half of each actuator is supplied pressure from a different PC system so that with only one PC system operating, control of the airplane can be maintained. In the event of engine failure, the emergency power control system will provide sufficient hydraulic pressure to PC No. 1 or PC No. 3 system to control the airplane attitude for landing.

6-5. A boot-strap type reservoir is used with each normal power control system to provide for variations in the total system volume because of temperature changes and differential displacement of various actuators. The boot-strap reservoir utilizes 3,000 psi system pressure acting on a small area piston to develop approximately 100 psi on the return system. With this design, there is no pressure on the return system until pressure is developed by the airplane pump, hydraulic test stand, or reservoir accumulator.

6-6. The hydraulic systems must be maintained as free of air/nitrogen as possible to provide proper response to pilot and AFCS system inputs. The effect of air/nitrogen in the system is not readily detected during ground tests since no airloads are being imposed upon the flight control surfaces.

6-7. The reservoirs incorporate a servicing (quantity level) window which is used both for servicing with fluid and for determining if excessive air/nitrogen is present in the system. The distance between the NO PRESS and SYS PRESS window index marks for a given fluid temperature equals the normal amount of compression of the hydraulic fluid plus the volume required to fill the surge dampers and emergency accumulators in that system. If the reservoir piston moves farther than normal, this is indicative of excessive air/nitrogen being compressed with the hydraulic fluid.

6-8. An emergency power control system provides emergency hydraulic pressure to the PC No. 1 or PC No. 3 system if the system hydraulic pump fails in flight.

6-9. The hydraulic indicating system provides a cockpit indication of hydraulic pressure in the hydraulic supply systems on separate pressure indicators. When the emergency power package is in operation, the pressure supplied to PC No. 1 or PC No. 3 circuits by the emergency hydraulic pump is indicated on PC No. 1 or PC No. 3 indicator. System components also include a low hydraulic pressure caution light and an emergency accumulator isolation caution light. The low hydraulic pressure caution light comes on when hydraulic pressure in any PC system drops below 1,500 psi. The emergency accumulator isolation caution light (EMERG HYD ISO) comes on when the emergency accumulator shutoff valve is in OPEN.

6-10. An accumulator precharge system is used to charge, depressurize, or pressure-check the emergency and utility accumulators. All operations are performed from a single location in the right wheel well through the accumulator filler valve package. The filler valve package consists of nine pneumatic charge and bleed valves and pressure gages in a common housing. On airplanes with PC No. 3 system, a tenth charge valve and gage is located below and forward of the common housing.

6-11. POWER CONTROL (PC) NO. 1 HYDRAULIC SUPPLY SYSTEM. (See figure 6-3 or 6-4.)

6-12. On airplanes through AF69-6196, PC No. 1 hydraulic supply system powers the automatic flight control system yaw actuator and half of the aileron, spoiler, unit

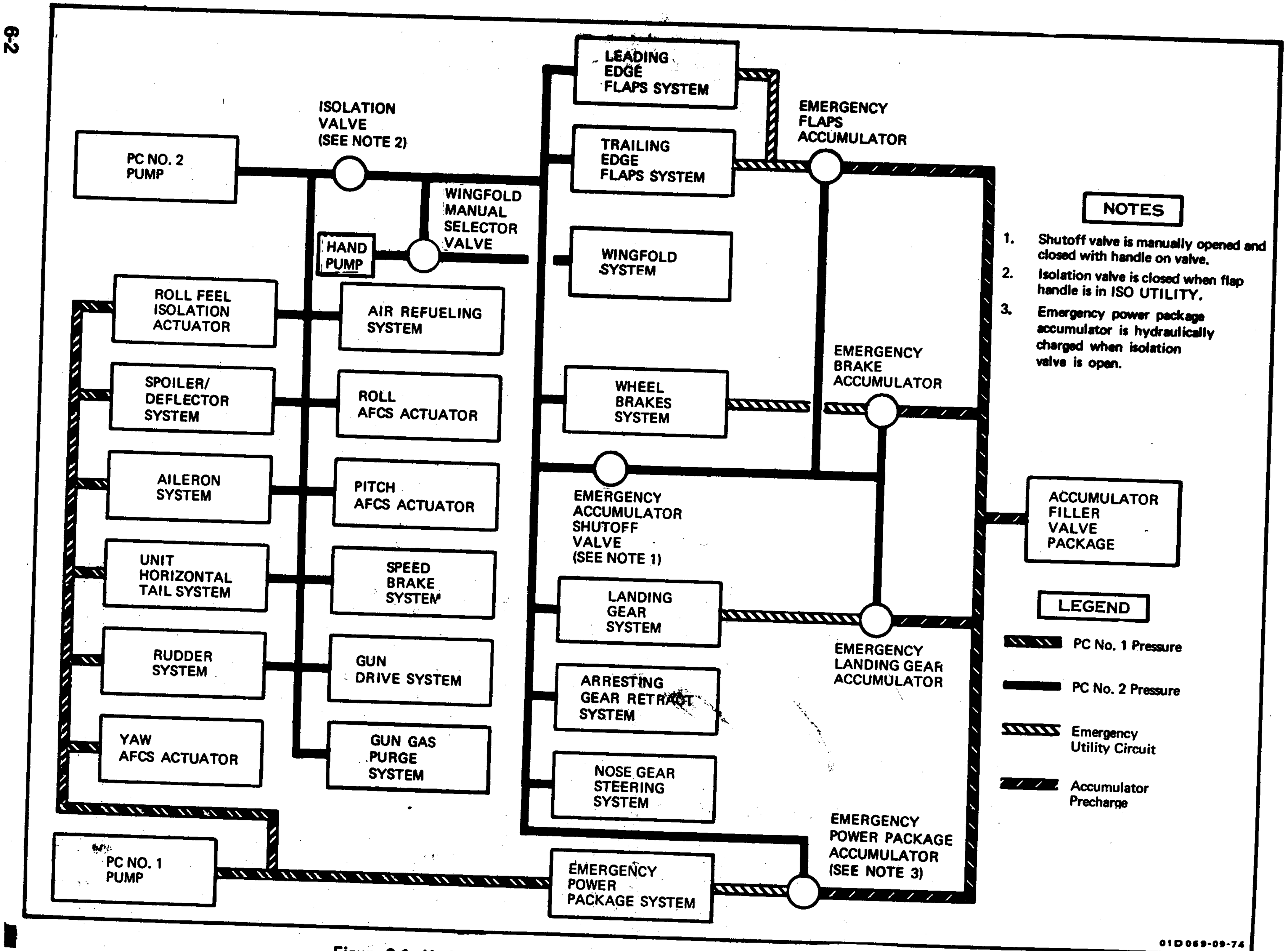
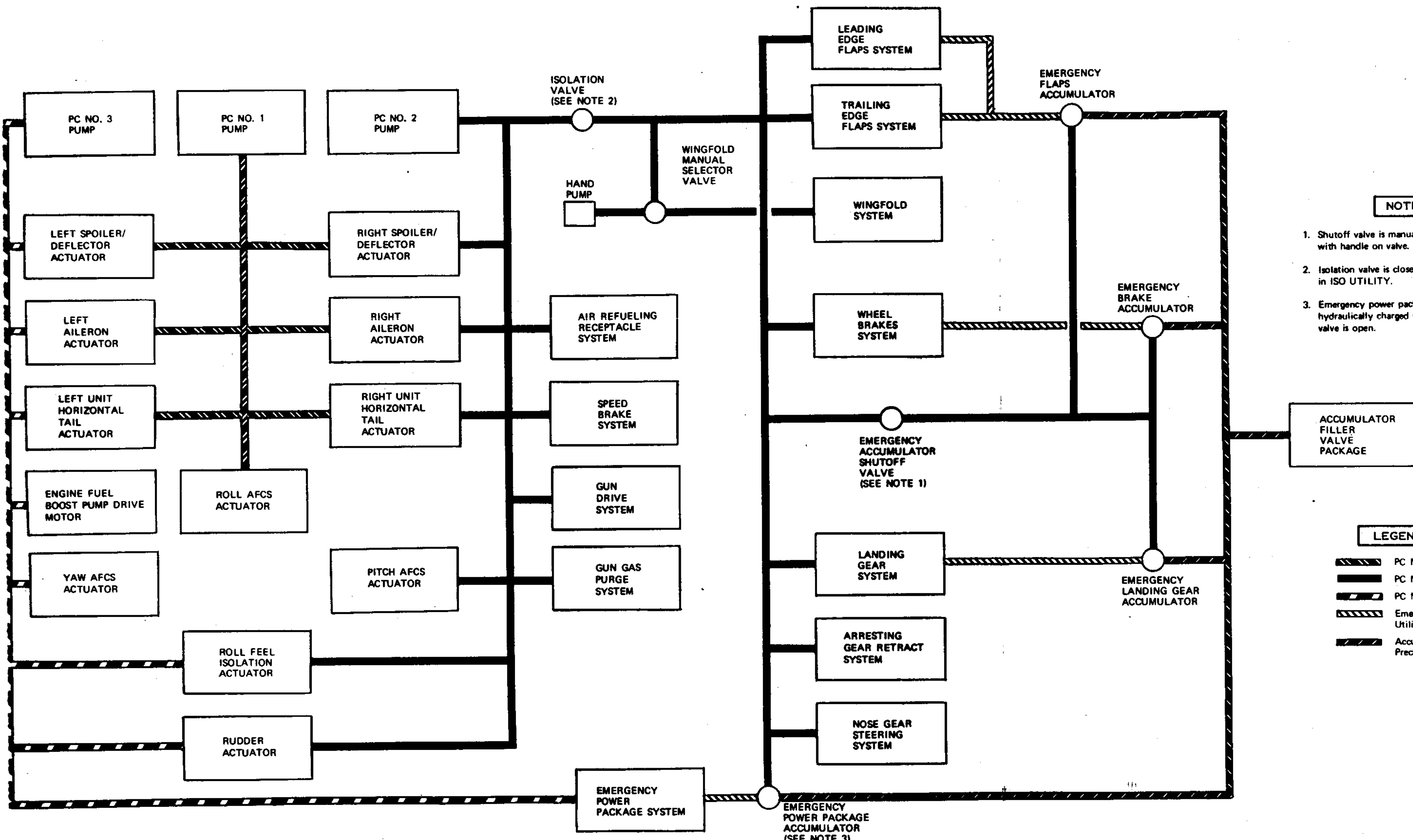


Figure 6-1. Hydraulic System Block Diagram (Airplanes Through AF69-6196)



NOTE

1. Shutoff valve is manually opened and closed with handle on valve.
2. Isolation valve is closed when flap handle is in ISO UTILITY.
3. Emergency power package accumulator is hydraulically charged when isolation valve is open.

LEGEND

- PC No. 1 Pressure
- PC No. 2 Pressure
- PC No. 3 Pressure
- Emergency Utility Circuit
- Accumulator Precharge

Figure 6-2. Hydraulic System Block Diagram (Airplanes AF69-6197 and Subsequent)

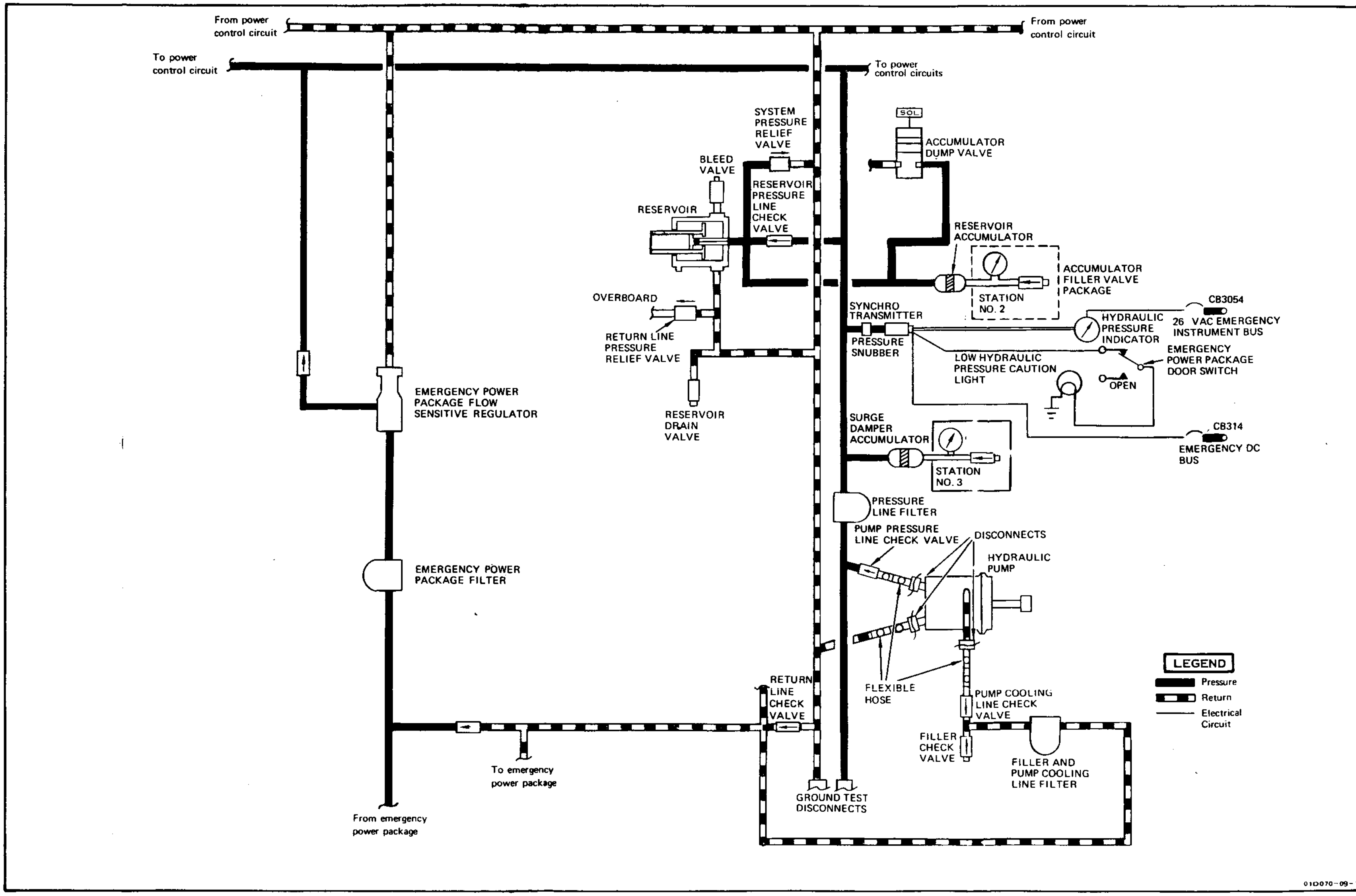


Figure 6-3. Power Control No. 1 Hydraulic Supply System Schematic Diagram (Airplanes Through AF69-6196)

horizontal tail, rudder, and roll feel isolation actuators. On airplanes AF69-6197 and subsequent, PC No. 1 hydraulic supply system powers the automatic flight control system roll actuator and half of the aileron, spoiler, and unit horizontal tail actuators. The PC No. 1 hydraulic supply system includes an engine-driven hydraulic pump, filters, accumulator, relief valves, check valves, and quick-disconnects.

6-13. The PC No. 1 engine-driven hydraulic pump is located on the engine accessory drive case. Internal pump cooling and lubrication are provided by bypass fluid circulated through the pump case and then routed to the hydraulic system return line. On airplanes through AF69-6196, cooling fluid is routed through the emergency power package and then to the system return line. A filter in the pump cooling line prevents foreign particles from entering the system. Hydraulic fluid entering the system through the system filler valve also passes through the pump cooling line filer.

6-14. When a system or component is actuated, fluid flows from the hydraulic pump, through the presure line filter, to the component. A pressure relief valve in the pressure line protects power control systems from excessive pressure by opening and porting fluid directly into the system return line.

6-15. Return line fluid flows back to the hydraulic pump. The reservoir stores fluid under sufficient pressure to ensure an adequate flow of fluid to the hydraulic pump. A return line pressure relief valve in the supply system protects the reservoir from overpressurization by venting fluid overboard when return line pressure is excessive.

6-16. The supply system contains an accumulator (surge damper) which absorbs surges in the supply system pressure line. On airplanes through AF69-6196, an additional accumulator (reservoir) provides fluid inlet pressure to the EPP pump.

6-17. POWER CONTROL (PC) NO. 2 HYDRAULIC SUPPLY SYSTEM. (See figure 6-5.)

6-18. On airplanes through AF69-6196, the PC No. 2 hydraulic supply system powers the automatic flight control system roll and pitch actuators, speed brake, air refueling probe, gun gas purge door, gun drive motor, half of the aileron, spoiler, unit horizontal tail, rudder, and roll feel isolation actuators. On airplanes AF69-6197 and subsequent, the PC No. 2 hydraulic supply system powers the speed brake, air refueling door and lock actuators, gun gas purge door, gun drive motor, automatic flight control system pitch actuator, automatic maneuvering flaps, and half of the tandem actuators controlling the roll feel isolation, rudder, right spoiler, right aileron, and right unit horizontal tail.

6-19. The PC No. 2 system also powers the following utility circuits through the isolation valve: flaps, wingfold, wheel brakes, landing gear, arresting gear, and nose gear steering. The system consists of the hydraulic pump, filters, reservoir, accumulator, relief valves, check valves, quick-disconnects, and shutoff valves.

6-20. Internal pump cooling and lubrication is provided by bypass fluid routed through the pump case and into the system return line. On airplanes AF69-6197 and subsequent, fluid is circulated through a fluid cooling loop located in access 2132-1 before reaching the system return line. An air inlet duct in access 2132-1 directs ambient air flow over the cooling loop to provide additional fluid cooling during flight.

6-21. The PC No. 2 hydraulic filters, relief valves, and reservoirs are basically the same as in PC No. 1 system except that PC No. 2 reservoir provides a slightly higher return pressure than PC No. 1.

6-22. The PC No. 2 hydraulic system incorporates an isolation valve in the hydraulic pressure line to the utility circuits. Since utility circuits are normally used only during landing, taxiing and takeoff, the flap handle is moved to ISO UTILITY following takeoff to close the isolation valve. The closed valve prevents depletion of hydraulic fluid and loss of PC No. 2 system if a utility circuit should start losing fluid. The isolation valve is open when the flap handle is in UP or DOWN.

6-23. If the PC No. 2 supply system fails, emergency operation of the landing gear, wheel brakes, and leading and trailing edge flaps is provided by three emergency accumulators. A fourth emergency accumulator provides emergency extension of the EPP if PC No. 2 system fails.

6-24. A hand pump mounted in the left wheel well provides hydraulic pressure to the system. To prevent damage to actuating cylinders with internal locking mechanisms, hand pump operation must be limited to the following:

a. Speed brake cycling.

b. Folding/spreading of the wings.

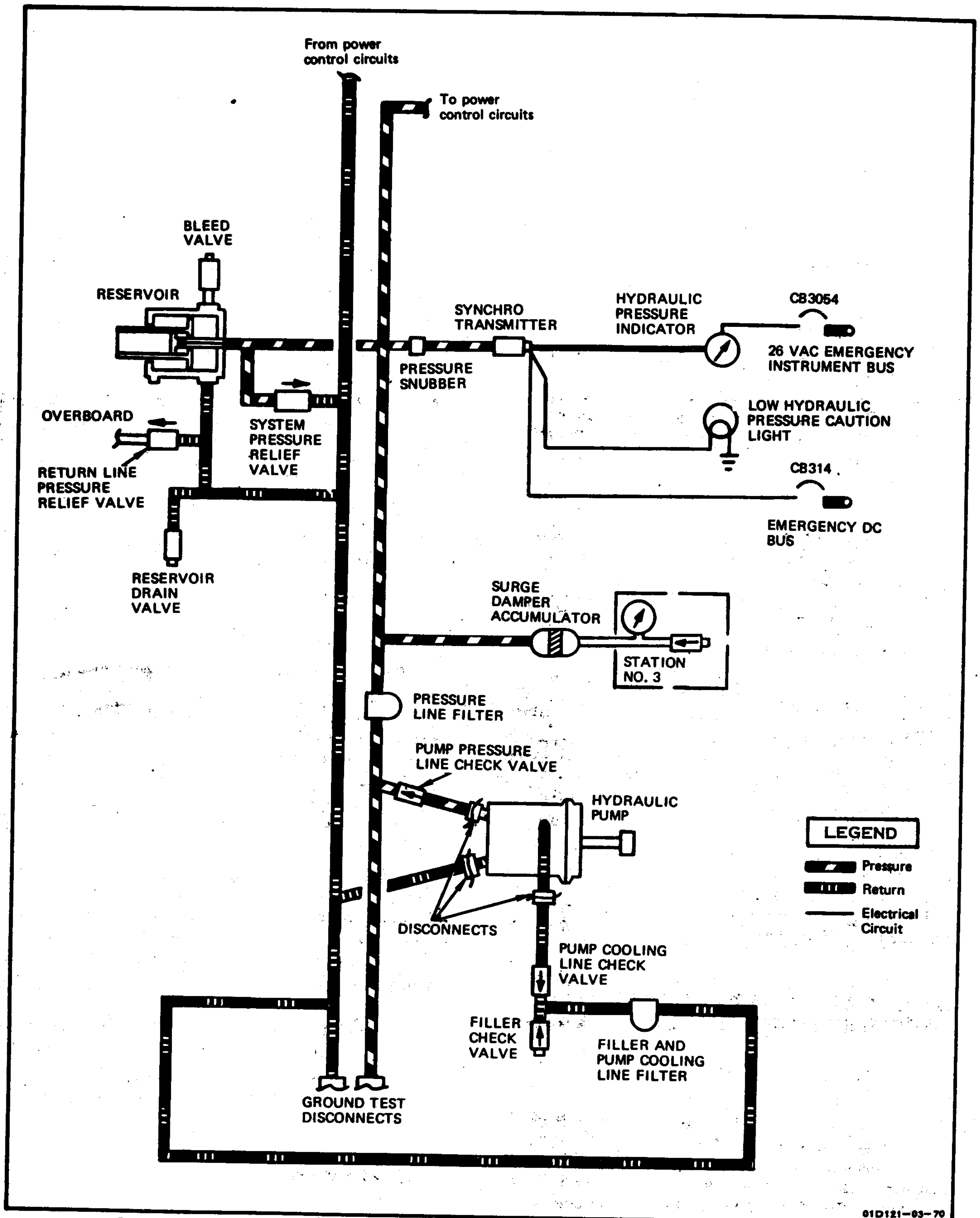


Figure 6-4. Power Control No. 1 Hydraulic Supply System Schematic Diagram (Airplanes AF69-6197 and Subsequent)

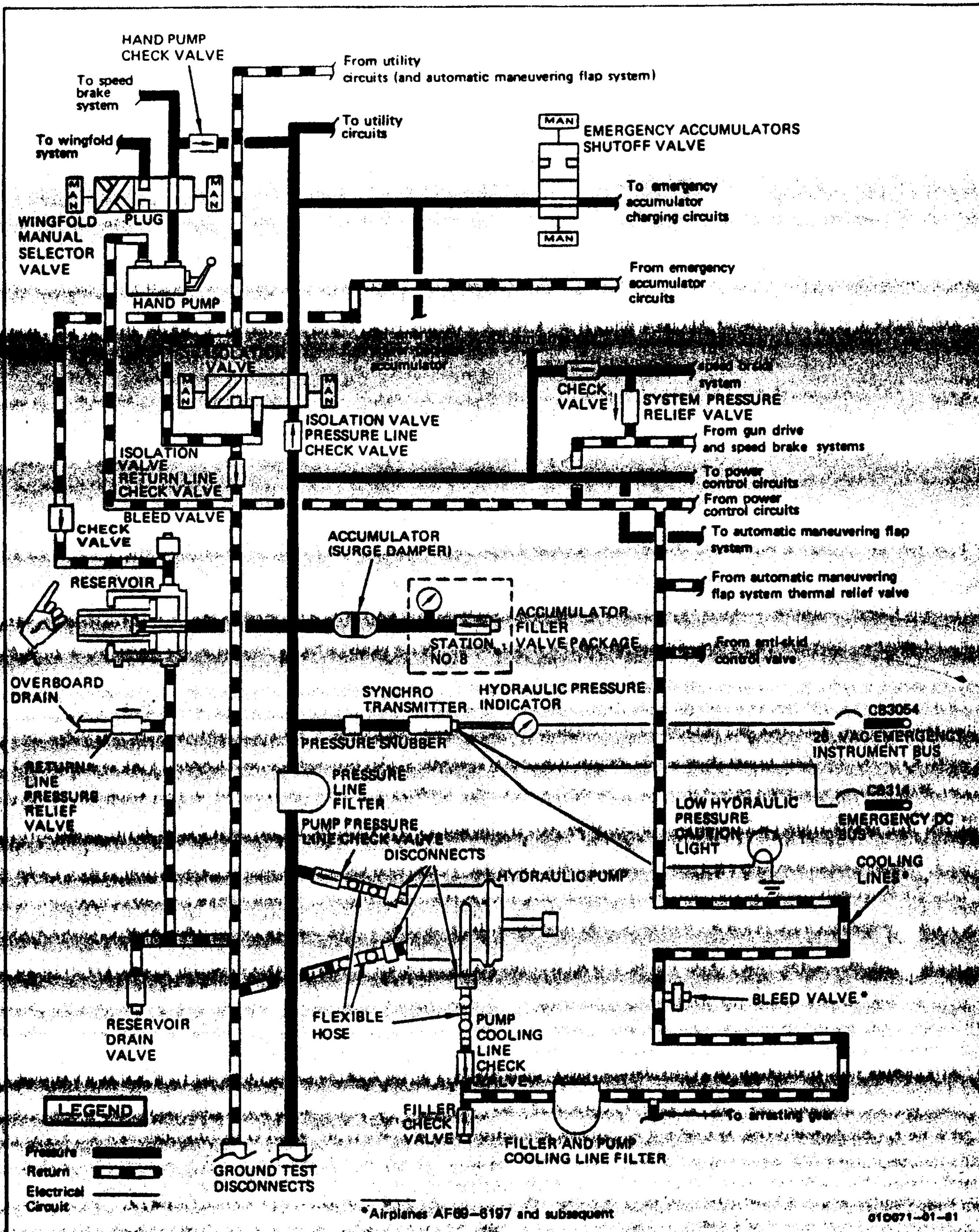


Figure 6-5. Power Control No. 2 Hydraulic Supply System Schematic Diagram

c. Charging of the utility brake and emergency accumulators.

d. Static pressurization of the system for leak detection.

6-25. POWER CONTROL (PC) NO. 3 HYDRAULIC SUPPLY SYSTEM. (Airplanes AF69-6197 and Subsequent.) (See figure 6-6.)

[illegible] PC No. 3 hydraulic supply system powers the automatic flight control system yaw actuator and half of the tandem actuators controlling the roll feel isolation, rudder, left spoiler, left aileron, and left unit horizontal tail. The PC No. 3 hydraulic supply system also supplies power to operate the hydraulic motor that drives the fuel boost pump. The PC No. 3 hydraulic supply system includes an engine-driven hydraulic pump, filters, reservoir, two accumulators, relief valves, check valves, and shutoff valves.

6-27. The PC No. 3 engine-driven hydraulic pump is [illegible] the engine accessory drive case. Internal pump cooling and lubrication are provided by bypass fluid circulated through the pump case, pump cooling line filter, and emergency power package and then routed back to the system return line. A filter in the pump cooling line prevents foreign particles from entering the system. Hydraulic fluid entering the system through the system filler valve also passes through the pump cooling line filter.

6-28. When a system or component is actuated, fluid flows from the hydraulic supply pressure line, through the pressure line filter, and to the component. A pressure relief valve in the pressure line protects the power control systems from excessive pressure by opening and porting fluid directly into the system return line.

6-29. Return line fluid flows back to the hydraulic pump. The reservoir stores fluid under sufficient pressure to ensure an adequate flow of fluid to the hydraulic pump. A return line pressure relief valve in the supply system protects the reservoir from overpressurization by venting fluid overboard when the return line pressure is excessive.

6-30. The supply system incorporates two accumulators, one to absorb pressure surges in the supply system pressure line and the other to provide fluid inlet pressure to the emergency power package.

6-31. EMERGENCY POWER CONTROL HYDRAULIC SUPPLY SYSTEM. (See figure 6-7.)

6-32. On airplanes through AF69-6196, the emergency power control hydraulic supply system supplies pressure to operate the automatic flight control system yaw actuator, aileron, spoiler, unit horizontal tail, rudder, and roll feel isolation actuators if PC No. 1 hydraulic pump fails in flight. On airplanes AF69-6197 and subsequent, the emergency power control hydraulic supply system supplies pressure to operate the [illegible] rudder, roll feel isolation actuators, unit horizontal tail, left aileron, and left spoiler if PC No. 3 hydraulic pump fails in flight. The emergency power control system consists of the emergency power package hydraulic pump, filter, and flow-sensitive regulator.

6-33. With the emergency power package extended, ram air drives the emergency power package turbine fan to operate the hydraulic pump. Pressurized fluid from the pump passes through the emergency power package filter and into the flow-sensitive regulator which regulates hydraulic flow as demanded by the system.

6-34. HYDRAULIC INDICATING SYSTEM.

6-35. The hydraulic indicating system provides hydraulic supply system pressure information, low hydraulic pressure indication, and emergency accumulator isolation indication. On airplanes through AF69-6196, a dual-pointer indicator is provided to indicate pressure in PC No. 1 and PC No. 2 hydraulic supply system. When the emergency power package is extended, emergency hydraulic pressure is indicated on the PC No. 1 pointer. On airplanes AF69-6197 and subsequent, three separate indicators are provided to indicate pressure in PC No. 1, PC No. 2, and PC No. 3 hydraulic systems. Emergency power package pressure is indicated on the PC No. 3 indicator.

6-36. The hydraulic pressure synchro transmitter is an autosyn-type, electrically operated transmitter. Interaction between the transmitter signal and the indicator signal provides the resultant hydraulic pressure indication.

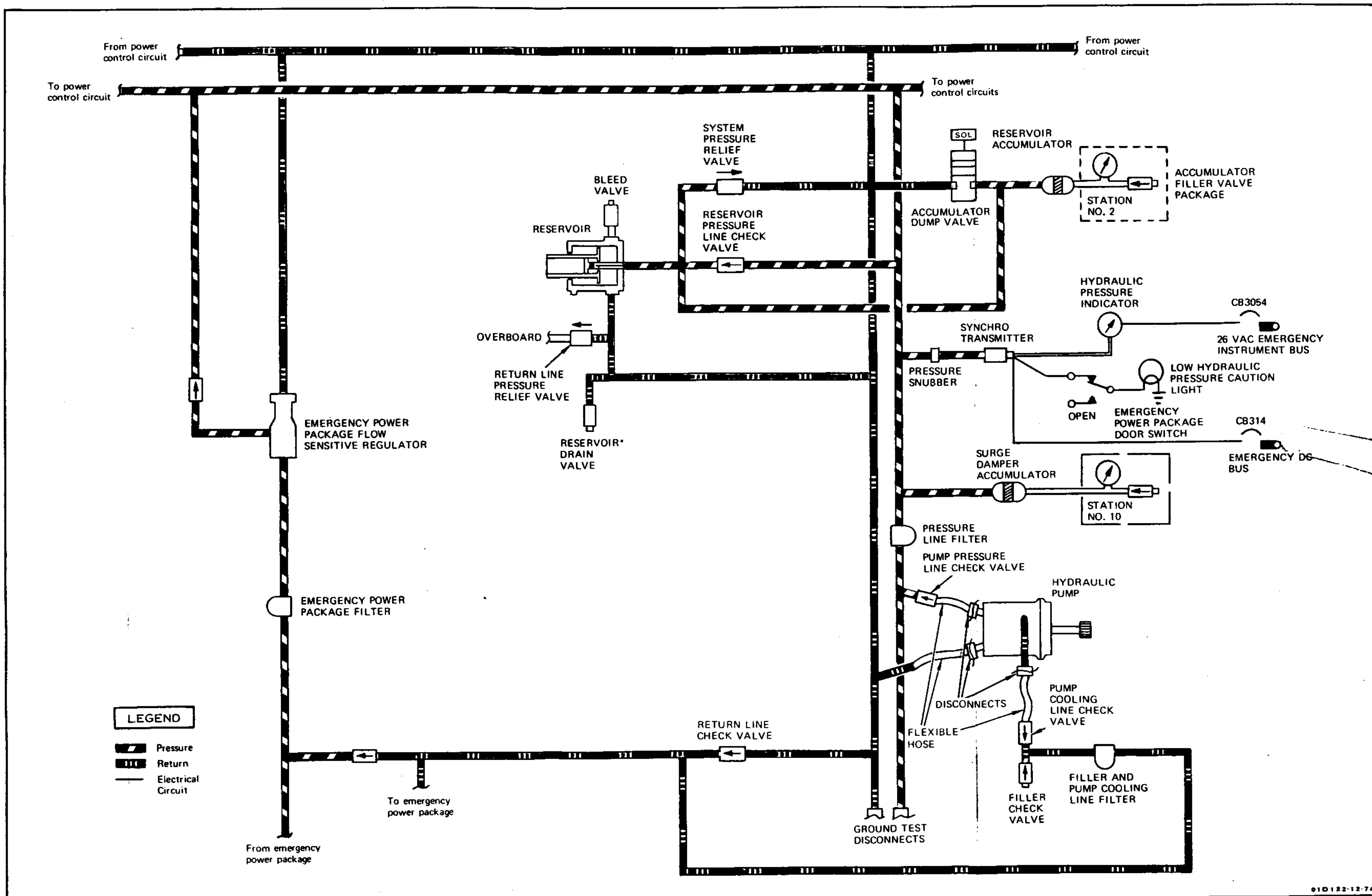


Figure 6-6. Power Control No. 3 Hydraulic Supply System Schematic Diagram (Airplanes AF69-6197 and Subsequent)

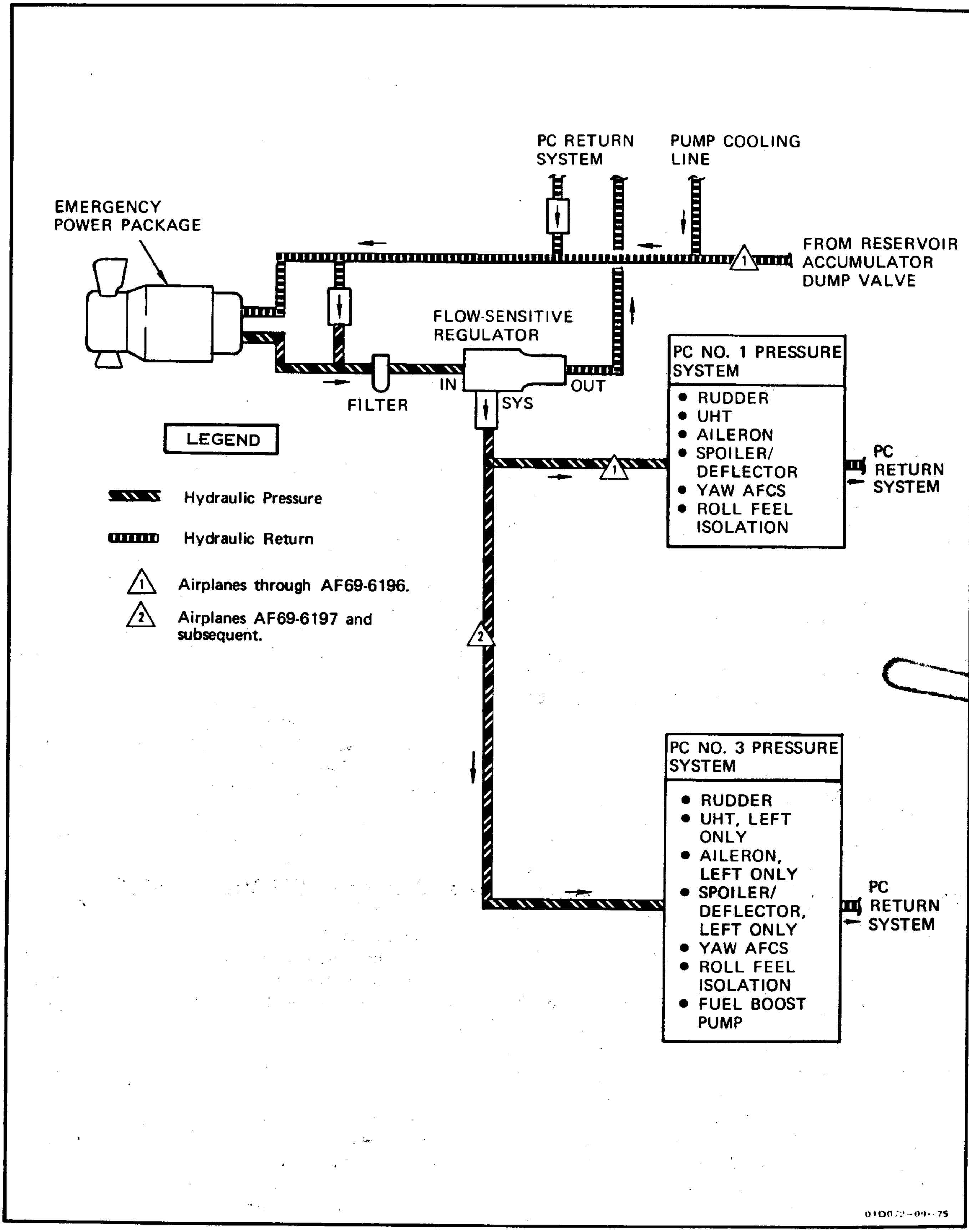


Figure 6-7. Emergency Power Control Hydraulic Supply System Schematic Diagram

6-37. The low hydraulic pressure caution light (HYD PRESS) on the caution light panel comes on when hydraulic pressure in any hydraulic supply system drops below 1,500 psi (figure 6-3 and 6-5).

6-38. Each transmitter contains a pressure switch which is closed at low hydraulic pressures. A closed switch in any transmitter routes electrical power to the low hydraulic pressure caution light. The switch opens when pressure increases to 1,840 psi.

6-39. On airplanes through AF69-6196, extension of the emergency power package opens the contacts of the emergency power package door switch, interrupting power from the PC No. 1 pressure transmitter to the low hydraulic pressure caution light. As a result, the light responds only to pressure drops in the PC No. 2 system when the emergency power package is extended.

6-40. On airplanes AF69-6197 and subsequent, extension of the emergency power package opens the contacts of the emergency power package door switch, interrupting power from the PC No. 3 pressure transmitter to the caution light. As a result, the caution light responds only to pressure drops in PC No. 1 and PC No. 2 when the emergency power package is extended.

6-41. The emergency accumulator isolation (EMERG HYD ISO) caution light comes on when the emergency accumulator shutoff valve is open.

6-42. ACCUMULATOR PRECHARGE SYSTEM. (See figure 6-8.)

6-43. The accumulator precharge system provides a means of charging with nitrogen, depressurizing, or pressure-checking the airplane accumulators from a single location in the right wheel well.

6-44. The precharge system consists of the accumulator filler valve package and the emergency accumulator test switch. The filler valve package consists of nine high pressure pneumatic charge and bleed valves and pressure gages mounted in a common housing. On airplanes with PC No. 3 system, a 10th charge valve and gage is located below and forward of the common housing. Each charge valve and gage is identified by a station number which corresponds to the accumulator to which it is connected. The 10 stations and corresponding accumulators are:

Station	Accumulator
1	Arresting gear
2	Reservoir (PC No. 1 or PC No. 3)
3	PC No. 1 surge damper
4	Emergency landing gear
5	Wheel brakes
6	Emergency power package
7	Emergency wheel brakes
8	PC No. 2 surge damper
9	Emergency flaps
10	PC No. 3 surge damper

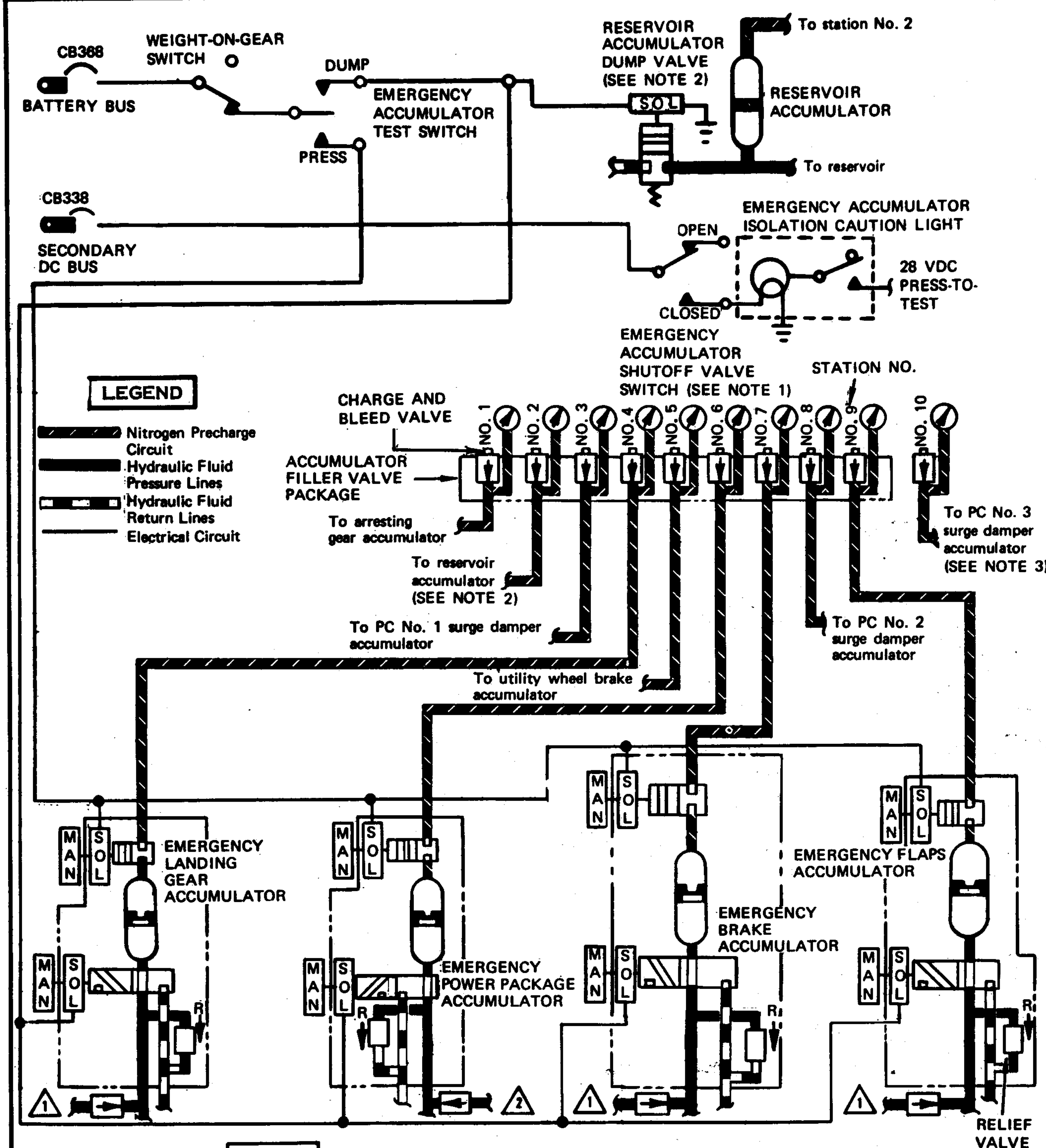
6-45. It is necessary to control the accumulator package solenoid-operated valves with the emergency accumulator test switch to charge, to check accumulator precharge (nitrogen) pressure, or to depressurize any one of the four emergency accumulators. Control of the solenoid valves allows hydraulic fluid to be dumped and connects the nitrogen side of the accumulators directly to the charge and bleed valves of the accumulator filler valve package.

6-46. To service any utility accumulator (except reservoir accumulator) does not require actuation of the emergency accumulator test switch. Servicing of reservoir accumulator requires that the accumulator dump valve be first actuated with the emergency accumulator test switch to dump hydraulic pressure.

6-47. AIR IN HYDRAULIC SYSTEM.

6-48. GENERAL. The A-7 hydraulic systems are closed systems, meaning they are not open to outside air. The system fluid is contained in the components and lines and should be air free. Even in the reservoir, no air is in contact with the hydraulic fluid.

6-49. The hydraulic system reservoir maintains a supply of hydraulic fluid for the system and allows for variations in total system volume because of temperature changes and differential displacement of various actuators. Return fluid does not flow through the reservoir. Instead, the fluid is recirculated by the pumps as components in the airplane are actuated.



NOTE

1. Switch is closed when shutoff valve handle is in OPEN.
2. Reservoir accumulator is in PC No. 1 system on airplanes through AF69-6196.
   Reservoir accumulator is in PC No. 3 system on airplanes AF69-6197 and subsequent.
3. Station 10 is only on airplanes AF69-6197 and subsequent.

⚠1 PC-2 pressure from emergency accumulator shutoff valve.

⚠2 PC-2 pressure from flap isolation valve.

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Figure 6-8. Accumulator Precharge System Schematic Diagram

6-50. Some of the more interesting facts about the A-7 hydraulic systems are as follows:

a. A-7 hydraulic systems are not self-bleeding because of closed system operation.

b. Air in the system lines or components will not be trapped in the reservoir but distributed throughout the system.

c. The system pumps are not self-priming. The boot-strap reservoir return pressure is required to maintain a fluid supply to the pumps.

d. If the reservoir is filled in a NO PRESS condition, it should be rechecked after system pressure is applied. If a reservoir is checked or filled under the SYS PRESS condition, it should be checked after the system is shut down. These checks provide a method of determining if the system contains excessive air.

e. A lack of pressure indication after engine start may be caused by air in the system.

6-51. SYMPTOMS OF AIR IN SYSTEM. Many times malfunctions are erroneously attributed to faulty components while the true cause is air. Some of the effect air has on a system that might be contributed to faulty components are discussed below.

a. Cavitation of the pump: Since the pump is not self-priming, air in the system may be ingested into the pump inlet and will interrupt the flow of fluid through the pump. A loss of fluid flow into the pump will result in loss of boot-strap pressure which normally supplies fluid under pressure to the pump suction port. With this loss of fluid supply, overheating and subsequent failure of the pump will usually occur.

b. Chattering controls: Air is compressible but hydraulic fluid is not, which causes a repeated, rapid cycling of pressure to the actuator as the air laden fluid flows through the actuator. This hammering effect could subsequently lead to mechanical damage.

c. Spongy controls: If a control surface can be repositioned by hand when no hydraulic pressure is applied to the actuator, the actuator is usually full of air. Since air has a lower viscosity than fluid, and since air is compressible, the flow of air through control orifices will be much more rapid than fluid and will result in a spongy response of the control surface.

d. Squealing sounds emanating from hydraulic components: Air flowing rapidly through orifices within the system can be heard as the air passes from a high pressure zone to a low pressure zone within the system.

e. Faulty operation of a component: Items such as AFCS actuators and the nose gear steering actuator are controlled by electro-hydraulic servo valves. Proper operation of these servo valves is possible only when air-free fluid is directed through tiny orifices into the fluid-pressure balance chambers within the servo valve. If air should enter the valve, erratic operation will result.

f. Reservoir servicing indication: When pressure is applied, the reservoir piston moves farther than normal from the NO PRESS to SYS PRESS window. This indicates air in the system is compressing with the increase in pressure.

g. Not only air but nitrogen from faulty accumulators may enter the hydraulic system. Nitrogen, just like air, jeopardizes the proper operation of an aircraft's hydraulic system and changes the bright, red hydraulic fluid into a pink, frothy mass.

6-52. HOW AIR IS INGESTED. Air gets into the hydraulic system in many ways with the following being the most likely.

a. Inadequate fluid in reservoir filler unit: If during reservoir filling operation, the fluid quantity of the filler unit is excessively low or the servicing hose has not been filled with fluid, air will be pumped into the aircraft reservoir.

b. Replacement components not filled with fluid: An example of this is during replacement of filter elements the replacement element should be positioned in the bowl and the element and bowl filled with clean fluid before installing. If a component is not filled during installation, the air in the component may be displaced into other parts of the hydraulic system and result in another malfunction.

c. Leakage of nitrogen from accumulators: If an accumulator requires repeated servicing with nitrogen and source of the leak cannot be readily detected, the possibility exists that the nitrogen is leaking across the accumulator piston and into the hydraulic system.

d. Improperly serviced reservoir: If a system reservoir is not properly bled while servicing in the unpressurized condition, the air in the reservoir may subsequently be ingested into the pump supply line when the aircraft assumes a certain flight attitude or g condition.

e. Operation of UHT cylinder with pressure applied to only one PC system: The tandem actuator design permits continued control of a flight control surface in the event of failure of one of the hydraulic systems. However, if during maintenance only one PC system is powered and the flight controls actuated, it is possible that air will be ingested into the unpressurized system. The differential area of the UHT cylinder will create a partial vacuum within the cylinder as the piston moves. Due to the distance between the cylinder and reservoir, fluid required to fill the expanding chamber of the cylinder will be supplemented by air which may be drawn across the O-ring seals and into the cylinder.

6-53. AIRPLANE REMOVAL FROM STORAGE.

6-54. When airplane is returned to active service after being down for 30 days or more, perform the following before engine run:

a. Using a lint-free cloth saturated with MIL-H-83282 hydraulic fluid, wipe down the exposed chrome surface of all actuator piston rods.

b. Using oil can filled with MIL-H-83282 hydraulic fluid or MIL-H-46170 preservative fluid, saturate the felt wipers of all actuators.

c. Service all accumulators (paragraph 3-48).

d. Perform hydraulic system bleeding (paragraph 3-41).

SECTION VII
POWERPLANT SYSTEMS

7-1. DESCRIPTION.

7-2. The powerplant system develops thrust for the airplane, drives engine mounted accessories, and supplies compressor bleed air for airframe use. Doors and panels on the sides and bottom of the aft fuselage section permit access for routine maintenance, inspection, and component replacement. The fuselage tail cone and lower half of the aft fuselage are removable for engine change.

7-3. Powerplant systems consist of the powerplant installation, airflow control system, engine instrument system, engine system, main fuel system, manual fuel system, temperature limiter amplifier system, ignition and starting system, and oil system.

7-4. POWERPLANT INSTALLATION.

7-5. The powerplant installation provides three engine-to-airframe mounting points. All engine vertical, lateral, and thrust loads are transmitted through the mount assemblies to the airframe structure.

7-6. The powerplant installation additionally includes an engine drainage system that provides necessary overboard drain for the engine and accessories. Hoses vent or drain the combustible fluids or vapors to overboard ports at the lower fuselage area. Airplanes utilize a residual fuel holding tank to trap the drainage from the HP fuel shutoff valve. The tank is automatically drained through the fuel vent mast during flight.

7-7. AIRFLOW CONTROL SYSTEM.

7-8. The airflow control system prevents compressor surges in the low rpm ranges of engine operation. This is accomplished by a set of variable geometric, high-pressure compressor inlet guide vanes and a seventh stage bleed valve. The guide vanes and bleed valve are operated simultaneously by the airflow control. The airflow control operates in response to signals received from the HP fuel pump and T1 phial.

7-9. ENGINE INSTRUMENT SYSTEM.

7-10. The engine instrument system provides visual cockpit display of turbine outlet pressure, oil pressure, oil quantity, turbine outlet temperature, and fuel flow. Caution lights warn of high turbine outlet temperature, low fuel pressure, low oil pressure, low oil quantity, high oil filter differential pressure, and manual fuel control selection.

7-11. ENGINE SYSTEM.

7-12. The airplane is powered by a TF41-A-1 twin spool, axial flow, full ducted, bypass turbojet engine. The engine consists of a low pressure compressor, intermediate pressure compressor, high pressure compressor, combustion section, high and low pressure turbine, and fan bypass duct.

7-13. MAIN FUEL SYSTEM.

7-14. The main fuel system matches fuel delivery rate automatically to engine requirement for all operating conditions and meters this fuel to the combustion chambers. In addition, pressurized fuel operates the airflow control system and airplane fuel system ejector pumps and is used as a cooling medium for engine and CSD transmission lubricating oil.

7-15. MANUAL FUEL SYSTEM.

7-16. The manual fuel system is utilized to meter fuel in the event of a main fuel control malfunction. The control provides fuel flow as a direct function of throttle position and fan discharge pressure (P2.1). When manual fuel control is selected, the manual fuel control caution light comes on. The manual fuel control bypasses the automatic limiting features of the main fuel control.

7-17. TEMPERATURE LIMITER AMPLIFIER SYSTEM.

7-18. Automatic limiting of mass airflow and turbine outlet temperature is accomplished by the temperature limiter amplifier if the engine is operating on the main fuel control. Speed signals from the low pressure compressor rotor tachometer and temperature signals from the low pressure compressor inlet and turbine outlet temperature sensors are transmitted to the temperature limiter amplifier. These signals are evaluated by the amplifier and the signal which requires the greatest correction is amplified and transmitted to the main fuel control solenoid. This solenoid ports air pressure to regulate fuel flow to prevent the engine from exceeding mass airflow limits or a turbine outlet temperature of 575°C. The amplifier includes a double datum system. This system allows turbine outlet temperature to increase approximately 19°C above the 575°C maximum and then decrease back to 575°C over a period of approximately 2 minutes.

7-19. IGNITION AND STARTING SYSTEM.

7-20. Components of the ignition system are a permanent magnet generator (PMG), ignition exciter, and two spark igniters. The generator produces electrical power for two ac circuits and one dc circuit. Each ac circuit supplies power to an element of the dual ignition system and the dc circuit supplies electrical power to operate the control relays and solenoids in the ignition system. A dual element ignition exciter contains a high voltage capacitor which discharges a high voltage impulse to the spark igniters. An automatic relight switch provides an automatic relight capability in the event of a rapid power loss (flame-out).

7-21. The jet fuel turbine starter is mounted on the aft end of the accessory drive gearcase. The starter is initiated by electrical power from the aircraft battery. The starter rotates the high-pressure compressor rotors for starting and is automatically shut down when airplane engine starting has been accomplished. Fuel is supplied from the airplane fuel system. An automatic abort system is incorporated to automatically shut down the starter if the starter start time exceeds 7 (± 1) seconds or battery voltage drops to 10.0 (± 0.5) volts. A purge switch is incorporated to provide a simplified method of bleeding the starter fuel system.

7-22. OIL SYSTEM.

7-23. The oil system is a full flow, dry sump, nonadjustable, pressure regulated system. Oil is stored in an engine mounted oil tank. The system is vented through the centrifugal breather to an overboard vent. One pressure pump and five scavenge pumps are included in the oil pump housing and are driven by one shaft from the accessory drive section. All main bearings are pressure lubricated by the pressure pump. Scavenge pumps return the oil from the main bearings and accessory drive case to the oil tank.

7-24. On engines before T.O. 2J-TF41-587, the oil filter is a single element, wire-wound filter without a bypass feature. After T.O. 2J-TF41-587, a dual element filter with a bypass feature which includes a popout indicator and caution light is installed.

SECTION VIII
FUEL SYSTEM

8-1. DESCRIPTION.

8-2. The fuel systems consist of main fuel system, internal transfer system, fuel vent and pressurization system, air refueling system, external fuel system, and fuel quantity indicating system. Fuel system containers are four external tanks, one wing integral tank, two forward fuselage tanks, two midfuselage tanks, one aft fuselage tank and a main sump tank.

8-3. On airplanes AF69-6197 and subsequent, highly porous polyurethane foam baffling is installed in the fuselage and wing tanks to reduce damage and fire hazard caused by combat or crash damage.

8-4. MAIN FUEL SYSTEM. (See figure 8-1 or 8-2.)

8-5. The main fuel system stores and transfers the airplane fuel supply. System capabilities include transfer, ground fueling and defueling, or dumping. The main fuel system containers are one wing integral tank, two forward fuel tanks, two mid fuel tanks, one aft fuel tank, and a main sump tank.

8-6. The main fuel system consists of primary and secondary precheck valves, a pressure shutoff valve, a pressure fueling manifold, wing and fuselage defueling check valves, fuel boost pump, bladder fuselage tanks, integral wing tank, and internal components of tanks such as ejector pumps.

8-7. Main fuel system pressure is supplied by three fuel pumps. On airplanes through AF69-6196, the fuel boost pump is engine-mounted and engine-driven. On airplanes AF69-6197 and subsequent, the fuel boost pump is airframe-mounted and driven by a hydraulic motor. Ejector pumps with no movable parts are used in fuel transfer functions. Electrical power is not required during servicing of internal fuel unless quantities of fuel are to be observed on the fuel quantity indicator. An automatic transfer system, requiring a minimum amount of attention from the pilot, is an integral part of the system. The sump tank and the lower portion of the aft tank are self-sealing.

8-8. INTERNAL TRANSFER SYSTEM.

8-9. The internal transfer system transfers fuel from the wing integral tank and fuselage tanks to the main sump tank and then to the engine.

8-10. Transfer system components consist of three selector valves (emergency wing transfer selector valve, wing transfer selector valve, and bypass transfer selector valve). The system also includes two quick-disconnects, pressure sensitive stop valve, water drain, fuel transfer manifold, a fuel transfer thermistor control unit, three thermistors and five ejector pumps. On airplanes AF69-6197 and subsequent, the transfer system also includes a manually operated alternate fuel feed selector valve, a manually operated motive flow shutoff valve, and one additional low fuel level indicating thermistor.

8-11. The primary function of the fuel transfer system is to provide the airplane engine with a constant flow of fuel, keeping the center of gravity as constant as possible. This is accomplished by using the external fuel supply first, then transferring wing tank fuel to the sump tank for use and using fuel from the fuselage tanks last. On airplanes AF69-6197 and subsequent, an alternate fuel feed system (figure 8-2) may be selected if the main sump tank feed system becomes damaged. In an emergency situation, the alternate system will be manually activated from the cockpit. The motive flow from the engine to the sump will be shut off, and fuel flow from the wing and/or aft tank to the sump will be diverted to feed directly to the engine. Also, as part of the alternate fuel feed system, fuel flows from the right mid tank to aft tank instead of to the sump tank.

8-12. FUEL VENT AND PRESSURIZATION SYSTEM.

8-13. The fuel vent and pressurization system prevents buildup of excessive tank cavity pressure differential (which might cause tank rupture or collapse) during climb/dive maneuvers and during fueling, defueling, and fuel transfer operations. During flight, the vent system maintains a slight positive pressure on the fuel.

The system also provides regulated air pressure for external tank fuel transfer.

8-14. The fuel vent and pressurization system consists of an air pressure vent valve, air pressure regulator, air selector valve, check valve, ground air connection, and vent mast on the lower aft fuselage.

8-15. AIR REFUELING SYSTEM.

8-16. The air refueling system permits complete refueling of the airplane fuel system (including external tanks) while the airplane is in flight. On airplanes through AF69-6196, the system consists of the air refueling probe and nozzle assembly, probe actuating cylinder, lock, swivel joint, two restrictor valves, probe actuator extend and retract switches, air refueling probe switch, probe out advisory light, probe floodlight, transformer, and selector valve. On airplanes AF69-6197 and subsequent, the system consists of the air refueling receptacle, receptacle door, door hydraulic actuator, manual selector valve, nozzle latch, solenoid selector valve, release handle, push-pull control assembly, slipway lights and rheostat, air refueling system reset switch, air refueling signal amplifier and amplifier switch, disconnect switch, and air refueling indicator panel.

8-17. With the probe in the extend position and engaged with the tanker drogue on airplanes through AF69-6196 or the tanker airplane's flying boom engaged in the refueling receptacle on airplanes AF69-6197 and subsequent, refueling of the airplane fuel system is accomplished automatically, including automatic fuel shutoff. The fuel is transferred into the tanks through the same valves and lines used in normal pressure fueling.

8-18. EXTERNAL FUEL SYSTEM.

8-19. The external fuel system provides the airplane with additional fuel storage and transfer capabilities. The system consists of external fuel tanks, which can be mounted on pylons at wing store stations 1, 3, 6, and 8. The system also includes an air selector valve, air regulator, external tank ground refueling switch in the left main gear well, fueling shutoff valve in each wing pylon, and pylon mounting provisions for connection of electrical wiring, air, and fuel lines. When the landing gear is retracted, fuel in the external tanks is transferred directly into the fuselage tanks for use by the engine.

8-20. The external fuel tanks may be fueled by pressure or gravity. Tanks may also be defueled or jettisoned. Fuel in the external tanks may be indirectly dumped through the wing dump mast, retaining the external tanks.

8-21. FUEL QUANTITY INDICATING SYSTEM.

8-22. The fuel quantity indicating system measures the quantity of fuel in the airplane fuel tanks and provides visual cockpit indication. The system consists of capacitance type transmitters (fuel probes) in each fuel tank for measuring fuel quantity, compensators (density monitors) to compensate for fuel density changes, selector switch (which contains repeater transformers), and fuel quantity indicator. The fuel quantity indicator indicates main (fuselage tanks) and transfer fuel system quantities (external or wing tanks) and total quantity of all fuel aboard.

8-23. Main and transfer fuel system quantities are indicated by individual pointers in the fuel quantity indicator which is calibrated in pounds. Total fuel quantity is indicated by a digital counter on the fuel quantity indicator. The fuel tank quantity selector switch permits monitoring of the fuel in the wing tank or any of the individual external tanks.

8-24. RESIDUAL FUEL HOLDING TANK

8-25. The residual fuel holding tank, located in the engine bay of the airplane at station 552, will provide temporary storage and subsequent inflight dumping of fuel discharged by the engine at shutdown or during false starts. The tank will hold an accumulation of fuel from 3 starts or attempted starts. Further starts or attempted starts will cause the tank to overflow through the vent mast unless the tank is drained. Inflight dumping or draining will also occur at the fuel vent mast. The installation consists of a 2-liter tank with drain valve, flexible drain line from the engine fuel shutoff cock valve to the holding tank, positive-pressure line, and negative-pressure line from tank to fuel vent mast.

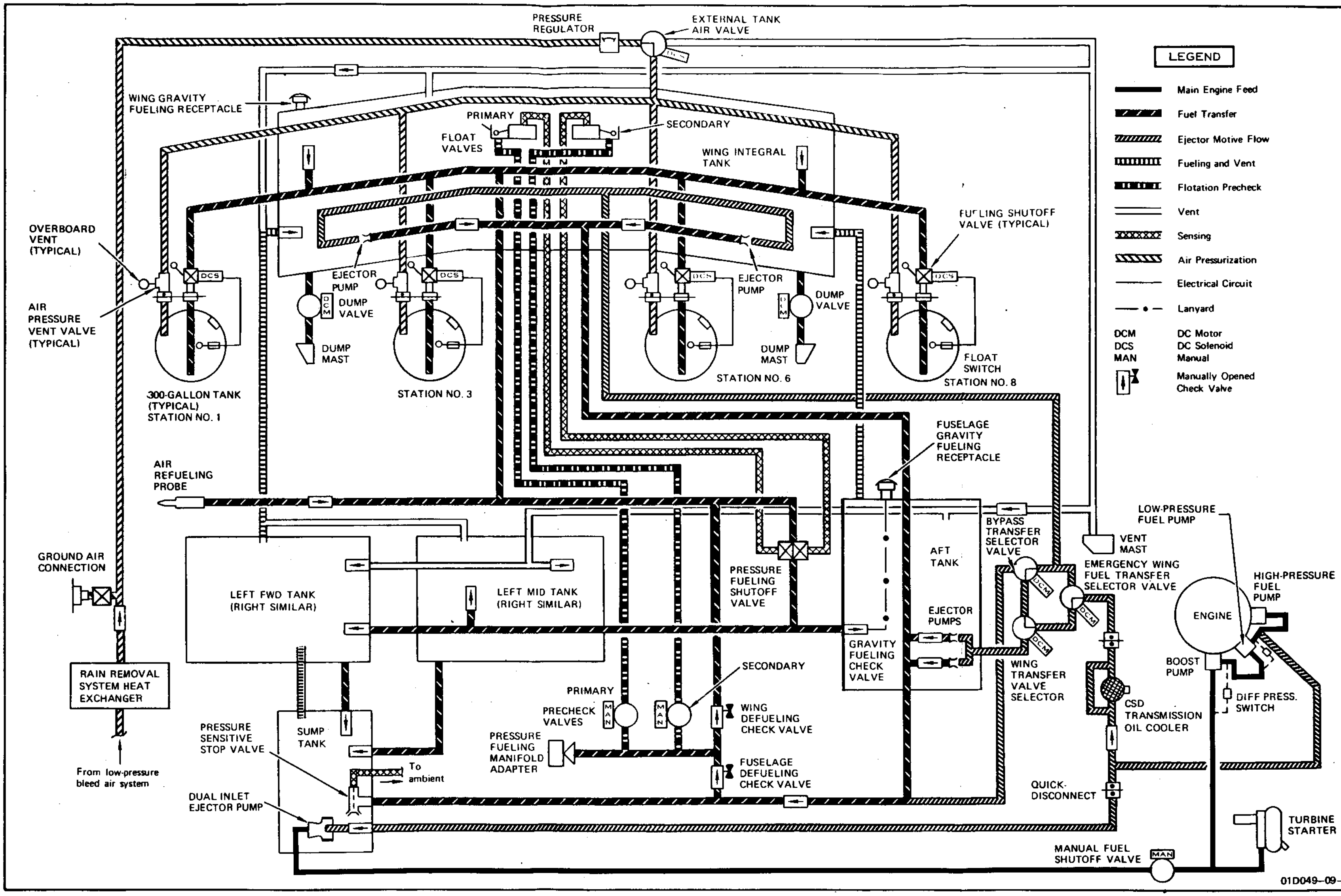


Figure 8-1. Fuel System Schematic Diagram (Airplanes Through AF69-6196)

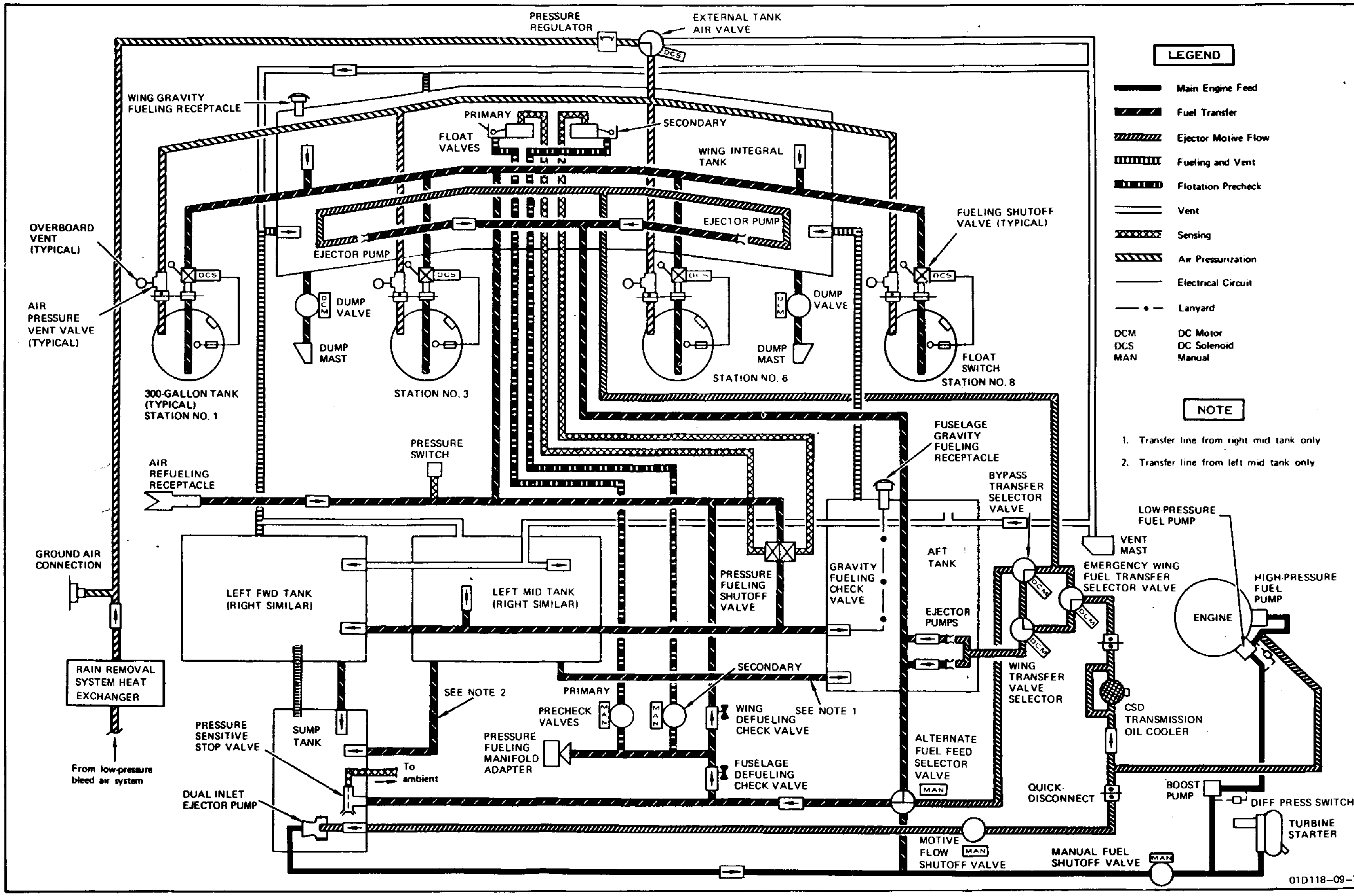


Figure 8-2. Fuel System Schematic Diagram (Airplanes AF69-6197 and Subsequent)

SECTION IX
LANDING GEAR SYSTEMS

9-1. DESCRIPTION.

9-2. A retractable, hydraulically actuated, tricycle landing gear is provided to support the airplane while on the ground. The nose gear, attached to the fuselage forward section, is retracted aft into the nose gear wheel well. Dual wheels are installed on the nose gear axle and a steering mechanism is provided for power steering of the nose gear. The main gear, attached to the fuselage midsection, is tripod mounted and retracts forward into the main gear wheel well. An arresting gear, attached to the fuselage aft section, is provided to stop the airplane, when required, and is hydraulically actuated.

9-3. Major subsystems of the landing gear system consist of the control and indicating system, main and nose landing gear system, normal hydraulic system, emergency hydraulic system, wheel brake system, nose gear steering system, and arresting gear system.

9-4. MAIN AND NOSE LANDING GEAR SYSTEM. (See figure 9-1.)

9-5. The landing gear is mechanically controlled and hydraulically operated tricycle arrangement consisting of two main gears and a nose gear.

9-6. Each main gear consists of a shock strut, tension strut, and gear actuator. These members are attached to the airplane by trunnions which permit gear extension, retraction, and transfer of landing loads to the airplane structure. As the main gear retracts forward into the wheel well, an uplock mechanism is actuated mechanically by the gear and locks the gear in the retracted position. The door actuator hydraulically closes and mechanically locks hinged doors by a torque tube arrangement. When the gear is lowered, the door actuator rotates the torque tube arrangement, opens the doors, and mechanically locks the doors in the open position. As the doors are locked open, the main gear uplock mechanism releases and allows the gear actuator to extend the gear. When the gear is extended, the gear actuator assumes a rigid position and serves as the drag strut.

9-7. The nose gear includes an air-oil shock strut. The gear is trunnion mounted and is enclosed by two hinged doors which are hydraulically operated through a door shaft and linkage assembly. The gear doors are mechanically locked in position and are sequenced by an uplock mechanism. The nose gear drag link, which redistributes drag loads, is a two-piece assembly mounted between the shock strut and fuselage bulkhead structure. The nose gear is mechanically locked down by means of a spring-loaded mechanical downlock located on the drag strut and operated by gear actuator overtravel. Also mounted on the lower drag link are two leaf springs and cam arrangement which aid gear extension in an emergency. During retraction, the nose gear is automatically centered by a roller mounted on the strut which moves along a centering cam attached to the airframe.

9-8. LANDING GEAR NORMAL HYDRAULIC SYSTEM. (See figure 9-1.)

9-9. The landing gear normal hydraulic system consists primarily of a gear actuating cylinder, door actuating cylinder in each wheel well, and mechanically operated, cockpit-controlled selector valve. Each main gear actuator has internal fingers which lock the actuator in the retracted position (gear down) and which must be hydraulically released to permit gear retraction. The PC No. 2 hydraulic system provides hydraulic power to the landing gear system by means of a manually operated isolation valve.

9-10. LANDING GEAR EMERGENCY HYDRAULIC SYSTEM. (See figure 9-1.)

9-11. An accumulator package provides power for emergency extension of the landing gear. The accumulator is precharged with nitrogen and is hydraulically charged by the PC No. 2 hydraulic system. This provides a stored energy source adequate for a single gear extension cycle. In addition to the landing gear and door actuating cylinders, the landing gear emergency hydraulic system consists of a manually operated, cockpit-controlled emergency selector valve and an emergency accumulator package consisting of an accumulator, a solenoid-operated emergency pressure dump valve, a solenoid-operated precharge shutoff valve and a thermal relief valve.

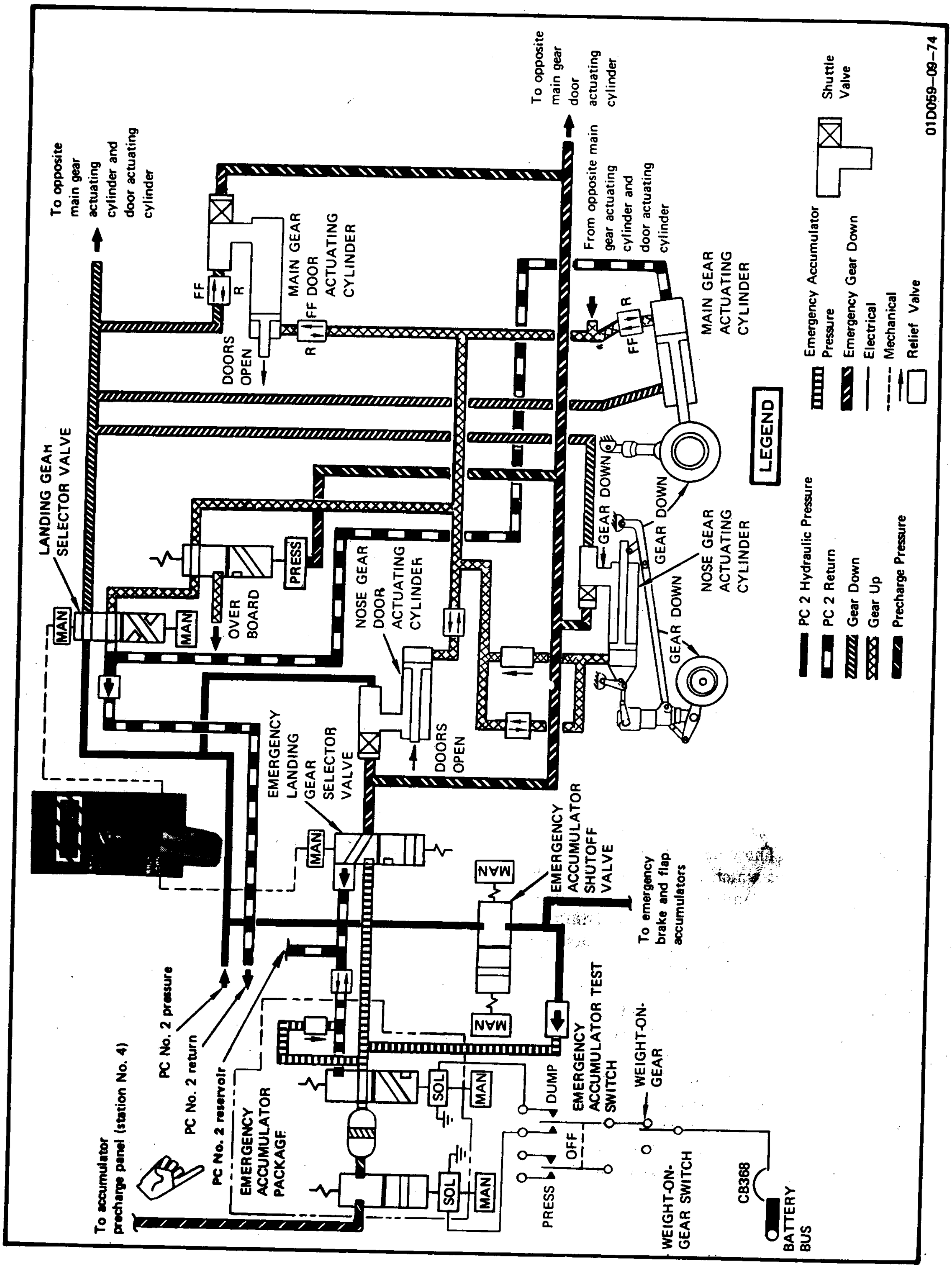


Figure 9-1. Landing Gear System Schematic Diagram

9-12. LANDING GEAR CONTROL AND INDICATING SYSTEM.

9-13. The landing gear control and indicating system consists of a landing gear control handle, landing gear handle warning light, landing gear handle safety solenoid, position indicating lights, and wheels/flaps warning lights.

9-14. The landing gear control handle connected to normal and emergency hydraulic selector valves by separate cables provides mechanical control of the landing gear position during normal or emergency operation. During normal operation, the landing gear safety solenoid mechanically locks the landing gear handle in WHLS DOWN when airplane weight is on the right main landing gear. In a ground emergency, the landing gear safety solenoid can be released by the downlock emergency release switch.

9-15. The landing gear handle warning light located in the landing gear handle comes on when landing gear position differs from the position selected by the landing gear handle. The landing gear handle switch controls the warning light when either the gear uplock or downlock switches are actuated.

9-16. The landing gear position indicating lights come on to indicate a safe condition when the landing gear is down and locked. Each of the gear position indicating lights is controlled by its respective gear downlock switch.

9-17. Operating functions of the wheels/flaps warning light depends on the selected position of the AMF (Automatic Maneuvering Flaps) switch. If the AMF switch is in OFF, the wheels/flaps warning light comes on when the gear is down and locked and leading edge flaps are not down, or when the gear is up and locked and leading edge flaps are down. The warning light is controlled by the main and nose gear down-and-locked switches and the leading edge flaps down switches or through the nose gear up-and-locked switch and the leading edge up switches. When the AMF switch is in AUTO, the warning light will come on if any of the following conditions are met: (1) flap handle in any position other than ISO UTILITY; (2) emergency flap switch in EMER DN; or (3) the existence of an overspeed condition (or AMF TEST switch in OVSP 1 or OVSP 2) with leading edge flaps not up and locked.

9-18. BRAKE SYSTEM. (See figure 9-2.)

9-19. The wheel brake system is a full-power, multiple-disk type wheel brake mounted on the main gear. Brake pressure is supplied from PC No. 2 hydraulic system and is controlled by brake pedal deflection transmitted through mechanical linkage to power brake cylinders. The brake cylinders meter pressure to the corresponding wheel through the anti-skid control valve. When the anti-skid system is on, hydraulic fluid flow to the brakes is controlled by the anti-skid control valve. A utility brake accumulator installed in the brake pressure line is system charged to provide a limited number of brake applications with the hydraulic system not operating. A two-position, normally closed, solenoid-operated shutoff valve is installed downstream of the utility brake pressure accumulator to prevent loss of utility brake accumulator pressure in the event of PC No. 2 hydraulic system failure during flight. The shutoff valve is controlled by the three position (ANTI-SKID, OFF, and BRAKE ACCUM) anti-skid switch located on the left console. The brake accumulator shutoff valve is electrically energized by power from the battery bus when the battery switch is placed in BATT and the anti-skid switch is placed in BRAKE ACCUM. When energized, the shutoff valve directs the hydraulic pressure stored in the utility brake accumulator into the normal brake system to provide differential braking when the PC No. 2 system is inoperative.

9-20. The emergency brake control is actuated by pulling a spring-loaded emergency brake handle located on the left console which manually operates the emergency brake valve. An emergency brake accumulator package, system-charged and isolated from the normal brake system by pressure-operated shuttle valves, supplies power to the brakes.

9-21. The anti-skid system is an electrically controlled braking system which prevents tire skid. The system is actuated by a switch on the left console and is energized when the airplane weight is on the gear. A speed sensor near the wheel exciter ring senses rate of deceleration in each wheel. It then sends signals through the anti-skid control box to the control valve. If a near-skid develops in either wheel, brake pressure is relieved from both wheel brakes until wheel speed is equal. Brake pressure is then reapplied to both wheels. When either sensor senses a locked wheel, brake pressure is relieved, allowing the wheels to

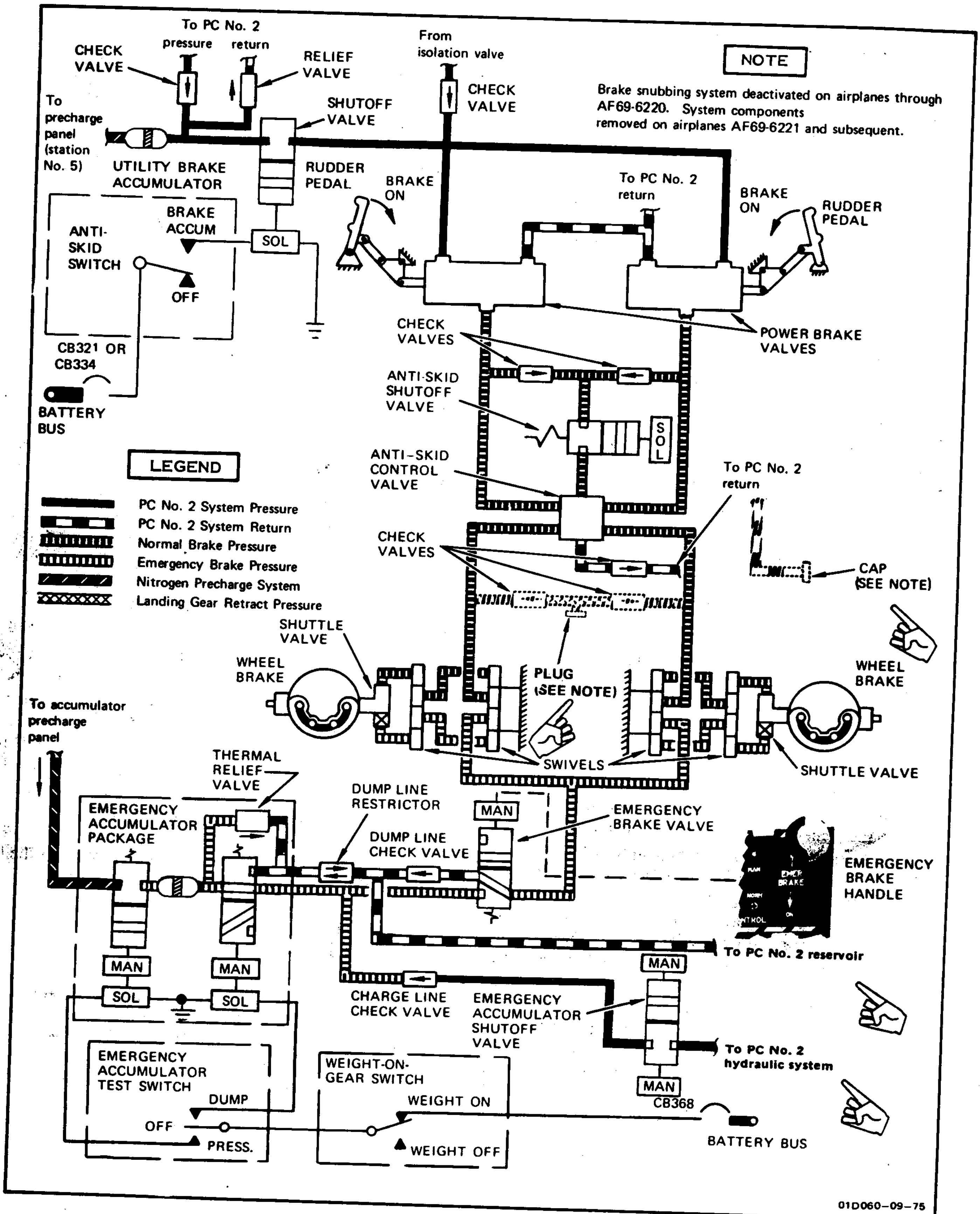


Figure 9-2. Wheel Brake System Schematic Diagram

return to synchronized speed, at which time brake pressure will be reapplied to both wheels. The anti-skid system will automatically revert to manual braking when groundspeeds are less than 8 knots. A caution light on the right console comes on when the system malfunctions or when the gear is down and the anti-skid switch is off.

9-22. NOSE GEAR STEERING SYSTEM.

9-23. The nose gear steering system is an electrically controlled, hydraulically actuated system which provides power steering for slow speed ground operations and automatic nose gear shimmy damping for high speed ground operation. A momentary contact switch located on the stick grip engages nose gear steering when airplane weight is on the main gear. The switch operates a holding circuit and must be depressed a second time to deenergize the circuit. Deflection of the rudder pedals controls the steering actuator when the system is engaged. The steering system provides the capability of turning the nosewheel 61° left or right from the airplane centerline.

9-23A. On airplanes before T.O. 1A-7-505, the steering system automatically cuts off anytime the 61° steering limit is exceeded or when airplane weight is off the main gear.

9-23B. On airplanes after T.O. 1A-7-505, the steering system automatically cuts off anytime the 61° steering limit is exceeded, the airplane weight is off the main gear or the nose gear steering amplifier senses an open or shorted circuit in the nose gear system.

9-24. ARRESTING GEAR SYSTEM. (See figure 9-3.)

9-25. The arresting gear system reduces airplane landing roll for emergency field operations. A combination of gravity loads and accumulator pressure extends the arresting gear and applied PC No. 2 hydraulic system pressure retracts the gear. The arresting gear actuator is a combination hydraulic actuator and dashpot accumulator. The arresting gear can pivot laterally to compensate for off-center engagement and vertically to permit variations in airplane attitude during engagement. A centering device returns the gear to center before retraction, and the uplock mechanism mechanically locks the gear in the up position. If accumulator pressure fails, an accumulator pressure operated bypass valve automatically opens and vents the arresting gear actuator retract pressure overboard, allowing the arresting gear to free-fall when the arresting gear control handle is positioned to DOWN. An electrical circuit controls gear retraction by directing PC No. 2 hydraulic pressure to the retract side of the actuator. The arresting gear handle warning light comes on when the handle and gear position do not agree. An indicating light on the caution panel comes on when the arresting gear is down.

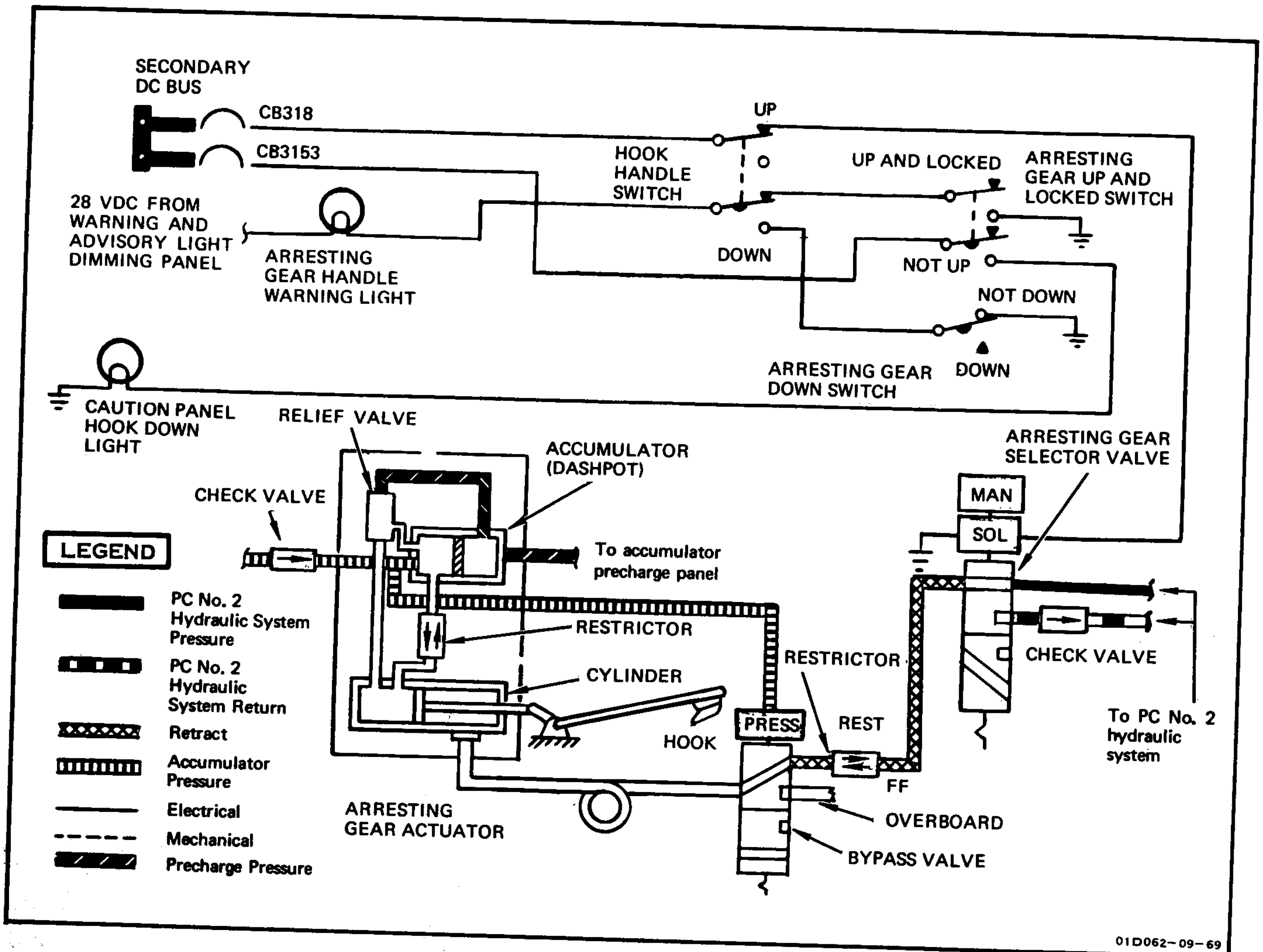


Figure 9-3. Arresting Gear System Schematic Diagram

SECTION X

FLIGHT CONTROL SYSTEMS

10-1. DESCRIPTION.

10-2. The primary flight control systems (figure 10-1) provide a means to control directional, lateral, and longitudinal attitudes of the airplane. The control stick and rudder pedals operate mechanical linkages to position servo valves of the hydraulic power control actuators. The actuators, connected to the flight controls by mechanical linkage, move the flight control surfaces to maneuver the airplane. Movements of flight control surfaces are also accomplished by roll, pitch, and yaw trim controls. Automatic flight control system (AFCS) augments pilot command when the AFCS is engaged. Refer to Section XI for description of the Automatic Flight Control System. Three viscous dampers, one in the roll control system and two in the pitch control system, are provided to prevent rapid stick movement and dampen control system oscillations. Flaps are installed on the leading and trailing edges of the wing to provide additional lift and stability during takeoff and landing. The flaps are controlled by the flap selector handle in the cockpit and actuated by hydraulic power. **The flaps are also controlled by the automatic maneuvering flaps (AMF) system. When the AMF system is engaged, the flaps are automatically extended whenever the airplane flies at low airspeeds and high angles of attack. A speed brake is installed under the fuselage midsection forward of the main landing gear for inflight braking to reduce speed. The speed brake is electrically controlled and hydraulically powered.**

10-3. Components of the directional control system are conventional rudder pedals, closed loop cable system, combination clean condition surface stops and feel spring linkage assembly, landing condition feel spring, AFCS actuator, landing condition surface stops, linkage load-limiting link, hydraulic power control package, and rudder surface. The lateral control system consists primarily of an articulated control stick, forward control linkage with a viscous damper and bobweight, roll feel isolation package consisting of roll feel springs, roll feel isolation actuator, and roll AFCS actuator. Other components of the lateral control system are the aileron trim and mixing linkage, wing control linkage, wing outer panel aileron and wing center section spoiler/deflector power control, and aileron and spoiler/deflector surface controls. Components of the longitudinal control system are an articulated control stick, fuselage control link linkage, aft cam spring mechanism, two viscous dampers and bobweights, feel and trim autopilot package, linkage load-limiting links, surface travel stops, hydraulic power control packages, and two movable horizontal stabilizer surfaces identified as the unit horizontal tail (UHT).

10-4. CONTROL STICK AND GRIP.

10-5. The control stick grip is a one-piece handle which contains a roll and pitch trim button, trigger switch, weapons release switch, target designate switch, and nose gear steering switch. The grip is mounted on a stick force sensor which is installed on the control stick by a splined shaft which connects to the roll control linkage in the stick housing. The stick is pivoted near the cockpit floor by a torque tube and bearing arrangement to provide fore and aft movement. The stick force sensor provides signals to the automatic flight control system. An automatic flight control disconnect switch is mounted on the stick force sensor.

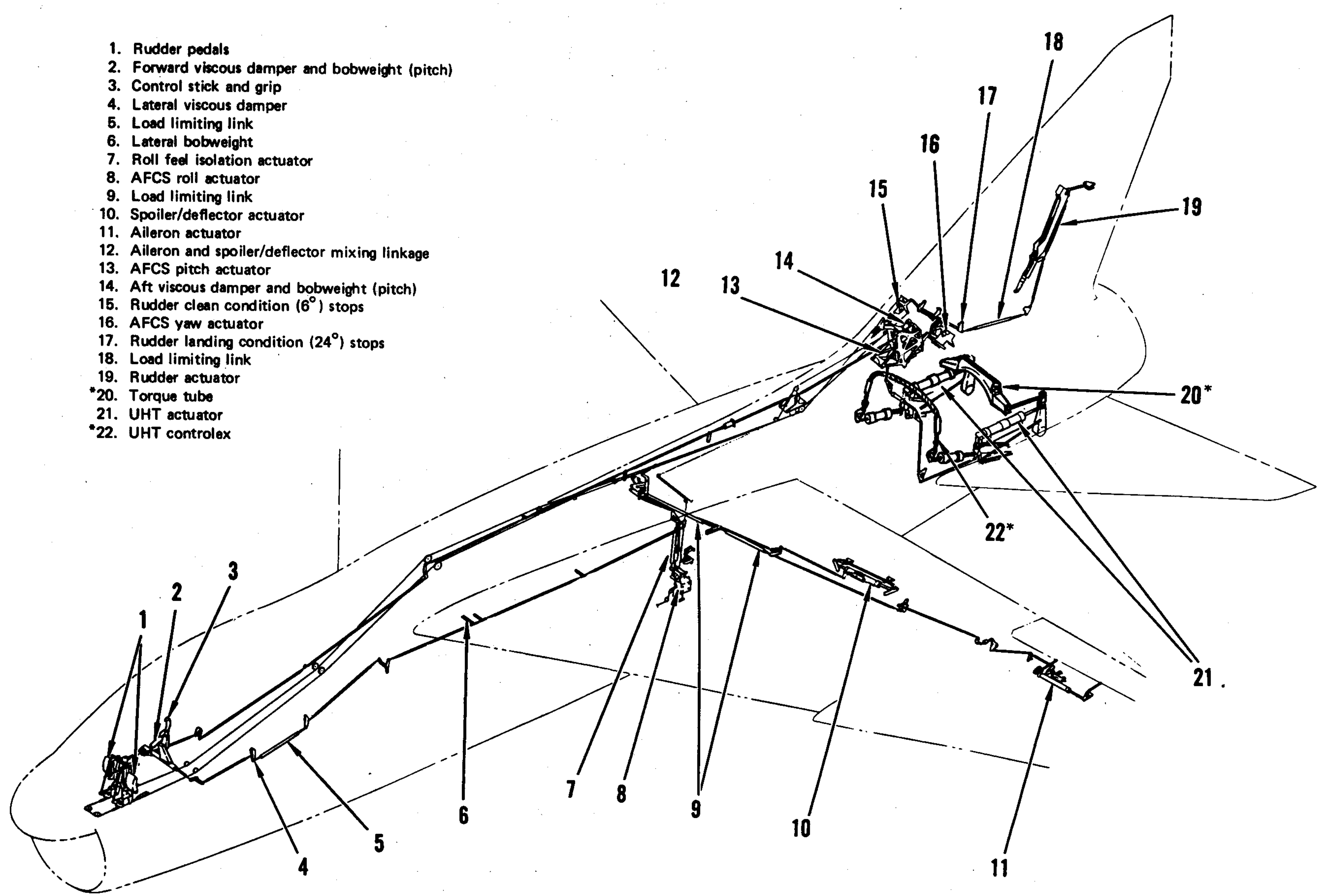
10-6. Lateral movement of the stick grip is transmitted through the stick force sensor splined shaft to provide inputs to the aileron and spoiler/deflector control linkage. Fore and aft movement of the stick is transmitted through a torque tube to the UHT control system linkage.

10-7. AILERON CONTROL SYSTEM.

10-8. The aileron control system is a mechanically controlled, hydraulically powered flight control system used to control airplane movement about the roll axis. Control system inputs are provided by lateral movement of the control stick grip, series roll trim signals, and signals from the automatic flight control system (AFCS). The ailerons are installed on the wing outer panel trailing edge and are powered by a tandem hydraulic actuator installed in each wing outer panel.

10-9. Lateral movement of the stick grip is mechanically transmitted to a hydraulic servo valve mounted on the feel isolation actuator. The servo valve meters hydraulic fluid to position the actuator as determined by the

1. Rudder pedals
2. Forward viscous damper and bobweight (pitch)
3. Control stick and grip
4. Lateral viscous damper
5. Load limiting link
6. Lateral bobweight
7. Roll feel isolation actuator
8. AFCS roll actuator
9. Load limiting link
10. Spoiler/deflector actuator
11. Aileron actuator
12. Aileron and spoiler/deflector mixing linkage
13. AFCS pitch actuator
14. Aft viscous damper and bobweight (pitch)
15. Rudder clean condition (6°) stops
16. AFCS yaw actuator
17. Rudder landing condition (24°) stops
18. Load limiting link
19. Rudder actuator
*20. Torque tube
21. UHT actuator
*22. UHT controlex



*Airplanes AF69-6197 and subsequent

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Figure 10-1. Flight Control System

displacement of the grip. A roll feel spring provides simulated airload resistance at the control stick grip. The feel spring is preloaded to return the control stick grip to neutral when the stick is deflected and released.

10-10. A roll feel isolation actuator isolates the control stick from excessive forces induced by load-limiting links or AFCS actuator feedback. When the control stick is deflected, it mechanically operates the feel isolation actuator servo valve which meters hydraulic fluid to control the roll feel isolation actuator cylinder. The roll feel isolation actuator operates the aileron and spoiler/deflector mixing linkage through a series of mechanical links. Mechanical links from the mixing linkage provide inputs to the aileron and spoiler/deflector servo valves which meter hydraulic fluid to the actuating cylinders for positioning the ailerons and spoiler/deflectors.

10-11. Downstream of the roll feel isolation actuator, an AFCS actuator is connected into the control system through a scissors linkage. During manual movement of the control stick, the scissors linkage acts as a simple idler for outputs from the roll feel isolation actuator. When the AFCS actuator receives signals from the automatic flight control system, the actuator moves the scissors linkage. The scissors linkage then acts as a variable-length link and provides control inputs to the aileron and spoiler/deflector mixing linkage independent of the control stick.

10-12. ROLL TRIM SYSTEM.

10-13. The roll trim system allows the ailerons to be positioned without deflecting the control stick grip. The system consists of a linear electromechanical trim actuator, combination roll and pitch trim amplifier package, four-position roll and pitch trim button on the stick grip, and roll trim disengage switch. The trim actuator is located in the aileron trim and mixing linkage and normally acts as a series-connected, variable-length rod in the aileron control system. With the roll trim disengage switch in ON, trim actuator inputs are provided by pushing right or left on the trim button. Maximum trim movement of the aileron is 14° up and 13° down. Spoiler/deflector position is not affected by roll trim inputs and there are no provisions for emergency roll trim. Placing the aileron trim switch in RIGHT or LEFT will actuate the roll trim as desired and the amount of trim will be indicated by the roll and pitch trim indicator. When the desired amount of trim is obtained, the trim button is released and will return to the center position by spring tension.

10-14. SPOILER /DEFLECTOR CONTROL SYSTEM.

10-15. The spoiler/deflector control system operates in conjunction with the aileron control system to provide increased roll rate. The spoiler/deflector surfaces are controlled by tandem hydraulic actuators supplied by the independent hydraulic systems. The left spoiler/deflector operates in conjunction with upward movement of the left aileron and the right spoiler/deflector with upward movement of the right aileron. The spoiler extends up into the airstream, disrupting the airflow and causing decreased lift. Simultaneously, the deflector extends down into the airstream and acts as a scoop to direct airflow over the wing surface aft of the spoiler which prevents flow separation in that area. System inputs are provided by lateral movement of the control stick grip and signals from the automatic flight control system through the aileron and spoiler/deflector mixing linkage. Roll trim signals do not affect the position of the spoiler/deflectors.

10-16. RUDDER CONTROL SYSTEM.

10-17. The rudder control system is a conventional hydromechanical system used to control airplane movement about the yaw axis. Control system inputs are provided by positioning the rudder pedals or by supplying yaw trim signals or signals from the automatic flight-control system (AFCS). Yaw control is obtained through a tandem hydraulic actuator installed in a power control package and attached to the rudder. Artificial rudder pedal feel forces are provided by a mechanical spring arrangement which supplies a different feel force gradient for the cruise (clean) and landing condition of the airplane. Rudder throw available by pilot input is 6° for clean condition and 24° for landing condition. Rudder throw is restricted to 6° either side of neutral when the main landing gear is retracted.

10-18. Forward and aft movement of the rudder pedals is mechanically transmitted to the rudder control cables. Rudder pedal movement is limited by a stopbolt on each rudder pedal bellcrank. The stopbolts are adjusted to allow rudder pedals to overtravel slightly after the landing condition (24°) stops in the fin are contacted. The right and left rudder pedals are connected by a jumper cable which closes the loop for the cable portion of the control system. Two tension regulators in the jumper cable assembly compensate for variations in cable tension due to temperature and structural effects.

10-19. Rudder pedal movement is transmitted by the rudder cables to a clean-condition (6°) stop assembly. When the landing gear extends, the release cable attached to a variable gain assembly causes a roller to disengage from a fishmouth cam and release the 6° stop assembly. This allows the stops to move with the rudder cables and transfers the stop function to the landing condition (24°) stops in the vertical stabilizer to permit full rudder travel.

10-20. UHT CONTROL SYSTEM.

10-21. The UHT control system controls airplane movement about the pitch axis. Control system inputs are provided by fore and aft movement of the control stick, parallel pitch trim signals, or signals from the automatic flight control system. Longitudinal control is obtained through two tandem hydraulic actuators, each installed in a power control package and attached to each separate half of a unit horizontal tail. The two power control packages are hydraulically synchronized to move both horizontal tail surfaces simultaneously. Artificial control stick feel forces are provided by bobweights, viscous dampers and mechanical springs. The UHT deflection is limited by mechanical stops to approximately 6°45' trailing edge down and 26°30' trailing edge up.

10-22. On airplanes AF69-6197 and subsequent, a backup system mechanically connects both horizontal tail horns through links and a yoke structure mounted above the engine on pivot pins. This arrangement ensures operation of both UHT surfaces if one power control package becomes inoperative. In addition, the backup system provides a mechanical connection between the UHT PC package input arms of both UHT power control packages through a controlex cable.

10-23. PITCH TRIM SYSTEM.

10-24. A pitch trim system is provided to trim the UHT surfaces. The control stick assumes a new neutral position in response to trim inputs. The system consists of a linear electromechanical pitch trim actuator, a combination pitch and roll trim amplifier package, a four-position roll and pitch trim button on the stick grip, and a pitch trim disengage switch. The trim actuator is located in the feel and trim linkage package, and normally acts as a fixed-length link in the UHT control system. Manual trim control is provided by up or down movement of the trim button. A maximum trim of 14°30' trailing edge up and 2° trailing edge down can be obtained. Automatic pitch trim is provided whenever the automatic flight control system is in the attitude hold and/or altitude hold mode of operation.

10-25. CONTROL SURFACE POSITION INDICATING SYSTEM.

10-26. The control surface position indicating system consists of a dual pointer roll and pitch trim indicator. The roll and pitch trim indicator operates as a synchro system, receiving electrical signals from the roll and pitch trim actuators, to provide continuous indication of aileron and UHT trim positions.

10-27. FLAP SYSTEM.

10-28. The flap system provides increased airplane stability and lift during takeoff and landing. Four full-span, two-position flaps at the leading edge of the center and outer wing are extendible to 35°. Two single-slotted, variable-position flaps at the trailing edge of the wing center section can be stopped at any position between 0° and 40° during normal operation. In addition, three flap slot doors along each trailing edge flap leading edge extend downward into the airstream to control airflow over the flaps when the trailing edge flaps are extended. Normal flap operating pressure is provided by PC No. 2 hydraulic system.

10-29. Emergency extension of the flaps is provided by hydraulic accumulator package which is precharged with nitrogen. This provides a stored hydraulic energy source adequate for one flap extension. There are no provisions for emergency flap retraction. Cockpit indications of leading and trailing edge flap positions are provided by two indicators on the main instrument panel.

10-30. Flap operation is controlled by the flap handle. Placing the flap handle in DN mechanically actuates the flap selector valve to extend all flaps. Placing the flap handle in UP mechanically actuates the flap selector valve to retract all flaps. The trailing edge flaps can be extended or retracted to any position between fully retracted (0°) and fully extended (40°) during normal operation. The flap handle is spring loaded and when released from DN moves outboard between TE UP and TE DN. Intermediate trailing edge flap positions from 0° to 40° are selected by momentarily moving and releasing the flap handle forward to TE UP for trailing edge flap up movement and aft to TE DN for trailing edge flap down movement. Leading edge flaps remain down. To increase aerodynamic smoothness of the lower wing surface during cruise with flaps retracted, slot doors are mechanically retracted to the closed position to fair in the gap between the center wing section and trailing edge flaps.

10-31. Emergency flap extension is accomplished by placing the emergency flap switch in EMER DN which opens the emergency flap selector valve. Emergency flap accumulator hydraulic pressure discharges through the emergency flap selector valve to extend the flaps.

10-32. AUTOMATIC MANEUVERING FLAPS SYSTEM.

10-33. The automatic maneuvering flaps (AMF) system provides increased turn performance at lower airspeeds and increases the angle of attack at which stalls and departures can occur. To gain these improved flight characteristics, the leading edge flaps are fully extended and the trailing edge flaps are partially extended automatically by the AMF system when certain flight conditions exist. These flight conditions are lower airspeeds and high angles of attack. When these flight conditions no longer exist, the AMF system fully retracts all flaps.

10-34. The AMF system is enabled by placing the flap handle in ISO UTILITY and the AMF switch in AUTO. When the system automatically extends the flaps, the pilot has the capability to momentarily override the actuated system (thereby retracting the flaps) by pressing the AMF retract/nose gear steering engage/AR probe disconnect switch on the stick grip assembly. This AMF retract switch is functional only if the airplane's weight is off the landing gear and the air refueling door is closed.

10-35. If emergency flaps are selected while the AMF system is engaged, the emergency flaps hydraulic pressure will have priority and be routed to the flaps.

10-36. SPEED BRAKE SYSTEM.

10-37. The speed brake system is an electrically controlled, hydraulically powered system which provides the capability for inflight braking of the airplane to decrease airspeed. The amount of braking is proportional to the extent the brake surface is extended into the airstream. The brake can be extended and held in any position between fully closed and fully open. Maximum speed brake extension, with reference to the bottom of the fuselage, is approximately 60°. The speed brake automatically retracts when the landing gear is extended or electrical power is lost. An advisory light provides a cockpit indication when the speed brake is not closed. Speed brake travel is registered on the speed brake indicator in degrees.

10-38. Placing and holding the speed brake selector switch (on the throttle handle) in OPEN with the landing gear handle in WHLS UP extends the speed brake. As the speed brake extends, two hinged chines are mechanically rotated approximately 105° to enlarge the effective speed brake surface. If the selector switch is released, it will return to STOP. The selector valve returns to the hold position, and the speed brake stays in the position existing at the time STOP was selected. Placing the speed brake selector switch in CLOSE retracts the speed brake. The chines close as the brake retracts. Internal locks in the cylinder lock the cylinder in the retracted position.

10-39. The unload valve provides for speed brake extension in conjunction with manual operation of the selector valve using the hydraulic hand pump. Rotating the valve handle clockwise against the stop opens the valve. The valve is secured with lockwire in the closed position. To extend the speed brake with the hand pump, pressure must be built up in the system by operating the hand pump. After pressure is greater than 200 psi, solenoid No. 1 button on the speed brake selector valve is depressed before the unload valve is opened. Opening of the unload valve with the system pressurized applies a differential pressure across the speed brake cylinder to unlock the piston. Continued hand pump operation will extend the speed brake.

SECTION XI
AUTOMATIC FLIGHT CONTROL SYSTEM

11-1. DESCRIPTION.

11-2. The AN/ASW-30(V)2 (airplanes before T.O. 1A-7-530) or AN/ASW-30A(V)4 (airplanes after T.O. 1A-7-530) automatic flight control system (AFCS) is a three-axis, dual-channel autopilot with control augmentation (control stick steering). The system includes self-test and failure monitoring with automatic disconnect and warning. Provisions are included for manual trimming of the yaw axis with the trim control mounted on the left console. Manual and automatic trim for the pitch axis are also provided. The roll and pitch trim control switch is mounted on the pilot's stick grip. The three axes of the AFCS are pitch (longitudinal control), roll (lateral control), and yaw (direction control). In each of the three axes an actuator position indicator is provided to show the travel of the dual AFCS actuator. The seven basic modes of operation of the AFCS are:

a. Yaw stabilization

b. Control augmentation

c. Attitude hold

d. Altitude hold

e. Heading hold

f. Heading select

g. Automatic terrain following (airplanes after T.O. 1A-7-530)

11-3. AFCS PITCH AXIS.

11-4. The pitch axis consists of a dual-channel amplifier-computer, rate gyro, normal accelerometer, stick force sensor, dual-channel electrohydraulic actuator, and attitude gyros. Modes of operation for the pitch axis are control augmentation, attitude hold, and altitude hold. The altitude signal is supplied by the air data computer and the attitude signal is supplied by the inertial measurement set (airplanes before T.O. 1A-7-562) or inertial navigation system (airplanes after T.O. 1A-7-562) and standby gyro. The control augmentation mode of operation in the pitch axis improves longitudinal stability and control. The attitude hold mode is used to maintain the airplane at the attitude existing at the time of engagement, provided the pitch attitude is within ±60° and roll attitude is within ±70°. The altitude hold mode maintains the airplane at the selected altitude at the time of engagement by using input signals from the air data computer. The attitude hold or altitude hold mode of operation will be disengaged when control stick sensor breakout force is exceeded (1.5 pounds of longitudinal force for attitude hold mode and 2.5 pounds of longitudinal force for altitude hold mode). When stick force is removed, the pitch axis will revert to the attitude hold or control augmentation mode of operation depending on the position of the AFCS mode engage switch.

11-5. AFCS ROLL AXIS.

11-6. The roll axis consists of a dual-channel amplifier-computer, rate gyro, stick force sensor, and dual-channel electrohydraulic actuator. The rate gyro signal and stick force signal, in conjunction with the inertial measurement set (airplanes before T.O. 1A-7-562) or inertial navigation system (airplanes after T.O. 1A-7-562) and horizontal situation indicator, provide the necessary signals to allow maximum control of the airplane in the roll axis. The roll axis modes of operation are control augmentation, attitude hold, heading hold, and heading select. The control augmentation mode of operation in the roll axis improves lateral stability and control of the airplane. The attitude hold mode is used to maintain the airplane at the attitude existing when the mode is engaged (provided the pitch attitude is within ±60° and roll attitude is within ±70°). The heading hold mode is used to maintain the airplane at the heading existing at the time of engagement. The heading hold signal is supplied by the inertial measurement set. The heading select mode of operation is basically the same as heading hold, except the heading select signal is selected on and supplied by the horizontal situation indicator. The AFCS servo command signal of each axis in any mode of operation supplies a command to an electrical servocontrol valve which initiates movement of a dual actuator. The dual actuator movement is summed with the pilot's manual input to mechanically position a PC slider valve. The PC slider valve, in turn, allows a hydraulic power control cylinder to position the control surfaces by controlling the hydraulic pressure supplied by the hydraulic power control systems. The indicator is driven by the followup signal which is a function of actuator position. Deflection of the indicator shows the direction that the airplane would rotate if that particular axis should be disconnected. The attitude hold, heading hold, or heading select mode of operation will be disengaged when control stick sensor breakout force is exceeded (1.5 pounds of lateral force for attitude hold mode and 2.5 pounds of lateral force for heading hold mode or heading select mode). With force removed from the stick, roll and pitch axes will return to the attitude hold or control augmentation mode of operation, depending on the position of the AFCS mode engage switch.

11-7. AFCS YAW AXIS.

11-8. The yaw axis includes a dual-channel amplifier-computer, lateral accelerometer, rate gyro, aileron position transducer, unit horizontal tail (UHT) aileron-rudder interconnect (ARI) variable resistor, manual trim control, and dual-channel electrohydraulic actuator. The UHT ARI variable resistor combined with the aileron ARI transducer forms the aileron-rudder interconnect (ARI) circuit. The rate gyro signal provides yaw stability, and the aileron-rudder interconnect circuit provides for coordinated turns. The automatic directional trim circuit corrects for airplane drift by using signals from the lateral accelerometer, yaw trim control, ARI, and rate gyro. The signals are summed to initiate a signal to the rudder servo for repositioning the rudder which corrects for airplane drift. The yaw axis mode of operation is yaw stabilization.

11-9. The yaw stabilization mode provides directional damping, aileron-rudder interconnect, and manual and automatic rudder trim. The yaw stabilization switch is manually positioned in the yaw stabilization mode position. The yaw stabilization mode of operation must be engaged prior to engagement of any other AFCS mode.

11-10. AUTOMATIC TERRAIN FOLLOWING MODE.

11-11. On airplanes after T.O. 1A-7-530, an automatic terrain following (ATF) capability is added in the AFCS through the CU-2360A ATF coupler. ATF gives the airplane the ability to fly hands off at low altitude in a selected ground clearance plane. ATF is activated only when the FLR terrain following (TF) mode and either the AFCS control augmentation mode or attitude mode have first been selected. In the TF mode, radar altitude and the selected ground clearance plane are automatically displayed on the head-up display (HUD). Manual TF commands are presented on the HUD and attitude director indicator (ADI). The TF climb/dive command input to the ATF system is provided by the FLR terrain following computer. With the ATF mode selected, the FLR TF climb/dive command (command g) is routed to the CU-2360A ATF coupler. In the coupler, the command is summed with 1 – cos Ø roll attitude from the AFCS roll computer. The sum of these two signals is called the radar command. Two paths are established for the radar command: (1) a pitch control path and (2) a redundant TF path. In the pitch control path, the radar command is summed with actual airplane normal acceleration. The resulting pitch steering error signals are sent from the ATF coupler to the AFCS pitch computer. These signals are used to control movement of the UHT to achieve and maintain the commanded g for correct clearance. For safety, the ATF coupler limits the magnitude of the pitch steering error commands to the AFCS pitch computer. The maximum absolute positive (pitchup) g generated in response to the ATF commands is limited to 3.0g, and the maximum absolute negative (pitchdown) g generated in response to the ATF commands is limited to 0.3g. The redundant TF path is a safety feature of the ATF coupler. In the redundant TF path, the radar command is compared to a duplicate radar command. A duplicate FLR TF climb/dive command is synthesized in the ATF coupler from additional inputs from the FLR. This duplicate climb/dive command is summed with 1 – cos Ø roll attitude from the AFCS roll computer to produce the duplicate radar command. Any disagreement between the radar command and the duplicate radar command causes the ATF system to disconnect. With the ATF mode engaged, an override submode in the system allows for partial manual control of the airplane.

SECTION XII
INSTRUMENT SYSTEMS

12-1. DESCRIPTION.

12-2. Instruments are provided to indicate the airplane position while in flight, provide information for navigation, and monitor the operation of airplane systems. Instruments are functionally grouped on the instrument panel. The instrument panel is shock mounted and is illuminated with white lighting.

12-3. Major functional instrument groups are airplane instruments, counting accelerometer system, and standby attitude indicating system.

12-4. INSTRUMENTS. (See figures 12-1, 12-2, 12-2A, 12-3, 12-4, 12-4A, and 12-5 through 12-8.)

12-5. Flight and navigation instruments located in the center of the instrument panel include the airspeed indicator, angle-of-attack indicator, clock, attitude director indicator, horizontal situation indicator, altimeter, vertical velocity indicator, accelerometer, and radar altimeter.

12-6. Engine monitor indictors located on the upper right section of the instrument panel include the tachometer, turbine outlet temperature indicator, oil pressure indicator, fuel flow indicator, oil quantity indicator, and turbine outlet pressure indicator.

12-7. The armament control panel is located on the lower left section of the instrument panel. Located on the upper left section of the instrument panel are the radar indicator, flap, landing gear and speed brake position indicators, standby attitude indicator, and AN/APR-36/37 display.

12-8. Other miscellaneous instruments located on the lower right section of the instrument panel include the fuel quantity indicator, oxygen quantity indicator, hydraulic pressure indicator, cabin pressure altimeter, and true airspeed indicator. The head-up display is located in the upper center of the instrument panel.

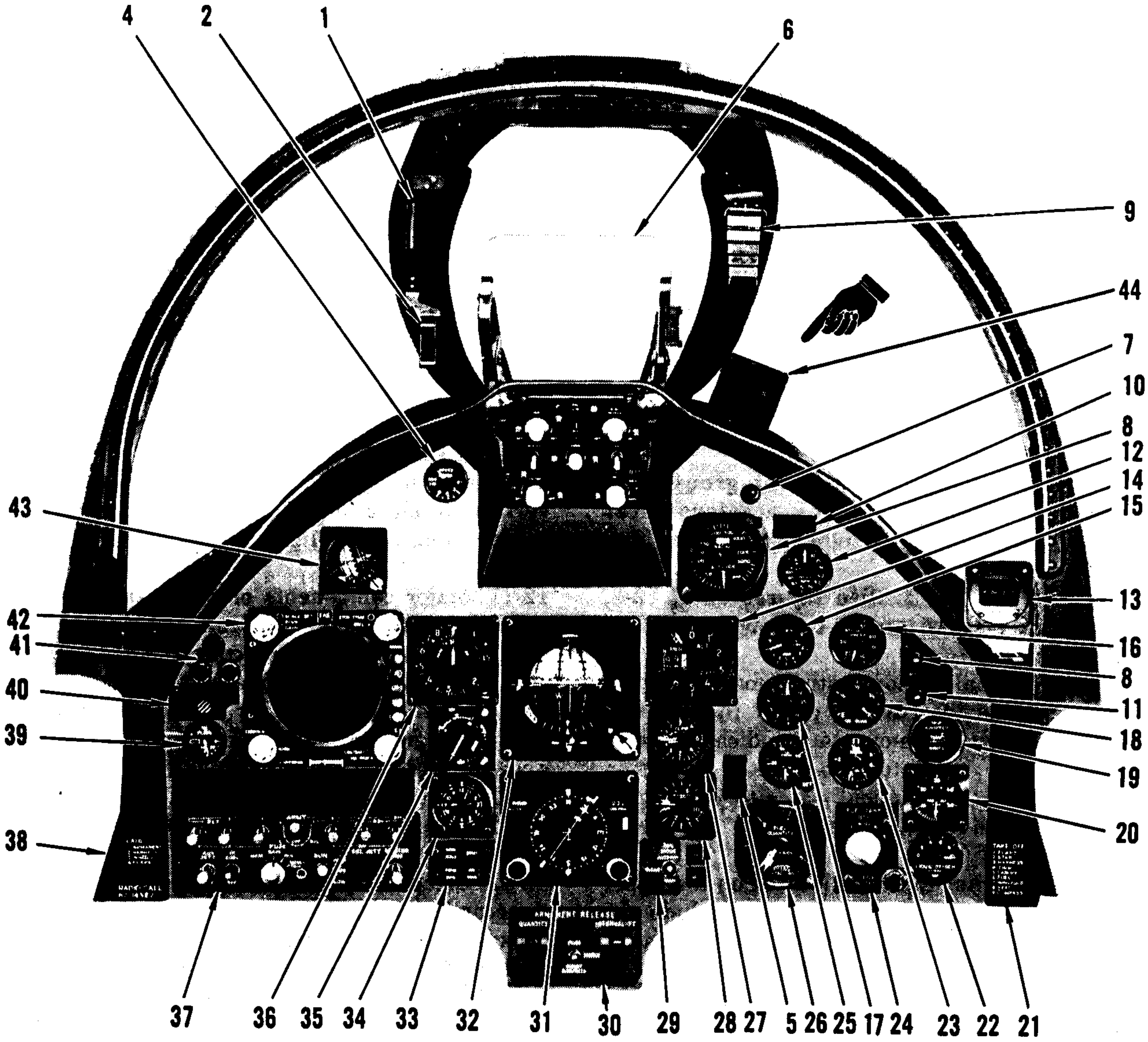
12-9. COUNTING ACCELEROMETER SYSTEM.

12-10. The counting accelerometer system senses and records the number of times each of four preset airframe vertical acceleration values are equalled or exceeded. The system senses and records positive vertical accelerations to indicate stresses placed on the airframe during flight.

12-11. Major components of the system include a unidirectional acceleration-sensing counting accelerometer transducer, counting accelerometer indicator, and left main gear up-and-locked switch. The counting accelerometer transducer transmits a separate signal to the counter for 5g, 6g, 7g, and 8g accelerations. The indicator dials display the number of times that each of the four preset g-loads has been equalled or exceeded.

12-12. Electrical power is supplied from the 28-volt dc secondary bus, through the left main gear up-and-locked switch, to the counting accelerometer indicator. The left main gear up-and-locked switch automatically connects 28-volt dc power to the counting accelerometer indicator when the left main gear is retracted and locked. A radio noise filter is installed in the indicator input power circuit to dampen brush-contact radio interference. Electrical power for the counting accelerometer transducer is supplied from the counting accelerometer indicator power circuit. When any one of the vertical acceleration values are equalled or exceeded, the transducer senses the gravity pull and transmits a signal to the counting accelerometer indicator. When g-forces fall below 5, the indicator registers the number of the value of g-force equalled or exceeded.

MAIN INSTRUMENT PANEL



1. Wheels/Flaps Warning Lights
2. Approach Indexer
3. Deleted
4. Speed Brake Position Indicator
5. Master Caution Light
6. Head-Up Display Unit
7. Fire Warning Light Press-to-Test Switch
8. Radar Altimeter Indicator/Warning Light
9. Threat Lights
10. Fire Warning Light
11. Marker Beacon Light
12. Tachometer
13. Standby Compass
14. Counter Pointer Altimeter (Barometric)
15. Turbine Outlet Temperature Indicator
16. Oil Pressure Indicator
17. Fuel Flow Indicator
18. Oil Quantity Indicator
19. True Airspeed Indicator
20. Cabin Pressure Altimeter
21. Takeoff Check List
22. Liquid Oxygen Quantity Indicator
23. Hydraulic Pressure Indicator
24. Fuel Quantity Tank Selector
25. Turbine Outlet Pressure Indicator
26. Fuel Quantity Indicator
27. Vertical Velocity Indicator
28. Accelerometer
29. Heading Mode Controls
30. Armament Release Controls
31. Horizontal Situation Indicator
32. Attitude Director Indicator
33. Attack Mode Controls
34. Clock
35. Angle-of-Attack Indicator
36. Mach and Airspeed Indicator
37. Armament Select Panel
38. Land Check List – Radio Call Placard
39. TE Flaps Position Indicator
40. LE Flaps Position Indicator
41. Landing Gear Position Indicators
42. Radar Indicator
43. Standby Attitude Indicator
44. UHF Remote Channel Indicator

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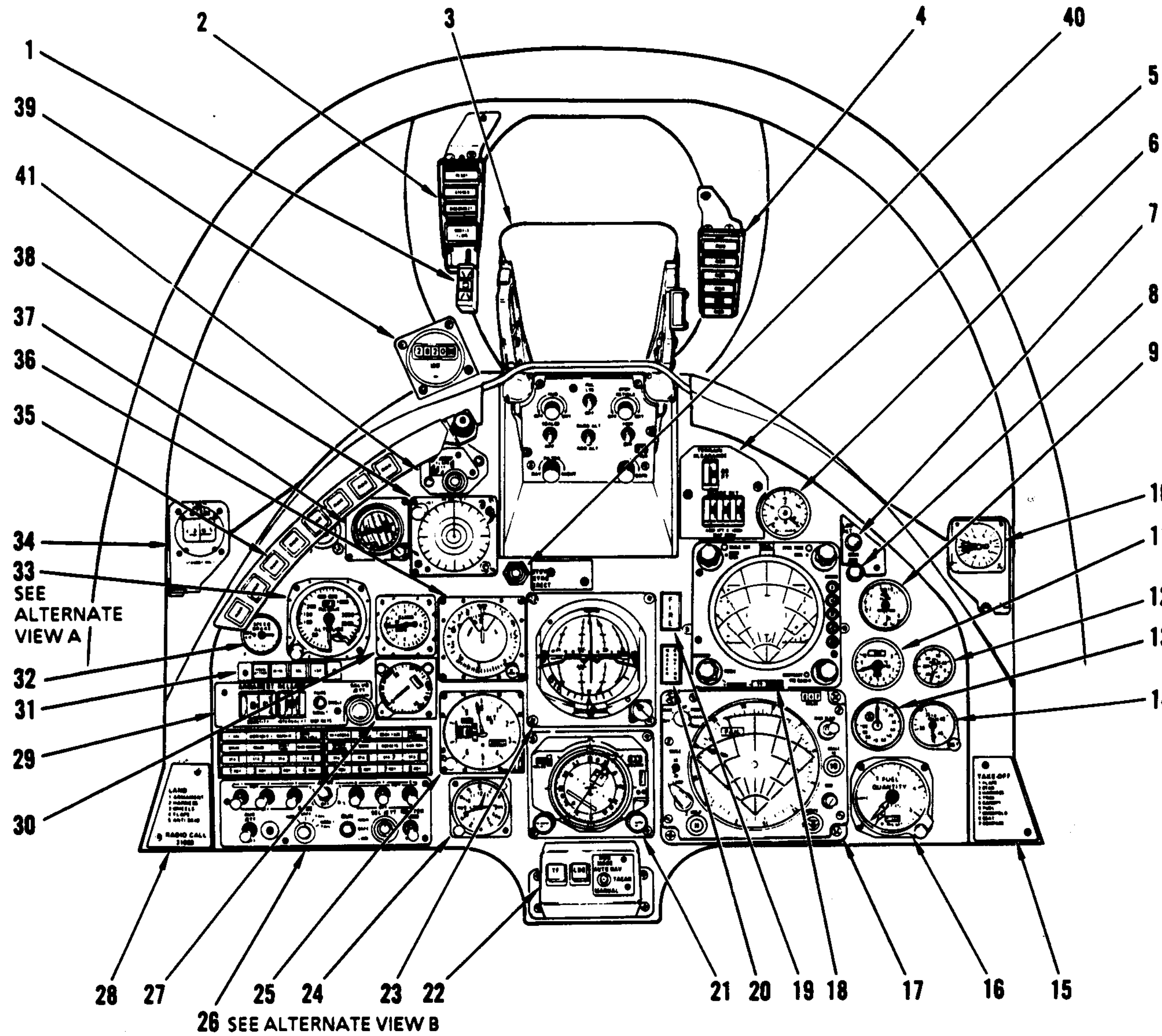
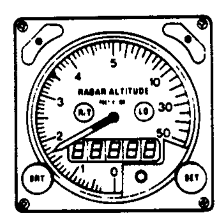
Figure 12-1. Main Instrument Panel (Airplanes Through AF69-6196)

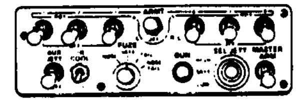


1. Approach indexer
2. IFR and wheel/flaps warning lights
3. Head-up display unit
4. Threat lights
5. Radar set control
6. Oil quantity indicator
7. Radar altimeter warning light
8. Marker beacon light
9. Fuel flow indicator
10. Accelerometer
11. Turbine outlet temperature indicator
12. Oil pressure indicator
13. Tachometer
14. Turbine outlet pressure indicator
15. Takeoff checklist
16. Fuel quantity indicator
17. Projected map display
18. Radar indicator
19. Fire warning light
20. Master caution light
21. Horizontal situation indicator
22. Heading mode controls
23. Attitude director indicator
24. Clock
25. Counter pointer altimeter
26. Armament select panel
27. Angle-of-attack indicator
28. Land checklist – radio call placard
29. Armament release controls
30. Vertical velocity indicator
31. Attack mode controls
32. Speed brake indicator
33. Radar altimeter indicator
34. Standby compass
35. Threat lights and correlate switch
36. Mach and airspeed indicator
37. Standby attitude indicator
38. ECM threat display unit
39. UHF remote channel indicator
40. Standby gyro erect switch
41. Flare jettison switch



ALTERNATE VIEW A

(Airplanes after T.O. 1A-7-502)

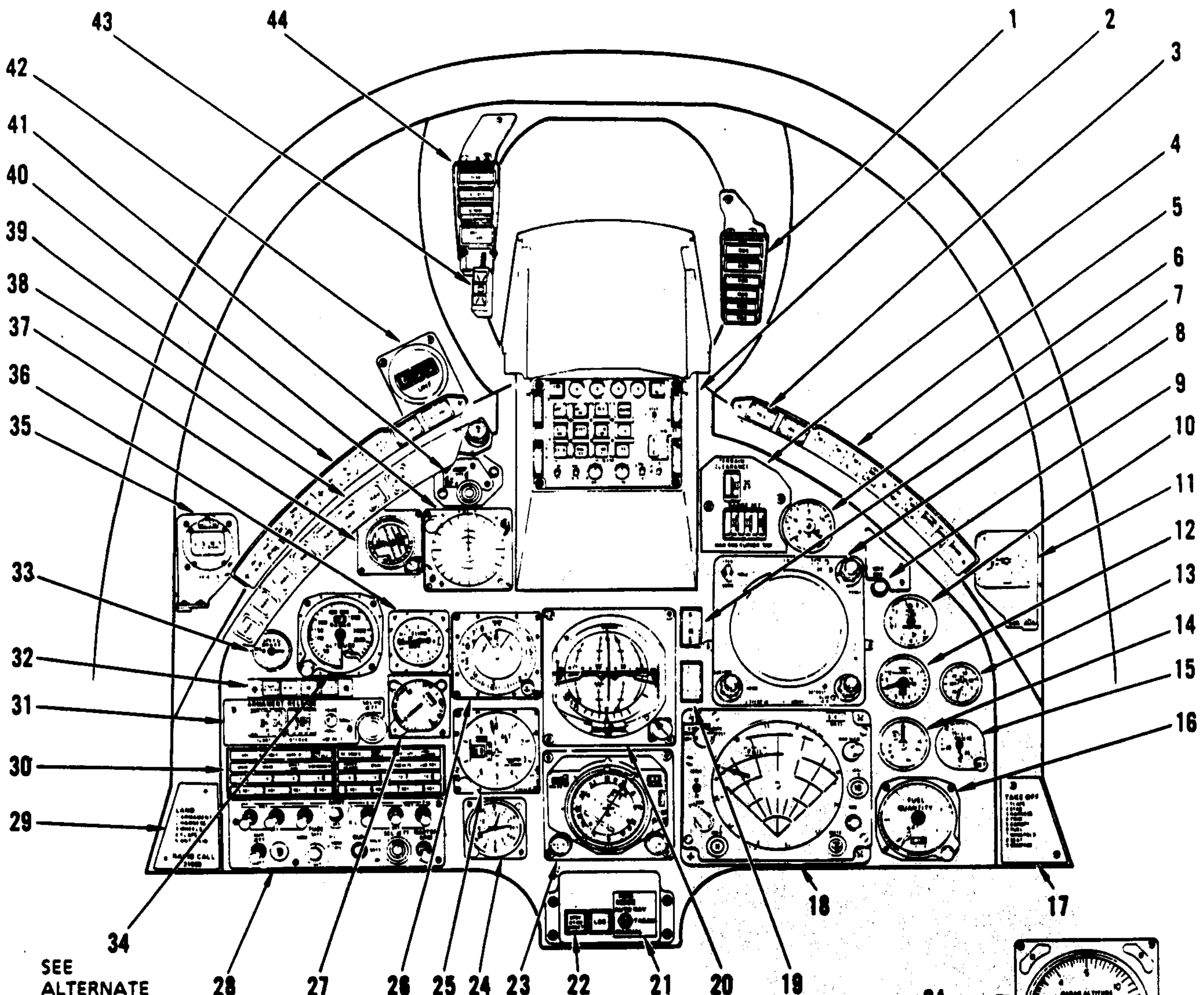


ALTERNATE VIEW B

(Airplanes after T.O. 1A-7-631)

01D136-02-90

Figure 12-2. Main Instrument Panel (Airplanes AF69-6197 and Subsequent Before T.O. 1A-7-530)



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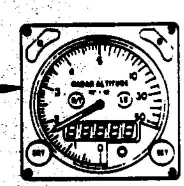


ALTERNATE VIEW A

(Airplanes after T.O. 1A-7-602)

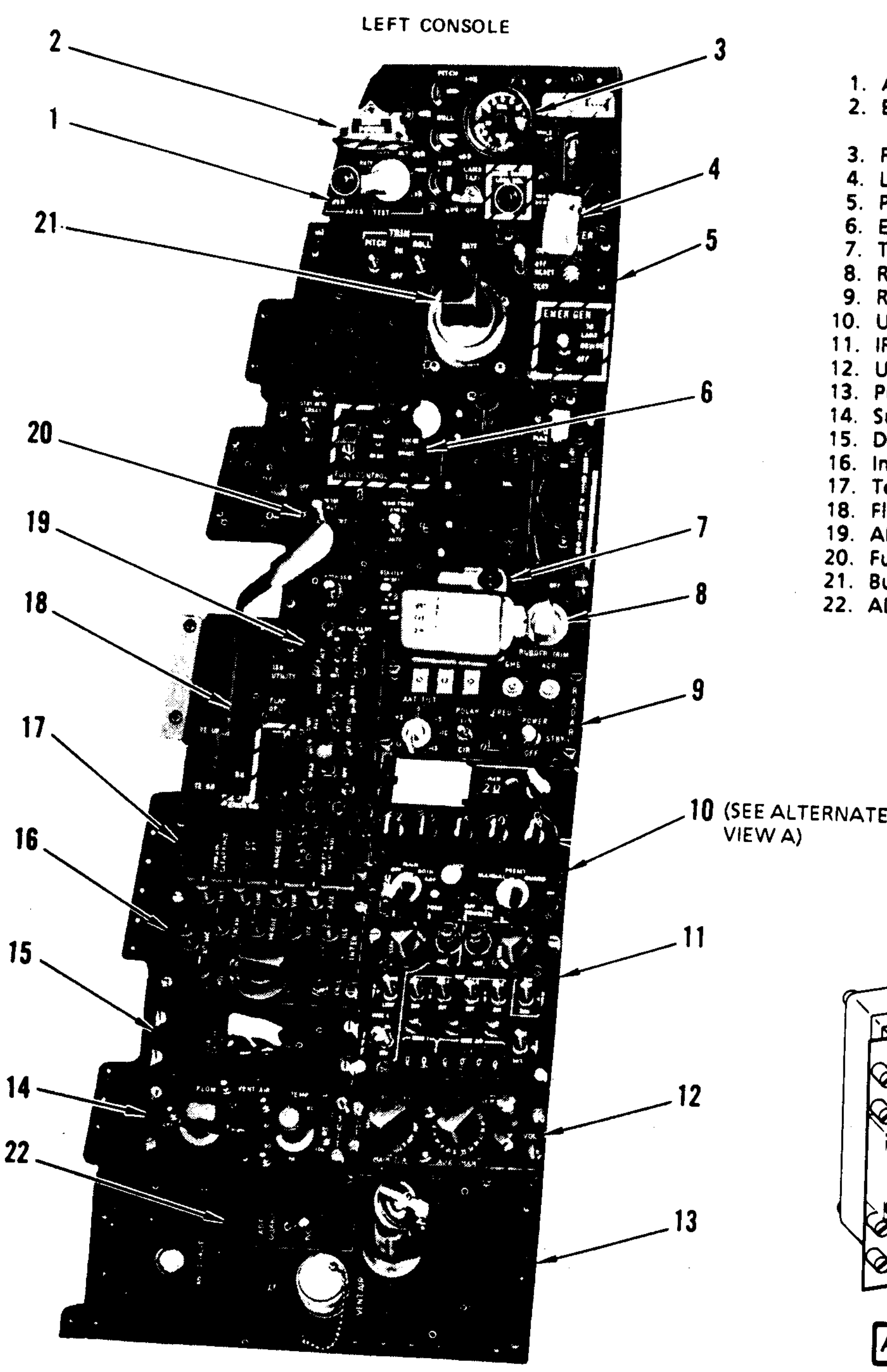
ALTERNATE VIEW B

(Airplanes after T.O. 1A-7-631)

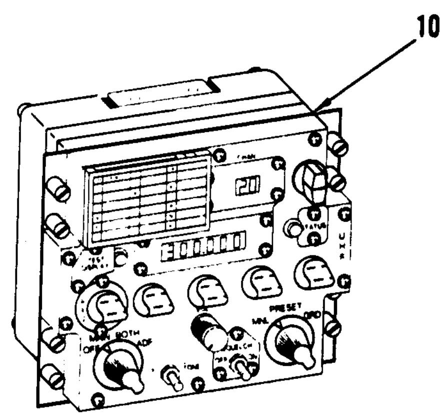
1. Threat lights
2. Head-up display unit
3. Radar altimeter warning light (moved from rt. inst. pnl.)
4. Radar set control
5. RH cowl light/switch module assembly
6. Oil quantity indicator
7. Fire warning light
8. Radar indicator
9. Marker beacon light
10. Fuel flow indicator
11. Accelerometer
12. Turbine outlet temperature indicator
13. Oil pressure indicator
14. Tachometer
15. Turbine outlet pressure indicator
16. Fuel quantity indicator
17. Takeoff checklist
18. Projected map display unit
19. Master caution light
20. Attitude director indicator
21. Heading mode controls (STBY GYRO ERECT sw added)
22. Standby gyro erect
23. Horizontal situation indicator
24. Clock
25. Counter pointer altimeter
26. Mach and airspeed indicator
27. Angle of attack indicator
28. Armament select panel
29. Land checklist-radio call placard
30. Armament advisory panel
31. Armament release controls
32. Attack mode controls
33. Speed brake indicator
34. Radar altimeter
35. Standby compass
36. Vertical velocity indicator
37. Standby attitude indicator
38. Threat lights and correlate switch
39. LH cowl light/switch module assembly
40. ECM threat display unit
41. Flare jettison switch
42. UHF remote channel indicator
43. Approach indexer
44. IFR and wheel/flaps warning lights

01D208-02-90

Figure 12-2A. Main Instrument Panel (Airplanes After T.O. 1A-7-530)



1. AFCS Test Control
2. Emergency Power Package Control Handle
3. Roll Pitch Trim Indicator
4. Landing Gear Control Handle
5. Pilots Generator Control Panel
6. Emergency Brake Control Panel
7. Throttle Control
8. Rudder Trim Control
9. Radar Set Control
10. UHF Set Control
11. IFF Transponder Control
12. UHF/ADF Control
13. Pilot Services Panel
14. Suit Temperature Control
15. Double Datum Lock-out Switch
16. Intercommunications Set Control
17. Terrain Clearance and Range Set Control
18. Flaps Control
19. AFCS Control Panel
20. Fuel Management Panel
21. Bullpup Control Stick
22. ADF Guard Switch



ALTERNATE VIEW A

(AIRPLANES AFTER T.O. 1A-7-577)

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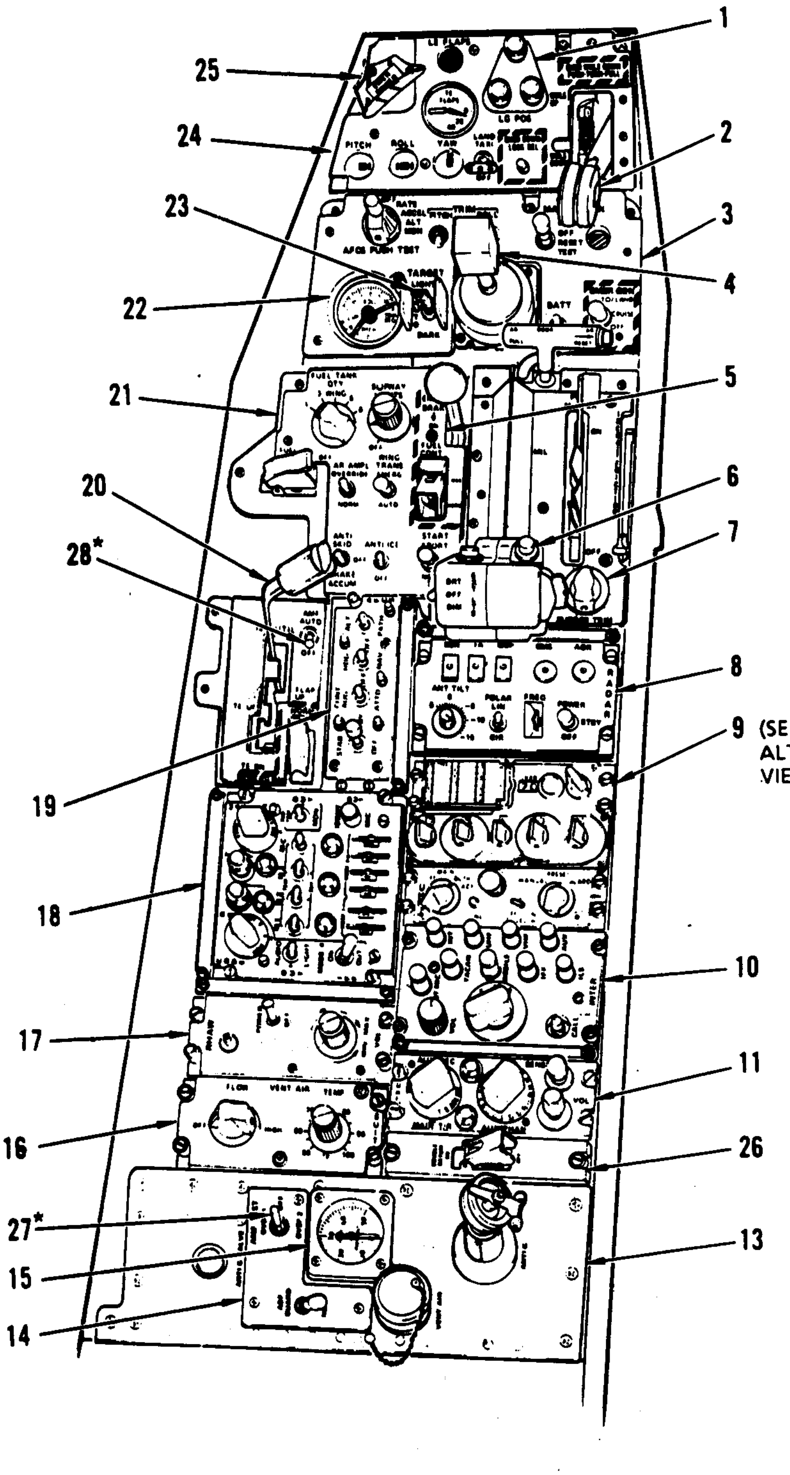
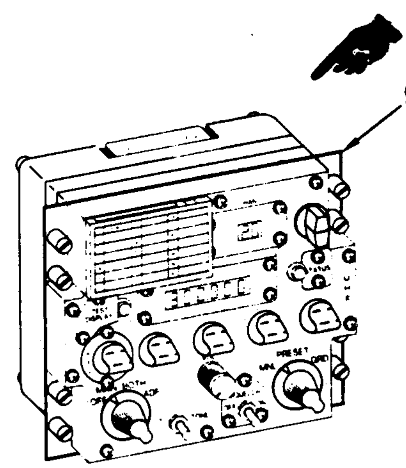
Figure 12-3. Left Console (Airplanes Through AF69-6196)



1. Landing gear position indicators
2. Landing gear control handle
3. Pilots generator control panel
4. Bullpup control stick
5. Emergency brake control panel
6. Throttle control
7. Rudder trim control
8. Radar set control
9. UHF set control
10. Intercommunications set control
11. UHF/ADF control
12. Deleted
13. Pilot services panel
14. ADF guard switch
15. Cabin pressure altimeter
16. Suit temperature control
17. RHAW control
18. IFF transponder control
19. AFCS control panel
20. Flaps control
21. Fuel management panel
22. Roll pitch trim indicator
23. Target contrast switch
24. AFCS test control
25. Emergency power package control handle
26. Double datum lock-out switch
27. AMF test switch
28. AMF switch



ALTERNATE VIEW

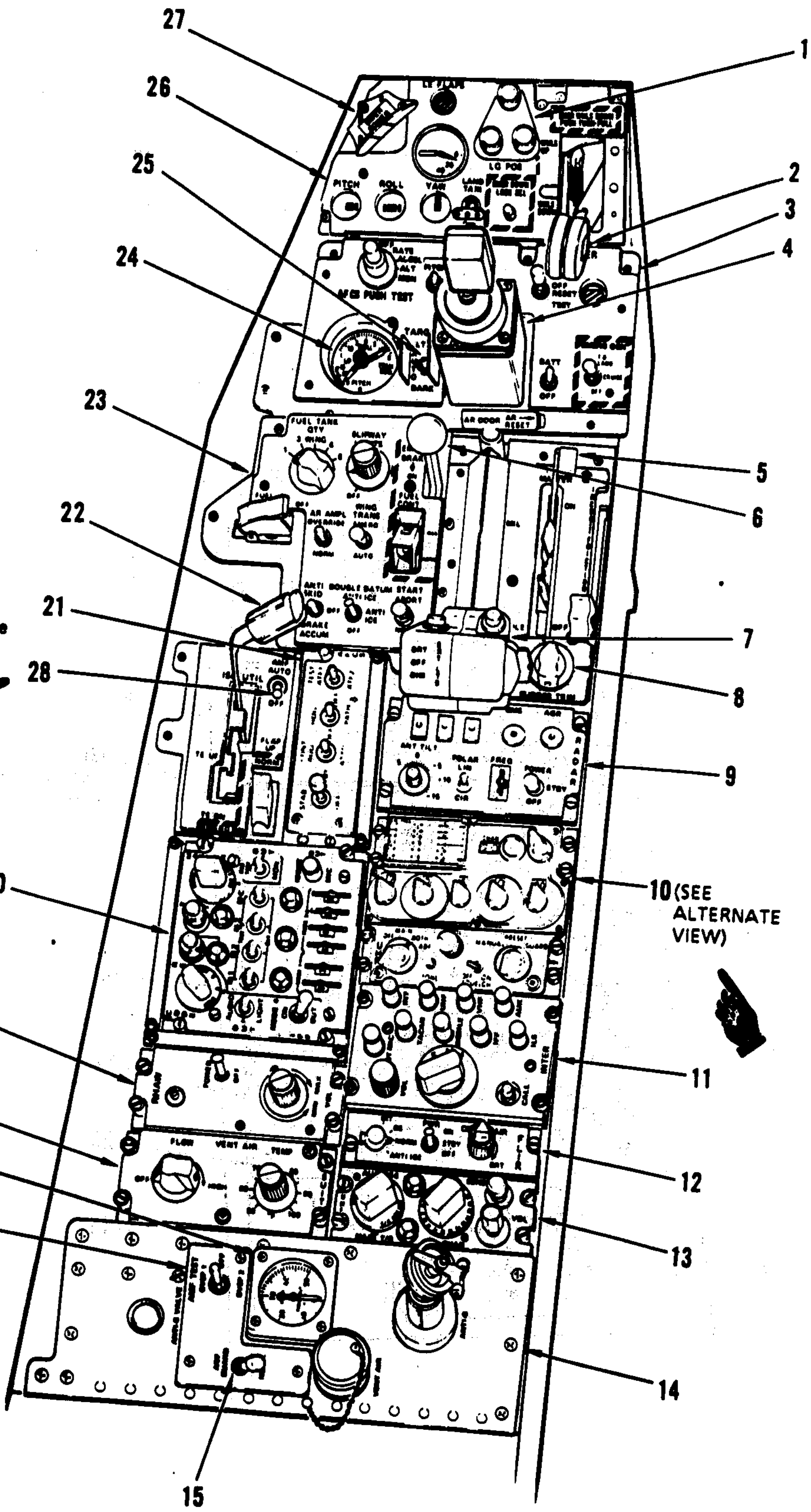
(AIRPLANES AFTER T.O. 1A-7-577)

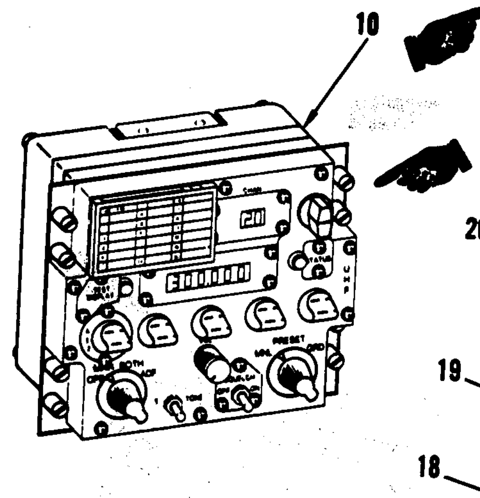
*Airplanes after T.O. 1A-7D-821

01D137-04-90

Figure 12-4. Left Console (Airplanes AF69-6197 and Subsequent Before T.O. 1A-7-530)

1. Landing gear position indicators
2. Landing gear control handle
3. Pilots generator control panel
4. Bullpup control stick
5. Fuel master control
6. Emergency brake control panel
7. Throttle control
8. Rudder trim control
9. Radar set control
10. UHF set control
11. Intercommunications set control
12. FLIR set control
13. UHF/ADF control
14. Pilot services panel
15. ADF guard switch
16. AMF test switch
17. Cabin pressure altimeter
18. Suit temperature control
19. RHAW control
20. IFF transponder control
21. AFCS control panel
22. Flaps control
23. Fuel management panel
24. Roll pitch trim indicator
25. Target contrast switch
26. AFCS test control
27. Emergency power package control handle
28. AMF switch





ALTERNATE VIEW
(AIRPLANES AFTER T.O. 1A-7-577)

Figure 12-4A. Left Console (Airplanes After T.O. 1A-7-530)

01D209-04-90

1. Landing gear position indicators
2. Landing gear control handle
3. Pilots generator control panel
4. Bullpup control stick
5. Fuel master control
6. Emergency brake control panel
7. Throttle control
8. Rudder trim control
9. Radar set control
10. UHF set control
11. Intercommunications set control
12. FLIR set control
13. UHF/ADF control
14. Pilot services panel
15. ADF guard switch
16. AMF test switch
17. Cabin pressure altimeter
18. Suit temperature control
19. RHAW control
20. IFF transponder control
21. AFCS control panel
22. Flaps control
23. Fuel management panel
24. Roll pitch trim indicator
25. Target contrast switch
26. AFCS test control
27. Emergency power package control handle

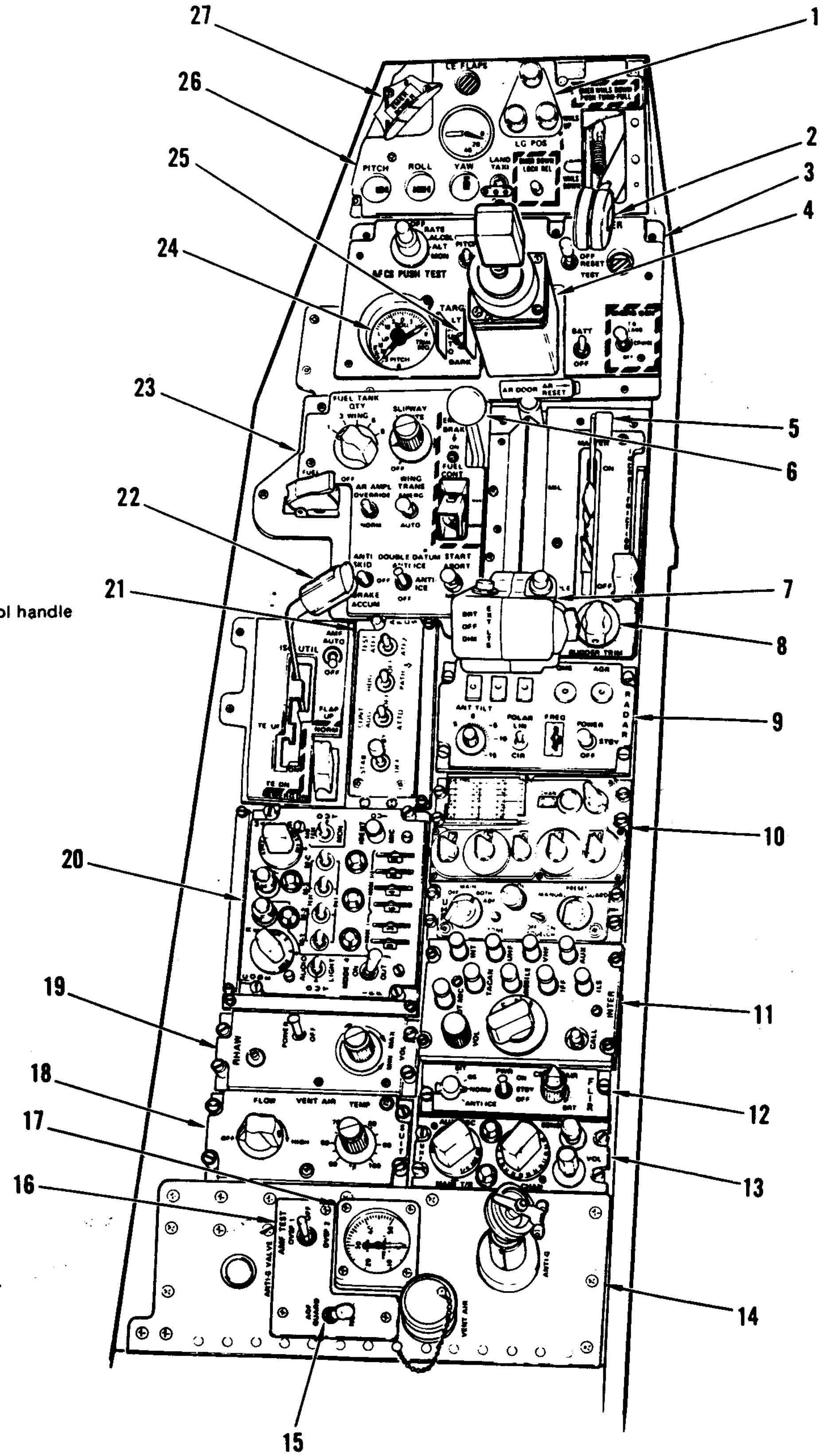


Figure 12-4A. Left Console (Airplanes After T.O. 1A-7-530)

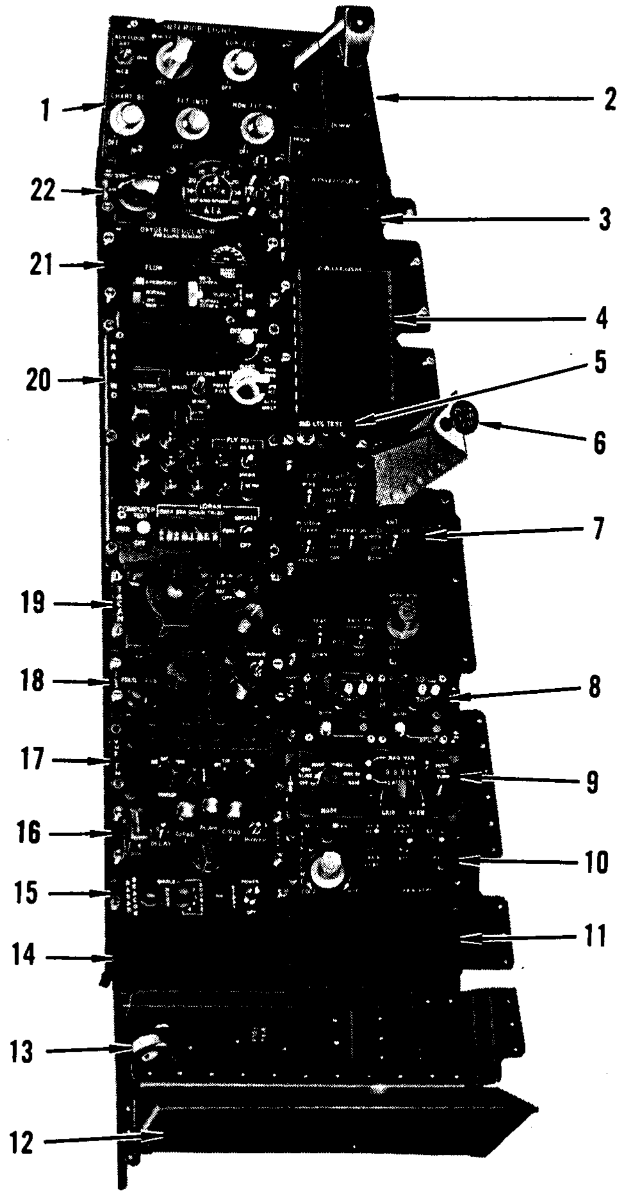
12-13. STANDBY ATTITUDE INDICATING SYSTEM.

12-14. The standby attitude indicating system provides a continuous pictorial display of airplane pitch and roll with respect to gravity vertical. The system functions throughout 360° of roll attitude but is limited to ±82° from horizontal in the pitch attitude. The system is provided as a backup system for the primary attitude indicator and provides continuous pitch reference to the automatic flight control system for comparison with inertial measurement set (airplanes before T.O. 1A-7-562) or inertial navigation system (airplanes after T.O. 1A-7-562) pitch references. Components of the system include a standby attitude indicator, vertical displacement gyro, rate switching gyro, and gyro erect switch.

12-15. The standby attitude indicator consists of a sphere marked with a horizon bar which is observed in relation to a fixed miniature airplane attached to the case. A pitch and bank angle scale are superimposed upon the sphere. The pitch angle scale is marked in increments of 5° from zero to 85° climb and dive. The bank angle scale is marked to indicate bank altitudes of 10°, 20°, 30°, 60°, and 90°, left and right. The sphere is mounted on a gimbal, rotates about the roll axis for roll indication, and rotates in relation to the roll gimbal about the pitch axis for pitch indication.

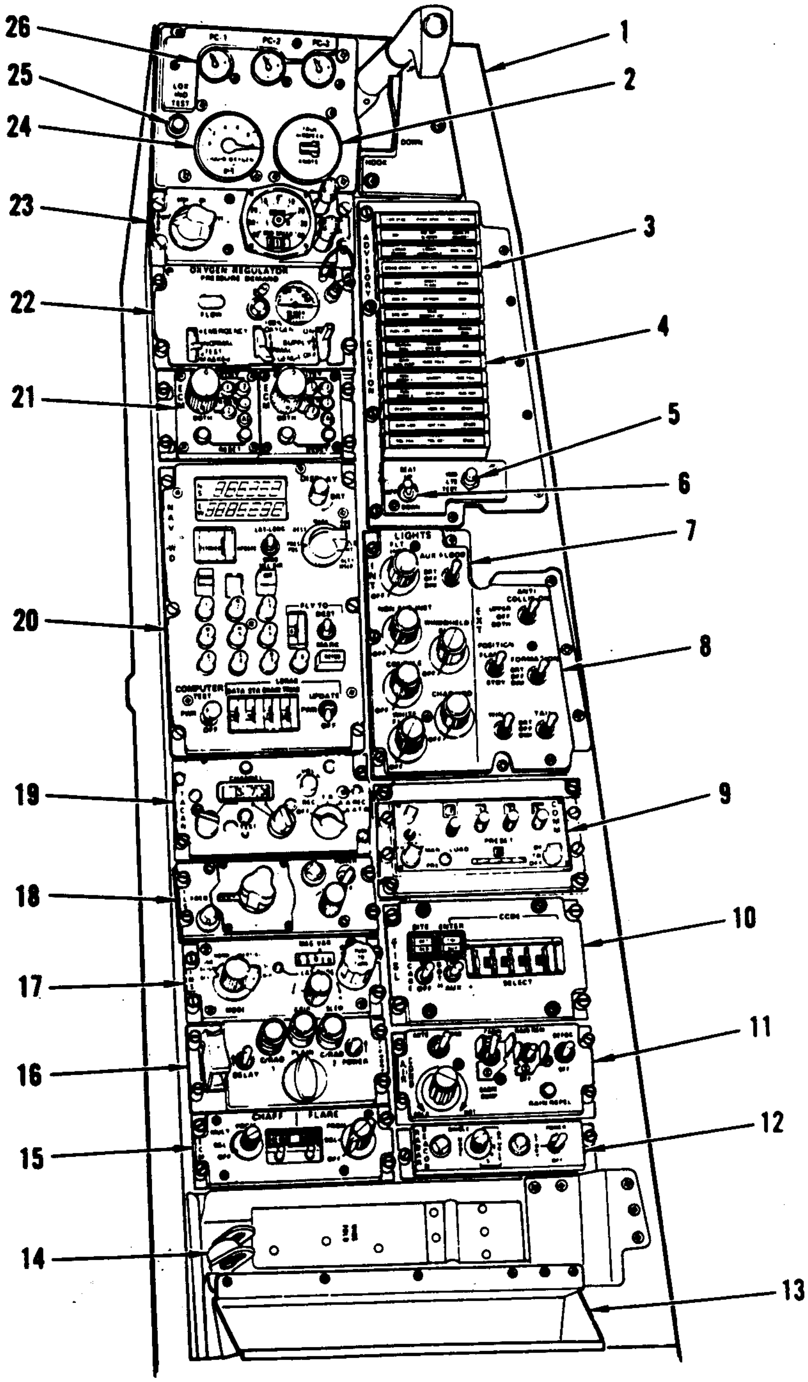
12-16. Signals to drive the indicator are supplied by the vertical displacement gyro which senses airplane pitch and roll attitudes. The vertical gyro also supplies displacement signals to the AN/ASW-30(V)2 AFCS pitch computer. The rate switching gyro disconnects the roll erection function in the vertical displacement gyro when the airplane rate of turn exceeds 15° per minute, preventing false erection of the displacement gyro. A standby attitude erect switch provides manual control of fast erection voltage to the vertical displacement gyro. Airplane maneuvers in excess of approximately 82° in pitch and certain continued maneuvers will result in precession of the vertical gyro and may introduce considerable error in the indications until the vertical gyro has reerected. Operation of the gyro erect switch will speed up the normal erection rate until approximately level indications are obtained on the attitude indicator.

1. Interior lights panel
2. Arresting hook control panel
3. Advisory annunciator panel
4. Caution annunciator panel
5. Caution and advisory lights press-to-test switch
6. Foot vent control
7. Exterior lights panel
8. ECM pod control
9. IMS control
10. Environmental system control
11. Blank panel
12. Map case
13. Wingfold control handle
14. Blank panel
15. Radar beacon control panel
16. Speech security set control
17. VHF FM control
18. ILS control
19. TACAN control
20. Tactical computer control panel
21. Oxygen regulator control
22. Doppler radar control panel



01D107-09-74

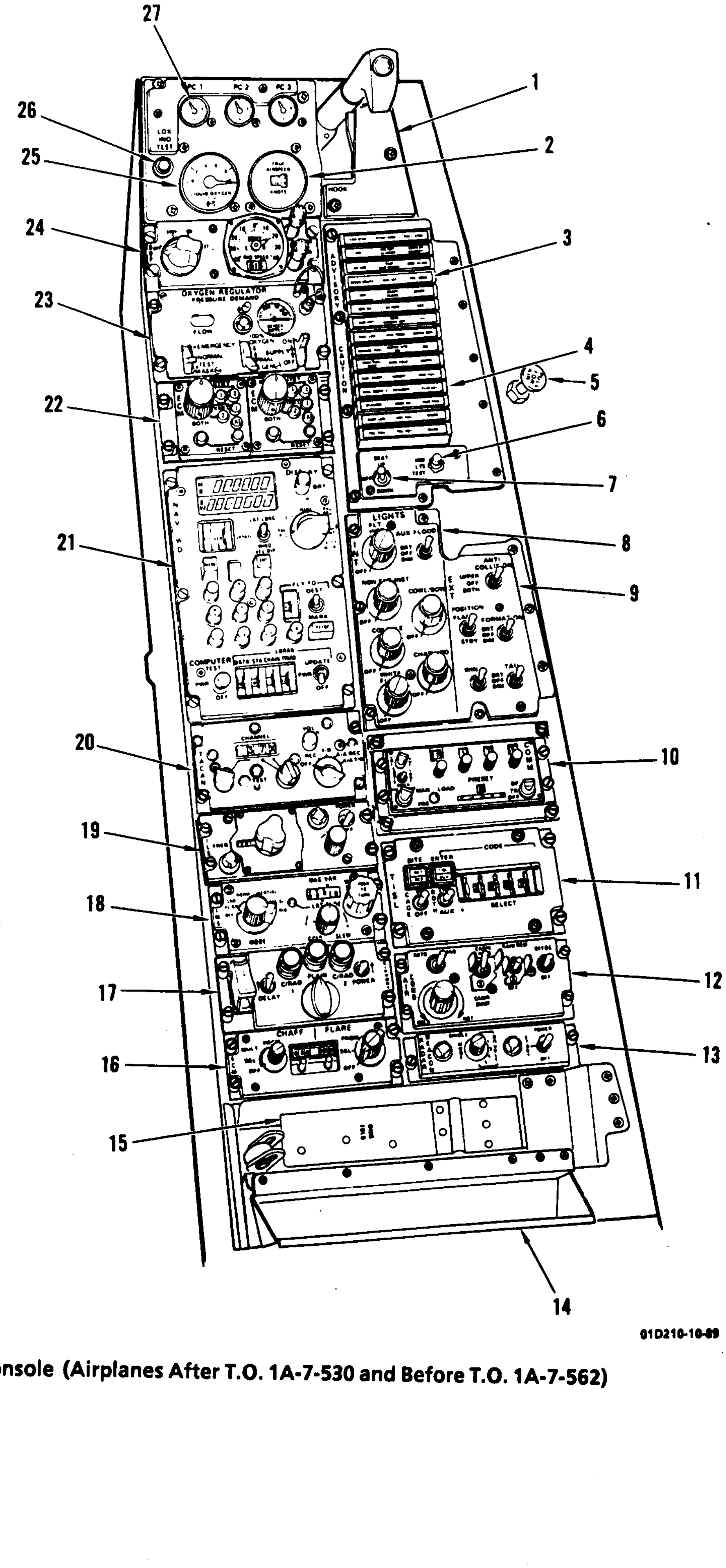
Figure 12-5. Right Console (Airplanes Through AF69-6196)



1. Arresting hook control panel
2. True airspeed indicator
3. Advisory annunciator panel
4. Caution annunciator panel
5. Indicator lights test switch
6. Seat adjust switch
7. Interior lights panel
8. Exterior lights panel
9. VHF AM/FM control
10. Laser target identification set control
11. Environmental system control
12. Radar beacon control panel
13. Map case
14. Wingfold control handle
15. Chaff flare dispenser control panel
16. Speech security set control
17. IMS control
18. ILS control
19. TACAN control
20. Tactical computer control panel
21. ECM pod control
22. Oxygen regulator control
23. Doppler radar control panel
24. Liquid oxygen quantity indicator
25. Liquid oxygen indicator test switch
26. Hydraulic pressure indicators

01D138-10-89

Figure 12-6. Right Console (Airplanes AF69-6197 and Subsequent Before T.O. 1A-7-530 and T.O. 1A-7-562)



1. Arresting hook control panel
2. True airspeed indicator
3. Advisory annunciator panel
4. Caution annunciator panel
5. Foot vent control
6. Indicator lights test switch
7. Seat adjust switch
8. Interior lights panel
9. Exterior lights panel
10. VHF AM/FM control
11. Laser target identification
12. Environmental system control
13. Radar beacon control panel
14. Map case
15. Wingfold control handle
16. Chaff flare dispenser control panel
17. Speech security set control
18. IMS control
19. ILS control
20. TACAN control
21. Tactical computer control panel
22. ECM pod control
23. Oxygen regulator control
24. Doppler radar control panel
25. Liquid oxygen quantity indicator
26. Liquid oxygen indicator test switch
27. Hydraulic pressure indicators

Figure 12-7. Right Console (Airplanes After T.O. 1A-7-530 and Before T.O. 1A-7-562)

1. Arresting hook control panel
2. True airspeed indicator
3. Advisory annunciator panel
4. Caution annunciator panel
5. Foot vent control
6. Indicator lights test switch
7. Seat adjust switch
8. Interior lights panel
9. Exterior lights panel
10. VHF AM/FM control
11. Laser target identification
12. Environmental system control
13. Radar beacon control panel
14. Map case
15. Wingfold control handle
16. Blank panel
17. Speech security set control
18. ILS control
19. TACAN control
20. Chaff flare dispenser control panel
21. Blank panel
22. Control display unit
23. ECM pod control
24. Oxygen regulator control
25. Doppler radar control panel
26. Liquid oxygen quantity indicator
27. Liquid oxygen indicator test switch
28. Hydraulic pressure indicators

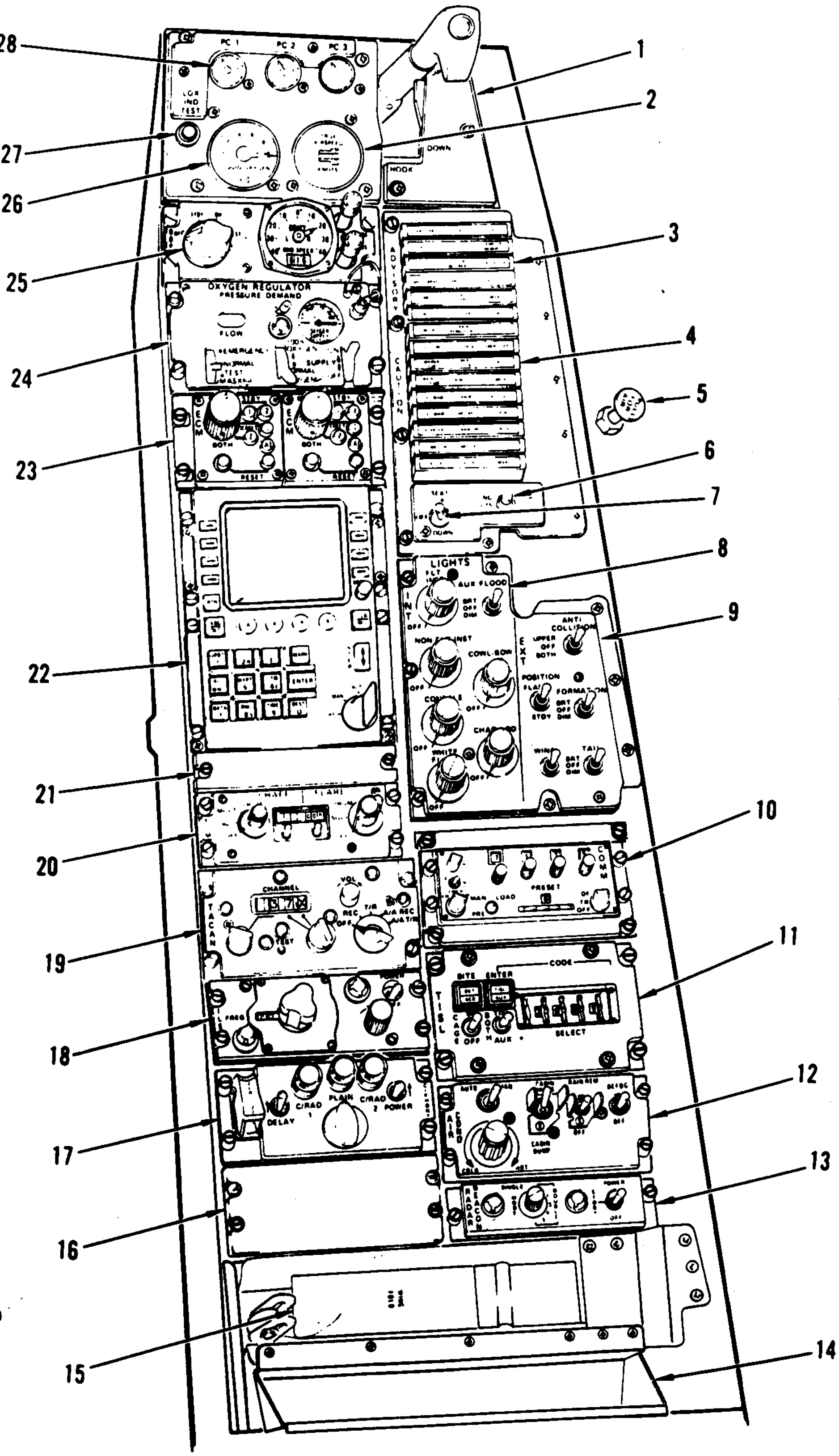


Figure 12-8. Right Console (Airplanes After T.O. 1A-7-530 and T.O. 1A-7-562)

SECTION XIII

ELECTRICAL POWER AND LIGHTING SYSTEMS

13-1. DESCRIPTION.

13-2. The electrical power and lighting systems provide the electrical power and interior and exterior lighting necessary for airplane or system operation. Included with the electrical power and lighting systems is a fire detection system to detect and provide a warning indication of fire or overheat condition in the engine compartment of the airplane.

13-3. The electrical power systems include the constant speed drive system, ac power supply system, dc power supply system, battery system, power distribution system, external power supply system, and emergency power system. These systems include the necessary equipment for generation, regulation, control, protection, conversion, and distribution of electrical power required for airplane operation under normal or emergency conditions.

13-4. The lighting systems consist of an exterior and interior lighting system. The exterior lighting system provides cockpit control of all exterior lights. The system includes circuitry and components to provide for light flashing, light intensity control, and low operating voltage to the wing and tail position lights, formation lights, and flood lights. The interior lighting system provides illumination of the instrument board and cockpit consoles. The system also includes circuitry and components to control intensity and permits testing of warning, caution, and advisory lights located in the cockpit.

13-5. The fire detection system provides an indication of fire or an overheating condition in the engine compartment. The system includes circuitry and components to sense, illuminate, disable, and test the engine fire or overheat warning light located on the instrument board.

13-6. CONSTANT SPEED DRIVE.

13-7. The constant speed drive (CSD) transmission converts the variable speed input from the airplane engine to a constant-speed output to drive the master ac generator. Components of the constant speed drive system are the transmission and transmission oil cooler. An oil filter and disconnect coupling are integral components of the transmission.

13-8. Hot oil is routed from the transmission to the transmission oil cooler. Cold fuel from the high-pressure fuel pump is also routed into the oil cooler. Although the fuel and oil are separated, the hot oil is cooled by the fuel by means of a heat exchange process. Cooled oil is filtered and returned to the transmission. If the transmission malfunctions or becomes overheated, the transmission is disconnected from the engine by the disconnect coupling.

13-9. AC POWER SUPPLY SYSTEM.

13-10. The master ac generator supplies electrical power for airplane systems which require ac power. Components of the ac power supply system are the master ac generator, generator control panel, master generator switch, master generator indicator, current transformers, and test panel.

13-11. Power is supplied to the distribution system by the master ac generator when the engine and constant speed drive transmission are operating. The master generator switch is placed in ON to route ac power to the airplane power distribution system. The master generator indicator provides a V indication when the master generator is operating properly. The generator control panel functions are voltage regulation, overvoltage protection, undervoltage protection, and underfrequency control. Phase C from the emergency ac bus provides power to a step-down instrument transformer. The 115-volt ac power is reduced to 26-volt ac power for the primary and emergency instrument buses. The test panel is provided to isolate a malfunction in the ac power supply system to a particular component.

13-12. DC POWER SUPPLY SYSTEM.

13-13. Electrical power from the secondary ac bus is supplied to the transformer-rectifier which converts 115-volt ac electrical power to 28 volts dc. Power from the transformer-rectifier is applied to the primary dc, secondary dc, emergency dc, and battery buses.

13-14. BATTERY SYSTEM.

13-15. The battery system provides 28-volt dc electrical power for the gas turbine starter and the airplane battery buses. Components of the battery system are the battery, battery charger, battery relay, standby inverter, and battery switch.

13-16. The battery provides power for the gas turbine starter during engine starting through relay K401 (airplanes before T.O. 1A-7-551), or relay K402 (airplanes after T.O. 1A-7-551). The battery supplies electrical power to the battery buses through energized battery relay K2. Relay K2 is energized through the deenergized contacts of the secondary dc bus relay, the emergency AC bus relay, and closed battery switch.

13-17. POWER DISTRIBUTION SYSTEM.

13-18. The distribution system consists of an ac power relay, primary ac relay, primary dc relay, emergency ac relay, secondary dc relay, circuit breaker panels, and interconnecting wiring. The ac power relay has two sets of coils and contacts. The relay is energized when the master generator switch is actuated and ac power is routed through the relay contacts to the primary, secondary, and emergency ac buses through the appropriate bus relays.

13-19. The secondary dc relay will be energized when the secondary dc bus is being supplied with power from the transformer-rectifier. The relay contacts will be open, thus preventing emergency power from being routed to the buses when the emergency ac generator switch is actuated. If the master generator fails, causing loss of power to the transformer-rectifier, the relay will deenergize, providing a route to energize the primary and emergency ac relays as well as the primary and emergency dc relays.

13-20. The circuit breakers are connected directly to the ac and dc buses and are mounted in the circuit breaker panels. The circuit breakers provide protection to individual components of systems requiring electrical power in the airplane.

13-21. EXTERNAL POWER SUPPLY SYSTEM.

13-22. The external power receptacle provides the connections for applying an external power source to the airplane. Components of the external power supply system are an external power receptacle, external power monitor, external power arming relay, and remote control switch.

13-23. The external power monitor protects the airplane bus system against phase reversal, overvoltage, undervoltage, overfrequency, and underfrequency. The power monitor contains a rectifier for converting the external ac power to dc power. The ac power relay is energized by dc power applied to the external power coil through the external power arming relay.

13-24. The remote control switch may be actuated to reset the external power monitor in the event power which is not within voltage and frequency limits has been applied from the external power unit.

13-25. EMERGENCY POWER SYSTEM.

13-26. The emergency power system provides emergency ac and dc electrical power for the primary, emergency, and battery buses and emergency hydraulic power. The self-contained emergency power package consists of a turbine fan and governor assembly, ac/dc generator and ac voltage regulator, and fixed displacement hydraulic pump. Extension and retraction is controlled by the emergency power handle in the cockpit. Mechanical energy for the emergency power supply generator and hydraulic pump is provided by a common shaft driven by the turbine fan assembly. The speed of the fan assembly is controlled by the governor assembly to provide generator frequency control. The voltage regulator is a power transistor type and operates on an average 3-phase sense basis.

13-27. EXTERIOR LIGHTING SYSTEM.

13-28. The exterior lighting system consists of a land/taxi light, upper and lower anticollision lights, wing formation lights, floodlights, wing/tail position lights, position lights flasher, and exterior lights flasher relay. The land/taxi light provides illumination of the runway for landing and taxiing the airplane. The upper and lower anticollision lights provide a warning marker on top and bottom of the airplane so the airplane's location will be noted by other airplanes in the vicinity. The formation lights provide location indication for wings of the airplane and floodlights provide illumination of a portion of the lower fuselage and vertical tail during night formation flying. The position lights provide location points of the right and left wingtips and the vertical tail during night flying. The wing/tail position lights flasher provides a means of flashing the wing and tail position lights by intermittently interrupting power to the exterior lights flasher relay.

13-29. INTERIOR LIGHTING SYSTEM.

13-30. The interior lighting system consists of console lights, instrument lights, cockpit floodlights, chartboard light, utility light, and warning, caution and advisory lights. Power for the console lights is provided through a dimming control unit which controls the intensity of the lights. Power for the instrument lights is supplied through two dimming control units (one for flight instruments and the other for all other instruments). Each light has a separate potentiometer for adjustment of the light intensity. The cockpit floodlights, chartboard light, and utility light provide additional lighting as required in the cockpit. Warning, caution, and advisory lights may be tested by actuating press-to-test switches or by pressing the indicator light test switch.

13-31. FIRE DETECTION SYSTEM.

13-32. The fire detection system consists of fire sensing elements, control unit, warning light, and test switch. The sensing elements are a continuous cable mounted to the airplane interior structure around the forward section of the engine. The sensing elements are connected to the control unit which performs two functions. The control unit will provide a route for power to cause the fire warning light to come on if heat or fire raises the temperature above predetermined level in the engine compartment. The control unit will also disable the fire warning light circuitry if a short circuit exists in the sensing elements. The test switch enables a check to be made of the fire detection circuitry and determines that all components of the system are functioning properly.

SECTION XIV
RADIO COMMUNICATION AND NAVIGATION SYSTEMS

14-1. DESCRIPTION.

14-2. Communication and navigation equipment consists of radio and radar transmitter and receiver sets. The radio communication equipment consists of an AN/ARC-164(V) uhf radio set, AN/ARC-186(V) vhf radio set, and AN/ARR-69 uhf auxiliary radio receiver. The radio navigation equipment consists of the AN/ARA-50 uhf automatic direction finder radio set, AN/ARN-118(V) TACAN set, and AN/ARN-58 ILS set. Radar units which are used with ground radar are the AN/APX-72 IFF set and AN/APN-154 radar beacon set. Other radar navigation equipment includes an AN/APN-194(V) (airplanes before T.O. 1A-7-502) or AN/APN-232(V) (airplanes after T.O. 1A-7-502) radar set which provides accurate altitude and an AN/APN-190 radar navigation set that provides groundspeed and drift angle. AN/AIC-26 audio system provides headset and microphone interface with the radio communications system. The audio system also provides head-set audio from other airplane systems generating aural indications. A speech security set is used with the uhf and vhf sets for coded communication. An AN/ASN-90(V) inertial measurement set (airplanes before T.O. 1A-7-562) or inertial navigation system (airplanes after T.O. 1A-7-562) provides velocity and attitude information required for airplane navigation and weapon delivery functions. The approach attitude indicating system provides visual indications of airplane angle-of-attack for use in maintaining optimum approach speed. The pitot-static system supplies pitot and static pressures to the air data computer and cockpit instruments for use in developing flight information. The air data computer system provides true airspeed, indicated airspeed, Mach number and altitude information. The heading mode system provides for control and display of flight and navigation information.

14-3. AN/ARC-164(V) UHF RADIO SET.

14-4. The AN/ARC-164(V) radio set functions as the main communications receiver-transmitter and the auxiliary automatic direction finder (ADF) receiver. The main function provides two-way, amplitude-modulated, radio-telephone communication. The auxiliary function provides ADF audio error signals to the AN/ARA-50 ADF set by receiving ADF rf signals from ground stations. The set is capable of transmitting and receiving on any one of 7,000 channels spaced 25 kilohertz apart in the 225.000- to 399.975-kilohertz band. The C-9682/ARC-164(V) radio set control permits selection of any one of the 20 preset channels within the specified frequency range or the manual selection of any of the 7,000 available frequencies. The preset channels are selected from the cockpit by remote control during flight. A guard channel frequency of 243.000 megahertz may be monitored continuously in addition to tuning the radio set control to a tactical frequency.

14-4A. On selected airplanes, depending on mission requirements, the standard uhf radio is replaced by a jam resistant uhf radio. For airplanes selected for antijam (AJ) uhf radio capability, the AN/ARC-164(V) will have 14 preset channels. In the AJ mode, as many as six preset channels may be used for loading word of day (WOD). In the normal mode, the radio will not use the memory contents of preset channels 15 through 20 as operating frequencies.

14-5. The standard AN/ARC-164(V) uhf radio set consists of: RT-1145/ARC-164(V) receiver-transmitter, MT-4838/ARC-164(V) mount assembly, C-9682A/ARC-164(V) radio set control, and ID-1961B/ARC-164(V) or ID-1961C/ARC-164(V) remote frequency channel indicator. After accomplishment of T.O. 1A-7-508, the standard uhf radio receiver-transmitter (RT) will change to RT-1145C/ARC-164(V) receiver-transmitter. For airplanes with HAVE QUICK capability (airplanes after T.O. 1A-7-539), the uhf receiver-transmitter (RT) will change to RT-1504/ARC-164(V) receiver-transmitter. On airplanes after T.O. 1A-7-577, the C-9682A/ARC-164(V) radio set control is replaced with the C-11721/ARC-164(V) radio set control.

14-6. AN/ARA-50 AUTOMATIC DIRECTION FINDER SET.

14-7. The AN/ARA-50 automatic direction finder (ADF) set provides ADF rf signals to a receiver and uses the resulting receiver audio output for ADF antenna positioning which is displayed as relative bearing to station on the horizontal situation indicator (HSI). The ADF receiver is also used as an auxiliary uhf command receiver. The four main elements in the system are the C-1457A/ARR-40 receiver control. AS-909/ARA-48 or AS-909A/ARA-48 antenna assembly, AM-3624/ARA-50 relay amplifier, and R-1286/ARR-69 or R-1286A/ARR-69 uhf receiver. The system is integrated with the uhf radio set, provided as an auxiliary ADF receiver.

14-8. The C-1457A/ARR-40 receiver control provides switching for the selection of function and frequency and controls for receiver audio volume level and sensitivity. The AS-909/ARA-48 or AS-909A/ARA-48 antenna assembly provides the ADF rf input to the receiver and applies antenna position information to the horizontal situation indicator. The AM-3624/ARA-50 relay amplifier provides amplification and filtering for receiver ADF audio signals to drive the phase-sensitive antenna motor. An ADF switch provides the capability for ADF operation on guard frequency using the AN/ARR-69 receiver. The R-1286/ARR-69 or R-1286A/ARR-69 uhf receiver functions as the main ADF receiver and as an auxiliary communications receiver. It provides ADF audio error signals as its main function and provides command audio to the audio intercommunication system as an auxiliary functions.

14-9. AN/ARC-186(V) VHF RADIO SET.

14-10. The AN/ARC-186(V) vhf AM/FM radio set is an airborne communication receiver-transmitter. This vhf AM/FM radio set operates on 1,839 communication channels, spaced 25 kilohertz apart, within the tactical FM band of 30,000 to 75.950 megahertz. The radio set is comprised of six major units: RT-1300/ARC-186(V) receiver-transmitter, MT-6048/ARC-186(V) mounting base, MT-( )/FM-622A mount, C-10604(V)3/ARC-186(V) control box, antenna coupler, and fin notch antenna. Set design permits tuning in the FM band to 87.975 megahertz; however, the antenna configuration limits performance to 75.950 megahertz. Above 75.950 megahertz, performance is degraded, and operation in this higher region should not be attempted. The fin notch antenna and antenna feed assembly are identical to vhf radio set installations before T.O. 1A-7D-857 (paragraph 14-9). The radio set provides two-way communications between air-to-air and air-to-ground stations and may be used in conjunction with the speech security set.

14-11. AN/AIC-26 AUDIO SYSTEM.

14-12. The AN/AIC-26 audio system provides individual or simultaneous monitoring of eight system audio outputs at the pilot's headset and provides keying grounds and microphone audio to either the vhf or uhf transmitter. During ground maintenance, the audio system also functions as an intercommunication system with personnel outside the airplane. The audio system includes two basic units, C-8187/AIC-26 intercommunication set control, C-6624/AIC-26 intercommunication station, two isolation transformer panels, and a microphone switch.

14-13. The C-8187/AIC-26 intercommunication set control is mounted on the left console. The set control front panel contains all controls and switches except the press-to-talk switch which is on the throttle. Eight combination monitor switch-volume controls enable monitoring and individual audio level adjustment of eight audio inputs. A master volume control permits adjustment of all audio inputs to the headset simultaneously. A seven-position rotary selector switch is provided for selection of either the vhf or uhf transmitters or in the fully clockwise position, provides for selection of intercommunication communications. The throttle press-to-talk switch controls the operation of the selected transmitter. The front panel also contains a continuity energized microphone switch and a call switch used to communicate with the C-6624/AIC-26 intercommunication station located in the liquid oxygen compartment. The call switch provides for direct communication to personnel outside the airplane regardless of switch and control positions. When the call or press-to-talk switches are actuated, all other audio inputs are suppressed 6 decibels to provide a call exalt feature. Pressing the throttle microphone switch disconnects all audio except the side tone of the transmitted signal; however, if the selector switch is in INT, the uhf and vhf also remain connected. Two 5-volt panel lamp assemblies provide illumination for the plastic edge-lighted plate.

14-14. SPEECH SECURITY SET.

14-15. The speech security set is used in conjunction with the uhf and vhf radio sets to provide coding and decoding of voice communications. On airplanes before T.O. 1A-7-606, the set includes a C-7990/ARC control mounted in the right console, RE-978/ARC relay assembly, and TSEC/KY-28 coder/decoder. Operation of the speech security set is controlled by the C-7990/ARC control. On airplanes after T.O. 1A-7-606, the set includes a Z-AHP-4 control panel, an RE-978/ARC relay assembly, a KY-58-2 coder/decoder, and a Z-AHQ adapter for installation of the coder/decoder into its mount. Operation of the speech security set is controlled by the Z-AHP-4 control panel.

14-16. AN/APX-72 IFF SET.

14-17. The AN/APX-72 IFF set provides automatic radar identification of airplane to all suitably equipped challenging airplanes, surface ships, and ground facilities within operational range of the system. Specially coded identification of position and emergency signals may be transmitted to interrogating stations when conditions warrant.

14-18. Components of the AN/APX-72 IFF set include RT-859/APX-72(V) or RT-859A/APX-72(V) receiver-transmitter, CVAT-98 antenna, C-6280(P)APX transponder control set, KIT-1A/TSEC MK XII computer, UHF/IFF diplexer, and TS-1843/APX or TS-1843A/APX or TS-1843B/APX transponder tester. The diplexer permits joint use of the CVAT-98 antenna by both the IFF radar set and the UHF radio set. The receiver-transmitter receives, decodes, and responds to characteristic interrogations of operational modes 1, 2, 3/A, C, and 4. Signals, consisting of pairs of pulses spaced to form a code, are transmitted to the receiver-transmitter which receives the coded signal and transfers it to the decoder. The decoder checks the incoming signal for valid code and proper mode (except for mode 4 interrogations which are sent directly to the KIT-1A/TSEC MK XII computer). If valid, the decoder signal is sent to the encoder which prepares the coded reply. The coded reply is sent through the transmitter and antenna to the interrogating source. The C-6280(P)/APX applies power to the receiver-transmitter, determines modes and categories of operation, and selects the mode setting (except for mode 2 setting which

is set on the receiver-transmitter). The KIT-1A/TSEC Mk XII (classified) is required for mode 4 operation of the RT-859/APX-72(V) or RT-859A/APX-72(V). KIT-1A/TSEC Mk XII processes mode 4 interrogations and prepares the coded reply for transmission. The CPU-140/A air data computer is used in mode C operation to prepare for transmission coded signals, indicating airplane pressure altitude in hundreds of feet. The transponder tester provides an inflight testing capability of the AN/APX-72 IFF set on a go/no go basis.

14-19. AN/ARN-118(V) TACAN SET.

14-20. The AN/ARN-118(V) TACAN set is an airborne tactical air navigation set which operates in conjunction with an AN/URN-3 surface navigation beacon or with another airplane equipped with a similar TACAN set. The set operates in four modes; receive, transmit-receive, air-to-air receive, and air-to-air transmit-receive. In the receive mode of operation, the set provides a continuous indication of bearing relative to the ground beacon station. In addition, when the set is in either the receive or transmit-receive mode, an audio signal is provided to identify the station. In the air-to-air receive mode, the set provides an indication of bearing relative to a suitably equipped cooperating airplane. In the air-to-air transmit-receive mode, the set provides an indication of distance and bearing relative to a suitably equipped cooperating airplane. In the air-to-air transmit-receive mode, the set also provides distance information to another airplane when interrogated.

14-21. AN/ARN-58A(V) INSTRUMENT LANDING SET.

14-22. The AN/ARN-58A instrument landing set (ILS) is used in conjunction with ground transmitting equipment and the airplane heading mode and audio systems to form the instrument landing system. The airborne components of the ILS provide the ability to receive three discrete signals which are marker beacon, glide slope, and localizer. These signals are displayed for the pilot to give him the necessary information to accomplish an instrument landing.

14-23. AN/APN-154(V) RADAR BEACON SET.

14-24. The AN/APN-154(V) radar beacon set extends the radar tracking range of the airplane navigational system and aids in determining the range and location of the airplane. The radar beacon set consists of an RT-763B/APN-154(V), RT-763C/APN-154(V), or RT-763D/APN-154(V) receiver-transmitter, C-4419/APN-154(V) control panel, CU-1104/APN-154(V) duplexer, AS-1739A/APN-154(V) antenna, 202-33411-1 antenna adapter, and two CG-2574/APN-154(V) radio frequency cable assemblies.

14-25. The antenna used in the radar beacon set is a vertically polarized, X-band skirt dipole which receives pulse-modulated signals from an interrogating radar. The radar signals are modulated with either single- or double-pulse trains. The signals received by the antenna are transferred through an antenna adapter to the duplexer. The duplexer is a ferrite isolator that permits signal reception and transmission with a single antenna. Incoming signals are directed by the duplexer through an rf cable assembly to the receiver section of the receiver-transmitter.

14-26. The receiver-transmitter consists of receiving-transmitting, amplifying, decoding, modulating, and power supply assemblies. The control panel contains the mode switch and power switch for the radar beacon set. The transmitter output signal is coupled through an rf cable assembly to the duplexer for transfer to the antenna.

14-27. AN/APN-190(V) RADAR NAVIGATION SET.

14-28. The AN/APN-190(V) radar navigation set is a Doppler radar set which provides continuous measurement and indication of airplane groundspeed and drift angle. The set consists of the RT-927/APN-190(V) receiver-transmitter, C-7765/APN-190(V) control indicator, AS-2262/APN-190(V) antenna, and MT-4037/APN-190(V) receiver-transmitter mount. The set operates at a frequency of 13.325 gigacycles, provides groundspeed indications of 100 to 999 knots and drift angle indications of ±30° on the control indicator at altitudes from 40 to 50,000 feet, and will provide accurate indications with the airplane attitude at ±20° in pitch and ±30° in roll. Two beams of microwave energy are transmitted at one time. One beam looks forward, the other aft, resulting in an upshifted and downshifted Doppler return from the fore and aft beams, respectively. The two returns are beat together to produce a Doppler return at twice the Doppler shift in either return. Each beam is switched left and right of ground track for drift sensing and in turn, beam-lobed for over-water shift error. The crossover frequency of this beam-lobed pair of Doppler echoes is determined by using a zero frequency discriminator which results in a frequency proportional to groundspeed. Automatic signal acquisition occurs within 25 seconds after a usable Doppler return signal is obtained. Built-in test equipment (BITE) is provided to determine proper operation of the antenna and receiver-transmitter units. Groundspeed, drift angle, and operational status information is converted to digital format before being routed through a data channel to the tactical computer.

14-29. AN/ASN-90(V) INERTIAL MEASUREMENT SET. (Airplanes Before T.O. 1A-7-562.)

14-30. The AN/ASN-90(V) inertial measurement set (IMS), prime sensor for instantaneous velocity and attitude information required for navigation and weapon delivery functions, is used in conjunction with the tactical computer set.

14-31. The inertial measurement set consists of an inertial measurement unit (IMU), IMU adjustable mount, adapter/power supply unit, battery, and control panel. The IMU is a four-gimbal, all attitude unit containing gyroscopes, accelerometers, and associated electronic control equipment and is provided to sense rotations and velocities in the three airplane axes (roll, pitch, and yaw). The IMU adjustable mount provides a means for adjusting the IMU during boresighting and for interchanging the IMU without the necessity of realignment. The adapter/power supply contains circuitry which provides secondary power to the IMS and also provides attitude information produced by the IMU through the tactical computer and other airplane avionics. The adapter/power supply stabilizes magnetic heading information using IMU and ML-1 remote compass transmitters. Sequencing of the IMS through the various modes during start-up and operation is also accomplished by the adapter/power supply. A battery is provided to ensure operation of the IMS for up to 30 seconds during power interruptions.

14-32. Three lights (GROUND ALIGN, IMS NOT ALIGNED, AND IMS) are provided on the cockpit advisory panel to indicate IMS conditions. The GROUND ALIGN light comes on when the rotary select switch is placed in GND ALIGN position. The IMS NOT ALIGNED light comes on when the tactical computer set is operating and the IMS is operating in a computer controlled mode. The IMS light comes on in the event of IMS failure.

14-32A. INERTIAL NAVIGATION SYSTEM. (Airplanes After T.O. 1A-7-562.)

14-32B. The inertial navigation system (INS) is a self-contained, all-attitude navigation set. The INS provides digital and analog information required for navigation and weapon delivery. The inertial navigation functional system consists of the following line replaceable units (LRUs): inertial navigation unit (INU); INU mount; control display unit (CDU); and an ML-1 remote compass transmitter. The INS has three ring laser gyros (RLGs) mounted in a strapdown inertial configuration where the inertial devices (gyros and accelerometers) are attached directly to the carrier. This eliminates the stable platform and gimbal system. Communication between the various components of the INS and other avionic systems is via serial digital multiplex lines. Analog and discrete outputs interface as required.

14-32C. The INS is an accurate navigation system designed for high performance airplane use. The three RLGs are mounted on a machined inertial sensor assembly (ISA) in a strapdown inertial configuration. System interface is under the control of a master bus controller (MBC). The tactical computer (NWDC) is the MBC unless it is off/failed. Then, the bus system interface unit (BSIU) becomes the MBC. The MBC directs all the 1553 MUX bus traffic between the INU and CDU as well as all other systems. The INU requires an input of pressure altitude. This input is via the 1553 MUX bus from the air data computer (ADC). The INS provides airplane pitch, roll, and heading. The INS also provides compensated acceleration, angular rate, and linear velocity signal outputs. The pitch and roll signals represent the attitude of the airplane. The heading data wanders in azimuth at a rate determined by airplane latitude and velocity. Azimuth orientation of the attitude reference relative to north is computed in the inertial computer processor (ICP) (A4). The ICP output is velocity and heading data referenced to a north/east reference. This output is for use by the NWDC to update position information. The INS is capable of being gyro-compassed on the ground or Doppler gyro-compassed in the air. It also will operate as a pure inertial system with backup modes selected manually or will be selected automatically if the NWDC fails.

14-32D. The INS provides digital and analog data to the NWDC, BSIU, flight director computer (FDC) set, automatic flight control system (AFCS), and heading mode system (HMS). Magnetic heading data from the ML-1 remote compass transmitter is provided to the NWDC. This is via the BSIU if the INS is off/failed. During power loss, power is supplied to the INS from the airplane battery for a period of 1.5 minutes or more if the airplane battery charge is good. If power is restored, battery power will be disconnected.

14-32E. The INS mount provides a mechanical interface between the airframe, cabling, and cooling air. The mount provides for alignment stability and easy installation and removal of the INS. The INS does not require any realignment after replacement. Secure mounting and alignment with the airframe equipment shelf is done with shims inserted between the INS mount and airframe mounting points. These are used to adjust pitch and roll of the level axis. Slotted holes are provided in three of the four INS mount bolt holes for mount adjustment during boresight. Boresight is required each time a mount is installed.

14-32F. The CDU is the control and display interface with the INS. The CDU controls the mode functions of the INS and allows entering, recalling, and displaying data from the INS.

14-32G. A self-test feature using built-in test equipment (BITE) provides a functional check of the INS. The INS is tested during the ground align mode. Performance is also monitored during flight. A go/no go condition is displayed by BITE/FAULT indicators and a fail is displayed on the caution panel. A fail also is sent to other avionic systems. An elapsed time meter indicates total operating time of the unit. INS self-test can be initiated from the NWDC test page using the CDU menu keys. Caution lights, CDU FAIL and INS fail, indicate line replaceable unit (LRU) failure. An advisory light (INS NOT ALIGNED) indicates the alignment progress and when an alignment is complete. If the airplane is moved before completing a full alignment, the INS will sequence automatically to the inertial mode (NAVIGATE). Alignment will continue from where it left off after the airplane has stopped.

14-33. AN/ARW-77 BULLPUP CONTROL SET.

14-34. On airplanes through AF69-6196, the AN/ARW-77 Bullpup control set provides guidance commands to the Bullpup A or B missiles. The set consists of a T-904/ARW-77 or T-904A/ARW-77(V) radio transmitter, MT-2872/ARW-77 mount, C-4504A/ARW-77(V) control selector, E302 antenna, and transmitter test switch. The control selector also provides control functions for the head-up display set (HUD) and projected map display set (PMDS) on all airplanes. The radio transmitter and mount are not installed on airplanes AF69-6197 and subsequent.

14-35. The transmitter consists of two mated units (transistorized logic assembly and rf assembly). The logic assembly contains an adaptive control board, command board, mixer board, rf generator board, crystal unit, and delay line assembly. Components of the mixer network, rf amplifier, and power supply are contained in the rf assembly. The control selector is basically a miniature control stick with the internal mechanism enclosed in a cylindrical housing. The transmitter mount provides a shock resistant attachment to the airplane.

14-36. AN/ASN-99A PROJECTED MAP DISPLAY SET. (Airplanes After T.O. 1A-7D-578.)

14-37. The AN/ASN-99A projected map display set (PMDS) is a navigation aid employing full color projection to provide a continuous display of airplane position in relation to ground position. The PMDS consists of the ID-1665A/ASN-99 projected map display unit, CV-2622/ASN-99 signal data converter, and MT-4168/ASN-99 electrical shock mount base. The display unit contains a cassette which contains film for projection, mechanical drive mechanisms, and controls and indicators to provide visual operational data. The projected map display set provides a continuous, automatic presentation to the pilot of the exact horizontal relationship of the airplane to the terrain over which it is flying. A scale map of the applicable area, stored on 35mm film, is displayed on a graduated screen. With the airplane depicted stationary on the screen, the map moves under the screen in the correct direction and at the proper speed. The position of the airplane, normally depicted centered on the screen, may be decentered to provide a larger viewing area of flightpath.

14-38. AN/APN-194(V) RADAR SET (AIRPLANES BEFORE T.O. 1A-7-502).

14-39. The AN/APN-194(V) radar set consists of the RT-1042/APN-194(V) receiver-transmitter, MX-9132A APN-194(V) interference blanker, ID-1687/APN-141(V) height indicator, and two AS-1233/APN-141(V) radar altimeter antennas.

14-40. The AN/APN-194(V) radar set is an air-to-ground range tracking radar which provides continuous cockpit indications of altitude in the range of 0(+10. -5) to 5,000 feet, regardless of airplane attitude within bank angles of ±30° and pitch angles of ±50°. The system also provides cockpit warning indication of airplane descent below a preset altitude level, and furnishes altitude factors used in position calculation by other systems.

14-40A. AN/APN-232(V) RADAR SET (AIRPLANES AFTER T.O. 1A-7-502).

14-40B. The AN/APN-232(V) radar altimeter set consists of the RT-1438/APN-232(V) receiver-transmitter, ID-2329 heigh indicator, two AS-3646/APN-232(V) antennas, and CV-3800/APN-232(V) signal data converter (SDC).

14-40C. The AN/APN-232(V) radar altimeter set is an air-to-ground range tracking radar which provides continuous cockpit indications of altitude in the range of 0 to 50,000 ft regardless of airplane altitude within bank angles of ±60° and pitch angles of ±30°. The system also provides cockpit indication of airplane descent below a preset altitude level, and furnishes altitude failure used in position calculation by other systems.

14-41. APPROACH ATTITUDE INDICATING SYSTEM.

14-42. The approach attitude indicating system provides visual indication of airplane angle of attack for use in maintaining optimum approach speed. In addition, the system includes a stall warning circuit which shakes the right rudder pedal when a stall (high angle-of-attack) condition is approached. Components of the system include an approach indexer, indexer dimming control, angle-of-attack indicator, angle-of-attack transducer, rudder pedal shaker, ground test switch. and control relays.

14-43. The approach indexer is mounted above the instrument panel in the cockpit and provides indications of five angle-of-attack conditions indicated by combinations of three symbols. These symbols are an upper chevron, circle, and lower chevron (figure 14-1). A dimming control mounted on the exterior lights control panel provides a means of dimming the approach indexer lights.

14-44. The angle-of-attack indicator is mounted in the center of the instrument panel and provides angle-of-attack indications. The indicator dial is calibrated in units that correspond to 1 1/2° angle of attack. Zero angle of attack (airplane waterline 100 reference) is set at 6.2 units on the indicator dial. A power OFF flag on the dial face disappears when power is applied to the indicator.

14-45. The angle-of-attack transducer mounted below the left side of the cockpit has a vane extended into the airstream to sense airplane angle of attack. A signal from the transducer is transmitted to the angle-of-attack indicator, tactical computer, and head-up display. A single-pole switch in the transducer disrupts power to the automatic flight control system (AFCS) roll amplifier computer during high angle-of-attack.

14-46. The rudder pedal shaker is mounted on the right rudder pedal linkage and is energized by circuits completed through the angle-of-attack indicator. A ground test switch bypasses the weight-off-gear relay so ground testing of the rudder pedal shaker and AFCS roll amplifier computer can be accomplished.

14-47. PITOT-STATIC SYSTEM.

14-48. The pitot-static system supplies pitot (impact) pressure and static pressure to the Mach and airspeed indicator and the air data computer. Static pressure only is supplied to the altimeter, vertical velocity indicator, cockpit air pressure regulator, and cockpit air safety valve. Drain fittings are provided in the system tubing for draining any moisture accumulated in the lines. An electrical heating element is provided to prevent ice accumulation at the pitot head opening.

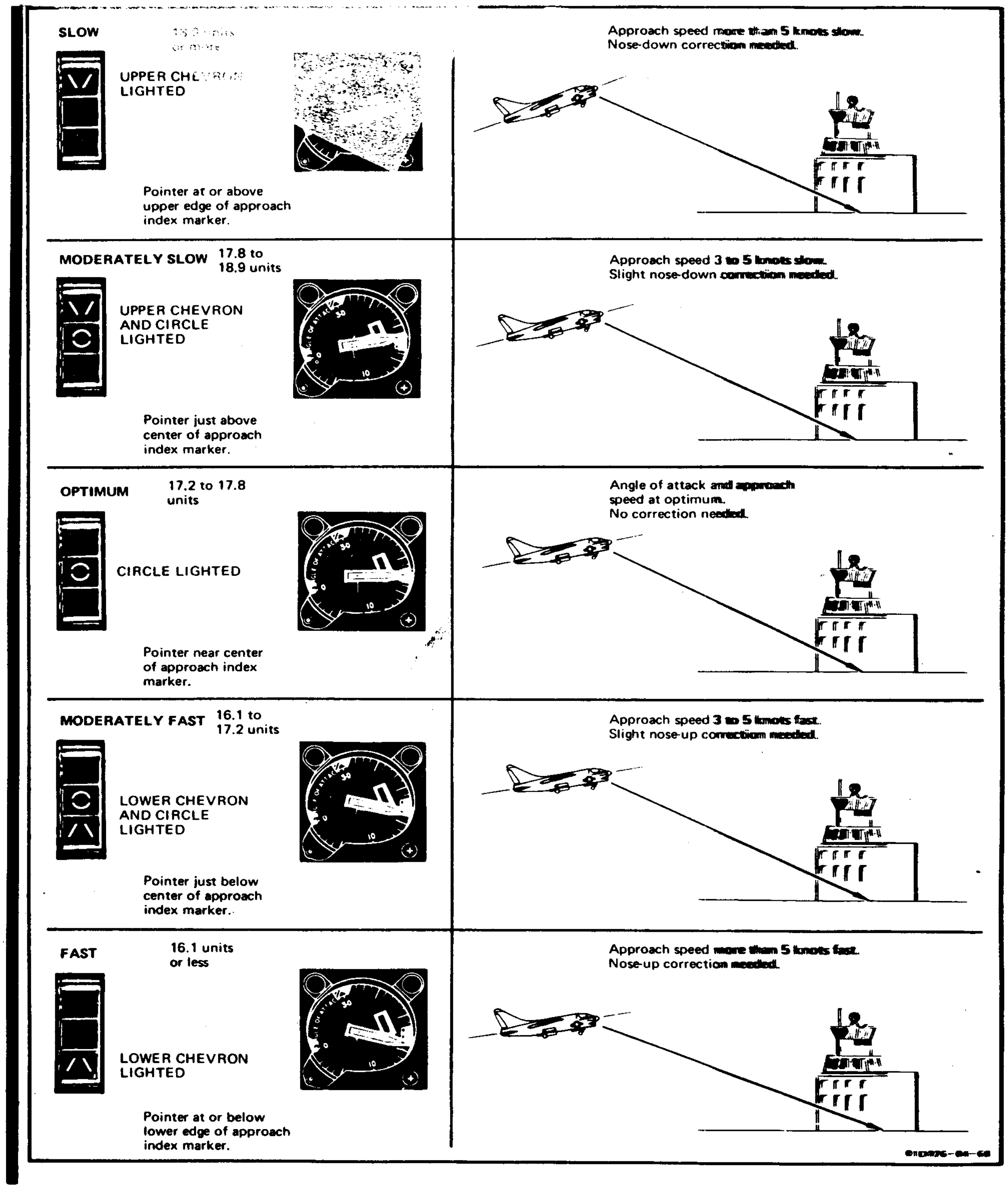


Figure 14-1. Approach Attitude Indicating System Symbols

14-49. AIR DATA COMPUTER.

14-50. The air data computer (ADC) system uses total pressure, static pressure, and total temperature inputs to calculate true airspeed, indicated airspeed, Mach number, altitude, altitude hold, and encoded altitude output signals. The ADC system consists of a CPU-140/A air data computer, total temperature probe, and true airspeed indicator.

14-51. The ADC consists of twelve electronic modules and a chassis. The ADC is a microprocessor-based system and uses a mechanization bus to connect the various modules. The bus consists of a bidirectional data bus, an address bus, and control signals. The total and static transducer modules convert the applied pressures to electronic signals. These signals are in the form of a variable frequency clipped sine wave. The frequencies of the signals are proportional to the applied air pressures. The transducer interface module (TIM) converts the frequencies from the pressure transducers into a digital format. This digital information, together with total temperature equivalent voltage, is fed to the digital processor. The digital processor uses this information to calculate true airspeed, indicated airspeed, Mach number, and pressure altitude signals which are outputted using electronically simulated potentiometers and synchros.

14-51A. An airplane identification connector provides the ADC with the identification code for the A-7D airplane. This informs the ADC to accept the required inputs and provide the applicable outputs for the A-7D airplane.

14-51B. The ADC power supply module (PSM) is mounted on the outside of the ADC. It is connected by a 37-pin, two-part connector. Airplane 115-volt ac power is applied to the PSM which provides all ADC power requirements. The 115-volt ac power for the altimeters is switched by a relay in the ADC. A 1/4-ampere fuse in the 115-volt output circuit protects the AAU-19/A or AAU-19A/A altimeter. Total operating hours of the system are recorded on an elapsed time indicator on the computer. The total temperature probe provides free airstream temperature inputs to the air data computer for use in developing the true airspeed output signals. True airspeed is displayed by the true airspeed indicator on the instrument panel.

14-51C. The ADC continuously monitors its performance by means of an automatic built-in test (BIT) feature that detects failures and provides a means of isolating faults, both in the air and on the ground. BIT can be manually initiated from the BIT panel on the ADC. The BIT panel consists of a SELF TEST SELECT switch, a SELF TEST RUN switch, a two-digit display, and a fault indicator. The two-digit display is used to show the test selected or fault codes logged. The fault indicator will set to invalid (turn white) in the event of a confirmed ADC fault.

14-52. STANDBY ATTITUDE INDICATING SYSTEM.

14-53. The standby attitude indicating system provides a continuous pictorial display of airplane pitch and roll with respect to gravity vertical. The system functions throughout 360° of roll attitude but is limited to ±82° from horizontal in the pitch attitude. The system is provided as a backup system for the primary attitude indicator and provides continuous pitch reference to the automatic flight control system for comparison with inertial measurement set (airplanes before T.O. 1A-7-562) or inertial navigation system (airplanes after T.O. 1A-7-562) pitch references. Components of the system include a standby attitude indicator, vertical displacement gyro, rate switching gyro, and gyro erect switch.

14-54. The standby attitude indicator consists of a sphere marked with a horizon bar which is observed in relation to a fixed miniature airplane attached to the case. A pitch and bank angle scale are superimposed upon the sphere. The pitch angle scale is marked in increments of 5° from zero to 85° climb and dive. The bank angle scale is marked to indicate bank altitudes of 10°, 20°, 30°, 60°, and 90°, left and right. The sphere is mounted on a gimbal, rotates about the roll axis for roll indication, and rotates in relation to the roll gimbal about the pitch axis for pitch indication.

14-55. HEADING MODE SYSTEM.

14-56. The heading mode system provides for control and display of flight and navigation information. The heading mode system indicators display information provided by the AN/ARN-118(V) TACAN set, AN/ARA-50 automatic direction finder set, AN/ASN-91(V) tactical computer set, AN/ARN-58A(V) instrument landing set (ILS), AN/APQ-126(V)8 (airplanes before T.O. 1A-7-530) or AN/APQ-126(V)11 (airplanes after T.O. 1A-7-530) forward looking radar set, and AN/ASN-90(V) inertial measurement set (IMS) (airplanes before T.O. 1A-7-562) or inertial navigation system (INS) (airplanes after T.O. 1A-7-562). Flight information is also routed through the heading mode system to the AN/AVQ-29(V) (airplanes before T.O. 1A-7-530) or AN/AVQ-31 (airplanes after T.O. 1A-7-530) head-up display (HUD).

14-57. Components of the heading mode system include the heading mode switch, two master function switches. ARU-21/A attitude director indicator (ADI), horizontal situation indicator (HSI), TRU-2A/A turn rate gyro transmitter, flight director computer, left avionic relay assembly, and right midequipment bay relay assembly.

14-58. The heading mode and master function switches determine the mode of operation for flight and navigation information displayed on the ADI, HSI, and HUD. The heading mode switch has three mode positions: AUTO NAV (automatic navigation), TACAN, and MAN (manual heading) (airplanes through AF69-6196) or MANUAL (airplanes AF69-6197 and subsequent). The master function switches are terrain following mode (TF) and landing mode (LDG). (Four additional master function switches control attack modes of operation.) The terrain following master function switch overrides normal heading mode switch selection to display terrain following pitch commands on the ADI horizontal pointer and HUD display unit. The landing master function switch overrides normal heading mode switch selection to display ILS roll and pitch steering commands on the ADI vertical and horizontal pointers and raw ILS deviation signals on the HSI course deviation bar and ADI displacement pointer. These signals are also routed to the HUD. The selection of master function and heading mode switch positions determines the mode of operation. On airplanes before T.O. 1A-7-530, the switches control relays which route power and signals through the left avionic relay assembly for indicator operation and display and to establish the flight director computer mode of operation. On airplanes after T.O. 1A-7-530, the switches control relays which route power and signals through the left avionic relay assembly and right midequipment bay relay assembly. From there, power is routed for computer operation and display and to establish the flight director computer mode of operation. On airplanes before and after T.O. 1A-7-530, flag circuits in the ADI and HSI indicate power failure and signal reliability. The ADI displays airplane attitude and heading, lateral steering commands, pitch steering commands, glideslope deviation, rate of turn, and airplane slip. On airplanes before T.O 1A-7-530, roll, pitch, and azimuth signals are routed directly to the ADI from the IMS or INS. The indicator steering pointers and pointer flags are controlled by the flight director computer for all modes except automatic navigation mode where the tactical computer drives the vertical pointer and flag. On airplanes after T.O. 1A-7-530, roll, pitch, and azimuth signals are routed to the ADI from the IMS or INS through the right midequipment bay relay assembly. The indicator steering pointers and pointer flags are controlled by the tactical computer for manual and automatic navigation modes and by the flight director computer for all other modes. The flight direction computer also provides lateral steering signals to the ADI in case of tactical computer failure during MANUAL mode. On airplanes before and after T.O. 1A-7-530, the turn rate gyro provides a dc signal proportional to the airplane rate of turn to the ADI rate-of-turn indicator. The HSI displays bearing, distance, course, TACAN or localizer deviation, and heading (azimuth) information. On airplanes before T.O. 1A-7-530, these displays are controlled by the left avionic relay assembly, HSI controls, and flight director computer. Information signals are routed to the HSI through the left avionic relay assembly. Course resolver signals from the TACAN set and azimuth signals provided by the IMS or INS are routed directly to the HSI and are available in all modes of operation. On airplanes after T.O. 1A-7-530, these displays are controlled by the left avionic relay assembly, right midequipment bay relay assembly, HSI controls, flight director computer, and tactical computer. Information signals are routed to the HSI through the left avionic relay assembly and right midequipment bay relay assembly.

14-59. The flight director computer is a solid state, two channel (pitch and roll) computer which provides steering command signals to the ADI vertical and horizontal pointers and head-up display set. The flight director computer steering command signals are used during TACAN navigation and ILS approach to align the airplane on a proper beam intercept track. Beam capture with minimum overcontrol and overshoot is accomplished with this type of display. To calculate the steering command signals, the computer combines deviation signals from the ILS, TACAN set, and HSI heading synchro with airplane pitch and roll attitude from the IMS or INS, course error from the HSI, preprogrammed rates, and maximum limits. The computer houses plug-in circuit boards containing power supplies, relays, and transistorized circuitry to provide signal routing, signal demodulation, beam signal level detection, gain adjustment, and logic switching functions. A power monitor circuit continuously evaluates the internal dc power supplies to provide an indication of computer failure. A self-test switch, accept light, and failure light mounted on the computer front panel provide ground check facilities.

SECTION XV

ARMAMENT SYSTEMS

15-1. DESCRIPTION.

15-2. The airplane armament systems are used to control firing of the internal gun and the delivery of external stores. A gunnery system, weapons release system, and weapons suspension system comprise the armament systems. Gunnery system components are installed in the fuselage forward section and consist of a 20mm M61A1 gun and ammunition handling components. Weapons release system components are installed in the fuselage forward section and midsection and consist of controls, advisory lights, and interconnecting circuitry. A weapons suspension system is installed on the fuselage midsection and wing center section. Weapons suspension system consists of pylons, ejector racks, and launchers.

15-3. GUNNERY SYSTEM. (See figures 15-1 and 15-2.)

15-4. The gunnery system consists of a M61A1 gun, linkless ammunition handling system, hydraulic gun drive system, gun gas purge system, and electrical control system.

15-5. The M61A1 gun fires electrically primed 20mm ammunition at a rate of either 4,000 or 6,000 shots per minute. The guns consists of a circular cluster of six barrels, each with its own breech bolt. The breech bolts and barrels are mounted to a rotor assembly that rotates inside a fixed housing. During each revolution, a round is fed, chambered, fired, extracted, and ejected from each of the six barrels. Firing voltage is applied to the round when the respective barrel is rotated to the firing position. During gun operation, ammunition is delivered to the gun transfer unit, which removes the ammunition from the conveyor elements, feeds the rounds to the gun, and replaces the empty cases in the conveyor elements. The gun and transfer unit is driven by the gun drive unit through the gun drive assembly.

15-6. (Before TCTO 1A-7-541.) The ammunition handling system stores the ammunition, delivers and feeds it to the gun, receives expended cases and cleared rounds from the gun, and returns them to the ammunition drum. Cartridges are placed in the conveyor as it passes through the exit unit on the ammunition drum. The conveyor moves through the feed chute to the transfer unit, which transfers the cartridges from the conveyor into the gun. The transfer unit also unloads empty cases and unfired or misfired cartridges from the gun and replaces them in the conveyor. The conveyor travels through the return chute to the entrance unit on the ammunition drum, where the empty cases and unfired cartridges are deposited in the rows of partitions in the drum. The conveyor, now empty, passes through the bypass chute, around the ammunition drum to the exit unit, and again receives cartridges to transport to the gun. Power to operate the ammunition handling system is provided by the gun drive unit, ensuring that the system and the gun are always synchronized. Power to operate the ammunition drum and entrance and exit units is fed through a flexible shaft coupled to the gun drive unit.

15-6A. (After TCTO 1A-7-541.) The ammunition handling system stores the ammunition, delivers and feeds it to the gun, receives expended cases and cleared rounds from the gun, and returns them to the ammunition drum. Cartridges are placed in the conveyor as it passes through the exit unit on the ammunition drum. The conveyor moves through the feed chute to the transfer unit and aircraft adapter assembly, which transfers the cartridges from the conveyor into the gun. The transfer unit and aircraft adapter assembly also unloads empty cases and unfired or misfired cartridges from the gun and replaces them in the conveyor. The conveyor travels through the return chute to the entrance unit on the ammunition drum, where the empty cases and unfired cartridges are deposited in the rows of partitions in the drum. The conveyor, now empty, passes through the bypass chute, around the ammunition drum to the exit unit, and again receives cartridges to transport to the gun. Power to operate the ammunition handling system is provided by the gun drive unit, ensuring that the system and the gun are always synchronized. Power to operate the ammunition drum and entrance and exit units is fed through a flexible shaft coupled to the gun drive unit.

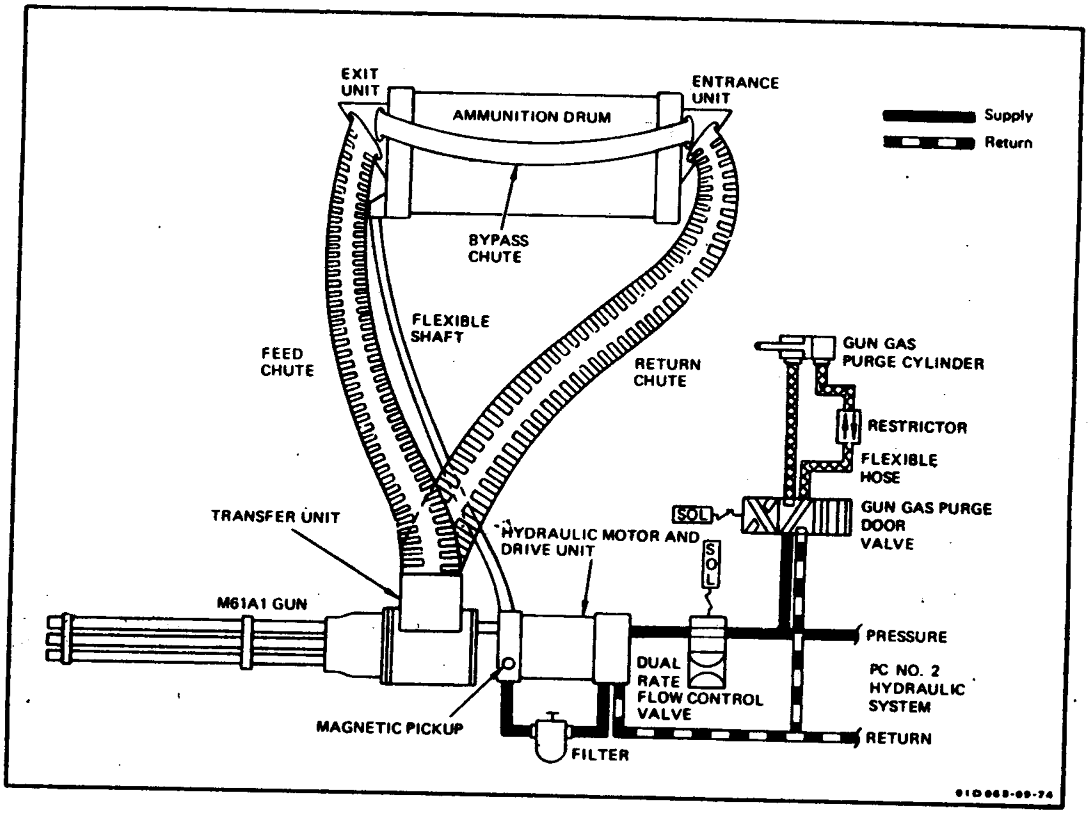


Figure 15-1. Gunnery System Schematic Diagram (Before TCTO 1A-7-541)

15-7. The hydraulic gun drive system supplies the power to operate the gun. Rate of fire of the gun is controlled by the dual rate flow control valve which determines rate of hydraulic flow to the gun drive hydraulic motor. A manual control valve which allows the system to operate at variable rates of speed during gun checkout or loading (with hydraulic power) is an integral part of the hydraulic motor. The gun drive unit contains gears which transfer the rotary motion of the hydraulic motor to the takeoffs that power the gun and ammunition handling system. A resettable rounds counter, mounted on the gun drive unit, records the number of rounds fired or cycled through the gun.

15-8. The gun gas purge system is used to force explosive gun gases from the gun compartment and ammunition drum. When the purge door is opened, the door interlock switch is actuated and the gun gas purge valve is opened to allow air from the air-conditioning system to flow into the gun compartment and ammunition gun compartment. The gun gas purge system is in operation during gun firing and remains in operation after the trigger switch is released for approximately 120 seconds. The gun system electrical circuit is interlocked with the purge system to prevent the gun from firing if purge system fails to operate.

15-9. The electrical control system controls the operation of the gunnery system. The gunnery system may be operated any time the landing gear handle is up or the safety disable switch is actuated, provided ammunition is present. If ammunition is not present or has been expended to the point where the last round switch is released, the last round bypass switch must be placed in bypass to cycle the gun through normal trigger operation. (This switch is used for ground checkout of empty system only.) The gun firing cycle begins when power is applied to the hydraulic gun drive system and the firing circuit. Gun firing is initiated by depressing the trigger switch to the second detent position which supplies 28 volts dc through the armament station control unit to the solenoid on the gun gas purge door valve. As the door opens, the gun gas purge door interlock switch is released and the switch directs power to the gun gas purge air valve. An interlock switch in the gun gas purge air valve completes the circuit to apply a ground to the hydraulic motor solenoid. Control voltages are supplied to the gun control unit through the applicable switches for the triggering and time-delay

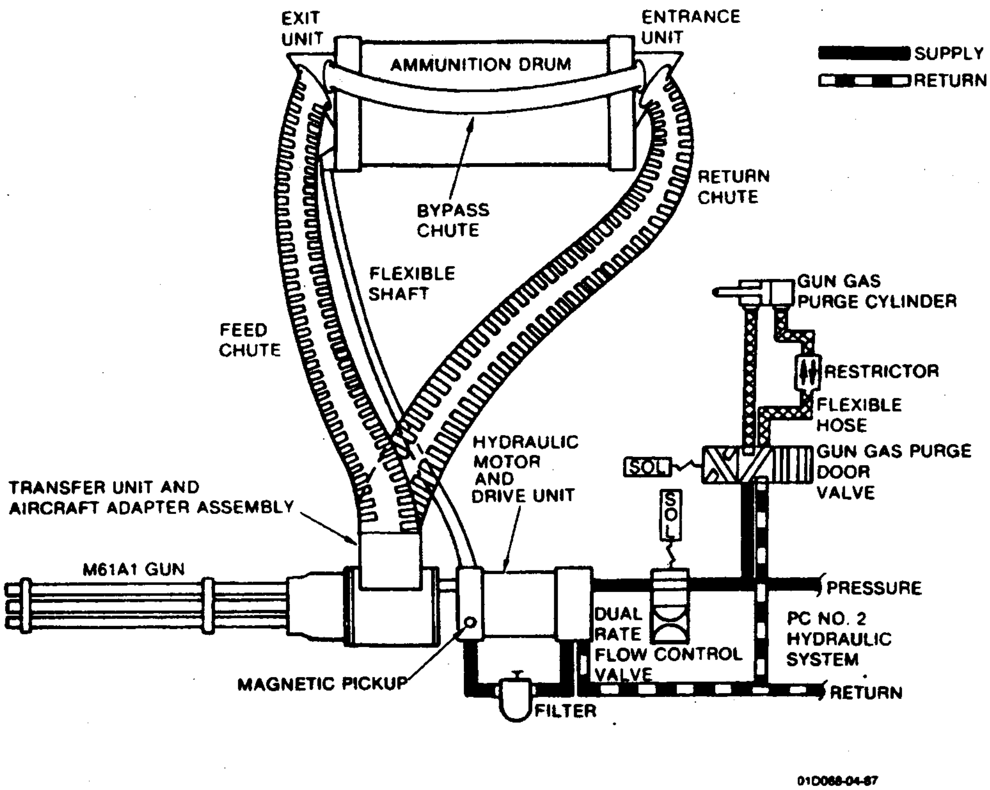


Figure 15-1A. Gunnery System Schematic Diagram (After TCTO 1A-7-541)

circuits within the gun control unit. The firing voltage (115 volts ac) is routed through a transformer-rectifier in the gun control unit where it is converted to 250 to 400 volts dc and then applied to the gun firing contacts. The gun firing cycle ends when the trigger switch or the last round switch is released, which causes the gun to begin decelerating. When the gun has decelerated to approximately 3,500 shots per minute, a magnetic pickup on the gun supplies an ac voltage to a frequency-to-dc converter in the gun control unit to initiate the gun clearing cycle.

15-10. WEAPONS RELEASE SYSTEM.

15-11. The weapons release system controls the release, firing, launching, and/or actuation of external stores mounted on the fuselage and wing pylons. The system provides five computed, one manual, one manual-computed release, and three jettison modes. The

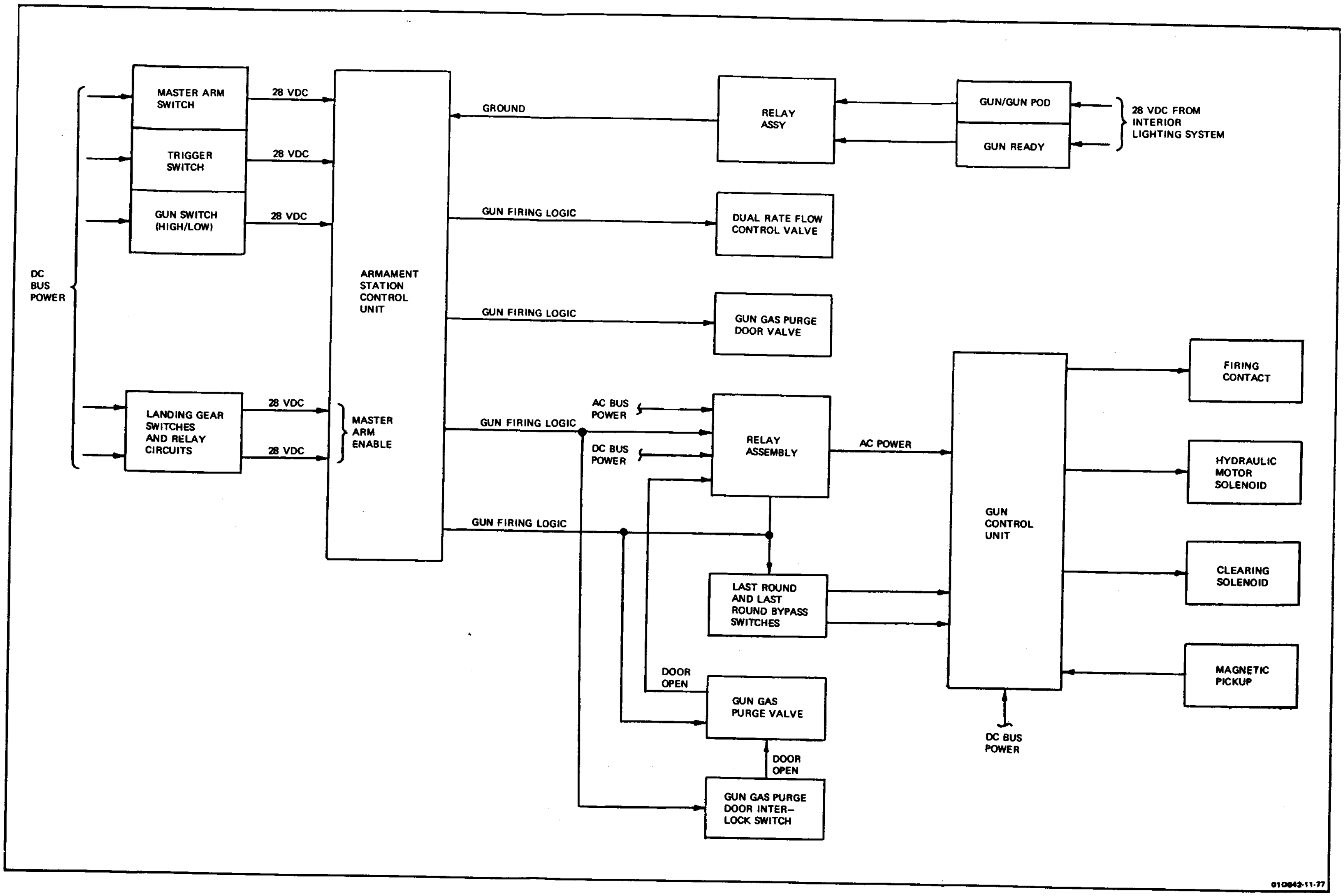


Figure 15-2. Gunnery System Block Diagram

available modes of computed release for bomb and dispenser type stores are normal attack (airplanes through AF69-6196), visual attack (airplanes AF69-6197 and subsequent), normal attack offset, radar bomb, radar bomb offset, and navigation bomb. Should the computer be inoperative or manual release be desired, all stores may be released manually using pilot-estimated lead angle or data from bomb tables, as applicable. If the computer is operational and two or more releases at intervals are desired, the manual-computed mode may be used for weapons release. The three jettison modes of release are salvo jettison, select jettison, and auxiliary jettison.

15-12. The system consists of the armament station control unit (ASCU), armament select panel, armament release panel, three switches mounted on the stick grip, thumbwheel encoder located on the throttle quadrant, master function switches, advisory lights, and safety interlock switches.

15-13. The computed release modes use the tactical computer to provide accurate and precise release control of weapons. The computer outputs to the ASCU for release of weapons are computed from inputs provided by the AN/ASN-90(V) inertial measurement set (airplanes before T.O. 1A-7-562) or inertial navigation system (airplanes after T.O. 1A-7-562), AN/APQ-126(V)8 (airplanes before T.O. 1A-7-530) or AN/APQ-126(V)11 (airplanes after T.O. 1A-7-530) radar set, CPU-140/A air data computer, armament station control unit, AN/APN-190(V) radar navigation set, AN/APN-194(V) (airplanes before T.O. 1A-7-502) or AN/APN-232(V) (airplanes after T.O. 1A-7-502) radar set, angle-of-attack transducer, and armament controls. Steering and targeting symbols are presented on the head-up display (HUD) or the AN/APQ-126(V)8 or AN/APQ-126(V)11 radar indicator.

15-14. In normal attack mode, the HUD displays attack symbology and the computer provides computations for releasing the weapons at the proper time. Normal attack offset mode uses a known landmark from which the airplane may be steered to the target. Release is the same as in normal attack mode. Radar bomb mode provides for limited all-weather attacks using the radar ground mapping modes to locate the target instead of visual sighting. In radar offset bomb mode, a known landmark is located on the radar indicator and the airplane is steered from this point to the target. In navigation bomb mode, known coordinates are set into the computer and the airplane is guided to the target using the coordinates instead of the radar ground mapping or visual sighting. The gun or rockets may be fired in any computed mode with the HUD continuously displaying computed impact points.

15-15. The manual mode may be selected, if desired or whenever the tactical computer is inoperative by deselecting all computed modes and setting quantity switches to 01 or by selecting a weapon other than bombs and dispensers for release. In manual mode, the standby reticle on the HUD and radar antenna depression angles are set as required using data from bomb tables for the type of delivery desired. One firing or bomb drop from the station(s) selected occurs in priority order each time the armament release switch is pressed. The manual-computed mode may be selected by deselecting all computed modes, setting quantity selector for 02 or more releases, and setting interval switches for distance desired between releases. The drop interval is controlled by the tactical computer by computation of the distance the airplane has flown over the ground from the point of first release, which occurs when the armament release switch is pressed, until the number of releases selected has been made.

15-16. The salvo jettison mode provides a means of releasing all stores and supplementary racks from the MAU-12 bomb ejector racks on all wing stations. When the salvo jettison (SALVO JETT) switch is pressed, the circuit is activated causing automatic disabling of mechanical fusing and release of wing stores. The select jettison mode provides the same capabilities as the salvo mode, except the pilot may select specific stations from which stores and supplementary racks are to be jettisoned. The auxiliary jettison mode allows the pilot to jettison any store, empty or full, from a MER or TER without jettisoning the MER or TER rack, starting with the highest priority station or pair of stations selected. Interlock switches prevent application of electrical power to weapon release and jettison circuits, except when the airplane is in flight.

15-17. Electrical power is connected to the armament station control unit (ASCU) by placing the master arm switch in ARM. Electrical power from the ASCU is applied to the armament select panel, advisory lights, and armament release panel. Placing an armament station select switch in RDY applies a signal to the ASCU. The ASCU coded switches are preset to identify and apply release signals to the specific type of weapons carried. A signal flows from the ASCU to the armament select advisory lights to identify the store station(s) which is ready for armed release. In most cases, weapon advisory lights go off, depending on the type of store, when station select switch is placed in OFF or an empty signal is received from the ASCU.

15-18. When all stations are selected with the sequence switch in SINGLE, the normal priority or release sequence for all externally mounted stores is 5, 4, 1, 8, 2, 7, 3, and 6. With the sequence switch in PAIRS, firing sequence in most cases is 5 and 4, 1 and 8, 2 and 7, and 3 and 6. Pairs priority will revert to a single firing order if the station contains Walleye or Bullpup misiles. (Airplanes through AF69-6196 contain the Bullpup weapon and control system. Airplanes AF69-6197 and subsequent contain only the Bullpup control for use in other weapon aiming systems.) With the sequence switch in SIMULT, all selected stations containing rocket launchers each fire one launcher simultanelusly, and stations selected containing vertical dispensers are operated simultaneously. Sidewinders or target rockets fire one at a time regardless of sequence switch position. In manual mode of operation, the depression angle of the standby reticle on head-up display (HUD) is manually positioned as required for the type of delivery desired.

15-19. If the stores selected require mechanical fuzing, the corresponding advisory light comes on and fuze selector switch is placed in proper position for arming the store to be released. With NOSE/TAIL selected, power will be supplied to all mechanical arming solenoids (MAU-12, MER, TER) on each station selected. With TAIL selected, the function is the same as NOSE/TAIL except only the tail solenoids are energized. Power is also applied to the MAU-12 racks center solenoids on right stations, but not on left station due to rack reversal. With switch in SAFE, mechanically armed stores may be released without arming. With switch NOSE, function is the same as in NOSE/TAIL except only nose solenoids are powered. Power is also applied to MAU-12 racks center solenoids on right wing stations but not on left wing stations due to rack reversal.

15-20. Firing, releasing, or operating stores other than guns, after selection, is accomplished by the armament release switch on the flight control stick grip. Firing of guns, after selection, is accomplished by the trigger switch on the flight control stick.

15-21. WEAPONS SUSPENSION SYSTEM.

15-22. The weapons suspension system provides interconnecting equipment necessary to secure and release external weapons from six wing-mounted and two fuselage-mounted pylon stations. The system consists of pylons, ejector racks, launchers, and interconnecting electrical wiring.

15-23. Wing pylons provide interconnecting electrical wiring and mounting points for the MAU-12 bomb ejector rack. Fuselage pylons provide mounting points and interconnecting wiring for the Aero 3B launcher.

15-24. The MAU-12 bomb ejector rack provides mounting points for single stores, MER-10N, TER-9A ejector racks, and missile launchers. When the MAU-12 bomb ejector rack is energized with an electrical firing pulse, two impulse cartridges are simultaneously ignited to supply pressure to release the store. The pressure from the cartridges opens the suspension hooks and forces the store from the ejector rack. Gas pressure can be controlled by installing smaller or larger gas metering orifices to achieve a predetermined forward and aft ejection force.

15-25. The two operating modes of the TER-9A ejector racks are select rockets and stores release. The select rockets mode is predetermined by setting the ASCU store-type switches. In the select rockets mode, the ROCKET/CBU switch is preset according to stores installed and has no function except for CBU or rocket firing. Fire pulses are applied to rocket launchers through a 5-ohm resistor in order of center, left, and right. When ROCKET is selected on the ROCKET/CBU switch, function of the TER is the same when it is placed in CBU except that the 5-ohm resistor is bypassed. The TER will automatically bypass empty (unloaded) stations. Each time power is applied from the master arm switch, the TER will home to the first loaded station. Cluster bomb units (dispenser type) and rockets are not carried on the MER. Stores release modes for the MER are the same as the TER except that firing order is different. Firing order for the MER is aft center, forward center, aft left, forward left, aft right, and forward right.

15-26. Stores release mode is predetermined by setting the ASCU store type switches in any position except rocket/dispensers codes. In stores release mode, the fire pulse is routed sequentially to the individual ejector units, independent of ROCKET/CBU switch position. When an ejector unit on the MER or TER is energized with a firing pulse, the impulse cartridge is ignited in the breech assembly. The breech assembly moves aft to open the suspension hooks, which releases the store from the ejector unit. Gas pressure is also transmitted to the ejector foot to force the store from the rack.

15-27. When a store is mounted on the Aero-3B launcher, a detent mechanism retains the forward hanger of the store. A coil spring holds the forward end of the detent in the down position and will allow the detent to tilt aft when the store is launched. Voltage from the launcher power supply is applied to ignite the store gas generator. Operation of the gas generator closes the power supply firing relay to ignite the store motor. When store thrust has built up to 300 to 800 pounds, the store overrides the restraining effect of the coil spring, allowing the store to travel along the launcher rails.

SECTION XVII

ELECTRONIC COUNTERMEASURE SYSTEMS

17-1. DESCRIPTION.

17-2. Electronic countermeasure (ECM) systems detect the presence of enemy radar during penetration of radar-controlled defenses and warn the pilot that the airplane is being tracked. The systems are also capable of defeating and degrading hostile radar reception by transmitting jamming signals. Associated countermeasure systems provide blanking of receivers during transmission of energy from onboard transmitters operating at or near the same frequency and destruction of security sensitive equipment in emergency situations. Electronic countermeasure systems consist of the countermeasure receiving sets, interference blanker, ECM destruct initiator, pod control, and ECM pods.

17-3. POD CONTROL.

17-4. The pod control located on the right console controls the ECM pods mounted on wing stations 1 and 8. The control is adaptable for use with any pod configuration and controls power application, mode selection, and operating characteristics of the pods.

17-5. ECM PODS.

17-6. The ECM pods are mounted on wing stations 1 and 8 and provide detection and jamming of enemy radars. The pods have varied capabilities and are selected for the specified mission. Blanking of the pod receivers is provided by the airplane blanker, and destruct control signals are initiated by the airplane destruct system.

17-7. AN/ALR-46(V) COUNTERMEASURE RECEIVING SET.

17-8. The AN/ALR-46(V) countermeasure receiving set detects the presence of enemy radar during penetration of radar-controlled defenses. The set provides visual and aural indications of the threat to the pilot so that evasive measures may be taken.

17-9. RF BLANKING.

17-10. The MX-9688A interference blanker prevents false indications or damage to the AN/ARN-118(V) TACAN set, AN/ALR-46(V) countermeasure receiver, and ECM pods by gating conditioned blanking pulse outputs from blanking pulse inputs generated by the TACAN set, AN/APX-72(V) IFF set, AN/APQ-126(V)8 (airplanes before T.O. 1A-7-530) or AN/APQ-126(V)11 (airplanes after T.O. 1A-7-530) radar set, AN/APN-194(V) (airplanes before T.O. 1A-7-502) radar set, and ECM pods.

17-11. AN/ALE-40(V)-11 COUNTERMEASURE DISPENSING SYSTEM.

17-12. The AN/ALE-40(V)-11 countermeasure dispensing system dispenses radar reflective materials and infrared flares to counteract or deceive radar or infrared homing devices. The system dispenses expendable payloads consisting of chaff or flares either individually or in groups. Chaff or flares, or both, may be ejected individually or by preprogrammed quantity and rate through a programmer which is set prior to flight. The type of payload to be dispensed and the mode of dispensing (single, multiple, or programmed) may be selected and fired when it is necessary to take countermeasure action.

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SECTION XVIII
INTEGRATED AVIONIC SYSTEMS

18-1. DESCRIPTION.

18-2. The integrated avionic systems provide voice communications, navigation displays, weapon delivery commands, and flight data information. The integrated avionic systems are: uhf and vhf communications, uhf communications and automatic direction finder, air data reference, attitude heading reference, heading mode, radio navigation, radar navigation, and weapon delivery and release.

18-3. UHF AND VHF COMMUNICATIONS SYSTEM.

18-4. The uhf and vhf communications system provides voice communications in the uhf and vhf frequency ranges and audio monitoring. The system consists of the AN/ARC-164 uhf radio set, FM-622A vhf radio set, AN/AIC-26 audio system, and TSEC/KY-28 speech security set. The uhf radio set provides amplitude-modulated voice communications in the frequency range of 225 to 399.95 megacycles. The set is also a backup receiver for the AN/ARA-50 automatic direction finder (ADF) set. The R-1286/ARR-69 receiver of the ADF is an auxiliary uhf voice communications receiver. The FM-622A vhf radio set provides frequency-modulated voice communications in the frequency range of 30 to 76 megacycles. The AN/AIC-26 audio system provides interconnection between the pilot's headset and microphone, uhf and vhf radio sets, and press-to-talk switch. The audio system controls selection of uhf or vhf transmission, headset volume, and transmitter keying. The press-to-talk switch located on the throttle provides keying of either the uhf or vhf transmitters. The speech security set provides encoding and decoding for speech secure transmissions on either the uhf or vhf radio sets.

18-5. UHF COMMUNICATIONS AND AUTOMATIC DIRECTION FINDER SYSTEM.

18-6. The uhf communications and automatic direction finder (ADF) system provides primary and auxiliary uhf voice communications and direction finder error signals to the horizontal situation indicator (HSI) on the instrument board. The system consists of the AN/ARA-50 ADF set and the AN/ARC-164 uhf radio set. The R-1286/ARR-69 receiver of the ADF set provides primary ADF reception in the 265- to 284.9-megacycle frequency range. The receiver is also an auxiliary voice communications receiver. The RT-742B/ARC-164 receiver-transmitter of the uhf radio set is a backup receiver for the ADF set. The AN/ARA-50 set controls receiver and antenna selection and generates synchro control signals to drive the HSI from audio error signals detected by the ADF antenna.

18-7. AIR DATA REFERENCE SYSTEM.

18-8. The air data reference system provides true airspeed, calibrated airspeed, Mach number, vertical velocity, altitude, altitude hold, and encoded altitude signals developed from total pressure, static pressure, and total temperature inputs. The air data reference system consists of the CPU-140/A air data computer, AAU-19/A or AAU-19A/A altimeter, AAU-18/A vertical velocity indicator, AVU-8/A Mach and airspeed indicator, static pressure system, total (pitot) pressure system, and total temperature probe. On airplanes before T.O. 1A-7-530, the system provides air data reference to the AN/APX-72 IFF set, AN/AVQ-29(V) head-up display set, AN/APQ-126(V)8 radar set, AN/ASW-30(V)2 automatic flight control system, AN/ASN-91(V) tactical computer set, and true airspeed indicator. On airplanes after T.O. 1A-7-530, the system provides air data reference to the AN/APX-72 IFF set, AN/AVQ-31 head-up display set, AN/APQ-126(V)11 radar set, AN/ASW-30(V)4 automatic flight control system, tactical computer set, and true airspeed indicator.

18-9. ATTITUDE HEADING REFERENCE SYSTEM.

18-10. Attitude heading reference system provides roll, pitch, and yaw reference data to the pilot and to various airplane systems. In addition, the system provides incremental velocities for automatic navigation and weapon delivery. The system consists of the AN/ASN-90(V) inertial measurement set (IMS) (airplanes before T.O. 1A-7-562) or inertial navigation system (airplanes after T.O. 1A-7-562), standby attitude indicating system, horizontal situation indicator (HSI), and ARU-51/A attitude director indicator (ADI). On airplanes before T.O. 1A-7-530, the standby attitude indicating system displays roll and pitch attitude to the pilot on a standby indicator and provides a pitch reference signal to the AN/ASW-30(V)2 automatic flight control system (AFCS) for comparison with the pitch reference from the IMS or INS. The IMS or INS provides airplane attitude and heading to the ADI horizontal sphere, AFCS, and AN/ASN-91(V) tactical computer; roll and pitch to the AN/APQ-126(V)8 radar set, AN/APN-190(V) radar navigation set, and CPU-80/A or CPU-80A/A flight director computer; and magnetic heading to the HSI compass card and the AN/ARN-118(V) TACAN set. On airplanes after T.O. 1A-7-530, the standby attitude indicating system displays roll and pitch attitude to the pilot on a standby indicator and provides a pitch reference signal to the AN/ASW-30(V)4 automatic flight control system (AFCS) for comparison with the pitch reference from the IMS or INS. The IMS or INS provides airplane attitude and heading to the ADI horizontal sphere, AFCS, and tactical computer; roll and pitch to the AN/APQ-126(V)11 radar set, AN/APN-190(V) radar navigation set, and CPU-80/A or CPU-80A/A flight director computer; and magnetic heading to the HSI compass card and the AN/ARN-118(V) TACAN set.

18-11. HEADING MODE SYSTEM.

18-12. The heading mode system provides for the selection and display of flight navigation information. The system consists of the heading mode switch, two master function switches, relay switching assemblies, flight director computer, turn rate gyro, horizontal situation indicator (HSI), and attitude director indicator (ADI). The head-up display (HUD) also displays flight navigation information supplied from other reference systems and the heading mode system. Altitude signals from the radar altimeter set and roll and pitch signals from the IMS or INS are routed to the flight director computer where they are used in computing ADI vertical and horizontal pointer steering command signals. The heading mode switch has three positions: MAN (airplanes through AF69-6196) or MANUAL (airplanes AF69-6197 and subsequent) (manual heading), TACAN, and AUTO NAV (automatic navigation). In the TACAN heading mode, ADF and TACAN information, including course deviation, is displayed on the HSI, and TACAN steering commands are displayed on the ADI. In the automatic navigation and manual modes of operation the ADI and HSI display navigation information from the tactical computer set. The two master function switches are: terrain following (TF) and landing (LDG). The master function switches override certain displays selected by the heading mode switch. In terrain following mode, the HSI and ADI displays are dependent upon the mode selected by the heading mode switch and, in addition, the ADI and HUD display pitch commands from the forward looking radar (FLR) set. In the landing mode, the HSI displays are dependent upon the mode selected by the heading mode switch with the exception of the course deviation bar which displays raw localizer information from the AN/ARN-58A(V) instrument landing set (ILS). The ADI displays glideslope and localizer commands from the flight director computer The flight director computer provides proportional fly-to steering commands to the head-up display set and to the ADI vertical pointer during TACAN or manual heading and to the ADI vertical and horizontal pointers during landing.

18-13. RADIO NAVIGATION SYSTEM.

18-14. The radio navigation system provides navigational aids to the pilot from ground-radiated radio frequency navigational systems. The radio navigation system consists of an AN/ARN-118(V) TACAN set for reception and display of TACAN bearing and distance information, an AN/ARA-50 automatic direction finder (ADF) set for reception and display of ADF bearing information, and an AN/ARN-58A(V) instrument landing set (ILS) for reception of localizer, glideslope, and marker beacon information. All indications of the radio navigation information except marker beacon are displayed on the ADI and HSI of the heading mode system.

18-15. RADAR NAVIGATION SYSTEM.

18-16. The radar navigation system provides navigational aids and flight data to various airplane systems from onboard radar sets. The system also provides identification and position information to radar systems on the ground or in other airplanes. The radar navigation system consists of the AN/APQ-126(V)8 (airplanes before T.O. 1A-7-530) or AN/APQ-126(V)11 (airplanes after T.O. 1A-7-530) radar set, AN/APN-190(V) radar navigation set, AN/APN-194(V) (airplanes before T.O. 1A-7-502) or AN/APN-232(V) (airplanes after T.O. 1A-7-502) radar set, AN/APN-154(V) radar beacon set, and AN/APX-72(V) IFF set. The AN/APQ-126(V)8 or AN/APQ-126(V)11 radar set is a forward looking radar that provides terrain following to the HUD and to the heading mode system, and slant range data to the tactical computer set. The AN/APN-190(V) radar navigation set is Doppler radar that provides groundspeed and drift angle to a display and to the tactical computer set. The AN/APN-194(V) (airplanes before T.O. 1A-7-502) or AN/APN-232(V) (airplanes after T.O. 1A-7-502) radar set is a range-tracking radar that displays absolute altitude above the terrain on a radar altimeter mounted in the instrument panel. The set also supplies absolute altitude information to the tactical computer set, AN/APQ-126(V)8 or AN/APQ-126(V)11 radar set, CPU-80/A or CPU-80A/A flight director computer, and head-up display. The AN/APN-154(V) radar beacon set transmits coded replies when pulsed by other ground or airplane radar systems to extend the radar tracking range and to aid in identification. The radar beacon set is a self contained unit that, when energized and interrogated with properly coded pulses, will automatically transmit coded replies. The AN/APX-72(V) IFF set operates in conjunction with ground-based or airborne radar systems to automatically provide coded identification when interrogated by challenging IFF systems. The IFF set also provides identification of individual airplanes with a formation, transmission of emergency signals, and altitude reporting from altitude data supplied by the air data reference system.

18-17. AUTOMATIC NAVIGATION SYSTEM.

18-18. The automatic navigation system provides groundtrack, bearing to destination, distance to destination, and steering error signals to the heading mode system during automatic navigation mode. The system also provides the pilot with a continuously updated present position display on the navigation control panel. The automatic navigation computations are provided by the tactical computer set and are based on inputs from the attitude heading reference system, air data reference system, radar navigation system, inertial measurement set (IMS) (airplanes before T.O. 1A-7-562) or inertial navigation system (INS) (airplanes after T.O. 1A-7-562), angle-of-attack transducer, and preflight data inserted into the navigation control panel. The tactical computer sequences through the navigation computations at the rate of 5 hertz. If one or more system inputs are incorrect or not reasonable, the computer replaces primary computations with secondary computations based upon the best available information for the most accurate navigation data.

18-19. WEAPON DELIVERY AND RELEASE SYSTEM.

18-20. The weapon delivery and release system provides accurate, computer-derived attack data to correctly position the airplane in relation to the target and provides precise release of weapons or firing signals to guns or rockets. Attack data is computed by the tactical computer set from inputs provided by the armament station control unit (ASCU), AN/ASN-90(V) inertial measurement set (IMS) (airplanes before T.O. 1A-7-562) or inertial navigation system (airplanes after T.O. 1A-7-562), angle-of-attack transducer, AN/APQ-126(V)8 (airplanes before T.O. 1A-7-530) or AN/APQ-126(V)11 (airplanes after T.O. 1A-7-530) radar set, AN/APN-190(V) radar navigation set, CPU-140/A air data computer (ADC), C-4504A/ARW-77 Bullpup controller, target designate switch on the pilot's stick grip, fuze switch on the armament select panel, attack master function switches, and information inserted through the C-7831/ASN-91(V) tactical computer control. The AN/AVQ-29(V) head-up display set (HUD) (airplanes before T.O. 1A-7-530) or AN/AVQ-31 HUD (airplanes after T.O. 1A-7-530) visually displays combined attack data and command signals which overlay the pilot's field of view. The computer sequences through the weapon delivery computations at the rate of 25 hertz. If one or more system inputs are incorrect or not reasonable, the computer replaces primary computations with secondary computations based upon the best available information for the most accurate weapon delivery. Automatic weapon delivery is accomplished in seven modes selected by the attack master function switches. Normal bombing uses the HUD to indicate airplane maneuvers and the computer to release the weapon. Normal offset bombing uses a known landmark from which the airplane may be steered to the target. Radar offset bombing uses a known landmark located on the radar display. Navigation bombing uses known target coordinates set in the computer for airplane guidance. In the normal guns and rockets mode, aiming symbols are displayed on the HUD.

18-21. APPROACH ATTITUDE INDICATING SYSTEM.

18-22. The approach attitude indicating system provides visual indications of airplane angle of attack to the pilot for use in maintaining optimum approach speed. In addition, the system includes a stall warning circuit which shakes the right rudder pedal when a stall (high angle of attack) condition is approached. The system consists of an angle-of-attack transducer, angle-of-attack indicator, approach indexer, dimming control, switching relays, control switches, and rudder pedal shaker.

18-23. RADAR SYSTEMS.

18-24. Radar functions are provided by the AN/APN-190(V) navigation radar set, AN/APN-194(V) (airplanes before T.O. 1A-7-502) or AN/APN-232(V) (airplanes after T.O. 1A-7-502) radar altimeter set, AN/APN-154(V) radar beacon, and AN/APX-72(V) IFF set. The AN/APN-190(V) radar navigation set provides Doppler-derived ground-speed and drift angle information. On airplanes before T.O. 1A-7-502, the AN/APN-194(V) radar altimeter set is a pulsed, range-tracking radar which operates in the C-band (4,300 (±10) megahertz) to provide accurate altitude information. On airplanes after T.O. 1A-7-502, the AN/APN-232(V) radar altimeter set is a frequency modulated, continuous wave, range-tracking radar which operates in the C-band (4,300 (±10) megahertz) to provide accurate altitude information. The AN/APN-154(V) radar beacon is an X-band pulsed radar transponder which extends the range of tracking radar systems by transmitting coded reply pulses in response to pulses received. The AN/APX-72(V) IFF set operates in conjunction with ground-based or airborne radar systems to automatically provide coded identification information when interrogated by challenging IFF systems. The IFF set also provides barometric altitude from the CPU-140/A air data computer for AIMS reporting and automatically transmits modes 1, 2, and 3/A when the pilot ejects.

18-25. TACTICAL COMPUTER SET.

18-26. On airplanes before T.O. 1A-7-530, the AN/ASN-91(V) tactical computer set consists of the C-7831/ASN-91(V) tactical computer control, CP-952A/ASN-91(V) tactical computer, and MT-4078/ASN-91(V) shock-mounted base. On airplanes after T.O. 1A-7-530, the tactical computer set consists of the C-7831/ASN-91(V) tactical computer control, CP-1775/A tactical computer, and MT-4078/ASN-91(V) mount. On airplanes before and after T.O. 1A-7-530, the tactical computer processes data from interfaced airplane systems to derive computed automatic navigation and weapon delivery control and display data. Computer programming is accomplished by a program tape (T.O. 33D1-1-3) loaded into computer memory with the AN/ASM-395 memory loader/verifier. The computer control displays information from the computer and provides a means of inserting navigational data into the computer. Information displayed on the computer control is determined by pilot selection of switch positions and pushbuttons.

18-27. The tactical computer contains a power supply, signal converter, and central computer section. The power supply provides regulated dc voltage for computer operation and reference or excitation voltage for interfaced systems. The signal converter performs signal processing necessary for interface compatibility with other airplane systems. The central computer contains all memory circuits, generates clock pulses for signal processing, and controls the input/output conversion and interface functions.

18-28. VIDEO MANAGEMENT SYSTEM.

18-29. The video management system is a control network which provides a means to manage the scenes displayed on the forward looking radar intra-target indicator (IDI) and the head-up display unit (HUD DU). Video management also manages the video and audio data recorded on the airborne video tape recorder (VTR). Video management includes the VTR and the cockpit television sensor (CTVS).

18-30. Video inputs from FLR, ASCU, FLIR, HUD, and CTVS are amplified, mixed, and controlled to present outputs to the FLR, IDI, HUD DU and VTR. Except for the manually forced selection of forward looking radar and weapons TV all display mode selection is managed by the tactical computer. Selection of the VTR enables hot-microphone audio to the VTR.

SECTION XIX

FUSELAGE FORWARD SECTION

19-1. DESCRIPTION.

19-2. The fuselage forward section is a semimonocoque structure and extends from FS 181.9 to 346.5. System components housed by the forward section include the engine air inlet duct, air-conditioning package, air refueling probe, M61A1 gun, emergency power package, and associated ducts, piping, and wiring. A pressurized cockpit encloses system controls and indicators, seat and ejection system, and armor plate. Provisions are included for attaching the nose landing gear on the lower side of the forward section.

19-3. Components of the fuselage forward section include a windshield assembly, upper, middle, and lower access steps, cockpit armor plate, nose radome, main instrument panel, and console panels. The windshield assembly consists of a bullet-resistant, laminated center glass and two acrylic side panels. Upper and middle steps are flush-mounted, swing-out units with quick-opening, snap-type latches. The lower steps are attached to a sliding bar and are raised and lowered through an access opening. A nose radome houses forward-looking radar antennas mounted on the forward section. The main instrument panels and consoles are provided for control and indicator mounting.

19-4. FUSELAGE FORWARD SECTION ARMOR PLATE ARRANGEMENT. (See figure 1-15.)

19-5. On airplanes through AF69-6196, three aluminum armor plates are installed on the cockpit floor, two below and one bewteen the rudder pedals. On airplanes AF69-6197 and subsequent, two steel armor plates are installed on the forward looking radar compartment bulkhead to provide pilot protection in an area 45° below the flight line reference plane.

19-6. On airplanes AF69-6197 and subsequent, in addition to the two steel armor plates located on the radar compartment bulkhead, 17 ceramic armor plates are arranged in the cockpit area to provide additional protection for the pilot, panel mounted instruments, console mounted controls and instruments, and electrical wiring. Five of the ceramic armor plates are mounted on the cockpit floor, two below and one between the rudder pedals and two below the pilot's ejection seat. The twelve remaining plates are arranged along the left and right sides of the cockpit from approximately FS 221 to FS 285 and from the cockpit floor to the canopy sill. The ceramic armor plates are attached to both airframe structure and access panels as necessary to provide maximum protection and accessibility. All armor plates are secured with nuts and/or bolts and washers to facilitate removal and installation.

19-7. GUN BLAST PORT PLUG. (See figure 19-1.)

19-8. A locally manufactured gun blast port plug may be fabricated for installation in the M61A1 gun blast port for protection of the airplane internal structure and gun system components when the M61A1 gun is removed. The gun blast port plug is designed primarily for flight use when the M61A1 gun is removed; however, it may be installed for protection during periods of extended maintenance or airplane storage with gun removed. For removal and installation procedures, refer to paragraph 19-71.

19-9. COCKPIT LEAKAGE TEST. (See figure 19-2.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	1123-100 (Sprague Engineering Division, Teledyne, Inc.)	Cabin pressure tester	Check for cockpit pressure leakage.
19-2	7525472 (Oklahoma City ALC)	Hose adapter, cabin pressure tester	Connect tester blower hose to airplane ground test fitting.
	8246288-10 (USAF)	Canopy retaining net	Retain canopy assembly in case of retention system failure.

a. Remove cabin pressure altimeter (T.O. 1A-7D-2-3).

b. Open accesses 1211-1, 1211-2, and 2222-4.

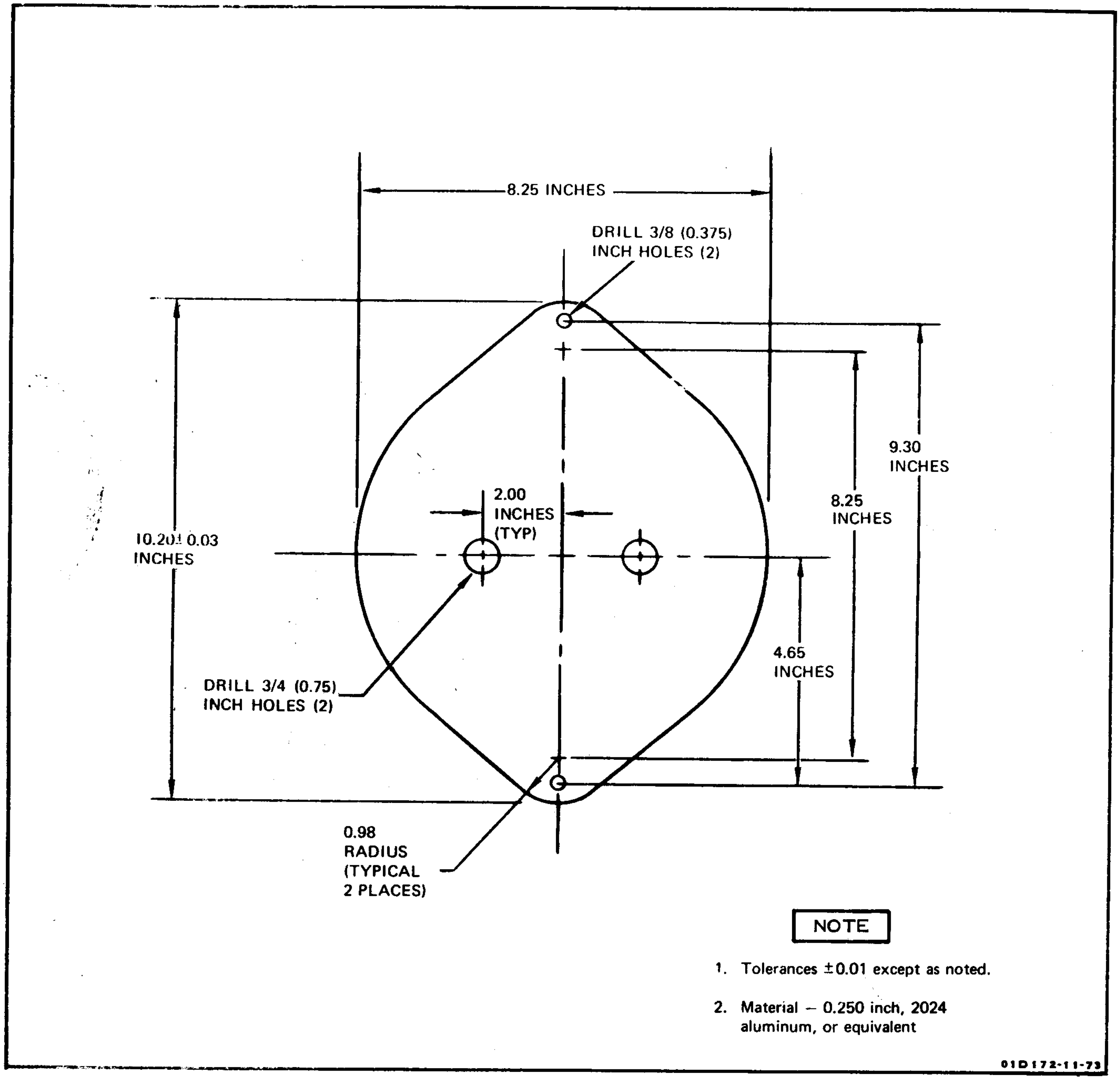


Figure 19-1. M61A1 Gun Blast Port Plug Fabrication

c. Check that static ports are unobstructed and that static lines and connections are tight and undamaged.

d. Cut lockwire on cockpit air pressure regulator handle and position handle in TEST ONLY ALL OFF.

e. Close access 1211-2.

f. Remove caps (1 and 2) from ground test fitting (3) and pressure sensing line fitting (4).

g. Connect hose adapter (5) to ground test fitting (3). Connect blower hose (6) to adapter and tester.

h. Connect test hose (7) to pressure sensing line fitting (4) and CABIN PRESSURE outlet on pressure tester.

i. Position airplane controls as follows:

Control	*Position*
Cockpit pressure switch	CABIN PRESS
Defog switch	OFF
Rain removal switch	OFF
Suit flow control knob	HIGH

j. Push in and rotate emergency vent air knob to close emergency vent air scoop.

k. Close and secure canopy.

kl. Install canopy retaining net, Part No. 8246288-10.

l. Disconnect control air line from port E of control air manifold in access 2222-4.

NOTE

Cabin pressure tester CANOPY SEAL outlet pressure is used to hold the cabin dump valve closed.

m. Connect test hose (8) to disconnected control air line and CANOPY SEAL outlet on pressure tester.

n. Rotate DUMP VALVE control (9) fully counterclockwise to fully open position.

o. Rotate CANOPY SEAL AIR REGULATOR control (10) counterclockwise until control feels loose.

p. Rotate PRESSURE ADJUSTMENT control (11) until 5.0 (±0.1) psig is indicated on PRESSURE INDICATOR (12).

q. Start and operate cabin pressure tester (T.O. 33A4-4-8-1).

r. Adjust CANOPY SEAL AIR REGULATOR control (10) clockwise until 18 (±3) psi pressure is indicated on CANOPY SEAL PRESSURE GAGE (13).

CAUTION

To prevent damage to equipment, temperature of air to cockpit should not exceed 49°C (120°F), and cockpit pressure should not be increased or decreased beyond red line limits on CABIN PRESSURE CHANGE gage (14).

s. Slowly rotate DUMP VALVE control (9) clockwise to the fully closed position.

t. Check that BLOWER PRESSURE gage (16) indication is equivalent to PRESSURE INDICATOR (12) indication and that TEMPERATURE gage (17) indication is below 49°C (120°F).

u. Check cockpit leakage rate indicated on FLOWMETER (18). Correct FLOWMETER indication according to FLOWMETER TEMPERATURE CONVERSION CHART (19). Corrected leakage rate shall not exceed 55 cubic feet per minute at 5.0 (±0.1) psig.

v. Measure gap between center windshield glass and frame. Gap on each side of windshield shall not exceed 0.40 inch.

w. Shut down cabin pressure tester (T.O. 33A4-4-8-1).

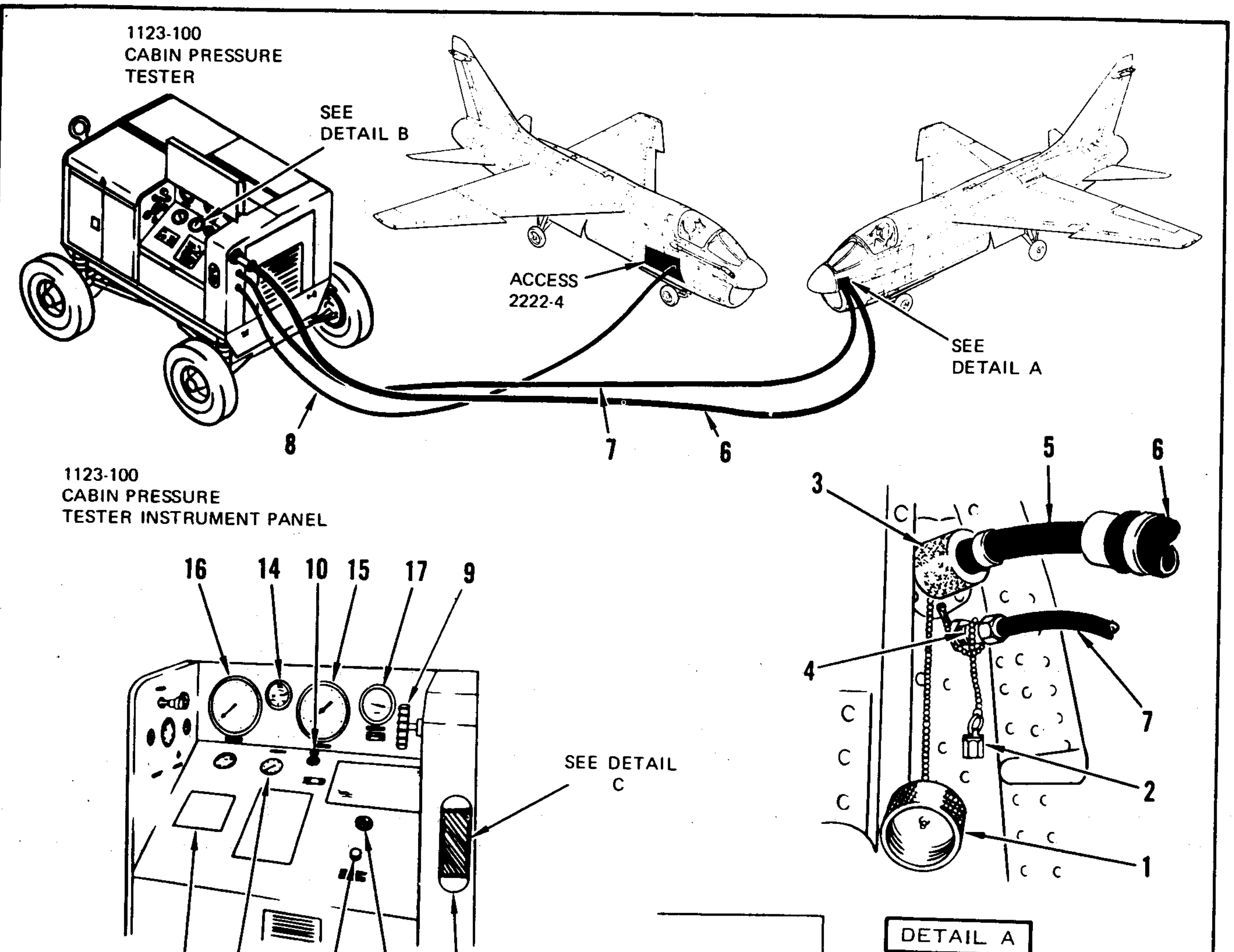
x. Slowly rotate DUMP VALVE control (9) counterclockwise (open) and allow cockpit pressure to dissipate.

y. Check that CABIN PRESSURE gage (14) returns to zero.

z. Slowly rotate CANOPY SEAL AIR REGULATOR control (10) counterclockwise (open).

aa. Disconnect test hose (8) from control air line and tester.

ab. Connect control air line to port E of control air manifold.



1. Cap
2. Cap
3. Ground test fitting
4. Pressure sensing line fitting
5. Hose adapter
6. Blower hose
7. Test hose
8. Test hose
9. Dump valve control
10. Canopy seal air regulator control
11. Pressure adjustment control
12. Pressure indicator
13. Canopy seal pressure gage
14. Cabin pressure change gage
15. Cabin pressure gage
16. Blower pressure gage
17. Temperature gage
18. Flowmeter
19. Flowmeter temperature conversion chart

Figure 19-2. Cockpit Leakage Test

ac. Disconnect test hose (7) from airplane and tester.

ad. Disconnect blower hose (6) from hose adapter (5) and tester, and remove adapter from ground test fitting (3).

ae. Install caps (1 and 2) on fittings (3 and 4).

af. Open access 1211-2.

ag. Place cockpit air pressure regulator handle in FLIGHT and secure handle with MS20995C32 lockwire.

ah. Remove canopy retaining net, Part No. 8246288-10, open canopy and install cockpit pressure altimeter (T.O. 1A-7D-2-3).

ai. Stow hoses and adapter in tester and secure tester.

aj. Close accesses 1211-1, 1211-2, and 2222-4.

19-10. WINDSHIELD CENTER GLASS REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MIL-C-9834	Vacuum cleaner	Clean cockpit area.
	850-2 1/2 (Semco Sales and Service)	Sealant gun	Apply sealant to windshield.

19-11. REMOVAL. (See figure 19-3.)

a. Open accesses 1211-4, 1213-14, 1222-12, and canopy.

b. Remove head-up display (T.O. 1A-7D-2-14).

c. On airplanes through AF69-6196, place protective covering across cowl. On airplanes AF69-6197 and subsequent, remove instrument cowl and place protective covering across cowl opening to prevent entry of foreign objects into cockpit.

d. Remove left and right windshield side panels (paragraph 19-14).

e. Remove left and right defog tubes from center windshield frame. Note position of clamps for installation.

f. Remove wheel/flap warning light (T.O. 1A-7D-2-7), approach indexer (T.O. 1A-7D-2-12). RHAW warning lights (T.O. 1A-7D-2-15), and indicator lights from center windshield frame.

g. Remove left and right windshield center glass retainer angles. Remove all cork tape.

h. Loosen screws securing forward (lower) retainer angle. Do not remove retainer angle.

i. Remove screws from aft retainer angle. Loosen sealant to permit retainer removal and remove retainer angle.

NOTE

Do not damage formed-in-place seal if windshield glass is being removed for access and the same windshield glass will be reinstalled.

j. Loosen sealant from edges of windshield center glass and remove glass from windshield frame.

k. Remove all cork tape adhering to windshield frame.

CAUTION

If windshield frame has been previously coated with sealant for corrosion prevention, use care when cleaning to prevent damage to sealant coating.

l. Wipe windshield frame clean and check for voids in sealant coating on frame (if previously coated). Repair voids with MIL-S-8802 sealant as required (paragraph 19-12).

m. Remove all adhering sealant from retainer angles.

n. Remove vinyl tape from windshield frame and retainer angles.

o. Vacuum clean cowl and cockpit areas.

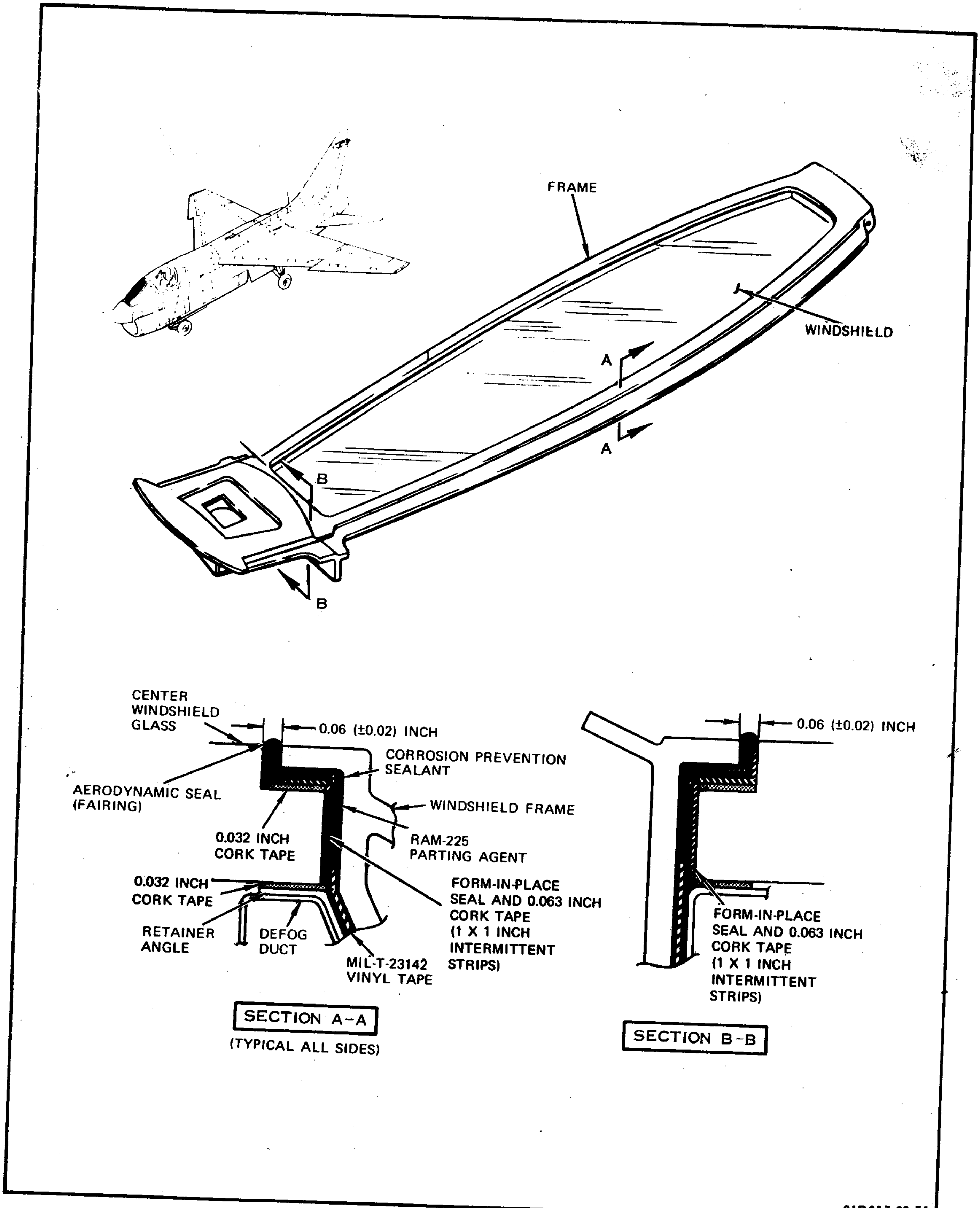


Figure 19-3. Windshield Center Glass Removal and Installation

19-12. INSTALLATION. (See figure 19-3.)

CAUTION

Handle windshield center glass carefully. Scratches, chips, and most solvents can cause premature glass failure and impair optical qualities of the glass. Do not force-fit the glass; cracks and premature failure can result from stresses induced during installation.

a. Visually check replacement windshield center glass for serviceable condition. Leave protective cover on glass to prevent damage during installation.

b. Peel back upper protective paper approximately 1 inch and place a continuous strip of MIL-T-6841 cork tape (NSN 9390-00-599-7823), 0.032 inch thick and 0.8 inch wide, on upper surface of glass in glass-to-frame mating area.

NOTE

A minimal amount (0.03 inch maximum) of filing or trimming of windshield frame is permitted to obtain required tolerances.

c. Carefully position glass panel in windshield frame. Center glass in frame to obtain gap of 0.04 inch minimum between upper (exterior) edge of glass and frame around entire periphery.

CAUTION

To prevent glass damage resulting from contact with the metal frame, short strips of cork tape shall be used to maintain gap tolerances and prevent glass movement during sealant cure.

d. Place 1-inch square strips of 0.063-inch thick MIL-T-6841 cork tape intermittently between vertical edge of glass and windshield frame, as required around periphery, to adjust position of glass in frame and maintain required gap tolerances. Build up tape thickness as required to hold glass in proper position.

e. After obtaining windshield fit, remove glass from frame.

f. If bare metal is exposed due to filing, trimming, tool scratches, or other damage, repair as follows:

1. Surface treat bare metal in accordance with T.O. 1-1-2.

2. Apply 4 coats of MIL-P-23377 primer over bare metal.

NOTE

For preparation and handling of MIL-S-8802 sealant, refer to T.O. 1A-7D-23, Airframe Sealing (Nonfuel Areas). Heat not to exceed 160°F may be used to accelerate sealant cure time if all glass panels are removed from windshield frame.

3. On airplanes with corrosion prevention sealant previously applied on frame, apply MIL-S-8802 sealant thinned 10% by weight with methyl ethyl ketone 0.007 to 0.012 inch thick to repaired area.

4. Allow sealant to cure completely before installing windshield glass.

NOTE

If windshield frame has been previously coated with corrosion prevention sealant, omit step g.

g. On windshield frames not previously coated with corrosion prevention sealant, apply MIL-S-8802 sealant thinned 10% by weight with methyl ethyl ketone on windshield frame where glass and retainers will contact windshield frame casting, 0.007 to 0.012 inch thick, and cure sealant completely.

h. Apply MIL-T-23142 barrier tape (vinyl) to windshield frame in area of contact with retainer angles (T.O. 1A-7D-23, Corrosion Protection for Dissimilar Metals).

i. Using retainer angles as template, mark off margin on lower side protective paper with soft lead pencil that will be covered by retainer angles when glass is installed in frame. This margin will be used as reference line for peeling back protective paper for installation of cork tape to lower glass surface.

j. Peel protective paper from marked off margin area, cut 0.032-inch thick MIL-T-6841 cork tape to match entire exposed lower surface of glass panel, and apply tape.

CAUTION

To prevent damage to windshield frame during subsequent windshield glass removals, ensure that parting agent covers entire frame area that will contact formed-in-place seal.

k. Apply parting agent 225 (Ram Chemical Co.) on windshield frame over corrosion prevention sealant coat. MIL-G-81322 grease or VV-P-236 petrolatum may be used as suitable substitute.

NOTE

Sealant shall be applied in a continuous seal without a gap or break. New sealant application is not required if the windshield glass was removed for maintenance access and the formed-in-place seal is not damaged.

l. Using sealant gun, lay bead of MIL-S-8802 sealant (approximately 1/4 inch in diameter) to upper glass surface and over intermittent strips of cork tape. Lay sealant bead no more than 1/4 inch from edge of glass. Refer to T.O. 1-1-3 for sealant gun operation.

m. Using nonmetallic spatula, tongue suppressor, or similar tool, spread sealant completely around windshield glass surfaces (upper and vertical edge) that will mate with windshield frame. Add additional sealant as required.

NOTE

To maintain specified gap tolerances and prevent movement of glass during sealant cure, ensure that cork tape applied in step d is in proper position. Cork tape or sealant shall separate glass from metal frame the entire periphery of the glass.

Wood spatulas of correct thickness may be inserted at several points between glass and frame for additional assurance of proper glass centering. After sufficient sealant cure, remove spatulas and fill voids left by spatulas.

n. Maintaining gap tolerances specified in step c, position glass in windshield frame for installation. Check for sealant squeezeout around entire sealed area.

o. If sealant squeezeout does not appear around entire periphery of windshield, remove windshield glass and apply more sealant in those areas. Reinstall windshield glass according to step n.

p. Fill all voids between windshield frame and edge of glass with sealant.

NOTE

Remove excess sealant from formed-in-place seal before installing retainer angles.

q. Install aft (upper) retainer angle. Do not tighten screws.

r. Install left and right side retainer angles. Do not tighten screws.

s. In sequence given, tighten forward (lower) retainer angle screws, tighten side retainer screws (by crisscross method), and then tighten aft retainer screws.

t. Using new O-ring seals, install defog tubes in windshield retainer clamps, position as noted during removal, and secure.

u. Install lights and indicators on windshield frame.

v. Remove protective cover from cowl deck and install instrument cowl if cowl was removed. Reinstall cover.

w. Remove foreign material from side windshield frame and inspect sealant on glass.

x. Install left side windshield panel (paragraph 19-14).

y. Install right side windshield panel (paragraph 19-14).

z. Apply aerodynamic fairing compound around all glass panels as required (T.O. 1A-7D-3, Aerodynamic Discrepancy Repairs).

CAUTION

To prevent damage to sealant, allow sealant to cure thoroughly before performing cockpit leakage test. Normal cure for MIL-S-8802 sealant requires 72 hours at room temperature (70°F). Heat, not to exceed 120°F, may be used to accelerate sealant cure time to approximately 40 hours. Heat exceeding 120°F may damage windshield glass panel.

NOTE

Actual sealant cure time for varying conditions may be determined by placing a small ball of sealant on a piece of scrap metal near windshield edge at time of cure.

aa. Allow sealant to cure completely. If accelerated cure method is used, do not exceed 120°F temperature.

ab. Perform cockpit leakage test (paragraph 19-9) except as follows:

1. Cockpit leakage test may be omitted if same windshield glass panel removed from airplane is reinstalled and new application of sealant, other than aerodynamic fairing, is not required.

2. Cockpit leakage test may be omitted if airplane is scheduled for functional test flight and cockpit pressurization check is scheduled as part of test flight.

ac. Remove protective covering from cowl decking and vacuum cockpit area.

ad. Remove interior and exterior glass protective paper covering and clean interior surface of glass. Clean and polish surface as required (paragraph 19-13).

ae. Check windshield for proper installation (T.O. 1A-7D-3, Aerodynamic Discrepancy Repairs). Ensure windshield center glass does not contact metal frame at any point.

af. Install head up display unit (T.O. 1A-7D-2-14).

ag. Close canopy and accesses 1211-4, 1213-14, and 1222-12.

19-13. WINDSHIELD CENTER GLASS CLEANING.

NOTE

Do not clean windshield center glass with a dry cloth. A dry cloth may cause scratches and build-up an electrostatic charge. If an electrostatic charge has been built up (indicated by attracted dust particles), remove dust particles by wiping with a clean damp chamois.

a. Before cleaning windshield center glass, check that canopy is closed and locked.

b. Remove dust and residue from exterior surface with a gentle stream of compressed air.

c. Flush surface with plenty of clean, fresh water; gently dislodge any dirt, salt, mud, or other particles with bare hands.

d. Wash glass gently with a mild solution of water and castile soap using bare hands. A clean dirt-free soft cloth, chamois, or sponge may be used to carry the soapy water to the windshield. Ensure that water is free of dirt or abrasive material.

e. Blot dry with a damp chamois. Do not rub.

f. If exterior surface requires polishing, apply P-P-560 cleaning and polishing compound, and use a clean, damp cotton flannel cloth to polish surface to a high gloss.

g. Open canopy.

CAUTION

Do not use cleaning and polishing compound on inside surface of windshield center glass or damage to the optical surface may occur.

h. Clean interior surface of windshield center glass by wiping surface lightly with a clean grit-free soft cloth or chamois. Keep cloth or chamois free from soil or grit by rinsing frequently in clean water. If haze or film still exists on surface, wash gently with a mild solution of castile soap and water and a clean grit-free cloth or chamois. Be sure water is free of dirt or abrasive material.

i. Blot dry with damp chamois. Do not rub.

j. Check exterior and interior for scratches or crazing.

k. Remove cleaning equipment.

l. Close canopy.

19-14. SIDE WINDSHIELD PANEL REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MIL-C-9834	Vacuum cleaner	Clean cockpit area
	850-2 1/2 (Semco Sales and Service)	Sealant gun	Apply sealant to side windshield panel.

19-15. REMOVAL.

a. Open accesses 1211-4, 1213-14, 1222-12, and canopy.

b. Cover cowl to prevent entry of foreign objects into cockpit.

c. For left side windshield panel removal, remove left rain repellent nozzle (T.O. 1A-7D-2-3).

d. Remove attaching screws and install a protective cover to inner and outer surfaces of glass panel.

NOTE

Do not damage formed-in-place seal if windshield glass panel is being removed for access and the same glass will be installed.

Retain entrance handle for reinstallation.

e. Loosen sealant as required and remove windshield in outboard direction.

f. Clean sealant material from windshield area.

g. Vacuum clean windshield area to remove old sealant, dirt, and chips.

19-16. INSTALLATION.

NOTE

If windshield panel to be installed was removed to facilitate other maintenance, inspect formed-in-place seal and cork tape previously applied to glass side panel. Repair minor damage or voids to formed-in-place seal with MIL-S-8802 sealant. If cork tape and formed-in-place seal require replacement or if new glass panel is to be installed, perform all steps. If replacement of cork tape and formed-in-place seal are not required, omit steps a through f.

a. Peel back protective covering and check panel for cracks, scratches, chips, or other related damage. Reapply covering.

b. Align glass panel with windshield frame and check for proper alignment and fit. Remove and trim as required.

c. Cut strips of 0.032-inch thick, MIL-T-6841 cork tape (NSN 9390-00-599-7823) 1 1/2-inches wide to match entire glass panel-to-frame mating surface. Mark panel hole pattern on tape and punch 3/16-inch holes in tape.

NOTE

For preparation and handling of MIL-S-8802 sealant, refer to T.O. 1A-7D-23, Airframe Sealing (Nonfuel Areas).

d. Apply very thin coating of MIL-S-8802 (thinned 10% by weight with methyl ethyl ketone) on glass panel to match glass panel-to-frame mating surface. Keep holes as clean as possible.

e. Remove backing from tape and install tape over thin sealant coating. Ensure that holes are properly aligned.

f. Apply 1/16-inch thick coating of MIL-S-8802 sealant over cork tape.

NOTE

Install metal retainer assembly (8427034 and 8427035) wet with MIL-S-81733 sealant or equivalent, using existing windscreen attaching screws.

Use of metal retainer assembly (8427034 and 8427035) is an optional procedure. Steps g. and i. use of retainers is up to the discretion of the using activity.

g. (Optional) Install metal retainer assembly (8427034 and 8427035) wet with MIL-S-81733 sealant or equivalent, using existing windscreen attaching screws.

h. Apply parting agent 225 (Ram Chemical Co.) to windshield frame. MIL-G-81322 grease or VV-P-236 petrolatum may be used as suitable substitute.

i. Carefully align glass panel with windshield frame. (Optional) Install windscreen retainer and attaching screws (coated with sealant) in bottom side first, and then forward and aft sides. Check top holes for alignment and ensure that screws can be inserted in top holes with a finger fit. If holes are offset enough to cause screws to be inserted at an angle, replace glass panel. If holes align, install top screws. Install entrance handle on bottom row at screw position No. 8 through No. 14 counting right to left, using sealant (MIL-S-81733) between handle and windshield assembly.

j. Tighten attaching screws evenly around periphery of glass panel, using care to avoid any concentrated stresses to panel. Final torque valve for these screws shall be 22-28 inch pounds.

k. If removed, install left rain repellent nozzle (T.O. 1A-7D-2-3).

CAUTION

To prevent damage to sealant, allow sealant to cure thoroughly before performing cockpit leakage test. Normal cure for MIL-S-8802 sealant requires 72 hours at room temperature (70°F). Heat, not to exceed 120°F, may be used to accelerate sealant cure time to approximately 40 hours. Heat exceeding 120°F may damage windshield acrylic side panel.

NOTE

Actual sealant cure time for varying conditions may be determined by placing a small ball of sealant on a piece of scrap metal near windshield edge at time of cure.

l. Allow sealant to cure completely.

m. Perform cockpit leakage test (paragraph 19-9) except as follows:

1. Cockpit leakage test may be omitted if the same windshield glass panel removed from airplane is reinstalled and a new application of sealant, other than aerodynamic fairing, is not required.

2. Cockpit leakage test may be omitted if airplane is scheduled for a functional test flight and the cockpit pressurization check is scheduled as part of test flight.

n. Apply aerodynamic fairing compound to fill gaps between glass panel and frame as required (T.O. 1A-7D-3, Aerodynamic Discrepancy Repair).

o. Remove covering from cowl decking and vacuum clean cowl area and cockpit.

p. If required, touch up paint on windshield frame and adjacent skin panels (T.O. 1A-7D-3).

q. Remove protective covering from side windshield panels.

r. Clean and polish windshield panels (paragraph 19-17).

s. Close canopy and accesses 1211-4, 1213-14, and 1222-12.

19-17. SIDE WINDSHIELD AND CANOPY CLEANING.

CAUTION

Never clean windshield or canopy using dry cloth as this may cause scratches and build up an electrostatic charge. If an electrostatic charge has been built up (indicated by attracted dust particles), remove dust by wiping clean with a clean damp chamois.

a. Close and lock canopy.

NOTE

Remove rings and hard objects from hands before cleaning canopy and side windshield.

b. Flush canopy and side windshield panels with fresh clean water; using bare hand, gently dislodge any sand, grit, or abrasive materials.

c. Wash surfaces with mild detergent and water solution. A clean chamois, soft cloth, or sponge may be used in washing, but only as a means of carrying the detergent solution. Use bare hand to wash surface and to dislodge any abrasive materials.

d. Rinse with fresh clean water.

e. Blot dry with clean, damp chamois, or soft cloth. Do not rub.

CAUTION

The use of any strong, harsh materials is extremely harmful to acrylic plastics. Use only approved cleaners, solvents, and materials for cleaning or maintenance.

f. Clean with P-P-560 cleaning and polishing compound, using only soft clean cloth.

g. Cleaning of interior plastic surfaces [illegible] accomplished as follows:

1. Dust surface with a soft clean cloth or chamois, saturated with clean fresh water.

2. Wipe carefully with a soft, damp cloth or chamois. Keep free from grit by rinsing frequently in clean fresh water.

3. Clean with P-P-560 cleaning and polishing compound.

19-18. COCKPIT UPPER AND MIDDLE STEP MAINTENANCE.

19-19. REMOVAL. (See figure 19-4.)

a. Open upper step access 1211-4 or middle step access 1222-12.

b. Disconnect linkage (5) at step (10) by removing screw (1), washers (2 and 4), and bushing (3).

c. Remove bolts (6), washers (7), springs (8), and bushings (9) to release step (10) from airplane.

19-20. INSTALLATION. (See figure 19-4.)

a. Install bushings (9), washers (7), springs (8), and bolts (6) to connect step (10) to airplane.

b. Connect linkage (5) to step (10) using bushings (3), washers (4 and 2), and screws (1).

c. Lubricate step pivot points with MIL-L-7870 oil.

d. Check step for freedom of operation and close upper step access 1211-4 or middle step access 1222-12.

19-21. LATCH REPLACEMENT.

a. Open upper step access 1211-4 or middle step access 1222-12.

b. Remove attaching rivets and remove latch from the step.

c. Position latch on step and install attaching rivets.

d. Operate latch several times to ensure positive locking and freedom of operation.

e. Lubricate latch with MIL-L-7870 oil.

f. Close upper step access 1211-4 or middle step access 1222-12.

19-22. COCKPIT LOWER STEP MAINTENANCE.

19-23. REMOVAL. (See figure 19-5.)

b. Remove six screws (1), six washers (2), and six nuts (3) securing pushbutton latch assembly (4) to airframe.

c. Remove blind rivets (5), in accordance with T.O. 1A-7D-3, from skin (6) and remove skin to gain access to step upper attachment.

d. Remove step upper attachment as follows:

1. On airplanes through AF68-8225, remove nut (7), washers (8), and bolt (9) securing step upper attachment to airframe.

2. On airplanes AF68-8226 and subsequent, remove two bolts (10), two washers (11), and two spacers (12) securing step upper attachment to airframe.

e. Remove four bolts (13) and four washers (14) securing outer tube lower support bracket to airframe and remove step assembly, splice plate, and shims from step access.

19-24. INSTALLATION. (See figure 19-5.)

a. Install step assembly, splice plate, and shims in step access.

b. Install four washers (14) and four bolts (13) securing outer tube lower support bracket to airframe.

c. Install step upper attachment as follows:

1. On airplanes through AF68-8225, install bolt (9), washer (8), and nut (7) securing upper attachment to airframe.

2. On airplanes AF68-8226 and subsequent, install two bolts (10), two washers (11), and two spacers (12) securing upper attachment to airframe.

d. Install rivets (5) securing skin (6) to airframe.

e. Install six screws (1), six washers (2), and six nuts (3) securing pushbutton latch assembly (4) to airframe.

f. Extend and retract steps to check for freedom of operation.

g. Retract step and close access 1213-14.

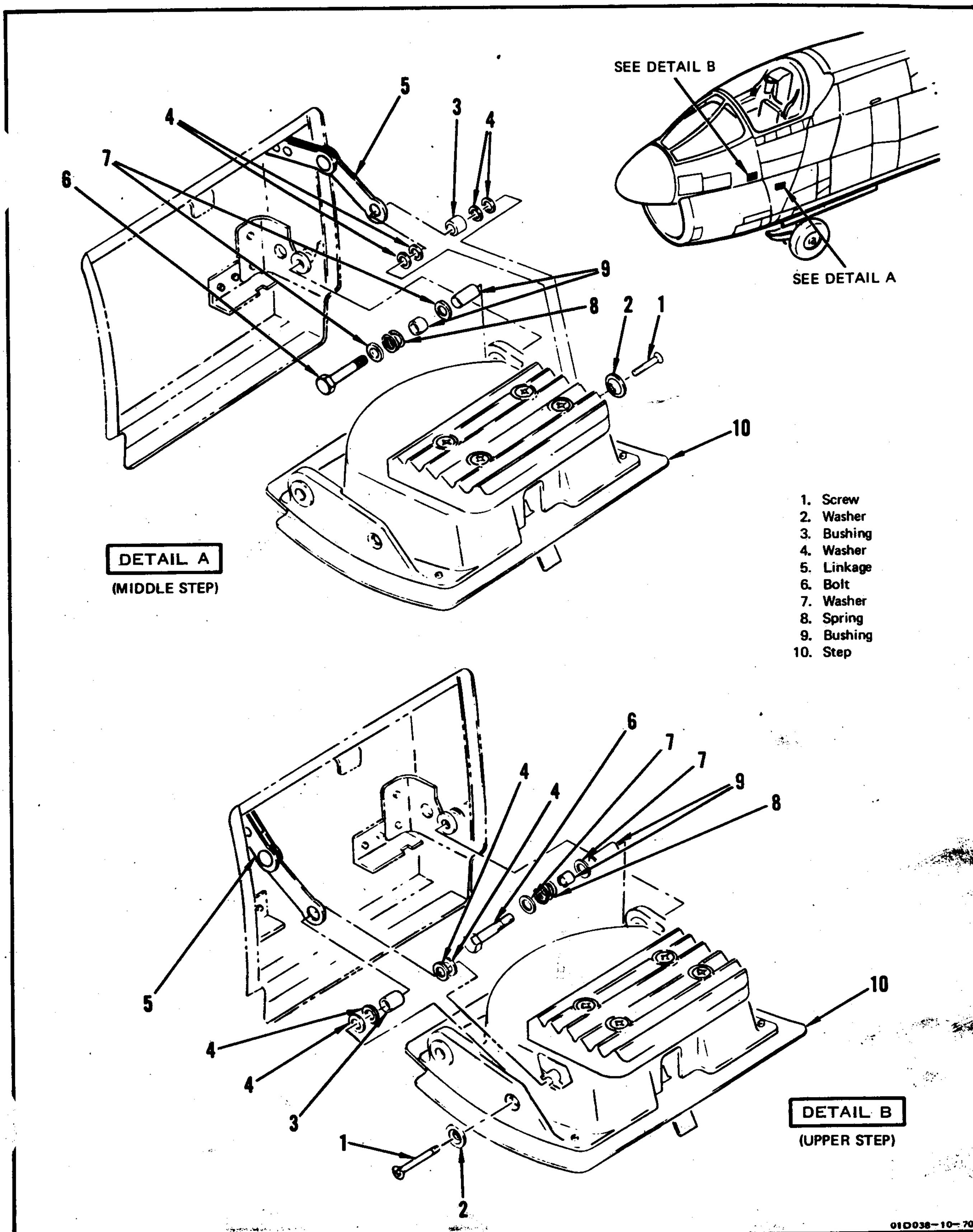


Figure 19-4. Cockpit Upper and Middle Step Removal and Installation

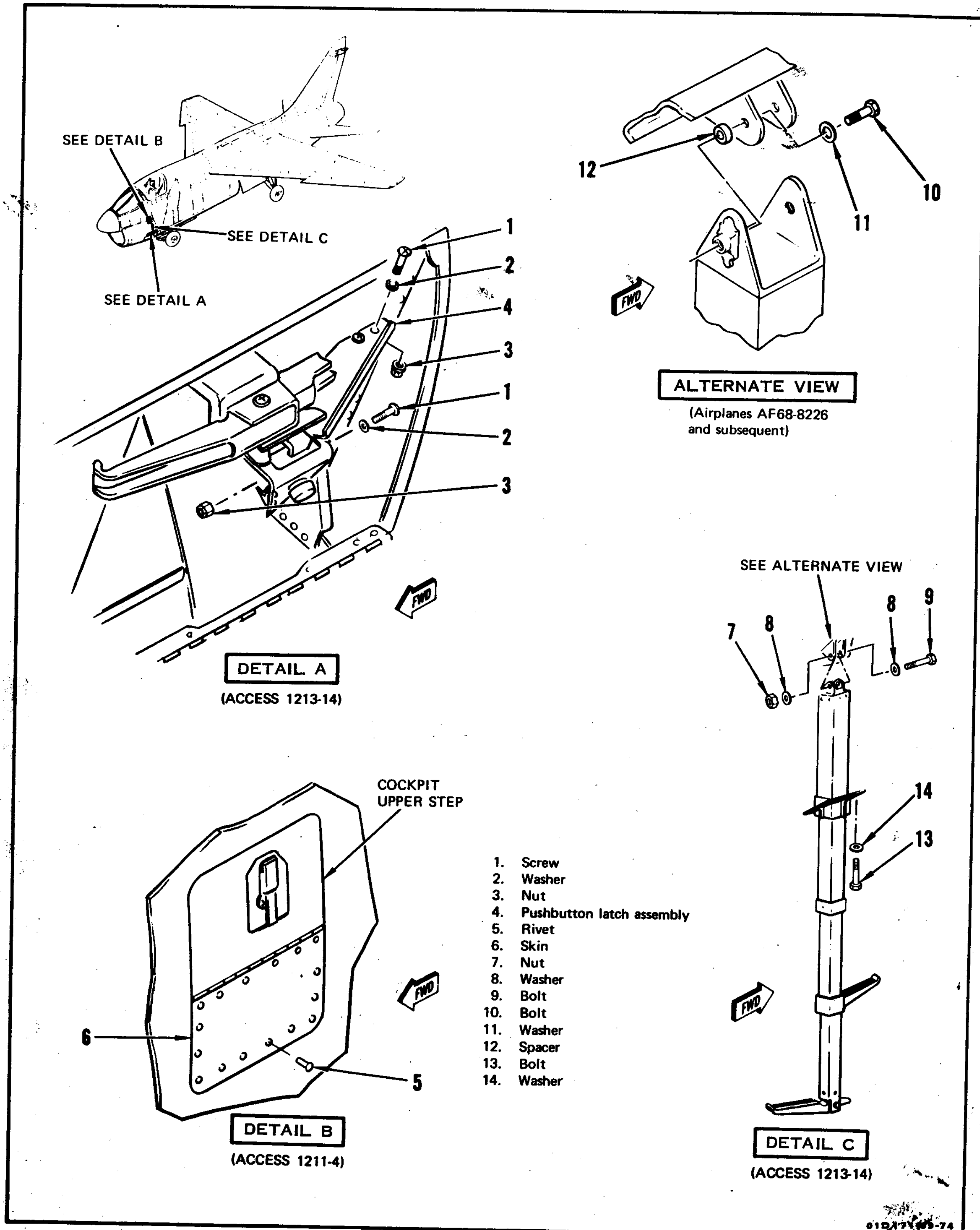


Figure 19-5. Cockpit Lower Step Removal and Installation

19-25. COCKPIT FLOOR ARMOR PLATE REMOVAL AND INSTALLATION (Airplanes Through AF69-6196).

19-26. REMOVAL. (See figure 19-6.)

CAUTION

Exercise care to prevent damage to adjacent power brake and rudder actuating control rods when performing tasks that require removal/installation of cockpit floor armor plating.

a. Remove left or right armor plate from cockpit floor as follows:

1. Open access 1211-2 or 2211-2.

2. Remove bolts (2 and 3) attaching armor plate (1 or 6), and remove plate from cockpit floor (12).

b. Remove armor plate from center of cockpit floor as follows:

WARNING

Ensure that electrical power is not connected to the airplane and that battery switch is in OFF before disconnecting electrical connector to prevent injury to personnel or damage to equipment.

1. Disconnect electrical conduit (10) by disconnecting connector (9).

2. Remove bracket (11) by removing locknut (8) and bolts (4).

3. Remove bolts (7), and remove armor plate (5) from floor (12).

19-27. INSTALLATION. (See figure 19-6.)

CAUTION

Exercise care to prevent damage to adjacent power brake and rudder actuating control rods when performing tasks that require removal/installation of cockpit floor armor plating.

a. Install left or right armor plate on cockpit floor (12) as follows:

1. Position armor plate (1 or 6) for installation, and install bolts (2 and 3).

2. Close access 1211-2 or 2211-2.

b. Install center armor plate on cockpit floor as follows:

1. Position armor plate for installation and install bolts (7).

2. Install bracket (11) by installing bolts (4) and locknut (8).

3. Install connector (9).

19-28. COCKPIT FLOOR ARMOR PLATE REMOVAL AND INSTALLATION (Airplanes After AF69-6197 and Subsequent).

19-29. REMOVAL. (See figure 19-7.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

Exercise care to prevent damage to adjacent power brake and rudder actuating control rods when performing tasks that require removal/installation of cockpit floor armor plating.

a. Remove left armor plate (1) or right armor plate (2) from cockpit floor as follows:

1. Remove cockpit floor located below rudder pedals.

2. Remove six bolts (3) and washers (4) securing armor plate to cockpit floor.

3. Position rudder pedals for maximum clearance and lift armor plate from airplane.

b. Remove center armor plate (5) from cockpit floor as follows:

1. Remove four bolts (6) and washers (7) securing armor plate to airframe.

2. Remove four bolts (8) securing relief horn support bracket (9) to armor plate and remove bonding jumper (17).

3. Lift support bracket (9) sufficiently to clear armor plate and remove armor from airplane.

c. Remove ejection seat forward armor plate (10) from cockpit floor as follows:

1. Remove ejection seat (T.O. 1A-7D-2-2).

2. Remove eight bolts (11) and washers (12) securing armor plate to mount brackets.

3. Lift armor plate from airplane.

d. Remove ejection seat aft armor plate (13) from cockpit floor as follows:

1. Remove ejection seat (T.O. 1A-7D-2-2).

2. Remove eight bolts (14) and washers (15) securing armor plate to mount brackets.

3. Lift armor plate from airplane.

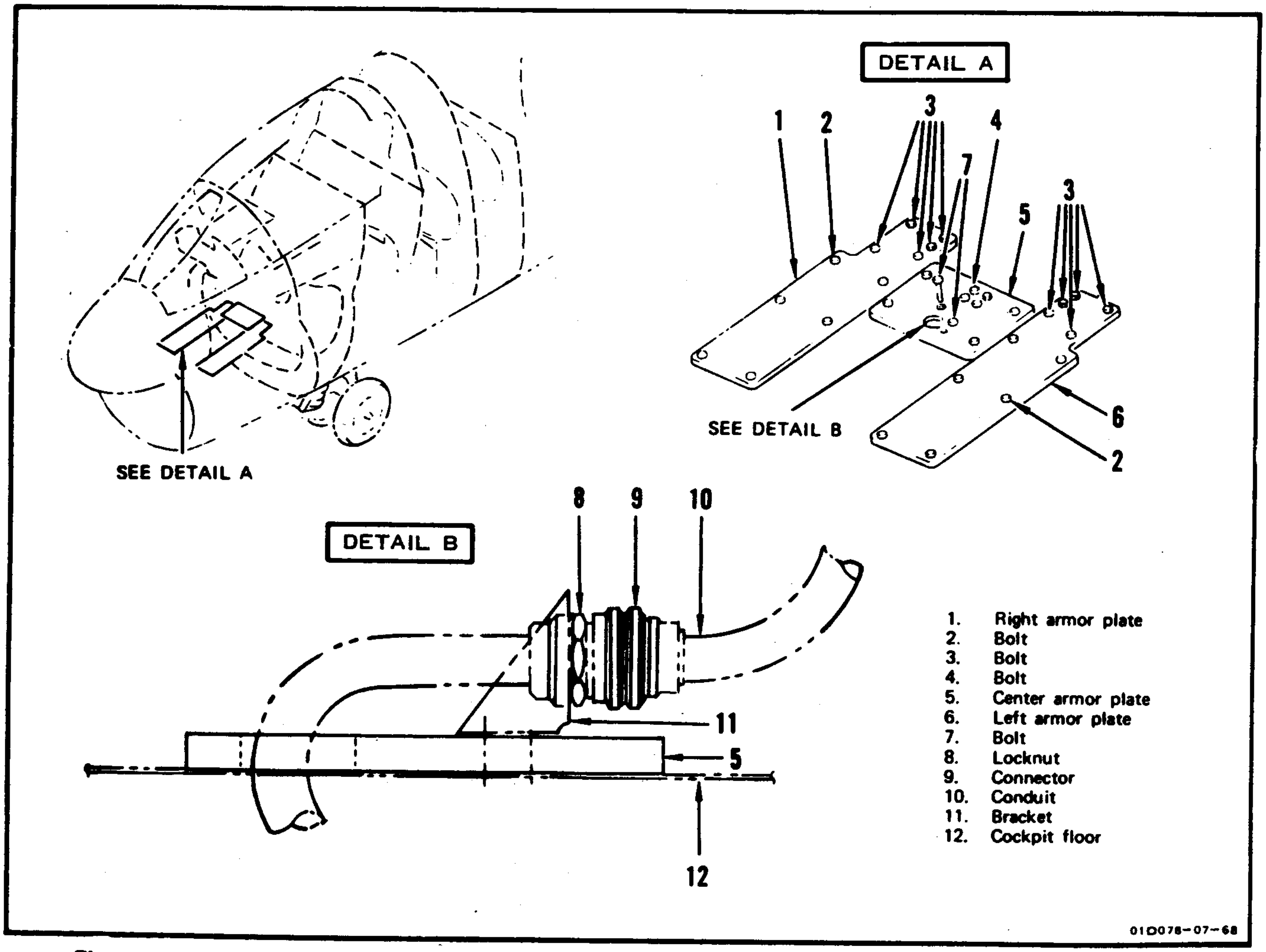
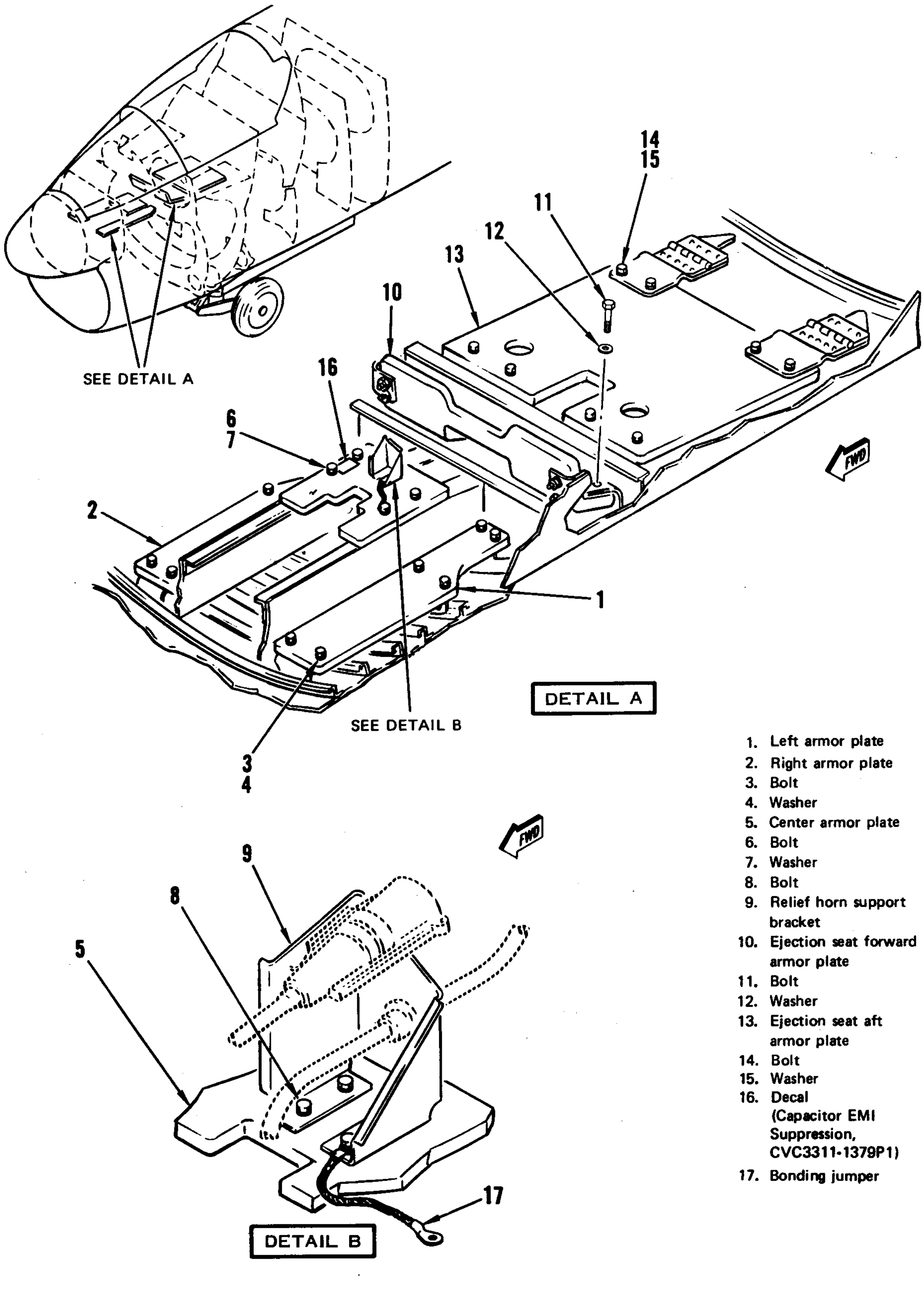


Figure 19-6. Cockpit Floor Armor Plate Removal and Installation (Airplanes Through AF69-6196)



1. Left armor plate
2. Right armor plate
3. Bolt
4. Washer
5. Center armor plate
6. Bolt
7. Washer
8. Bolt
9. Relief horn support bracket
10. Ejection seat forward armor plate
11. Bolt
12. Washer
13. Ejection seat aft armor plate
14. Bolt
15. Washer
16. Decal (Capacitor EMI Suppression, CVC3311-1379P1)
17. Bonding jumper

Figure 19-7. Cockpit Floor Armor Plate Removal and Installation (Airplanes AF69-6197 and Subsequent)

19-30. INSTALLATION. (See figure 19-7.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

Exercise care to prevent damage to adjacent power brake and rudder actuating control rods when performing tasks that require removal/installation of cockpit floor armor plating.

a. Install left armor plate (1) or right armor plate (2) as follows:

1. Position armor plate on cockpit floor for installation. Move rudder pedals as necessary to provide access.

2. Install six bolts (3) and washers (4) securing armor plate to cockpit floor.

3. Install cockpit floor below rudder pedals.

b. Install center armor plate (5) as follows:

1. Position center armor plate on cockpit floor for installation. Lift pilot's relief horn support bracket (9) to provide access.

2. Install bonding jumper (17), four bolts (6), and washer (7) securing armor plate to cockpit floor.

3. Position relief horn support bracket and install four bolts (8) securing bracket to armor plate.

4. Install decal (16).

c. Install ejection seat forward armor plate (10) on cockpit floor as follows:

1. Position armor plate on mount brackets for installation.

NOTE

Do not tighten bolts installed in mount brackets with slotted holes until all other mounting bolts have been tightened.

2. Install eight bolts (11) and washers (12) securing armor plate to mounting brackets.

3. Install ejection seat if installation of aft armor plate (13) is not required (T.O. 1A-7D-2-2).

d. Install ejection seat aft armor plate (13) on cockpit floor as follows:

1. Position armor plate on mount brackets for installation.

2. Install eight bolts (14) and washers (15) securing armor plate to mount brackets.

3. Install ejection seat (T.O. 1A-7D-2-2).

19-31. FORWARD LOOKING RADAR COMPARTMENT BULKHEAD ARMOR PLATE REMOVAL AND INSTALLATION. (Airplanes AF69-6197 and Subsequent.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MIL-H-4034	Torque wrench, 10 to 150 pound-inches	Measure torque of forward looking radar shock mount latches.
	GGG-W-686	Support strut assembly	Hold radar forward assembly in maintenance position.

19-32. REMOVAL. (See figure 19-8.)

WARNING

To prevent injury to personnel, ensure that electrical power is not connected to the airplane and that battery switch is in OFF during removal and installation of forward looking radar compartment bulkhead armor plate.

a. Open access F10211-1 and install radome stay-rod assembly to support access in open position.

b. Tighten two latches on right side of radar mount to 80 (± 5) pound-inches torque to eliminate shock mount action.

c. Remove two pins from left side of mount.

d. Swing out radar forward assembly and secure with support strut assembly.

e. Remove eight bolts (1) and washers (2) securing upper armor plate (3), electrical, and hydraulic clamps to bulkhead and remove armor plate from airplane.

f. Remove six bolts (4) and washers (5) from lower armor plate (6) and remove armor plate from airplane.

g. If armor plate is not to be installed, perform the following:

1. Secure electrical and hydraulic clamps to bulkhead.

2. Remove support strut assembly and swing radar forward assembly into compartment.

3. Insert two pins on left side of mount.

4. Loosen two latches on right side of mount to free shock mount.

5. Store radome stay-rod and close access F10211-1.

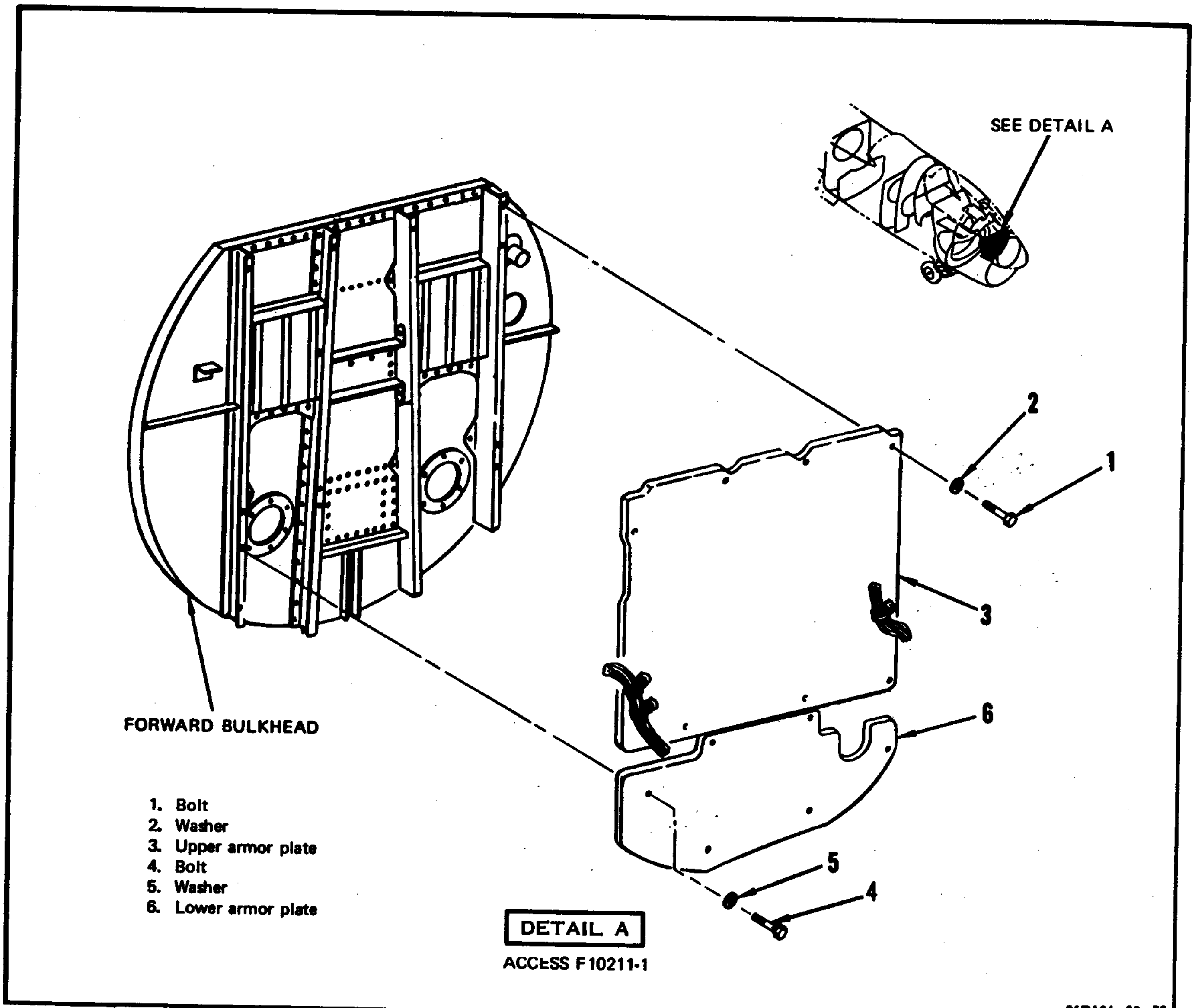


Figure 19-8. Forward Looking Radar Compartment Bulkhead Armor Plate Removal and Installation (Airplanes AF69-6197 and Subsequent)

19-33. INSTALLATION. (See figure 19-8.)

a. Open access F10211-1 and install radome stay-rod assembly to support access in open position.

b. Tighten two latches on right side of radar mount to 80 (± 5) pound-inches torque to eliminate shock mount action.

c. Remove two pins from left side of mount.

d. Swing out radar forward assembly and secure with support strut assembly.

e. Remove electrical and hydraulic clamps and move to one side.

f. Position lower armor plate (6) on bulkhead and secure with six bolts (4) and washers (5).

g. Position upper armor plate (3) and electrical and hydraulic clamps on bulkhead and secure with eight bolts (1) and washers (2).

h. Remove support strut assembly and swing radar forward assembly into compartment.

i. Insert two pins on left side of mount.

j. Loosen two latches on right side of mount to free shock mount.

k. Stow radome stay-rod and close access F10211-1.

19-34. COCKPIT UPPER LEFT SIDE ARMOR PLATE (FS 221 TO 240) REMOVAL AND INSTALLATION.

19-35. REMOVAL. (See figure 19-9.)

a. Remove ejection seat (T.O. 1A-7D-2-2).

b. Remove main instrument panel (paragraph 19-65).

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

c. Remove four bolts (1) and washers (2) securing land checklist (3) and mount bracket (4) to airframe and armor plate (5) to mount bracket. Remove checklist and mount bracket from airplane.

d. Remove six bolts (6) and washers (7) securing mount bracket (8) to armor plate and airframe. Remove mount bracket.

e. Remove two bolts (9) securing wiring support bracket (10) and mount bracket (11) to airframe. Removal of wiring support clamp from support bracket not required.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

f. Remove two nuts (12) and washers (13) securing mount bracket (11) to armor plate and remove mount bracket.

g. Remove two nuts (14) securing mount bracket (15) and support bracket (16) to armor plate. Removal of component support clamps from support bracket (16) are not required.

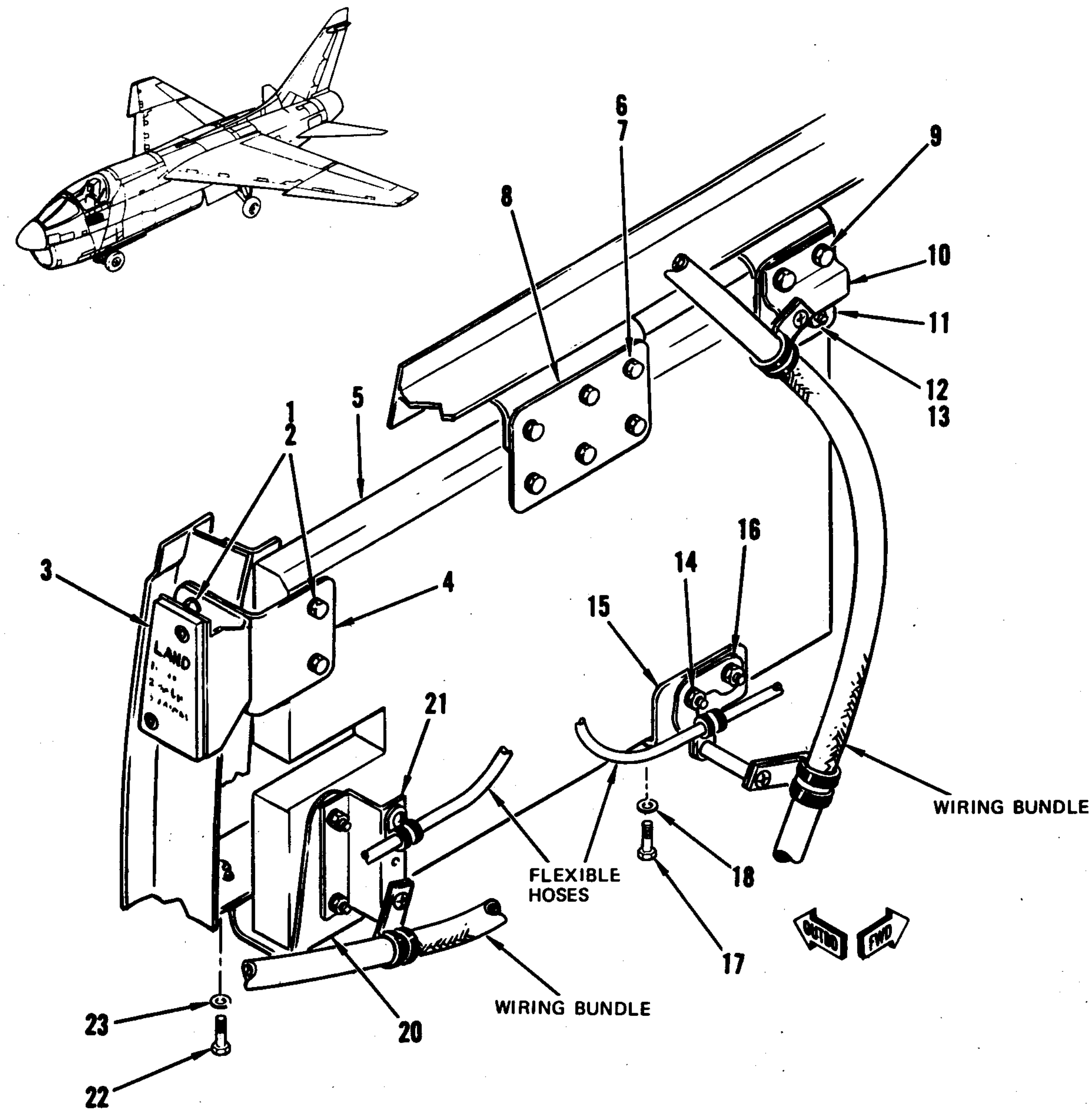
h. Remove two bolts (17) and washers (18) securing mount bracket (15) to airframe and remove mount bracket.

i. Remove two nuts (19) securing mount bracket (20) and support bracket (21) to armor plate. Removal of component support clamps from support bracket (21) are not required.

j. Open access 1211-2.

k. Remove two bolts (22) and washers (23) securing mount bracket (20) to airframe.

l. Remove armor plate from airplane. Mount bracket (20) must remain in installed position during removal.



1. Bolt
2. Washer
3. Land checklist
4. Bracket
5. Armor plate
6. Bolt
7. Washer
8. Bracket
9. Bolt
10. Bracket
11. Bracket
12. Nut
13. Washer
14. Nut
15. Bracket
16. Bracket
17. Bolt
18. Washer
19. Nut
20. Bracket
21. Bracket
22. Bolt
23. Washer

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Figure 19-9. Cockpit Upper Left Side Armor Plate (FS 221 to 240) Removal and Installation

19-36. INSTALLATION. (See figure 19-9.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

a. Position armor plate (5) in airplane for installation. Mount bracket (20) must be attached to armor plate before armor plate is positioned in airplane.

NOTE

Do not tighten any bolts or nuts attaching armor plate to mount brackets until all attaching bolts have been installed.

b. Install two bolts (22) and washers (23) securing mount bracket (20) to airframe.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

c. Position support bracket (21) and install two nuts (19) securing support bracket and mount bracket (20) to armor plate.

d. Position mount bracket (15) and support bracket (16) on armor plate and install two nuts (14).

e. Install two bolts (17) and washers (18) securing mount bracket to airframe.

f. Position mount bracket (11) and support bracket (10) for installation and install two bolts (9), two nuts (12), and washers (13).

g. Position mount bracket (8) for installation and install six bolts (6) and washers (7).

h. Position mount bracket (4) and landing checklist (3) for installation and install four bolts (1) and washers (2).

i. Tighten all attaching bolts and nuts.

j. Install main instrument panel (paragraph 19-65).

k. Close access 1211-2.

l. Install ejection seat (T.O. 1A-7D-2-2).

19-37. COCKPIT UPPER LEFT SIDE ARMOR PLATE (FS 240 TO 250) REMOVAL AND INSTALLATION.

19-38. REMOVAL. (See figure 19-10.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

a. Remove pilot's generator control panel (T.O. 1A-7D-2-11).

b. Remove interior canopy jettison initiator (T.O. 1A-7D-2-2).

c. Remove three bolts (1) and washers (2) securing floodlight (3), two support clamps (4), and armor plate mount bracket (5) to airframe.

d. Remove two bolts (6) and washers (7) securing armor plate (8) to mount bracket and remove bracket.

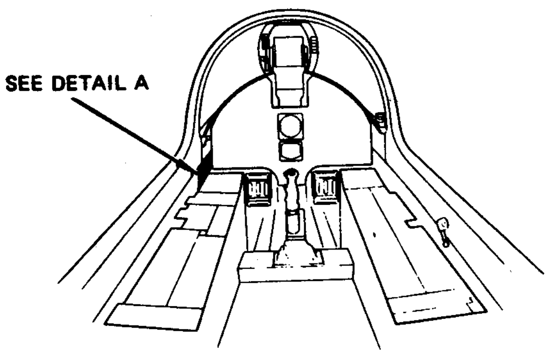
e. Remove two bolts (9) and washers (10) securing armor plate to forward mount bracket (11) and remove armor plate from airplane.

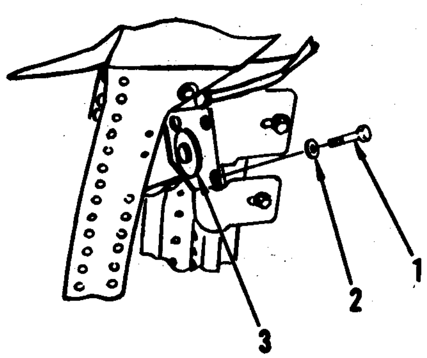
19-39. INSTALLATION. (See figure 19-10.)

CAUTION

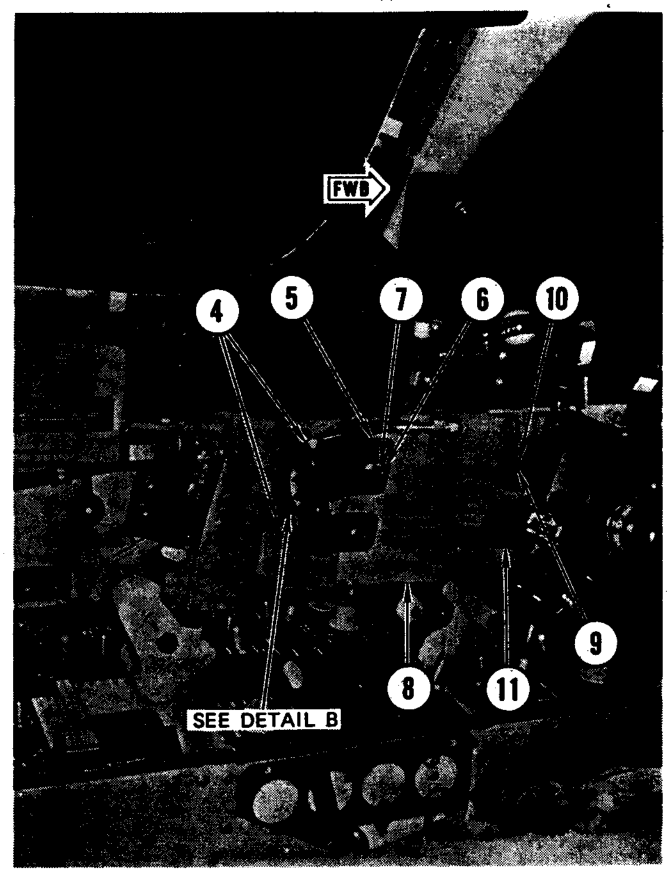
Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

a. Position armor plate (8) in airplane for installation.





DETAIL B



DETAIL A

1. Bolt
2. Washer
3. Light
4. Clamp
5. Bracket
6. Bolt
7. Washer
8. Armor plate
9. Bolt
10. Washer
11. Bracket

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Figure 19-10. Cockpit Upper Left Side Armor Plate (FS 240 to 250) Removal and Installation

b. Install two bolts (9) and washers (10) securing armor plate to forward mount bracket (11).

c. Position aft mount bracket (5) on armor plate and install two bolts (6) and washers (7). Do not tighten bolts.

d. Install three bolts (1) and washers (2) securing floodlight (3), two wiring support clamps (4), and armor plate to airframe. Tighten bolts (6).

e. Install interior canopy jettison initiator (T.O. 1A-7D-2-2).

f. Install pilot's generator control panel (T.O. 1A-7D-2-11).

19-40. COCKPIT LOWER LEFT SIDE ARMOR PLATE (FS 240 TO 247) REMOVAL AND INSTALLATION.

19-41. REMOVAL. (See figure 19-11.)

CAUTION

Mounting screws for console panels incorporate a captive feature. Loosen or tighten screws, in sequence, no more than three turns at a time. More than three turns of screws will result in damage to captive feature and edge-lighted panel.

a. Remove flap and landing gear position indicator panel as follows:

1. Loosen six captive screws attaching indicator panel to left slant panel.

WARNING

Ensure that electrical power is not connected to the airplane and that battery switch is in OFF before disconnecting electrical connectors to prevent injury to personnel or damage to equipment.

2. Lift panel and disconnect electrical connector.

3. Remove panel from airplane.

b. Remove pilot's generator control panel (T.O. 1A-7D-2-11).

c. Remove fuel management panel as follows:

1. Loosen five captive screws securing panel to left console.

2. Lift panel and disconnect electrical connector.

3. Remove panel from airplane.

d. Remove nut (1), screw (2), and spacer (3) securing wiring bundle clamp (4) and two static line anchor clamps (5) to support bracket (6).

e. Cap or plug open line and fittings as applicable.

f. Remove two cockpit pressurization static lines (11) between bulkhead (FS 254.82) and forward support bracket. Cap or plug open lines.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

g. Remove upper bolt (12) and washer (13) securing mount bracket (14) to airframe.

h. Open access 1211-3 and remove lower two bolts (12) and washers (13) securing mount bracket to airframe.

i. Open access 1211-2 and remove three bolts (15) and washers (16) securing mount bracket (17) to airframe.

j. Identify position of mount brackets for proper installation on armor plate (18) during installation.

k. Remove three nuts (19) and washers (20) securing support bracket (8) and mount bracket (17) to armor plate.

l. Remove three nuts (21) and washers (22) securing support bracket (6) and mount bracket (14) to armor plate.

m. Remove armor plate from airplane through generator control panel opening in console.

19-42. INSTALLATION. (See figure 19-11.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

NOTE

Do not tighten bolts installed in mount brackets with slotted holes until all other mount bolts have been installed.

a. Position armor plate in airplane for installation.

b. Position mount bracket (14) and support bracket (6) on armor plate (18) and install three nuts (21) and washers (22).

c. Position mount bracket (17) and support bracket (8) on armor plate and install three nuts (19) and washers (20).

d. Install three bolts (15) and washers (16) securing mount bracket (17) to airframe. Tighten bolts and close access 1211-2.

e. Install three bolts (12) and washers (13) securing mount bracket (14) to airframe.

f. Tighten all attaching bolts and close access 1211-3.

g. Uncap or unplug two cockpit pressurization static lines (11) and fittings, and install lines between bulkhead (FS 254.82) and forward support bracket.

h. Install two anchor clamps (5) and wiring bundle clamp (4), and secure with spacer (3), screw (2), and nut (1).

CAUTION

Mounting screws for console panels incorporate a captive feature. Loosen or tighten screws, in sequence, no more than three turns a time. More than three turns of screws will result in damage to captive feature and edge-lighted panel.

i. Install fuel management panel as follows:

1. Connect electrical connector.

2. Place panel in position for installation.

3. Secure panel to console with five captive screws.

j. Install pilot's generator control panel (T.O. 1A-7D-2-11).

k. Install flap and landing gear position indicator panel as follows:

1. Connect electrical connectors.

2. Place panel in position for installation.

3. Secure indicator panel to left slant panel with six captive screws.

l. Perform operational checkout of leading edge and trailing edge flap indicator systems (T.O. 1A-7D-2-8).

m. Perform AFCS operational checkout (T.O. 1A-7D-2-9).

n. Perform landing gear control and indicator system operational checkout (T.O. 1A-7D-2-7).

o. Perform fuel quantity indicating system operational checkout (T.O. 1A-7D-2-6).

p. Perform antiskid system operational checkout (T.O. 1A-7D-2-7).

q. Perform anti-ice system operational checkout (T.O. 1A-7D-2-5).

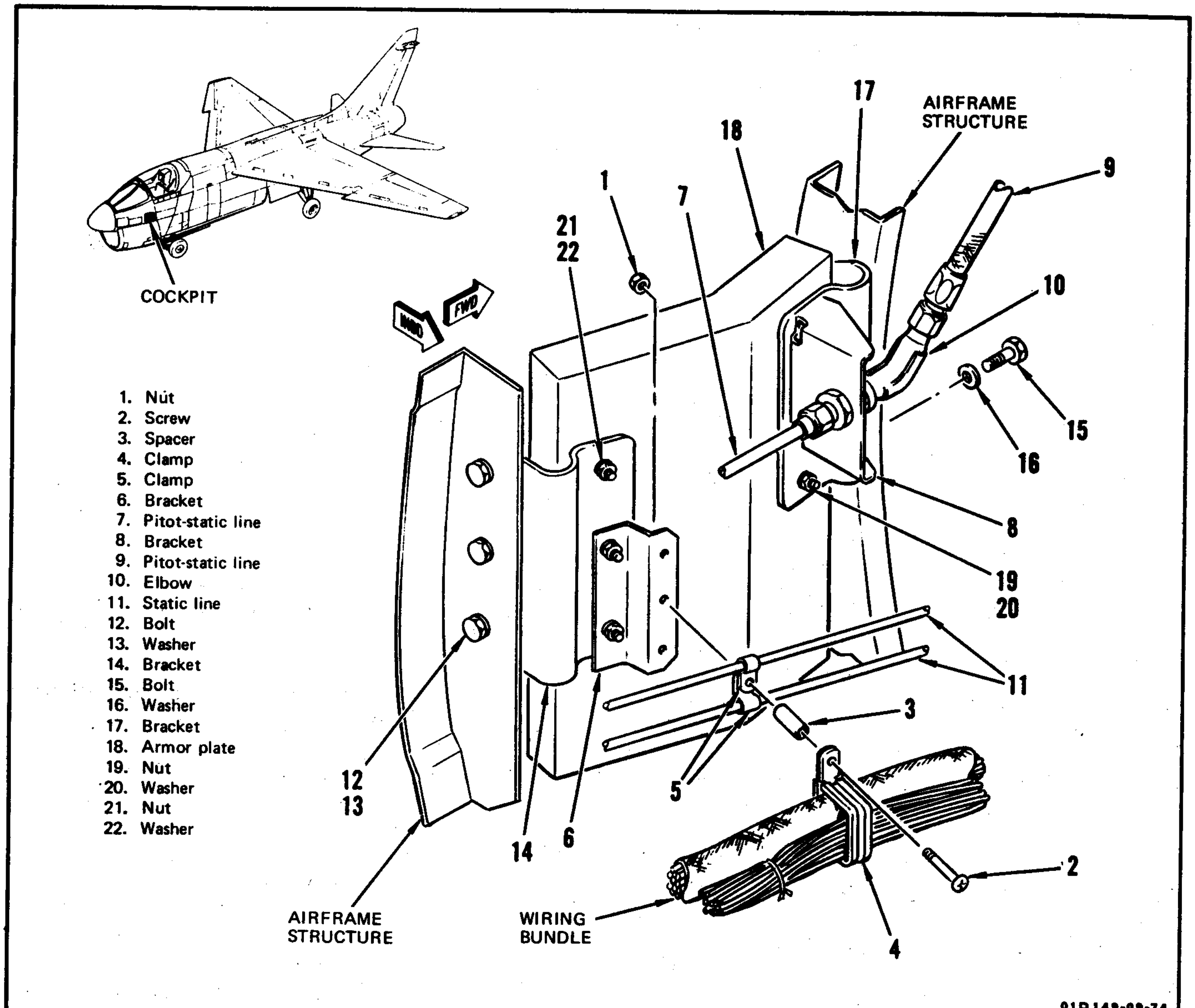


Figure 19-11. Cockpit Lower Left Side Armor Plate (FS 240 to 247) Removal and Installation

19-43. COCKPIT UPPER LEFT SIDE ARMOR PLATE (FS 254 TO 275) REMOVAL AND INSTALLATION.

19-44. REMOVAL. (See figure 19-12.)

a. Remove flap control assembly (T.O. 1A-7D-2-8).

b. Remove four screws (1) securing alternate fuel feed control (2) to airframe.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

c. Remove three bolts (3) securing mount bracket (4), light assembly (5), and two wiring support brackets (6) to airframe.

d. Remove three screws (7) and washers (8) securing armor plate (9) to mount bracket and remove mount bracket.

e. Remove four bolts (10) and washers (11) securing forward mount bracket (12) to armor plate and airframe and remove bracket.

f. Remove five bolts (13) and washers (14) securing aft mount bracket (15) to armor plate and airframe and remove bracket.

g. Remove three bolts (16) and washers (17) securing armor plate to mount bracket (18).

h. Remove four bolts (19) and washers (20) securing mount bracket (21) to armor plate and airframe and remove bracket.

i. Open access 1221-1.

j. Remove three bolts (16) and washers (17) securing mount bracket (18) to airframe and remove bracket.

k. Remove armor plate from airplane.

19-45. INSTALLATION. (See figure 19-12.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

a. Position armor plate (9) in airplane for installation.

NOTE

Do not tighten any bolts attaching armor plate to mount brackets until all attaching bolts have been installed.

b. Position mount bracket (21) for installation and install four bolts (19) and washers (20).

c. Position mount bracket (18) for installation and install six bolts (16) and washers (17). Tighten bolts securing mount bracket to airframe and close access 1221-1.

d. Position mount bracket (15) and install five bolts (13) and washers (14).

e. Position mount bracket (12) and install four bolts (10) and washers (11).

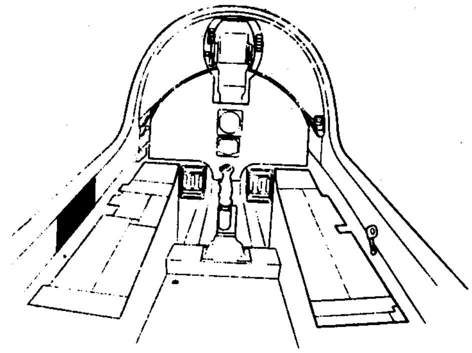
f. Position mount bracket (4) and install screws (7) and washers (8) securing mount bracket to armor plate.

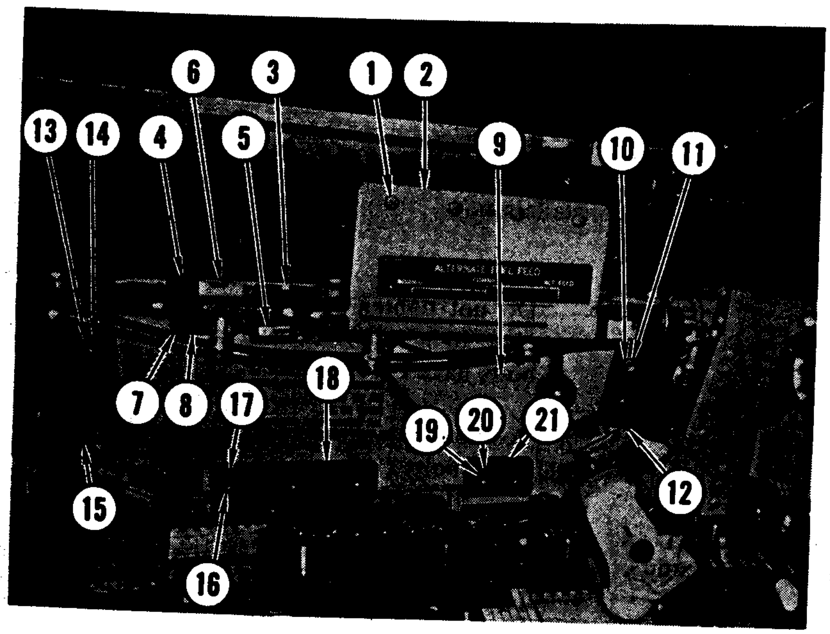
g. Install three bolts (3) securing mount bracket (4), light assembly (5), and two wiring support brackets (6) to airframe.

h. Tighten all attaching bolts not tightened during installation.

i. Install four screws (1) securing alternate fuel feed control (2) to airframe.

j. Install flap control assembly (T.O. 1A-7D-2-8).





1. Screw	11. Washer
2. Fuel feed control	12. Bracket
3. Bolt	13. Bolt
4. Bracket	14. Washer
5. Light	15. Bracket
6. Bracket	16. Bolt
7. Screw	17. Washer
8. Washer	18. Bracket
9. Armor plate	19. Bolt
10. Bolt	20. Washer
	21. Bracket

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Figure 19-12. Cockpit Upper Left Side Armor Plate (FS 254 to 275) Removal and Installation

19-46. COCKPIT UPPER RIGHT SIDE ARMOR PLATE (FS 221 TO 240) REMOVAL AND INSTALLATION.

19-47. REMOVAL. (See figure 19-13.)

a. Remove ejection seat (T.O. 1A-7D-2-2).

b. Remove main instrument panel (paragraph 19-65).

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

c. Remove two bolts (1) and washers (2) securing mount bracket (3) to armor plate (4).

d. Remove four bolts (5) and washers (6) securing two upper mount brackets (7) to airframe.

e. Open access 2211-2.

f. Remove four bolts (8) and washers (9) securing two lower mount brackets (10) to airframe.

g. Remove defog tube (11) if required for armor plate clearance during removal.

h. Remove armor plate from airplane.

i. Identify position of each mount bracket, remove mount brackets, and install in same position on new armor plate.

19-48. INSTALLATION. (See figure 19-13.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

NOTE

Do not tighten bolts installed in mount brackets with slotted holes until all other mount bolts have been installed.

a. Position armor plate (4) in airplane.

b. Install four bolts (8) and washers (9) securing two lower mount brackets (10) to airframe.

c. Install defog tube (11) if tube was removed.

d. Close access 2211-2.

e. Install four bolts (5) and washers (6) securing two upper mount brackets (7) to airframe.

f. Install two bolts (1) and washers (2) securing mount bracket (3) to armor plate.

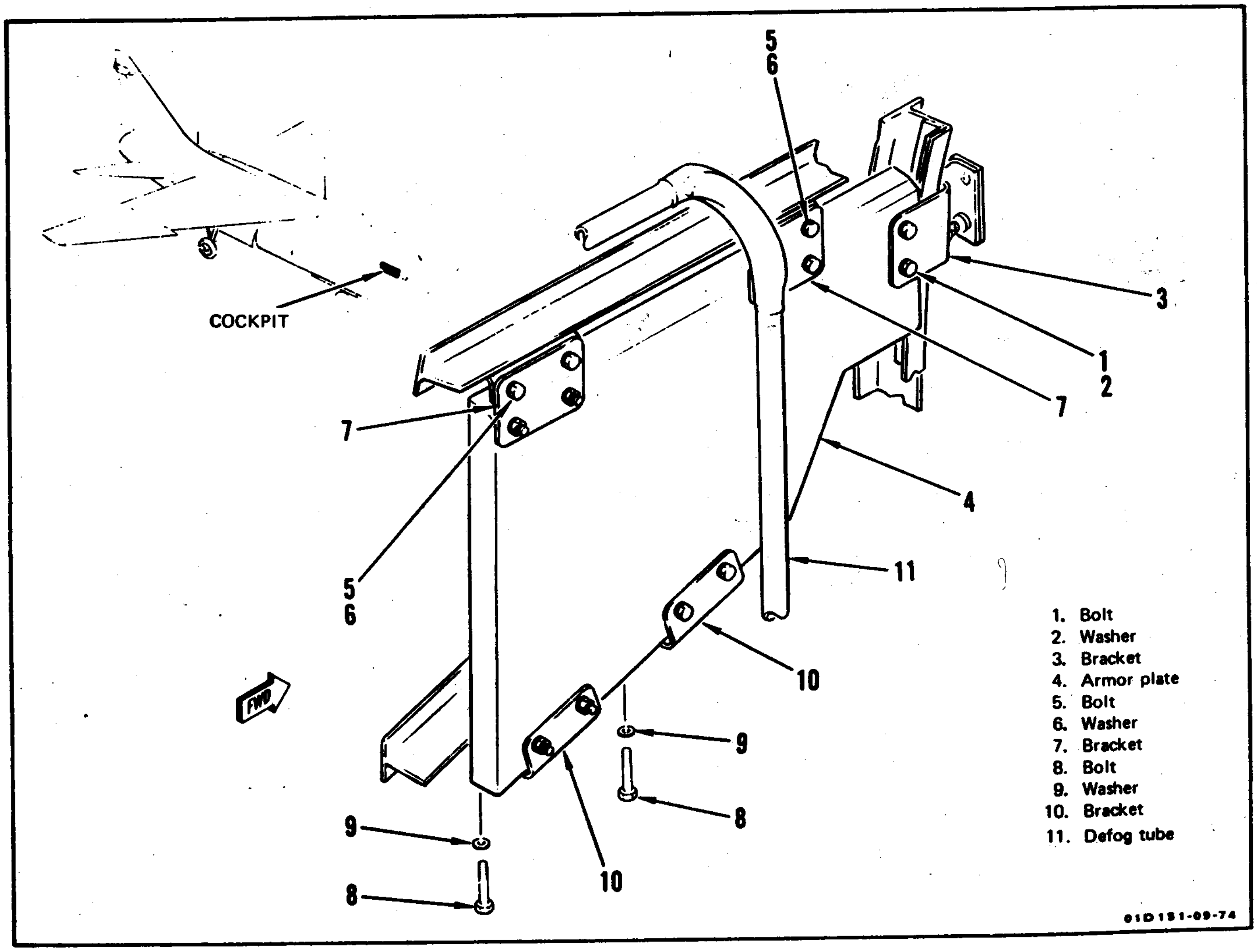


Figure 19-13. Cockpit Upper Right Side Armor Plate (FS 221 to 240) Removal and Installation

g. Tighten all attaching bolts.

h. Install main instrument panel (paragraph 19-65).

i. Install ejection seat (T.O. 1A-7D-2-2).

19-49. COCKPIT UPPER RIGHT SIDE ARMOR PLATE (FS 240 TO 250) REMOVAL AND INSTALLATION.

19-50. REMOVAL. (See figure 19-14.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

a. Remove five bolts (1) and washers (2) securing mount bracket (3) to armor plate (4) and bulkhead.

b. Remove four bolts (5) and washers (6) securing mount bracket (7) to armor plate and airframe, and remove mount bracket.

c. Remove armor plate and aft mount bracket from airplane.

19-51. INSTALLATION. (See figure 19-14.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

NOTE

Do not tighten bolts installed in mount brackets with slotted holes until all other mount bolts have been installed.

a. Position mount bracket (3) and armor plate (4) in airplane, and install bolts (1) and washers (2).

b. Install mount bracket (7) and secure with four bolts (5) and washers (6).

c. Tighten all bolts.

19-52. COCKPIT UPPER RIGHT SIDE ARMOR PLATE (FS 260 TO 285) REMOVAL AND INSTALLATION.

19-53. REMOVAL. (See figure 19-15.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

NOTE

Identify location of each mount bracket before removal to ensure proper installation of armor plate.

a. Remove four bolts (1) and washers (2) securing mount bracket (3) and anchor clamp (4) to armor plate (5) and airframe. Remove mount bracket.

b. Remove four bolts (6) and washers (7) securing mount bracket (8), floodlight (9), and anchor clamp (10) to armor plate and airframe. Remove mount bracket.

c. Remove four screws (11) securing light assembly (12) to mount bracket (13) and stow light assembly.

d. Remove seven screws (14) securing map case (15) to console and remove map case.

e. Remove four screws (16) securing stowage pocket (17) to bulkhead and remove stowage pocket.

f. Remove four bolts (18) and washers (19) securing mount bracket (20) and wiring anchor clamp (21) to armor plate and bulkhead. Remove mount bracket.

g. Remove four bolts (22) and washers (23) securing mount bracket (24) to armor plate and bulkhead. Remove mount bracket.

h. Disconnect map light (25) from mount and stow.

i. Open access 2221-1.

j. Remove six bolts (26) and washers (27) securing mount bracket (28) to armor plate and airframe. Remove mount bracket.

k. Remove armor plate from airplane.

19-54. INSTALLATION. (See figure 19-15.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

a. Position armor plate (5) in airplane for installation.

NOTE

Do not tighten any bolts attaching armor plate to mount brackets until all attaching bolts have been installed.

b. Position mount bracket (28) for installation and install six bolts (26) and washers (27). Tighten three bolts securing mount bracket to airframe.

c. Close access 2221-1.

d. Install map light (25) on mount.

e. Position mount bracket (24) and install four bolts (22) and washers (23).

f. Position mount bracket (20) and wiring anchor clamp (21) for installation and install four bolts (22) and washers (23).

g. Install stowage pocket (17) and secure with four screws (16).

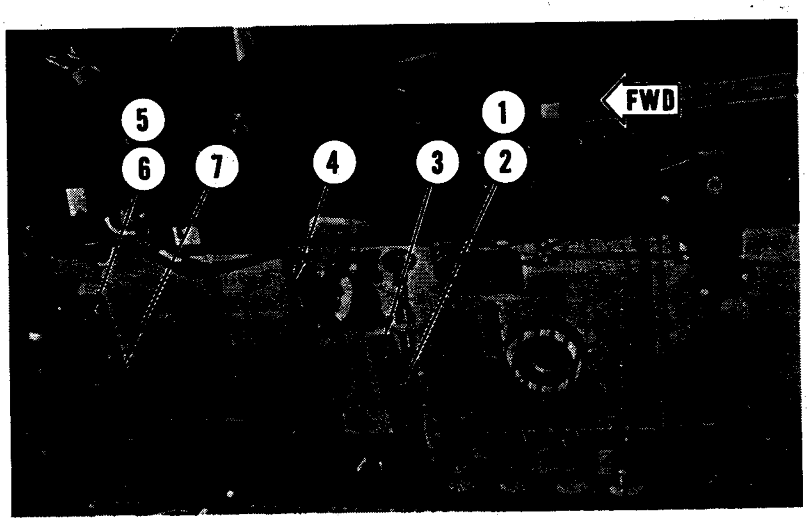
h. Install map case (15) and secure with seven screws (14).

i. Install light assembly (12) on mount bracket (13) and secure with four screws (11).

j. Position mount bracket (8), floodlight (9), and anchor clamp (10), and install four bolts (6) and washers (7).

k. Position mount bracket (3) and anchor clamp (4), and secure with four bolts (1) and washers (2).

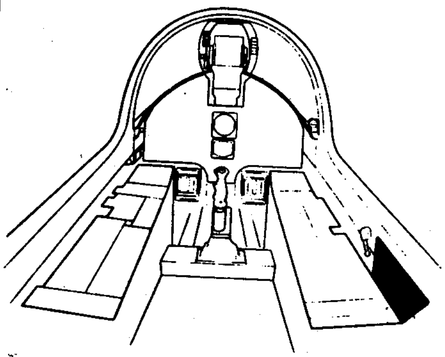
l. Tighten all bolts.

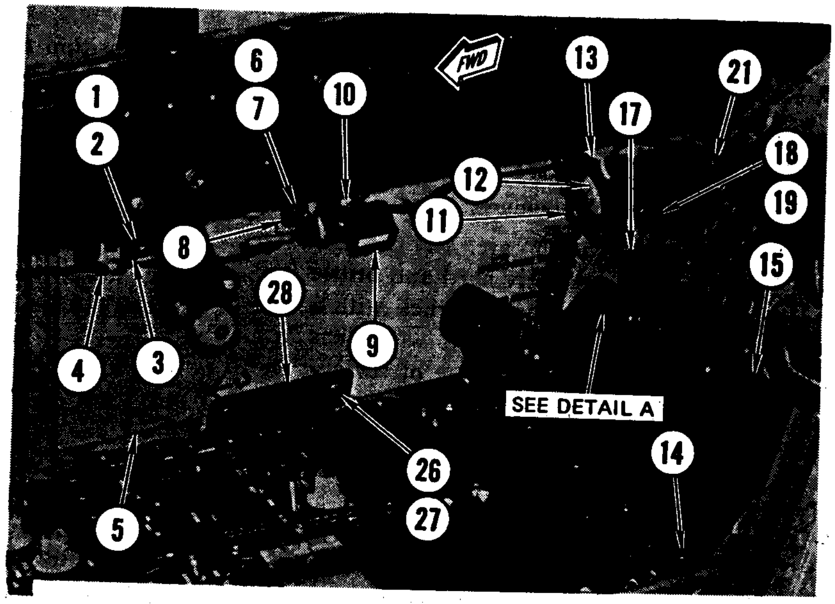


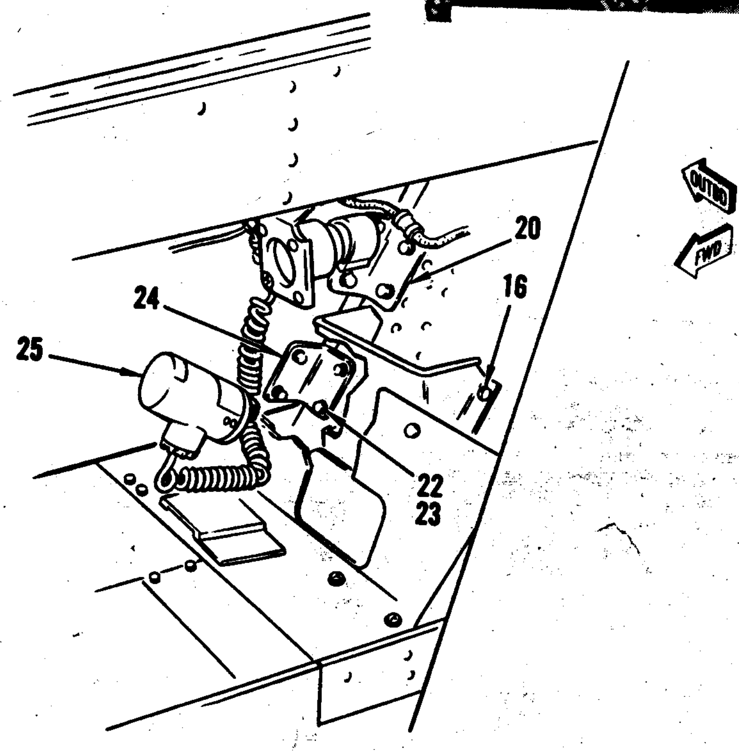
1. Bolt
2. Washer
3. Bracket
4. Armor plate
5. Bolt
6. Washer
7. Bracket

01D152-07-70

Figure 19-14. Cockpit Upper Right Side Armor Plate (FS 240 to 250) Removal and Installation







DETAIL A

1. Bolt
2. Washer
3. Bracket
4. Clamp
5. Armor plate
6. Bolt
7. Washer
8. Bracket
9. Light
10. Clamp
11. Screw
12. Light assembly
13. Bracket
14. Screw
15. Map case
16. Screw
17. Stowage pocket
18. Bolt
19. Washer
20. Bracket
21. Clamp
22. Bolt
23. Washer
24. Bracket
25. Map light
26. Bolt
27. Washer
28. Bracket

01D153-07-70

Figure 19-15. Cockpit Upper Right Side Armor Plate (FS 260 to 285) Removal and Installation

19-55. FUSELAGE FORWARD SECTION ACCESS PANEL MOUNTED ARMOR PLATE REMOVAL AND INSTALLATION.

19-56. REMOVAL.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

a. Remove access panel from airplane.

b. Identify and note position of each armor plate mount bracket and attaching parts for proper installation in same position on new armor plate.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

c. Remove nuts and/or bolts and washers securing mount brackets to armor plate and access panel as required.

CAUTION

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

d. Lift armor plate from access panel. If as a result of mission requirements armor plate is not to be installed, reinstall armor plate mount brackets on access panel.

19-57. INSTALLATION.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

a. Position armor plate on access panel for installation.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

NOTE

Do not tighten bolts or nuts attaching mount brackets to armor plate and access panel until all attaching bolts have been installed.

b. Install armor plate mount brackets and secure with bolts and/or nuts and washers.

c. Install access panel.

19-58. NOSE RADOME REMOVAL AND INSTALLATION.

19-59. REMOVAL. (See figure 19-16)

a. Release fasteners, open nose radome, and secure with stay-rod.

b. Remove hinge springs. Support radome in open position and disconnect stay-rod.

c. Remove nuts, washers, and bolts securing hinge pin halves together.

d. Slide aft hinge pins halves inboard to disengage from radome hinge fittings, and remove radome. Note position of hinge pins for installation.

e. Remove radome hinge pin halves.

f. Remove radome.

g. Check moisture seals at radome mating area on fuselage. Replace defective rubber bulb seal if damaged. Remove formed-in-place sealant seal at upper radome mating area adjacent to hinge if damaged. Do not apply new sealant seal at this time.

19-60. INSTALLATION. (See Figure 19-16.)

a. If a new radome is to be installed, fit radome as follows, otherwise proceed to step b.

1. Place radome in installed position with latch fittings aligned and note areas to be trimmed for proper fit. Latches may be adjusted by moving serrated block forward or aft as necessary to obtain allowable clearances and/or latch security. Maximum allowable clearance between aft ring of radome and airplane skin is 0.03 inch along bottom and sides and 0.09 inch at top in area of hinge.

2. Remove radome and trim as required.

b. Place nose radome on airplane in open position and align holes in radome hinge halves with slots in airframe hinge halves.

c. Install hinge pin halves outboard through slots and holes in hinge support and secure the two halves with bolts, washers, and nuts as noted during removal.

d. Secure radome in open position with stay-rod.

e. Compress hinge springs and install between hinge pin boltheads and hinge fitting boltheads on airframe.

f. If required, add new formed-in-place seal to radome-to-skin gap along top aft edge of radome (hinge area). Refer to T.0. 1A-7D-23 for instructions.

g. Support radome and stow stay-rod.

h. Close and latch radome. Check that condition of moisture seals provide protection against entry of water into radar compartment.

19-61. **(AIRPLANES THROUGH AF69-6196).**

19-62. **REMOVAL.** (See figure 19-17.)

a. Open accesses 1211-2 and 2211-2.

WARNING

Ensure that electrical power is not connected to the airplane and that battery switch is in OFF before disconnecting electrical connectors to prevent injury to personnel or damage to equipment.

b. Disconnect electrical connectors P2021 and P2022 from rear of instrument panel.

c. Disconnect pilot and static lines at left side of panel.

d. Remove attitude director indicator (T.O. 1A-7D-2-12).

e. Remove radar indicator (T.O. 1A-7D-2-14-3).

f. Remove four screws from radar indicator plug P2059 to disconnect plug from radar mount box.

g. Remove fuel quantity indicator (T.O. 1A-7D-2-6).

h. Disconnect fuel tank quantity selector.

i. Remove lamps and brackets from cockpit left and right rail aft of instrument panel.

j. Disconnect control stick grip (T.O. 1A-7D-2-8) and rotate grip so panel will clear during removal.

k. Remove interior canopy jettison handle (T.O. 1A-7D-2-2).

l. Remove land and takeoff edge-lighted panels (T.O. 1A-7D-2-11).

m. Remove armament release control panel and attached wire bundle (T.O. 1A-7D-2-13).

n. Disconnect thermocouple leads mounted on radar compartment bulkhead.

o. Remove nuts (1) from shock mount (2).

p. Support instrument panel and remove nuts (3), washers (4), and bolts (5).

CAUTION

When removing instrument panel from airplane, extreme care must be taken to prevent damage to master function switches.

q. Remove instrument panel from airplane.

19-55. FUSELAGE FORWARD SECTION ACCESS PANEL MOUNTED ARMOR PLATE REMOVAL AND INSTALLATION.

19-56. REMOVAL.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

a. Remove access panel from airplane.

b. Identify and note position of each armor plate mount bracket and attaching parts for proper installation in same position on new armor plate.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

c. Remove nuts and/or bolts and washers securing mount brackets to armor plate and access panel as required.

CAUTION

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

d. Lift armor plate from access panel. If as a result of mission requirements armor plate is not to be installed, reinstall armor plate mount brackets on access panel.

19-57. INSTALLATION.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

a. Position armor plate on access panel for installation.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

NOTE

Do not tighten bolts or nuts attaching mount brackets to armor plate and access panel until all attaching bolts have been installed.

b. Install armor plate mount brackets and secure with bolts and/or nuts and washers.

c. Install access panel.

19-58. NOSE RADOME REMOVAL AND INSTALLATION.

19-59. REMOVAL. (See figure 19-16.)

a. Release fasteners, open nose radome, and secure with stay-rod.

b. Remove hinge springs. Support radome in open position and disconnect stay-rod.

c. Remove nuts, washers, and bolts securing hinge pin halves together.

d. Slide aft hinge pins halves inboard to disengage from radome hinge fittings, and remove radome. Note position of hinge pins for installation.

e. Remove radome hinge pin halves.

f. Remove radome.

g. Check moisture seals at radome mating area on fuselage. Replace defective rubber bulb seal if damaged. Remove formed-in-place sealant seal at upper radome mating area adjacent to hinge if damaged. Do not apply new sealant seal at this time.

19-60. INSTALLATION. (See figure 19-16.)

a. If a new radome is to be installed, fit radome as follows, otherwise proceed to step b.

1. Place radome in installed position with latch fittings aligned and note areas to be trimmed for proper fit. Maximum allowable clearance between aft ring of radome and airplane skin is 0.03 inch along bottom and sides and 0.09 inch at top in area of hinge.

2. Remove radome and trim as required.

b. Place nose radome on airplane in open position and align holes in radome hinge halves with slots in airframe hinge halves.

c. Install hinge pin halves outboard through slots and holes in hinge support and secure the two halves with bolts, washers, and nuts as noted during removal.

d. Secure radome in open position with stay-rod.

e. Compress hinge springs and install between hinge pin boltheads and hinge fitting boltheads on airframe.

f. If required, add new formed-in-place seal to radome-to-skin gap along top aft edge of radome (hinge area). Refer to T.O. 1A-7D-23 for instructions.

g. Support radome and stow stay-rod.

h. Close and latch radome. Check that condition of moisture seals provide protection against entry of water into radar compartment.

19-61. MAIN INSTRUMENT PANEL REMOVAL, BUILDUP, AND INSTALLATION (Airplanes Through AF69-6196).

19-62. REMOVAL. (See figure 19-17.)

a. Open accesses 1211-2 and 2211-2.

WARNING

Ensure that electrical power is not connected to the airplane and that battery switch is in OFF before disconnecting electrical connectors to prevent injury to personnel or damage to equipment.

b. Disconnect electrical connectors P2021 and P2022 from rear of instrument panel.

c. Disconnect pitot and static lines at left side of panel.

d. Remove attitude director indicator (T.O. 1A-7D-2-12).

e. Remove radar indicator (T.O. 1A-7D-2-14-3).

f. Remove four screws from radar indicator plug P2059 to disconnect plug from radar mount box.

g. Remove fuel quantity indicator (T.O. 1A-7D-2-6).

h. Disconnect fuel tank quantity selector.

i. Remove lamps and brackets from cockpit left and right rail aft of instrument panel.

j. Disconnect control stick grip (T.O. 1A-7D-2-8) and rotate grip so panel will clear during removal.

k. Remove interior canopy jettison handle (T.O. 1A-7D-2-2).

l. Remove land and takeoff edge-lighted panels (T.O. 1A-7D-2-11).

m. Remove armament release control panel and attached wire bundle (T.O. 1A-7D-2-13).

n. Disconnect thermocouple leads mounted on radar compartment bulkhead.

o. Remove nuts (1) from shock mount (2).

p. Support instrument panel and remove nuts (3), washers (4), and bolts (5).

CAUTION

When removing instrument panel from airplane, extreme care must be taken to prevent damage to master function switches.

q. Remove instrument panel from airplane.

19-63. BUILDUP.

a. Remove nuts, shims, and aft mounts from defective panel and reinstall on replacement panel assembly.

b. Disconnect and remove all instruments, indicators, and switches from defective panel.

c. Identify wires to armament advisory and warning lights. Cut wires at lights and remove lights.

d. Remove eight cable clamps from right rear of instrument panel near true airspeed indicator.

e. Remove cable clamp on right rear of instrument panel near turbine outlet pressure indicator.

f. Remove two clamps on left rear of instrument panel near trailing edge flap indicator.

g. Install cable clamps on replacement instrument panel.

h. Install advisory and warning lights.

i. Connect wires to lights and remove identification tags.

j. Install and connect all instruments, indicators, and switches on replacement instrument panel.

19-64. INSTALLATION. (See figure 19-17.)

CAUTION

When installing instrument panel, extreme care must be taken to prevent damage to master function switches.

a. Position instrument panel on shock mounts (2).

b. Install bolts (5), washers (4), and nuts (3) to connect clevis (6) to instrument panel.

c. Install shims (7) CVC754-148E21, CVC754-248E21, CVC754-348E21, CVC754-548E21, or CVC754-848E21 in combinations required to maintain clearance of 0.50 (+0.02, -0.08) inch between lower surface of support lug and tension tie hinge on instrument panel mount.

d. Install nuts (1) on shock mounts (2).

e. Connect thermocouple leads at radar compartment bulkhead..

f. Install armament release control panel and attached wire bundle (T.O. 1A-7D-2-13).

g. Install land and takeoff edge-lighted panels (T.O. 1A-7D-2-11).

h. Install interior canopy jettison handle (T.O. 1A-7D-2-2).

i. Connect control stick grip (T.O. 1A-7D-2-8).

j. Install lamps and brackets on cockpit left and right rail aft of instrument panel.

k. Connect fuel tank quantity selector.

l. Install fuel quantity indicator (T.O. 1A-7D-2-6).

m. Install radar indicator plug P2059 in radar indicator mount box using 4 screws.

n. Install radar indicator (T.O. 1A-7D-2-14-3).

o. Install attitude director indicator (T.O. 1A-7D-2-12).

p. Connect pitot and static lines at right side of panel.

q. Connect electrical connectors P2021 and P2022 at rear of instrument panel.

r. Perform pitot-static leak check (T.O. 1A-7D-2-12).

s. Perform operational checkout of advisory and caution lights (T.O. 1A-7D-2-11).

t. Perform operational checkout of radar indicator (T.O. 1A-7D-2-14-3).

u. Perform operational checkout of fuel quantity and fuel tank selector (T.O. 1A-7D-2-6).

v. Perform operational checkout of vertical velocity indicator and accelerometer, (T.O. 1A-7D-2-10).

v.1. Perform operational checkout of attitude director indicator, horizontal situation indicator and altimeter (T.O. 1A-7D-2-12).

w. Close accesses 1211-2 and 2211-2.

x. Start engine (paragraph 2-51) and perform operational checkout of engine instruments (T.O. 1A-7D-2-5) and air-conditioning system (T.O. 1A-7D-2-3).

y. Shut down engine (paragraph 2-51).

19-65. MAIN INSTRUMENT PANEL REMOVAL, BUILDUP, AND INSTALLATION (Airplanes AF69-6197 and Subsequent).

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten bolts

19-66. REMOVAL. (See figure 19-18.)

a. Open access 1211-2.

WARNING

Failure to remove electrical power from airplane when connecting or disconnecting electrical connectors or wires may result in injury to personnel and damage to equipment.

b. Disconnect electrical connectors P2021 (1), P2149 (2), P2140 (3), and P2141 (4) located on left side of instrument panel (5). Install protective covers on connectors.

c. Disconnect pitot pressure line (6) and static line (7). Cap or plug lines and fittings as required to prevent contamination.

d. Open access 2211-2.

e. Disconnect electrical connector P2022 located adjacent to right rudder pedal. Install protective covers on connectors.

f. Remove RHAW lights (T.O. 1A-7D-2-15) and floodlight mounted below instrument panel cowl.

g. Remove instrument panel cowl.

h. Remove components attached to left and right upper longerons aft of main instrument panel as required to provide sufficient clearance for instrument panel removal.

i. Remove land and takeoff edge-lighted panels (T.O. 1A-7D-2-11).

J. Remove left and right slant panels. Install protective covers on electrical connectors.

k. Remove control stick grip (T.O. 1A-7D-2-8).

CAUTION

To prevent damage to delicate instruments, handle with care during removal and store in a safe, padded area.

l. Remove fuel quantity indicator (T.O. 1A-7D-2-6).

m. Remove head-up display unit (T.O. 1A-7D-2-14) and IP-1443/APQ-126(V) intratarget data indicator (IDI) (T.O. 1A-7D-2-14-3).

n. Remove oil quantity indicator (T.O. 1A-7D-2-5).

o. Remove attitude director indicator and horizontal situation indicator (T.O. 1A-7D-2-12).

p. Remove armament release, armament advisory lights, and armament select panels (T.O. 1A-7D-2-13).

q. Remove projected map display unit (T.O. 1A-7D-2-12).

r. Remove heading mode switch panel and mounting bracket (T.O. 1A-7D-2-12).

s. Remove nut (8), washers (9), and bolt (10) securing strut (11) to mounting bracket (12).

t. Remove four spring-loaded screws (13) and disconnect projected map display unit electrical connector J2150 (14). Install protective cover on connector.

u. Remove four spring-loaded screws (15) and disconnect IP-1443/APQ-126(V) IDI electrical connector P2059 (16). Install protective cover on connector.

v. Disconnect coaxial connectors P2152 (17), P2153 (18), and P2154 (19) and thermocouples (20). Install protective covers on connectors.

w. Remove nut (21), washer (22), and bolt (23) securing right upper shock mount (24) to airframe.

x. Remove bolts (25) and bonding strap (26) securing upper center shock mount (27) to instrument panel.

y. Remove nut (28) and washer (29) securing instrument panel to left lower shock mount (30).

z. Remove nut (31) and washer (32) securing instrument panel to right lower shock mount (33).

aa. Remove eight screws (34) securing lower forward shock mount (35) to instrument panel.

ab. Support instrument panel and remove bolts (36), washers (37), and bonding strap (38) securing left upper shock mount (39) to airframe.

CAUTION

When removing instrument panel from airplane, extreme care must be taken to prevent damage to master function switches, instruments, and edge-lighted panels.

ac. Lift panel sufficiently to clear lower shock mounts and remove instrument panel from airplane.

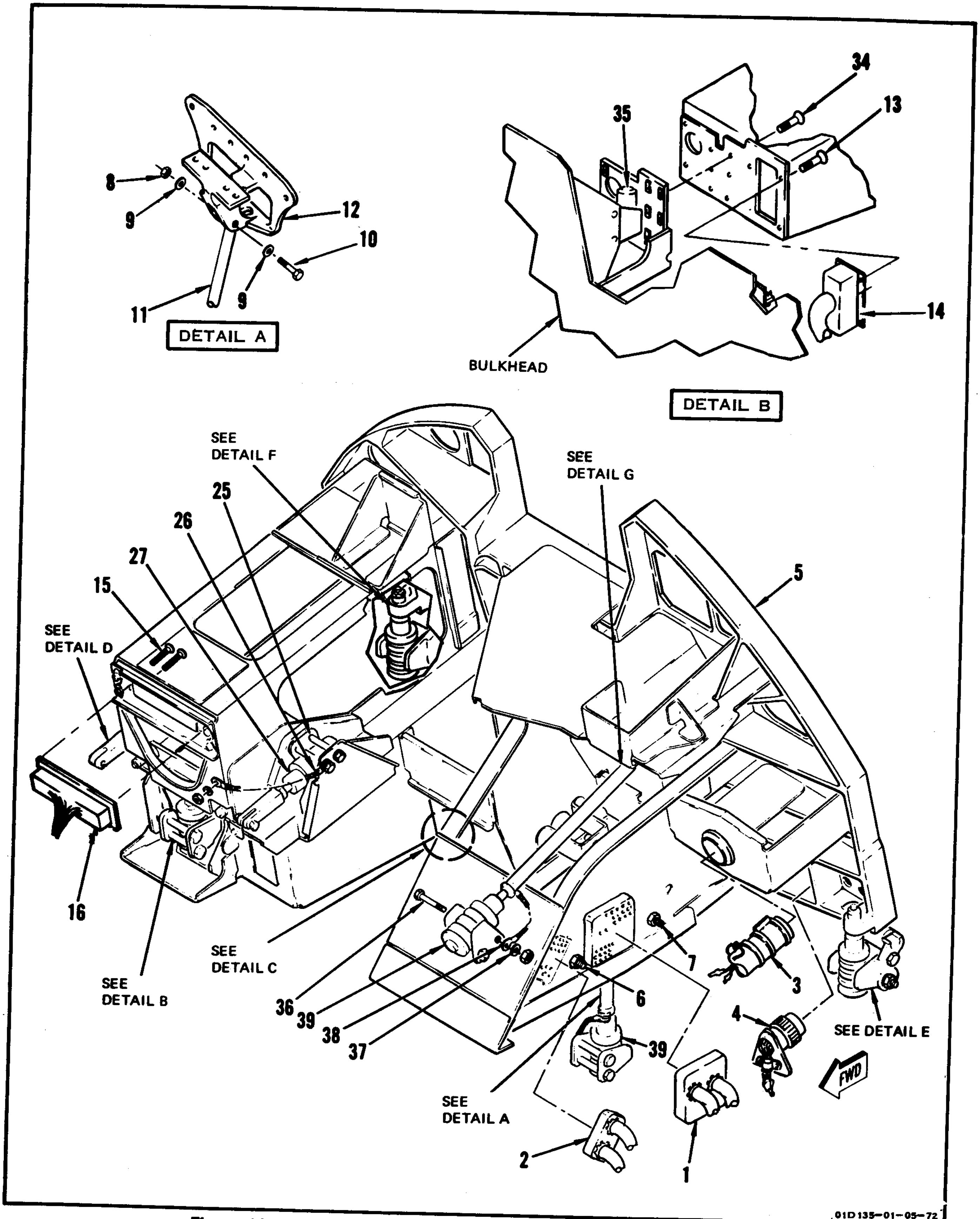
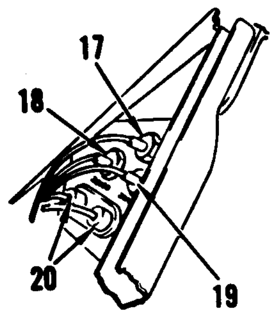
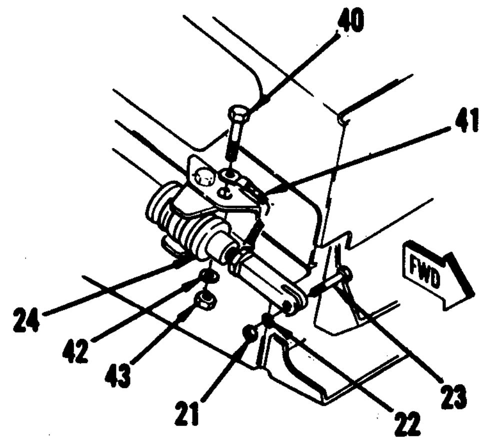


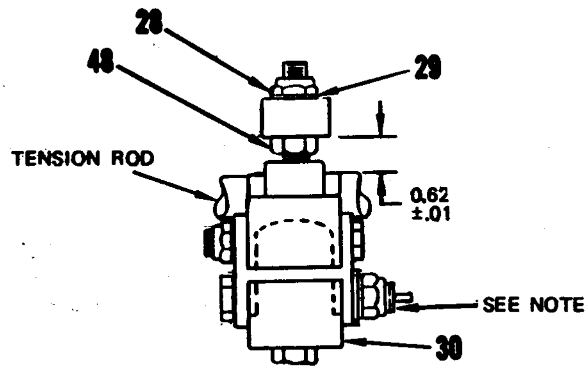
Figure 19-18. Main Instrument Panel Removal and Installation (Airplanes AF69-6197 and Subsequent)(Sheet 1)



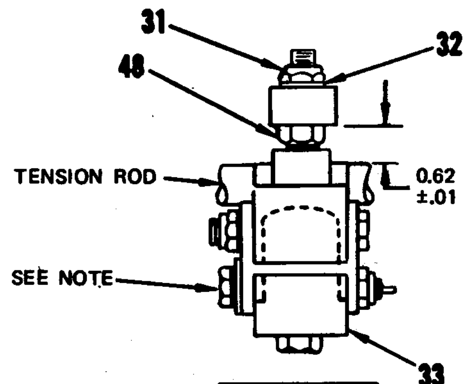
DETAIL C



DETAIL D

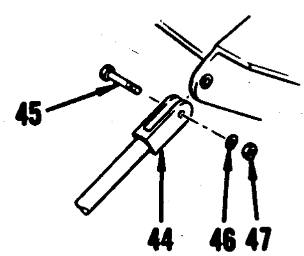


DETAIL E



DETAIL F

1. Electrical connector (P2021)
2. Electrical connector (P2149)
3. Electrical connector (P2140)
4. Electrical connector (P2141)
5. Master instrument panel
6. Pitot pressure connection
7. Static connection
8. Nut
9. Washer
10. Bolt
11. Strut
12. Bracket
13. Screw
14. Electrical connector (J2150)
15. Screw
16. Electrical connector (P2059)
17. Coaxial connector (P2152)
18. Coaxial connector (P2153)
19. Coaxial connector (P2154)
20. Thermocouple
21. Nut
22. Washer
23. Bolt
24. Shock mount
25. Bolt
26. Bonding strap
27. Shock mount
28. Nut
29. Washer
30. Shock mount
31. Nut
32. Washer
33. Shock mount
34. Screw
35. Shock mount
36. Bolt
37. Washer
38. Bonding strap
39. Shock mount
40. Bolt
41. Bonding strap
42. Washer
43. Nut
44. Rod
45. Bolt
46. Washer
47. Nut
48. Jamnut



DETAIL G

NOTE

If lower bolts are removed from either shock mount (30 or 33), shim as required (0.063 inch maximum) using AN960PD416L and AN960PD416 washers to provide clearance between shock mount and attach fitting. Tighten bolts 30 to 35 pound-inches torque.

01D135-02-05-72

Figure 19-18. Main Instrument Panel Removal and Installation (Airplanes AF69-6197 and Subsequent)(Sheet 2)

19-67. BUILDUP. (See figure 19-18.)

NOTE

To ensure proper connection of components removed from instrument panel, attach an identification tag to each electrical wire, connector, tubing, and hose during component removal.

a. Remove all instruments and indicators. Attach identification tag to each connector.

b. Remove from defective instrument panel and install in replacement instrument panel, in reverse sequence of removal, all attachments (i.e., support and anchor clamps, clip, screws, etc.), switches, edge-lighted panels, warning lights, wiring harnesses, cables, and electrical connectors. Do not cut and splice wiring unless absolutely necessary.

c. Remove all pressure lines and manifold and static lines, and install on replacement instrument panel.

d. Inspect instrument panel shock mounts in accordance with T.O. 1-1-19 and replace if necessary.

e. Remove right upper shock mount (24), install on replacement instrument panel, and secure with bolts (40), bonding strap (41), washers (42), and nuts (43). Ensure bonding strap is connected to forward bolt. Tighten bolts to 17 (+3, −2) pound-inches torque.

f. Remove left upper shock mount rod (44), install on replacement instrument panel, and secure with bolt (45), washer (46), and nut (47).

19-68. INSTALLATION. (See figure 19-18.)

CAUTION

When installing instrument panel, extreme care must be taken to prevent damage to master function switches, instruments, and edge-lighted panels.

a. Position and support instrument panel (5) in airplane.

b. Install left upper shock mount (39) and secure with bolts (36), washer (37), and bonding strap (38). Tighten bolts to 17 (+3, −2) pound-inches torque.

c. Install eight screws (34) securing lower forward shock mount (35) to instrument panel.

d. Adjust jamnut (48) on right and left aft shock mounts to obtain 0.62 (±.01) inch gap between the lower surface of the panel assembly support lug and the upper surface of the tension rod hinge.

e. Install nut (31) and washer (32) securing right lower shock mount (33) to instrument panel.

f. Install nut (28) and washer (29) securing left lower shock mount (30) to instrument panel.

g. Install bolts (25) and bonding strap (26) securing upper center shock mount (27) to instrument panel. Tighten bolts to 17 (+3, −2) pound-inches torque.

h. Install bolt (23), washer (22), and nut (21) securing right upper shock mount (24) to airframe.

i. Remove protective covers and connect coaxial cables P2152 (17), P2153 (18), and P2154 (19) and thermocouples (20).

j. Remove protective covers and install four spring-loaded screws (15) securing IP-1443/APQ-126(V) IDI electrical connector P2059 (16) to instrument panel.

k. Remove protective covers and install four spring-loaded screws (13) securing projected map display unit electrical connector J2150 (14) to instrument panel.

l. Install bolt (10), washers (9), and nut (8) securing strut (11) to mounting bracket (12).

m. Seal faying surfaces between mounting bracket (12) and instrument panel for corrosion protection of dissimilar metals (T.O. 1A-7D-3).

n. Install mounting bracket (12) and heading mode switch panel (T.O. 1A-7D-2-12).

o. Install projected map display unit (T.O. 1A-7D-2-12).

p. Install armament release, armament advisory lights, and armament select panels (T.O. 1A-7D-2-13).

q. Install attitude director indicator and horizontal situation indicator (T.O. 1A-7D-2-12).

r. Install oil quantity indicator (T.O. 1A-7D-2-5).

s. Install head-up display unit (T.O. 1A-7D-2-14) and IP-1443/APQ-126(V) IDI (T.O. 1A-7D-2-14-3).

t. Install fuel quantity indicator (T.O. 1A-7D-2-6).

u. Install control stick grip (T.O. 1A-7D-2-8).

v. Remove protective covers and install left and right slant panels.

w. Install land and takeoff edge-lighted panels (T.O. 1A-7D-2-11).

x. Install components removed in paragraph 19-66, step h.

y. Install instrument cowl.

z. Install RHAW lights and floodlights mounted below instrument cowl.

aa. Remove protective covers and connect electrical connector P2022.

ab. Close access 2211-2.

ac. Remove protective covers and connect electrical connectors P2021 (1), P2149 (2), P2140 (3), and P2141 (4) located on left side of instrument panel (5).

ad. Uncap or unplug pitot pressure line (6), static lines (7), and fittings and connect lines to fittings on left side of instrument panel.

ae. Close access 1211-2.

af. Perform pitot-static leak check (T.O. 1A-7D-2-12).

ag. Perform operational checkout of advisory and caution lights (T.O. 1A-7D-2-11).

ah. Perform operational checkout of radar indicator (T.O. 1A-7D-2-3).

ai. Perform operational checkout of fuel quantity indicator and fuel tank selector (T.O. 1A-7D-2-6).

aj. Perform operational checkout of vertical velocity indicator and accelerometer (T.O. 1A-7D-2-10).

ak. Perform operational checkout of attitude director indicator, horizontal situation indicator, and altimeter.

al. Start engine (paragraph 2-51) and perform operational checkout of the engine instruments (T.O. 1A-7D-2-5) and air-conditioning system (T.O. 1A-7D-2-3).

am. Shut down engine (paragraph 2-51).

19-69. GUN BLAST PORT ASSEMBLY REMOVAL AND INSTALLATION.

19-70. For removal and installation of gun blast port assembly, refer to T.O. 1A-7D-2-13.

19-71. GUN BLAST PORT PLUG REMOVAL AND INSTALLATION.

19-72. REMOVAL.

a. Remove gun blast port assembly (T.O. 1A-7D-2-13).

b. Remove nuts, washers, and bolts securing gun blast port plug to blast port. Retain nuts, washers, and bolts for installation of gun stabilizer ring.

c. Install stabilizer ring and gun blast port assembly (T.O. 1A-7D-2-13).

19-73. INSTALLATION.

a. Remove gun blast port assembly (T.O. 1A-7D-2-13).

b. Remove stabilizer ring from gun blast port assembly and retain for later use.

c. Attach gun blast port plug (local fabrication, figure 19-1) to blast port with bolts, washers, and nuts removed from stabilizer ring.

WARNING

To prevent possible injury to personnel and damage to equipment, ensure that all gun electrical connectors and harnesses are stowed and safe.

d. Install gun blast port assembly (T.O. 1A-7D-2-13).

19-74. GUN GAS PURGE SHROUD INSPECTION, REPAIR, REMOVAL AND INSTALLATION.

NOTE

The following procedures provide inspection criteria and individual instructions for removal and installation of each section (cover assembly) of the gun gas purge shroud. Disassemble the shroud only to the degree required for replacement of defective section(s).

19-75. INSPECTION.

a. Inspect each section of shroud for cuts, tears, and holes as follows.

NOTE

Wear is not a rejection criterion for the shroud unless the condition degrades to holes or tears.

1. Cuts: cuts are limited to 1/2-inch singularly or 1 1/2-inch collectively.

2. Holes and three corner tears: holes and three-corner tears are not limited in number, but are limited to 1/8-inch diameter in size for any individual hole.

3. Linear tears: linear tears (i.e. not corners) are to be considered as cuts.

b. Cuts, tears, and holes in a section of gun gas purge shroud that exceeds the limits specified in step a shall be cause for replacement/rejection of the defective section.

19-76. REPAIR.

NOTE

The following is intended for repair and strengthening of the tail portion of upper outboard gun gas purge cover. However, the same general steps may be used to repair other damage, provided the damage does not exceed limits specified in paragraph 19-75.

a. Remove upper outboard gun gas purge cover (paragraph 19-77, step b).

b. Cut 2 patches approximately 4 by 11 inches from nylon cloth (Part No. 5200-5187, Uniroyal Inc.).

c. Rough area on both sides of damaged section with coarse sandpaper.

WARNING

Methylisobutylketone (MIBK) is flammable and toxic. Skin and eye protection is required; good general ventilation or respiratory protection is required.

d. Clean both sides thoroughly with TT-M-268 methyl isobutyl ketone or comparable nonoil base solvent.

e. Apply adhesive (EC 870, Minnesota Mining and Manufacturing Co) to prepared areas of the cover and to one side of each patch.

f. Permit adhesive to dry for 25 minutes and apply a second coat. Allow an additional 25 minutes for drying of the second coat.

g. Affix patches to both sides of damaged area and apply pressure clamps over repaired area. Allow patches to cure-dry for 48 hours.

h. Remove clamps and install gun gas purge cover (paragraph 19-78).

19-77. REMOVAL. (See figure 19-19.)

a. Remove upper mid cover assembly (1) as follows:

1. Open access 1222-8.

2. Open all zippers or turn fasteners.

3. Unsnap cover assembly from forward and aft baffles.

4. Remove cover assembly from airplane.

b. Remove upper outboard cover assembly (2) as follows:

1. Open gun removal access 1222-6 (T.O. 1A-7D-2-13) and access 1222-8.

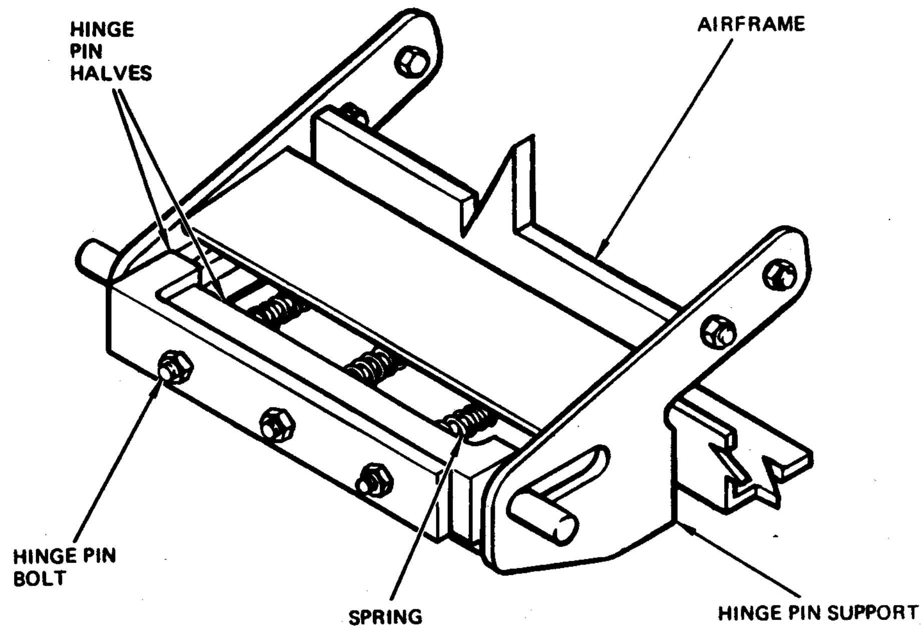
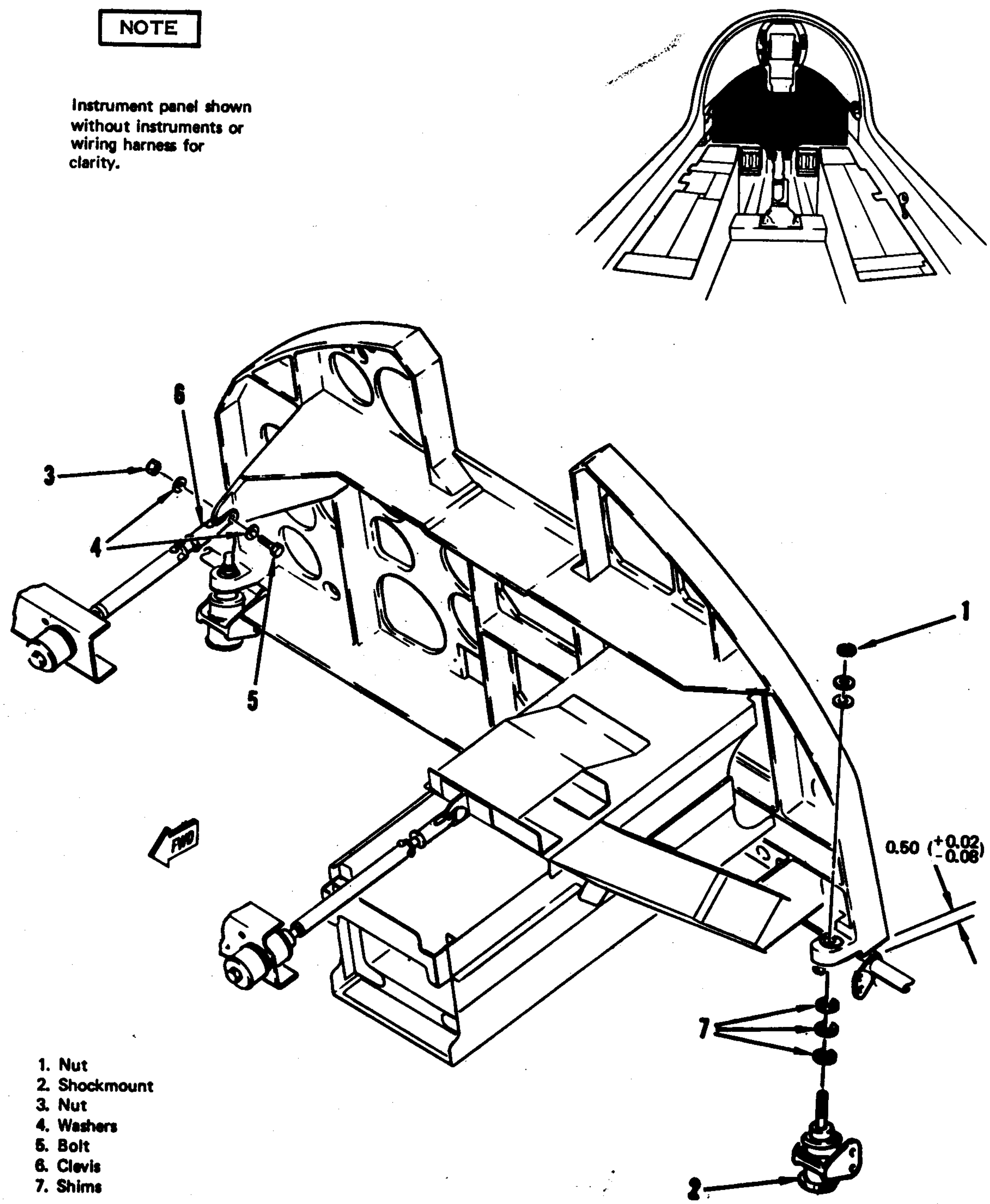


Figure 19-16. Radome Hinge Removal and Installation

NOTE

Instrument panel shown without instruments or wiring harness for clarity.



1. Nut
2. Shockmount
3. Nut
4. Washers
5. Bolt
6. Clevis
7. Shims

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Figure 19-17. Main Instrument Panel Removal and Installation (Airplanes Through AF69-6196)

2. Open turn fasteners or two zippers attaching outboard cover assembly (2) to mid cover assembly (1).

3. Remove screw (3), washer (4), and nut (5) securing cover assembly to airframe.

4. Remove five screws (6), washers (7), and nuts (8) securing cover assembly (2) and metal strip (9) to airframe.

5. Unsnap cover assembly from forward and aft baffles and remove cover assembly from airplane.

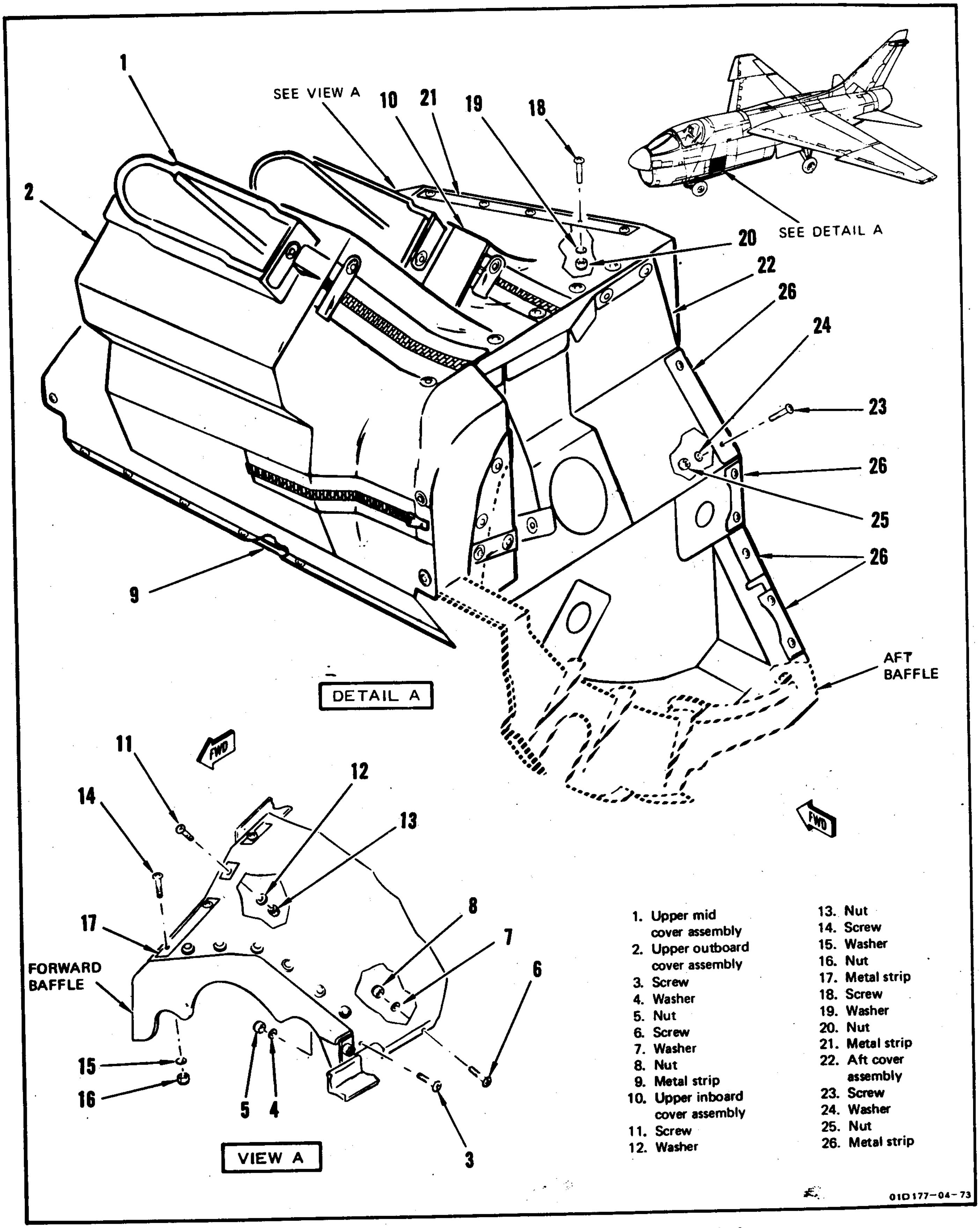


Figure 19-19. Gun Gas Purge Shroud Removal and Installation

c. Remove upper inboard cover assembly (10) as follows:

1. Remove M61A1 gun housing group (T.O. 1A-7D-2-13).

2. Remove screw (11), washer (12), and nut (13) securing cover assembly to airframe.

3. Remove two screws (14), washers (15), and nuts (16) securing cover assembly (10) and metal strip (17) to airframe.

4. Remove five screws (18), washers (19), and nuts (20) securing cover assembly and metal strip (21) to airframe.

5. Remove cover assembly from airplane.

d. Remove aft cover assembly (22) as follows:

1. Remove M61A1 gun housing group (T.O. 1A-7D-2-13).

NOTE

Identify position of metal strips (26) for reinstallation.

2. Remove seven screws (23), washers (24), and nuts (25) securing cover assembly and four metal strips (26) to airframe.

3. Unsnap cover assembly from aft baffle and remove cover assembly from airplane.

19-78. INSTALLATION. (See figure 19-19.)

a. Install upper mid cover assembly (1) as follows:

1. Position cover assembly between ammunition chutes.

2. Close all zippers or turn fasteners and button snaps at forward and aft baffles.

3. Close access 1222-8.

b. Install upper outboard cover assembly (2) as follows:

1. Using old cover assembly as a template, locate and punch screw holes in new cover assembly as required.

2. Position cover assembly and metal strip (9) for installation and install five screws (6), washers (7), and nuts (8) securing cover assembly to airframe.

3. Install screw (3), washer (4), and nut (5) securing cover assembly to airframe.

4. Close turn fasteners or two zippers attaching cover assembly (2) to cover assembly (1).

5. Button snaps at forward and aft baffles.

6. Close gun removal access 1222-6 (T.O. 1A-7D-2-13) and access 1222-8.

c. Install upper inboard cover assembly (10) as follows:

1. Using old cover assembly as a template, locate and punch screw holes in new cover assembly as required.

2. Position cover assembly and metal strip (21) for installation and install five screws (18), washers (19), and nuts (20) securing cover assembly to airframe.

3. Position cover assembly and metal strip (17) for installation and install two screws (14), washers (15), and nuts (16).

4. Install screw (11), washer (12), and nut (13) securing cover assembly to airframe.

5. Install M61A1 gun housing group (T.O. 1A-7D-2-13).

d. Install aft cover assembly (22) as follows:

1. Using old cover assembly as a template, locate and punch screw holes in new cover assembly as required.

2. Position cover assembly and four metal strips (26) for installation and install seven screws (23), washers (24), and nuts (25) securing cover assembly to airframe.

3. Button snaps to aft baffle.

4. Install M61A1 gun housing group (T.O. 1A-7D-2-13).

19-79. COCKPIT PANELS CAPTIVE SCREW REPLACEMENT. (See figure 19-20.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	216-01108-1	Crimping tool set	Remove and install panel captive screws.

NOTE

Crimping tool set contains removal and installation adapter tools for 8-32 and 10-32 screws with recessed (Phillips) or hex head styles.

a. Remove defective screw as follows:

1. Remove cockpit panel from airplane.

2. Thread applicable removal nose assembly into installation tool.

3. Place slotted opening of removal nose assembly over screw head.

4. Squeeze handles of installation tool to force screw free of retaining sleeve.

5. Remove installation tool.

6. Remove screw and sleeve from panel.

b. Install screw as follows:

1. Remove removal nose assembly from installation tool.

2. Install nose unit and puller in installation tool.

3. Insert replacement screw assembly through hole in cockpit panel.

4. Thread screw into installation tool until screw bottoms.

5. Squeeze handles of installation tool sufficiently to flare screw retaining sleeve.

6. Remove installation tool from screw.

7. Check that sleeve is properly flared and that sleeve retains screw in panel.

8. Install cockpit panel.

19-80. AN/APQ-126(V)8 OR AN/APQ-126(V)11 RADAR REPLACEMENT BALLAST (216-20366-102) INSTALLATION. (See figure 19-21.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten bolts

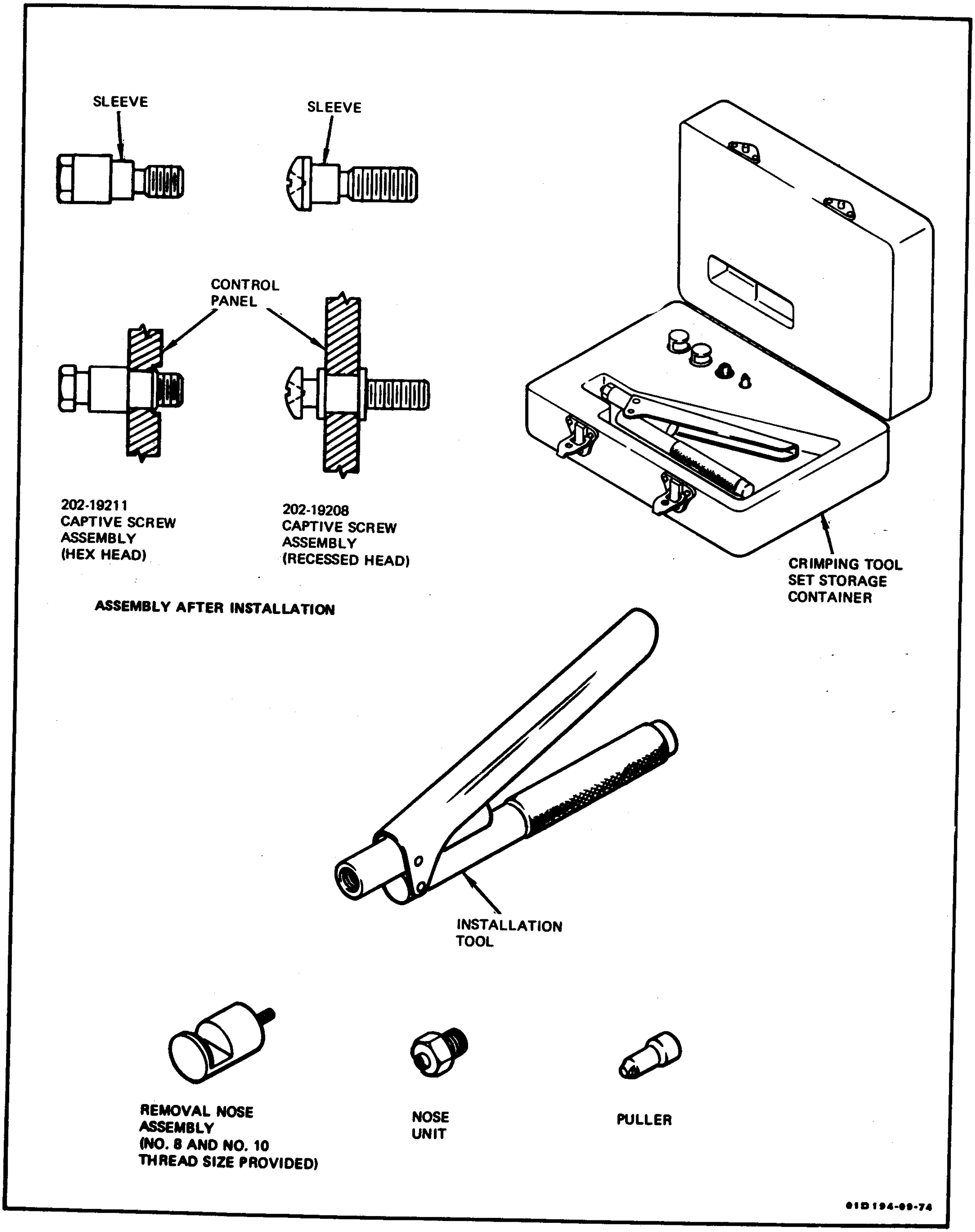
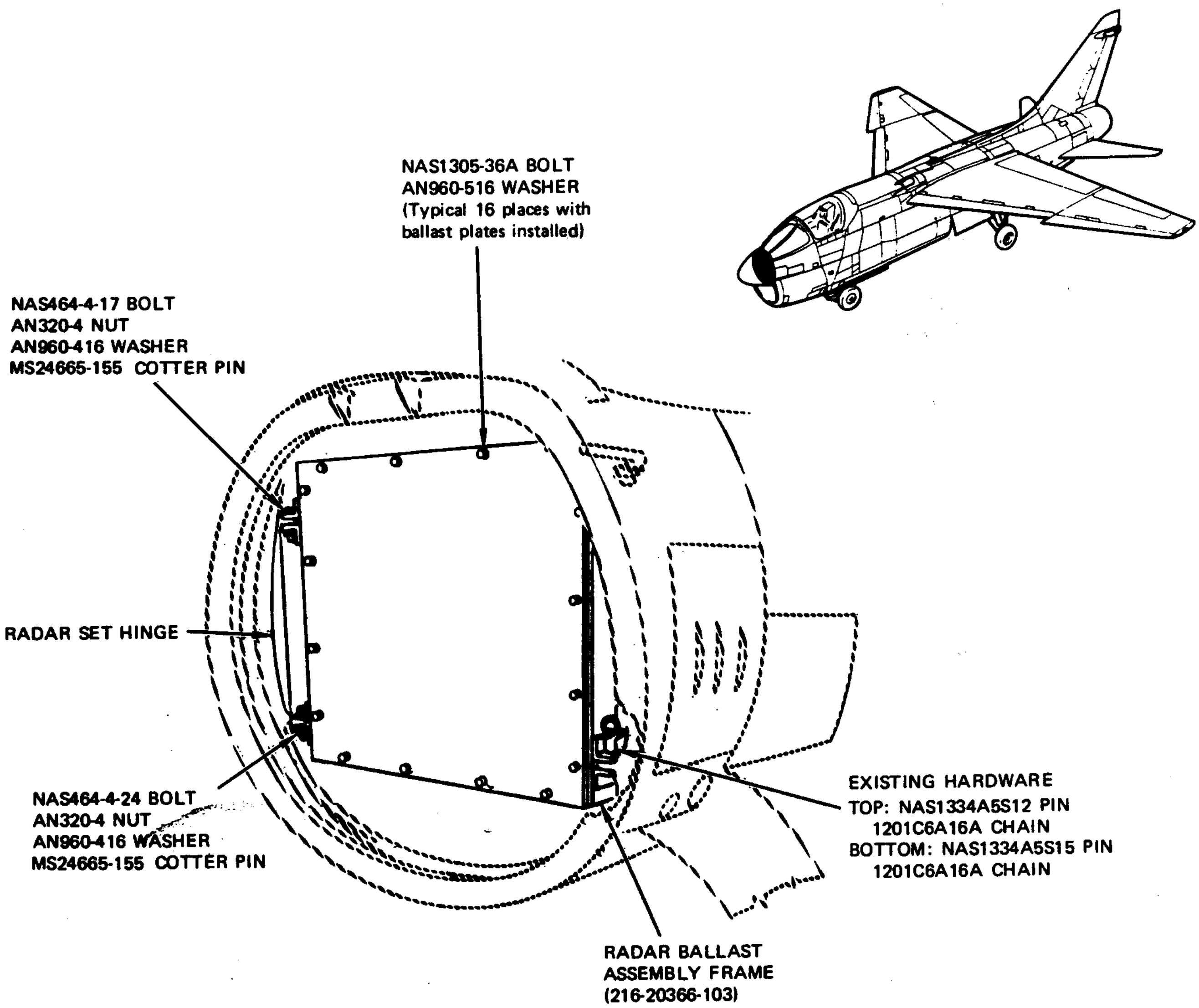


Figure 19-20. Cockpit Panels Captive Screw Replacement



INSTALLATION

NOTE

Use forward looking radar ballast when airplane is to be flown with the forward looking radar set and MT-4043/APQ-126(V)8 electrical equipment shock mount base removed. For weight and balance information, refer to T.O. 1-1B-40.

a. Position ballast frame assembly on existing hinge and secure with hardware shown above.

b. Secure left edge of frame with existing quick-disconnect pins.

c. Position the 3/16-inch plate and six 1/4-inch plates, one at a time, in the frame assembly.

d. Secure all plates to frame (16 places) with bolts and tighten to 120 (±20) pound-inches torque.

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Figure 19-21. Forward Looking Radar Replacement Ballast (216-20366-102) Installation

SECTION XX

FUSELAGE MIDSECTION

20-1. DESCRIPTION.

20-2. The fuselage midsection is a semimonocoque structure and extends from FS 346.5 to 526.5. Major components housed by the fuselage midsection are the fuselage fuel tanks, main landing gear, hydraulic system, and main avionic equipment. Provisions are included for installing antennas, upper and lower anticollision lights, landing light, and dorsal fairing.

20-3. Components of the fuselage midsection include the engine air duct seal and wing attachment links. The engine air duct seal provides a seal between the engine air inlet duct and the engine. Forward wing attachment links are installed to attach the wing to the fuselage.

20-4. FUSELAGE MIDSECTION ARMOR PLATE ARRANGEMENT. (See figure 1-15.)

20-5. On airplanes AF69-6197 and subsequent, in addition to the steel armor plate mounted on the outside surface of access 5113-1, protection of the alternate fuel feed manual selector valve, of the fuel motive flow shutoff valve and of the connecting fuel manifold is provided by four pieces of ceramic armor plate. The armor plates are arranged to provide maximum protection from the bottom, front, and both sides of the fuel valves and manifold. Two armor plates are mounted to the inside structure of access 5213-3, and the other two are mounted to the longerons forming the left and right sides of the fuel valve compartment. All four armor plates are secured to mount brackets with nuts and/or bolts and washers to facilitate removal and installation.

20-6. ENGINE AIR DUCT SEAL REMOVAL AND INSTALLATION.

20-7. REMOVAL.

a. Remove engine (T.O. 1A-7D-2-5).

NOTE

Mark position of each retaining strip.

b. Remove rivets securing four retaining strips and seal to aft side of aft bulkhead. Remove retaining strips and seal.

c. Clean seal retaining strips and bulkhead mounting ring surface with P-D-680 drycleaning solvent.

20-8. INSTALLATION.

a. Inspect and repair bulkhead mounting ring as follows:

1. Inspect seal attachment holes. If holes are elongated or oversized, a standard repair rivet (pull type) may be used for seal installation provided the edge of the hole is 0.20 inch minimum from edge of ring. Oversized holes having less than 0.20 inch edge clearance must be plugged (T.O. 1A-7D-3).

2. If hole must be plugged, drill new holes in ring with nominal 0.25-inch edge clearance and a minimum of 0.50 inch each side of damaged holes. Maintain maximum distance of 2.00 inches between attachment holes. Nuts and screws may be used to install seal, if attachment holes will clean up by drilling them out using a number 16 (0.177) drill bit.

3. Inspect for corrosion. Remove corrosion and treat surface (T.O. 1-1-2).

4. Refinish surface with applicable paint system (T.O. 1A-7D-23).

b. If repair of mounting ring holes was required, drill new holes in retaining strips to match before installing seal.

NOTE

Reinstall each retaining strip to same location from which removed. Inside edge of seal should be flush within 0.06 inch of inside edge of bulkhead mounting ring. All surfaces shall be clean and dry.

c. Position seal and four retaining strips and secure with small C-clamps. Pilot-drill small holes through seal to ensure alignment to rivet holes. In lieu of C-clamps, seal can be held in place by use of an aluminum band constructed from 0.050 x 4.0 x 115.25 inch 2024-T4 aluminum. Butt ends together and splice on inner circumference with strip of above material using six AN426DD-5 rivets installed flush from outside of band. Place seal on band, and place band in the air inlet duct for seal installation.

d. Drill holes in seal mounting flange and retaining strips and seal to bulkhead mounting ring with MS20600AD-4-4 rivets or standard repair rivets as required. Seal installation using nuts and screws; (a) MS21042-08 nuts, (b) MS24677-16 screws, (c) NAS620-8 washer or a clip on nut SL210-08-1 may be used instead of MS21042-08 nuts and NAS620-8 washers. The screw heads should face aft.

e. Install engine (T.O. 1A-7D-2-5).

20-9. WING ATTACHMENT LINK, REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	215-00211-1	Wing hoist sling	Raise wing sufficiently to facilitate removal of wing attaching link.

20-10. REMOVAL.

a. Open accesses 1121-7, 3113-10, 2121-7, and 4113-10.

b. Attach wing hoist sling and apply hoist tension to support wing.

c. Remove nuts, bolts, and washers securing links. Record location of washers for use during installation.

d. Remove link.

20-11. INSTALLATION.

NOTE

Install nuts finger-tight. Loosen nuts only enough to align cotter pins.

a. Install nuts, bolts, and washers securing links to fuselage and wing.

b. Remove hoist and wing hoist sling.

c. Install accesses 1121-7, 2121-7, 3113-10, and 4113-10.

20-12. ROLL FEEL ISOLATION ACTUATOR ARMOR PLATE REMOVAL AND INSTALLATION. (Airplanes AF69-6197 and Subsequent.)

20-13. REMOVAL.

a. Remove four screws securing armor plate to the outside of access 5113-1.

b. Remove armor plate from airplane.

20-14. INSTALLATION.

a. Place armor plate over four holes located on access 5113-1.

b. Install armor plate using four screws.

c. If exterior finish is scratched or chipped, touch up in accordance with T.O. 1A-7D-23.

20-15. FUEL SYSTEM RIGHT SIDE ARMOR PLATE REMOVAL AND INSTALLATION.

20-16. REMOVAL. (See figure 20-1.)

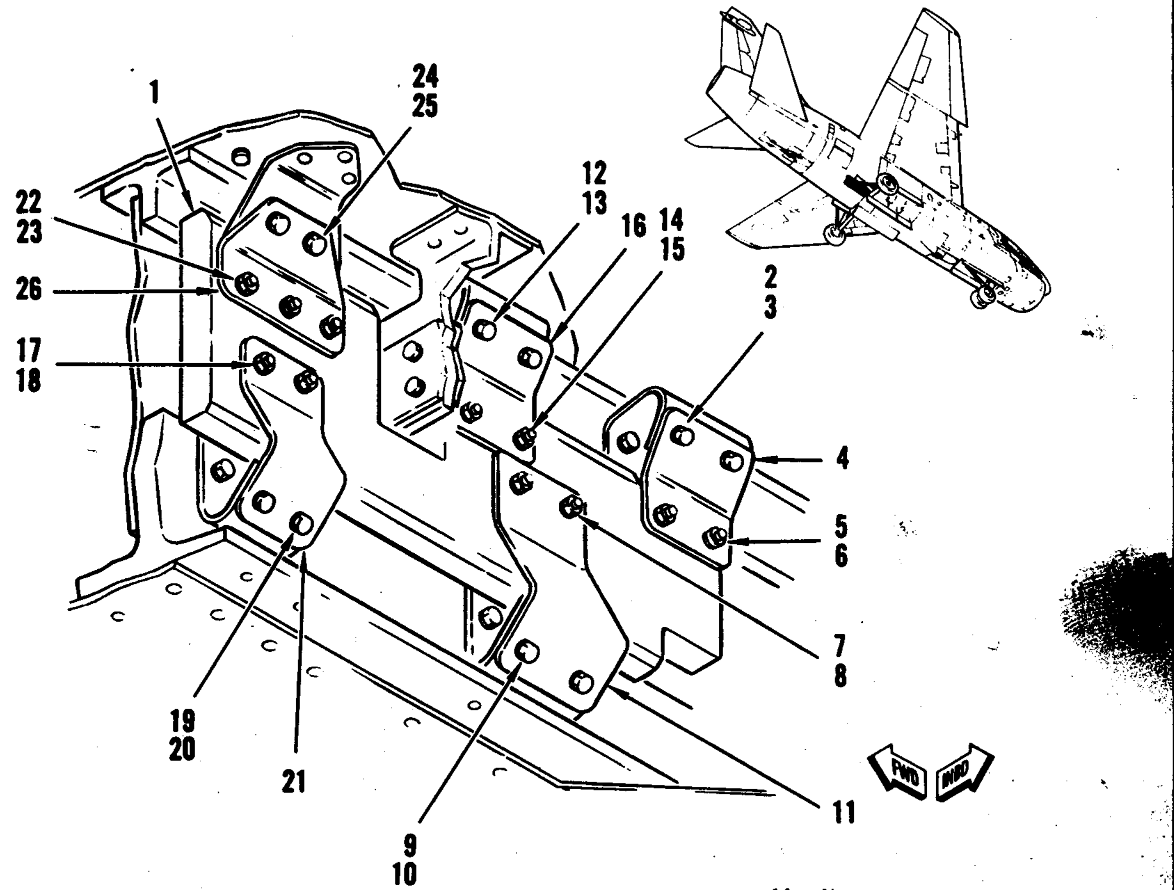
a. Open access 5213-3.

b. Identify position of each mount bracket on armor plate (1) for installation in same position on new armor plate.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

c. Remove two bolts (2) and washers (3) securing mount bracket (4) to airframe.



1. Armor plate
2. Bolt
3. Washer
4. Bracket
5. Nut
6. Washer
7. Nut
8. Washer
9. Bolt
10. Washer
11. Bracket
12. Bolt
13. Washer
14. Nut
15. Washer
16. Bracket
17. Nut
18. Washer
19. Bolt
20. Washer
21. Bracket
22. Nut
23. Washer
24. Bolt
25. Washer
26. Bracket

Figure 20-1. Fuel System Right Side Armor Plate Removal and Installation

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

d. Remove two nuts (5) and washers (6) securing bracket (4) to armor plate, and remove mount bracket.

e. Remove two nuts (7) and washers (8) and two bolts (9) and washers (10) securing mount bracket (11) to airframe and armor plate; remove mount bracket.

f. Remove two bolts (12) and washers (13) and two nuts (14) and washers (15) securing mount bracket (16) to airframe and armor plate; remove mount bracket.

g. Remove two nuts (17) and washers (18) and two bolts (19) and washers (20) securing mount bracket (21) to airframe and armor plate; remove mount bracket.

h. Remove three nuts (22) and washers (23) and two bolts (24) and washers (25) securing mount bracket (26) to airframe and armor plate; remove mount bracket.

CAUTION

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

i. Remove armor plate from airplane.

20-17. INSTALLATION. (See figure 20-1.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

a. Position armor plate (1) in airplane for installation.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

NOTE

Do not tighten bolts or nuts attaching mount brackets to armor plate and airframe until all attaching bolts have been installed.

b. Position mount bracket (26) and install two bolts (24) and washers (25) and three nuts (22) and washers (23) securing mount bracket to airframe and armor plate.

c. Position mount bracket (21) and install two bolts (19) and washers (20) and two nuts (17) and washers (18) securing mount bracket to airframe and armor plate.

d. Position mount bracket (16) and install two bolts (12) and washers (13) and two nuts (14) and washers (15) securing mount bracket to airframe and armor plate.

e. Position mount bracket (11) and install two bolts (9) and washers (10) and two nuts (7) and washers (8) securing mount bracket to airframe and armor plate.

f. Position mount bracket (4) and install two bolts (2) and washers (3) and two nuts (5) and washers (6) securing mount bracket to airframe and armor plate.

g. Tighten all bolts and nuts securing armor plate to airframe.

h. Close access 5213-3.

20-18. FUEL SYSTEM LEFT SIDE ARMOR PLATE REMOVAL AND INSTALLATION.

20-19. REMOVAL. (See figure 20-2.)

a. Open access 5213-3.

b. Remove alternate fuel feed manual selector valve (T.O. 1A-7D-2-6).

c. Remove motive flow shutoff valve (T.O. 1A-7D-2-6).

d. Identify position of each mount bracket on armor plate for installation in same position on new armor plate.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

e. Remove two bolts (1) and washers (2) securing mount bracket (3) to airframe.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

f. Remove two nuts (4) and washers (5) securing mount bracket to armor plate and remove mount bracket.

g. Remove two bolts (6) and washers (7) and two nuts (8) and washers (9) securing mount bracket (10) to airframe and armor plate; remove mount bracket.

h. Remove two bolts (11) and washers (12) and three nuts (13) and washers (14) securing mount bracket (15) to airframe and armor plate; remove mount bracket.

i. Remove two nuts (16) and washers (17) and two bolts (18) and washers (19) securing mount bracket (20) to airframe and armor plate; remove mount bracket.

j. Remove two nuts (21) and washers (22) and two bolts (23) and washers (24) securing mount bracket (25) to airframe and armor plate; remove mount bracket.

CAUTION

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

k. Remove armor plate (26) from airplane.

20-20. INSTALLATION. (See figure 20-2.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

a. Position armor plate (26) in airplane for installation.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

NOTE

Do not tighten bolts or nuts attaching mount brackets to armor plate and airframe until all attaching bolts have been installed.

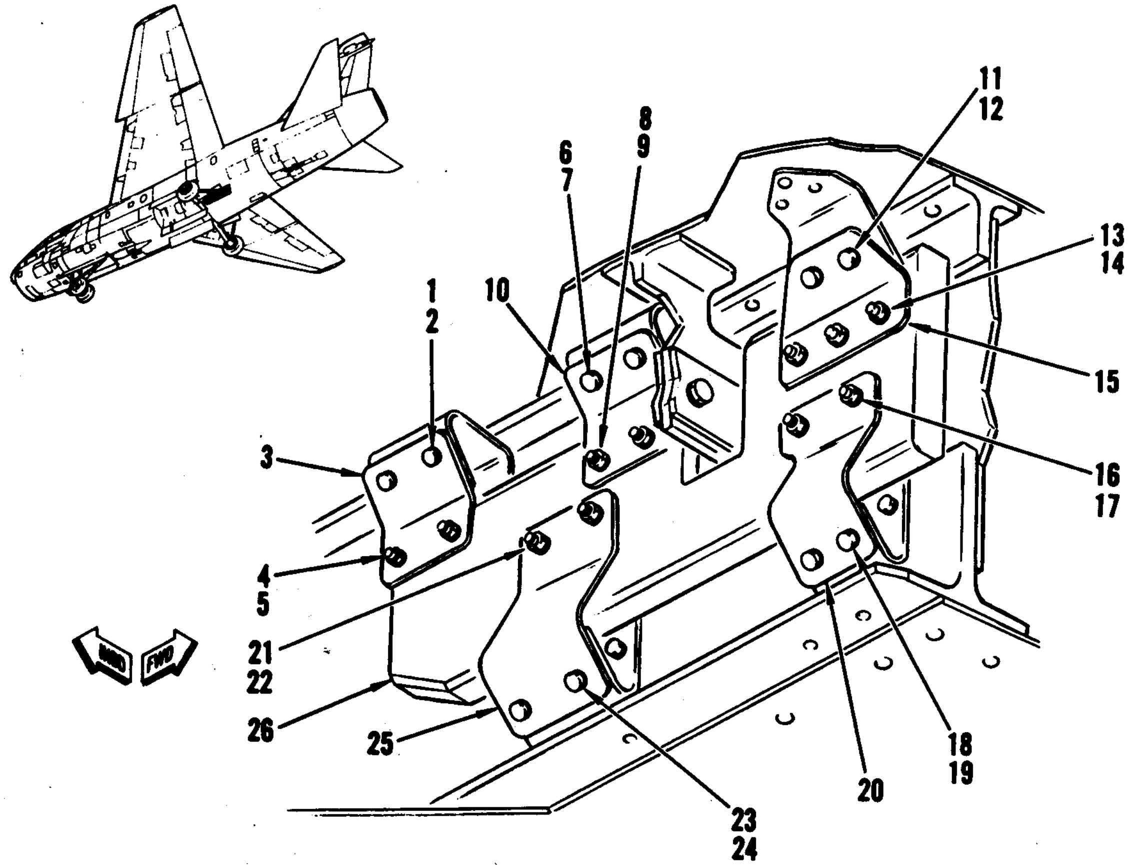
b. Position mount bracket (25) and install two bolts (23) and washers (24) and two nuts (21) and washers (22) securing mount bracket to airframe and armor plate.

c. Position mount bracket (20) and install two bolts (18) and washers (19) and two nuts (16) and washers (17) securing mount bracket to airframe and armor plate.

d. Position mount bracket (15) and install two bolts (11) and washers (12) and three nuts (13) and washers (14) securing mount bracket to airframe and armor plate.

e. Position mount bracket (10) and install two bolts (6) and washers (7) and two nuts (8) and washers (9) securing mount bracket to airframe and armor plate.

f. Position mount bracket (3) and install two bolts (1) and washers (2) and two nuts (4) and washers (5) securing mount bracket to airframe and armor plate.



1. Bolt
2. Washer
3. Bracket
4. Nut
5. Washer
6. Bolt
7. Washer
8. Nut
9. Washer
10. Bracket
11. Bolt
12. Washer
13. Nut
14. Washer
15. Bracket
16. Nut
17. Washer
18. Bolt
19. Washer
20. Bracket
21. Nut
22. Washer
23. Bolt
24. Washer
25. Bracket
26. Armor plate

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Figure 20-2. Fuel System Left Side Armor Plate Removal and Installation

g. Tighten all bolts and nuts securing armor plate to airframe.

h. Install motive flow shutoff valve and alternate fuel feed manual selector valve (T.O. 1A-7D-2-6).

i. Close access 5213-3.

20-21. FUSELAGE MIDSECTION ACCESS PANEL MOUNTED ARMOR PLATE REMOVAL AND INSTALLATION.

20-22. REMOVAL.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

a. Remove applicable access panel from airplane.

b. Identify and note position of each armor plate mount bracket and attaching parts for proper installation in same position on new armor plate.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

c. Remove nuts, bolts, and washers securing mount brackets to armor plate and access panel.

CAUTION

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

d. Lift armor plate from access panel. If as a result of mission requirements armor plate is not to be installed, reinstall armor plate mount brackets on access panel.

20-23. INSTALLATION.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

a. Position armor plate on access panel for installation.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

NOTE

Do not tighten bolts or nuts attaching mount brackets to armor plate and access panel until all attaching bolts have been installed.

b. Install armor plate mount brackets and secure with bolts, nuts, and washers.

c. Install access panel.

SECTION XXI

FUSELAGE AFT SECTION

21-1. DESCRIPTION.

21-2. The fuselage aft section is a semimonocoque structure which extends from FS 526.5 to 712.0. System components housed by the fuselage aft section include the engine, engine mount trunnion, unit horizontal tail control installation, mounting provisions for the strike camera, and battery. Provisions for attaching the unit horizontail tail, aft dorsal fairing, and arresting gear are provided. Also included are mounting provisions for the vertical tail and floodlights.

21-3. Components of the fuselage aft section are a tail cone, generator cooling air duct, overboard vent mast, and engine removal door. The tail cone is installed on the aft end of the aft section to house the engine tailpipe and fair the fuselage. Rotary latches are installed for quick removal of the tail cone. A generator cooling air duct is installed to direct cooling air to the engine driven ac generator. A large engine removal door is provided at the bottom of the aft fuselage to facilitate engine removal. A retractable hydraulically powered arresting gear is installed to stop the airplane during an emergency arrested landing.

21-4. FUSELAGE AFT SECTION ARMOR PLATE ARRANGEMENT. (See figure 1-15.)

21-5. On airplanes AF69-6197 and subsequent, in addition to the four steel armor plates protecting UHT components, protection for vital engine accessories, fuel, and hydraulic system components installed in the engine bay area is provided by 25 ceramic armor plates. The 25 armor plates are located along both sides and bottom of the fuselage aft section and engine removal door from FS 526.5 to 624 to provide maximum protection and accessibility. All armor plates are secured to the airframe or mount brackets with nuts and/or bolts and washers to facilitate removal and installation. The armor plates, except the camera compartment armor plate, will normally be installed in the airplane. The camera compartment armor plate must be removed to allow installation of the camera and reinstalled when the camera is removed.

21-6. TAIL CONE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	*Part Number*	*Nomenclature*	*Use and Application*
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Check latch operation

21-7. REMOVAL. (See figure 21-1.)

a. Insert 1/4-inch square drive extension bar into rotary latch fitting and turn counterclockwise until latches release.

b. Separate tail cone from airplane and remove.

21-8. INSTALLATION. (See figure 21-1.)

a. Before installing tail cone, check the four eyebolts on fuselage bulkhead for condition. If broken or excessively worn, replace eyebolt. If an eyebolt is replaced, adjust until one thread extends through the nut on forward side of bulkhead and eyebolt slot is parallel to fuselage contour.

CAUTION

Before installing tail cone, ensure that all four rotary latches are unlocked. Latches are unlocked when outside plunger is depressed and inside spring is extended. Failure to fully unlock latches will result in damage to latches.

b. Unlock rotary latches and position tail cone on airplane. Insert 1/4-inch square drive extension bar and turn clockwise to lock rotary latches.

c. Check for proper latch operation and adjustment as follows:

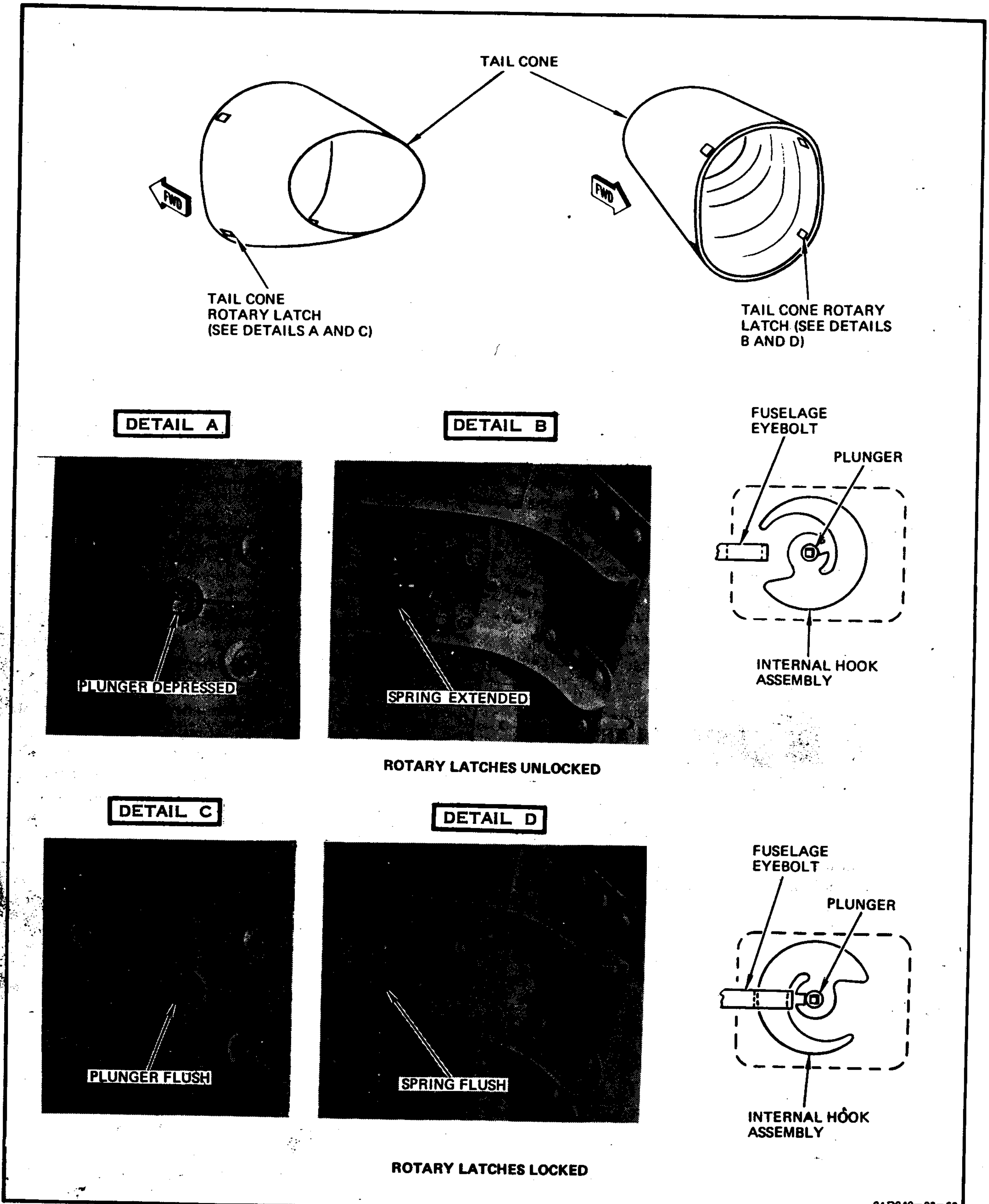


Figure 21-1. Tail Cone Rotary Latch Operation

1. Bearing blocks on each rotary latch should seat against fuselage bulkhead. Adjust nuts on eyebolts(s) as required. Maximum allowable gap between each of the bearing blocks and bulkhead is 0.005 inch at the closest point.

2. Maximum torque required to open a latch with the other three latches closed shall be 70 pound-inches. If any latch exceeds the opening torque, the eyebolt must be adjusted.

3. Latches are fully locked when plunger on outside of latch is flush with airplane skin.

21-9. TAIL CONE ROTARY LATCH ASSEMBLY REPAIR.

21-10. If the lockpin assembly of the tail cone latches should shear or become distorted during tail cone installation, repair as follows:

a. Remove latch assembly by removing four nuts, washers, and bolts attaching the latch to the tail cone.

b. Drill out the two rivets attaching the cover plate to the latch housing and remove the plate.

c. Remove and discard the sheared or damaged lockpin assembly.

d. Install new lockpin assembly.

e. Reinstall plate on latch housing with two MS20426D5 rivets.

f. Reinstall the latch assembly on the tail cone with four bolts, washers, and nuts.

g. Check repaired rotary latch assembly for proper operation.

21-11. GENERATOR COOLING AIR DUCT HOSE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten generator cooling air duct clamps.

21-12. REMOVAL

a. Remove access 6222-1.

b. Remove hardware securing duct to the fuselage air intake and generator cooling air inlet.

c. Remove duct.

21-13. INSTALLATION.

a. Position duct on generator cooling air inlet and position duct to fuselage air intake opening.

b. Secure duct with hose clamps and tighten hose clamp to 20 (±5) pound-inches torque.

c. Secure hose clamps with MS20995C32 lockwire.

d. Close access 6222-1.

21-14. ENGINE REMOVAL DOOR (ACCESS 5222-3) REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power for operational checkout of arresting gear.
	215-00303-41	Multipurpose dolly	Aid in handling engine removal door during removal and installation.
	215-00306-28	Engine removal door adapter	Adapt engine removal door to multipurpose dolly.
	GGG-W-686	Torque wrench 10 to 150 pound-inches	Tighten coupling.

WARNING

Avoid possible radiation contamination of personnel by adhering to following exposure limitations. When physical contact is made with the oil tank source tube, maximum safe exposure time is 15 minutes at any one time or a total of 20 minutes per week. At a distance of 12 inches from the source tube, maximum safe exposure time is 3.3 hours per week. There is no exposure time limit 3 feet from source tube. Any deviations to these limits shall be approved by the base medical service. Personnel working with or near this source tube shall become familiar with the procedures contained in T.O. 00-110N-11.

21-15. REMOVAL.

WARNING

When bathtub section is removed, sharp edge of the UHT presents a hazard to workers. Guard the sharp edge by covering with cushioning material, NSN 8135 00 0013 8962 or similar guarding material. When cutting cushioning material insure that wire edge does not present a sharp pin point.

a. Place arresting gear handle in DOWN and rest hook on a block of wood.

b. Open accesses 5222-3-1 and 6222-2-1.

c. Loosen clamp and disconnect starter intake duct flexible hose from starter (located on right side of engine). Squeeze intake duct flexible hose in a downward direction to ensure hose is completely disconnected.

d. Remove coupling securing low pressure engine air duct to engine flange and disconnect duct.

e. Manually close arresting gear uplock by pushing up on locking mechanism, releasing spring tension on control cable linkage. Disconnect control cable linkage at quick-disconnect.

f. Remove engine tail cone (paragraph 21-6).

g. Open left and right bolt accesses near aft end of engine removal door.

h. Remove two cotter pins, nuts, bolts, and washers from each side of engine removal door.

i. Position dolly with adapter installed under engine removal door.

j. Raise dolly until adapter pads contact door. Check pads for proper fit to door contour.

k. Raise multipurpose dolly until adapter pads start to compress.

WARNING

To prevent possible damage to airplane or injury to personnel, open arresting gear circuit breaker (CB318) prior to engine operation or to applying external hydraulic power when engine removal door is removed and arresting gear control cable is disconnected.

CAUTION

To prevent damage to starter intake duct flexible hose, ensure that hose is disengaged from starter duct before lowering engine removal door.

Damage to electrical harness will occur if door is lowered excessively before disconnecting electrical connector.

l. Unlock fasteners around door and retract dolly sufficiently (approximately 6 inches) to allow performance of steps m and n.

m. On airplanes AF69-6197 and subsequent after T.O. 1A-7D-831, disconnect electrical connector P428, accessible at approximately FS600 on left side of engine removal door.

n. Disconnect combustion chamber drainline.

o. Retract dolly until engine removal door clears airframe and engine, and remove door.

21-16. INSTALLATION.

a. Position dolly with door adapter and engine removal door aligned with airplane. Raise dolly to place door within approximately 6 inches of airplane.

b. Connect combustion chamber drainline.

c. On airplanes AF69-6197 and subsequent after T.O. 1A-7D-831, connect electrical connector P428 at left side of engine removal door.

d. Carefully extend dolly, checking alignment pins for proper alignment in upper edges of door. Raise dolly and door assembly until aft bolts can be installed.

e. Secure door with four bolts, washers, nuts, and cotter pins.

f. Lock fasteners around door. Retract and remove dolly and adapter assembly from airplane.

g. Connect low pressure engine cooling duct as follows:

1. Install gasket on flange end of low pressure engine cooling duct.

2. Position low pressure engine cooling duct on engine flange.

NOTE

If seal bulb does not compress evenly around cooling duct or movement of seal is restricted, refer to paragraph 21-66 for proper cooling duct seal installation.

3. Center low pressure engine cooling duct in engine removal door hole. Ensure seal bulb is evenly compressed around cooling duct and moves freely with spacers secured.

4. Tighten coupling to 70 pound-inches torque.

5. Rap periphery of coupling with a plastic mallet to seat coupling on flange.

6. Tighten coupling to 105 (±10) pound-inches torque.

7. Ensure cooling duct does not extend more than 0.30 inch beyond contour of engine removal door skin.

CAUTION

To prevent damage to hose, do not use sharp tools to install starter intake flexible hose; use hands only. If necessary, a very light coat of VV-P-236 petrolatum may be applied to contact area on intake duct to aid in slipping hose over duct.

NOTE

If starter intake duct does not align with engine removal door, refer to T.O. 1A-7D-2-5 starter installation procedures for duct alignment.

h. Connect starter intake duct flexible hose to starter intake and tighten clamp.

i. Manually close arresting gear uplock mechanism and connect arresting gear control cable quick-disconnect.

j. Install tail cone.

k. Close and lock left and right bolt accesses.

l. Close accesses 5222-3-1 and 6222-2-1.

m. Close arresting gear circuit breaker CB318.

WARNING

To prevent airplane damage or possible injury, check that all personnel and equipment are clear of hook path during testing.

n. Press override button on arresting gear selector valve and operate hand pump to retract arresting gear.

o. Connect electrical power (paragraph 1-28).

p. Place arresting gear handle in the down position, observe arresting gear handle light illumination, hook down light illumination, master caution light flashing, and ensure arresting gear hook is in the down position.

q. Reset master caution light, place arresting gear handle in the up position, manually hand pump arresting gear to the up and locked position, observe arresting gear handle light and hook down lights go out. If improper arresting gear operation or light sequence is noted, refer to T.O. 1A-7D-2-7 and perform arresting gear uplock rigging.

r. Perform operational checkout of AN/ALE-40 chaff/flare system (T.O. 1A-7D-2-15).

s. Disconnect external electrical power (paragraph 1-28).

21-17. ARRESTING GEAR ACTUATING CYLINDER SUPPORT REMOVAL AND INSTALLATION.

a. Open accesses 5223-2 and 6222-2.

b. Depressurize arresting gear accumulator (paragraph 3-59) before removing support.

c. Remove and install support through access 6222-2.

d. Service arresting gear accumulator (paragraph 3-48) following installation of support.

e. Perform arresting gear system operational checkout (T.O. 1A-7D-2-7).

f. Close accesses 5223-2 and 6222-2.

21-18. UNIT HORIZONTAL TAIL (UHT) LOWER ARMOR PLATE REMOVAL AND INSTALLATION. (Airplanes AF69-6189, AF69-6197 and Subsequent.)

NOTE

For removal of access screws and access panels 5133-1 or 6133-1, the UHT must be manually moved to full nose down position by applying down force against leading edge while the control stick is moved AFT.

21-19. REMOVAL. (See figure 21-2.)

a. Open access 5133-1 for left side or access 6133-1 for right side.

b. Remove four bolts (1) and washers (2) from armor plate (3) and remove plate from airplane.

21-20. INSTALLATION. (See figure 21-2.)

a. Open access 5133-1 for left side or access 6133-1 for right side.

b. Position armor plate (3) in airplane and secure with four bolts (1) and washers (2).

c. Close access 5133-1 for left side or access 6133-1 for right side.

21-21. UPPER LEFT ARMOR PLATE (FS 526 TO 552) REMOVAL AND INSTALLATION.

21-22. REMOVAL. (See figure 21-3.)

a. Remove engine (T.O. 1A-7D-2-5).

b. Open access 5222-1.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

c. Remove nut (1), two spacers (2), screw (3), and two clamps (4 and 5) securing lines (6 and 7) to support bracket.

d. Disconnect and remove line (6).

e. Disconnect line (7) at upper connection (8).

f. Remove bowl from hydraulic filter (9) (T.O. 1A-7D-2-4).

g. Remove 16 bolts (10) and washers (11) securing armor plate mount brackets (12) to airframe and remove armor plate (13).

h. Identify location of mount brackets for installation on replacement armor in same positions to ensure proper fit.

CAUTION

To prevent damage to ceramic material when removing or installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

i. Remove 16 nuts (14) and washers (15) securing mount brackets (16) to armor plate (13).

21-23. INSTALLATION. (See figure 21-3.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. Install all armor plate mount brackets (16) on armor plate (13) with 16 nuts (14) and washers (15).

b. Position armor on airframe and secure mount brackets (12) with 16 bolts (10) and washers (11).

c. Install bowl on hydraulic filter (5) (T.O. 1A-7D-2-4).

d. Connect hydraulic line (7) at upper connection (8).

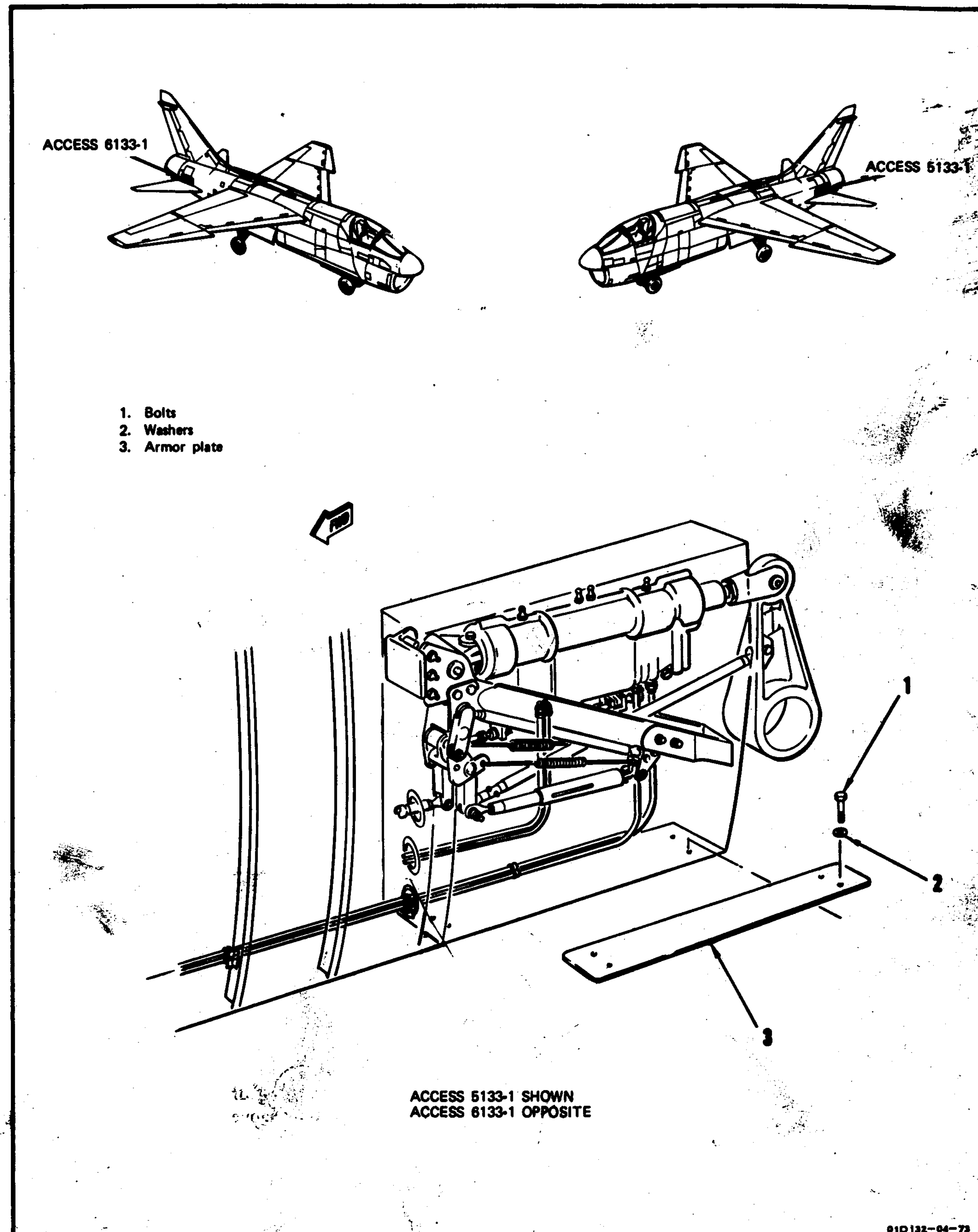
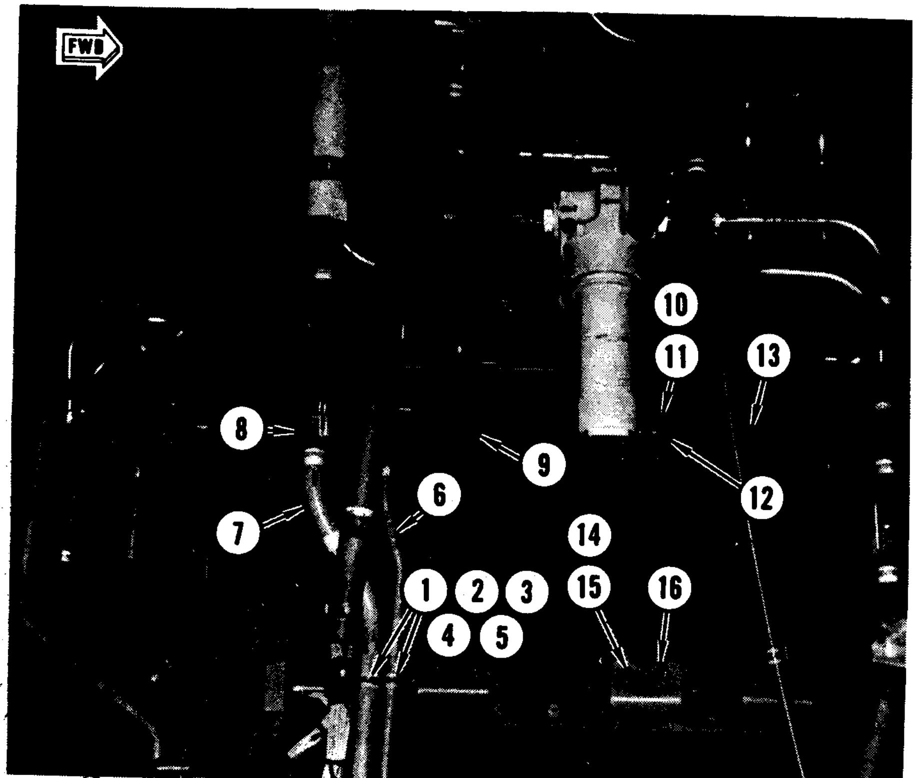


Figure 21-2. Unit Horizontal Tail (UHT) Lower Armor Plate Removal and Installation (Airplanes AF69-6197 and Subsequent)



1. Nut
2. Spacer
3. Screw
4. Clamp
5. Clamp
6. Hydraulic line
7. Hydraulic line
8. Connection
9. Hydraulic filter
10. Bolt
11. Washer
12. Bracket
13. Armor plate
14. Nut
15. Washer
16. Bracket

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Figure 21-3. Upper Left Armor Plate (FS 526 to 552) Removal and Installation

e. Install hydraulic line (6).

f. Secure lines (6 and 7) to support bracket with two clamps (4 and 5), two spacers (2), screw (3), and nut (1).

g. Install engine (T.O. 1A-7D-2-5).

h. Close access 5222-1.

i. Perform hydraulic system air check (paragraph 3-40).

21-24. LOWER LEFT ARMOR PLATE (FS 526) REMOVAL AND INSTALLATION.

21-25. REMOVAL. (See figure 21-4.)

a. Remove engine (T.O. 1A-7D-2-5).

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

b. Open access 5222-1.

c. Remove nut (1), screw (2), spacer (3), and clamps (4 and 5) securing drain tube assembly (6) to hydraulic line (7) and remove tube assembly.

d. Disconnect hydraulic lines (7, 8, and 9) at support bracket (10).

e. Remove nut (11), check valve (12), and washer (13) securing hose assembly (14) to bracket (10).

f. Remove nut (15), elbow (16), and washer (17) securing hose assembly (18) to bracket (10).

g. Remove nut (19), elbow (20), and washer (21) securing hose assembly (22) to bracket (10).

h. Remove nut (23), screw (24), spacer (25), and clamps (26 and 27) securing tube assembly (28) to hydraulic line (7) and remove tube assembly.

i. Remove six bolts (29) and washers (30) securing three armor plate mount brackets (31, 32, and 33) to airframe.

j. Identify mount bracket locations for installing brackets in same location on replacement armor.

CAUTION

To prevent damage to ceramic material when removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

k. Remove six nuts (34) and washers (35) securing three mount brackets (31, 32, and 33) to armor plate (36).

21-26. INSTALLATION. (See figure 21-4.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

To prevent damage to ceramic material when installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. Install three armor plate mount brackets (31, 32, and 33) on armor plate (36) with six nuts (34) and washers (35).

b. Position armor plate (36) and secure to airframe with six bolts (29) and washers (30).

c. Install tube assembly (28) and secure to hydraulic line (7) with clamps (26 and 27), spacer (25), screw (24), and nut (23).

d. Connect hose assembly (22) to support bracket (10) with washer (21), elbow (20), and nut (23); connect hydraulic line (9) to elbow (20).

e. Connect hose assembly (18) to support bracket (10) with washer (17), elbow (16), and nut (15); connect hydraulic line (8) to elbow (16).

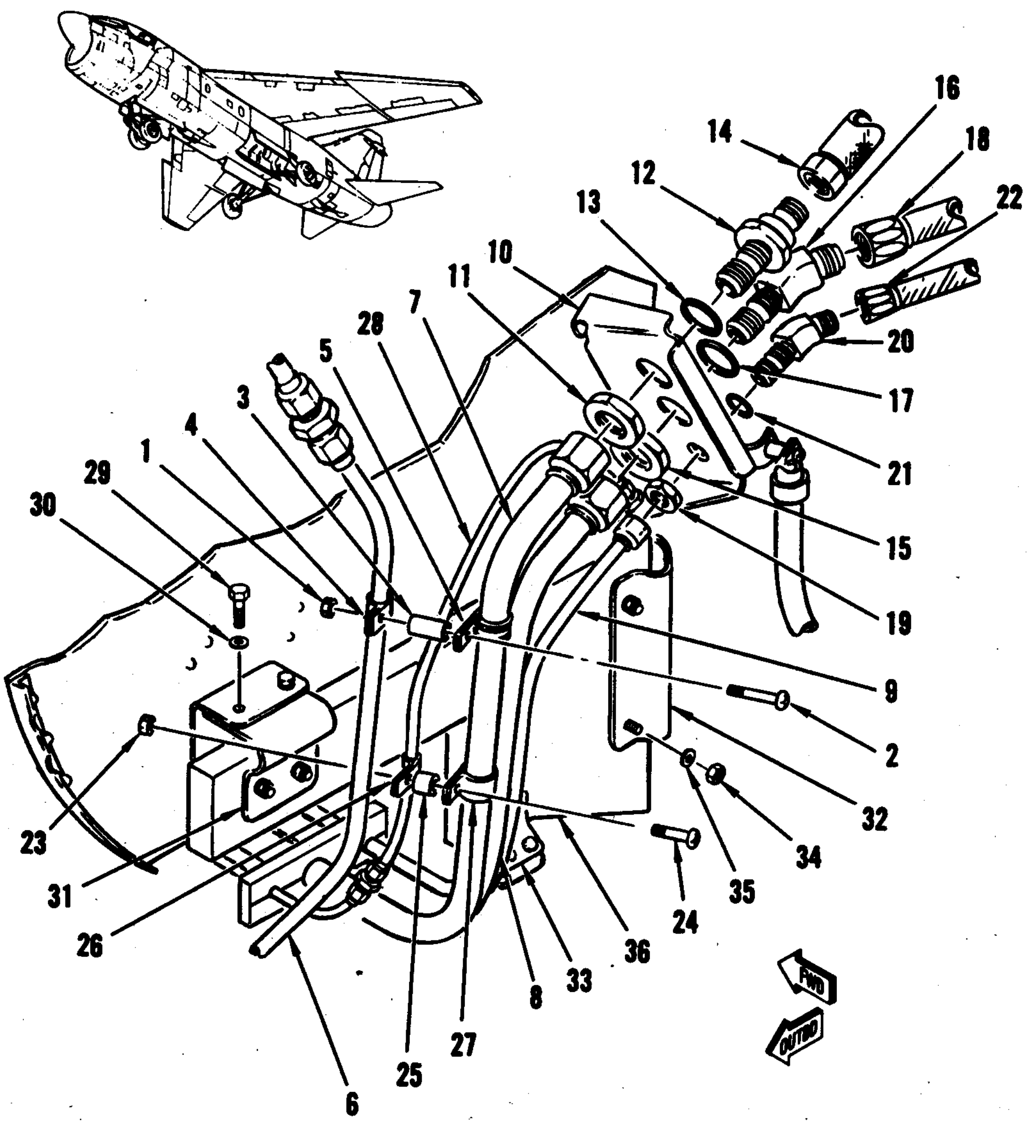
f. Connect hose assembly (14) to support bracket (10) with washer (13), check valve (12), and nut (11); connect hydraulic line (7) to check valve.

g. Install tube assembly (6) and secure to hydraulic line (7) with clamps (4 and 5), spacer (3), screw (2), and nut (1).

h. Install engine (T.O. 1A-7D-2-5).

i. Close access 5222-1.

j. Perform hydraulic system air check (paragraph 3-40).



1. Nut
2. Screw
3. Spacer
4. Clamp
5. Clamp
6. Tube assembly
7. Hydraulic line
8. Hydraulic line
9. Hydraulic line
10. Bracket
11. Nut
12. Check valve
13. Washer
14. Hose assembly
15. Nut
16. Elbow
17. Washer
18. Hose assembly
19. Nut
20. Elbow
21. Washer
22. Hose assembly
23. Nut
24. Screw
25. Spacer
26. Clamp
27. Clamp
28. Tube assembly
29. Bolt
30. Washer
31. Bracket
32. Bracket
33. Bracket
34. Nut
35. Washer
36. Armor plate

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Figure 21-4. Lower Left Armor Plate (FS 526) Removal and Installation

21-27. LOWER RIGHT ARMOR PLATE (FS 526) REMOVAL AND INSTALLATION.

21-28. REMOVAL. (See figure 21-5.)

a. Remove engine (T.O. 1A-7D-2-5).

b. Open access 6222-1.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

c. Remove camera shroud (T.O. 1A-7D-2-14).

d. Remove flexible hydraulic hose (1).

e. Remove three nuts (2), six washers (3), and three bolts (4) securing manifold (5) to support bracket (6).

f. Disconnect hydraulic line (7) at manifold (5).

g. Disconnect tube assembly (8) at union (9).

h. Disconnect tube assembly (10) at union (11).

i. Remove four bolts (12) and washers (13) securing armor plate mount brackets (14 and 15) and armor plate (16) to bulkhead brackets.

j. Remove two bolts (17) and washers (18) securing armor plate mounting bracket (19) to bulkhead bracket.

k. To ensure proper fit, identify location of armor plate mount brackets for installation on replacement armor plate.

CAUTION

To prevent damage to ceramic material when removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

l. Remove six nuts (20) and washers (21) securing armor plate mount brackets (14, 15 and 19) to armor plate (16).

21-29. INSTALLATION. (See figure 21-5.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

To prevent damage to ceramic material when installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. Install armor plate mount brackets (14, 15, and 19) on armor plate (16) with six nuts (20) and washers (21).

b. Position armor plate (16) on bulkhead brackets and secure mount brackets (14 and 15) with six bolts (12) and washers (13).

c. Secure mount bracket (19) to bulkhead bracket with two bolts (17) and washers (18).

d. Connect tube assembly (10) to union (11).

e. Connect tube assembly (8) to union (9).

f. Install manifold (5) on bracket (6) with three bolts (4), six washers (3), and three nuts (2).

g. Install flexible hydraulic hose (1).

h. Connect hydraulic line (7) to manifold (5).

i. Install camera shroud (T.O. 1A-7D-2-14).

j. Install engine (T.O. 1A-7D-2-5).

k. Close access 6222-1.

l. Perform hydraulic system air check (paragraph 3-40).

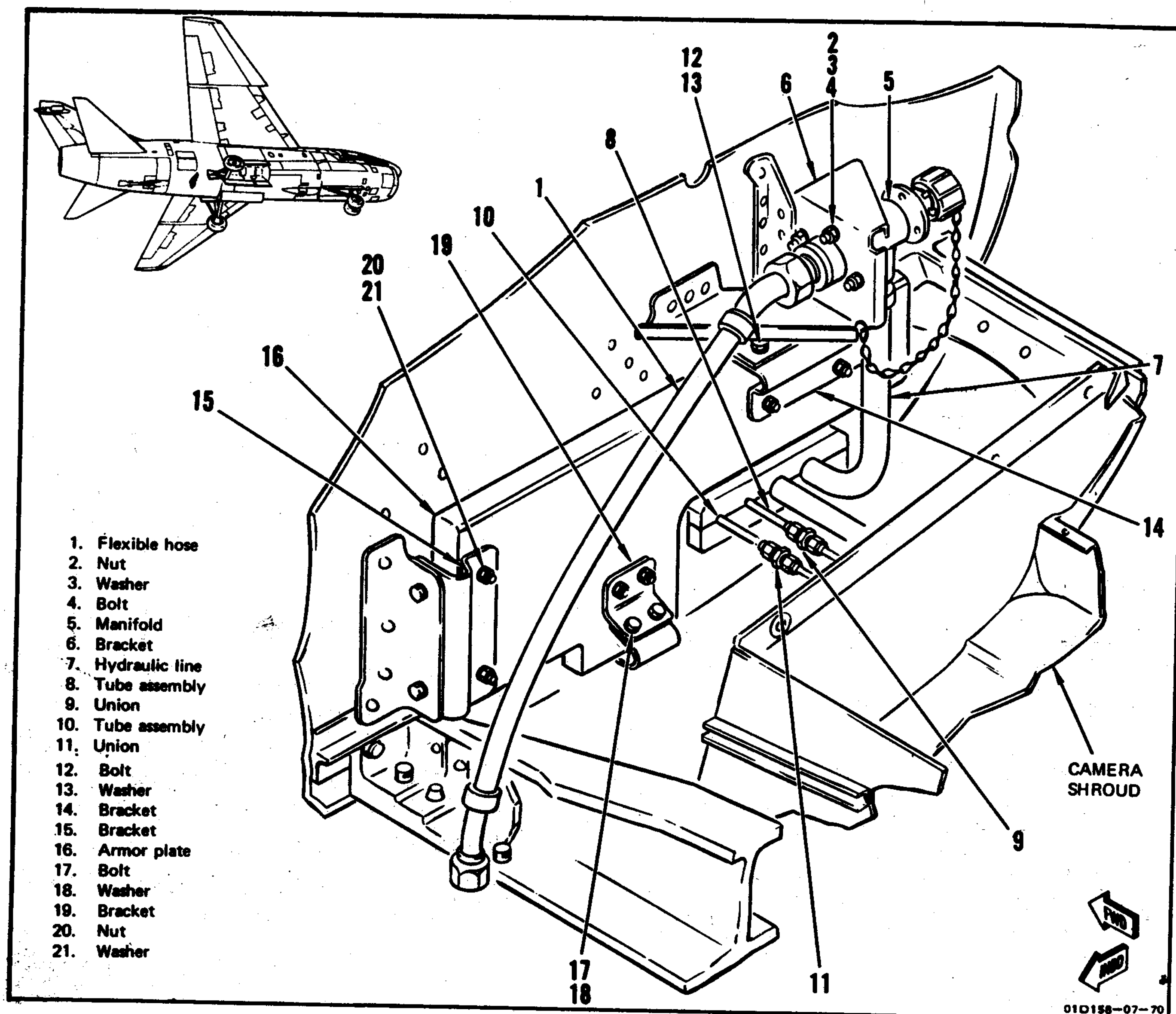

Figure 21-5. Lower Right Armor Plate (FS 526) Removal and Installation

21-30. LOWER ARMOR PLATE (FS 526 TO 552) REMOVAL AND INSTALLATION.

21-31. REMOVAL. (See figure 21-6.)

a. Remove engine (T.O. 1A-7D-2-5).

b. Open access 5222-1.

c. Remove two screws (1) and clamp assembly (2) securing fuel tube (3) to airframe.

d. Disconnect and remove fuel tube (3).

e. Remove starter fuel supply line (4).

f. Remove fuel boost pump (5) (T.O. 1A-7D-2-6).

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

To prevent damage to ceramic material when removing or installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

g. Remove 20 nuts (6) and washers (7) securing splice plate (8) to armor plate and remove splice plate.

h. Remove six bolts (9) and washers (10) securing three armor plate mount brackets (11, 12, and 13) and upper section of armor plate (14) to airframe.

i. Remove armor plate from airplane and identify location of mount brackets (11, 12, and 13) for installing in the same place on replacement armor plate.

j. Remove four nuts (15) and washers (16) securing mount brackets (11, 12, and 13) to armor plate (14).

CAUTION

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

k. Remove four bolts (17) and washers (18) securing lower armor plate (19) and two mount brackets (20 and 21) to airframe.

l. Remove armor plate from airplane and identify location of mount brackets (20 and 21).

m. Remove six nuts (22) and washers (23) securing mount brackets (20 and 21) to armor plate (19).

21-32. INSTALLATION. (See figure 21-6.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. Install two armor plate mount brackets (20 and 21) on lower armor plate (19) with four washers (23) and nuts (22).

b. Position armor plate with attached brackets for installation and secure to airframe with four bolts (17) and washers (18).

c. Install three armor plate mount brackets (11, 12, and 13) on upper section of armor plate (14) with six washers (16) and nuts (15).

d. Position armor plate with attached brackets for installation and secure to airframe with four bolts (9) and washers (10).

e. Install splice plate (8) on armor with 20 washers (7) and nuts (6).

f. Install fuel boost pump (T.O. 1A-7D-2-6).

g. Install fuel tube (3). Secure to airframe with clamp assembly (2) and two screws (1).

h. Install starter fuel supply line (4).

i. Install engine (T.O. 1A-7D-2-5).

j. Close access 5222-1.

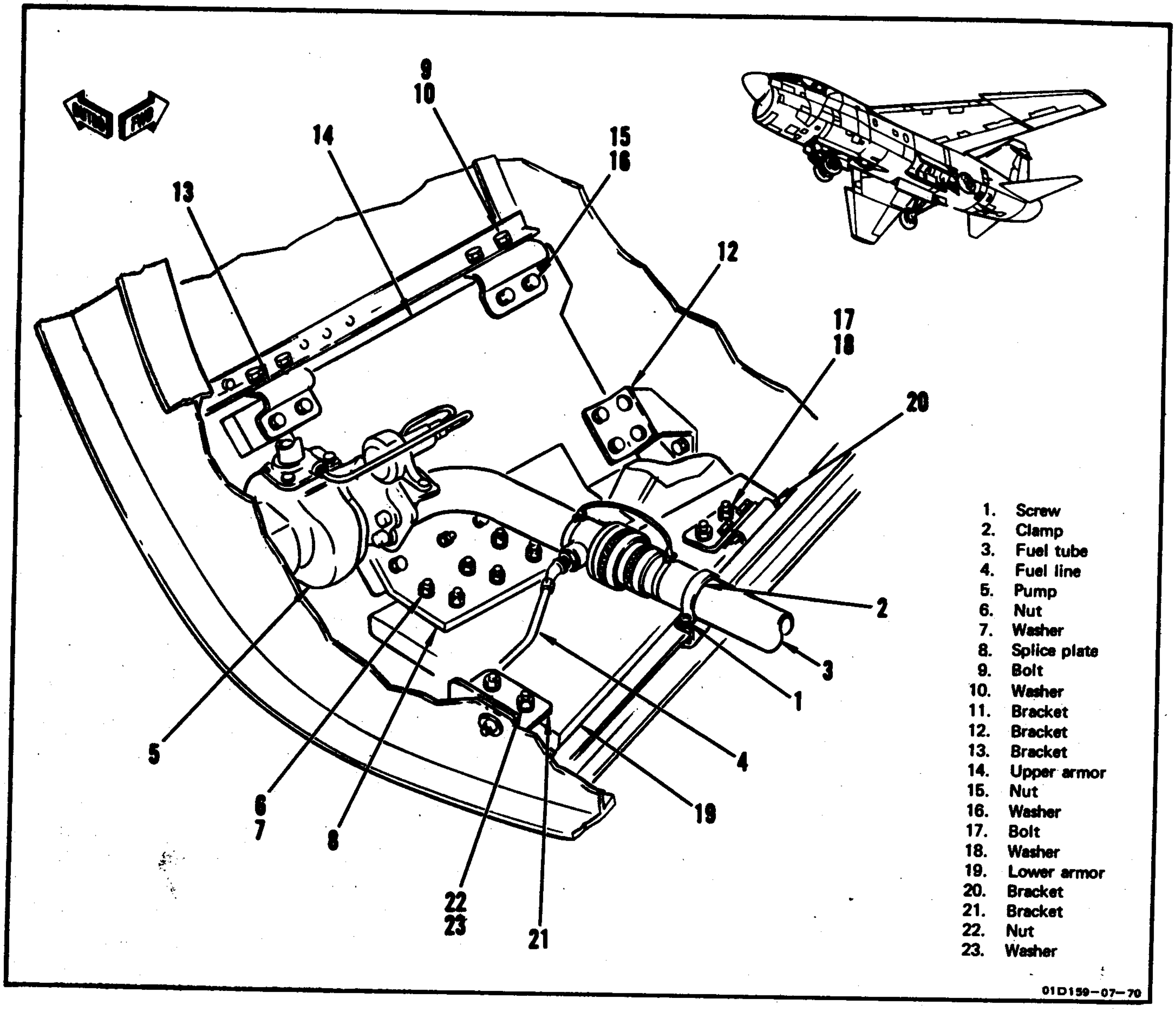

Figure 21-6. Lower Armor Plate (FS 526 to 552) Removal and Installation

21-33. CAMERA COMPARTMENT ARMOR PLATE REMOVAL AND INSTALLATION.

21-34. REMOVAL. (See figure 21-7.)

a. Open access 6222-1.

b. Remove camera compartment cover.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

c. Remove electrical connector (1) from stowage receptacle (2).

CAUTION

To prevent damage to ceramic material when removing or installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

d. Remove nut (3) and washer (4) securing clamp (5) and wire harness (6) to armor plate (7).

e. Remove eight bolts (8) and washers (9) securing four armor plate mount brackets (10) to airframe, and remove armor plate (7) from compartment.

f. Identify mount brackets for installation on replacement armor plate.

CAUTION

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

g. If armor plate is to be replaced, remove eight nuts (11) and washers (12) securing mount brackets (10) to armor plate (7).

21-35. INSTALLATION. (See figure 21-7.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. Install armor plate mount brackets (10) on armor plate (7) with eight nuts (11) and washers (12).

b. Position armor plate (7) in camera compartment and secure mount brackets (10) to airframe with eight bolts (8) and washers (9).

c. Secure wire harness (6) to armor plate (7) with clamp (5), washer (4), and nut (3).

d. Stow connector (1) in receptacle (2).

e. Install camera compartment cover.

f. Close access 6222-1.

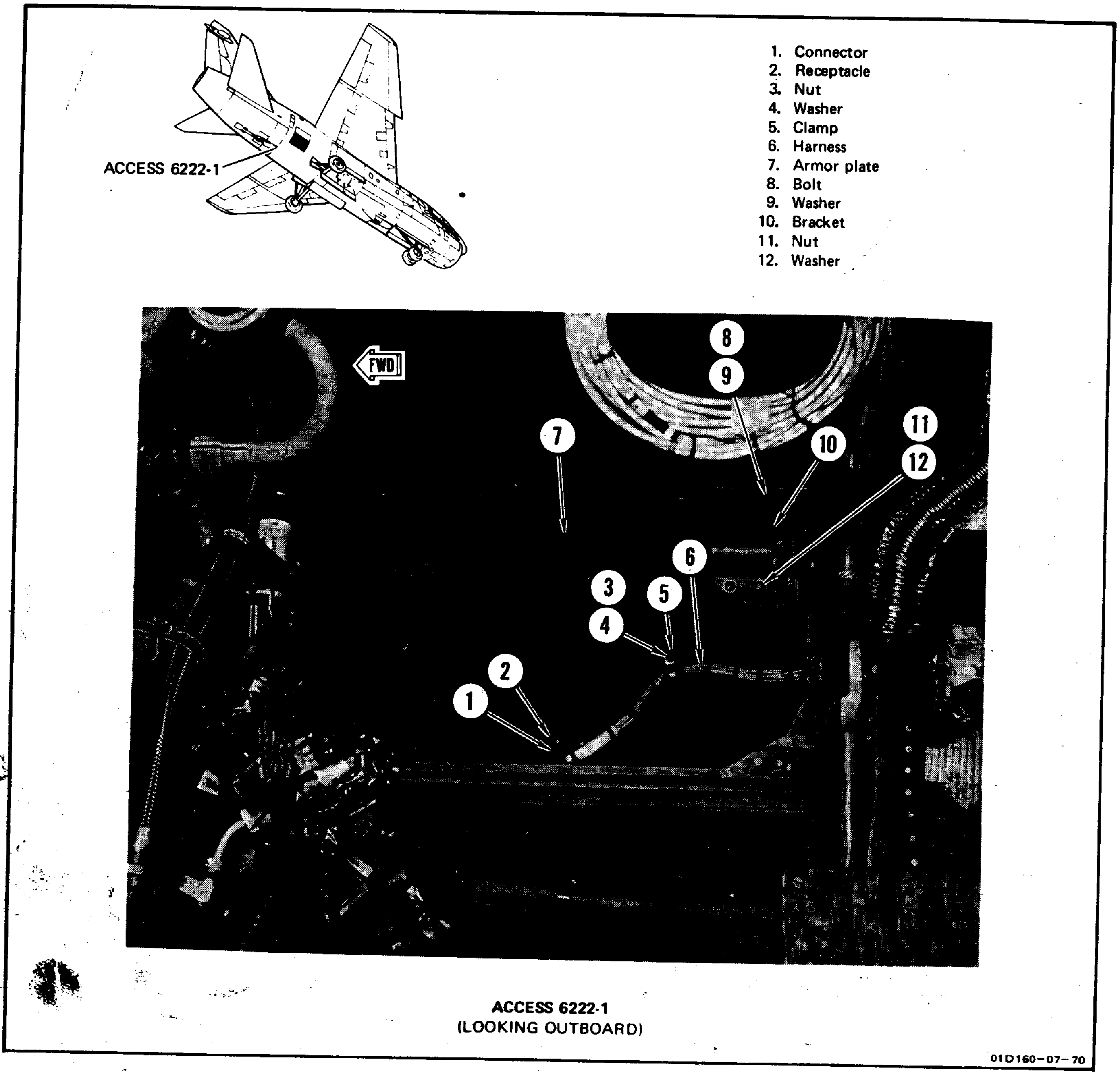

Figure 21-7. Camera Compartment Armor Plate Removal and Installation

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21-36. UPPER RIGHT ARMOR PLATE (FS 526 TO 552) REMOVAL AND INSTALLATION.

21-37. REMOVAL. (See figure 21-8.)

a. Remove engine (T.O. 1A-7D-2-5).

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

b. Remove screw (1), nut (2), washer (3), and clamp (4) securing wire harness to support bracket.

c. Remove screw (5), nut (6), washer (7), and clamp (8) securing wire harness to support bracket.

d. Remove nut (9), lockwasher (10), and washer (11) securing ground terminals (12) to support bracket.

e. Remove screw (13), nut (14), washer (15), spacer (16), and clamp (17) securing wire harness to support bracket.

f. Open access 6222-1.

g. Remove emergency wing transfer selector valve (T.O. 1A-7D-2-6).

h. Remove four screws securing generator cooling vent (18) and remove vent.

CAUTION

To prevent damage to ceramic material when removing or installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

i. Remove six nuts (19) and washers (20) securing bracket (21) to armor plate (22).

j. Swing bracket (21) and attached wiring inboard to provide clearance for armor plate removal.

k. Disconnect camera test switch connector (23).

l. Identify location of armor plate mount brackets (24) for installation on replacement armor.

m. Remove 14 bolts (25) and washers (26) securing mount brackets (24) and armor plate (22) to airframe and remove armor plate.

CAUTION

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

n. Remove eight nuts (27) and washers (28) securing remaining brackets (29) to armor plate.

21-38. INSTALLATION. (See figure 21-8.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. Install lower forward and aft armor plate mount brackets (24) on armor plate (22) with four nuts (27) and washers (28).

b. Position armor plate (22) on airframe and install all mount brackets (29) on airframe with 14 bolts (25) and washers (26).

c. Install wiring support bracket (21) on center armor studs and secure with six nuts (19) and washers (20).

d. Install remaining four nuts (19) and washers (20) securing armor plate (22) to mount brackets (24).

e. Connect camera test switch connector (23).

f. Install emergency wing transfer selector valve (T.O. 1A-7D-2-6).

g. Install generator cooling vent (18) with four machine screws.

h. Secure wire harness to support bracket with clamp (4), screw (1), washer (3), and nut (2).

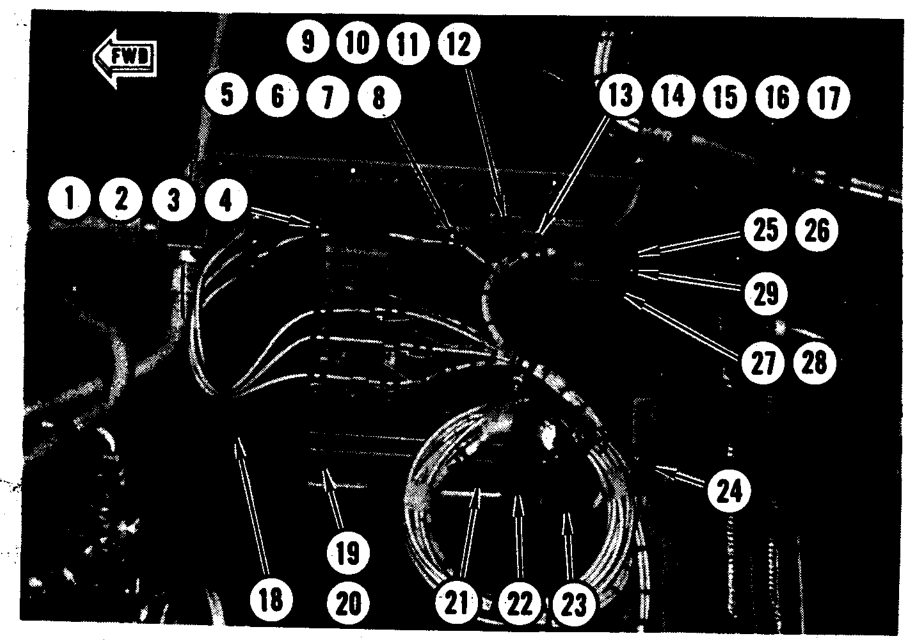
i. Secure wire harness to support bracket with clamp (8), screw (5), washer (7), and nut (6).

j. Secure ground terminals (12) to support bracket with washer (11), lockwasher (10), and nut (9).

k. Secure wire harness to support bracket with clamp (17), screw (13), spacer (16), washer (15), and nut (14).

l. Install engine (T.O. 1A-7D-2-5).

m. Close access 6222-1.



1. Screw
2. Nut
3. Washer
4. Clamp
5. Screw
6. Nut
7. Washer
8. Clamp
9. Nut
10. Lockwasher
11. Washer
12. Terminal
13. Screw
14. Nut
15. Washer
16. Spacer
17. Clamp
18. Vent
19. Nut
20. Washer
21. Bracket
22. Armor plate
23. Connector
24. Bracket
25. Bolt
26. Washer
27. Nut
28. Washer
29. Bracket

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Figure 21-8. Upper Right Armor Plate (FS 526 to 552) Removal and Installation

21-39. UPPER LEFT ARMOR PLATE (FS 552 TO 590) REMOVAL AND INSTALLATION.

21-40. REMOVAL. (See figure 21-9.)

a. Remove engine (T.O. 1A-7D-2-5).

CAUTION

Handle armor plate with care. The ceramic facing material is very hard and brittle and may crack if dropped or struck with a sharp object.

To prevent damage to ceramic material when removing or installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

b. Remove eight nuts (1) and washers (2) securing splice plate (3) to armor plates (4 and 5) and remove splice plate.

c. Open access 5222-2.

CAUTION

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

d. Remove 10 bolts (6) and washers (7) securing five aft armor plate mount brackets (8) to airframe and remove armor plate (4).

e. Identify location of armor plate mount brackets (8) for installation on replacement armor.

f. Remove 10 nuts (9) and washers (10) securing fire armor plate mount brackets (8) to aft armor plate (4).

NOTE

Gain access to upper forward armor plate mount bracket through fuel boost pump drive motor filter inspection door.

g. Remove 10 bolts (11) and washers (12) securing five forward armor plate mount brackets (13) to airframe.

h. Move armor plate (5) aft and inboard to remove from airplane.

i. Identify location of armor plate mount brackets (13) and remove ten nuts (14) and washers (15) securing five brackets to forward armor plate (5).

21-41. INSTALLATION. (See figure 21-9.)

CAUTION

Handle armor plate with care. The ceramic facing material is very hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. Install five armor plate mount brackets (13) on forward armor plate (5) with 10 washers (15) and nuts (14).

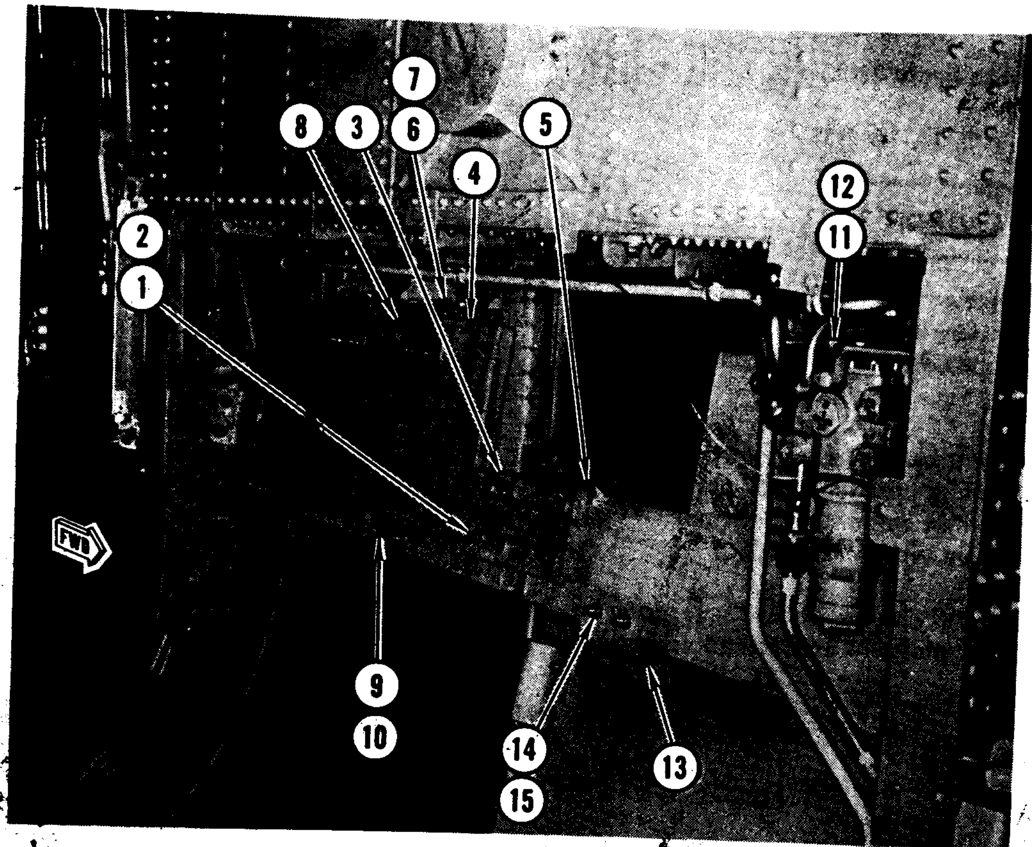
b. Position armor plate (5) on airframe and secure with 10 bolts (11) and washers (12).

c. Install five armor plate mount brackets (8) on aft armor plate (4) with 10 washers (10) and nuts (9).

d. Position armor (4) on airframe and secure with 10 bolts (6) and washers (7).

e. Install splice plate (3) on armor studs and secure with 8 washers (2) and nuts (1).

f. Install engine (T.O. 1A-7D-2-5).



1. Nut
2. Washer
3. Splice plate
4. Armor plate
5. Armor plate
6. Bolt
7. Washer
8. Bracket
9. Nut
10. Washer
11. Bolt
12. Washer
13. Bracket
14. Nut
15. Washer

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Figure 21-9. Upper Left Armor Plate (FS 552 to 590) Removal and Installation

21-42. MID LEFT ARMOR PLATE (FS 552 TO 570) REMOVAL AND INSTALLATION.

21-43. REMOVAL. (See figure 21-10.)

a. Remove engine (T.O. 1A-7D-2-5).

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

b. Remove fuel boost pump hydraulic motor (T.O. 1A-7D-2-6).

c. Remove screw (1), nut (2), spacer (3), and two clamps (4) securing fuel lines (5 and 6) to support bracket.

d. Remove screw (7), nut (8), spacer (9), and two clamps (10) securing fuel lines (5 and 6).

e. Disconnect and remove fuel lines.

f. Remove flexible hydraulic drain line (11).

CAUTION

To prevent damage to ceramic material when removing and installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

g. Remove 14 bolts (12) and washers (13) securing armor plate mount brackets (14) to bulkheads and longeron.

h. Identify location of armor plate mount brackets (14) for installation on replacement armor.

CAUTION

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

i. Remove six nuts (15) and washers (16) securing three aft armor mount brackets (14) to armor plate (17).

j. Lift aft edge of armor plate and move to the rear to remove from airplane.

21-44. INSTALLATION. (See figure 21-10.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

To prevent damage to ceramic material when removing and installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. On replacement armor plate, use eight nuts (15) and washers (16) and install all armor mount brackets (14) except those along aft edge.

b. Position armor plate (17) for installation and install three aft armor plate mount brackets (14) with six nuts (15) and washers (16).

c. Secure armor plate mount brackets (14) to bulkheads and longeron with 14 bolts (12) and washers (13).

d. Install flexible hydraulic drain line (11).

e. Install fuel lines (5 and 6).

f. Secure fuel lines (5 and 6) to support bracket with screw (1), two clamps (4), spacer (3), and nut (2).

g. Clamp fuel lines (5 and 6) with screw (7), two clamps (10), spacer (9), and nut (8).

h. Install fuel boost pump hydraulic motor (T.O. 1A-7D-2-6).

i. Install engine (T.O. 1A-7D-2-5).

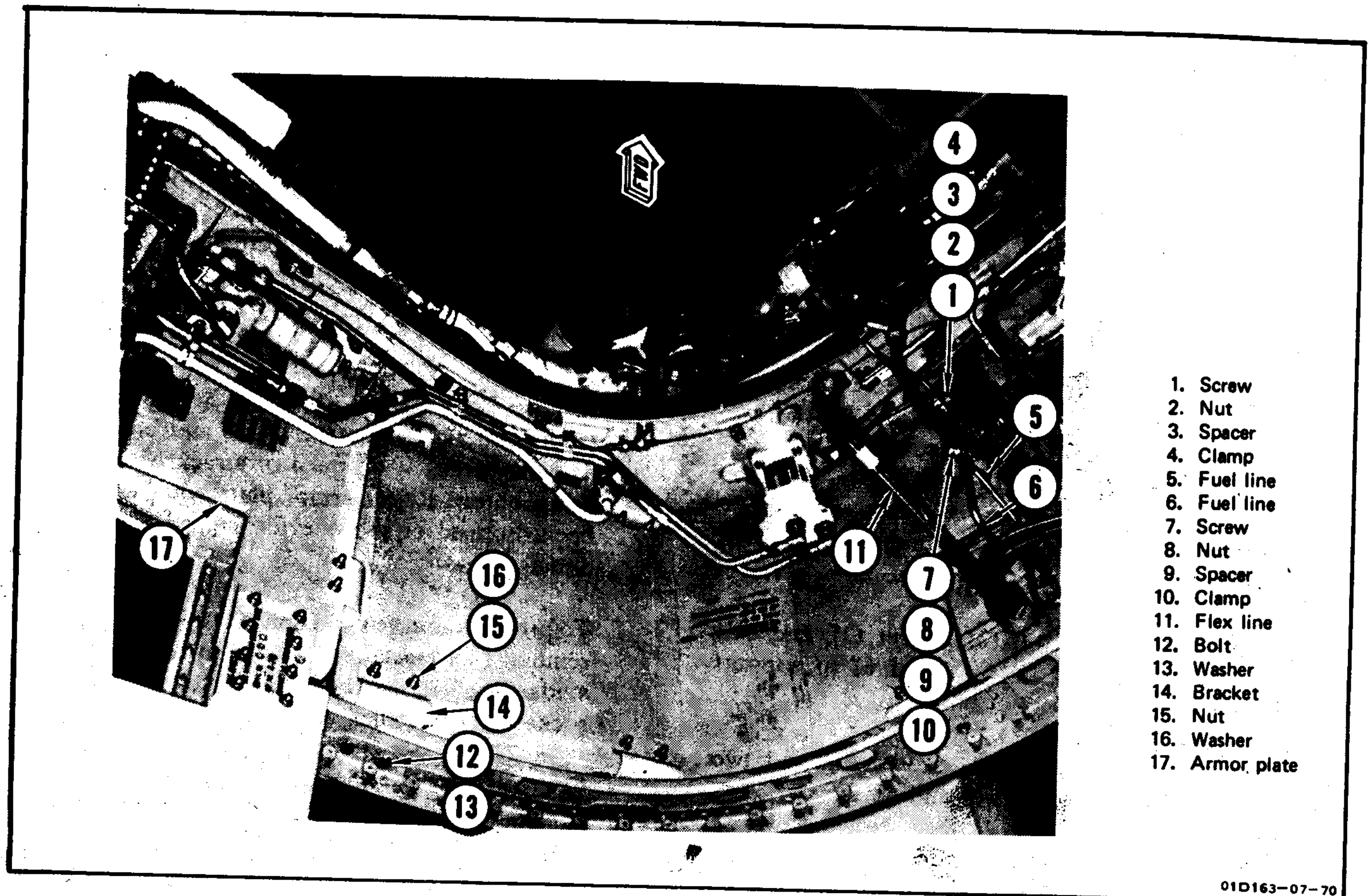


Figure 21-10. Mid Left Armor Plate (FS 552 to 570) Removal and Installation

21-45. LOWER ARMOR PLATE (FS 552 TO 570) REMOVAL AND INSTALLATION.

21-46. REMOVAL. (See figure 21-11.)

a. Remove engine (T.O. 1A-7D-2-5).

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

b. Disconnect flexible fuel drain line (1).

c. Remove screw (2), nut (3), three spacers (4), and three clamps (5) securing hydraulic lines (6, 7, and 8).

d. Remove screw (9), nut (10), two spacers (11), and two clamps (12) securing hydraulic lines (6 and 7).

e. Remove arresting gear actuator accumulator (T.O. 1A-7D-2-7).

f. Remove four bolts (13) securing forward arms of A-frame yoke (14).

g. Swing forward end of A-frame yoke up to allow clearance for armor plate (15) removal.

h. Remove 12 bolts (16) and washers (17) securing armor plate mount brackets (18) to airframe.

i. Lift aft end of armor plate (15) and move to the rear to clear bulkhead.

j. Remove armor plate (15) with attached mount brackets (18) from airplane.

CAUTION

To prevent damage to ceramic material when removing or installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

k. Identify armor plate mount bracket (18) locations. Remove 12 nuts (19) and washers (20) and remove mount brackets (18) from armor plate (15).

21-47. INSTALLATION. (See figure 21-11.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

a. Attach mount brackets (18) to armor plate (15) with 12 nuts (19) and washers (20).

b. Position armor plate (15) and attached mount brackets for installation and secure with 12 bolts (16) and washers (17).

c. Lower forward A-frame yoke (14) and install four bolts (13) securing yoke arms to longerons.

d. Install hydraulic lines (6, 7, and 8).

e. Secure hydraulic lines (6, 7, and 8) to support bracket (21) with three clamps (5), three spacers (4), screw (2), and nut (3).

f. Secure hydraulic lines (6 and 7) to support bracket (22) with two clamps (12), two spacers (11), screw (9), and nut (10).

g. Install flexible fuel line (1).

h. Install arresting gear actuator accumulator (T.O. 1A-7D-2-7).

i. Install engine (T.O. 1A-7D-2-5).

21-48. MID RIGHT ARMOR PLATE (FS 552 TO 570) REMOVAL AND INSTALLATION.

21-49. REMOVAL. (See figure 21-12.)

a. Remove engine (T.O. 1A-7D-2-5).

CAUTION

Handle armor plate with care. The ceramic facing material is very hard and brittle and may crack if dropped or struck with a sharp object.

b. Remove battery drain line (1).

CAUTION

To prevent damage to ceramic material when removing or installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

c. Remove armor plate (2) as follows:

1. Remove eight nuts (3) and washers (4) securing forward splice plate (5) and remove splice plate from armor plates.

2. Remove 12 nuts (6) and washers (7) securing aft splice plate (8) and remove splice plate from armor plates.

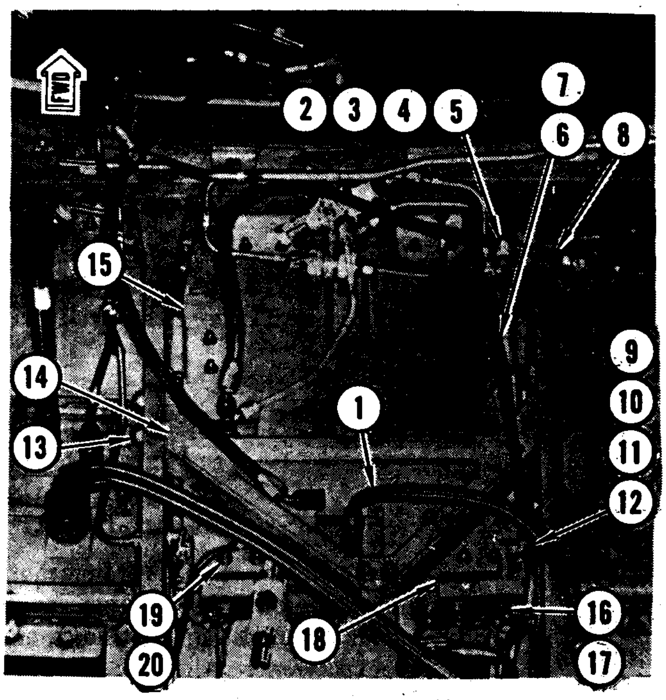
3. Remove eight bolts (9) and washers (10) securing four armor plate mount brackets (11) to airframe.

4. Remove armor plate (2) and attached brackets (11).

5. Identify locations of armor plate mount brackets (11) for installation on replacement armor plate.

6. Remove eight nuts (12) and washers (13) to remove mount brackets (11) from armor plate (2).

d. Remove lower camera cooling line (14).



1. Drain line
2. Screw
3. Nut
4. Spacer
5. Clamp
6. Hydraulic line
7. Hydraulic line
8. Hydraulic line
9. Screw
10. Nut
11. Spacer
12. Clamp
13. Bolt
14. Yoke
15. Armor plate
16. Bolt
17. Washer
18. Bracket
19. Nut
20. Washer

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Figure 21-11. Lower Armor Plate (FS 552 to 570) Removal and Installation

e. Tag and disconnect electrical wires at rear of electrical connector (15).

f. Remove ten bolts (9) and washers (10) securing five armor plate mount brackets (16) to airframe.

g. Remove armor plate (17) and attached brackets (16) from airplane.

h. Identify locations of armor plate mount brackets (16) for installation on replacement armor plate.

i. Remove 10 nuts (18) and washers (19) to remove brackets from armor plate (17).

21-50. INSTALLATION. (See figure 21-12.)

CAUTION

Handle armor plate with care. The ceramic facing material is very hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or which shows evidence of surface damage.

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. Install five armor plate mount brackets (16) on armor plate (17) with 10 nuts (18) and washers (19).

b. Position armor plate on airframe and secure mount brackets (16) with ten bolts (9) and washers (10).

c. Install four armor plate mount brackets (11) on armor plate (2) with eight nuts (12) and washers (13).

d. Position armor plate on airframe and secure mount brackets (11) with eight bolts (9) and washers (10).

e. Install forward splice plate (5) on armor plate studs and secure with eight washers (4) and nuts (3).

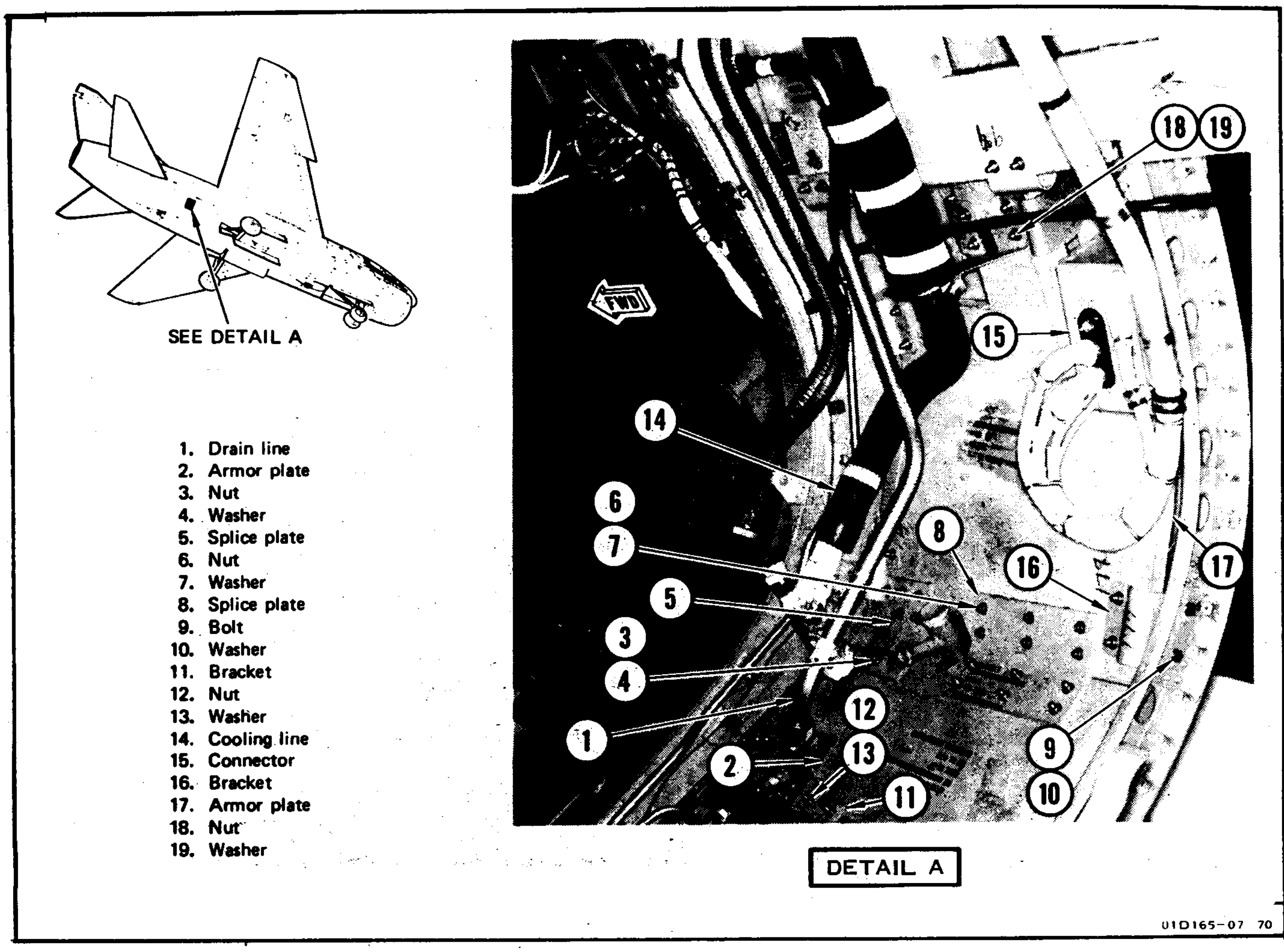


Figure 21-12. Mid Right Armor Plate (FS 552 to 570) Removal and Installation

f. Install aft splice plate (8) on armor plate studs and secure with 12 washers (7) and nuts (6).

g. Connect electrical wires at rear of electrical service connector (15).

h. Install lower camera cooling line (14).

i. Install battery drain line (1).

j. Install engine (T.O. 1A-7D-2-5).

21-51. UPPER RIGHT ARMOR PLATE (FS 552 TO 590) REMOVAL AND INSTALLATION.

21-52. REMOVAL. (See figure 21-13.)

a. Remove engine (T.O. 1A-7D-2-5).

b. Open access 6222-2.

CAUTION

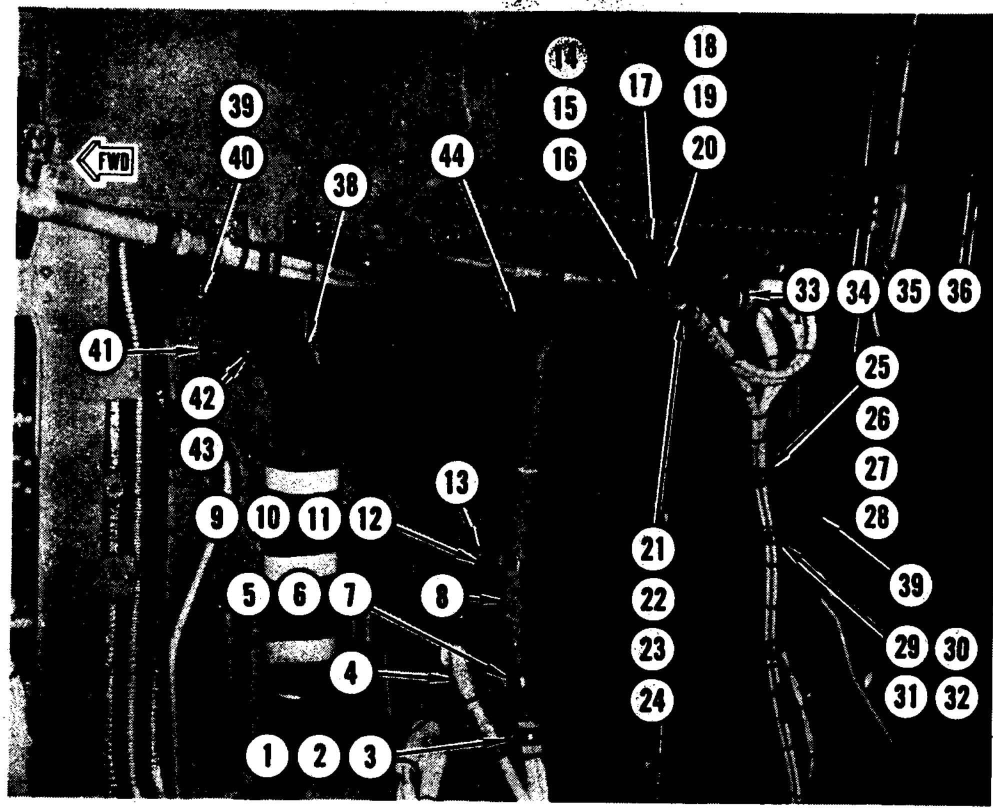
Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

c. Remove screw (1), nut (2), and clamp (3) securing wire harness to support bracket (4).

d. Remove screw (5), nut (6), and clamp (7) securing wire harness conduit (8) to support bracket (4).

e. Remove screw (9), two clamps (10), two spacers (11), and nut (12) securing wire harness conduit (8) to support bracket (13).

f. Remove screw (14), two clamps (15), and nut (16) securing wire harness conduit (8) to support bracket (17).



1. Screw
2. Nut
3. Clamp
4. Bracket
5. Screw
6. Nut
7. Clamp
8. Conduit
9. Screw
10. Clamp
11. Spacer
12. Nut
13. Bracket
14. Screw
15. Clamp
16. Nut
17. Bracket
18. Screw
19. Nut
20. Clamp
21. Screw
22. Spacer
23. Clamp
24. Nut
25. Screw
26. Nut
27. Spacer
28. Clamp
29. Screw
30. Nut
31. Spacer
32. Clamp
33. Nut
34. Washer
35. Bolt
36. Relay
37. Bulkhead
38. Cooling line
39. Bolt
40. Washer
41. Bracket
42. Nut
43. Washer
44. Armor plate

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Figure 21-13. Upper Right Armor Plate (FS 552 to 590) Removal and Installation

g. Remove screw (18), nut (19), and clamp (20) securing wire harness to support bracket (17).

h. Remove screw (21), spacer (22), two clamps (23), and nut (24) securing wire harness to airframe.

i. Remove screw (25), nut (26), spacer (27), and clamp (28) securing wire harness to airframe.

j. Remove screw (29), nut (30), two spacers (31), and two clamps (32) securing wire harness to airframe.

k. Remove two nuts (33), four washers (34), and two bolts (35) securing engine start relay (36) to bulkhead (37) and allow harness, conduit, and relay to swing inboard.

l. Disconnect camera cooling line (38) at upper connection and swing inboard.

m. Remove 18 bolts (39) and washers (40) securing armor plate mount brackets (41) to airframe and remove armor.

n. Identify location of armor plate mount brackets (41) for installation on replacement armor to ensure proper fit.

CAUTION

To prevent damage to ceramic material when removing or installing nuts on armor studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

o. Remove 18 nuts (42) and washers (43) securing armor plate mount brackets (41) to armor plate (44).

21-53. INSTALLATION. (See figure 21-13.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or which shows evidence of surface damage.

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. Install armor plate mount brackets (41) on armor plate (44) with 18 nuts (42) and washers (43).

b. Position armor plate (44) on airframe and secure mount brackets with 18 bolts (39) and washers (40).

c. Connect upper camera cooling line (38).

d. Install engine start relay (36) on bulkhead (37) with two bolts (35), four washers (34), and two nuts (33).

e. Secure wire harness to airframe with two clamps (32), two spacers (31), screw (29), and nut (30).

f. Secure wire harness to airframe with clamp (28), spacer (27), screw (25), and nut (26).

g. Secure wire harness to airframe with two clamps (23), spacer (22), screw (21), and nut (24).

h. Secure wire harness to support bracket (17) with clamp (20), screw (18), and nut (19).

i. Secure wire harness conduit (8) to support bracket (17) with two clamps (15), screw (14), and nut (16).

j. Secure wire harness conduit (8) to support bracket (13) with two clamps (10), two spacers (11), screw (9), and nut (12).

k. Secure wire harness conduit (8) to support bracket (4) with clamp (7), screw (5), and nut (6).

l. Secure wire harness to support bracket (4) with clamp (3), screw (1), and nut (2).

m. Install engine (T.O. 1A-7D-2-5).

n. Close access 6222-2.

21-54. UPPER LEFT ARMOR PLATE (FS 590 TO 600) REMOVAL AND INSTALLATION.

21-55. REMOVAL. (See figure 21-14.)

a. Remove engine (T.O. 1A-7D-2-5).

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

b. Remove six bolts (1) and washers (2) securing armor plate (3) and three brackets (4, 5, and 6) to airframe.

c. Identify and note location of armor plate mount brackets (4, 5, and 6) for installation on replacement armor.

CAUTION

To prevent damage to ceramic material when removing or installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

d. Remove six nuts (7) and washers (8) securing three mount brackets (4, 5, and 6) to armor plate (3).

21-56. INSTALLATION. (See figure 21-14.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate that has been dropped or shows evidence of surface damage.

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. Install three armor plate mount brackets (4, 5, and 6) on armor plate (3) with six nuts (7) and washers (8).

b. Position armor plate (3) with attached brackets on airframe and secure with six bolts (1) and washers (2).

c. Install engine (T.O. 1A-7D-2-5).

21-57. ENGINE REMOVAL DOOR ARMOR PLATE REMOVAL AND INSTALLATION.

21-58. REMOVAL. (See figure 21-15.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

a. Remove engine removal door (paragraph 21-14).

b. On armor plates to be replaced, remove bolts (1) and washers (2) to remove armor plates and attached mount brackets (3) from engine removal door.

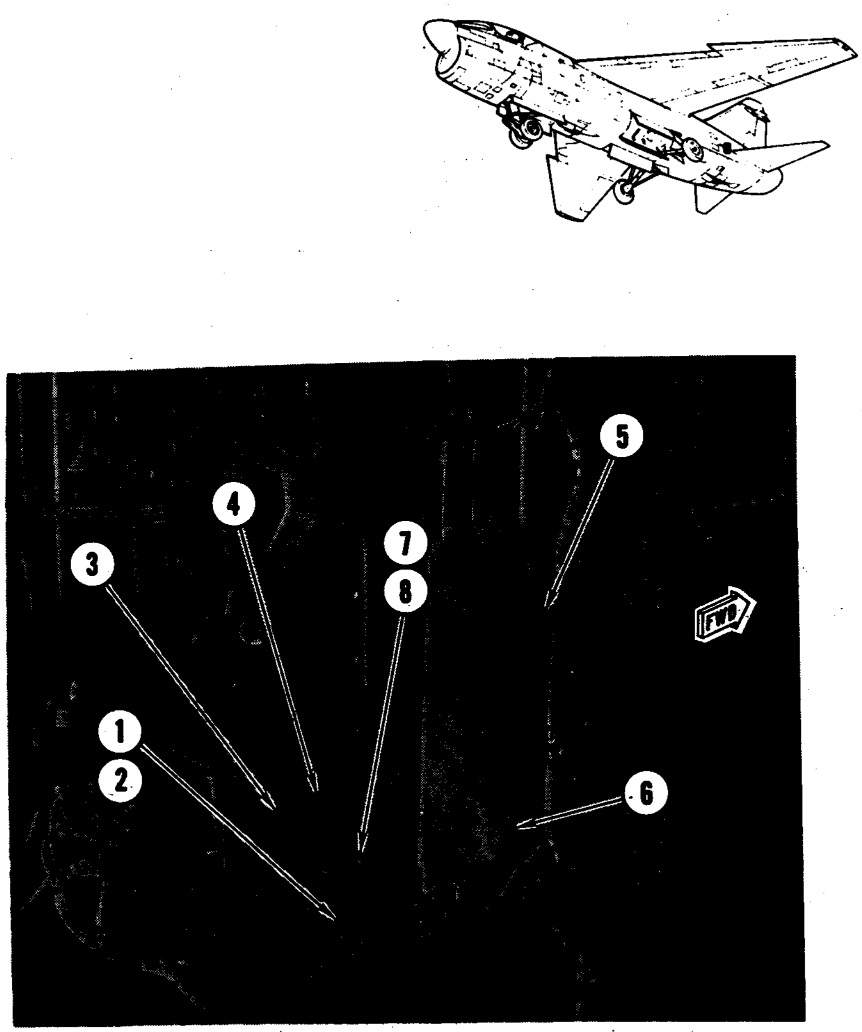
c. Identify armor plate mount bracket (3) locations for installation on replacement armor plates.

CAUTION

To prevent damage to ceramic material when installing or removing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

d. Remove nuts (4) and washers (5) to remove mount brackets (3) from armor plate.



1. Bolt
2. Washer
3. Armor plate
4. Bracket
5. Bracket
6. Bracket
7. Nut
8. Washer

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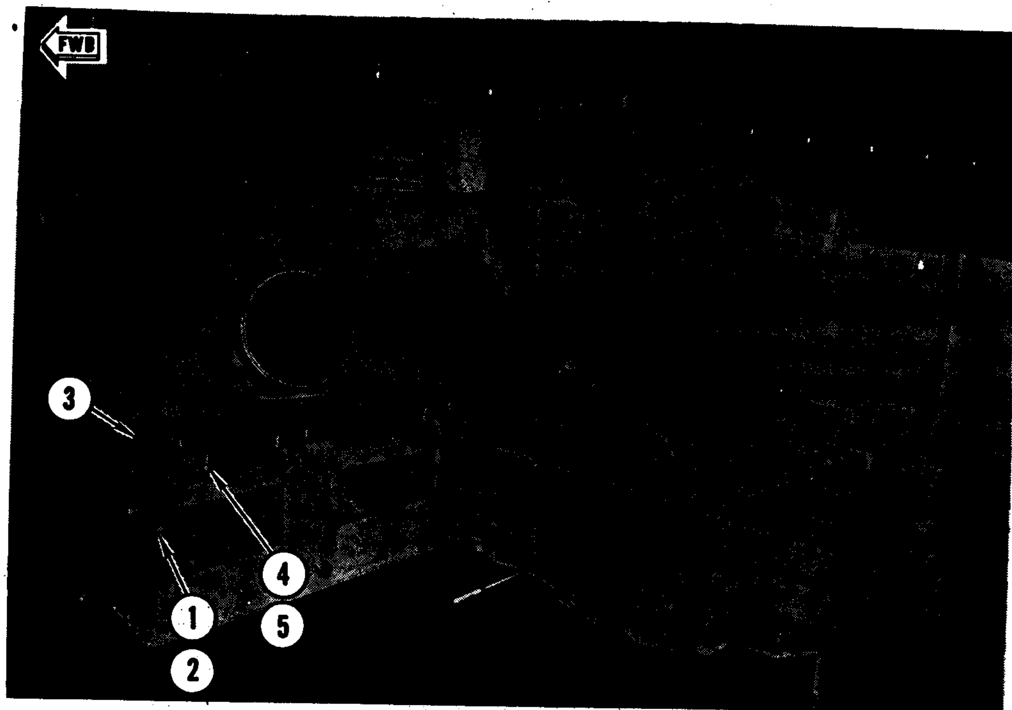
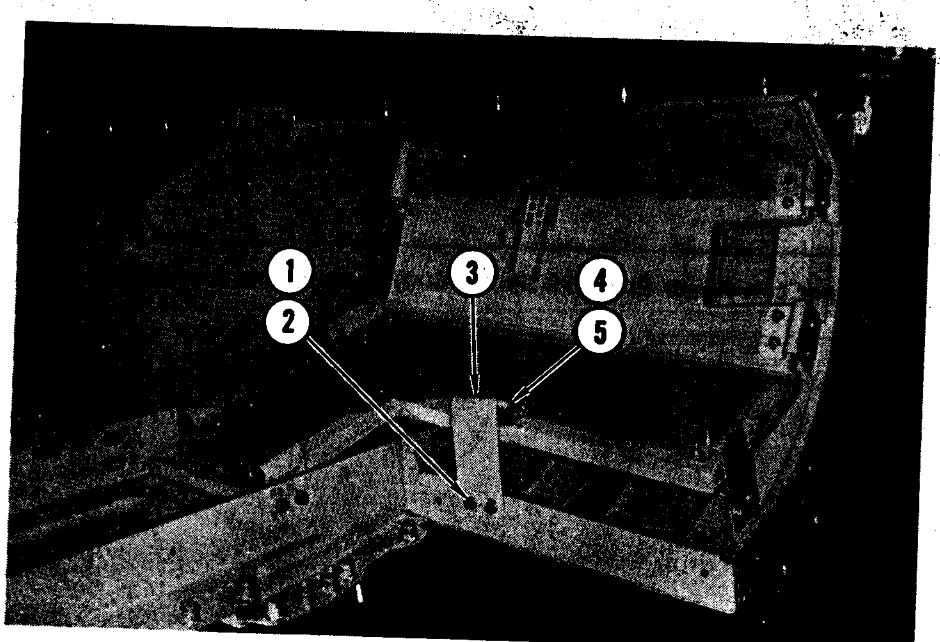
Figure 21-14. Upper Left Armor Plate (FS 590 to 600) Removal and Installation



RIGHT HAND SIDE

1. Bolt
2. Washer
3. Bracket
4. Nut
5. Washer



LEFT HAND SIDE

1. Bolt
2. Washer
3. Bracket
4. Nut
5. Washer

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Figure 21-15. Engine Removal Door Armor Plate Removal and Installation

21-59. INSTALLATION. (See figure 21-15.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

To prevent damage to ceramic material when removing or installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. Install armor plate mount brackets (3) on armor plate with nuts (4) and washers (5).

NOTE

Do not tighten bolts installed in mount brackets with slotted holes until all other mounting bolts have been installed.

b. Position armor plate and mount brackets (3) on engine door and secure with bolts (1) and washers (2).

c. Install engine removal door (paragraph 21-14).

21-60. UPPER RIGHT ARMOR PLATE (FS 590 TO 600) REMOVAL AND INSTALLATION.

21-61. REMOVAL. (See figure 21-16.)

a. Remove engine (T.O. 1A-7D-2-5).

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

b. Remove six bolts (1) and washers (2) securing armor plate (3) and three brackets (4, 5, and 6) to airframe.

c. Identify and note location of armor plate mount brackets (4, 5, and 6) for installation on replacement armor.

CAUTION

To prevent damage to ceramic material when removing or installing nuts on armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

To prevent damage to protruding studs on armor plate when armor plate is not installed, install nuts or equivalent protective cover.

d. Remove six nuts (7) and washers (8) securing three mount brackets (4, 5, and 6) to armor plate (3).

21-62. INSTALLATION. (See figure 21-16.)

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate that has been droppped or shows evidence of surface damage.

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

a. Install three armor plate mount brackets (4, 5, and 6) on armor plate (3) with six nuts (7) and washers (8).

b. Position armor plate (3) with attached mount brackets (4, 5, and 6) on airframe and secure with six bolts (1) and washers (2).

c. Install engine (T.O. 1A-7D-2-5).

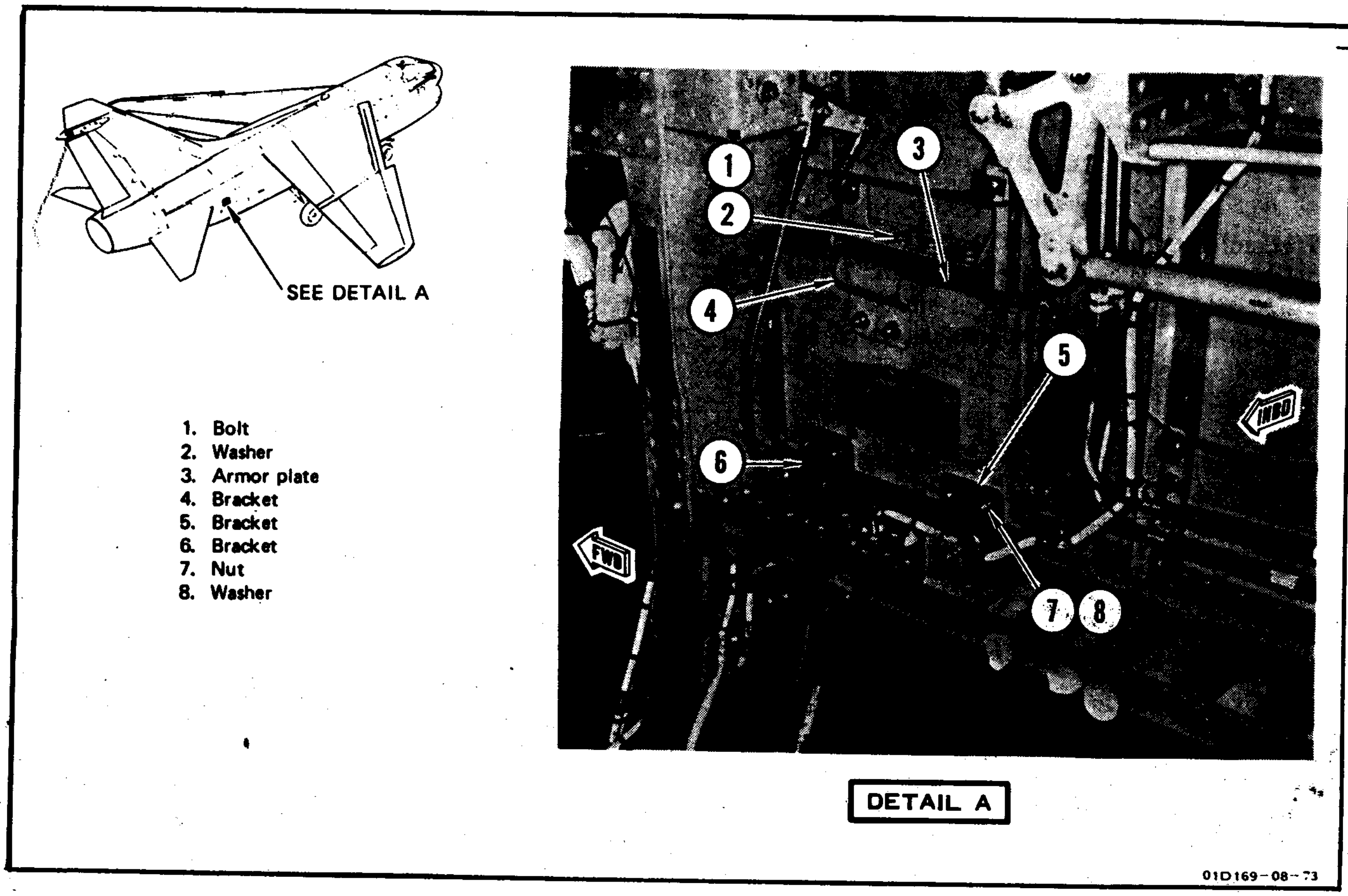


Figure 21-16. Upper Right Armor Plate (FS 590 to 600) Removal and Installation

21-63. FUSELAGE AFT SECTION ACCESS PANEL MOUNTED CERAMIC ARMOR PLATE REMOVAL AND INSTALLATION.

21-64. REMOVAL.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object.

a. Remove access panel from airplane.

b. Identify and note position of each armor plate mount bracket and attaching parts for installation on replacement armor plate.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

c. Remove nuts, bolts, and washers securing mount brackets to armor plate and access panel.

d. Lift armor plate from access panel. If as a result of mission requirements armor plate is not to be installed, reinstall armor plate mount brackets on access panel.

21-65. INSTALLATION.

CAUTION

Handle armor plate with care. The ceramic facing material is extremely hard and brittle and may crack if dropped or struck with a sharp object. Reject armor plate which has been dropped or shows evidence of surface damage.

a. Position armor plate on access panel for installation.

CAUTION

To prevent damage to ceramic material when installing or removing nuts from armor plate studs, the studs shall be held with an internal socket wrench (Allen type 3/32 hex).

NOTE

Do not tighten bolts or nuts attaching mount brackets to armor plate and access panel until all attaching bolts have been installed.

b. Install armor plate mount brackets and secure with bolts, nuts, and washers.

c. Install access panel.

21-66. ENGINE LOW PRESSURE COOLING DUCT SEAL REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten screws securing duct seal to engine removal door.

21-67. REMOVAL. (See figure 21-17.)

a. Remove engine removal door (paragraph 21-14).

b. Remove four screws (1) from engine removal door (2).

c. Remove two bracket assemblies (3).

d. Remove four spacers (4).

e. Remove seal assembly (5).

21-68. INSTALLATION. (See figure 21-17.)

CAUTION

To prevent damage to seal, ensure that seal assembly is installed with lip facing up.

a. Install seal assembly (5).

b. Install four spacers (4).

c. Install two bracket assemblies (3).

d. Tighten four screws (2) to 14 (+1, −2) pound-inches torque.

e. Check that seal assembly moves freely.

f. Install engine removal door (paragraph 21-14).

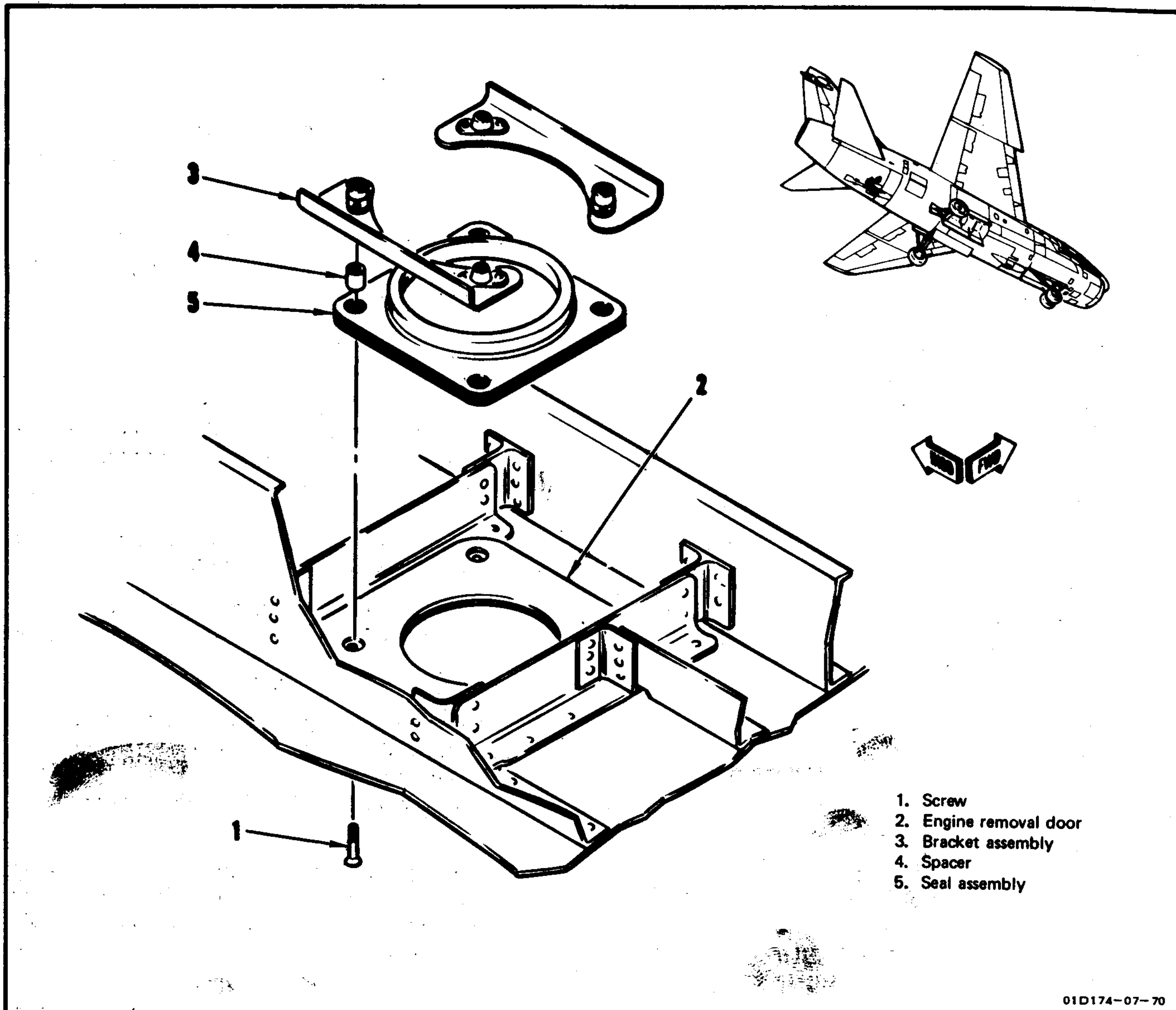


Figure 21-17. Engine Low Pressure Cooling Duct Seal Removal and Installation

SECTION XXII
WINGS

22-1. DESCRIPTION.

22-2. A fixed position, highly tapered, 35-degree sweptback wing is installed in the airplane. The wing group consists of a center section, two foldable outer panels, leading and trailing edge flaps, spoiler/deflector, and ailerons.

22-3. The wing center section is used to stabilize skin panels, carry loads imposed by external stores, and store fuel in the integral fuel tank. Attachments are provided on the wing center section for the spoiler/deflector control surfaces and leading and trailing edge flaps. Six pylon attachments, three on each side of the wing centerline, and two fuel dump masts are also provided on the wing center section. The wing center section is attached to the fuselage by lug and shear pin arrangement.

22-4. Foldable wing outer panels are attached on the right and left side of the wing center section at the wingfold ribs. The outer panels are folded by hydraulic power to facilitate close proximity parking. Provisions for mounting leading edge flaps, ailerons, and wingtip fairings are provided on the wing outer panel. The right wing outer panel also contains provisions for mounting the remote compass transmitter. Wingtip fairings, installed on the extreme outboard ends of the outer panel, contain formation and navigation lights.

22-5. Full span leading edge flaps and center section trailing edge flaps function concurrently as high lift devices for takeoff and landing. Ailerons attached to the outer panels and slotted spoilers and air deflectors in the wing center section are provided for roll control of the airplane. For complete description of the flight controls, refer to T.O. 1A-7D-2-8.

22-6. SPOILER /DEFLECTOR SUPPORT REMOVAL AND INSTALLATION.

22-7. REMOVAL.

a. Remove spoiler/deflector actuator assembly (T.O. 1A-7D-2-8).

b. Disconnect spoiler/deflector bellcrank from spoiler power control strut by removing cotter pin, nut, bolt, and washer.

c. Disconnect bellcrank from spoiler /deflector actuating cylinder by removing cotter pin, nut, bolt, and washer.

d. Remove bellcrank and spoiler control link.

e. Remove spoiler power control strut bearing by cutting lockwire and removing nuts, washers, and tapered pins. Remove strut bearing end.

f. Remove spoiler/deflector support. Remove six screws, washers, and nuts.

22-8. INSTALLATION.

a. Position spoiler/deflector support and secure with six screws, washers, and nuts.

b. Place spoiler power control strut bearing end through support bearing, and align with strut. Install tapered pins, washers, and nuts. Secure nuts with MS20995C32 lockwire.

c. Install spoiler/deflector actuating cylinder (T.O. 1A-7D-2-8).

d. Position bellcrank and spoiler control link on soiler/deflector actuating cylinder and secure with bolt, washer, nut, and new cotter pin.

e. Position bellcrank on strut bearing end and secure with bolt, washer, nut, and new cotter pin.

f. Install spoiler and deflector (T.O. 1A-7D-2-8).

22-9. WING OUTER PANEL REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
22-1	CV15-206795-1	Forward wing hinge bolt pilot	Provide for installing forward wing hinge bolt.
22-1	CV15-206795-2	Aft wing hinge bolt pilot	Provide for installing aft wing hinge bolt.
22-2	215-00212-1	Wing outer panel hoisting adapter	Adapt hoist to wing outer panel.
2-1	215-00255-12	Wingfold support strut (2)	Support wing outer panel when folded.
		Equipment required for connecting external electrical power	Provide electrical power for energizing wingfold selector valve.

22-10. REMOVAL. (See figure 22-1.)

NOTE

If outer panel is being removed due to suspected hydraulic leak inside panel, confirm leak by performing pressure check of suspected line(s) before removing panel. If right wing outer panel is to be removed and replaced, ensure that the ML-1 remote compass transmitter is removed from the old wing outer panel for installation in the new wing outer panel.

a. Remove four screws in wing outer panel and place in holes provided in wing outer panel hoisting adapter. Position wing outer panel hoisting adapter (figure 22-2) on wing outer panel and secure with adapter bolts.

b. Fold wing outer panels (paragraph 2-16) and install wingfold support struts (paragraph 2-47).

WARNING

Ensure that electrical power is not connected to the airplane and that battery switch is in OFF before disconnecting electrical connectors to prevent injury to personnel or damage to equipment.

c. Disconnect electrical connector (1) and remove clamp (2) securing wire bundle.

d. Open access 3112-3 or 4111-3 and disconnect wingfold actuating cylinder (3) by removing cotter pin (4), nut (5), washer (6), and bolt (7).

e. Disconnect bonding jumpers (8) from outer panel.

f. Remove cotter pin (9), nut (10), washer (11), and bolt (12) securing aileron control linkage (13) to bellcrank.

g. Remove wingfold swivel joint (T.O. 1A-7D-2-8).

h. Remove forward hinge bolt grease fitting (14). Cut lockwire and remove nut (15) and washers (16). Observe type and position of washers for installation. Install forward hinge bolt pilot (17).

i. Remove screws (18) securing aft hinge pin cylinder fairing (19) and remove fairing.

j. Remove cotter pin (20), nut (21), and washers (22) securing aft hinge bolt (24). Install aft hinge bolt pilot (23).

WARNING

Be extremely careful when removing wingfold support strut. Inadvertent movement of wing outer panel may occur, causing serious injury to personnel or damage to equipment.

k. Connect hoist to hoisting adapter. Take up slack in hoist cable and remove wingfold support strut.

CAUTION

Be extremely careful to prevent disconnected outer panel from damaging wingfold hydraulic lines due to inadvertent movement.

l. Remove hinge bolts (24) and wing outer panel (25). Remove bolt pilots from hinge bolts.

m. Lower wing.

n. Remove hoist from hoisting adapter.

o. Remove bolts securing wing outer panel hoisting adapter and replace wing panel screws (figure 22-2).

1. Electrical connector
2. Clamp
3. Wingfold actuating cylinder
4. Cotter pin
5. Nut
6. Washer
7. Bolt
8. Bonding jumper
9. Cotter pin
10. Nut
11. Washer
12. Bolt
13. Aileron control linkage
14. Grease fitting
15. Nut
16. Washer
17. Pilot
18. Screw
19. Aft hinge pin cylinder fairing
20. Cotter pin
21. Nut
22. Washer
23. Pilot
24. Hinge bolt
25. Wing outer panel

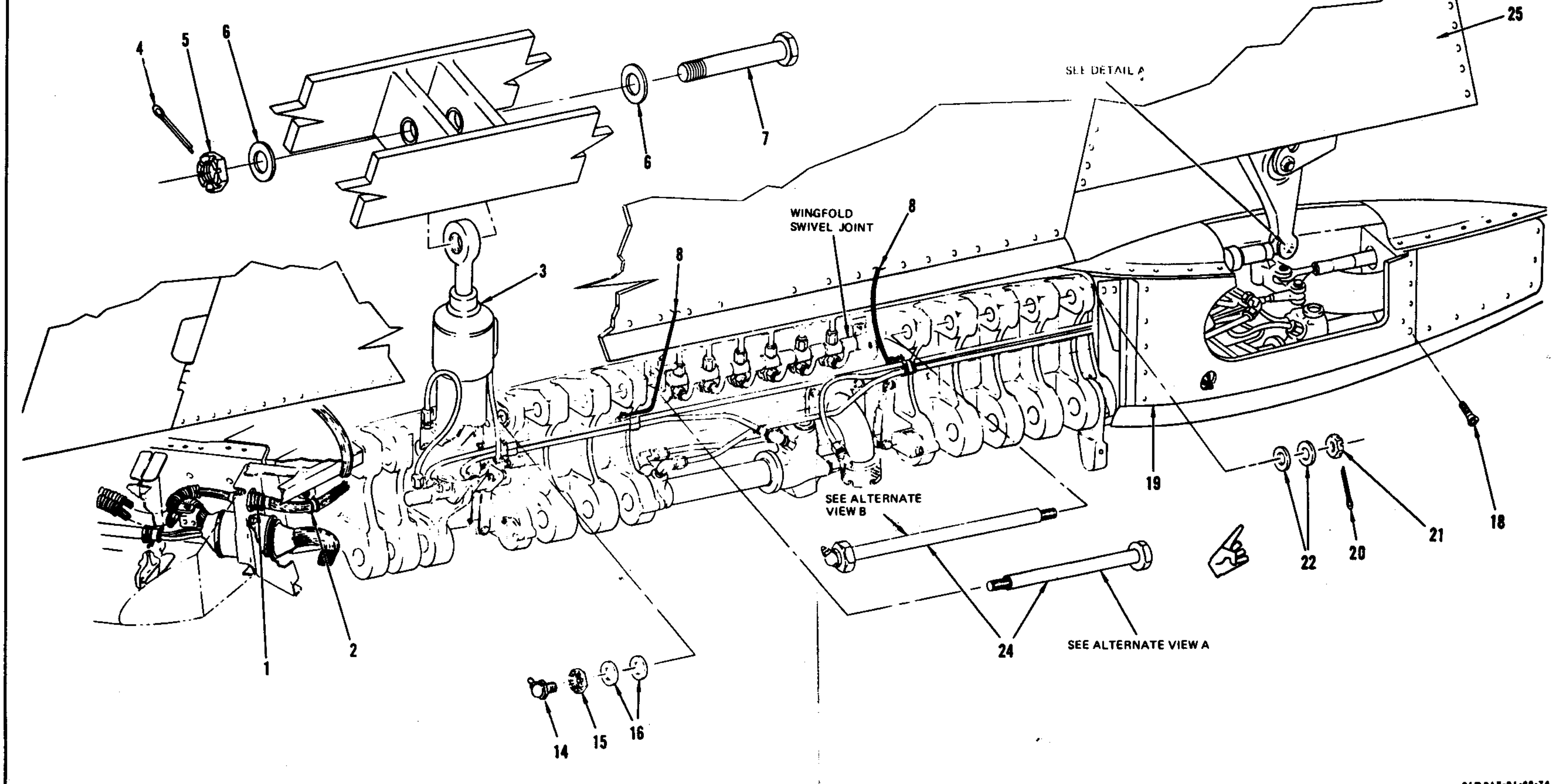


Figure 22-1. Wing Outer Panel Removal and Installation (Sheet 1)

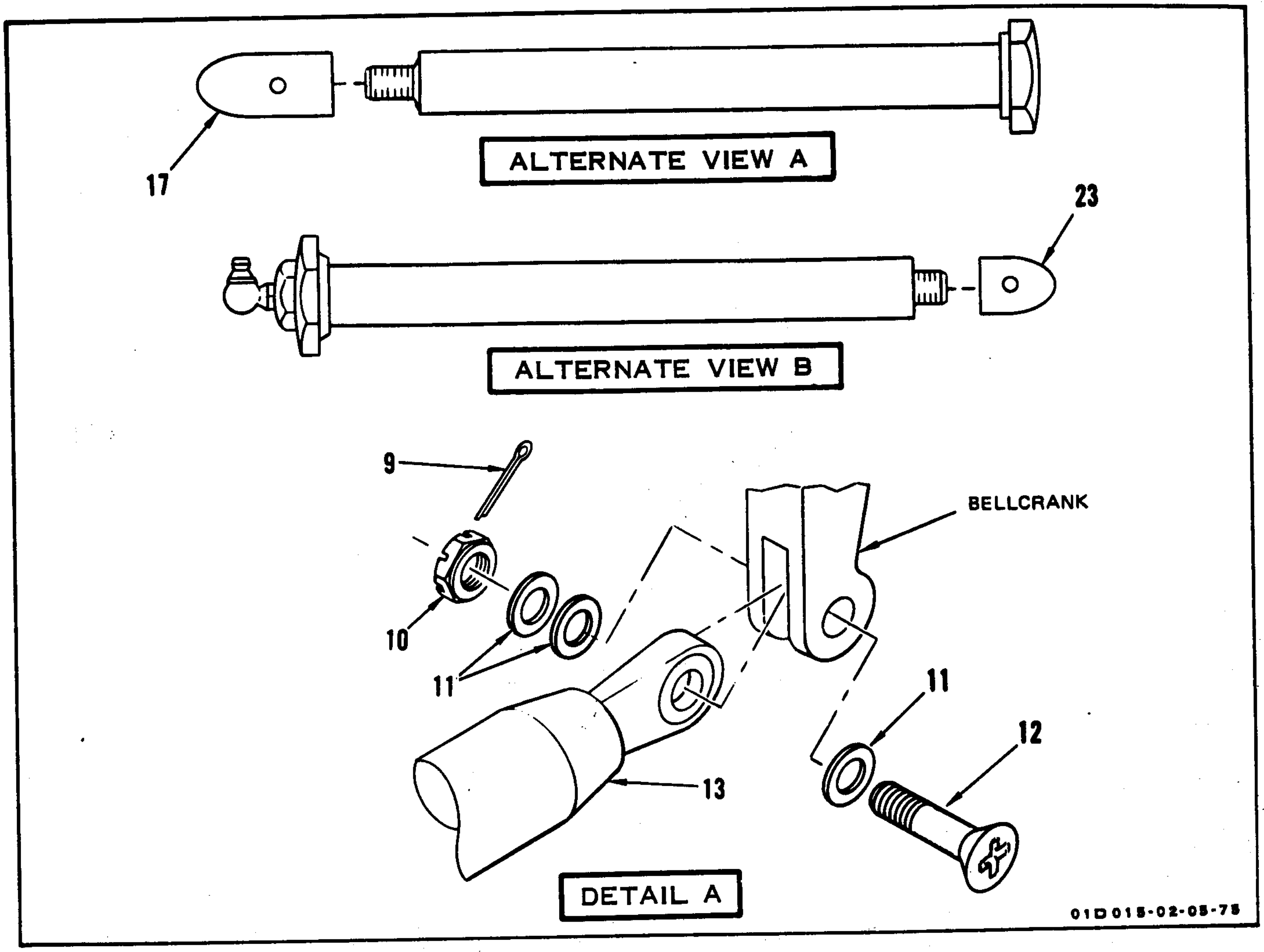


Figure 22-1. Wing Outer Panel Removal and Installation (Sheet 2)

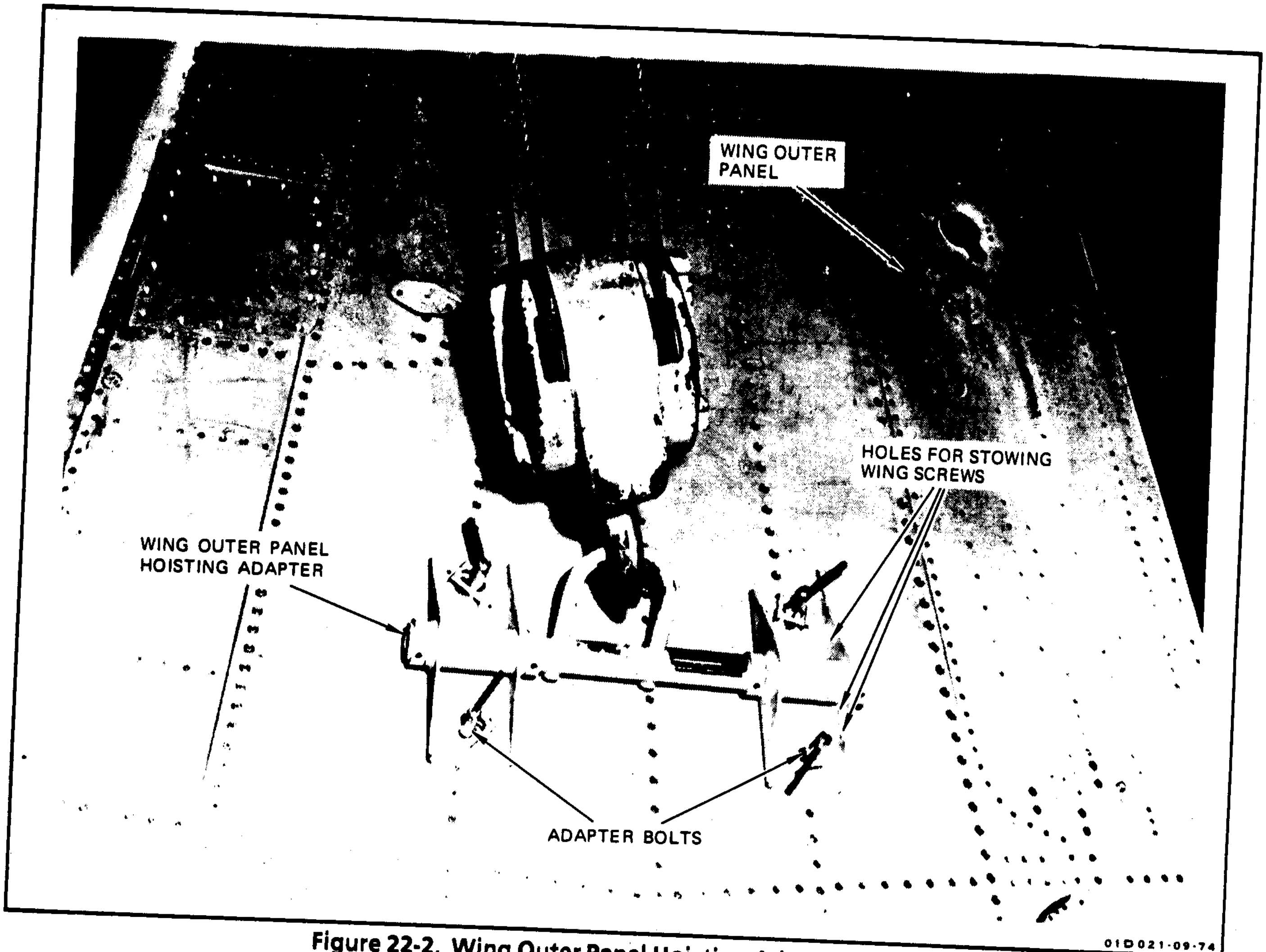


Figure 22-2. Wing Outer Panel Hoisting Adapter Installation

p. If replacing the wing outer panel, remove and retain the following items:

1. Wing outer panel leading edge flap (T.O. 1A-7D-2-8).

2. Wing outer panel leading edge flap actuating cylinders (T.O. 1A-7D-2-8).

3. Aileron (T.O. 1A-7D-2-8).

4. Aileron power control cylinder and flexible hoses (T.O. 1A-7D-2-8).

5. Input linkage (1) and bellcranks (2, 3, and 4, figure 22-2A).

6. If removing right wing outer panel, remove remote compass transmitter (T.O. 1A-7D-2-12).

22-11. INSTALLATION. (See figure 22-1.)

NOTE

When installing a new wing outer panel, install the items removed from the old wing outer panel.

a. If reinstalling same wing outer panel, proceed to step a-1. If installing new wing outer panel, proceed as follows:

1. If installing right wing outer panel, install remote compass transmitter (T.O. 1A-7D-2-12).

2. Secure bellcranks (2, 3, and 4, figure 22-2A) with washers, bolts, nuts, and new cotter pins. Secure input linkage (1) to bellcranks (3 and 4) with washers, bolts, nuts, and new cotter pins.

3. Install aileron power control cylinder and flexible hoses (T.O. 1A-7D-2-8).

4. Install aileron (T.O. 1A-7D-2-8).

5. Install wing outer panel leading edge flap actuating cylinders (T.O. 1A-7D-2-8).

6. Install wing outer panel leading edge flap (T.O. 1A-7D-2-8).

a-1. Remove four screws in wing outer panel and place in holes provided in wing outer panel hoisting adapter. Position wing outer panel hoisting adapter on wing outer panel and secure with adapter bolts.

b. Remove grease fittings (14) from new hinge bolts and install forward and aft wing hinge bolt pilots (17 and 23).

c. Lubricate hinge bolts with MIL-G-23827 grease.

CAUTION

Be extremely careful to prevent disconnected outer panel from damaging wingfold hydraulic lines due to inadvertent movement.

d. Raise wing outer panel (25) into position with hoist. Align hinge bolt holes and install hinge bolts (24).

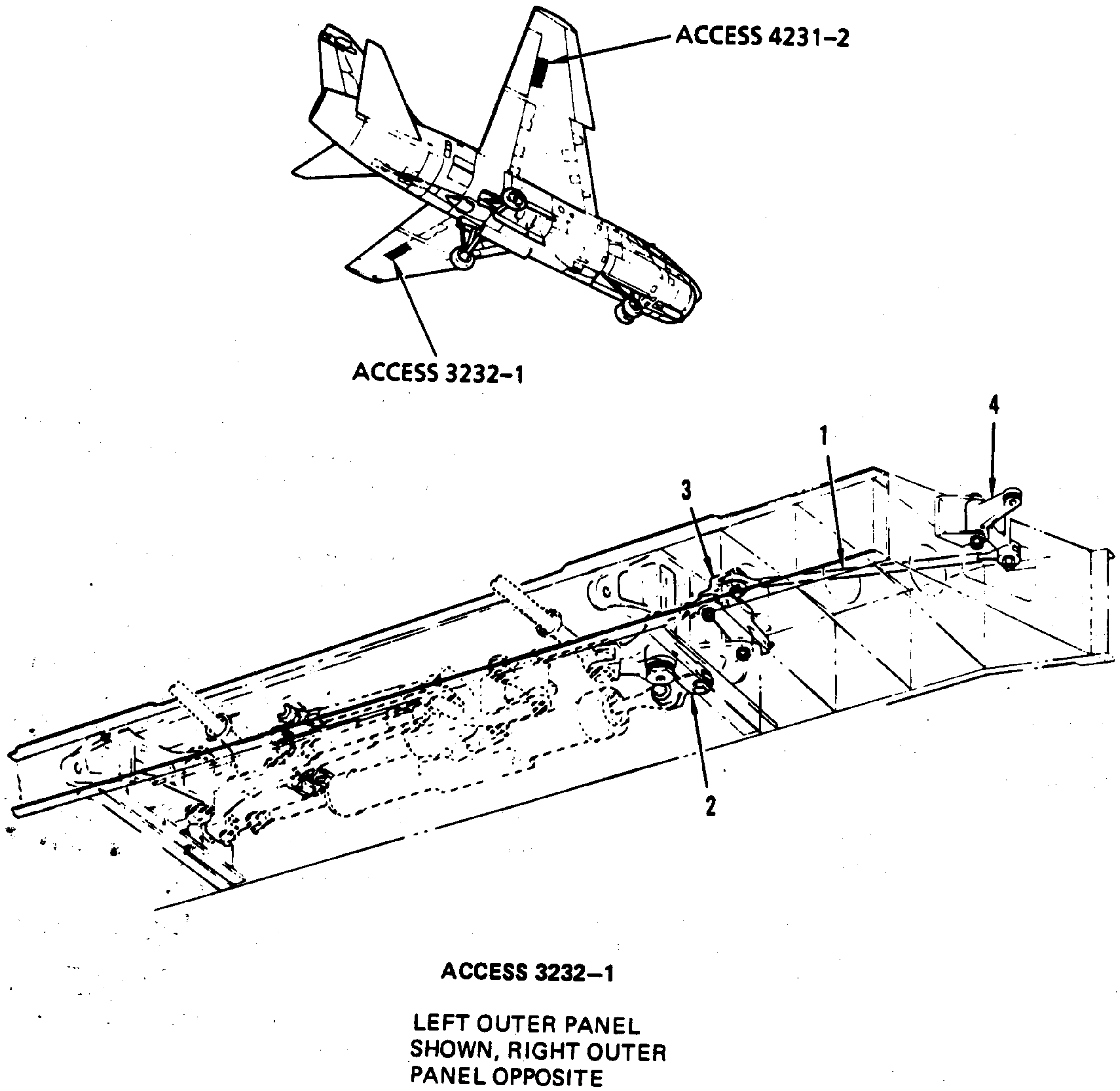
e. Remove hinge bolt pilots (17 and 23) and secure aft hinge bolt with washers (22) and nut (21). Tighten nut finger-tight and install new cotter pin (20).

f. Secure forward hinge bolt with washers (16) and nut (15). Tighten nut finger-tight and secure with MS20995C32 lockwire.

g. Install grease fittings (14) on both hinge bolts.

h. Install wingfold swivel joint (T.O. 1A-7D-2-8). Do not perform hydraulic system bleeding portion of installation procedures at this time.

i. Position aileron control linkage (13) and secure to bellcrank with bolt (12), washer (11), nut (10), and new cotter pin (9).



1. Input linkage
2. Bellcrank
3. Bellcrank
4. Bellcrank

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Figure 22-2A. Wing Outer Panel Buildup

j. Connect bonding jumpers (8) to outer panel.

k. Connect electrical connector (1) and secure wire bundle with clamp (2).

l. Connect external electrical power (paragraph 1-28).

m. Place wingfold control switch in SPREAD.

CAUTION

To prevent structural damage, guide rod end of wingfold actuating cylinder through attaching bracket when folding or spreading outer panel with hoist.

n. Slowly spread outer panel with hoist while checking for interference. When completely spread, check for proper fairing with wing center section. If necessary, fold outer panel with hoist, and trim outer panel to obtain proper gap with wing center section (T.O. 1A-7D-3).

o. Install wingfold actuating cylinder bolt (7) with washer (6) and secure with nut (5). Tighten nut finger-tight and install new cotter pin.

p. Deleted.

q. Deleted.

r. Deleted.

s. Shut down, but do not disconnect, electrical power.

t. Install aft hinge pin cylinder fairing (19) and secure with screws (18).

u. Lubricate wingfold lug bushings with MIL-G-23827 grease.

v. Close access 3112-3 or 4111-3.

w. Apply external electrical power.

x. Place wingfold control switch in FOLD and operate hydraulic hand pump. After pressure is obtained, remove wingfold support strut from opposite wing, and remove hoisting adapter from wing outer panel.

y. Spread wing outer panels with hydraulic hand pump (paragraph 2-16).

z. Check that outer panels spread smoothly.

aa. Place wing hinge pin lock lever in down-and-locked position to ensure that hinge pin cylinders are fully extended. Perform wingfold stopbolt adjustment (paragraph 24-26) and hydraulic sequence valve adjustment (paragraph 24-28).

ab. Raise wing hinge pin lock lever, place wingfold control switch in FOLD, and fold outer panels with hydraulic hand pump.

ac. Perform wingfold system operational checkout (paragraph 24-14).

ad. Perform bleeding procedure specified in wingfold swivel joint installation procedure (T.O. 1A-7D-2-8).

ae. Perform aileron control and flap system operational checkouts (T.O. 1A-7D-2-8).

af. Perform exterior lighting system operational checkout (T.O. 1A-7D-2-11).

NOTE

If right wing outer panel has been removed and replaced, ensure that the ML-1 remote compass transmitter has been removed from old wing outer panel and installed in new panel.

ag. If new right wing outer panel was installed, swing remote indicating compass (T.O. 1A-7D-2-12). If same right wing outer panel was installed, perform IMS (airplanes before T.O. 1A-7-562) or INS (airplanes after T.O. 1A-7-562) operational checkout (T.O. 1A-7D-2-12).

22-12. WINGTIP ASSEMBLY REMOVAL AND INSTALLATION.

22-13. REMOVAL.

a. Remove wing formation light (T.O. 1A-7D-2-11).

b. Disconnect terminal leads on wing formation light.

c. Remove screws from wingtip.

d. Remove wingtip by pulling outboard.

22-14. INSTALLATION.

a. Position wingtip on outer panel.

b. When new wingtip is installed, accomplish the following:

1. Locate and mark holes for screws.

2. Trim edges as necessary to ensure proper fit of wingtip.

3. Remove wingtip and drill holes for screws. Drill holes for screws using No. 11 drill bit. Countersink holes with 100° countersink.

c. Install formed-in-place seal (MIL-S-8802) along inside edge of tip.

d. Insert wing position and formation light wires through wingtip.

e. Attach wingtip with screws.

f. Connect wires to wing formation light and secure light to wingtip (T.O. 1A-7D-2-11).

g. Insert wing position light wires through clamp and attach clamp to airplane.

22-15. WING OUTER PANEL LEADING EDGE FAIRING REMOVAL AND INSTALLATION.

22-16. REMOVAL. (See figure 22-3.)

a. Disconnect wing outer panel leading edge flap from actuating cylinders and lower flap on its hinge. Refer to outer panel leading edge flap removal and installation procedures (T.O. 1A-7D-2-8).

b. Remove blind rivets and blind bolts securing fairing to cap and wing outer panel leading edge. Remove fairing.

NOTE

When removing blind bolts because of inaccessibility, drive blind bolt pins into wing cavity and leave pins there.

22-17. INSTALLATION. (See figure 22-3.)

NOTE

NAS 1669 Jo-bolts may be used as an alternate to secure the lower edge of fairing to airplane structure. Refer to T.O. 1A-7D-3 for installation procedures. If Jo-bolts are used, omit step a.

a. Install blind nut assemblies (part No. BN360, consisting of BN330-632 sleeve and BB341 expander) in existing holes in lower edge of cap in accordance with T.O. 1A-7D-3.

b. Position fairing on wing outer panel, and locate and mark existing rivet and bolthole pattern. Trim fairing and drill rivet and screw holes as required in fairing.

c. Secure fairing to wing outer panel leading edge with temporary (sheet metal) fasteners.

d. Manually raise flap and check clearance between fairing and knife-edge wiper of flap with flap in extended position. Trim or shim fairing as required to obtain clearance as follows:

1. On airplanes through AF73-998, 0.02 inch minimum to 0.12 inch maximum gap. Overlap of flap must be 0.05 inch minimum.

2. On airplanes AF73-999 and subsequent, 0.00 inch minimum to 0.03 inch maximum gap.

NOTE

Use washers between head of screws and fiber glass.

A Jo-bolt installation tool, for use in inaccessible areas, may be fabricated from a common 1/4-inch universal adapter by drilling the male end of adapter to fit the Jo-bolt stem. When using the modified adapter, the Jo-bolt nut must be held stationary with a box or open end wrench and the stem turned counterclockwise with a rachet attached to universal.

e. Secure fairing to wing outer panel leading edge with NAS 601 screws and blind nuts or NAS 1669 Jo-bolts on lower edge and blind rivets on top edge.

f. Trim and shave blind rivets as required.

g. Connect flap to actuating cylinders.

h. Perform flap system operational checkout (T.O. 1A-7D-2-8).

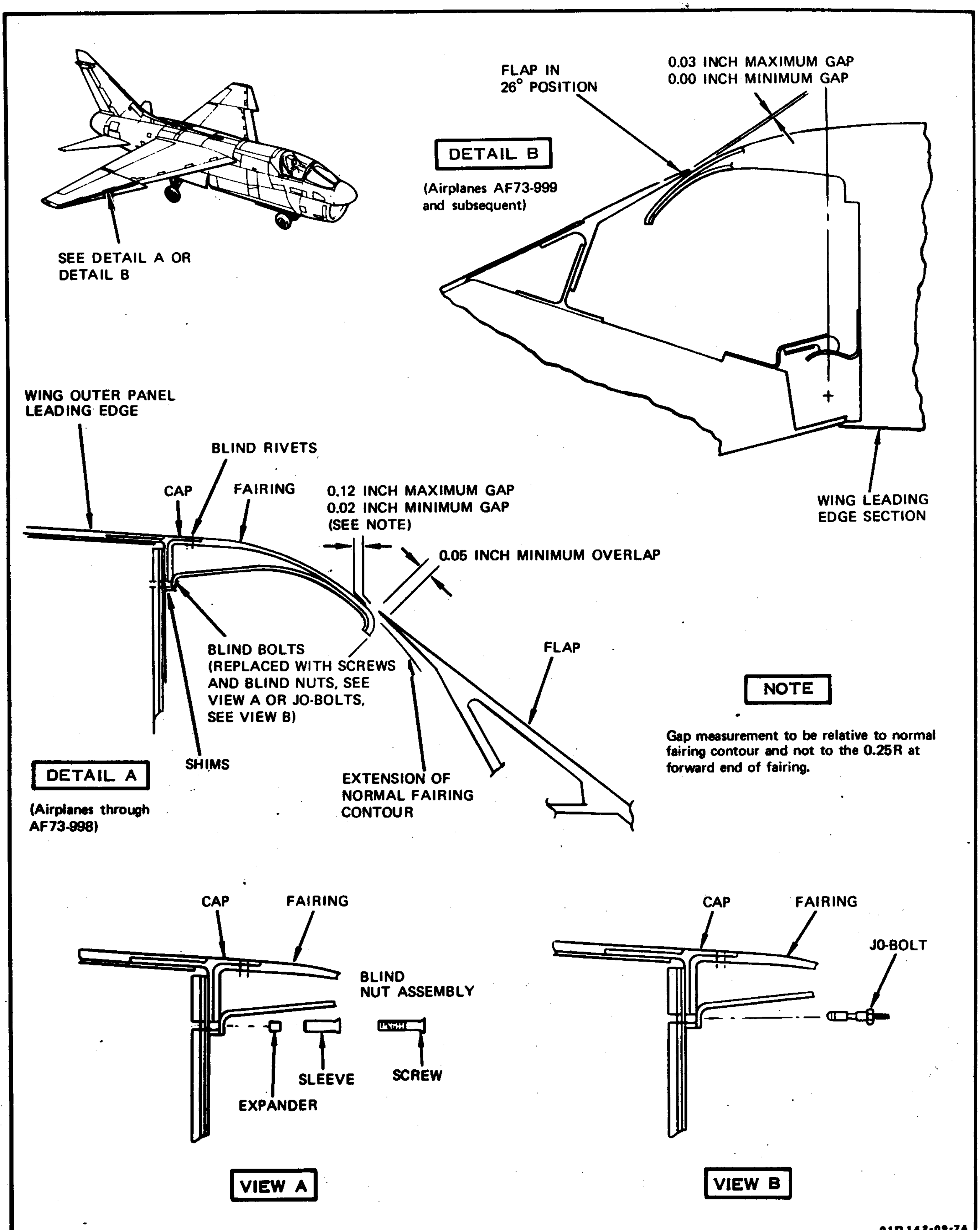


Figure 22-3. Wing Outer Panel Leading Edge Fairing Removal and Installation

22-18. WING CENTER SECTION LEADING EDGE FAIRING/WIRING HARNESS ASSEMBLY REMOVAL AND INSTALLATION.

22-19. REMOVAL. (See figure 22-4.)

a. Fold wing outer panels (paragraph 2-16).

b. Remove wing pylons (T.O. 1A-7D-2-13).

c. Open accesses as follows:

1. For left leading edge fairing/wiring harness removal, open accesses 1121-6, 1121-8, 3113-1, 3113-4, 3113-6, 3113-9, 3213-3, 3213-5, 3213-7, and 3213-8.

2. For right leading edge fairing/wiring harness removal, open accesses 2121-6, 2121-8, 4213-3, 4213-5, 4213-7, 4213-8, 4113-1, 4113-4, 4113-6, and 4113-9.

d. Remove wing center section leading edge flap (T.O. 1A-7D-2-8).

e. Remove four wing leading edge skin panels (1) by removing blind rivets (2).

f. Disconnect electrical connectors (3 through 7).

NOTE

To facilitate removal and installation of the fairing/wiring harness assembly, removal of coaxial cables and wiring associated with the harness assembly but routed through the wing leading edge electrical conduits is not necessary if coaxial cables and wires are not damaged. The coax and wire pins may be removed from the old harness and connectors and installed in the replacement harness and connectors. To ensure proper installation of replacement harness, identify and note each pin and coax/wire not to be removed from airplane with wiring harness assembly.

g. Remove pins from wiring harness electrical connectors, as required, for coaxial cables and wires routed through electrical conduits. Refer to T.O. 1A-7D-2-11 connector repair procedures for pin removal and installation.

h. Make alignment marks at several points on wing structure and old fairing/wiring harness assembly to facilitate alignment of replacement assembly.

i. Remove nuts (8), washers (9), and screws (10) securing fairing/wiring harness (11) to wing structure.

j. Remove clamp securing conduit at leading edge inboard web.

CAUTION

Use care not to damage coaxial cable and wiring harness enclosed in fairing.

k. Drill out two rivets in lower fairing skin (inboard and forward of small cutout) to remove clip holding forward end of conduit.

l. Slide conduit outboard (toward web) until clear of first cutout.

m. Remove backshell from P701 connector through accesses 1121-6 and 1121-8 for left side, or from the P702 connector through accesses 2121-6 and 2121-8 for right side.

n. On airplanes through AF73-1003, enlarge cutout in wing-to-fuselage fairing to permit removal of the P701 and P702 electrical connectors. Refer to figure 22-4 for information to make this enlargement.

o. Break faying bond between fairing/wiring harness and wing structure with a thin nonmetallic wedge.

p. Remove fairing/wiring harness from wing leading edge and carefully withdraw electrical connectors through accesses.

q. Remove old sealant from wing structure and prepare surface for new sealant (T.O. 1A-7D-3).

22-20. INSTALLATION. (See figure 22-4.)

a. Align replacement fairing/wiring harness assembly with alignment marks on old assembly and mark on new assembly, and then align replacement assembly with alignment marks on wing structure and temporarily secure in position.

b. Using existing holes as a template, pick up and drill rivet and screw holes to size. Remove and reinstall fairing/wiring harness assembly as necessary for marking and drilling holes.

c. Remove fairing/wiring harness from wing, and remove all rivet shanks and other foreign matter from wing leading edge structure.

d.Slide conduit forward (inboard toward fuselage), position clip and install two rivets.

e.Install aft conduit clamp (inboard web) and connector back shell.

f. Apply MIL-S-8802 corrosion protection faying surface seal on wing leading edge surface (T.O. 1A-7D-23).

g. Position fairing/wiring harness assembly on wing leading edge, while feeding electrical connectors through accesses.

h. Secure fairing/wiring harness to wing structure with screws (10), washers (9), and nuts (8).

i. Connect coaxial cables/wires, routed through electrical conduits, to applicable wiring harness connectors. If doubt exists regarding proper coaxial cable/wire to connector pin position, refer to applicable wiring diagram (T.O. 1A-7D-2-17).

j. Connect electrical connectors (3 through 7).

k. Perform wing tip lights check (T.O. 1A-7D-2-11).

l. Perform flap indicating system check (T.O. 1A-7D-2-8).

m. Perform remote compass indicating system check, right side only (T.O. 1A-7D-2-12).

NOTE

For blind rivet types and locations, refer to wing upper skin removal and installation (T.O. 1A-7D-3).

n. Secure wing leading edge skin panels (1) to fairing/wiring harness and wing structure with blind rivets (2).

o. Install wing center section leading edge flap (T.O. 1A-7D-2-8).

p. Install wing pylons (T.O. 1A-7D-2-13).

q. Perform operational checkout using armament release system test set (T.O. 1A-7D-2-13).

r. Perform operational checkout of fuel quantity indicating and external fuel transfer systems (T.O. 1A-7D-2-6).

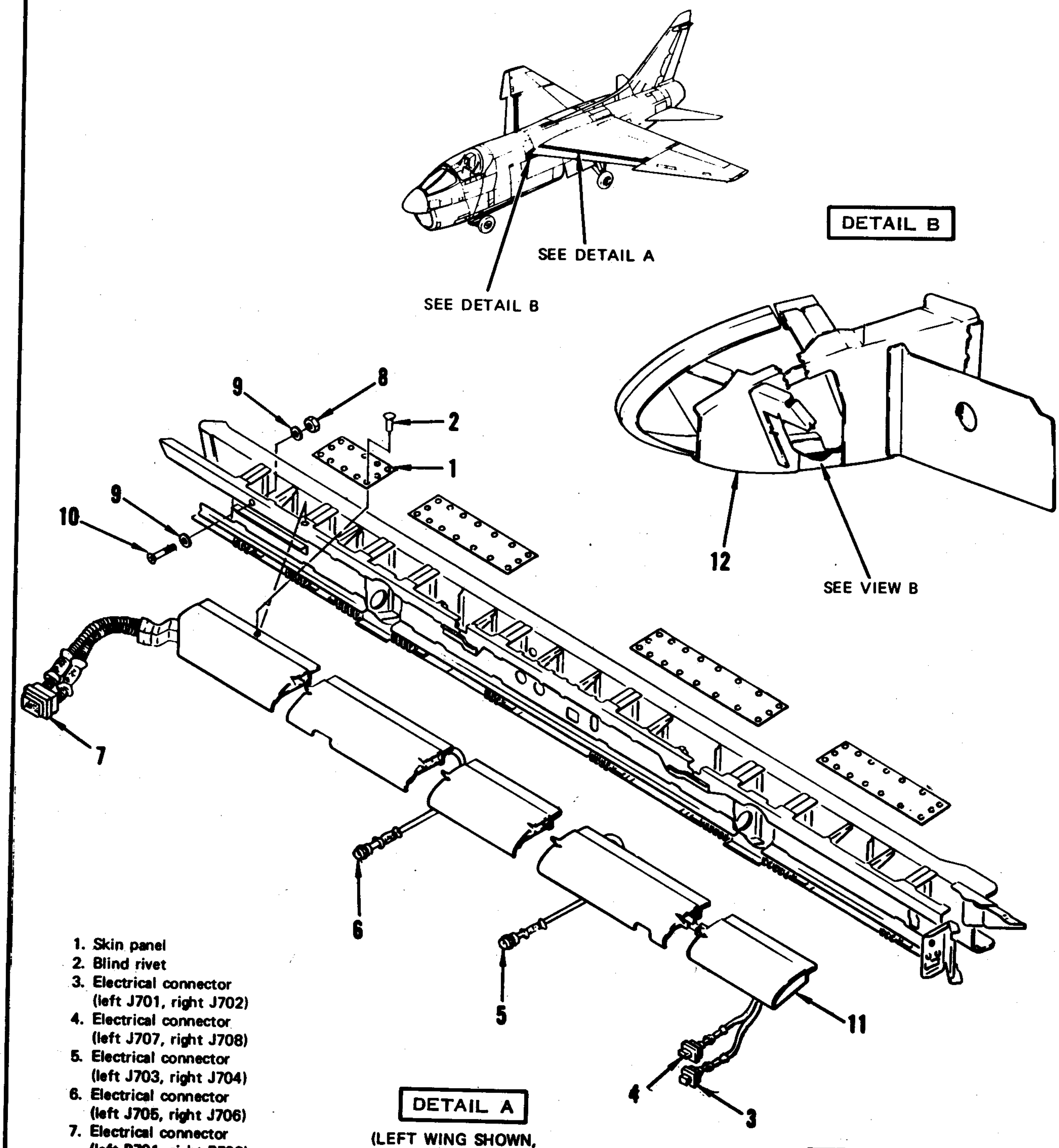
s. Close all accesses opened for fairing/wiring harness removal and installation.

22-21. WING CENTER SECTION REMOVAL, BUILDUP, AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	215-00211-1	Sling assembly, wing hoisting	Hoist complete wing or wing center section only.
	CV15-206568-1	Puller, wing center section bolt	Pull aft wing attach bolts during removal of wing center section from fuselage.
	CV15-206170-2	Guide, wing center section bolt	Align holes in aft wing attach lugs with mating holes in fuselage lugs during wing center installation.
	215-00835-1	Guide, wing forward wing attach bolt	Align holes in forward wing attach lugs with mating holes in fuselage lugs during wing center section installation.
	215-00110-4	Pin, rigging No. 14	Secure UHT aft cam mechanism.
		Hoist, overhead or crane, 5,000-lb capacity	Hoist wing center section for removal and installation.
	216-00210-28 or -1[1]	Airplane hoisting sling	Provide alternate hoisting of wing.

[1]Airplanes through AF69-6196 only



1. Skin panel
2. Blind rivet
3. Electrical connector (left J701, right J702)
4. Electrical connector (left J707, right J708)
5. Electrical connector (left J703, right J704)
6. Electrical connector (left J705, right J706)
7. Electrical connector (left P701, right P702)
8. Nut
9. Washer
10. Screw
11. Fairing/wiring harness assembly
12. Wing-to-fuselage fairing

NOTE

On left wing only, install screw through L.E. flap down position switch mount bracket with head on far side.

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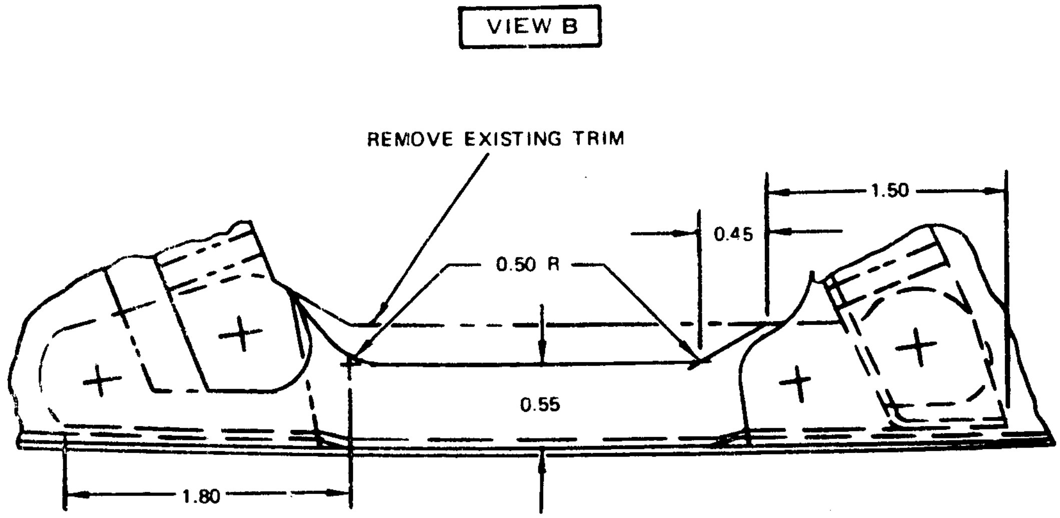
Figure 22-4. Wing Center Section Leading Edge Fairing/Wiring Harness Assembly Removal and Installation (Sheet 1)



NOTE

On airplanes through AF73-1003 the structural modification illustrated in Detail B is required to permit withdrawal of electrical connectors P701 and P702 (7) through wing-to-fuselage fairing (12). Careful attention to dimensions outlined in View B is necessary to provide necessary clearance without sacrificing stress tolerance.

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Figure 22-4. Wing Center Section Leading Edge Fairing/Wiring Harness Assembly Removal and Installation (Sheet 2)

22-22. REMOVAL. (See figure 22-5.)

a. Defuel airplane (paragraph 3-66).

b. Remove trailing edge flaps (T.O. 1A-7D-2-8). Flaps may be left installed if airplane hoisting sling (216-00210) is being used to lift wing

NOTE

If wing is being removed for extensive wing repair, removal of the wing outer panels is required. However, for minor repair (i.e., fuel leak), wing outer panel removal may be omitted.

c. Remove wing outer panels (paragraph 22-9).

d. Depressurize landing gear shock struts (paragraph 3-13 and 3-14).

e. Open access 5121-2.

f. Remove wing pylons (T.O. 1A-7D-2-13). Pylons may be left installed if airplane hoisting sling (216-00210) is being used to lift wing.

g. On airplanes through AF69-6196, perform the following:

1. Open accesses 1121-5, 1121-6, 1121-7, 1121-8, 2121-6, 2121-8, 2123-3, 3113-1, 3113-11, and 4113-11.

NOTE

When disconnecting hydraulic, air, and fuel lines and electrical connectors, plug or cap open lines, fittings, and connectors.

2. Disconnect electrical connectors (1).

3. Disconnect fuel lines (2).

4. Disconnect hydraulic lines (3 and 4).

5. Disconnect electrical connectors (5).

6. Disconnect UHT push-pull rod (6). Remove bell-crank Part No. 216-78463-3.

7. Disconnect fuel lines (10).

8. Open access 10113-1.

9. Remove skins (11) from left and right side of fuselage.

10. Disconnect electrical connector (12) from anticollision light and electrical connector (13) from TACAN antenna.

11. Disconnect fuel lines (14).

12. Disconnect air line (15), fuel cell air pressure line, and pylon air pressure coupling.

13. Open accesses 3123-1, 4123-1, 5111-1, 5111-3, 6111-1, and 10123-1.

h. On airplanes AF69-6197 and subsequent, perform the following:

1. Open accesses 1121-3, 1121-7, 1121-8, 1121-10, 1132-1, 2121-3, 2121-6, 2121-7, 2121-8, 3113-1, 3113-11, 3113-13, 4113-11, and 10113-1.

2. Remove IFR cover assembly (T.O. 1A-7D-2-6).

2a. Disconnect push-pull control rod bolt (T.O. 1A-7D-2-6, 10, figure 7-11) and pull rod end clear of lever (T.O. 1A-7D-2-6, 12, figure 7-11).

NOTE

When disconnecting hydraulic, air, and fuel lines and electrical connectors, plug or cap open lines, fittings, and connectors.

3. Disconnect electrical connectors P711, P712, P713, P714, P724, and P725 (1).

4. Disconnect fuel lines (2).

5. Remove hydraulic bleed lines (3).

6. Disconnect hydraulic lines (4).

7. Disconnect UHT push-pull rod (6). Remove bell-crank Part No. 216-78463-3.

8. Disconnect air lines (7).

9. Disconnect four hydraulic lines (8).

10. Disconnect electrical connector (9).

11. Disconnect fuel line (14).

12. Disconnect air line (15), fuel cell air pressure line, and pylon air pressure coupling.

13. Remove anticollision light assembly (T.O. 1A-7D-2-11).

14. Open accesses 3123-1, 3133-5, 4123-1, 5111-1, 5111-4, 6111-1, and 6111-3.

i. Disconnect UHT push-pull rod (16).

j. Remove support bracket (17) and disconnect wingfold controlex (18). Pull controlex clear of wing center section.

k. Disconnect fuel lines (19).

l. Disconnect air lines (20).

m. Disconnect fuel lines (21).

n. Disconnect air lines (22).

o. On airplanes through AF69-6196, disconnect electrical connectors (23).

p. Disconnect fuel lines (24).

q. Disconnect hydraulic lines (25 and 26).

r. Disconnect rudder cable (27).

NOTE

Attach cord or rope to end of rudder cables before pulling them forward. After cables are removed from wing, remove cord or rope from cables. Secure cord or rope to wing for installation of cables.

s. Remove pulleys (28) to free rudder cables. Pull rudder cables forward into fuselage.

t. Remove clamps securing all electrical wiring that must be removed to clear wing center section.

u. Disconnect UHT push-pull rod (29).

v. Open accesses 3233-4 and 4233-4.

w. Disconnect aileron control links (30).

x. Disconnect roll trim links (31).

y. Disconnect aileron control links (32).

z. Disconnect roll trim actuator preload spring (33).

aa. Open accesses 5112-2 and 6112-2 and remove screw from bonding wire (34).

ab. Disconnect 6° rudder stop cable (35).

CAUTION

Position ailerons trailing edge down (if wing outer panels are installed) and check that arms (Part No. 215-78106-3) are positioned clear of fuselage for wing removal.

ac. Open forward hoist accesses 3113-10 and 4113-10 and aft hoist accesses 3133-5 and 4133-5. Attach hoist sling and connect hoist to sling.

ad. If using wing hoisting sling (215-00211-1), adjust center of gravity as follows:

1. For wing center section removal only, place 14th link (painted black) from aft swivel in top of adjuster.

2. For removal of complete wing (center section and outer panels), place sixth link (painted black) from aft swivel in top of adjuster.

ae. If using airplane hoisting sling (216-00210), adjust center of gravity as follows:

1. With pylons installed and with leading and trailing edge flaps and outer panels removed, add 175 pounds of ballast as far forward as possible between the hoisting sling forward attach points.

2. With pylons and leading and trailing edge flaps installed and with outer panels removed, add 315 pounds of ballast as indicated in substep 1.

3. With pylons, leading and trailing edge flaps, and outer panels installed, add 935 pounds of ballast as indicated in substep 1.

4. For conditions specified in substeps 1 and 2, guide ropes may be used to maintain balance instead of weights. Attach ropes to hoist forward links. Do not use ropes for condition in substep 3.

NOTE

Identify washers used with each wing attach bolt and note position of each attach bolt for installation of wing.

af. Take up slack in hoist sling and using puller and wrench, remove cotter pins (36), nuts (37), washers (38), aft wing attach bolts (39), cotter pins (40), nuts (41), washers (42), and forward wing attach bolts (43).

ag. Remove wing from airplane and place wing on a suitable padded support structure. Remove hoist and sling from wing. Perform the following inspections:

ag.1. Part Number 215-70521-2 F.S. 480 attach bolts shall be cleaned and inspected as follows:

WARNING

Solvent, P-D-680 is toxic to skin, eyes and respiratory tract. Use in a well ventilated area. Avoid prolonged breathing of vapors. Avoid eye and repeated skin contact. Keep away from sparks and flames.

1. Clean P/N 215-70521-2 bolt using P-D-680 Type III cleaner.

2. Visually inspect bolt shank and rework any corrosion. Corrosion pits up to .025 inch deep covering no more than 20 percent of the bolt shank are acceptable and are not to be blended out.

3. Perform dimensional analysis of bolt insuring shank meets the requirements of Vought Corp Drawing 215-70521.

4. Perform magnetic particle inspection of bolt per MIL-I-6868 and T.O. 1A-7D-36.

5. If bolt is worn or corroded beyond limits or if the bolt is cracked, the defective bolt shall be replaced with a new P/N 215-70521-2 bolt.

6. Perform an ultra-sonic inspection of the WCS front spar in accordance with T.O. 1A-7D-36.

7. Perform an ultra-sonic inspection of the WCS rear spar in accordance with T.O. 1A-7D-36.

8. Perform a dimensional analysis of F.S. 375 WCS forward attach point lug bushings in accordance with T.O. 1A-7D-3. Additionally, inspect the bushings for cracks, gouges, corrosion or obvious damage. All defective bushings shall be replaced with Part No. 218-30513-5 Aluminum Bronze bushings.

9. If lug bushings are removed, perform an eddy current inspection of the WCS forward attach lugs in accordance with T.O. 1A-7D-36. If lug bushings are not removed, perform an ultra-sonic inspection of the WCS forward attach lugs in accordance with T.O. 1A-7D-36.

10. Perform a dimensional analysis of F.S. 480 WCS aft attach point lug bushings in accordance with T.O. 1A-7D-3. Additionally, inspect the bushings for cracks, gouges, corrosion or obvious damage. All defective bushings shall be replaced with Part No. 218-30513-7 Aluminum Bronze bushings.

11. If lug bushings are removed, perform an eddy current inspection of the WCS aft attach lugs in accordance with T.O. 1A-7D-36. If lug bushings are not removed, perform an ultra-sonic inspection of the WCS aft attach lugs in accordance with T.O. 1A-7D-36.

NOTE

If the wing center section is to be replaced, perform remaining steps to remove items that must be retained for installation on the new wing section. Identify and note position of components and attaching hardware, routing, support points, and connections of the tubing, wiring harnesses, cables, etc for proper reinstallation.

ah. Remove leading edge flaps, flap actuators, and fittings (T.O. 1A-7D-2-8).

ai. Remove trailing edge flap actuators and fittings (T.O. 1A-7D-2-8).

aj. Remove spoiler/deflector assembly, actuators, and fittings (T.O. 1A-7D-2-8).

ak. Remove wingfold actuating cylinders (paragraph 24-34).

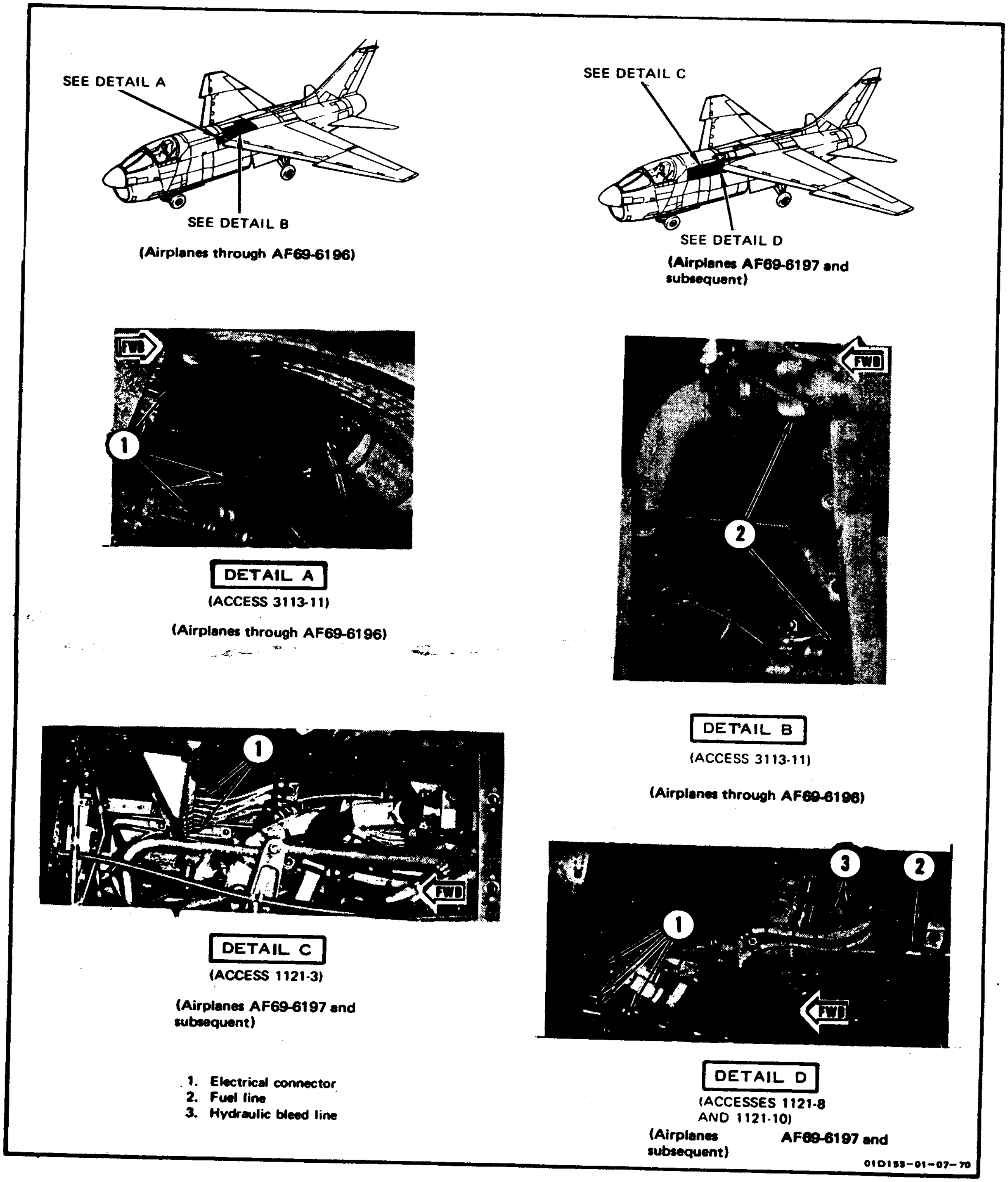


Figure 22-5. Wing Center Section Removal and Installation (Sheet 1)

al. Remove forward and aft hinge point cylinders (paragraphs 24-37 and 24-40).

am. Remove spread sequence valve (paragraph 24-43).

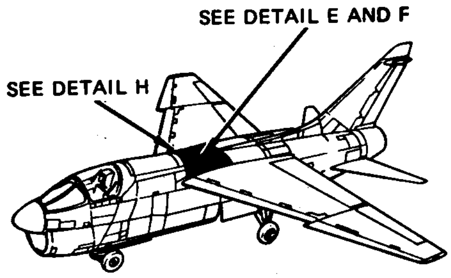
an. Remove wingfold mechanical control system. Refer to Section XXIV.

ao. Remove aileron and flap control system (T.O. 1A-7D-2-8).

ap. Remove fuel quantity indicating transmitters and dump valves (T.O. 1A-7D-2-6).

aq. Remove electrical wire bundles from along leading and trailing edges of wing.

ar. Remove hydraulic, air, and fuel lines and electrical wiring from top of wing.



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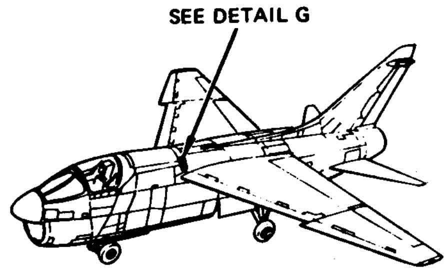
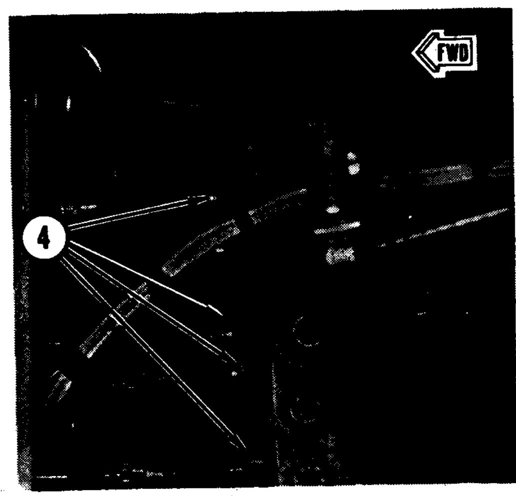


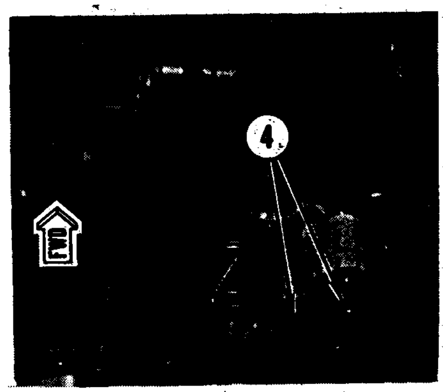
(Airplanes AF69-6197 and subsequent)



DETAIL E

(ACCESS 3113-11)

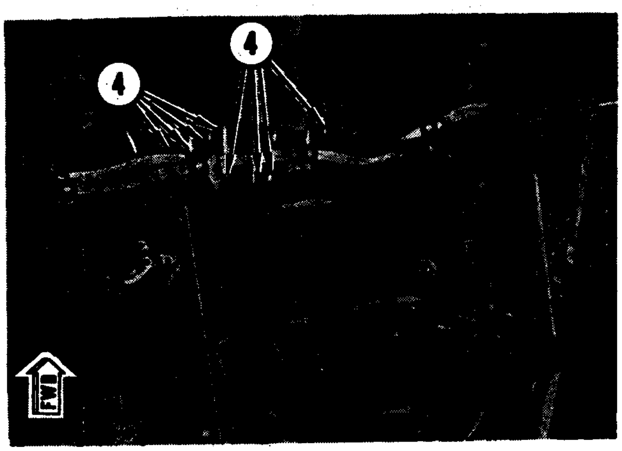
(Airplanes through AF69-6196)



DETAIL F

(ACCESS 3113-11)

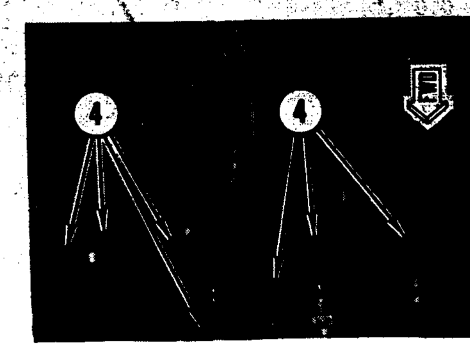
(Airplanes through AF69-6196)



DETAIL G

(IFR AREA)

(Airplanes AF69-6197 and subsequent)



DETAIL H

(ACCESS 4113-11)

(Airplanes through AF69-6196)

4. Hydraulic line

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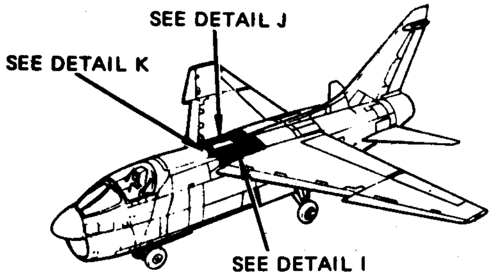
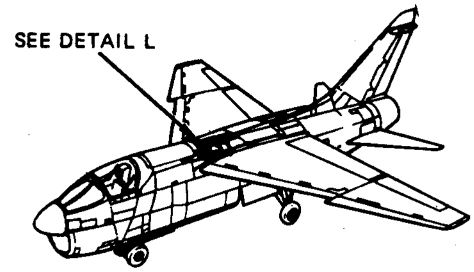
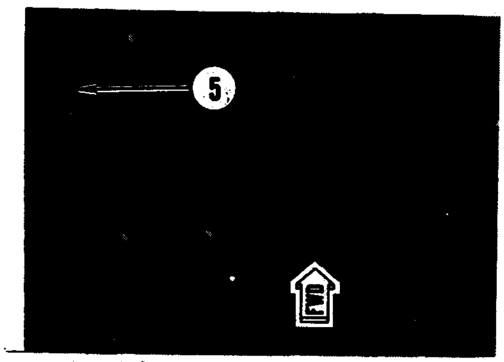
Figure 22-5. Wing Center Section Removal and Installation (Sheet 2)



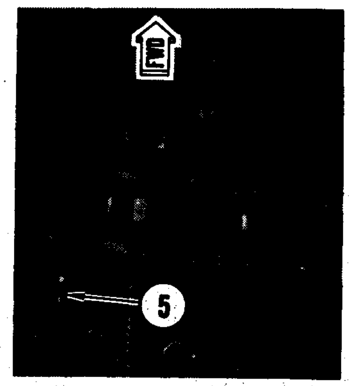
(Airplanes through AF69-6196)



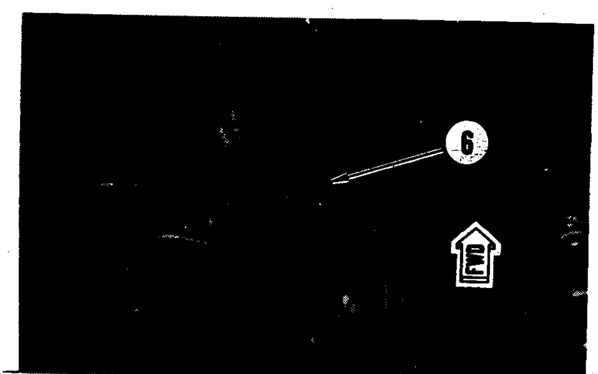
(Airplanes AF69-6197 and subsequent)



DETAIL I
(ACCESS 3113-11)
(Airplanes through AF69-6196)

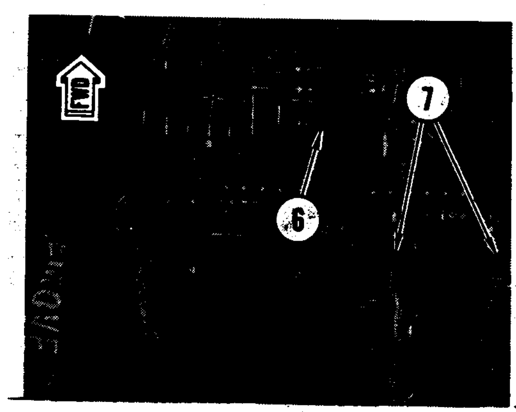


DETAIL J
(ACCESS 4113-11)
(Airplanes through AF69-6197)



DETAIL K
(ACCESS 1121-5)
(Airplanes through AF69-6196)

5. Electrical connector
6. UHT push-pull rod
7. Air line



DETAIL L
(ACCESS 3113-13)
(Airplanes AF69-6197 and subsequent)

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Figure 22-5. Wing Center Section Removal and Installation (Sheet 3)

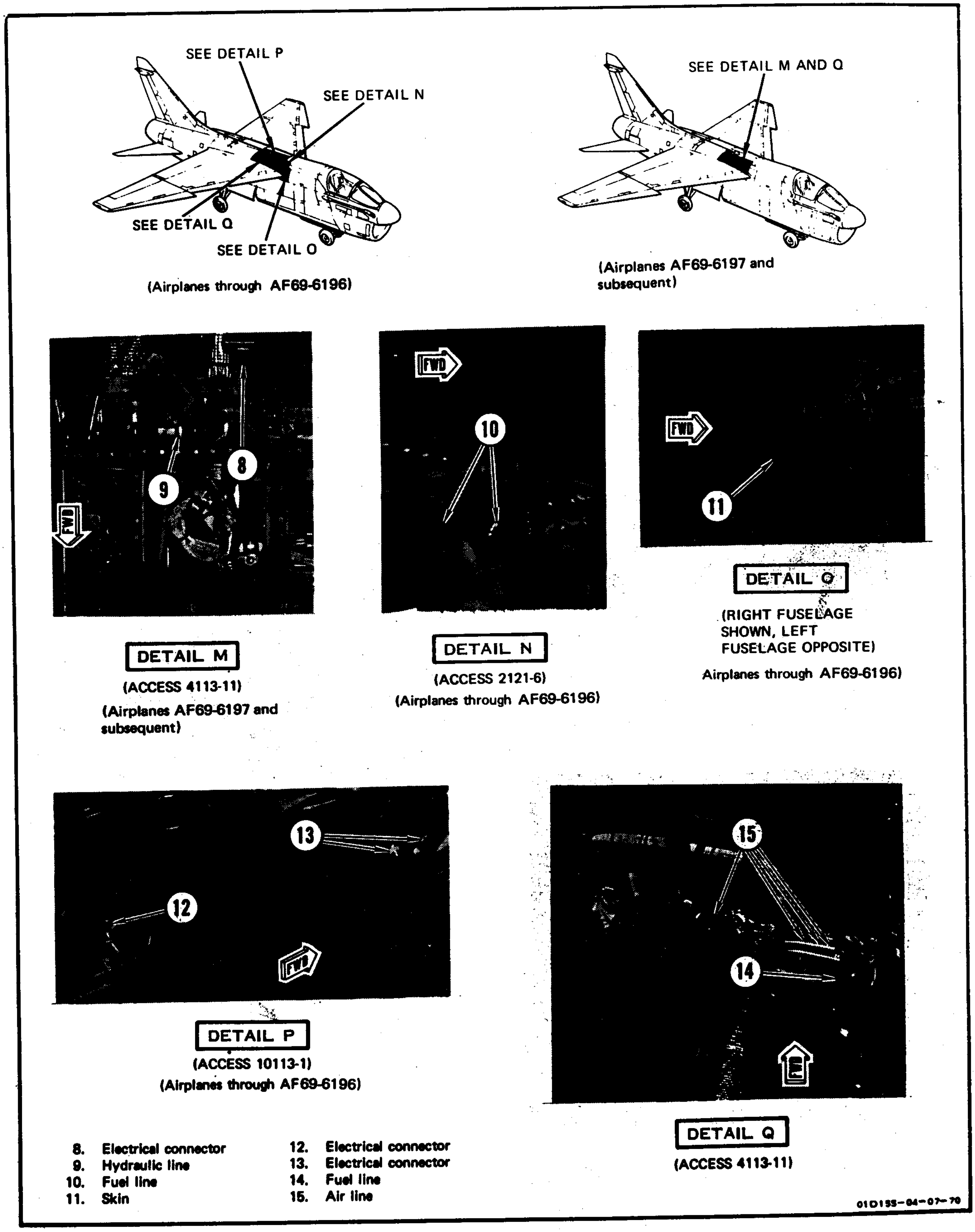


Figure 22-5. Wing Center Section Removal and Installation (Sheet 4)

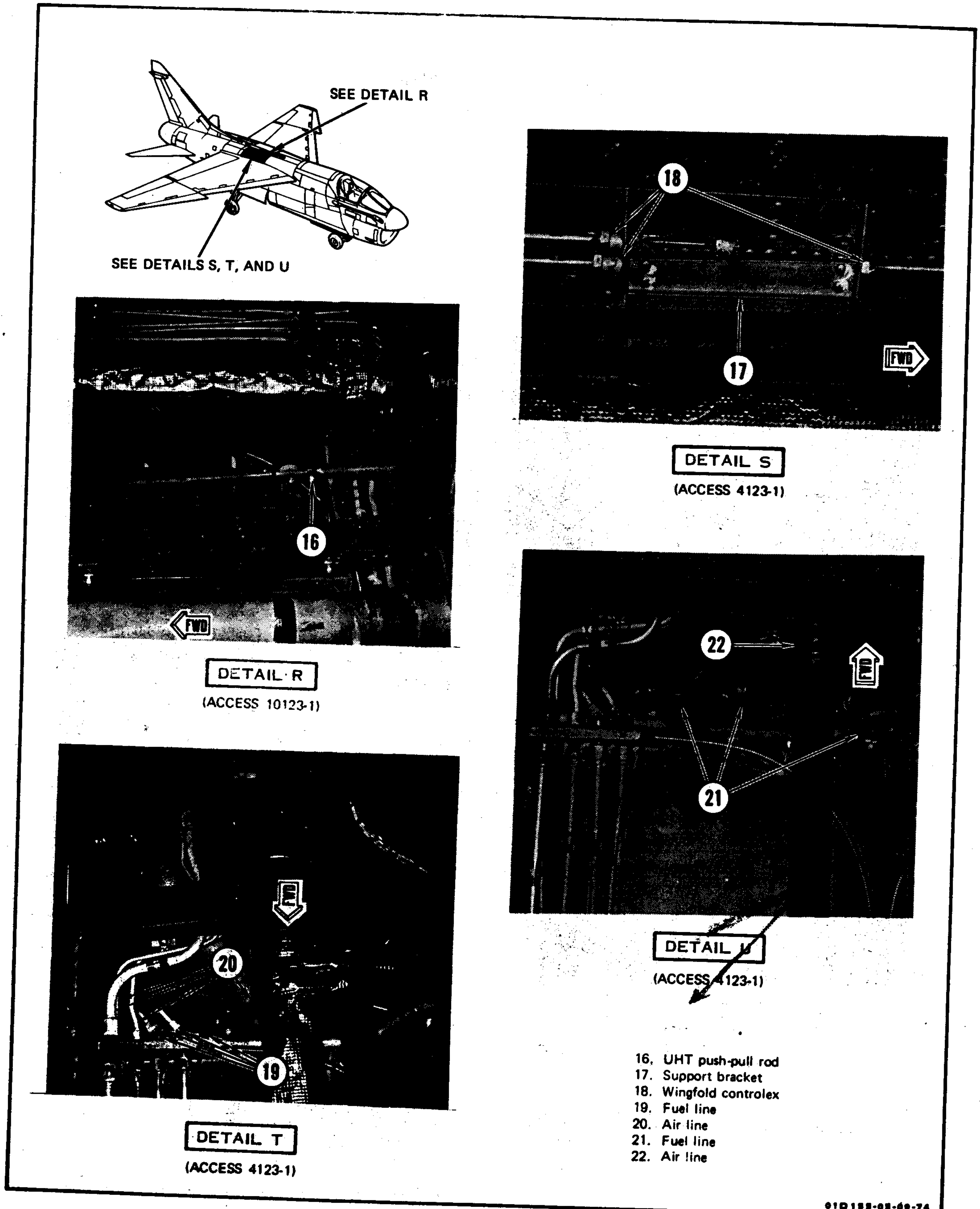


Figure 22-5. Wing Center Section Removal and Installation (Sheet 5)

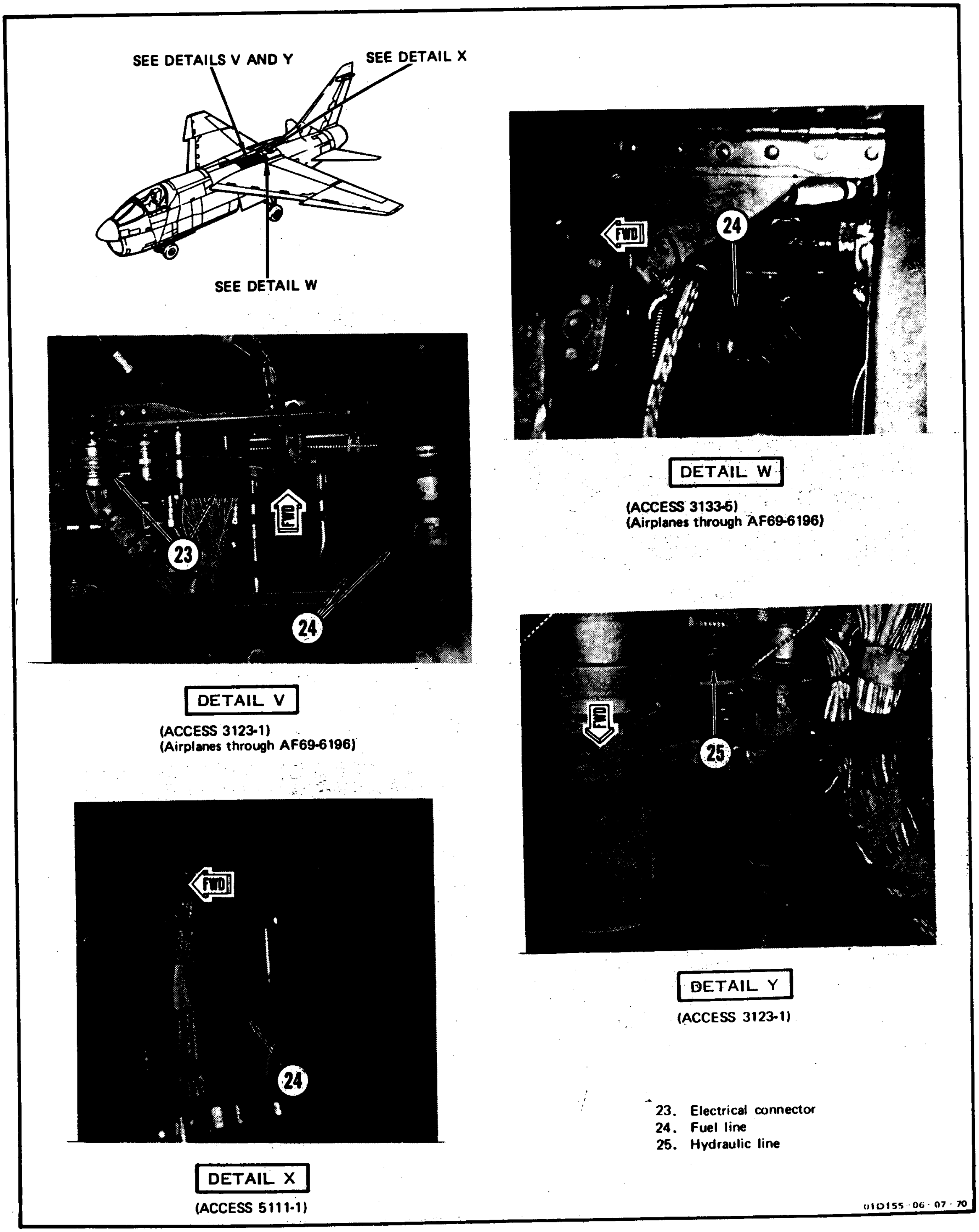


Figure 22-5. Wing Center Section Removal and Installation (Sheet 6)

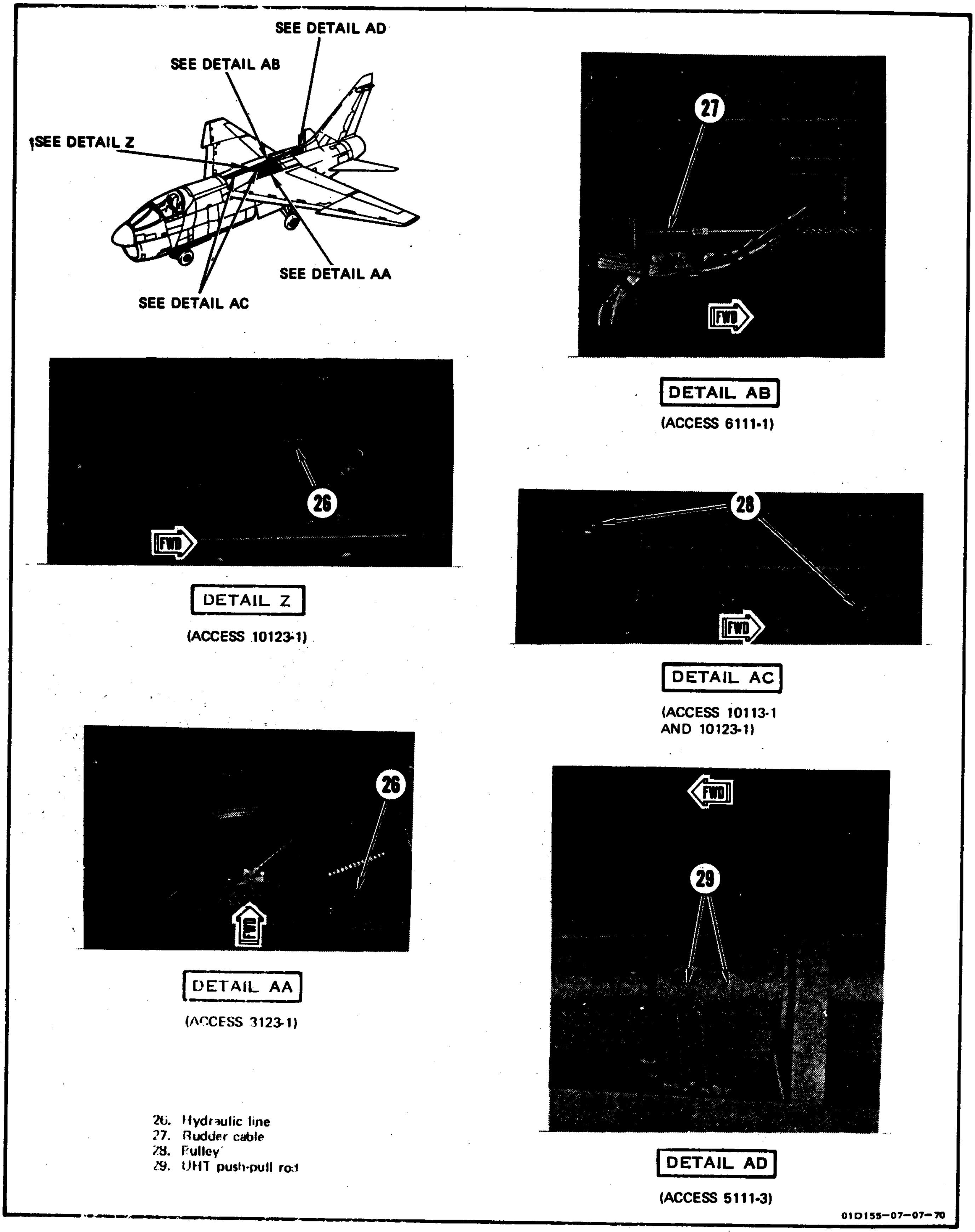
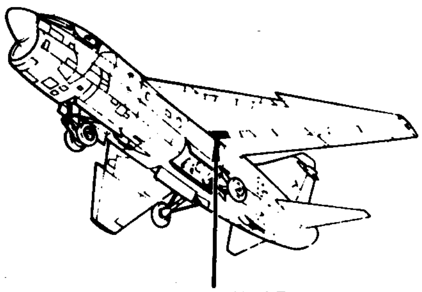
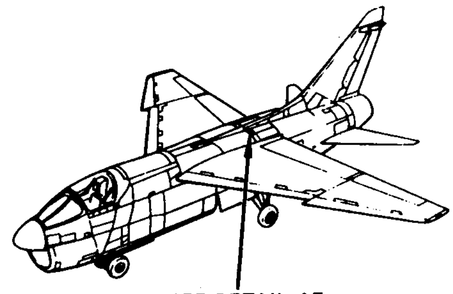


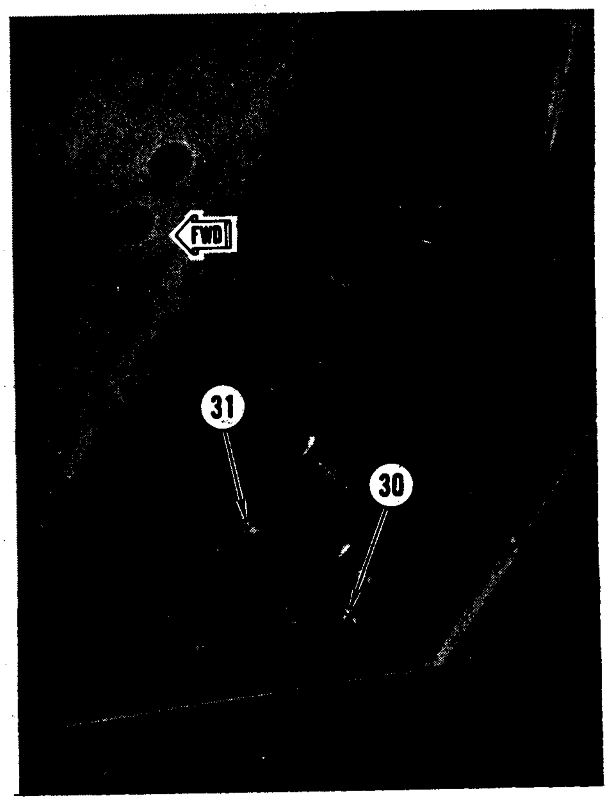
Figure 22-5. Wing Center Section Removal and Installation (Sheet 7)



SEE DETAIL AE

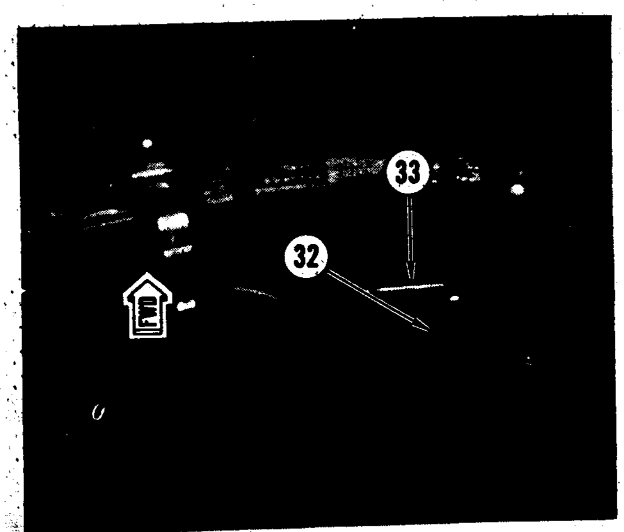


SEE DETAIL AF



DETAIL AE

(ACCESS 3233-4 SHOWN, 4233-4 OPPOSITE)



DETAIL AF

(ACCESS 5111-1)

30. Aileron control link
31. Roll trim link
32. Aileron control link
33. Roll trim actuator preload spring

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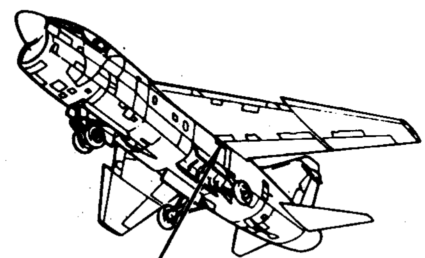
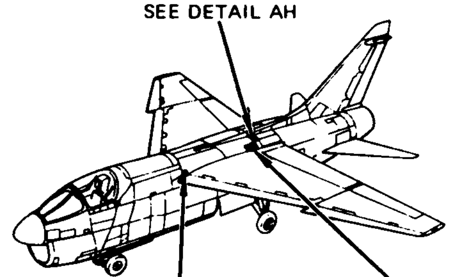
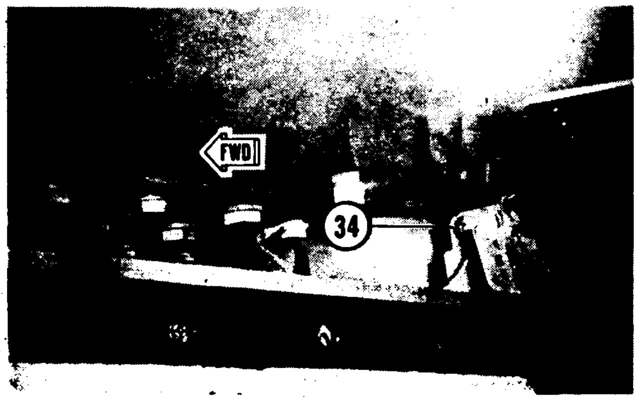
Figure 22-5. Wing Center Section Removal and Installation (Sheet 8)

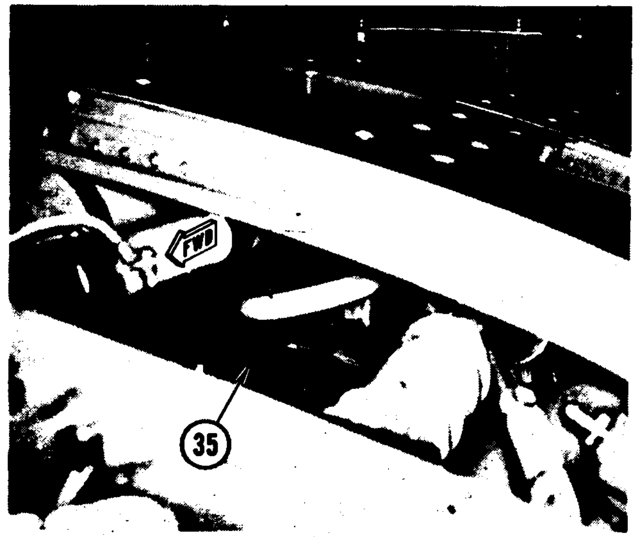






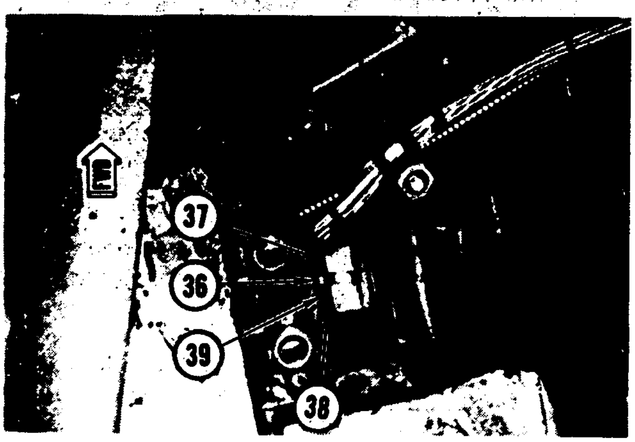
DETAIL AG

(ACCESS 5112-2 SHOWN, 6112-2 OPPOSITE)



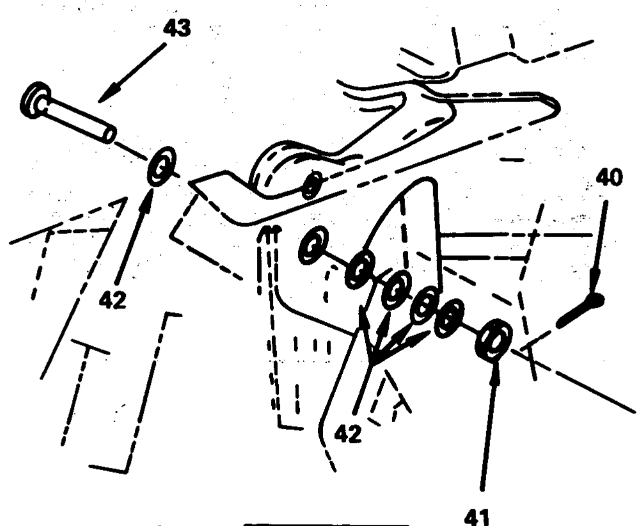
DETAIL AH

(ACCESS 5111-1)



DETAIL AJ

(ACCESS 3133-5 SHOWN, 4133-5 OPPOSITE)



DETAIL A1

(ACCESS 3113-10 SHOWN, 4113-10 OPPOSITE)

34. Bonding wire
35. 6° rudder stop cable
36. Cotter pin
37. Nut
38. Washer
39. Aft wing attach bolt
40. Cotter pin
41. Nut
42. Washer
43. Forward wing attach bolt

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Figure 22-5. Wing Center Section Removal and Installation (Sheet 9)

22-23. BUILDUP.

CAUTION

When connecting hydraulic lines, fuel lines, and electrical connectors, ensure that caps have been removed.

a. Install hydraulic, air, and fuel lines and wiring across top of replacement wing.

b. Install electrical wire bundles along leading and trailing edge of wing.

c. Install fuel quantity indicating transmitters and dump valves (T.O. 1A-7D-2-6).

d. Install aileron and flap control system (T.O. 1A-7D-2-8).

e. Install wingfold actuating cylinders (paragraph 24-34).

f. Install forward and aft hinge pin cylinders (paragraphs 24-37 and 24-40).

g. Install spread sequence valve (paragraph 24-39).

h. Install wingfold mechanical control system. Refer to Section XXIV.

i. Install spoiler/deflector assembly, actuators, and fittings (T.O. 1A-7D-2-8).

j. Install trailing edge flap actuators and fittings (T.O. 1A-7D-2-8).

k. Install leading edge flaps, flap actuators, and fittings (T.O. 1A-7D-2-8).

22-24. INSTALLATION. (See figure 22-5.)

a. Open forward hoist accesses 3113-10 and 4113-10 and aft hoist accesses 3113-5 and 4133-5. Attach wing hoist sling on wing and attach hoist to sling.

b. If using wing hoisting sling (215-00211-1), adjust center of gravity as follows:

1. For installation of wing center section only, place 14th link (painted black) from aft swivel in top of adjuster.

2. For installation of complete wing (center section and outer panels), place sixth link (painted black) from aft swivel in top of adjuster.

c. If using airplane hoisting sling (216-00210), adjust center of gravity by adding ballast to wing as indicated in removal procedure (step af-1).

d. Position wing on fuselage and install attach bolts, washers, and nuts as follows:

(1) Coat interfacing surfaces of the wing lugs, Part No. 215-70054 and the fuselage lugs, Part No. 215-70024, and the washers under the aft attach bolt heads and nuts with MIL-S-81733 sealant. Coat the aft attach bolt shanks with a thin coat of MIL-C-16173, Grade 2, corrosion preventative compound and install bolts (39), washers (38), and nuts (37), using bolt guides as required. Install nuts finger tight. Align cotter pin holes as necessary and install new cotter pins (36).

NOTE

The sealant under the washers shall be of sufficient thickness to assure squeeze out between washers and lug faces when the nuts are installed.

(2) Coat the forward wing attach bolt shanks with a thin coat of MIL-C-16173, Grade 2, corrosion preventative compound and install bolts (43), washers (42), and nuts (41) using bolt guides as required. Install nuts finger tight. Back off nuts to first cotter pin hole if necessary and install new cotter pins (40).

e. Remove wing hoist sling and hoist.

NOTE

When connecting flight control links, cables, etc, refer to applicable procedures in T.O. 1A-7D-2-8.

f. Connect 6° rudder stop cable (35) to turnbuckle.

g. Install bonding wire (34).

h. Connect roll trim actuator preload spring (33).

i. Connect aileron control links (32).

j. Connect roll trim links (31).

k. Connect aileron control links (30).

l. Connect UHT push-pull rod (29).

m. Tie cord or rope to rudder cables and pull cables through wing section and install pulleys (28). Remove cord or rope from cables. Install clamps to secure electrical wiring.

n. Connect rudder cables (27) to turnbuckles.

NOTE

Install new O-rings, split rings, backup rings, and seals in or on all lines, couplings, and fittings before installation.

o. Connect hydraulic lines (25 and 26).

p. Connect fuel line (24).

q. On airplanes through AF69-6196 connect electrical connectors (23).

r. Connect air line (22).

s. Connect fuel lines (21).

t. Connect air lines (20).

u. Connect fuel lines (19).

v. Install wingfold controlex (18) and support bracket (17).

w. Connect UHT push-pull rod (16).

x. Connect air lines (15), fuel cell air pressure line, and pylon air pressure coupling.

y. Connect fuel line (14).

z. On airplanes through AF69-6196, perform the following:

1. Connect electrical connector (13) to TACAN antenna.

2. Connect electrical connector (12) to anticollision light.

3. Install skins (11) on left and right side of fuselage.

4. Connect fuel lines (10).

5. Connect UHT push-pull rod (6). Reinstall bellcrank Part No. 216-78463-3.

6. Connect electrical connectors (5).

7. Connect hydraulic lines (4).

8. Connect fuel lines (2).

9. Connect electrical connectors (1).

aa. On airplanes AF69-6197 and subsequent, perform the following:

1. Install anticollision light assembly (T.O. 1A-7D-2-11).

2. Connect electrical connector (9).

2a. Reconnect push-pull control rod (T.O. 1A-7D-2-6, 11, figure 7-11) to control lever (T.O. 1A-7D-2-6, 12, figure 7-11).

3. Connect four hydraulic lines (8).

4. Connect air lines (7).

5. Connect UHT push-pull rod (6). Reinstall bellcrank Part No. 216-78463-3.

6. Connect hydraulic lines (4).

7. Install hydraulic bleed lines (3).

8. Connect fuel lines (2).

9. Connect electrical connectors (1).

10. Install IFR cover assembly (T.O. 1A-7D-2-6).

ab Service landing gear shock struts (paragraphs 3-13 and 3-14).

ac. Install wing outer panels (paragraph 22-9).

ad. Install trailing edge flaps (T.O. 1A-7D-2-8).

ae. Perform hydraulic system bleeding (paragraph 3-41).

af. Perform rigging (if applicable) and operational checkout of the following systems:

1. Rudder system (T.O. 1A-7D-2-8)

2. Wingfold system (paragraph 24-14)

3. 6° rudder stop cable system (T.O. 1A-7D-2-8)

4. UHT system (T.O. 1A-7D-2-8)

5. Aileron system (T.O. 1A-7D-2-8)

6. Flap system (T.O. 1A-7D-2-8)

7. Automatic flight control system (T.O. 1A-7D-2-9)

8. Pitch and roll trim system (T.O. 1A-7D-2-8)

9. Exterior lighting system (T.O. 1A-7D-2-11)

10. Fuel vent and pressurization system (T.O. 1A-7D-2-6)

11. AN/ARN-118 TACAN navigational set (T.O. 1A-7D-2-12)

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ag. Service airplane with fuel (paragraph 3-66).

ah. Start and operate engine (paragraph 2-51). Check the following during engine operation:

1. Fuel and hydraulic leaks

2. Hydraulic pressure

3. Fuel quantity

4. Engine fuel controls

5. Operation of systems listed in step ag.

ai. Shut down engine.

aj. Close all opened accesses.

22-25. WING FORWARD ATTACH LINK REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	215-00211-1	Sling assembly, wing hoisting	Relieve load on wing forward attach links.
	215-00835-1	Guide, wing forward attach bolt	Align holes in forward wing attach lugs with mating holes in attach links.
		Hoist, overhead or crane, 5,000-pound capacity	Use in conjunction with sling assembly to relieve load on wing attach links.

NOTE

This procedure is applicable for removal and installation of both left and right wing forward attach links.

22-26. REMOVAL. (See figure 22-6.)

a. Open access 3113-10 for removal of left attach link and access 4113-10 for removal of right attach link.

NOTE

Identify washer(s) removed from upper and lower link attach bolts for reinstallation in same location.

b. Remove nut (1) and washers (2) from bolt (3). Do not remove bolt.

c. Open aft hoist accesses 3133-5 and 4133-5.

d. Connect wing hoisting sling to overhead hoist and attach sling to forward and aft wing hoisting lugs as shown in figure 2-11.

e. Adjust sling for proper center of gravity by placing sixth link (painted black) from aft swivel in the top of the adjuster.

CAUTION

To prevent damage to airframe structure and systems components, do not remove both forward wing attach links at the same time (one link shall be installed at all times).

f. Take up slack in hoist sling sufficiently to relieve load on wing attach link and remove bolt (3). Maintain the no load condition with hoist.

g. Open access 1132-1 for removal of left attach link and access 2132-1 for removal of right attach link.

h. Remove nut (4), washers (5), and bolt (6).

i. Remove link (7) from airplane.

22-27. INSTALLATION. (See figure 22-6.) Inspect link for bearing displacement and freedom of movement. If bearing is displaced/or movement restricted.

a. Remove displaced bearings.

b. Inspect bearing hole in link for corrosion, cracks, or damage using dye penetrant or eddy current NDI methods in accordance with T.O. 1A-7D-36. Minor abrasions and scouring can be removed using a crocus cloth.

c. Inspect bearings for corrosion, galling/scoring, excessive looseness, or binding (Reference T.O. 44B-2-2). Stiff/frozen bearings may be loosened by using a light penetrating oil in accordance with VV-P-216B, Type 1, or equivalent. Bearings that do not pass this inspection or cannot be worked free must be replaced.

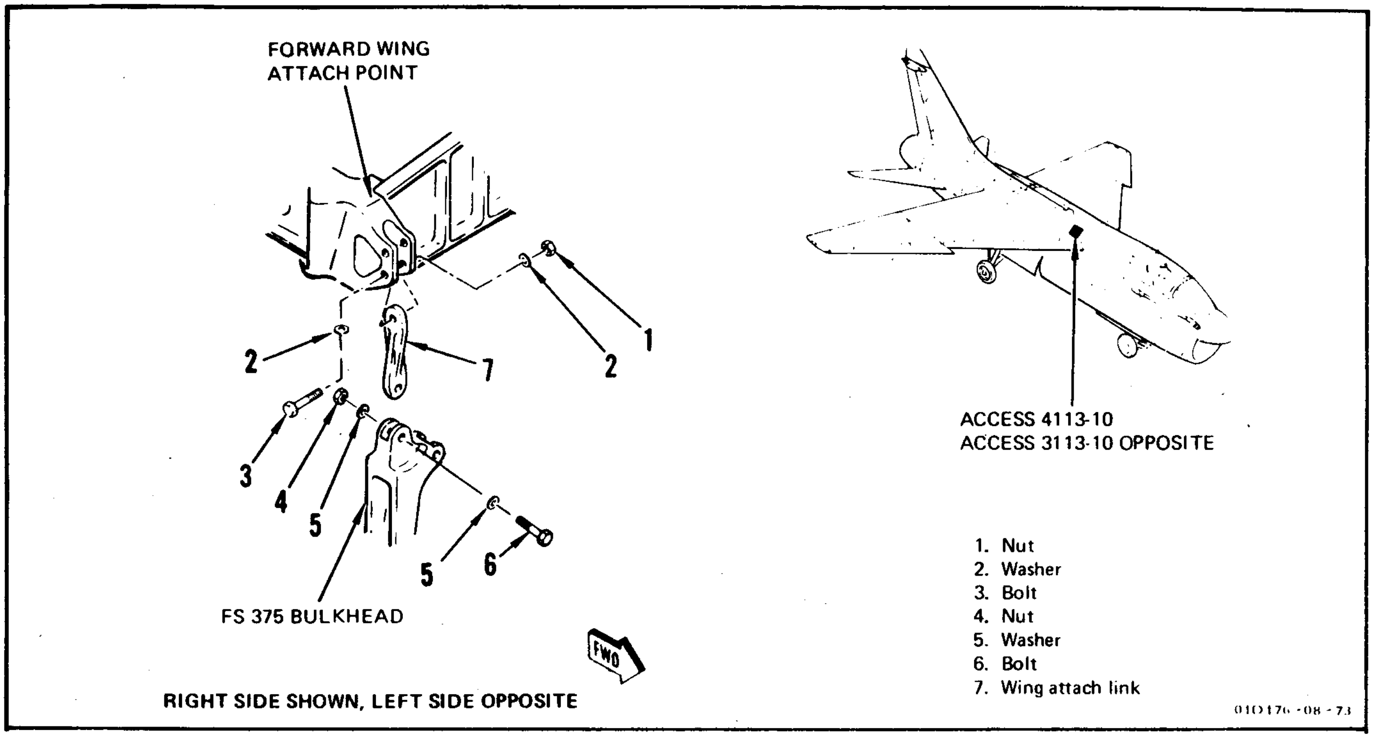


Figure 22-6. Wing Forward Attach Link Removal and Installation

d. Reinstall old bearing or install a new bearing, Heim Part No. NAG-9, using MIL-R-46082A, Type 1, retaining compound to provide a press fit. Insure mating surfaces are cleaned prior to installing bearing.

e. Groove stake bearing using tool in accordance with T.O. 1A-7D-3, Appendix F. Insure proper staking forces/torque values are used during the staking operation.

f. Seal outside of bearing race/link interface with MIL-S-8802 or MIL-S-81733 sealing compound.

g. Refinish link in accordance with T.O. 1A-7D-23.

h. Place link (7) in position for installation.

i. Wipe shank of bolt (6) with a thin coat of MIL-C-16173 Grade 2 corrosion-preventive compound. Install bolt, washers (5), and nut (4) and secure with cotter pin.

j. Using bolt guide, install bolt (3), washers (2), and nut (1) and secure with cotter pin.

k. Remove wing hoisting sling and hoist as required.

l. Close accesses 1132-1, 2132-1, 3113-10, 3133-5, 4113-10, and 4133-5 as applicable.

SECTION XXIII

EMPENNAGE

23-1. DESCRIPTION.

23-2. The empennage is the rear portion of the fuselage aft section and includes a vertical stabilizer, rudder, and unit horizontal tail (UHT). Components of the empennage control pitch and yaw motion and stabilize the airplane in the vertical and horizontal attitudes.

23-3. The vertical stabilizer, a semimonocoque structure, is permanently attached to the upper portion of the fuselage aft section. The main beam of the vertical stabilizer forms a part of the aft bulkhead in the fuselage aft section. A rudder is mounted on the aft portion of the vertical stabilizer by three hinges. Control rods and actuating mechanisms for rudder and UHT controls are housed inside the vertical stabilizer. Mounting provisions are provided on the vertical stabilizer for the UHF-IFF, ECM, and ILS antennas. The cap which covers the UHF-IFF antenna may be removed to facilitate maintenance.

23-4. The rudder controls the yaw motion of the airplane. Control is accomplished by mechanical linkage and a rudder servo valve.

23-5. The UHT is attached to the fuselage aft section by means of a torque tube and bearing on each half of the UHT. Movement of the two halves of the UHT is synchronized by a slider valve linkage to move as a single surface. The UHT serves as a horizontal stabilizer and control surface, controlling the pitch motion of the airplane.

23-6. EMPENNAGE ARMOR PLATE ARRANGEMENT (Airplanes AF69-6197 and Subsequent.) (See figure 1-15.)

23-7. Protection of the rudder actuator servo valve is provided by three steel armor plates. One is attached to the vertical beam forward of the servo valve and the other two plates are attached to accesses 9133-1 and 9133-2. The rudder control system is also protected by two steel armor plates which are attached to accesses 9113-2 and 9113-5. The rudder servo valve forward armor plate is secured with screws to facilitate removal and installation. The access mounted armor plates are secured with rivets and are an integral part of the access.

23-8. ANTENNA CAP ASSEMBLY REMOVAL AND INSTALLATION.

23-9. REMOVAL.

a. Remove screws securing antenna cap to vertical stabilizer.

b. Raise antenna cap from vertical stabilizer and disconnect coaxial cable at connector.

c. Remove antenna cap.

23-10. INSTALLATION.

a. Position cap on vertical stabilizer.

b. Connect coaxial cable to connector.

c. Secure antenna cap to vertical stabilizer with screws.

23-11. RHAW RADOME REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	MIL-M-7404	Maintenance stand	Gain access to vertical stabilizer to remove and replace radome.
	850-2 1/2	Sealant gun	Apply sealant to mating surfaces.

23-12. REMOVAL.

a. Remove 18 screws securing radome to airframe.

b. Break seal between radome and vertical stabilizer.

c. Disconnect coaxial cables from amplifiers, and remove radome.

23-13. INSTALLATION.

a. Remove all old sealant from mating surfaces.

b. If a new radome is to be installed, perform the following steps:

1. Position radome for installation and mark edges to be trimmed.

2. Remove radome and trim to fit.

c. Using No. 240 or 320 wet or dry sandpaper, remove rough or shiny portions from mating surfaces.

d. Wipe surfaces with clean, dry cloth. Do not touch mating surfaces with hands or allow surfaces to become soiled.

e. Connect coaxial cables to antenna connectors and safety-wire.

f. Apply MIL-S-8802 sealant to mating surface on airframe structure and MIL-G-7711 parting agent to mating surface on radome.

NOTE

Apply sealant in sufficient quantity to provide 100% extrusion of sealant between mating surfaces of radome and airframe.

g. Install radome and secure with 18 screws.

h. Connect coaxial cables to amplifiers and safety-wire.

i. Allow sealant to cure for 2 hours at 150° (± 10°)F or 24 hours at room temperature.

23-14. RUDDER SERVO VALVE FORWARD ARMOR PLATE REMOVAL AND INSTALLATION. (Airplanes AF69-6197 and Subsequent.)

23-15. REMOVAL. (See figure 23-1.)

a. Open accesses 9133-1 and 9133-2.

b. Remove rudder servo valve (T.O. 1A-7D-2-8).

c. Remove four attachment screws securing front armor plate to bulkhead.

d. Remove front armor plate from airplane.

e. If front armor plate is not to be installed, perform the following:

1. Install rudder servo valve (T.O. 1A-7D-2-8).

2. Perform rudder control system operational checkout (T.O. 1A-7D-2-8).

3. Close accesses 9133-1 and 9133-2.

23-16. INSTALLATION. (See figure 23-1.)

a. Open accesses 9133-1 and 9133-2.

b. If rudder servo valve is installed, remove servo valve (T.O. 1A-7D-2-8).

c. Attach armor plate to bulkhead using four attachment screws.

d. Install servo valve (T.O. 1A-7D-2-8).

e. Perform rudder control system operational checkout (T.O. 1A-7D-2-8).

f. Close accesses 9133-1 and 9133-2.

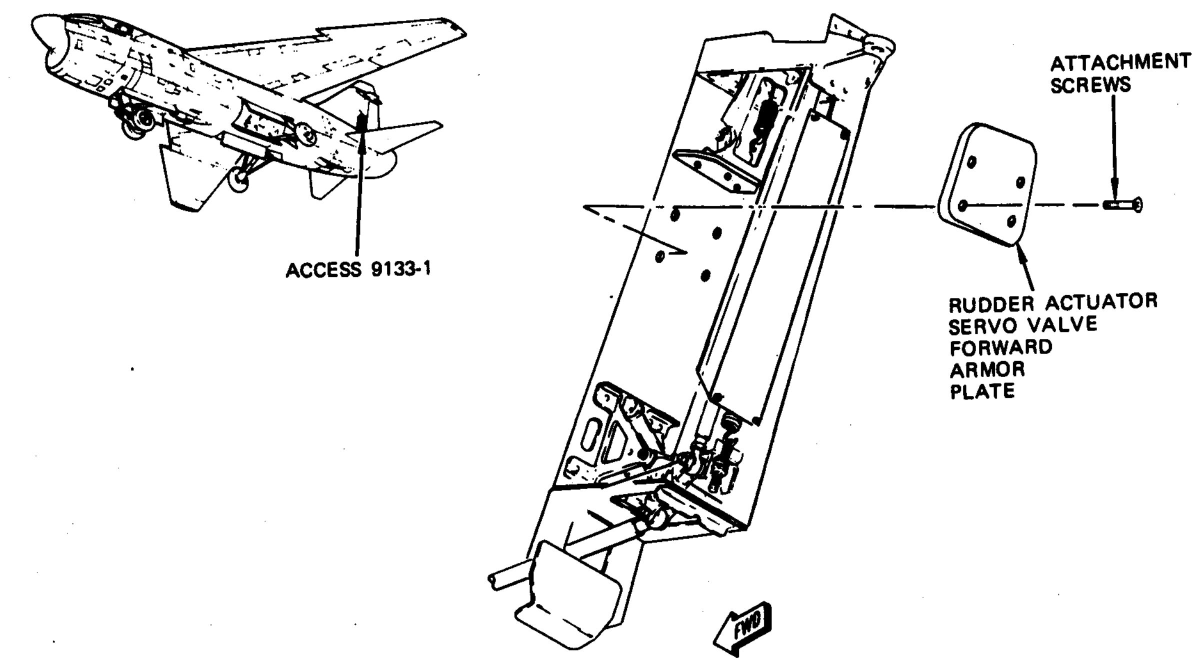


Figure 23-1. Rudder Actuator Servo Valve Forward Armor Plate Removal and Installation (Airplanes AF69-6197 and Subsequent)

SECTION XXIV
WINGFOLD SYSTEM

24-1. DESCRIPTION.

24-2. The wingfold system is provided to fold the wing outer panels to facilitate parking in a minimum amount of area. The wing outer panels are attached to the wing center section by forward and aft hinges. The wing outer panels are folded by hydraulic actuating cylinders, which are powered by PC No. 2 hydraulic system. Hydraulic components of the system consist of wingfold selector valve, wingfold actuating cylinder, forward and aft hinge pin cylinders, spread sequence valve, relief valve, wingfold manual selector valve, and various restrictors and check valves. Electrical components of the system include wingfold control switch, wingfold handle switch No. 1, wingfold handle switch No. 2, and 2-second time-delay relay. Mechanical components consist of a wing hinge pin lock lever, mechanical locks, warning flags, and combination of mechanical linkage and flexible push-pull control assembly (controlex) which connect the mechanical locks and flags with the wing hinge pin lock lever.

24-3. Four red warning flags and a wingfold caution light are incorporated in the system to indicate the position of the wing outer panels. A warning flag is located on top and bottom of each wing near the wingfold hinge points. The flags extend above and below the upper and lower wing surfaces when the mechanical locks are not engaged, providing a visual indication that the wing outer panels are not locked. The caution light, located on the caution light panel, comes on to provide additional indication when the wing outer panels are not spread and locked.

24-4. OPERATION. (See figures 24-1 and 24-2.)

24-5. OUTER PANEL FOLD. Raising the wing hinge pin lock lever in the cockpit disengages the mechanical locks from the hinge pin cylinder hinge pins, extends the warning flags, and exposes the wingfold control switch. While the lever is moving to the up-and-locked position, the mechanical linkage actuates wingfold handle switch No. 1 which completes a power circuit to the wingfold control switch and to a holding coil within the control switch. At the same time, the mechanical linkage deactuates wingfold handle switch No. 2, which then completes a power circuit to illuminate the wingfold advisory light. Deactuation of wingfold handle switch No. 2 also interrupts the power circuit to the wingfold selector valve spread solenoid.

24-6. Placing the wingfold control switch in FOLD completes an electrical circuit to energize the wingfold selector valve fold solenoid. The selector valve actuates to apply PC No. 2 hydraulic system pressure to retract the aft hinge pin cylinders and withdraw the hinge pins. When the aft hinge pins have been withdrawn, mechanical sequence valves, which are an integral part of the cylinders, actuate to allow hydraulic pressure to retract the forward hinge pin cylinders. When the forward hinge pins have been withdrawn, the integral sequence valves actuate to apply hydraulic pressure to the wingfold actuating cylinders, which extend to fold the outer panels. Return fluid from the cylinders is routed through the wingfold selector valve into the PC No. 2 hydraulic return system.

24-7. The wingfold control switch will remain in FOLD until it is manually placed in OFF or until electrical power to the holding coil is removed, allowing the magnetically held switch to move to the OFF position.

24-8. The wing outer panels may be folded, without connecting external electrical or hydraulic power, by means of a wingfold manual selector valve. When the valve is manually actuated, pressure provided by the hydraulic hand pump is discharged into the system fold lines. The wingfold control switch need not be operated when folding wings with the manual selector valve. The wing hinge pin lock lever, however, must be in the full up-and-locked position.

24-9. OUTER PANEL SPREAD. Placing the wingfold control switch in SPREAD applies 28 volts dc from the secondary dc bus to time-delay relay K209 and through a diode to the wingfold selector valve fold solenoid. The time-delay relay energizes the selector valve fold solenoid for 2 seconds prior to energizing the spread solenoid. The time delay ensures that the wing hinge pins are fully retracted before wing spreading. The wingfold selector valve actuates to complete a hydraulic circuit to the spread sequence valve, then to the wingfold actuating cylinder, spreading the outer panels. When the wingfold actuating cylinder fully retracts, the wing outer panel actuates the spread sequence valve to apply hydraulic pressure to the forward and aft hinge pin cylinders. The cylinders extend to insert the hinge pins through the hinge lugs.

24-10. When the outer panels are spread and the hinge pins fully extended through the hinge lugs, the wing hinge pin lock lever can be placed in the down-and-locked position to mechanically safety the hinge pins and retract the warning flags. While the wing hinge pin lock lever is moving to the down-and-locked position, the mechanical linkage deactuates wingfold handle switch No. 1, interrupting the power circuit to the wingfold control switch and its holding coil. The mechanical linkage also actuates wingfold handle switch No. 2, interrupting the power circuit to the wingfold advisory light and completing a circuit to the wingfold selector valve spread solenoid. This keeps the spread solenoid energized at all times when the lock lever is down and locked to prevent hinge pin drift and/or damage to the hinge pin locks.

24-11. Each hinge pin compresses a spring-loaded plunger when fully extended. This allows the mechanical locks to pivot into the locked position on the ends of the hinge pins when the lock lever in the cockpit is placed in the down-and-locked position. With the outer wing panels spread, inability to place the lock lever in the down-and-locked position indicates the hinge pins have not fully extended and the outer panels are not properly locked.

24-12. COMPONENTS.

24-13. For system components, their locations, and functions, refer to table 24-1.

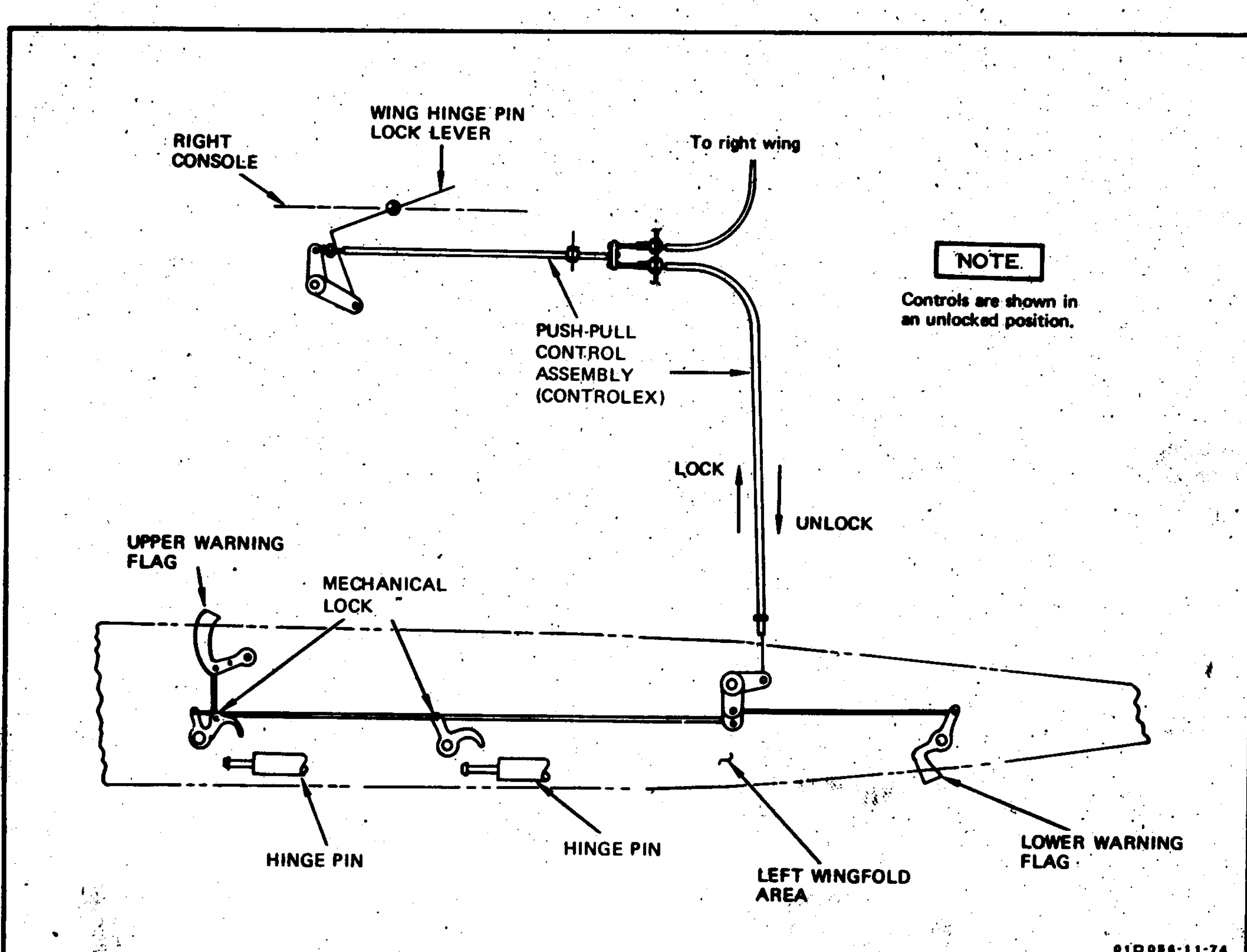
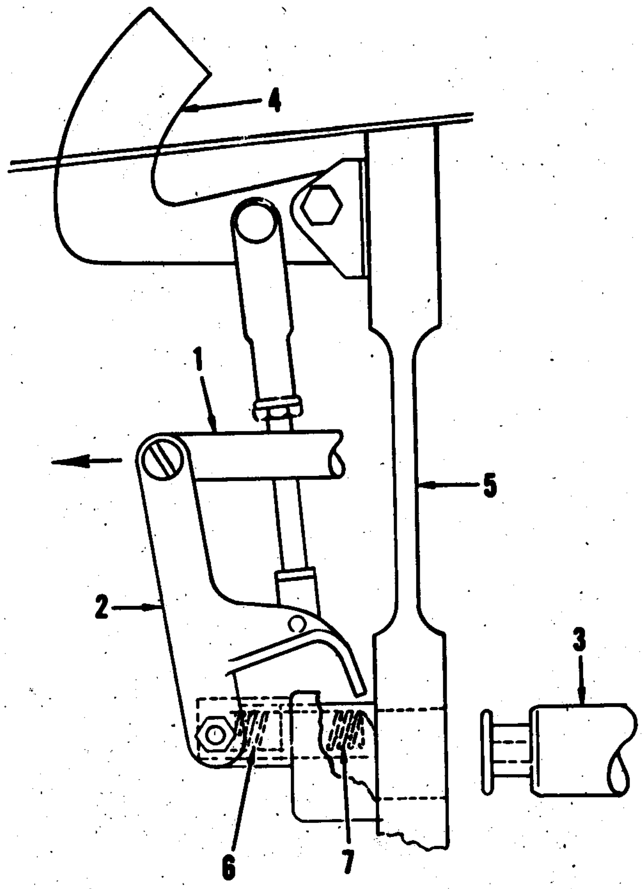
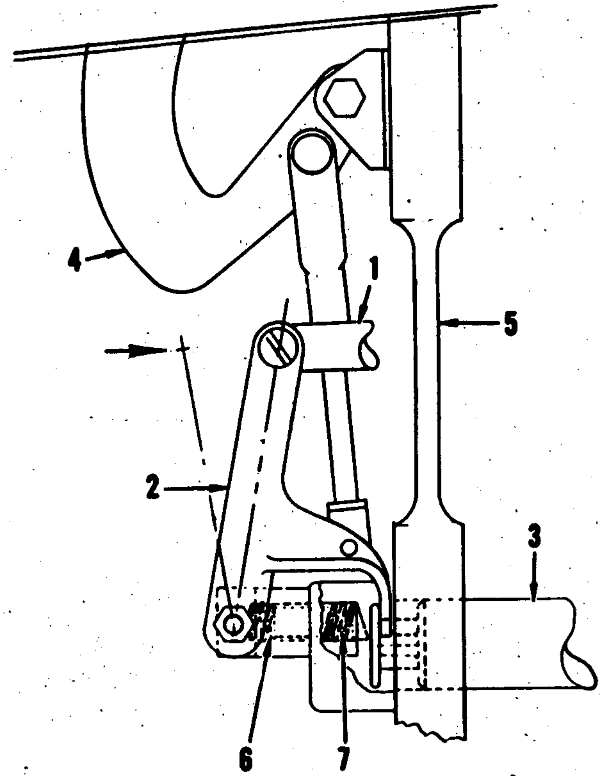


Figure 24-1. Wingfold Mechanical Control System Schematic Diagram



Wing hinge pin lock lever in cockpit is raised moving control pushrod (1) forward. Mechanical lock (2) rotates forward unlatching hinge pin (3) and extending wingfold warning flag (4). Hinge pin cylinder retracts, pulling hinge pin (3) out of wingfold hinge lug (5), unlocking outer panel. Plunger spring (6) extends plunger (7) preventing warning flag from being retracted with outer panel unlocked.

HINGE PIN RETRACTED
MECHANICAL LOCK DISENGAGED



Hinge pin cylinder extends, driving hinge pin (3) through wingfold hinge lugs (5), striking plunger (7), and compressing spring (6), allowing wing hinge pin lock lever to be placed in down-and-locked position. Placing wing hinge pin lock lever in down-and-locked position rotates mechanical lock (2) aft to engage and latch hinge pin (3) in extended position and retracts warning flag (4).

HINGE PIN EXTENDED
MECHANICAL LOCK ENGAGED

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Figure 24-2. Wingfold Warning Flag and Mechanical Lock Operation

Table 24-1. Wingfold System Components

Component	Access	Function
Electrical Components		
Diode (CR211)	2221-1	Blocks current flow to time delay relay coil when wingfold control switch is in FOLD.
Light, wingfold advisory	Right console	When ON, indicates wing hinge pin lock lever is not down and locked.
Relay, time-delay (K209)	2221-1	Energizes wingfold selector valve fold solenoid 2 seconds prior to energizing the spread solenoid.
Switch, wingfold control	2221-1	Controls application of 28 volts dc to wingfold selector valve for spreading and folding outer panels.
Switch No. 1, wingfold handle	2221-1	Controls electrical circuit to wingfold control switch.
Switch No. 2, wingfold handle	2221-1	Applies 28 volts dc to spread solenoid when wing hinge pin lock lever is down and locked. When wing hinge pin lock lever is not down and locked, completes a power circuit to illuminate the wingfold advisory light.
Hydraulic Components		
Cylinder, aft hinge pin (left and right)	Wingfold	Extends to insert hinge pin through wingfold hinge lugs after wingfold actuating cylinder is fully retracted (outer panels spread). Retracts hinge pins from wingfold hinge lug. When fully retracted, integral valve applies hydraulic pressure to forward cylinder.
Cylinder, forward hinge pin (left and right)	Wingfold	Same as aft hinge pin cylinder. When fully retracted, integral valve applies hydraulic pressure to wingfold actuating cylinder.
Cylinder, wingfold actuating (left and right)	3112-3, 4111-3	Extends to fold and retracts to spread outer panel when hinge pin cylinders are retracted.
Restrictor, fold line (left and right)	Wingfold	Controls rate of outer panel spreading.
Restrictor, spread line (left and right)	Wingfold	Controls rate of outer panel folding.

24-14. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required to connect external electrical power		Apply electrical power.
	Equipment required to connect external hydraulic power.		Apply hydraulic power.
	Stopwatch	GG-S-764	Check folding and spreading time.
	Wing hinge lock mechanism dummy pin	215-00344-1	Check locking system.

CAUTION

Ensure accesses 3112-3 and 4111-3 are closed when spreading or folding wings.

NOTE

A number, or numbers, enclosed in braces at the end of a step in the following checkout is a reference to a corresponding number in troubleshooting table 24-2.

a. Connect external electrical power (paragraph 1-28).

b. Connect external hydraulic power to PC No. 2 system (paragraph 1-34).

c. Remove wingfold support struts (paragraph 2-47) or fold wing (paragraph 2-17).

d. Ensure that wing hinge pin lock lever is in up-and-locked position. Manually depress spring-loaded plungers and check that plungers return freely to fully extended position when released.

e. Deleted.

f. Place wingfold control switch in FOLD.

g. Check that wingfold control switch is magnetically held in FOLD and moderate force is required to place switch in OFF. {2}

h. Return control switch to FOLD.

CAUTION

Damage to wingfold control mechanism may result if wing hinge pin lock lever is forced toward closed position.

i. Partially lower wing hinge pin lock lever and check that control switch returns to OFF. (3) Attempt to stow wing hinge lock lever. Lever should not stow. (6)

CAUTION

After approximately one-half inch of travel, release latch. Continue movement of wing hinge pin lock lever to the fully closed-and-latched position. Check that lever moves smoothly witn no binding.

Visually check that hinge pin cylinders do not extend until wing outer panels are fully spread. If cylinders begin to extend during initial outer panel movement, immediately place control switch in FOLD and correct discrepancy.

j. Raise lever and place control switch in SPREAD. Check that switch is magnetically held in SPREAD, outer panels spread smoothly, and hinge pins do not extend until after outer panels are fully spread. {2, 4, 5}

Table 24-1. Wingfold System Components (continued)

Component	Access	Function
Valve, fold line check	2123-3	Traps hydraulic fluid in fold lines when hand pump is used to fold wing outer panels. Prevents pressurization of hand pump circuit when folding the wings with PC No. 2 pressure.
Valve, spread sequence (left and right)	3233-1, 4233-1	Delays application of hydraulic pressure to hinge pin cylinders until wing outer panels are in spread position. Actuated by wing outer panel.
Valve, relief	2123-3	Prevents excessive pressure buildup in fold lines by passing fluid to return circuit. Full flow pressure, 3,850 psi; reseat pressure 3,390 psi.
Valve, wingfold manual selector	Left wheel well	Permits folding wing outer panels with the hydraulic hand pump. Manually actuated by lever on valve.
Valve, wingfold selector	2123-3	Controls application of PC No. 2 hydraulic system pressure to fold and spread lines. Electrically controlled from cockpit by wingfold control switch.
	Mechanical Components	
Flag, wingfold warning	Wingfold	Extended, indicates mechanical locks not engaged. Retracted, indicates hinge pin cylinders extended and locks engaged.
Lever, wing hinge pin lock	Right console	Controls engagement and disengagement of mechanical locks, exposes wingfold control switch, actuates and deactuates wingfold handle switches No. 1 and No. 2.
Locks, mechanical	Wingfold	Mechanically locks hinge pins in the extended (outer panel spread) position. Cockpit controlled by wing hinge pin lock lever.
Plungers, spring-loaded	Wingfold	Prevents actuation of wing hinge pin lock lever to down-and-locked position unless hinge pin cylinders are fully extended.

k. Allow 15 seconds for hinge pin cylinders to fully extend; then depress wingfold hinge pin lock lever latch and start movement of the wingfold hinge pin lock lever toward the closed position. After approximately one-half inch of travel, release latch. Continue movement of wingfold hinge pin lock lever to the fully closed and latched position. Check that lever moves smoothly with no binding. (6) Wingfold hinge pin lock lever shall be no more than 0.12 inch above or 0.03 inch below console level. If these limits are exceeded, visually inspect the following wingfold control assembly components for damage:

1. Lock Level Assembly, Part No. 215-21222-3.

2. Lock Lever Assembly Hinge Bolt, Part No. NAS464P3A34.

3. Latch Assembly, Part No. CV10-408196-10.

4. Latch Pin, Part No. CV10-408197-14.

5. Wingfold Control Assembly Box, Part No. 215-21222-27.

If no damage is found the wingfold control assembly is satisfactory as is.

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l. Check that all warning flags are fully retracted and wingfold advisory light is off. {7, 8}

1. Remove access 2123-3.

2. Remove electrical connector from wing-fold selector valve and using multimeter, probe pin 3 of plug P244 for 28 + 1 - 2 VDC.

m. Place wing hinge pin lock lever in up-and-locked position and check that all warning flags are fully extended. {9}

n. Place control switch in FOLD and check that outer panels fold. {10}

o. Cycle wingfold system and check that folding time is 11 (±2) seconds and spreading time is 12 (±2) seconds. {11}

p. Check operation of wingfold locking system as follows:

1. Fold wings.

2. Turn off hydraulic and electrical power.

WARNING

Hydraulic pressure and electrical power must not be applied to wingfold system during following check to prevent accidental spreading of wings. Accidental spreading of wings can cause serious injury to personnel working in wingfold area.

3. Place modeling clay (or equivalent) in the lock grooves of the wing hinge lock mechanism dummy pins.

4. Insert dummy pins into left and right wingfold fitting lugs to simulate hinge pins in locked position. Push dummy pins into lugs sufficiently to compress latch spring-loaded safety pins and allow insertion of halfmoons of dummy pin retainers into half of dummy pin lock grooves.

5. Place wing hinge pin lock lever in down-and-locked position. Check that the flags are retracted and locks (4 and 5, figure 24-7) are seated in lock slots.

6. Place lock lever in up-and-locked position.

7. Remove the dummy pins and check the impressions made in the modeling clay by the locks (4 and 5). At least one lock on each side of the wing shall contact the small diameter of the lock slot of the pin. The remaining lock on each side of the wing shall fail to engage by no more than 0.03-inch. {12}

8. Ensure that the dummy pins can be removed with the locking mechanism in the unlocked position with no binding. {12}

9. Remove modeling clay and clean area of all dirt and debris.

q. If outer panels are to remain folded, install wingfold support struts (paragraph 2-47). If not, spread and lock outer panels in accordance with paragraph 2-18.

r. Disconnect external hydraulic and electrical power (paragraph 1-28 and 1-34).

24-15. TROUBLESHOOTING. (See figures 24-3 and 24-4.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required to connect external hydraulic power		Apply hydraulic power.
	Equipment required to connect external electrical power		Apply electrical power.
	Multimeter	AN/PSM-6	Check continuity and voltage.

24-16. See figure 24-5 for troubleshooting information. Malfunctions are related to a corresponding number, or numbers, enclosed in braces following a step in the operational checkout.

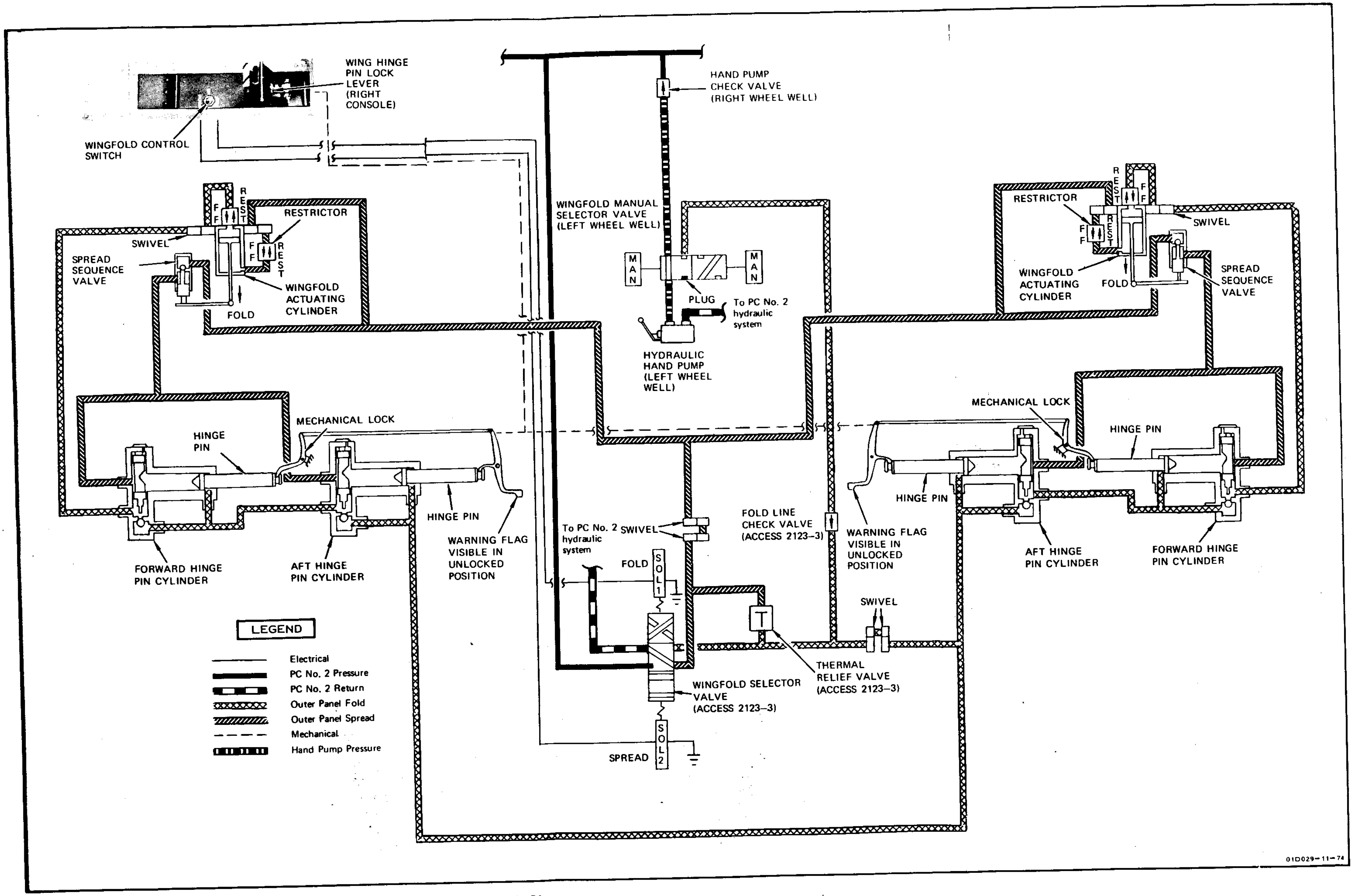
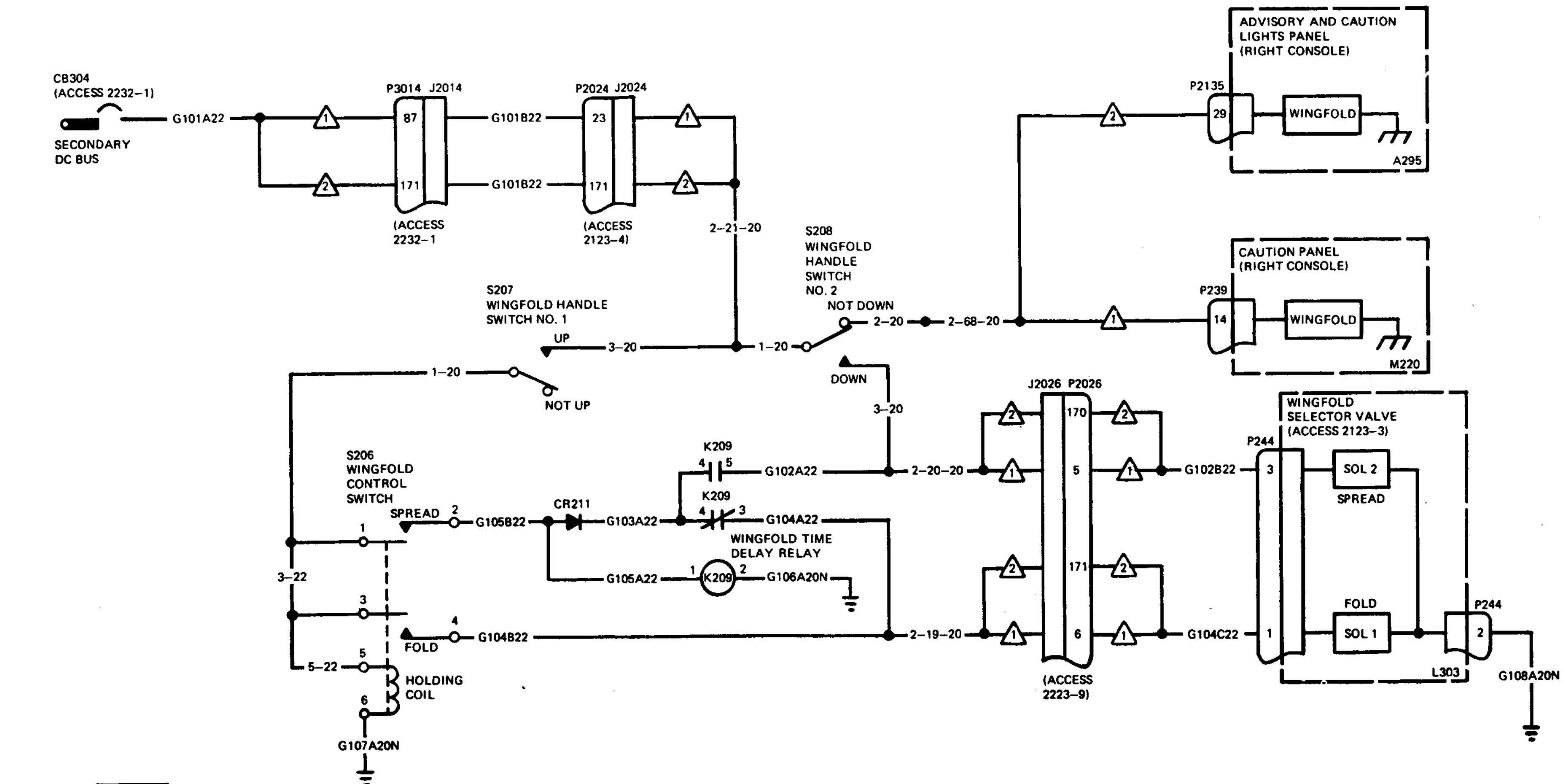


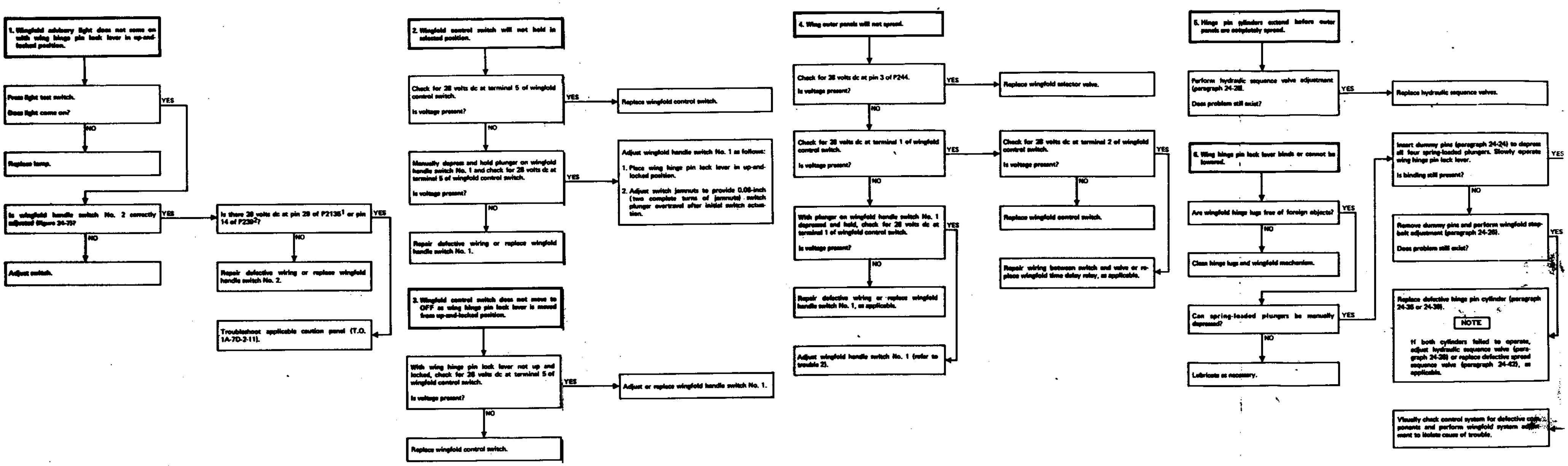
Figure 24-3. Wingfold Hydraulic Circuit Troubleshooting Schematic Diagram



NOTE

1. Airplanes through AF69-6196.
2. Airplanes AF69-6197 and subsequent.

Figure 24-4. Wingfold Electrical System Troubleshooting Schematic Diagram



[1]Airplanes through AF69-6196.
[2]Airplanes AF69-6197 and subsequent.

Figure 24-6. Wingfold System Troubleshooting (Sheet 1)

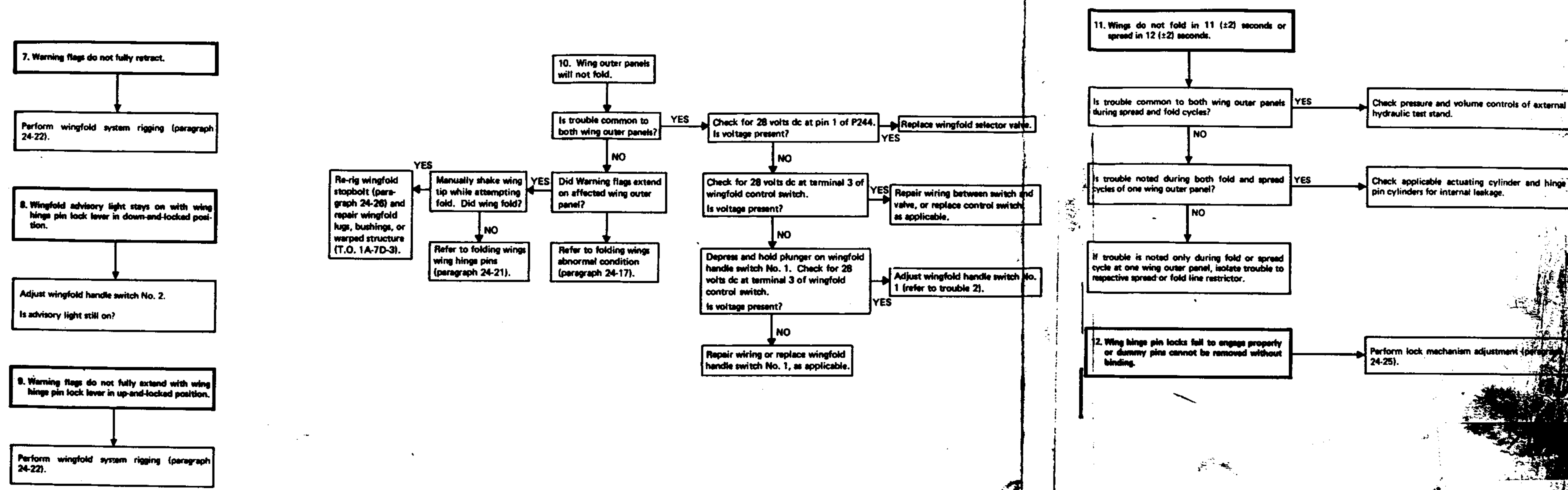


Figure 24-5. Wingfold System Troubleshooting (Sheet 2)

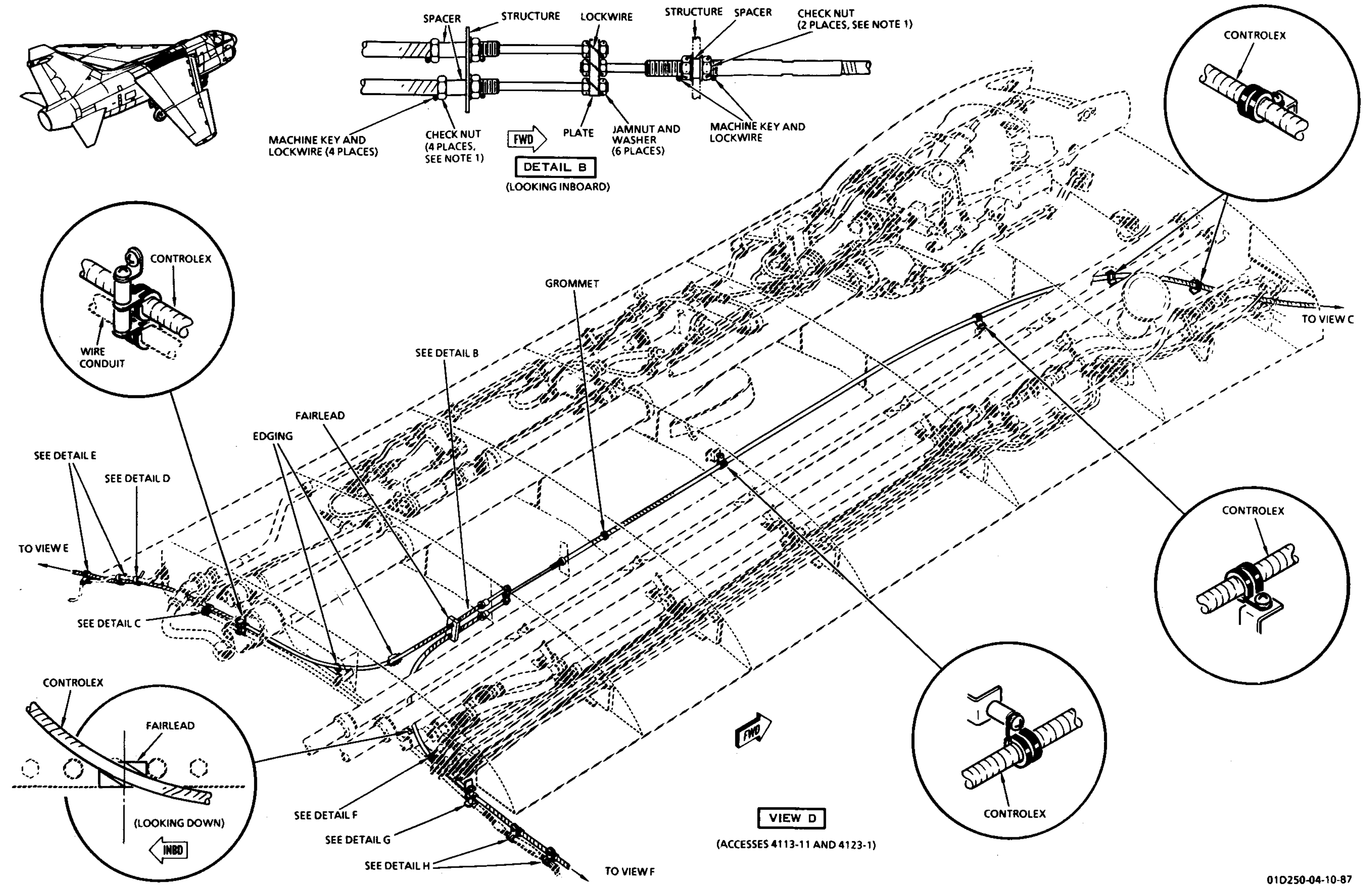


Figure 24-5A. Clamping and Routing of Wingfold Push-Pull Control Assembly (Sheet 4 of 7)

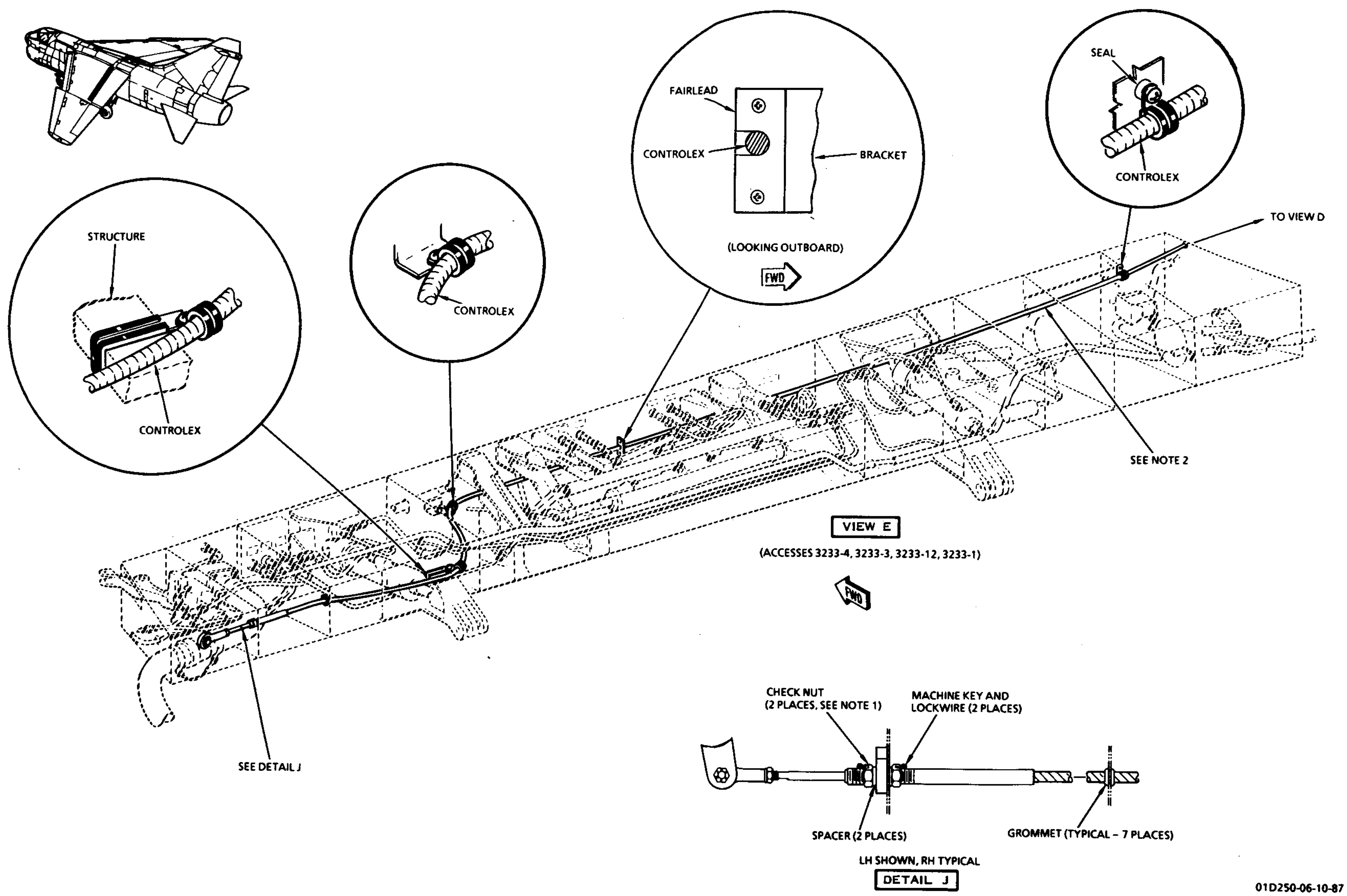


Figure 24-5A. Clamping and Routing of Wingfold Push-Pull Control Assembly (Sheet 6 of 7)

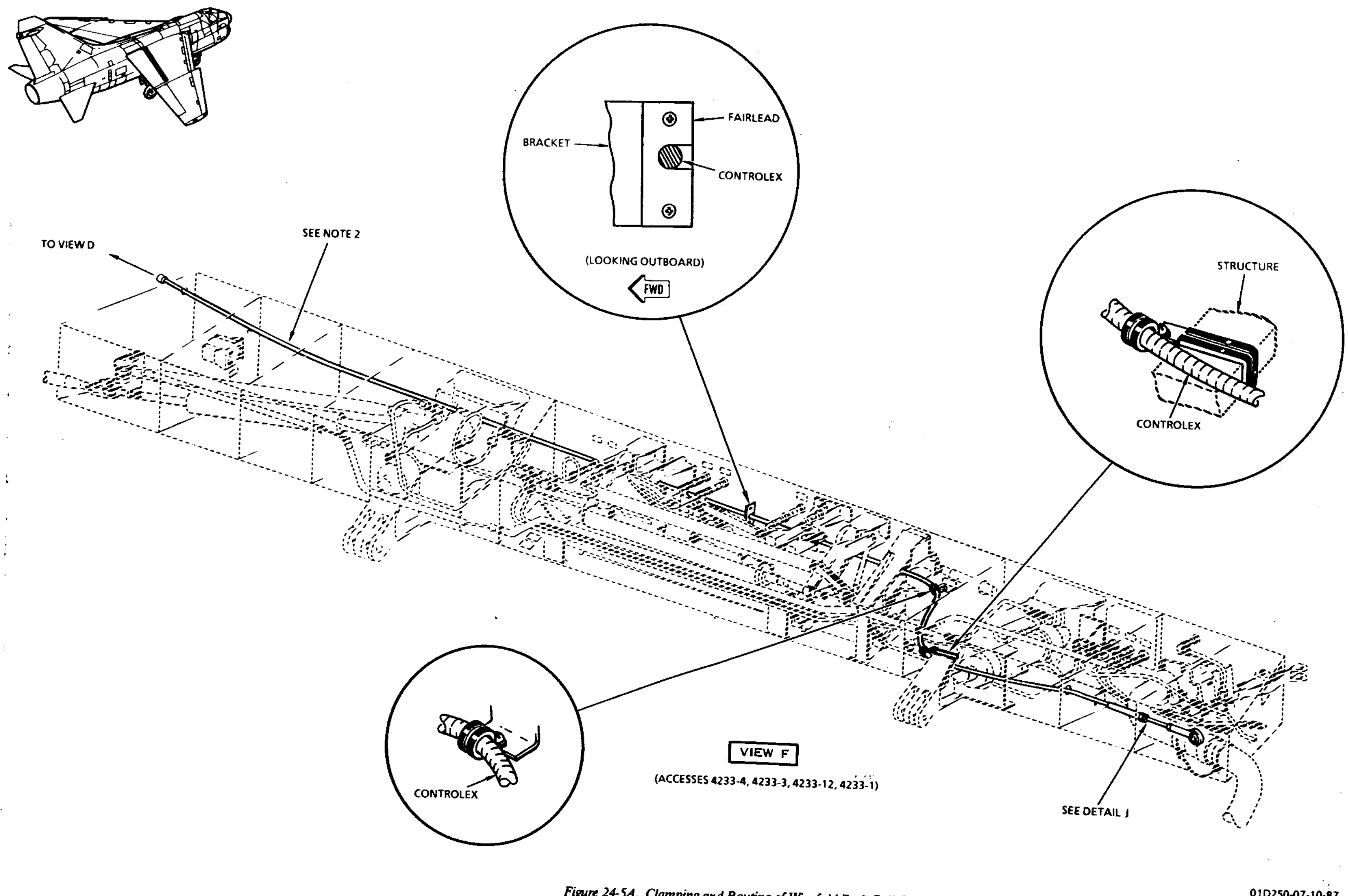
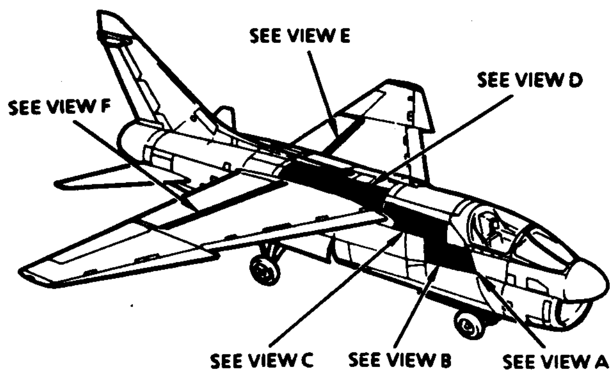


Figure 24-5A. Clamping and Routing of Wingfold Push-Pull Control Assembly (Sheet 7 of 7)



NOTE

1. DO NOT ALLOW CONTROLEX TO ROTATE, TIGHTEN CHECKNUTS TO 30–40 POUND-INCHES TORQUE.
2. REMOVE SEALANT AS NECESSARY TO REMOVE CONTROLEX FROM RIGHT AND LEFT WING TRAILING EDGES. AFTER CONTROLEX IS RIGGED AND CLAMPS ARE INSTALLED, APPLY SEALANT TO PREVENT CONTROLEX CHAFFING WITH STRUCTURE/HARDWARE.

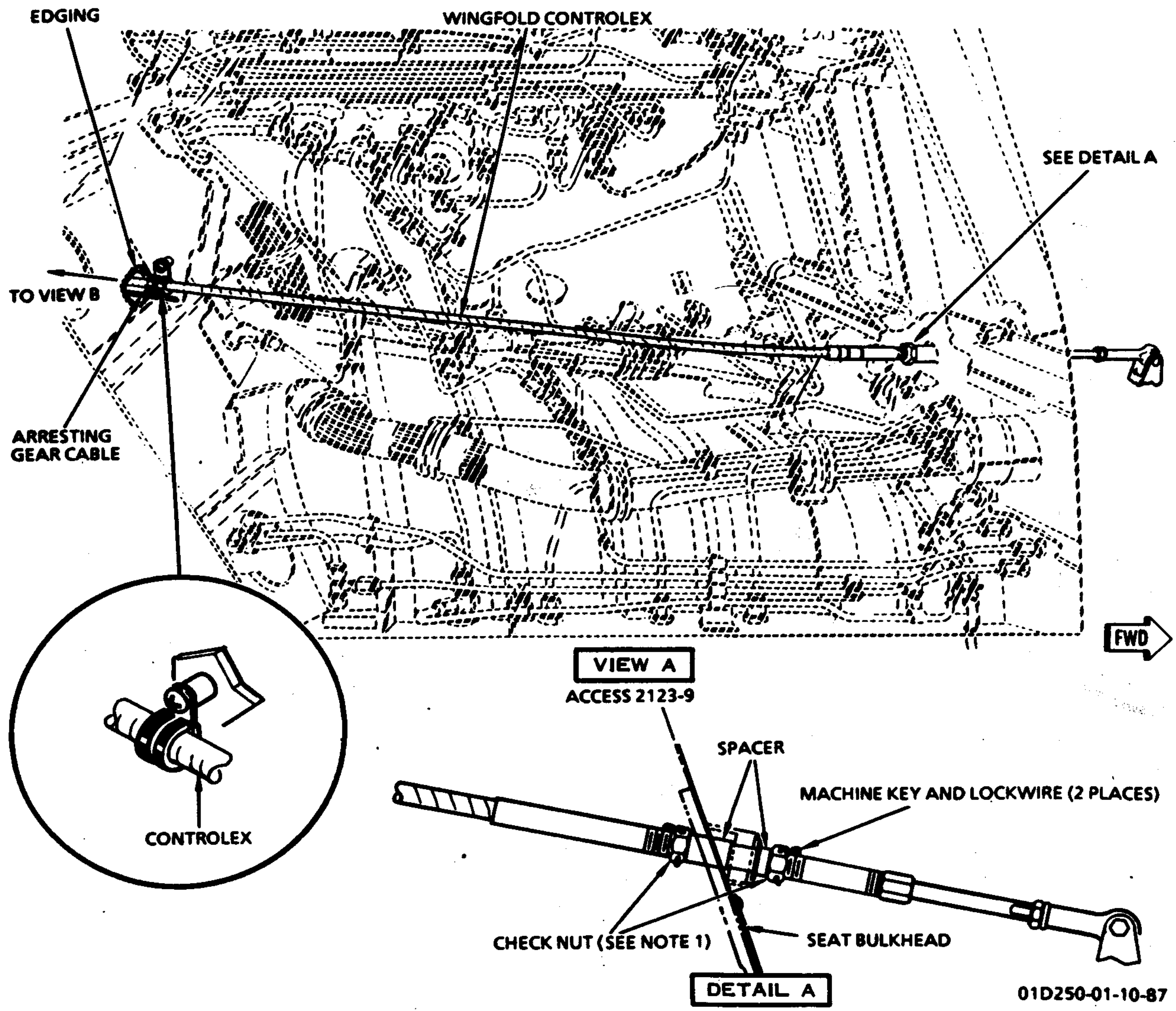


Figure 24-5A. Clamping and Routing of Wingfold Push-Pull Control Assembly (Sheet 1 of 7)

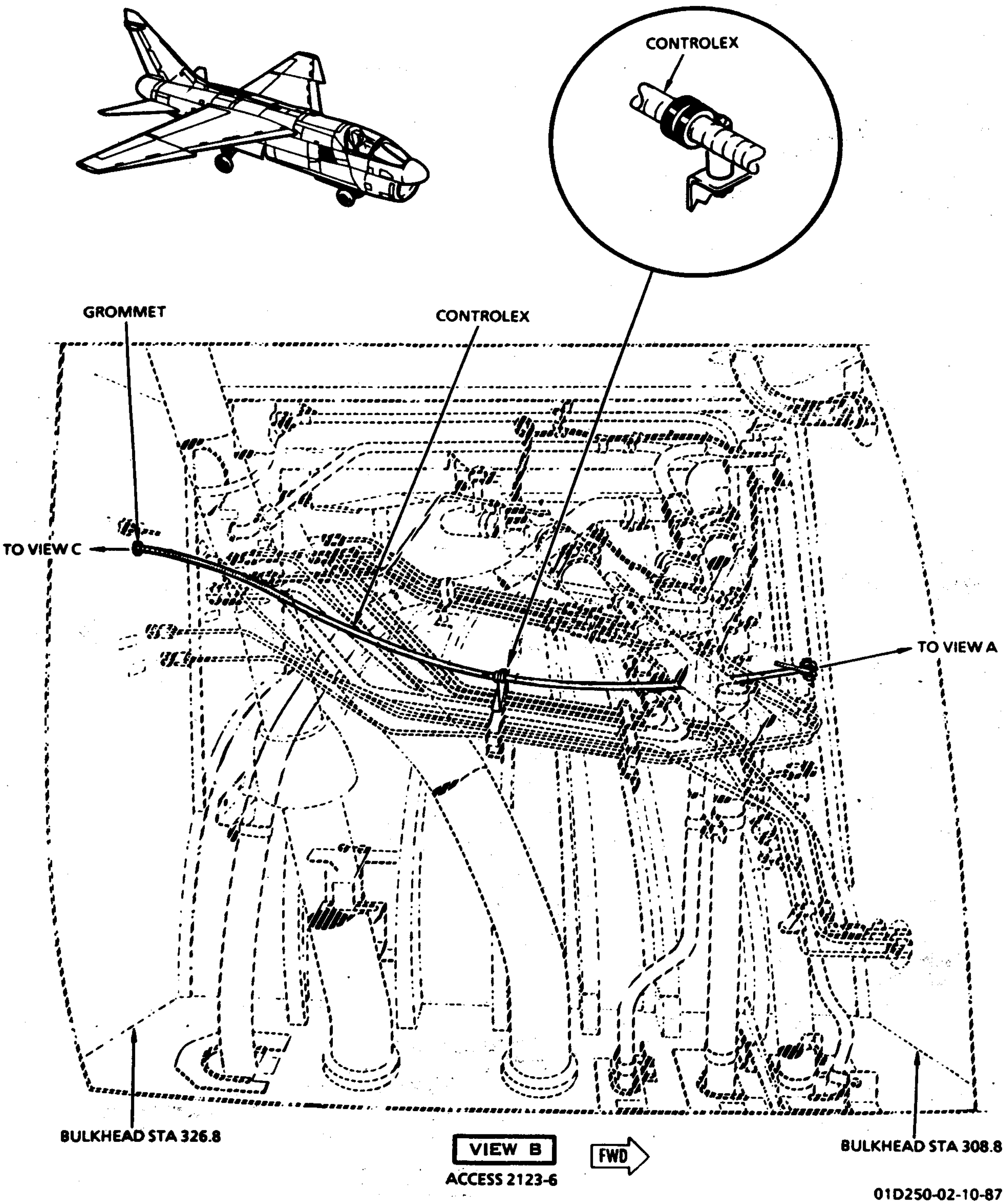


Figure 24-5A. Clamping and Routing of Wingfold Push-Pull Control Assembly (Sheet 2)

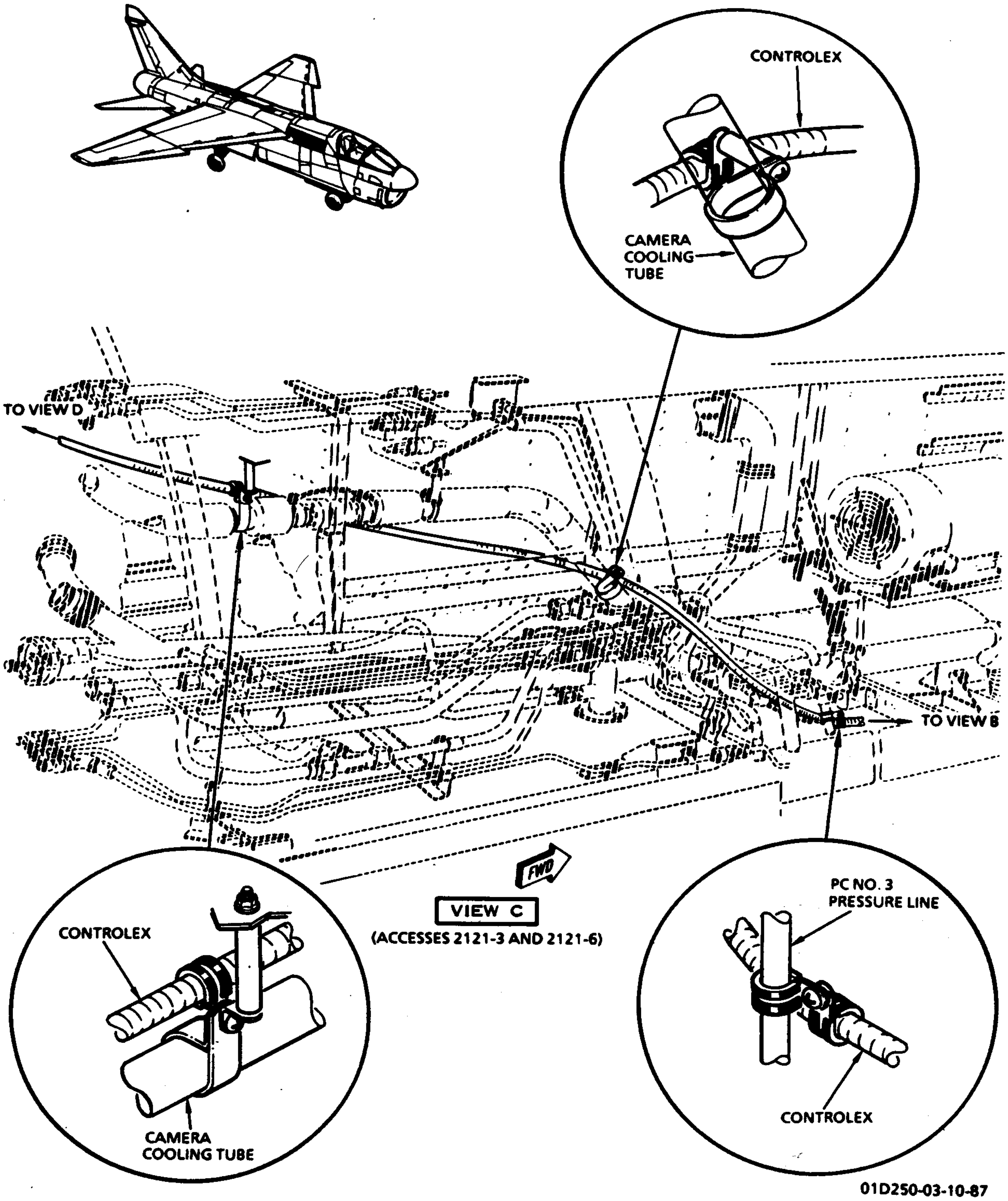


Figure 24-5A. Clamping and Routing of Wingfold Push-Pull Control Assembly (Sheet 3)

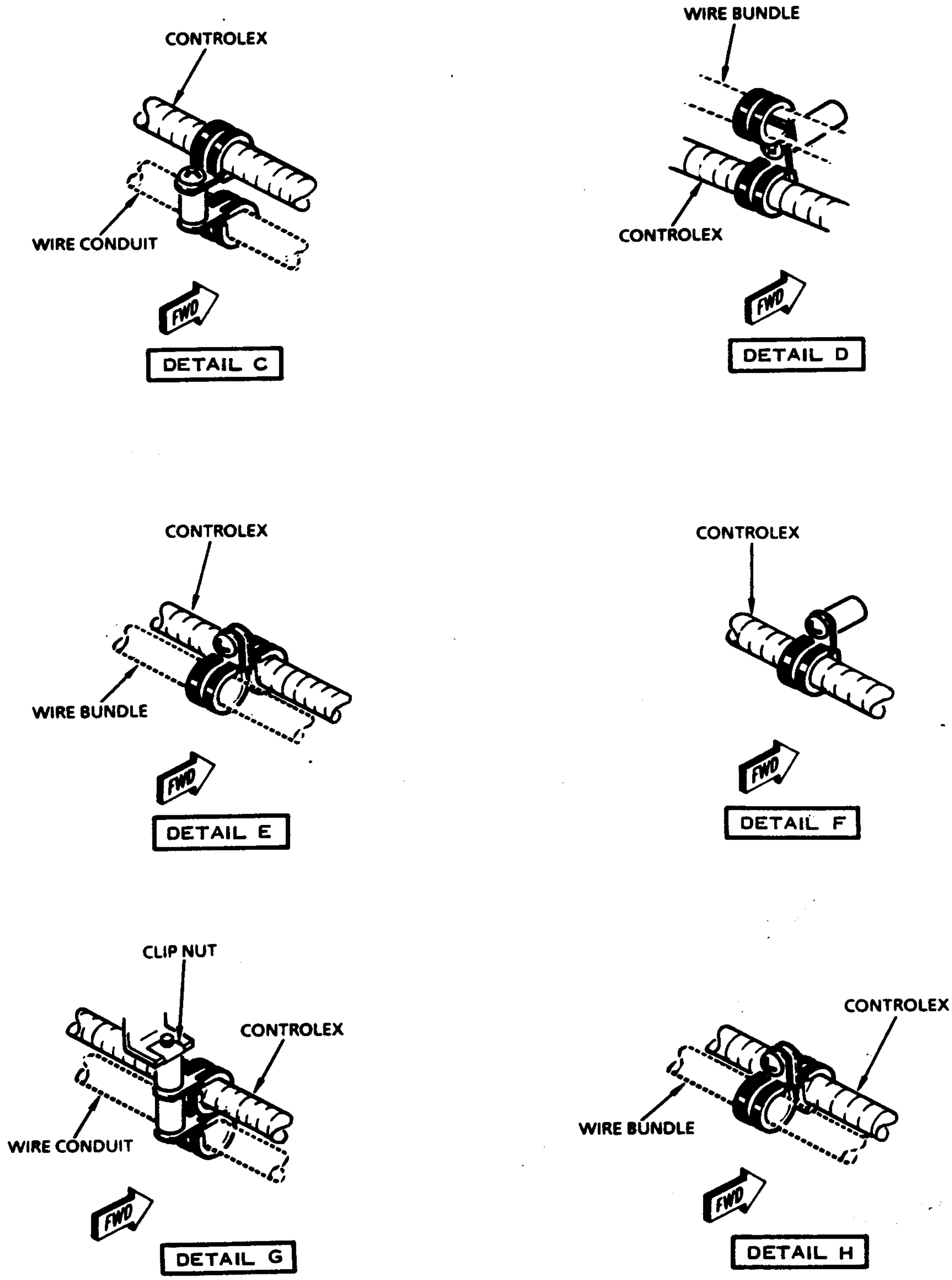


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Figure 24-5A. Clamping and Routing of Wingfold Push-Pull Control Assembly (Sheet 5)

24-17. FOLDING WINGS — ABNORMAL CONDITION.

24-18. To fold wings with defective locking mechanism, refer to paragraph 24-20.

24-19. To fold wings with binding hinge pins, refer to paragraph 24-21.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
2-1	Wingfold support strut (2)	215-00255-12	Support wing outer panels when folded.
	Wing pylon removal and installation adapter	216-01335-1	Attach pylon to lift truck.
	Aerial stores lift truck, MJ-1	56J13236	Support weight of pylon.
	Hydraulic filler and pressurization cart	E10385	Pressurize hinge pin cylinders.

24-20. FOLDING WINGS WITH DEFECTIVE LOCKING MECHANISM.

a. Remove outboard pylon (paragraph 24-66).

b. Remove pylon fairings.

c. Disconnect mechanical locks from linkages.

d. Connect external electrical power (paragraph 1-28).

e. Manually unlock mechanical locks.

f. Connect external hydraulic power to PC No. 2 system (paragraph 1-34).

g. Fold wing outer panels (paragraph 2-16).

h. Install wingfold support struts (paragraph 2-47).

i. Repair mechanical locking system. Re-rig wingfold locking system (paragraph 24-22). Install removed components and repair wingfold fairing (paragraph 24-66).

24-21. FOLDING WINGS WITH HINGE PINS BINDING. (See figure 24-6.)

a. Defuel wing tanks and external tanks if installed (paragraph 3-60).

b. Remove external stores from applicable outboard pylon (T.O. 1A-7D-33-1-2).

c. Ensure that MAU-12 ejector rack is installed in pylon.

d. Install pylon removal adapter on aerial stores lift truck.

e. Position lift truck and adapter under pylon and secure pylon to adapter. Operate lift to support weight of pylon.

f. Remove cotter pin (1), nut (2), pylon aft attach bolt (3), and washers (4).

g. Connect external electrical power (paragraph 1-28).

h. Connect external hydraulic power to PC No. 2 system (paragraph 1-34).

i. Fold wing outer panels.

j. If wings fold, repair aft pylon attach structure (T.O. 1A-7D-3).

k. If wings do not fold, shut down external hydraulic power and cycle flap handle to ISO and back to UP.

l. Open access 3233-1 or 4233-1.

m. Disconnect wingfold hydraulic line (5) from wing fitting. Cap wing fitting.

n. Connect hydraulic servicing cart to wingfold line using MS21900-4 adapter.

o. Place wingfold control switch in FOLD.

p. Actuate servicing cart hand pump to raise pressure on wingfold line to 3800 psi. Manually shake wing tip.

q. If wing folds, repair wingfold lugs, bushing or warped structure (T.O. 1A-7D-3). Re-rig stop bolts (paragraph 24-26).

CAUTION

If pressure applied directly to wingfold lines exceeds 3,800 psi, the following must be replaced: wingfold actuator and swivels, forward and aft hinge pin cylinders, and all wingfold hydraulic lines from point of pressure application to wingfold actuator.

r. If wing does not fold, continue shaking wingtip while increasing hydraulic pressure to 4,500 psi.

s. If wing folds, replace the following: wingfold actuator and swivels, forward and aft hinge pin cylinders, and wingfold hydraulic lines from point of pressure application to wingfold actuator. Repair wingfold lugs, bushings, or structure (T.O. 1A-7D-3). Re-rig stop bolts (paragraph 24-26).

t. If wing does not fold, reduce hydraulic pressure to zero.

u. Remove outboard pylon (paragraph 24-66).

v. Remove pylon fairings.

w. Remove cotter pin (6), nut (7), and bolt (8) securing forward latch to lower flag linkage (9).

x. Remove cotter pin (10), nut (11), and washer (12) securing linkage to upper flag (13). After linkage to upper flag is removed from forward latch assembly (14), remove washer (15).

y. Remove bolts (16) and washers (17). Remove forward latch with mechanism attached.

z. Remove cotter pin (18), nut (19), and bolt (20) securing linkage (9 and 21) to aft latch assembly (22). Remove linkage (9).

aa. Remove bolt (23) and washer (24) securing aft latch assembly (22). Remove latch assembly with mechanism attached.

ab. Actuate filler cart hand pump and increase hydraulic pressure to 3,000 psi.

WARNING

Use care while hammering hinge pins to avoid damage to wingfold ribs. When pins begin to move freely, shut down hydraulic pressure to avoid possible injury to personnel.

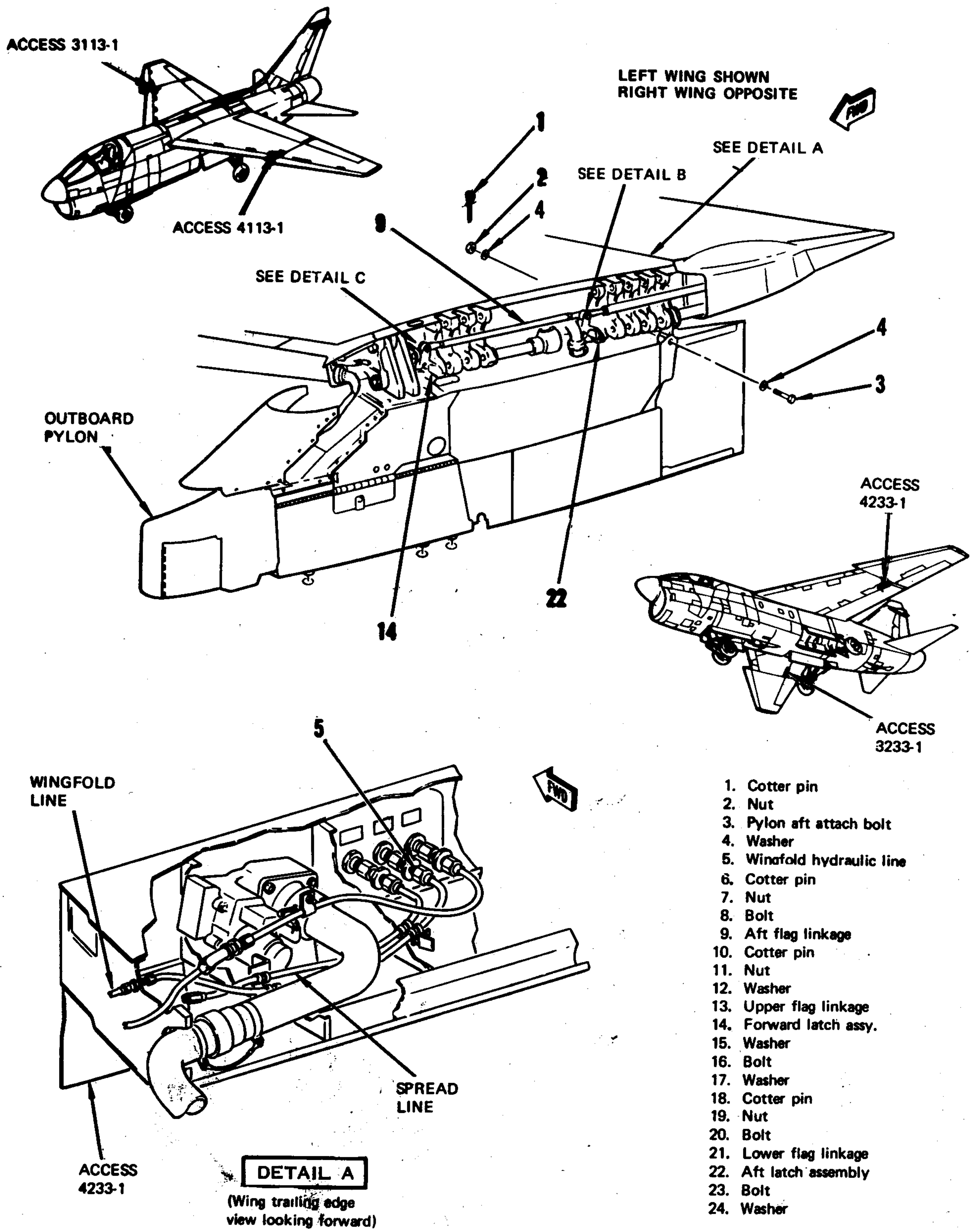
ac. Using bent drift pin and hammer, drive aft hinge pin toward retracted position. When pin begins to move freely, shut down hydraulic power. Remove drift pin and apply 3,000 psi to fold wings.

ad. Repeat step z on forward hinge pin.

ae. Repair damaged wingfold lugs, bushings or warped structure. Perform wingfold system rigging including stopbolts (paragraph 24-22).

af. Install removed components and repair wingfold fairings (paragraph 24-67).

ag. If hinge pins cannot be retracted by any of the preceding methods, authority to remove outer wing panel will be required.



1. Cotter pin
2. Nut
3. Pylon aft attach bolt
4. Washer
5. Wingfold hydraulic line
6. Cotter pin
7. Nut
8. Bolt
9. Aft flag linkage
10. Cotter pin
11. Nut
12. Washer
13. Upper flag linkage
14. Forward latch assy.
15. Washer
16. Bolt
17. Washer
18. Cotter pin
19. Nut
20. Bolt
21. Lower flag linkage
22. Aft latch assembly
23. Bolt
24. Washer

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Figure 24-6. Folding Wings with Hinge Pins Binding (Sheet 1)

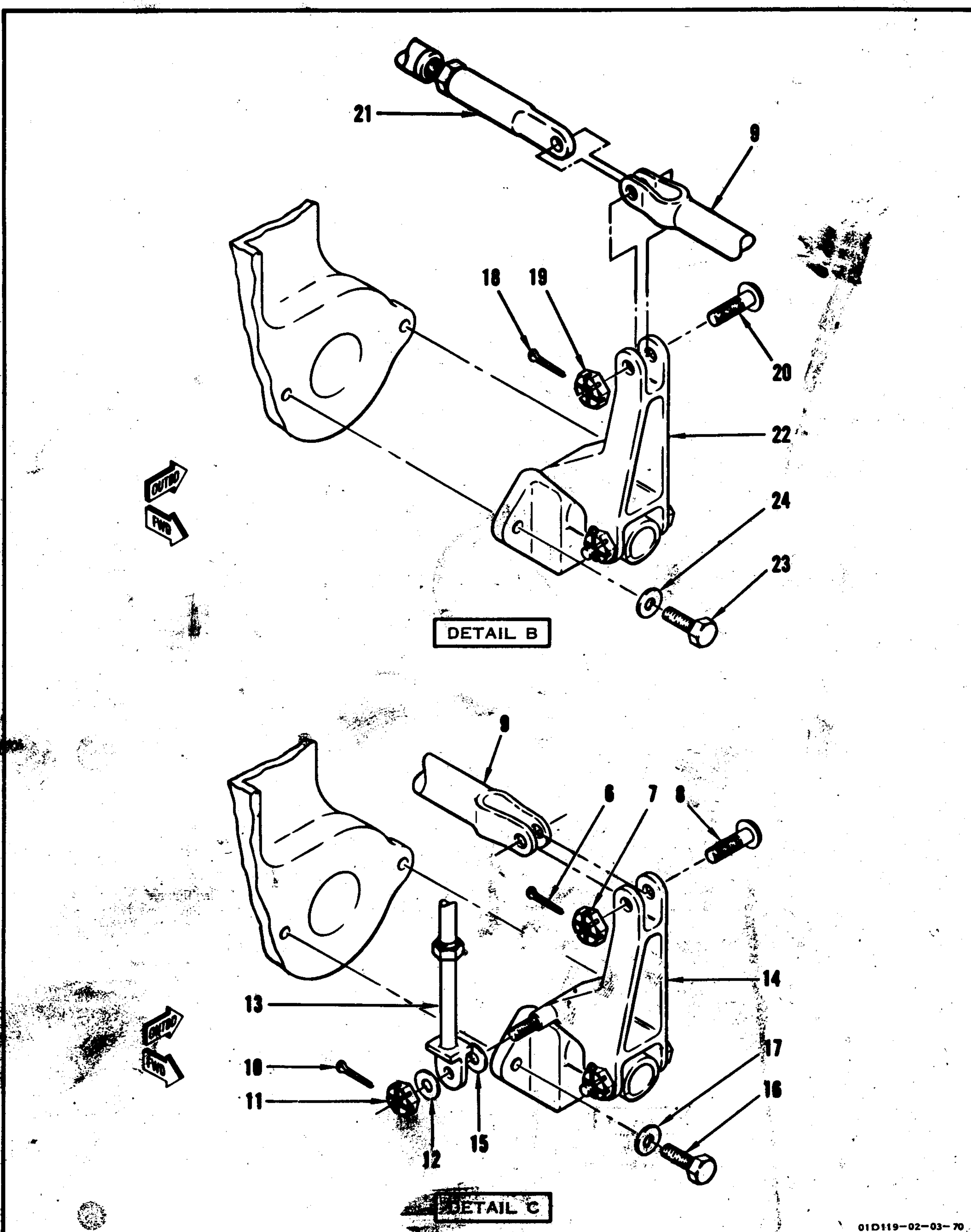

Figure 24-6. Folding Wings with Hinge Pins Binding (Sheet 2)

24-22. WINGFOLD SYSTEM RIGGING.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power for wingfold components while rigging components.
	AN/PSM-6	Multimeter	Check voltage of wingfold system components.
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten checknuts on wing hinge pinlock cockpit control.
	215-00110-3	Rigging pin	Rig wingfold system.
22-2	215-00212-1	Wing outer panel hoisting adapter	Adapt wing outer panel to hoist.
2-1	215-00255-12	Wingfold support struts (2)	Support wing outer panel when folded.
	215-00344-1	Wing hinge lock mechanism dummy pin	Inserted in place of wing hinge pin during rigging.
	413-900-020 (American Tool and Engineering Co.)	Torque wrench, 100 to 750 pound-inches	Tighten checknut on wingfold actuating cylinder.
	0013 (John Chatillon and Sons)	Spring scale, 0 to 40 pounds	Check load required to raise wing hinge pin lock lever.

NOTE

Paragraphs 24-23 through 24-29 provide procedures for rigging the entire wingfold control system in a continuous sequence. If desired, however, rigging of individual segments of the system may be performed independently as presented in each paragraph.

24-23. WINGFOLD COCKPIT CONTROLS AND FUSELAGE PUSH-PULL CONTROL. (See figure 24-7.)

NOTE

The following procedure provides instructions for rigging the wingfold control system from cockpit control to connection with push-pull controls (8 and 9) routed through wing.

a. Fold wing outer panels using airplane hydraulic hand pump (paragraph 2-16) and install wingfold support struts (paragraph 2-47).

b. Open accesses 2221-1 and 4123-1.

WARNING

To prevent possible injury to personnel and damage to airplane resulting from inadvertent operation of wingfold, do not apply external hydraulic or electrical power to airplane when performing rigging steps c through t.

c. Disconnect control (11) from plate (14) by removing nut and washer.

d. Disconnect link (13) from wing hinge pin lock lever (31) by removing cotter pin, nut, four washers two spacers, and bolt.

e. Using switch locknuts, adjust wingfold handle switch No. 2 (15) so it will not contact rod end (23) when rigging pin is inserted in bellcrank (12).

f. Insert rigging pin in rigging pin hole in bellcrank (12).

g. Adjust link (13) to shortest length which will allow wing hinge pin lock lever (31) to close without preloading link (13). Lever shall be no more than 0.12 inch above or 0.03 inch below console level. Inspect lever for damage if these limits are exceeded. Tighten checknuts to [illegible] pound-inches torque.

h. Connect link (13) to wing hinge pin lock lever (31) by installing bolt, two spacers, four washers, nut, and cotter pin.

i. Disconnect rod end (23) from bellcrank (12) by removing cotter pin, nut, two washers, and bolt.

NOTE

Refer to T.O. 1A-7D-4-17, Wingfold Control System, for exact location of clamping points.

j. Manually stroke moving element of control (11) through several cycles. Operation shall be free and smooth with a minimum stroke of 2.0 inches. The force required to stroke the control shall not exceed 3.5 pounds. If operation is unsatisfactory, check entire length of control for improper installation or damage to outer casing of control.

CAUTION

When tightening rod end, ensure that rod end is aligned and that control is held at wrench flat to avoid damage to control.

k. Adjust rod end (23) so that check nut is 0.30 (+0.00, – 0.06) inch from end of wrench flat. Tighten checknut to 60 (± 10) pound-inches torque.

l. Move rod end (23) forward until moving element of control bottoms.

m. Adjust checknuts (25) at support (26) so hole in rod end (23) is positioned 0.60 (±0.60) inch forward of hole in bellcrank (12).

n. Hold control at wrench flats and tighten checknuts (25) to 35 (±5) pound-inches torque. Secure checknuts (25) with MS20995C32 lockwire.

o. Remove rigging pin from bellcrank (12).

NOTE

Refer to T.O. 1A-7D-4-17, Wingfold Control System, for exact location of clamping points.

p. Adjust all clamps securing control (11) as required to allow moving elements of control to lay at an angle that approximately splits the travel arc of the bellcrank (12).

q. Connect rod end (23) to bellcrank (12) by installing bolt, two washers, nut, and cotter pin.

r. Insert end of moving element of control (11) into plate (14). Tighten two checknuts securing control (11) in plate (14) to 35 (±5) pound-inches torque maintaining 0.22 (+0.03, – 0.00) inch clearance between plate (14) and end of moving element of control (11).

NOTE

A multimeter should be used to determine actuation of switch.

s. With wing hinge pin lock lever (31) closed, perform adjustment of wingfold handle switch No. 2 (15) by turning checknuts until switch is actuated. Turn checknuts two full turns to obtain 0.06-inch overtravel.

t. Check switch operation. Switch shall be actuated before lever is locked and remain actuated after lever is closed and in locked position. Secure switch checknuts with MS20995C23 lockwire. Apply 10 pound upward force on lock lever. Switch shall no deactuate.

NOTE

If entire rigging or wingfold system is required, omit step u. and continue with paragraphs 24-24 through 24-28.

u. Remove wingfold support struts (paragraph 2-47) and perform rigging checkout (paragraph 24-29).

24-24. PUSH-PULL CONTROL IN WING. (See figure 24-7.)

NOTE

The following procedure provides instructions for rigging wingfold push-pull controls (8 and 9) from connection with fuselage routed push-pull control (11) to bellcrank (3) located in wingfold area of center wing section.

a. To perform this part of wingfold system rigging without reference to previous paragraphs, perform the following:

1. Fold wing outer panel using airplane hydraulic hand pump (paragraph 2-16) and install wingfold support struts (paragraph 2-47).

2. Open accesses 2221-1 and 4123-1.

3. Disconnect control (11) from plate (14) by removing nut and washer.

b. Install wing outer panel hoisting adapter on right wing (figure 22-2).

WARNING

To install right wing hinge pin lock dummy pins, the right wingfold support strut must be removed. To prevent possible injury to personnel and damage to airplane during rigging operation, the right wing outer panel shall be secured in the folded position before removing the wingfold support strut.

c. Secure right wing outer panel hoisting adapter to an overhead hoist. If a hoist is not available, the hoisting adapter may be secured to right aft airplane hoisting lug (access 4133-5) with a suitable rope or chain.

d. Open accesses 3233-1 and 4233-1.

e. Remove fairings from outboard of left and right wing aft hinge pin pull cylinders.

f. Remove right wingfold support strut. Insert dummy pins into left and right wingfold fitting lugs to simulate hinge pins in locked position. Push dummy pins into lugs sufficiently to compress latch spring-loaded safety pins and allow insertion of half-moons of dummy pin retainers into lower half of dummy pin lock groove.

WARNING

To prevent injury to personnel and damage to airplane resulting from inadvertent operation of wingfold, do not apply external hydraulic and electrical power to airplane when performing rigging steps g through ak.

NOTE

Push-pull control (9) serves the right wingfold lock system and control (8) serves the left wingfold lock system. Both controls are adjusted in the same manner.

g. Disconnect rod end (19) from bellcrank (3) by removing cotter pin, nut, two washers, and bolt.

CAUTION

The 215-28351-1 and -2 control cable assemblies shall be installed with the short end inboard. The short end is defined as the end which has 2.50 (± 0.12) inch pushrod showing when positioned in the mid-range position (figure 24-7).

h. Before making any attachments to ends of control (8 and/or 9), manually stroke control (8 and/or 9) through several cycles. Operation shall be free and smooth with a minimum stroke of 2 inches. If operation is unsatisfactory, check entire length of controls for improper installation or damage to outer casing before proceeding with adjustment.

CAUTION

When tightening rod end, ensure that rod end is aligned and that control is held at wrench flat to avoid damage to control.

i. Adjust rod end (19) to maintain 0.30 (+0.06, −0.00) inch clearance between checknut and wr[illegible] flats on control (8 and/or 9). Tighten checknut [illegible] (±10) pound-inches torque.

j. Adjust checknuts (20) to position control (8 and/or 9) in support (10) to obtain 0.74 (±0.06) inch thread extension. Hold moving elements of control (8 and/or 9) by means of wrench flat and tighten checknuts (20) to 35 (±5) pound-inches torque.

k. Secure checknuts (20) with MS20995C32 lockwire.

NOTE

Refer to T.O. 1A-7D-4-17, Wingfold Control System, for exact location of clamping points.

l. To provide for smooth operation of controls, adjust all clamps securing controls (8 and/or 9) as required to allow moving elements of controls to lay at an angle that approximately splits the travel arc of bellcrank (3).

m. Connect rod end (19) to bellcrank (3) by installing bolt, two washers, nut, and cotter pin.

n. If required, repeat steps h through m for opposite wing.

o. Loosen forward checknuts (21, 22, and 24).

p. Loosen screw in fairlead (18) until controls (8 and 9) can be moved. Adjust checknuts (21) for maximum extension of control (9) through support (16).

q. Pull moving elements in controls (8 and 9) fully forward. Adjust checknuts (21 and 22) until controls (8 and 9) extend through support (16) an equal distance. Tighten checknuts on controls (8 and 9) at plate (14) to 35 (±5) pound-inches torque maintaining 0.22 (+0.03, −0.00) inch dimension.

r. Align controls (8 and 9) in oversize holes in support (16) so elements can be stroked 1.25 inches minimum without binding when plate (14) is moved. End of control (11) shall align with center hole in plate (14) without binding.

s. Tighten checknuts (21 and 22) to 35 (±5) pound-inches torque and tighten screw in fairlead (18).

t. Remove the two dummy pins from each wing. Place modeling clay (or equivalent) in the lock grooves and reinstall dummy pins.

u. Push plate (14) forward until the flags are retracted and locks are seated in lock slots.

v. Push plate (14) aft.

w. Remove the dummy pins and check the impressions made in the modeling clay by the locks (4 and 5). At least one lock on each side of the wing shall contact the small diameter of the lock slot of the pin. The remaining lock on each side of the wing shall fail to engage by no more than 0.03 inch.

x. If one lock on each side of the wing seats properly and the other lock fails by more than 0.03 inch, accomplish procedures in paragraph 24-25, and proceed to step z.

y. If both locks on one side of the wing fail to engage the dummy pins, loosen the screw in fairlead (18) and alternately reposition the control housing of control (8 and 9) relative to support (16) by the following procedure:

NOTE

Remove and reinstall dummy pins as required to accomplish the following substeps.

1. On the side that does not engage, move the control housing forward by turning checknuts (21 or 22) one-half turn.

2. If the adjustment in step 1 above is insufficient, move the opposite control housing aft by turning checknuts (21 or 22) one-half turn.

3. Repeat steps 1 and 2 in turn until proper adjustments are accomplished.

4. Tighten checknuts (21 and 22) to 35 (±5) pound-inches torque.

5. Tighten screw in fairlead (18) and check the stroke and alignment of plate (14) as instructed in step r.

z. With dummy pins installed, pull plate (14) fully forward until flags are retracted and locks (4 and 5) are seated properly in lock grooves of dummy pins.

aa. Insert end of moving element of control (11) into plate (14). Tighten two checknuts securing control (11) in plate (14) to 35 (±5) pound-inches torque maintaining 0.22 (±0.03, −0.00) inch clearance between plate (14) and end of moving element of control (11).

ab. With wing hinge pin lock lever closed, rotate forward checknut (24) until it contacts support (17).

ac. Open wing hinge pin lock lever and position approximately 1/2 inch above console.

ad. Loosen aft checknut (24) as required and rotate forward checknut (24) 1 3/4 turns against support (17) and tighten aft checknut (24) to 35 (±5) pound-inches torque.

NOTE

Refer to T.O. 1A-7D-4-17, Wingfold Control System, for exact location of clamping points.

ae. Using spring scale, check latching load of wing hinge pin lock lever. Latching load shall not exceed 20 pounds. If latching load exceeds 20 pounds, check controls routing for misalignment and excessively tight clamps.

af. After checking controls for proper installation and if latching load remains excessive, back off checknuts (24) a maximum of one full turn in one-half turn increments. Check latch load after each one-half turn of checknut.

ag. Tighten checknuts (24) to 35 (±5) pound-inches torque.

NOTE

A multimeter should be used to check actuation of switch.

ah. Close wing hinge pin lock lever and perform adjustment of switch (15) by adjusting switch checknuts until switch is actuated.

ai. Obtain 0.06-inch switch overtravel by turning switch checknuts two full turns. Check switch operation. Switch shall be actuated before handle locking and remain actuated after handle is closed and in locked position.

aj. Secure switch checknuts with MS20995C32 lockwire.

NOTE

If entire rigging of wingfold system is required, omit steps ak and al. Continue with paragraphs 24-25 through 24-28.

ak. If no additional wingfold system rigging is required, perform the following:

1. Remove all dummy pins and install wingfold support strut (paragraph 2-47).

2. Remove equipment, including hoisting adapter used to secure right wing outer panel in folded position, and close access 4133-5 if open.

al. Remove wingfold support strut (paragraph 2-47) and perform rigging checkout (paragraph 24-29).

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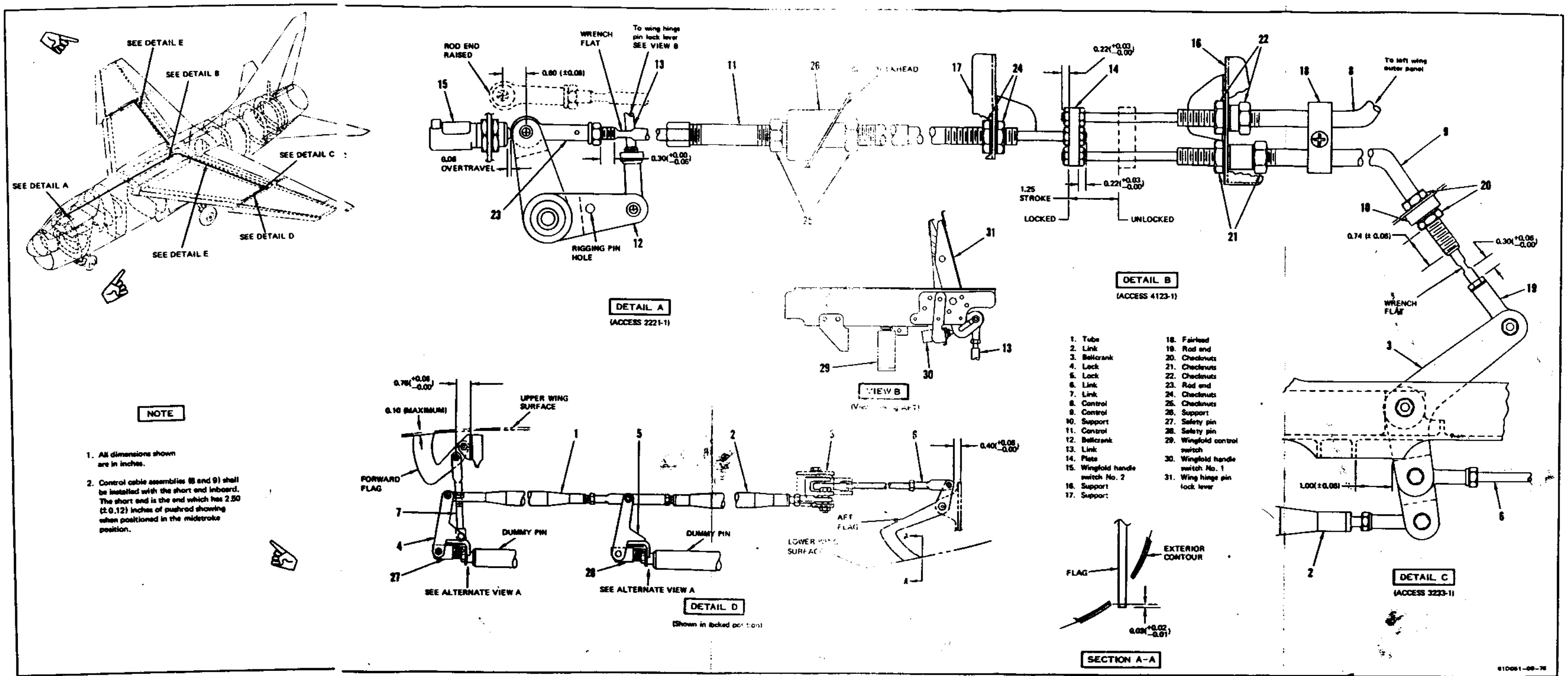
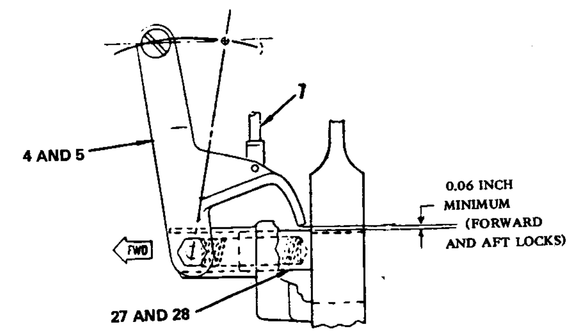


NOTE

1. All dimensions shown are in inches.
2. Control cable assemblies (8 and 9) shall be installed with the short end inboard. The short end is the end which has 2.50 (±0.12) inches of pushrod showing when positioned in the midstroke position.

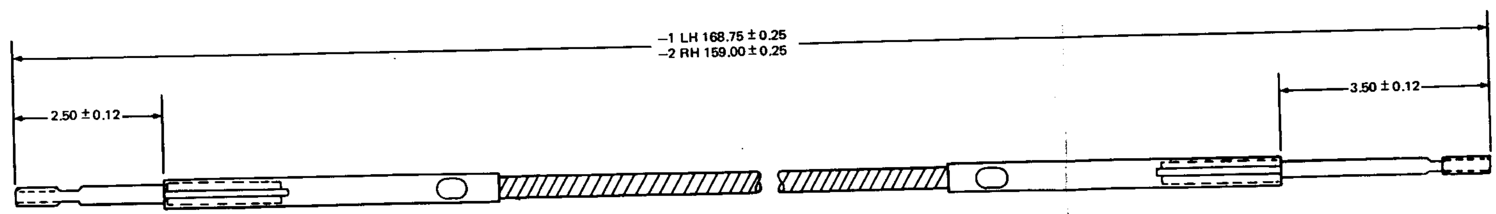
1. Tube
2. Link
3. Bellcrank
4. Lock
5. Lock
6. Link
7. Link
8. Control
9. Control
10. Support
11. Control
12. Bellcrank
13. Link
14. Plate
15. Wingfold handle switch No. 2
16. Support
17. Support
18. Fairlead
19. Rod end
20. Checknuts
21. Checknuts
22. Checknuts
23. Rod end
24. Checknuts
25. Checknuts
26. Support
27. Safety pin
28. Safety pin
29. Wingfold control switch
30. Wingfold handle switch No. 1
31. Wing hinge pin lock lever

Figure 24-7. Wingfold System Rigging (Sheet 1)



ALTERNATE VIEW A

(Shown in unlocked position with hinge pin retracted and dummy pin removed)



CONTROL SHOWN IN MIDSTROKE POSITON
(See Note 2)

DETAIL E

Figure 24-7. Wingfold System Rigging (Sheet 2)

24-25. WING HINGE PIN LOCK MECHANISM AT WINGFOLD. (See figure 24-7.)

NOTE

The following procedure provides instructions for rigging wing hinge pin locks and lock position indicator flags.

a. To perform this part of wingfold system rigging without reference to previous paragraphs, perform the following:

1. Fold wing outer panels (paragraph 2-16) and install wingfold support struts (paragraph 2-47).

2. Open accesses 3233-1 and 4233-1.

3. Remove fairings from outboard of left and right wing aft hinge pin pull cylinders.

4. Install wing outer panel hoisting adapter on right wing (figure 22-2).

WARNING

To install right hinge pin lock dummy pins, the right wingfold support strut must be removed. To prevent possible injury to personnel and damage to airplane during rigging operation, the right wing outer panel shall be secured in the folded position before removing the wingfold support strut.

5. Secure right wing outer panel hoisting adapter to an overhead hoist. If a hoist is not available, the hoisting adapter may be secured to right aft airplane hoisting lug (access 4133-5) with a suitable rope or chain.

6. Remove right wingfold support strut. Insert dummy pins into left and right wingfold fittings lugs to simulate hinge pins in locked position. Push dummy pins into lugs sufficiently to compress lock spring-loaded safety pins and allow insertion of half-moons of dummy pin retainers into lower half of dummy pin lock groove.

WARNING

To prevent injury to personnel and damage to airplane resulting from inadvertent operation of wingfold, do not apply external hydraulic and electrical power to airplane when performing rigging steps b through m.

b. Disconnect push-pull control rod end (19) from bellcrank (3) by removing cotter pin, nut, two washers, and bolt.

c. Position locks (4 and 5) to seat in dummy pin lock grooves by moving tube (1) aft.

d. Adjust links (1 and 2) to allow locks (4 and 5) to seat in lock groove at dummy pin.

e. Adjust link (2) to position bellcrank (3) to obtain 1.00 (±0.06) inch dimension shown in detail C, figure 24-5.

f. Adjust link (6) to provide 0.40 (±0.06) inch dimension at aft flag. Trim aft flag 0.03 (+0.02, -0.01) inch outside exterior contour of wing.

g. Adjust link (7) to obtain 0.76 (+0.06, -0.00) inch dimension at forward flag. While holding lock (4) in lock groove of dummy pin, apply fingertip pressure upward to bottom of flag and trim flag flush with exterior contour. Apply fingertip pressure downward on flag; clearance shall not exceed 0.10 inch below exterior contour.

h. Stroke wing hinge pin lock mechanism through several cycles. The echanism should move freely and without binding. With both locks (4 and 5) fully seated, verify clearance obtained in step c. Check that forward flag is below exterior contour of wing a maximum of 0.10 inch and aft flag extends below exterior contour of wing 0.03 (+0.02, -0.01) inch.

i. With locks (4 and 5) fully unlocked, check that dummy pins can be removed without binding.

j. Connect push-pull control rod end (19) to bellcrank (3) by installing bolt, two washers, nut, and cotter pin.

k. Repeat steps d through j for opposite wing, if required.

l. Remove all dummy pins and install wingfold support strut (paragraph 2-47).

m. Remove equipment, including hoisting adapter used to secure right wing outer panel in folded position, and close access 4133-5, if open.

NOTE

If entire rigging of wingfold system is required, omit step n and continue with paragraphs 24-26 through 24-28.

n. If no additional rigging is required, remove wingfold support struts (paragraph 2-47) and perform rigging checkout (paragraph 24-29).

24-26. WINGFOLD STOPBOLT.

NOTE

The following procedure provides instructions for aligning wingfold locking lugs in the event of binding hinge locking pins.

a. Remove wingfold support strut.

b. Connect external electrical power (paragraph 1-28).

c. Open isolation valve by placing flap handle UP or DOWN, according to position of flaps.

d. Raise wing hinge pin lock lever to up-and-locked position, place wingfold control switch in SPREAD, and spread wings with hand pump.

e. Open accesses 3112-3 or 4111-3.

f. Remove wingfold actuating cylinders and cap hydraulic lines.

CAUTION

Structural damage to actuating cylinder support will result if outer wing section is cycled by wingfold actuating cylinder when accesses 3112-3 and 4111-3 are not installed.

g. Check locking pin alignment and operation using the following:

1. Support wingfold actuator to prevent contact with structure during cycling.

2. Apply external hydraulic pressure of 1100 psi maximum.

3. Place the wingfold control switch to spread position.

4. After 15 seconds attempt to stow the wingfold lock lever. Perform visual inspection of wingfold locking system to verify locking pins fully extended.

5. Apply external hydraulic pressure of 1800 psi maximum.

6. Depress latch and open the lock lever. After one inch travel of the lock lever, release latch and continue lever movement to the full up-and-locked position.

7. Actuate wingfold control switch to the fold position.

8. Verify locking pins fully retracted by applying an upward force at the wing tip.

h. Check that locking pins extend and retract freely to full length as a result of proper alignment. Adjust stopbolts if required.

CAUTION

Application of excessive force on a pin that is binding could result in damage to bushing.

i. If alignment of locking lugs is not correct, adjust stopbolts as follows:

1. Raise outer wing section manually.

WARNING

To prevent possible injury to personnel and damage to airplane during stopbolt adjustment, the wing outer panel shall be secured in the folded position with wingfold support strut (paragraph 2-47) or equivalent.

2. Remove stopbolts and adjust by removing washers or laminations from washers or adding plain or laminated washers, as required.

3. Reinstall stopbolts with lockwasher under head of stopbolt and with laminated washer(s) sandwiched between lockwasher and plain steel washer(s).

4. Check that stopbolts are tight. Verify no gap exists between boltheads and wing center section wingfold rib using modeling clay.

j. Lower outer wing section and repeat steps g through i until locking lugs are properly aligned.

CAUTION

MIL-S-8802 sealant shall not contact face of bolt.

k. Secure stopbolts with MIL-S-8802 sealant around bolthead and adjacent area of wingfold fitting.

l. Reinstall wingfold actuating cylinders and adjust (paragraph 24-27).

m. Disconnect external electrical power (paragraph 1-28).

n. Close accesses 3112-3 and 4111-3.

NOTE

If entire rigging of wingfold system is required, omit step o. Continue with paragraphs 24-27 and 24-28.

o. If no additional rigging is required, perform rigging checkout (paragraph 24-29).

24-27. WINGFOLD ACTUATING CYLINDER.

NOTE

The following procedure provides instructions for adjusting wingfold actuating cylinder for proper wingfold operation.

a. To perform this part of wingfold system rigging without reference to previous paragraphs, perform the following:

1. Remove wingfold support strut (paragraph 2-47).

2. Connect external electrical power (paragraph 1-28).

3. Deleted.

4. Spread wings with hand pump (paragraph 2-20).

CAUTION

Structural damage to actuating cylinder support will result if outer wing section is cycled by wingfold actuating cylinder when accesses 3112-3 and 4111-3 are not installed.

5. Open accesses 3112-3 or 4111-3.

6. Disconnect wingfold actuating cylinders from outer wing sections, and allow outer wing sections to rest on stopbolts.

b. Cut lockwire and loosen actuator rod end jamnut enough to allow disengagement of locking device.

c. Retract piston rod until piston bottoms in cylinder. Wings must be resting on stops.

d. Adjust rod end until it will align properly with mounting hole in outer wing section attaching bracket.

e. Shorten actuator by screwing the rod end into the piston rod one turn clockwise to ensure that piston will not bottom out on spread cycle.

f. Engage protruding tab on inner section of locking device with notch in piston rod. Tighten jamnut to 550 (±50) pound-inches torque. Secure nut with MS20995C32 lockwire.

g. Secure rod end to outer wing section attaching bracket with washer, bolt, washer, and nut. Tighten nut finger-tight and secure with cotter pin.

h. Close accesses 3112-3 or 4111-3.

i. Disconnect external electrical power (paragraph 1-28).

WARNING

If entire rigging of wingfold system is required, omit step j and continue with paragraph 24-28.

j. If no additional rigging is required, perform rigging checkout (paragraph 24-29).

24-28. HYDRAULIC SEQUENCE VALVE.

NOTE

The following procedure provides instructions for adjusting the hydraulic sequence valve for proper operation of the wingfold hinge pin pull cylinders.

a. Fold wing outer panels using hydraulic hand pump (paragraph 2-16) and install wingfold support struts (paragraph 2-47).

b. Open accesses 3233-1 and 4233-1.

c. Remove fairings from outboard of left and right wing aft hinge pin pull cylinders and cut lockwire on sequencing valve jamnut.

d. Remove four bolts, nuts, and washers from fairing panel (access 3132-4 or 4131-5) above spread sequence valve pushrod on top of wing outer panel. Tape panel in place to prevent shifting when wings are spread. See figure 24-7A.

e. Connect external electrical power (paragraph 1-28).

f. Remove wingfold support struts (paragraph 2-47) and place wingfold control switch in SPREAD.

CAUTION

Ensure that access 3132-4 or 4131-5 above sequencing valve actuator pushrod does not bind during wing spreading operation.

g. Spread wings using hand pump (paragraph 2-16) and remove fairing panel.

h. Adjust actuating pushrod in the fully depressed position until 0.05 (±0.01) inch clearance is obtained between rod head and striker plate (see figure 24-7B).

CAUTION

Ensure that fairing panel above sequencing valve actuator pushrod does not bind during wingfolding and that hinge pins move freely.

i. Install access 3132-4 or 4131-5 above sequencing valve actuator pushrod and place wingfold control switch in FOLD. Fold wings with hand pump (paragraph 2-16).

j. Disconnect external electrical power (paragraph 1-28).

k. Install wingfold support struts and secure fairing panel with four bolts.

l. Tighten jamnut and secure with MS20995C32 lockwire.

m. Check split sleeve in pushrod guide bracket for excessive wear or looseness in bracket and for excessive pushrod play. If defective, replace sleeve by removing snapring and pushrod.

n. Install aft hinge pin pull cylinder outboard fairings on left and right wings.

o. Close accesses 3133-1 and 4233-1.

p. Perform rigging checkout (paragraph 24-29).

24-29. RIGGING CHECKOUT.

NOTE

The following procedure provides sufficient verification, after rigging wingfold system components, to safely perform an operation checkout of the system with full system hydraulic pressure applied.

a. Open accesses 2221-1, 3233-1, and 4233-1, and remove fairings from outboard of aft wing hinge pin pull cylinders.

b. Connect external electrical power (paragraph 1-28).

c. Latch the wing hinge pin lock lever in up-and-unlocked position and verify that it remains in this position.

d. Fold wings using hydraulic hand pump (paragraph 2-16). Check that wing hinge lock mechanism dummy pins may be installed/removed from wingfold fitting lugs with no binding.

e. Check that the wing hinge pin lock lever cannot be depressed to the down position. Levers (4 and 5) must be forced against safety pins when attempting to close the lock lever. Check that warning flags have not retracted.

f. Return hinge pin lock lever to full-raised position. Check that minimum clearance of 0.06 inch exists between all mechanical locks and spring loaded plungers as shown in figure 24-7, alternate view A.

g. Check that wingfold handle switch No. 1 is actuated by verifying that 28 volts dc is present at terminal 1 of wingfold control switch.

h. Place wingfold control switch in SPREAD, Operate hydraulic hand pump until wings are spread and hinge pins are fully extended (paragraph 2-16).

i. Place wing hinge pin lock lever in down-and-locked position. Check that wingfold handle switch No. 2 is actuated by verifying that wingfold caution light on caution light panel does not come on.

j. Check that load required to open or close wing hinge pin lock lever does not exceed 20 pounds.

k. Check that all nuts, jamnuts, and rods are tightened and secured with MS20995C32 lockwire or cotter pins, where applicable.

l. Perform wingfold system operational checkout (paragraph 24-14) and leave wings folded.

m. Install wingfold support struts (paragraph 2-47) and outboard aft wing hinge pin pull cylinder fairings.

NOTE

If wing outer panels are required to be in spread position after completion of rigging checkout, proceed with the following steps: otherwise, omit steps n and o.

n. Remove wingfold support strut assemblies, raise wing hinge pin lock lever to up-and-locked position, and place wingfold control switch in SPREAD.

o. When wings have spread, place control switch in OFF. Place wing hinge pin lock lever in down-and-locked position.

p. Disconnect external electrical power (paragraph 1-28).

q. Close accesses 2221-1, 3233-1, 4123-1, and 4233-1.

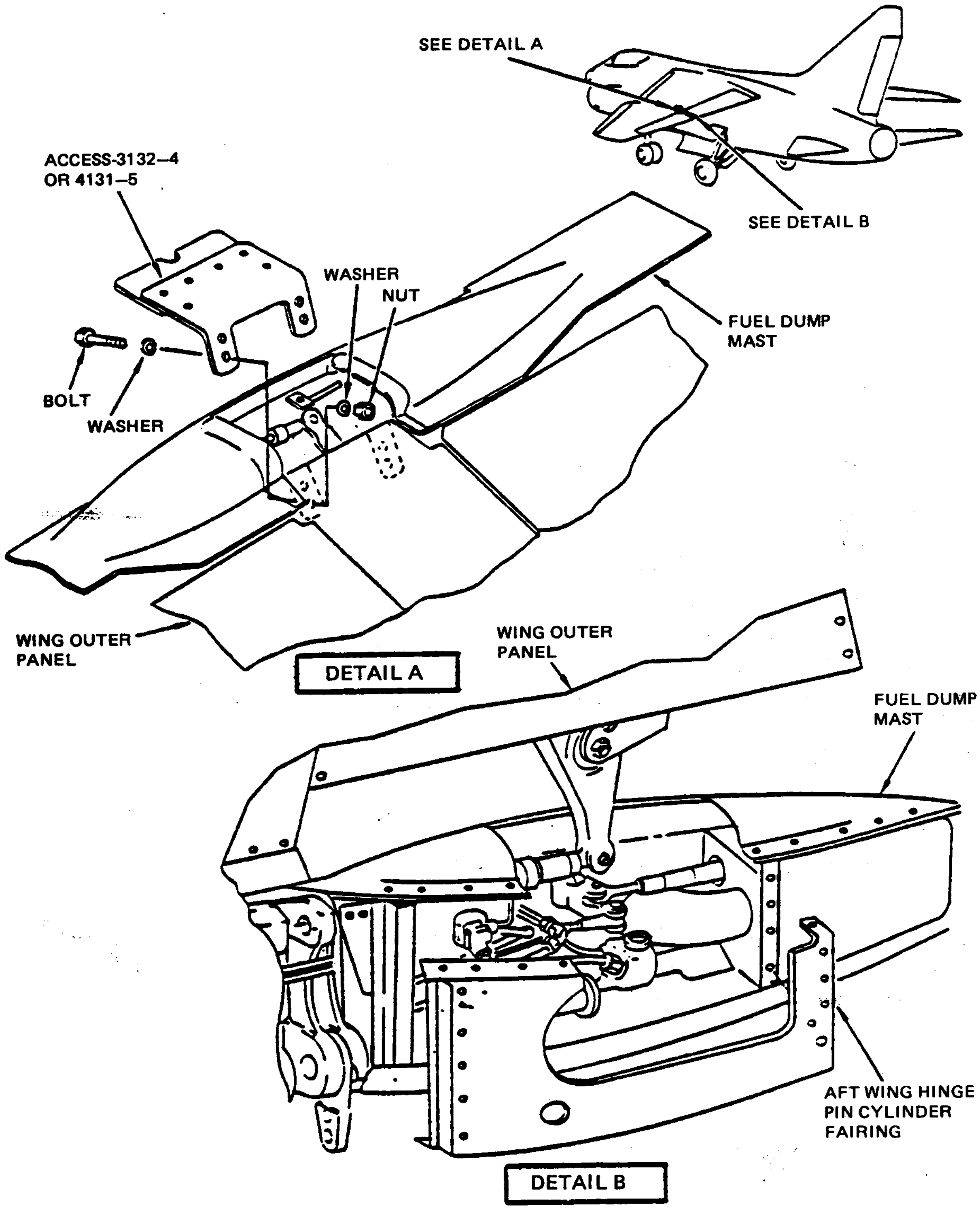


Figure 24-7A. Wingfold Fairing Removal

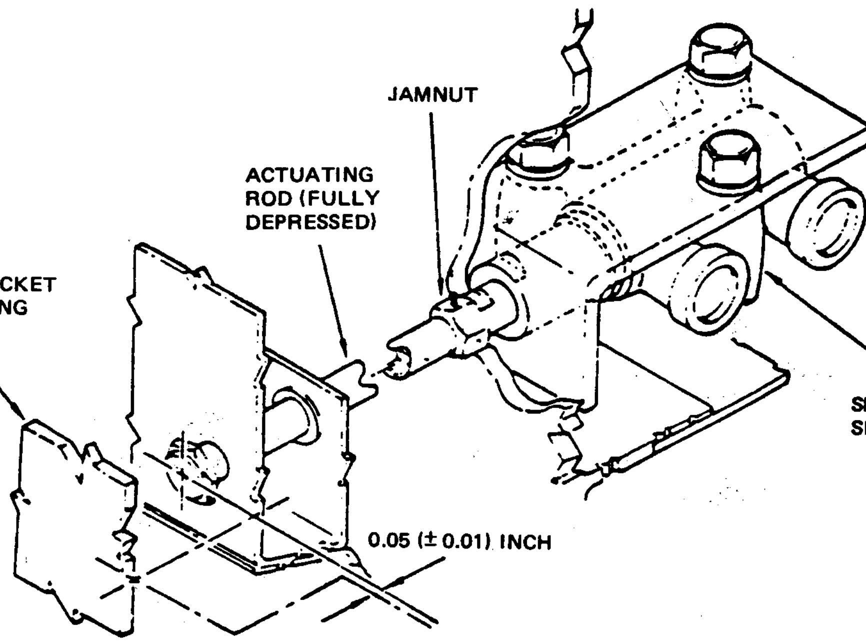


Figure 24-7B. Spread Line Sequence Valve Pushrod Adjustment

24-30. WINGFOLD SELECTOR VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power for checkout of wingfold selector valve.

CAUTION

To prevent damage to hydraulic system components resulting from contamination or improper maintenance practices, the hydraulic system standard precautions specified in T.O. 1A-7D-2-4 shall be observed when performing system maintenance.

24-31. REMOVAL. (See figure 24-8.)

a. Open access 2123-3.

NOTE

Selector valve can be replaced with wings spread or folded.

b. Connect external electrical power (paragraph 1-24).

c. Depressurize system by cycling wingfold control switch.

d. Disconnect external electrical power.

e. Disconnect electrical connector (1) from wingfold selector valve.

f. Disconnect hydraulic lines (2) from valve fittings. Cap or plug fittings and lines.

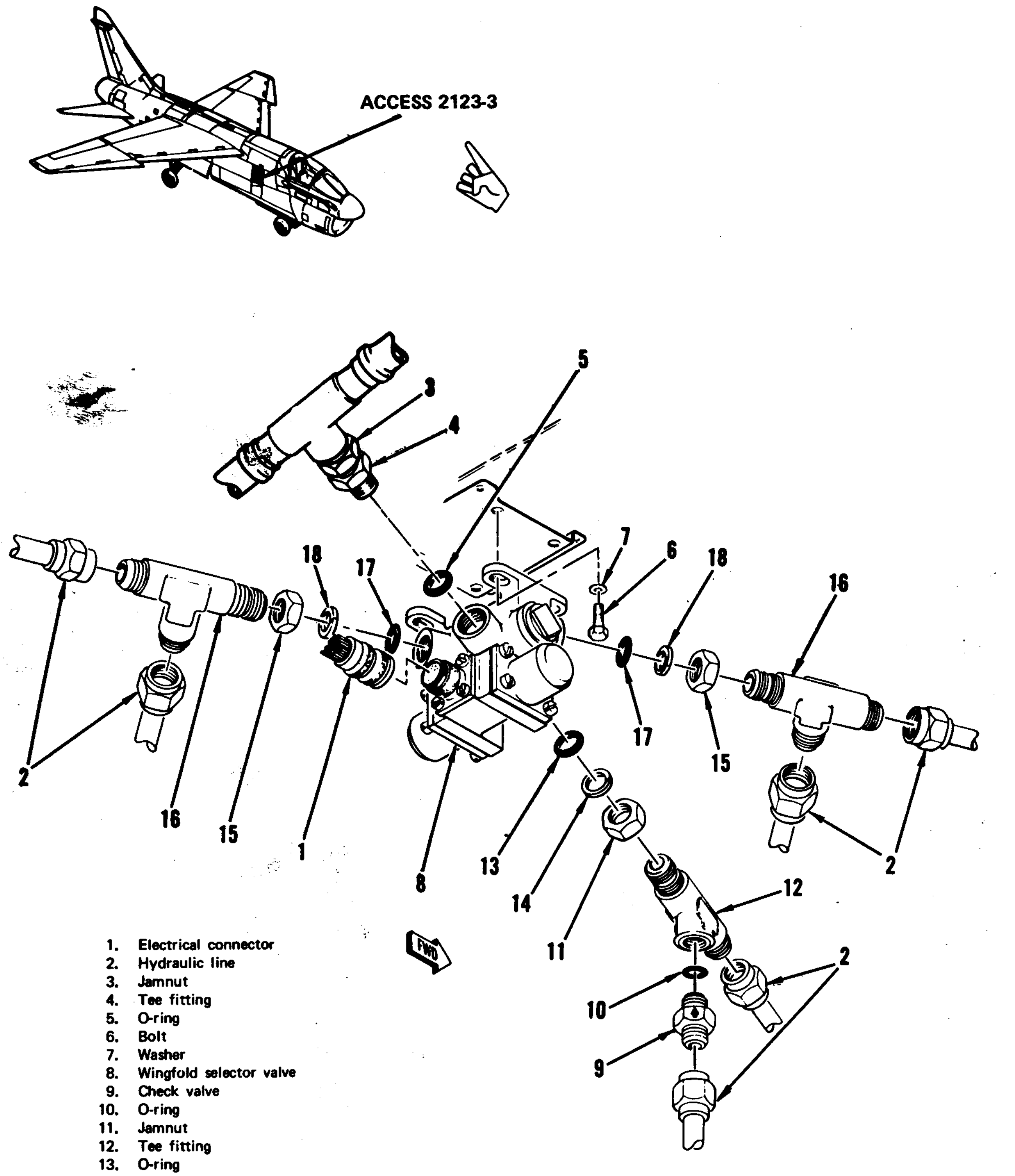
g. Loosen jamnut (3) and disconnect tee fitting (4) from valve. Remove O-ring (5). Cap fitting and plug port.

h. Remove bolts (6) and washers (7) securing valve to mounting, and remove selector valve (8).

i. Remove check valve (9) and O-ring (10) from tee fitting. Place check valve in clean plastic bag.

j. Loosen jamnut (11) and remove tee fitting (12), O-rings (13), split ring (14), and jamnut from CYL 1 port of valve. Plug valve port and place tee fitting and nut in clean plastic bag.

k. Loosen jamnuts (15) and remove tee fittings (16), O-rings (17), split rings (18), and jamnuts from RET and CYL 2 ports. Plug valve ports and place tee fittings and nuts in clean plastic bag.



1. Electrical connector
2. Hydraulic line
3. Jamnut
4. Tee fitting
5. O-ring
6. Bolt
7. Washer
8. Wingfold selector valve
9. Check valve
10. O-ring
11. Jamnut
12. Tee fitting
13. O-ring
14. Split ring
15. Jamnut
16. Tee fitting
17. O-ring
18. Split ring

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Figure 24-8. Wingfold Selector Valve Removal and Installation

24-32. INSTALLATION. (See figure 24-8.)

a. Install jamnuts (15), split rings (18), and new O-rings (17) on tee fittings (16) and install tee fittings in RET and CYL 2 ports of wingfold selector valve. Do not tighten jamnuts.

b. Install jamnut (11), split ring (14), and new O-rings (13) on tee fitting (12), and install tee fitting in CYL 1 port of valve. Do not tighten jamnut.

c. Position new O-ring (10) on check valve (9) and install check valve in tee fitting (12) with flow arrow pointing toward fitting.

d. Place valve (8) in mounting position in airplane and install washers (7) and mounting bolts (6). Do not tighten bolts.

e. Using new O-ring (5), connect tee fitting (4) to valve. Tighten jamnut (3).

f. Align tee fittings with hydraulic lines (2) and connect lines finger-tight at fittings and check valve.

g. Tighten valve mounting bolts and tee fitting jamnuts.

h. Connect external electrical power (paragraph 1-28).

i. Place wing hinge pin lock lever in up-and-locked position. Place wingfold control switch in SPREAD and operate hydraulic hand pump until fluid bleeding through finger-tight fittings is free of air. Tighten fittings from which fluid is bleeding.

j. Place wingfold control switch in FOLD and operate hydraulic hand pump until fluid bleeding through finger-tight fittings is free of air. Tighten fittings.

k. Perform wingfold system operational checkout (paragraph 24-14). Check selector valve and connections for leaks during folding and spreading.

l. Perform hydraulic system air check (paragraph 3-40).

m. Disconnect external electrical power (paragraph 1-28).

n. Close access 2123-3.

24-33. WINGFOLD ACTUATING CYLINDER REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power for checkout of wingfold actuating cylinder.
		Equipment required to connect external hydraulic power	Provide hydraulic power for checkout of wingfold actuating cylinder.
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Tighten hardware on wingfold actuating cylinder.
	215-00212-1	Wing outer panel hoisting adapter	Adapt wing outer panel to hoist.
2-1	215-00255-12	Wingfold support struts (2)	Support wing outer panels when folded.

CAUTION

To prevent damage to hydraulic system components resulting from contamination or improper maintenance practices, the hydraulic system standard precautions specified in T.O. 1A-7D-2-4 shall be observed when performing system maintenance.

24-34. REMOVAL. (See figure 24-9.)

a. Fold wing outer panels (paragraph 2-16).

b. Install wingfold support struts (paragraph 2-47).

c. Install wing outer panel hoisting adapter (figure 22-2) on applicable wing outer panel.

d. If defective actuator will not fold wings, perfor' the following:

1. Place wing hinge pin lock lever in up-and-locked position.

2. Manually raise wing outer panel slightly to ensure wing hinge pins are retracted.

3. Connect hoist to hoisting adapter and raise wing outer panel.

4. Install wingfold support strut (paragraph 2-47).

e. Open access 3112-3 or 4111-2.

f. Remove cotter pin (1), nut (2), washers (3), and bolt (4) securing actuating cylinder rod end to wing outer panel. Note position of washers (3).

g. Connect external electrical power (paragraph 1-28).

h. Place wingfold control switch in SPREAD and operate hydraulic hand pump until cylinder fully retracts.

i. Shut down but do not disconnect external electrical power.

j. Remove hydraulic lines (5).

k. Disconnect hydraulic lines (6) from swivels (10). Cap or plug lines and swivels.

l. Remove bolts (7), washers (8), and spacers (9) securing swivels (10) to cylinder. Cap swivels and place in clean plastic bag.

m. Remove retainer nut (11), bolt (12), shoulder washer (13), and pin (14). Note position of cylinder (15) for installation, and remove from airplane.

n. Remove restrictors (16) and O-rings (17) from cylinder ports. Plug ports and place unions in clean plastic bag.

24-35. INSTALLATION. (See figure 24-9.)

a. Remove plugs, drain preservative fluid, and install new O-rings (17) on restrictors (16) and install restrictors in wingfold actuating cylinder (15) ports.

b. With piston rod retracted, fill cylinder with hydraulic fluid and plug ports.

c. Apply coating of MIL-C-16173, Grade 1 corrosion preventive compound around periphery of wing center section wingfold actuator lug bearing. Thin compound as required with TT-T-291 thinner or naphtha.

d. Apply coating of MIL-C-16173, Grade 2 (VVL 800) corrosion preventive compound to pin (14).

e. Place actuating cylinder in mounting position and install pin (14), shoulder washer (13), bolt (12), and retainer nut (11). Tighten retainer nut 12 to 15 pound-inches torque. Secure retainer nut and bolthead to cylinder on inboard and outboard sides using MS20995C32 lockwire.

f. Connect hydraulic lines (6) to swivel fittings (10) finger-tight.

g. Connect hydraulic lines (5) to union (16) finger-tight.

h. Connect lower end of hydraulic lines (5) to swivel (10) finger-tight.

i. Insert bolts (7) through washers (8), swivel (10), and spacers (9), and secure swivels to cylinders.

j. Tighten hydraulic lines (6) at swivel (10).

k. Tighten wing fold line at swivel and tighten wing spread line at cylinder port. Leave fittings on opposite ends of lines loose for bleeding.

l. Apply external electrical power.

m. Place wingfold control switch in FOLD. Ensure that flap handle is in position corresponding to position of flaps.

n. Slowly operate hand pump and allow fluid and air to bleed from loose fittings as piston rod fully extends. Guide extending piston rod to avoid contact with wing outer panel structure.

o. When piston rod is fully extended, tighten spread line fitting.

p. Place wingfold control switch in SPREAD. Loosen fold line fitting and slowly operate hand pump, allowing fluid and air to bleed from loose fitting as piston rod fully retracts. Tighten fold line fitting.

q. Repeat bleeding steps as necessary until air-free fluid flows from spread and fold line fittings. Tighten all fittings.

r. Connect hoist (if not connected) to wing outer panel hoisting adapter.

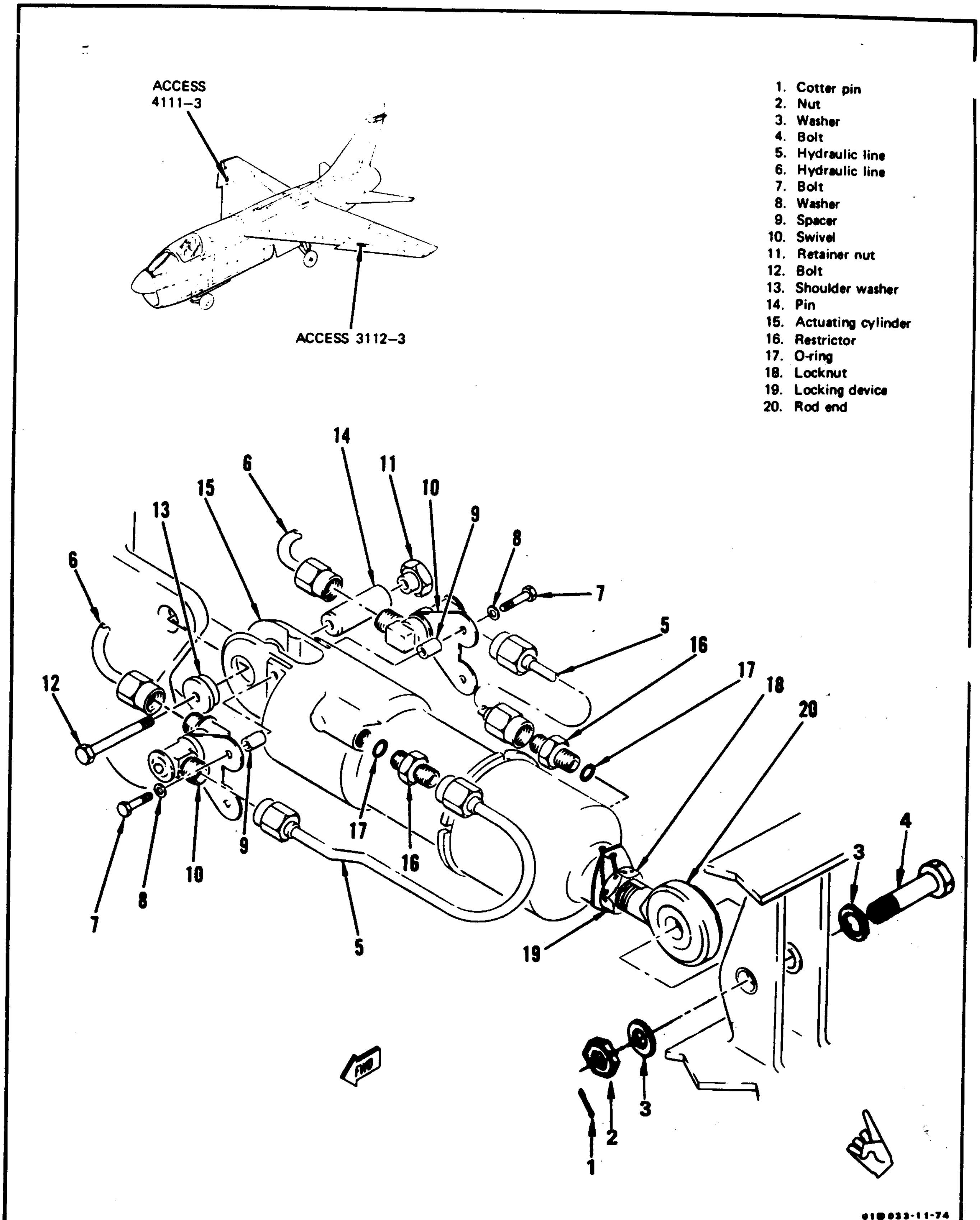


Figure 24-9. Wingfold Actuating Cylinder Removal and Installation

s. Remove wingfold support struts (paragraph ?-47).

t. Lower wing with hoist. Disconnect hoist from hoisting adapter.

u. Cycle wingfold control switch while operating hand pump and ensure that locking pins move freely.

v. Retract piston rod until piston bottoms in cylinder while wing is resting on stop.

w. Loosen locknut (18) enough for disengagement of locking device (19).

x. Adjust piston rod end (20) until it will align properly with mounting hole in outer wing attaching bracket.

y. Shorten cylinder stroke by turning rod end one turn clockwise to prevent piston from bottoming out on spread cycle.

z. Engage protruding tab on inner section of locking device with notch in piston rod and tighten locknut to a torque of 550 (±50) pound-inches. Secure locknut with MS20995C32 lockwire.

aa. Secure rod end to outer panel with bolt (4), washers (3, as noted during removal), and nut (2). Tighten nut finger-tight and secure with new cotter pin (1).

ab. Close access 3112-3 or 4111-2.

ac. Place wingfold control switch in SPREAD. Stroke hand pump and ensure that hinge pins move freely.

ad. Place wing hinge pin lock lever to down-and-locked position and ensure that warning flags retract. Raise wing hinge pin lock lever to up-and-locked position and ensure that warning flags extend.

ae. Place wingfold control switch in FOLD.

af. Operate hand pump and ensure that hinge pins retract. Fold wings.

ag. Remove hoisting adapter from wing outer panel.

ah. Perform wingfold system operational checkout (paragraph 24-14). Check cylinder installation for leaks during checkout.

ai. Perform hydraulic system air check (paragraph 3-40).

24-36. FORWARD HINGE PIN CYLINDER REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required for connecting external electrical power	Provide electrical power for operational checkout of forward hinge pin cylinder.
	215-00212-1	Wing outer panel hoisting adapter	Adapt wing to hoist.
2-1	215-00255-12	Wingfold support strut (2)	Support wing outer panels when folded.

CAUTION

To prevent damage to hydraulic system components resulting from contamination or improper maintenance practices, the hydraulic system standard precautions specified in T.O. 1A-7D-2-4 shall be observed when performing system maintenance.

24-37. REMOVAL. (See figure 24-10.)

a. Fold wing outer panels (paragraph 2-16).

b. Install wingfold support struts (paragraph 2-47).

c. Disconnect hydraulic lines (1) from hinge pin cylinder.

d. Remove bolts (2) and washers (3), and remove cylinder (4) from airplane.

e. Remove hydraulic line (5) from cylinder.

f. Loosen jamnuts (6) and remove elbows (7), reducer (8), O-rings (9), and backup rings (10). Note position of elbows for installation on replacement cylinder.

g. Cap or plug lines and cylinder ports.

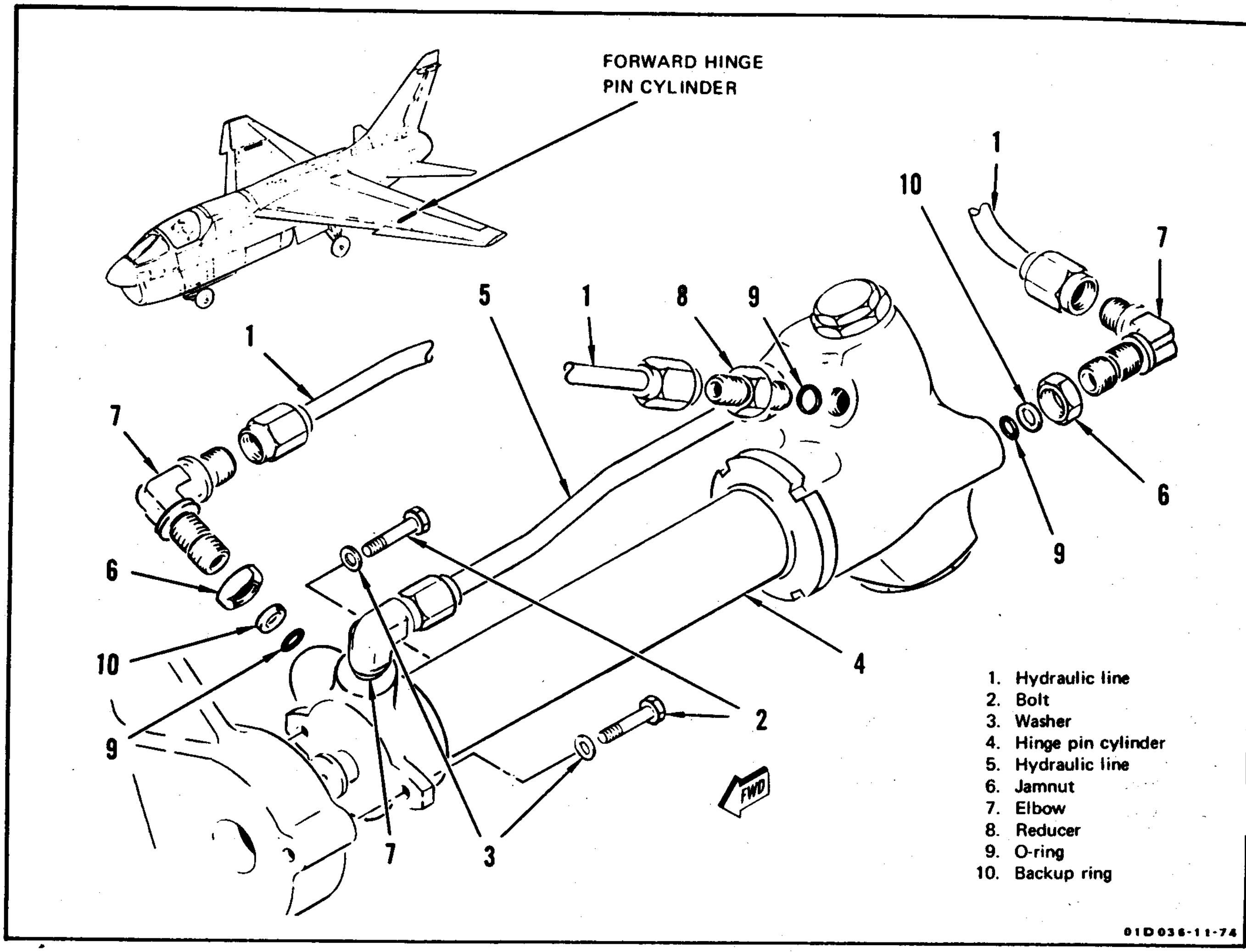


Figure 24-10. Forward Hinge Pin Cylinder Removal and Installation

24-38. INSTALLATION. (See figure 24-10.)

a. Remove plugs from actuator ports and using new backup rings (10) and new O-rings (9), install reducer (8) and elbows (7) in positions noted in removal. Tighten jamnuts (6).

b. Install hydraulic line (5).

c. Position wing hinge pin cylinder (4) and secure with washers (3) and bolts (2).

d. Connect hydraulic lines (1) on wing hinge pin cylinders, leaving spread and fold lines finger-tight.

e. Install wing outer panel hoisting adapter on applicable wing outer panel (figure 22-2). Secure hoisting adapter to overhead hoist or airplane hoisting lug with suitable rope or chain.

f. Remove wingfold support struts (paragraph 2-47).

g. Connect external electrical power (paragraph 1-28).

h. Bleed hinge pin cylinder as follows:

1. Place wingfold control switch in SPREAD.

2. Depress pushrod on spread sequence valve, and operate hydraulic hand pump until cylinder fully extends. Tighten fold line fitting on cylinder. Release pushrod.

3. Place wingfold control switch in FOLD.

4. Operate hydraulic hand pump until cylinder fully retracts. Tighten spread line fitting on cylinder.

5. Loosen spread and fold line fittings and repeat substeps 1 through 4 until all air is bled from cylinder. Leave cylinder retracted after bleeding.

i. Remove wing outer panel hoisting adapter.

j. Spread wing outer panels with hydraulic hand pump (paragraph 2-16).

k. Place wing hinge pin lock lever in down-and-locked position to ensure that hinge pin cylinders are fully extended.

l. Raise lock lever and place wingfold control switch in FOLD. Fold wings with hydraulic hand pump.

m. Perform wingfold system operational checkout (paragraph 24-14).

n. Perform hydraulic system air check (paragraph 3-40).

24-39. AFT HINGE PIN CYLINDER REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment required connecting external power	Provide electrical power for checkout of aft hinge pin cylinder.
	215-00212-1	Wing outer panel hoisting adapter	Adapt wing outer panel to hoist for raising outer panel.
	215-00255-12	Wingfold support strut	Support wing outer panel in folded position.

CAUTION

To prevent damage to hydraulic system components resulting from contamination or improper maintenance practices, the hydraulic system standard precautions specified in T.O. 1A-7D-2-4 shall be observed when performing system maintenance.

24-40. REMOVAL. (See figure 24-11.)

a. Install wing outer panel hoisting adapter on applicable wing outer panel (figure 22-2).

b. Fold wing outer panels (paragraph 2-16).

c. Secure hoisting adapter to overhead hoist or airplane hoisting lug with suitable rope or chain. Install wingfold support strut on opposite wing (paragraph 2-47).

d. Open access 3233-1 or 4233-1.

e. Remove aft hinge pin cylinder fairing.

CAUTION

To prevent system contamination, cap or plug all open lines and fittings as soon as practical after disconnecting or removing.

f. Disconnect hydraulic lines (1) from cylinder.

g. Remove jamnut (2), tee fitting (3), and washer (4) from bracket.

h. Disconnect pneumatic line (5).

NOTE

When removing elbow (8), drill out two rivets securing bracket (9) to airplane. When installing bracket, use bolts to secure to airplane.

i. Disconnect pneumatic flex line (6) from elbow. Remove jamnut (7) and elbow (8) from bracket (9). Remove washer (10) from elbow.

j. Loosen jamnut (11) on spread sequence valve actuating pushrod (12). Unscrew pushrod. Count and record required turns for removal of pushrod and leave pushrod in guide.

k. Remove bolts (13) and washers (14) securing cylinder to airplane.

NOTE

If difficulty in removing hinge pin cylinder is encountered, relieve stress by supporting aft end of pylon.

l. Move hinge pin cylinder (15) aft and then upward to remove from airplane.

m. Loosen jamnuts (16) and remove elbows (17), backup rings (18), and O-rings (19) from cylinder.

n. Remove reducers (20) and O-rings (21).

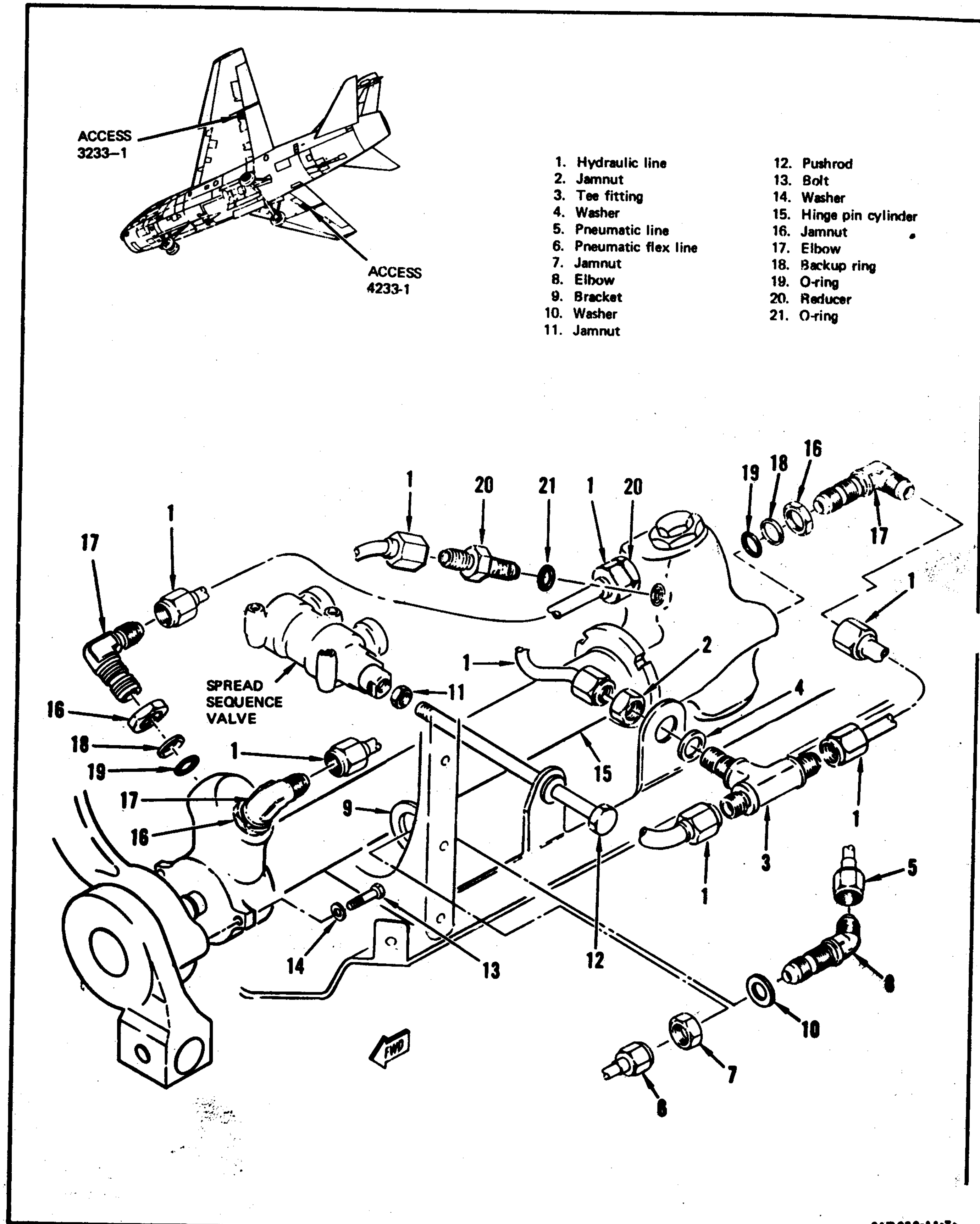


Figure 24-11. Aft Hinge Pin Cylinder Removal and Installation

SEE 155-3

24-41. INSTALLATION. (See figure 24-11.)

a. Install new O-rings (21) on reducers (20), and install reducers in cylinder ports.

b. Install jamnuts (16), new backup rings (18), and new O-rings (19) on elbows (17). Install elbows in cylinder ports. Do not tighten jamnuts.

NOTE

If difficulty in installing hinge pin cylinder is encountered, relieve stress by supporting aft end of pylon.

c. Position hinge pin cylinder (15) in airplane and secure with bolts (13) and washers (14).

NOTE

Ensure pushrod (12) is screwed in the same number of turns recorded during removal.

d. Install pushrod (12) in spread sequence valve.

e. Tighten jamnut (11) finger-tight.

f. Place washer (4) on tee fitting (3) and position in bracket. Install but do not tighten jamnut (2).

g. Connect hydraulic lines (1).

h. Tighten jamnuts (2 and 16).

i. Connect external electrical power (paragraph 1-28).

j. Bleed hinge pin cylinder as follows:

1. Loosen fold line at cylinder port.

2. Place wingfold control switch in SPREAD. Manually depress pushrod (12) and operate hydraulic hand pump until cylinder is fully extended. Tighten fold line fitting and release pushrod.

3. Loosen spread line at cylinder port.

4. Place wingfold control switch in FOLD. Operate hydraulic hand pump until cylinder is fully retracted. Tighten spread line fitting.

5. Repeat substeps 1 through 4 until all air is bled from cylinder. Leave cylinder retracted after bleeding.

k. Install bracket (9) with bolts.

l. Install washer (10) on elbow. Position elbow (8) in bracket (9) and install jamnut (7) securing elbow to bracket.

m. Connect pneumatic flex line (6) to elbow (8).

n. Connect pneumatic line (5) to elbow and to pneumatic elbow inside access 3233-1 or 4233-1.

o. Install aft wing hinge pin cylinder fairing.

p. Remove four bolts, nuts, and washers from fairing panel (access 3132-4 or 4131-5) above spread sequence valve pushrod on top of wing outer panel. Tape panel in place to prevent shifting when wings are spread.

q. Remove wing outer panel hoisting adapter.

r. Remove wingfold support strut (paragraph 2-47).

s. Spread wing outer panels with hydraulic hand pump (paragraph 2-16). Discontinue hand pump operation when panels rest on stopbolt.

t. Untape and remove access panel 3132-4 or 4131-5.

u. Manually depress pushrod (12) until bottomed out in sequence valve and check for 0.05 (±0.01) inch clearance between head of pushrod and pushrod striker bracket on outer panel. Adjust pushrod if necessary; then tighten jamnut (11).

v. Tape access panel 3132-4 or 4131-5 in position to prevent shifting when wings are folded.

w. Place wingfold control switch in FOLD and fold wing outer panels with hydraulic hand pump.

x. Secure access panel 3132-4 or 4131-5 to outer panel and remove tape.

y. Secure jamnut (11) with MS20995C32 lockwire.

z. Spread outer panels with hydraulic hand pump.

aa. Place wing hinge pin lock lever in down-and-locked position to ensure that hinge pins have fully extended.

ab. Raise wing hinge pin lock lever and fold outer panels with hydraulic hand pump to check for proper operation.

ac. Perform wingfold system operational checkout (paragraph 24-14).

ad. Perform hydraulic system air check (paragraph 3-40).

ae. Close access 3233-1 or 4233-1.

24-41A. LATCH PIN SAFETY PLUNGER REMOVAL AND INSTALLATION. (See figure 24-6).

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
2-1	215-00255-12	Wingfold Support Struts (2)	Support Wing Outer Panel Folded

CAUTION

To prevent damage to hydraulic system components resulting from contamination or improper maintenance practices, the hydraulic system standard precautions specified in T.O. 1A-7D-2-4 shall be observed when performing maintenance.

a. Fold wing outer panels.

b. Install wingfold support struts (paragraph 2-47).

c. Remove cotter pin (18), nut (19), and bolt (20).

d. Remove cotter pin (6), nut (7), and bolt (8) securing forward latch to remove flag linkage (9).

e. Remove cotter pin (10), nut (11), and washer (12) securing linkage to upper flag (13). After linkage to upper flag is removed from forward latch assembly (14), remove washer (15).

f. Remove bolts (16) and washer (17). Remove forward latch with mechanism attached.

g. Remove bolt (23) and washer (24) securing latch assembly (22) remove latch assembly with mechanism attached.

h. Remove safety plunger and spring mechanism from latch.

WARNING

Solvent P-D-680, Type II, is flammable and toxic. Skin and eye protection is required; good general ventilation or respiratory protection is required.

i. Clean plunger, spring and housing using P-D-680, Type II or equivalent MIL-G-23827 grease.

j. Lubricate safety plunger with MIL-G-23827 grease.

k. Install removed components in reverse order.

l. Perform operational check in accordance with paragraph 24-14.

24-42. SPREAD SEQUENCE VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment for connecting external electrical power	Provide electrical power for checkout of spread sequence valve.
2-1	215-00255-12	Wingfold support struts (2)	Support wing outer panel when folded.

CAUTION

To prevent damage to hydraulic system components resulting from contamination or improper maintenance practices, the hydraulic system standard precautions specified in T.O. 1A-7D-2-4 shall be observed when performing system maintenance.

24-43. REMOVAL. (See figure 24-12.)

a. Fold wing outer panels (paragraph 2-16).

b. Install wingfold support struts (paragraph 2-47).

c. Open access 3233-1 or 4233-1.

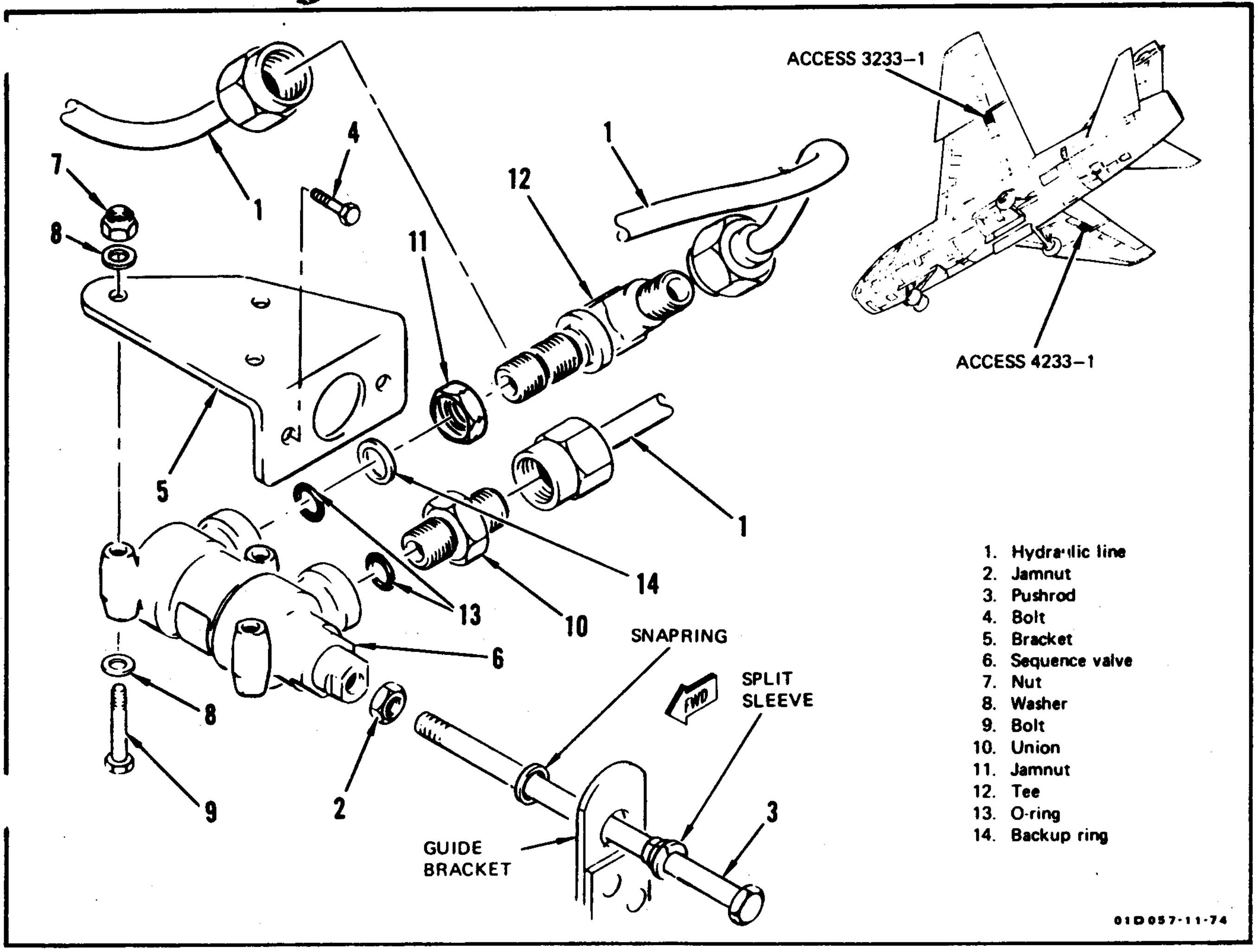


Figure 24-12. Spread Sequence Valve Removal and Installation

d. Disconnect hydraulic lines (1) from sequence valve, and cap lines.

e. Remove aft hinge pin cylinder fairing.

f. Loosen jamnut (2). Count and record number of turns required to remove pushrod (3). Leave pushrod positioned in guide bracket.

g. Remove bolts (4), and remove bracket (5) and sequence valve (6) from airplane.

h. Remove nuts (7), washers (8), and bolts (9), and remove sequence valve from bracket.

i. Remove union (10).

j. Loosen jamnut (11) and remove tee (12).

k. Remove and discard O-rings (13) and backup ring (14) from union and tee.

24-44. INSTALLATION. (See figure 24-12.)

a. Using new backup ring (14) and new O-ring (13), install tee (12) on replacement sequence valve. Do not tighten jamnut (11).

b. Using new O-ring (13), install union (10).

c. Secure sequence valve (6) to bracket (5) with bolts (9), washers (8), and nuts (7).

d. Check split sleeve in pushrod guide bracket for excessive wear or looseness in bracket and for excessive pushrod play. If defective, replace sleeve by removing snapring and pushrod.

e. Secure sequence valve and bracket on airplane with bolts (4).

f. Connect hydraulic lines (1). Leave lines loose for bleeding.

g. Tighten jamnut (11).

h. Thread pushrod (3) into sequence valve same number of turns as recorded during removal. Tighten jamnut (2) finger-tight.

i. Connect external electrical power (paragraph 1-28).

j. Bleed sequence valve as follows:

1. Place wingfold control switch in FOLD.

2. Operate hydraulic hand pump until air free fluid flows from loose line. Tighten line and discontinue hand pump operation.

3. Place wingfold control switch in SPREAD.

4. Depress pushrod (3) and operate hand pump until air free fluid flows from loose line. Tighten line, discontinue hand pump operation, and release pushrod.

5. Ensure that all hydraulic lines are properly tightened.

k. Install aft hinge pin cylinder fairing.

l. Remove nuts, washers, and bolts securing access panel 3132-4 or 4131-5 to outer panel. Tape access panel in place to prevent shifting when wings are spread.

m. Remove wingfold support struts (paragraph 2-47).

n. Spread outer panels with hydraulic hand pump (paragraph 2-16). Discontinue hand pump operation when outer panels rest on stopbolt.

o. Untape and remove access panel 3132-4 or 4131-5.

p. Manually depress pushrod (3) until bottomed out in sequence valve and check for 0.05 (±0.01) inch clearance between head of pushrod and pushrod striker bracket on outer panel. Adjust pushrod if necessary; then tighten jamnut (2).

q. Tape access panel 3132-4 or 4131-5 in position to prevent shifting when wings are folded.

r. Place wingfold control switch in FOLD and fold outer panels with hydraulic hand pump.

s. Secure access panel 3132-4 or 4131-5 to outer panel and remove tape.

t. Secure jamnut (2) with MS20995C32 lockwire.

u. Spread outer panels with hydraulic hand pump.

v. Place wing hinge pin lock lever in down-and-locked position to ensure that hinge pins have fully extended.

w. Raise wing hinge pin lock lever and fold outer panels with hydraulic hand pump to check for proper operation.

x. Perform wingfold system operational checkout (paragraph 24-14).

y. Perform hydraulic system air check (paragraph 3-40).

z. Close access 3233-1 or 4233-1.

24-45. WINGFOLD MANUAL SELECTOR VALVE REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
2-1	215-00255-12	Wingfold support struts (2)	Support wing outer panels when folded.

CAUTION

To prevent damage to hydraulic system components resulting from contamination or improper maintenance practices, the hydraulic system standard precautions specified in T.O. 1A-7D-2-4 shall be observed when performing system maintenance.

24-46. REMOVAL. (See figure 24-13.)

a. Disconnect hydraulic lines (1) from wingfold manual selector valve. Cap lines.

b. Remove bolt (2), washer (3), and handle (4) from valve shaft.

c. Remove bolts (5) and washers (6), and remove valve (7) from mounting bracket.

d. Loosen jamnuts (11) and remove elbows (8), O-rings (9), and backup rings (10) from valve.

e. Remove plug (12) and O-ring (13).

24-47. INSTALLATION. (See figure 24-13.)

a. Using new O-ring (13), install plug (12) in valve return port.

b. Using new backup rings (10) and O-rings (9), install elbows (8) in valve ports. Do not tighten jamnuts (11).

c. Secure valve to mounting bracket with washers (6) and bolts (5).

d. Install handle (4) on valve shaft and secure with washer (3) and bolt (2).

e. Connect hydraulic lines (1) and tighten jamnuts (11).

f. Place control lever on wingfold manual selector valve in up position (airplanes through AF69-6196) or in outboard position (airplanes AF69-6197 and subsequent).

g. Loosen fitting at wingfold system fold line check valve on end toward hydraulic hand pump. Operate hand pump and bleed line to check valve until fluid flowing from line is free of all air. Tighten fitting at check valve.

h. Fold wings using hydraulic hand pump and check selector valve installation for leaks.

i. Install wingfold support struts (paragraph 2-47).

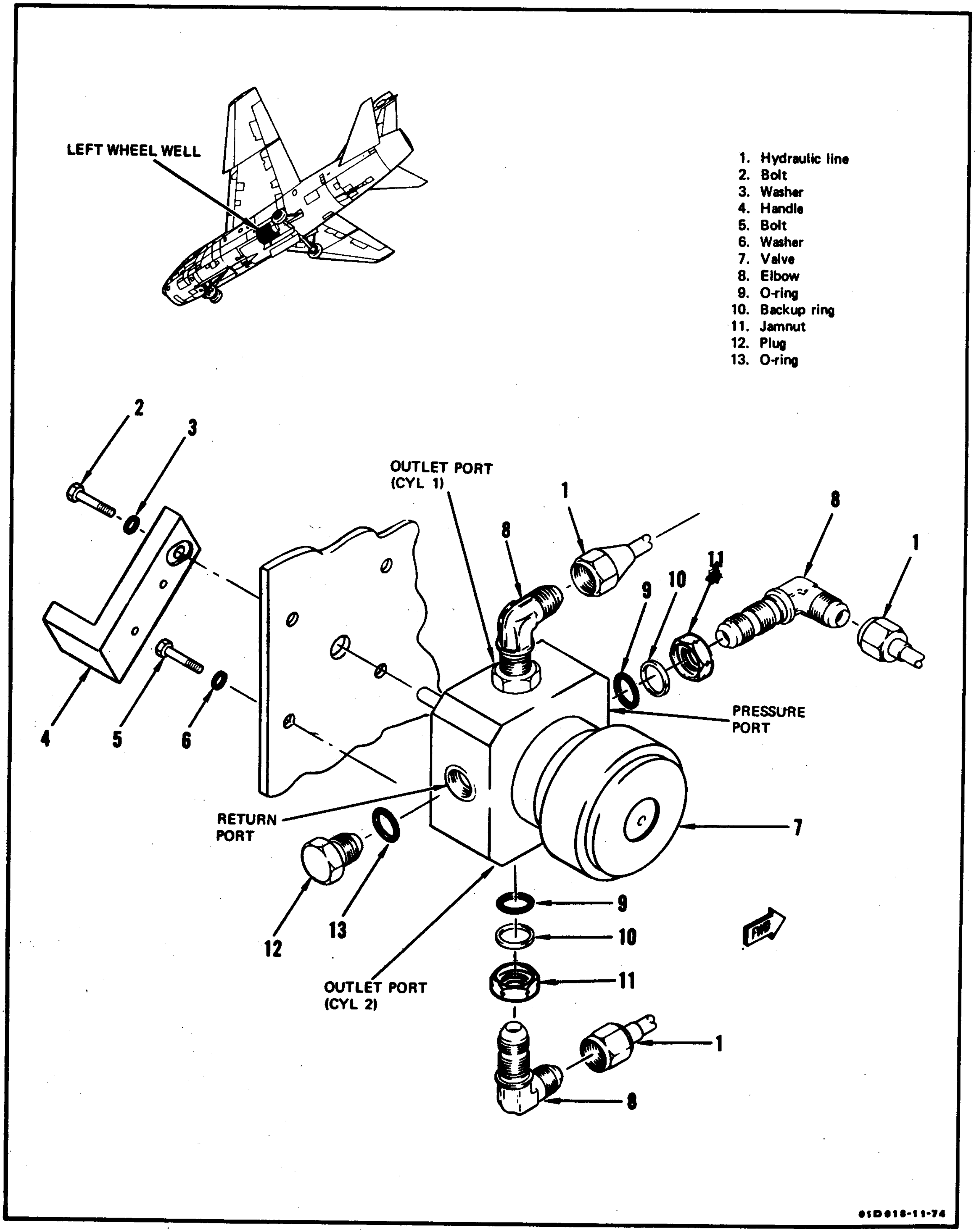


Figure 24-13. **Wingfold Manual Selector Valve Removal and Installation**

24-48. WINGFOLD CONTROL SWITCH REMOVAL AND INSTALLATION.

24-49. REMOVAL.

a. Open access 2221-1.

b. Raise wing hinge pin lock lever to up-and-locked position.

c. Remove top nut and washer securing switch to right console.

d. Disconnect and identify switch wiring.

e. Remove switch from airplane.

24-50. INSTALLATION.

a. Connect wiring to terminals of switch as noted during removal.

b. Position switch in mounting bracket and install top washer and nut.

c. Perform wingfold system operational checkout (paragraph 24-14).

d. Close access 2221-1.

24-51. WINGFOLD HANDLE SWITCH NO. 1 REMOVAL AND INSTALLATION.

24-52. REMOVAL.

a. Open access 2221-1.

b. Position wing hinge pin lock lever away from up-and-locked position.

c. Remove lockwire from switch jamnuts.

d. Remove inboard jamnut from switch and remove switch from mounting bracket.

e. Cut switch wiring at splices and identify wiring for installation.

f. Remove switch from airplane.

24-53. INSTALLATION.

a. Splice switch wiring to airplane wiring as noted during removal.

b. Position switch in mounting bracket and inst inboard jamnut.

c. Raise wing hinge pin lock lever to up-and-locked position.

d. Adjust switch jamnuts until switch initially actuates; then adjust jamnuts two additional full turns to provide 0.06-inch switch plunger overtravel.

e. Secure switch jamnuts with MS20995C32 lockwire.

f. Perform wingfold system operational checkout (paragraph 24-14).

g. Close access 2221-1.

24-54. WINGFOLD HANDLE SWITCH NO. 2 REMOVAL AND INSTALLATION.

24-55. REMOVAL.

a. Open access 2221-1.

b. Spread wing outer panels with hydraulic hand pump (paragraph 2-16).

c. Remove lockwire from switch jamnuts.

d. Remove jamnuts securing switch to mounting bracket.

e. Cut switch wiring at splices and identify wiring for installation.

f. Remove switch from airplane.

24-56. INSTALLATION.

a. Splice switch wiring to airplane wiring as noted during removal.

b. Position switch in mounting bracket and install jamnut.

c. Place wing hinge pin lock lever to down-and-locked position.

d. Adjust switch jamnuts until switch initially actuates; then adjust jamnuts two additional full turns provide 0.06-inch switch plunger overtravel.

e. Secure switch jamnuts with MS20995C32 lockwire.

f. Perform wingfold system operational checkout (paragraph 24-14).

g. Close access 2221-1.

24-57. TIME-DELAY RELAY REMOVAL AND INSTALLATION.

24-58. REMOVAL.

a. Open access 2221-1.

b. Remove nuts and washers attaching relay to mount.

c. Cut electrical wiring at relay and tag wires for installation.

24-59. INSTALLATION.

a. Splice wires between relay and airplane electrical wires.

b. Place relay into position and install attaching hardware.

c. Perform wingfold system operational checkout (paragraph 24-14).

d. Close access 2221-1.

24-60. DIODE REMOVAL AND INSTALLATION.

24-61. REMOVAL.

a. Open access 2221-1.

b. Remove nuts and washers from inboard side of bracket.

c. Remove electrical wires from diode. Observe wire locations for installation.

d. Remove diode from bracket.

24-62. INSTALLATION.

a. Position diode on inboard side of bracket.

b. Connect electrical wires.

c. Install nuts and washers attaching diode to bracket.

d. Close access 2221-1.

e. Perform wingfold system operational checkout (paragraph 24-14).

24-63. WING HINGE PIN LOCK LEVER REMOVAL AND INSTALLATION.

24-64. REMOVAL. (See figure 24-14.)

a. Place wing hinge pin lock lever in up-and-locked position.

b. Open access 2221-1, and remove console panels immediately forward of lock lever.

c. Disconnect control rod from lock lever by removing cotter pin (1), nut (2), washers (3 and 4), spacers (5), and bolt (6).

d. Remove lock lever from pivot point by removing nut (7), washers (8), bushing (9), cam (10), spacer (11), and bolt (12).

e. Remove lock lever (13).

24-65. INSTALLATION. (See figure 24-14.)

a. Lubricate bolt (6) with MIL-G-23827 grease.

b. Secure lock lever (13) to console with bolt (12), spacer (11), cam (10), bushing (9), washers (8), and nut (7).

c. Connect control rod to lock lever with bolt (6), spacers (5), washers (4 and 3), and nut (2).

d. Spread wing outer panels with hydraulic hand pump (paragraph 2-16).

e. Place lock lever in down-and-locked position.

f. Release down latch but do not raise lock lever. Outboard end of lock lever must come up approximately 0.20 inch above console. If necessary, perform adjustment procedures (paragraph 24-24).

g. Secure nut (2) with new cotter pin (1).

h. Perform wingfold system operational checkout (paragraph 24-14).

i. Secure removed console panels to right console.

j. Close access 2221-1.

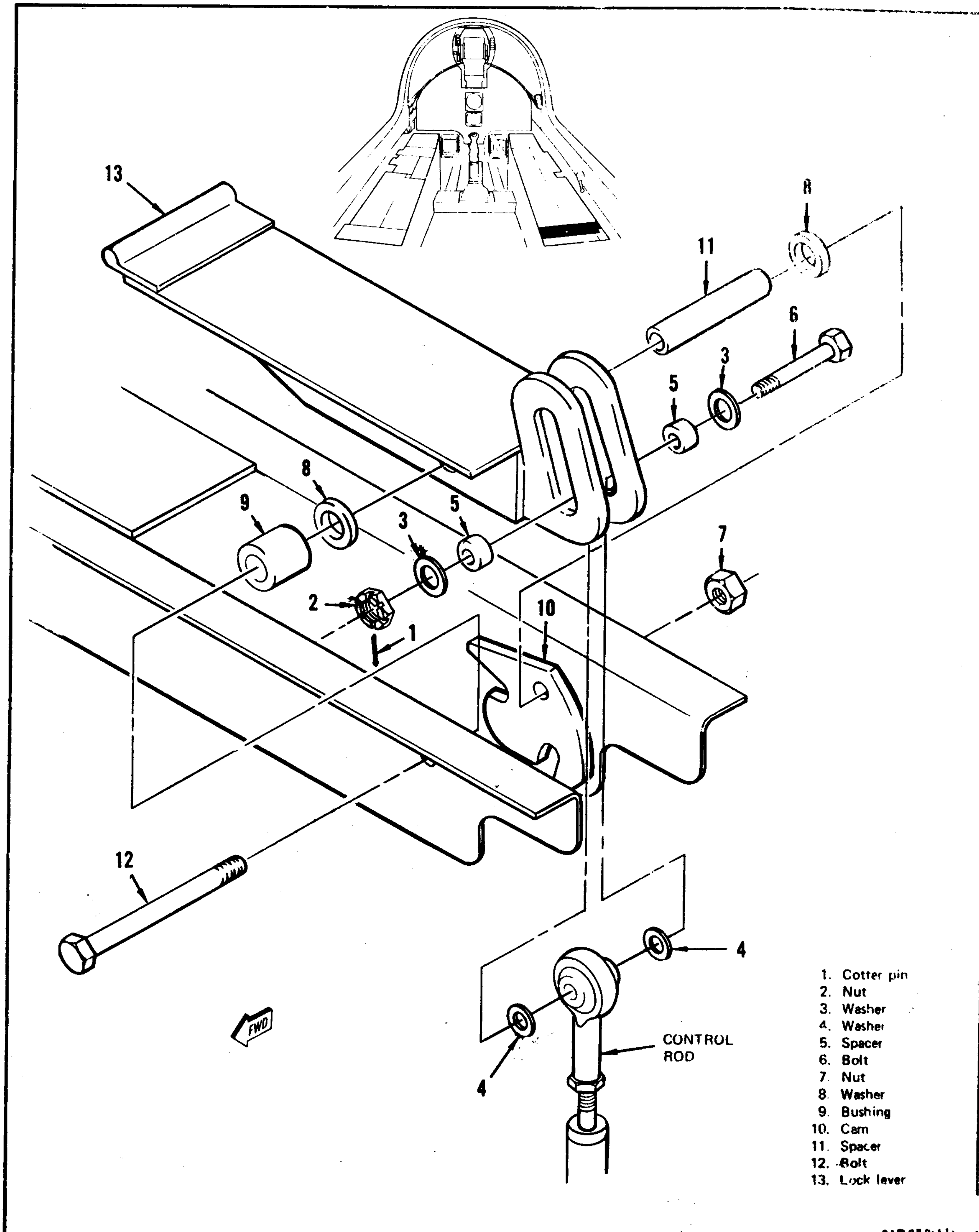


Figure 24-14. Wing Hinge Pin Lock Lever Removal and Installation

24-66. OUTBOARD PYLON REMOVAL WITH WINGS SPREAD. (See figure 24-15.)

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Wing pylon removal and installation adapter	216-01335-1	Attach pylon lift truck.
	Aerial stores lift truck, MJ-1	56J23136	Remove pylon.

WARNING

To avoid serious injury or death to personnel, ensure that ejection cartridges are removed from ejector rack.

a. Defuel wing and external tanks (paragraph 3-66).

b. Remove stores (T.O. 1A-7D-33-1-2).

c. Ensure that MAU-12 ejector rack is installed in pylon.

d. Install pylon removal adapter on aerial stores lift truck.

e. Align lift truck and adapter with pylon.

f. Ensure that ground safety pin is removed and using 3/8-inch square drive, open ejector rack hooks.

g. Raise lift truck until adapter lugs mate with hooks and close hooks. Install ground safety pin and tighten sway braces.

h. Open access 3113-1 or 4113-1.

CAUTION

To avoid damage to wingfold ribs or fairing, use care when cutting wingfold fairing. Removed fairing piece may be salvaged for reinstallation.

i. Cut wingfold fairing (1) at center of outer panel lug.

j. Remove eight rivets (2) from forward section of wingfold fairing (T.O. 1-1A-1 or T.O. 1-1A-8).

k. Remove cut section of fairing from top of wing.

l. Open pylon access B10212-1.

m. Disconnect four electrical connectors (3) and install dust covers.

n. Remove nuts (4) and washers (5) securing bracket (6) to structure and reposition bracket and wire bundle (7) to gain access to pylon forward attach bolts (8).

o. Open pylon access B10233-1.

p. Disconnect wing-to-pylon air hose (9) from pylon air fitting (10). Cap air line and fitting.

q. Cut lockwire and remove nuts (11), washers (12), and pylon forward attach bolts (8). Reposition pylon with lift truck to relieve tension on bolts.

r. Remove cotter pin (13, nut (14), washers (15), and pylon aft attach bolt (16).

CAUTION

The wing-to-pylon fuel line connector cannot be disconnected. During pylon removal, the pylon portion must be forcibly slipped from wing fitting. After pylon separation, the elbow, coupling, lines, and adjacent area shall be inspected for damage.

s. Lower pylon slowly, allowing fuel line (17) to pull from wing connection (18).

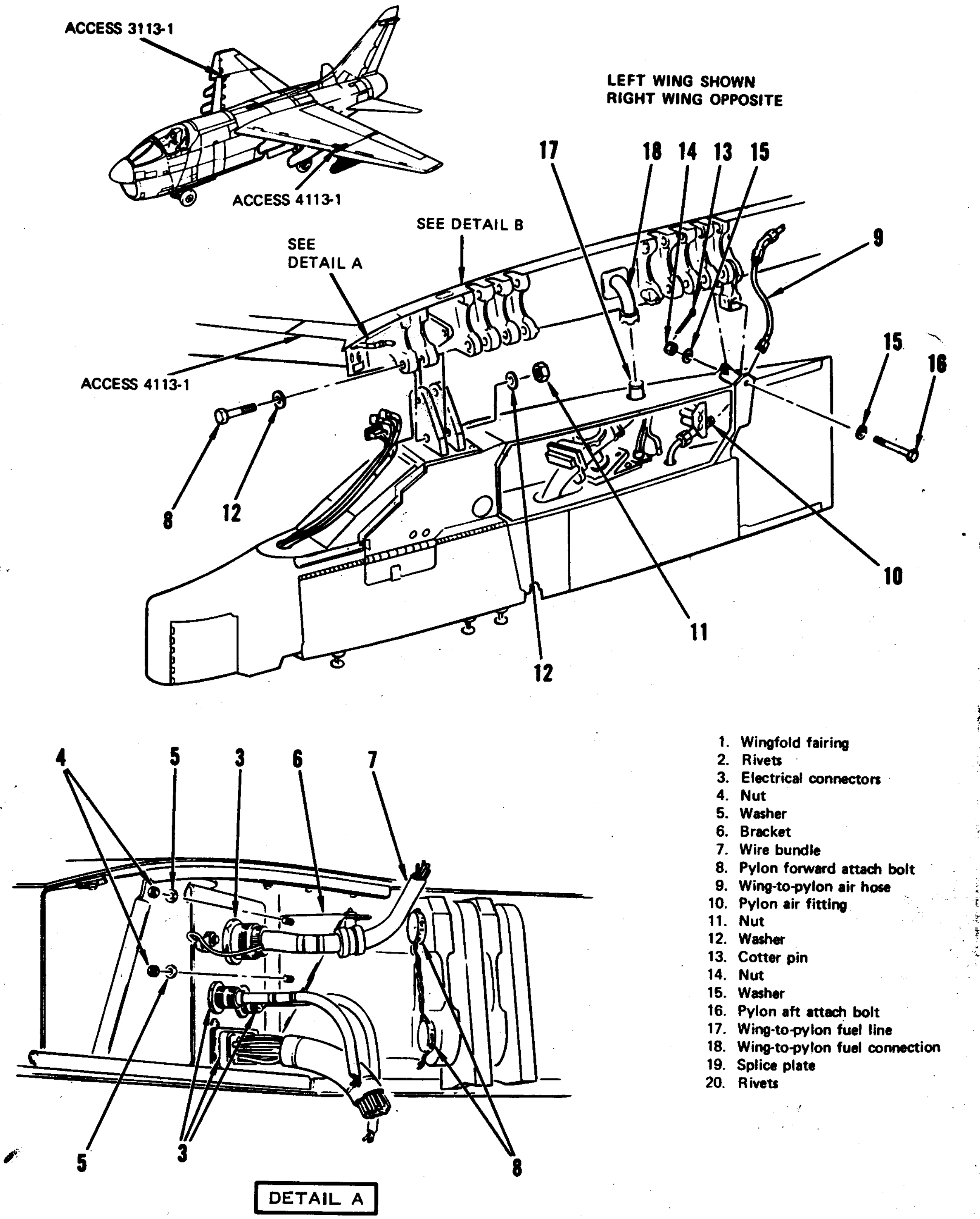
t. Cap pylon to wing fuel connection.

u. Fold wing outer panels (paragraph 24-16).

v. Inspect wing-to-pylon fuel connection and repair if required (T.O. 1A-7D-3).

w. If removed fairing is not reusable, either replace entire fairing (T.O. 1A-7D-3) or fabricate new fairing as follows:

1. Using old fairing as a pattern, cut new fairing from 0.50-inch 7075-T6 clad stock.



1. Wingfold fairing
2. Rivets
3. Electrical connectors
4. Nut
5. Washer
6. Bracket
7. Wire bundle
8. Pylon forward attach bolt
9. Wing-to-pylon air hose
10. Pylon air fitting
11. Nut
12. Washer
13. Cotter pin
14. Nut
15. Washer
16. Pylon aft attach bolt
17. Wing-to-pylon fuel line
18. Wing-to-pylon fuel connection
19. Splice plate
20. Rivets

Figure 24-15. Outboard Pylon Removal with Wings Spread (Sheet 1)

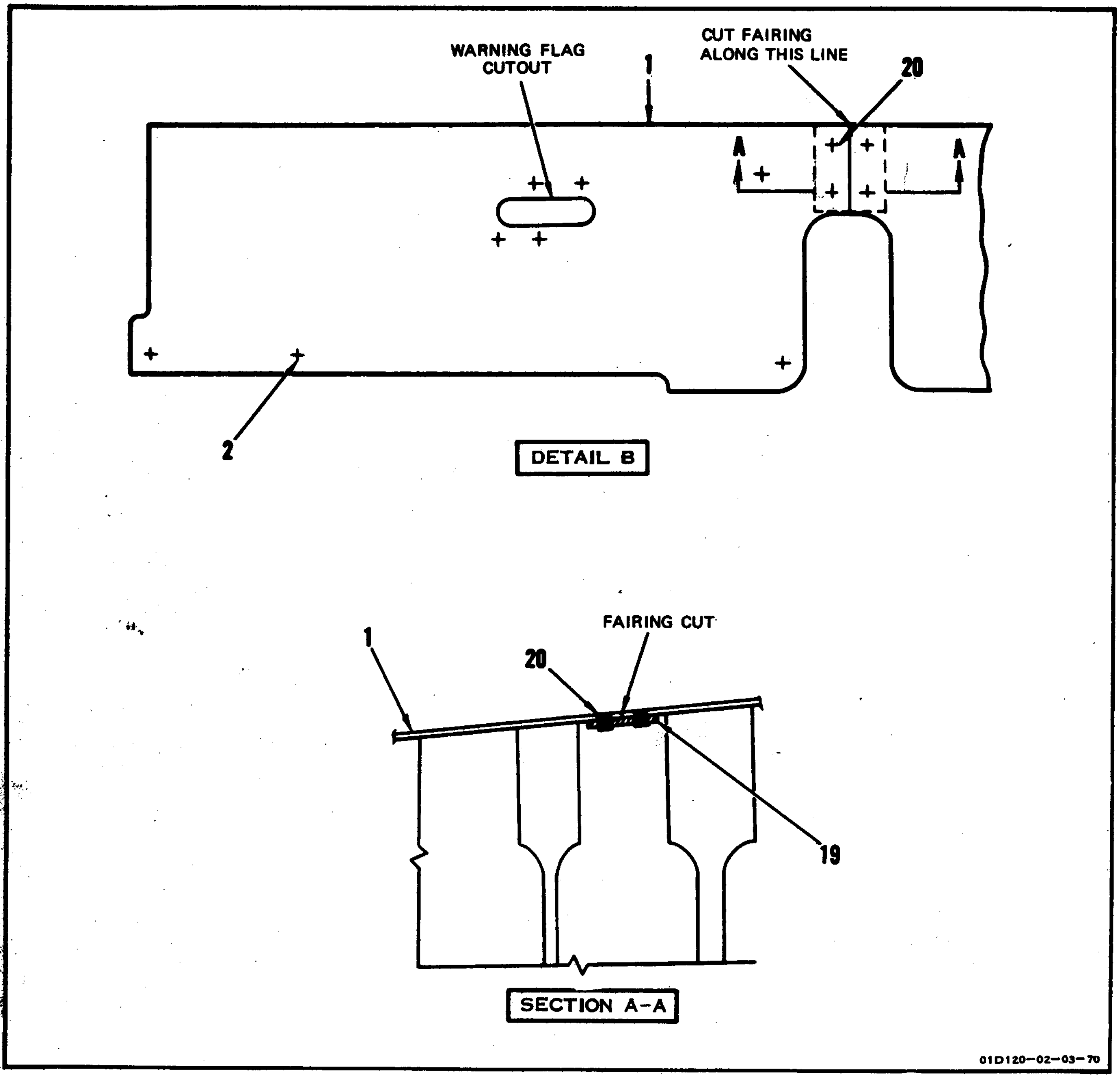


Figure 24-15. Outboard Pylon Removal with Wings Spread (Sheet 2)

2. Match and drill fastener holes.

3. Deburr and clean fairing.

4. Treat fairing with chemical film (T.O. 1-1-2).

x. Using plastic scraper, remove old sealant from wingfold work area and from fairing.

y. Using vacuum cleaner, remove dust and metal chips from wingfold area.

WARNING

Toluene is flammable and toxic. Skin and eye protection is required; good general ventilation or respiratory protection is required.

z. Clean repair area using a cloth moistened with TT-T-548 toluene or O-C-1889 safety solvent. Using clean dry cloth, wipe surfaces dry before cleaner evaporates.

aa. Treat edges of fairing with chemical film (T.O. 1-1-2).

ab. Reinstall fairing (1) using MS20601AD4 rivets (2).

ac. Fabricate 1.0 x 1.0 inch splice plate (19) from 0.032-inch 2024-T3 clad stock. Use standard corner radii (T.O. 1A-7D-3).

ad. Position splice plate beneath fairing. Clamp in place for drilling.

ae. Drill four holes (0.096 inch) through clamped parts. Use standard spacing of 2D edge distance and 4D rivet spacing.

af. Treat new holes with chemical film (T.O. 1-1-2).

ag. Using MS20426AD3 rivets (20), join fairings with splice plate.

ah. Refinish repair area (T.O. 1A-7D-3).

ai. Position bracket (6) and secure with washers (5) and nuts (4).

aj. Connect electrical connector P807 or P808 (3).

ak. Check for wingfold system discrepancy by performing operational checkout (paragraph 24-14),

al. Install pylon (T.O. 1A-7D-2-13).

24-67. RELIEF VALVE REMOVAL AND INSTALLATION.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
	Equipment required for connecting external electrical power		Apply electrical power.

24-68. REMOVAL. (See figure 24-16.)

a. Open access 2123-3.

b. Remove nuts (1), washers (2), and screws (3) securing relief valve (4) to mount bracket.

CAUTION

To ensure correct installation of new valve, note direction of pressure and return ports.

c. Disconnect hydraulic lines (5) and remove relief valve from airplane.

d. Remove unions (6) and O-rings (7) from relief valve. Discard O-rings.

e. Remove clamps (8) from valve housing.

24-69. INSTALLATION. (See figure 24-16.)

NOTE

To ensure operation of system, install relief valve that is adjusted to 3,850 psi.

a. Position clamps (8) on relief valve housing.

b. Install new O-rings (7) on unions (6) and install unions in relief valve (4).

c. Position relief valve in airplane and connect hydraulic lines (5).

NOTE

Ensure that adjacent line clamps and spacers are properly positioned on forward attaching screw.

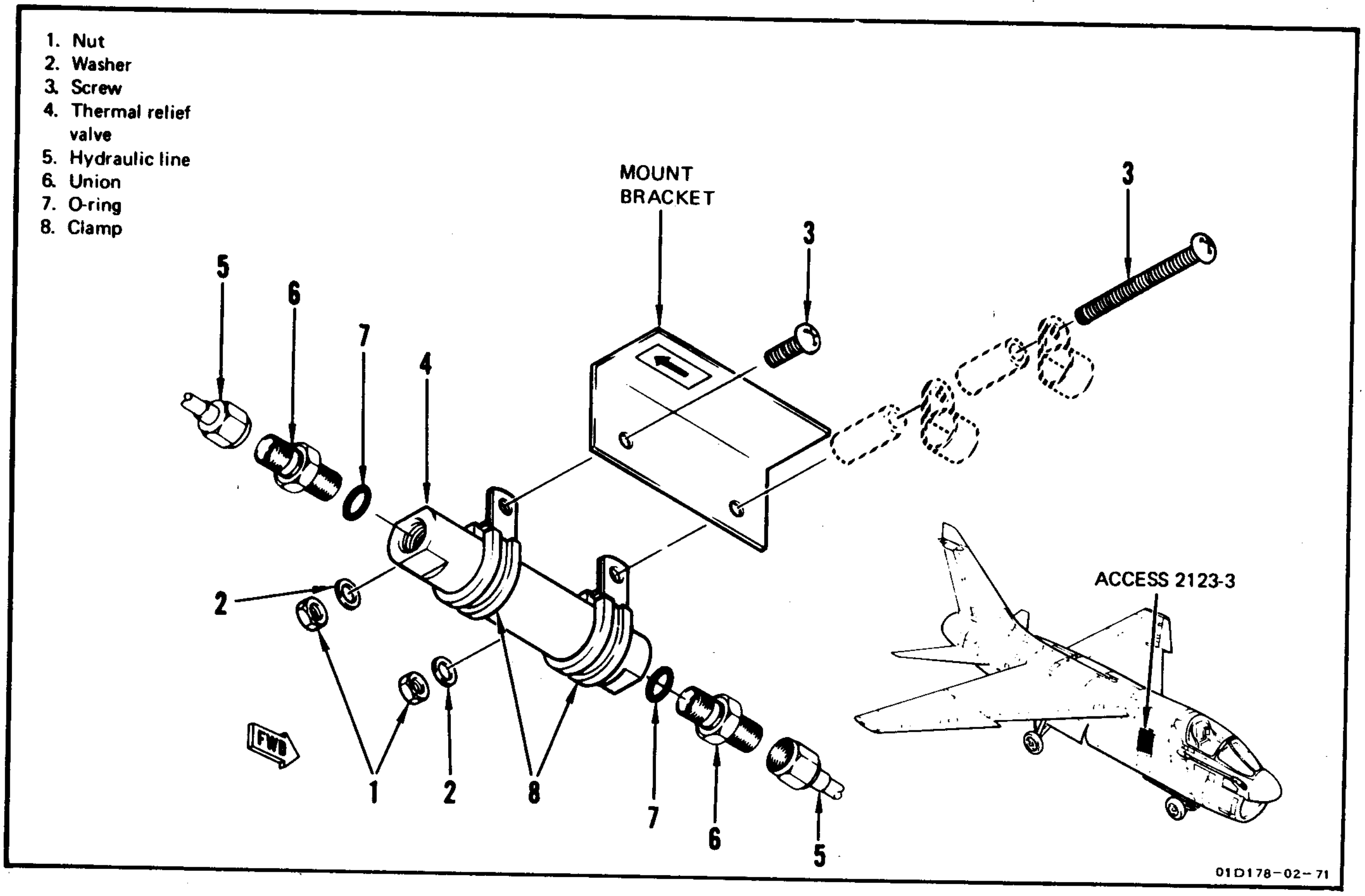


Figure 24-16. Relief Valve Removal and Installation

d. Secure relief valve to mount bracket with screws (3), washers (2), and nuts (1).

e. Connect external electrical power (paragraph 1-28).

f. Bleed valve using hydraulic hand pump as follows:

1. Loosen return line at valve, position wingfold control switch to SPREAD, and operate hand pump until fluid flowing from return line is free of air. Tighten hydraulic line.

2. Loosen line at pressure side of relief valve, position wingfold control switch to FOLD, and operate hand pump until fluid flowing from spread line is free of air. Tighten hydraulic line.

g. Perform wingfold system operational checkout (paragraph 24-14) and check valve installation for hydraulic leaks.

h. Perform hydraulic system air check (paragraph 3-40).

i. Close access 2123-3.

24-70. WINGFOLD ACTUATOR SUPPORT BRACKET INSPECTION REMOVAL AND INSTALLATION. (See figure 24-17.)

24-71. INSPECTION AND DAMAGE LIMITS.

CAUTION

To prevent structural damage to actuating cylinder support, do not fold or spread wing outer panel using wingfold actuator with accesses 3112-3 and 4111-3 open.

a. Open accesses 3112-3 and 4111-3.

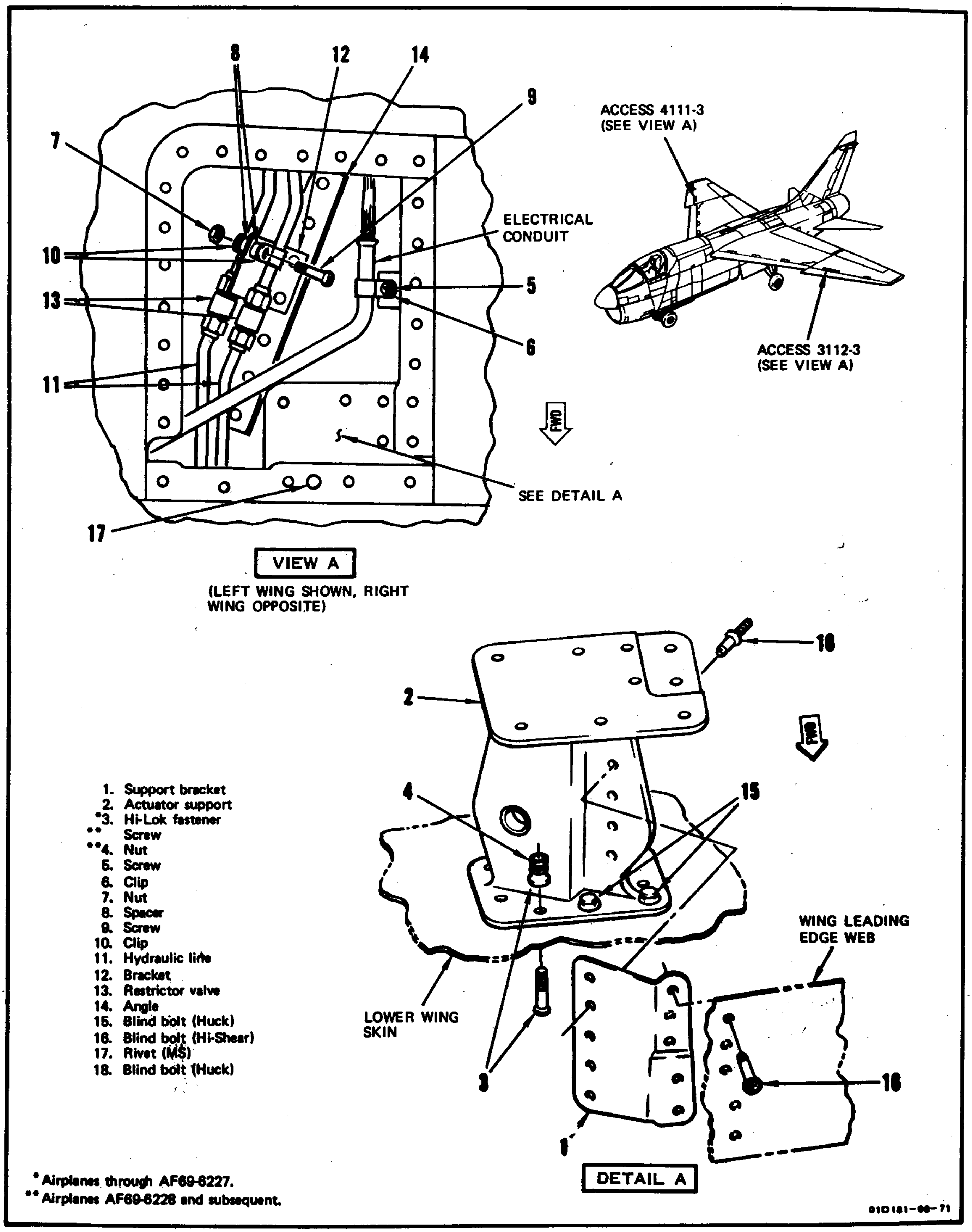


Figure 24-17. Wingfold Actuator Support Bracket Inspection, Removal, and Installation

b. Inspect left and right wing brackets (1) for cracks or other signs of failure.

NOTE

The most probable area for cracks is along radius of bend in bracket.

c. If either bracket is cracked, proceed as follows:

1. If length of crack is 2.0 inches or less, stop drill and continue unrestricted operation of wingfold system. Make proper entry in airplane records for replacement of bracket at next ACI/DLM.

2. If length of crack is greater than 2.0 inches, replace bracket in accordance with paragraphs 24-73 and 24-74.

d. If fasteners common to actuator support (2) and wing outer panel lower skin are found loose, proceed as follows:

1. On airplanes through AF69-6227, remove six Hi-Lok fasteners (3) (T.O. 1A-7D-3) and countersink holes to fit NAS 1623 screws. Replace Hi-Loks with NAS 1623 screws of proper grip length, wet with undiluted MIL-P-8585 zinc chromate primer, and secure with 202-16114-3 nuts (4).

2. On airplanes AF69-6228 and subsequent, remove six NAS 1623 screws (3), reinstall wet with zinc chromate primer, and secure with new 202-16114-3 nuts (4).

e. Close accesses 3112-3 and 4111-3.

24-72. REMOVAL.

a. Remove wing outer panel leading edge flap (T.O. 1A-7D-2-8).

WARNING

To prevent injury to personnel and damage to airplane, do not remove wingfold support strut with actuator disconnected unless wing outer panel is properly supported.

b. Remove wingfold actuating cylinder (paragraph 24-34).

c. Remove three screws (5) securing electrical conduit anchor clips (6) to wing structure and position conduit as necessary to provide access.

d. Remove nut (7), two spacers (8), and screw (9) from clips (10) securing hydraulic lines (11) to support bracket (12).

e. Disconnect hydraulic lines at restrictor valves (13) and position as necessary to provide access. Plug hydraulic lines and cap restrictor valves.

f. Remove seven rivets securing angle (14) and support bracket (12) to lower wing skin. Remove angle and bracket from airplane.

g. Remove fasteners securing actuator support (2) to lower wing skin as follows:

1. On airplanes through AF69-6227, remove six Hi-Lok fasteners (3) and two MS90353/B-100T Huck blind bolts (15) securing support to skin (T.O. 1A-7D-3).

2. On airplanes AF69-6228 and subsequent, remove six NAS 1623 screws (3), six 202-16114-3 nuts (4), and two MS90353/B-100T Huck blind bolts (15) securing support to skin (T.O. 1A-7D-3).

h. Remove five BB352 Hi-Shear blind bolts (16) (T.O. 1A-7D-3) securing bracket (1) to wing leading edge web.

i. Remove rivet (17) and move support (2) aft until support will clear access. Remove support from airplane.

j. Remove five MS90353/BP-T Huck blind bolts (18) (T.O. 1A-7D-3) securing bracket (1) to support (2) and separate. Retain bracket and support.

24-73. INSTALLATION.

NOTE

Brackets 215-80023-231 and 215-80023-232 are installed on the left and right wings respectively. If a new bracket is not available, a replacement part may be made using the old part as a template.

a. Using old bracket as a template, fabricate a new bracket from 0.100 inch thick, 7075-T6 clad aluminum.

b. Inspect support (2) for corrosion and damage to surface finish. Remove corrosion and repair surface finish as required (T.O. 1A-7D-23).

c. Apply chemical surface treatment and one coat of MIL-P-8585 zinc chromate primer to surfaces of new bracket (T.O. 1A-7D-23).

CAUTION

To prevent dissimilar metal corrosion, all fasteners shall be installed wet with undiluted MIL-P-8585 zinc chromate primer.

d. Secure new bracket (1) to support (2) with five MS90354/BP-T Huck blind bolts (18) wet with undiluted MIL-P-8585 zinc chromate primer (T.O. 1A-7D-23).

e. Position support (2) and bracket (1) in wing, and install MS20426AD rivet (17).

f. Install five BB352 Hi-Shear blind bolts (16) securing bracket (1) to wing leading edge web (T.O. 1A-7D-3). Install lower four bolts facing inward (aft) and top bolt facing outward (forward).

g. Install fasteners securing actuator support (2) to lower wing skin as follows:

1. On airplanes through AF69-6227, countersink six holes for fasteners (3) to fit NAS 1623 screws. Install NAS 1623 screws of proper grip length, and secure with 202-16114-3 nuts (4). Install two MS90353/B-100T Huck blind bolts (15) (T.O. 1A-7D-3).

2. On airplanes AF69-6228 and subsequent, install six NAS 1623 screws (3), six 202-16114-3 nuts (4), and two MS90353/B-100T Huck blind bolts (15) (T.O. 1A-7D-3).

h. Install seven MS20426AD rivets securing angle (14) and support bracket (12) to lower wing skin.

NOTE

Install restrictor valves with free flow toward flap cylinder.

i. Remove plugs and caps from hydraulic lines (11) and restrictor valves (13), and connect hydraulic lines to restrictor valves.

j. Secure hydraulic lines (11) to support bracket (12) by installing anchor clips (10), screw (9), two spacers (8), and nut (7).

k. Install three anchor clips (6) and screws (5) securing electrical conduit to wing structure.

l. Install wingfold actuating cylinder (paragraph 24-34).

m. Install wing outer panel leading edge flap (T.O. 1A-7D-2-8).

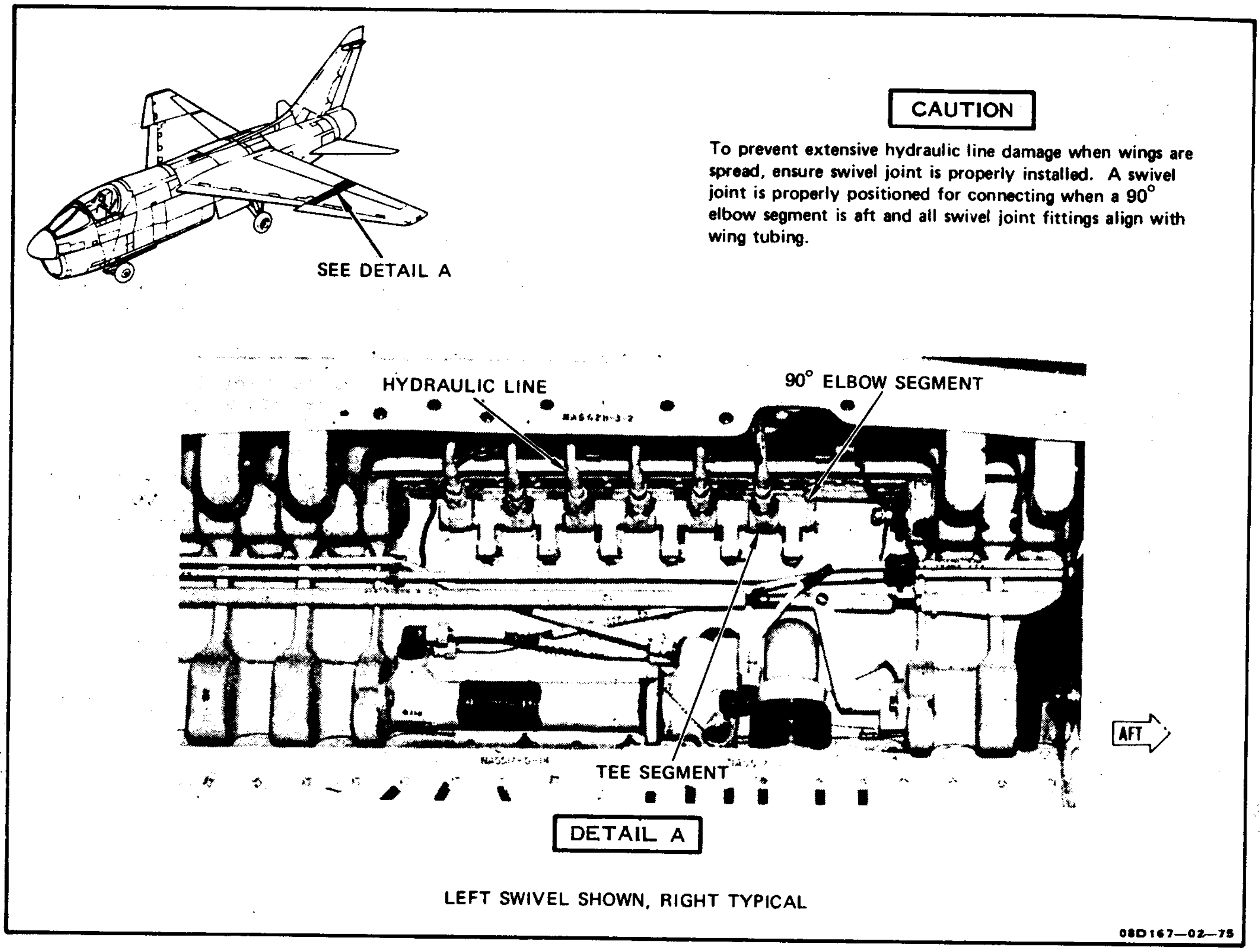


Figure 24-18. Wingfold Swivel Joint Removal and Installation

24-74. WINGFOLD SWIVEL JOINT REMOVAL AND INSTALLATION.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
		Equipment for connecting external electrical power	Connect electrical power
		Equipment for connecting external hydraulic power	Connect hydraulic power
	215-00255-12	Wingfold support struts (2)	Hold wings folded while removing/ installing swivels

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24-75. REMOVAL. (See figure 24-18.)

a. Connect external electrical power (paragraph 1-28).

b. Connect external hydraulic power to all PC hydraulic systems (paragraph 1-34). Apply pressure only to PC No. 2 hydraulic system.

c. Fold wing outer panels and install wingfold support struts.

d. Shut down hydraulic power to PC No. 2 system.

e. Dump accumulator hydraulic pressures.

f. Back nuts off swivel joint tees. Cap or plug lines.

g. Beginning at either end, back nuts off swivel joint elbows, alternately turning each nut one turn until all nuts are disconnected. As each bulkhead line is disconnected from elbow, rotate elbow on swivel. Cap or plug lines and elbows.

h. Remove swivel joint from airplane.

24-76. INSTALLATION. (See figure 24-18.)

CAUTION

To prevent extensive hydraulic damage when wings are spread, ensure swivel joint is properly installed. A swivel joint is properly positioned for connecting when a 90° elbow segment is aft and all swivel joint fittings align with wing tubing.

a. Position swivel joint in airplane with a 90° elbow segment aft.

b. Start all tubing nuts on swivel elbows and tighten each nut one-half turn until all are snug. Do not tighten at this time.

c. Start all tubing nuts on swivel tees and tighten each nut one-half turn until all are snug. Leave nuts loose for bleeding.

d. Tighten all nuts on swivel elbows.

e. Apply 100 psi hydraulic pressure to all PC systems.

f. When air-free fluid flows from each swivel tee connection, tighten connection.

g. After all connections are tightened, increase pressure to 3,000 psi and check for evidence of leakage.

h. Remove wingfold support struts and cycle wing outer panels five times, checking for leaks between cycles.

i. Cycle flaps and ailerons and check for free operation.

j. Service PC hydraulic systems.

k. Disconnect external hydraulic power and electrical power (paragraphs 1-28 and 1-34).

SECTION XXV
ENGINE CONTROL SYSTEM

25-1. DESCRIPTION.

25-2. The engine control system (figure 25-1) provides a means for operating the control cambox. The system consists of the throttle quadrant, bellcrank asssembly push-pull control assembly, and engine control adapter. The throttle quadrant houses a throttle lever, friction lever, and fuel master control lever. Also, the throttle quadrant incorporates a microphone switch, speed brake switch, rudder trim potentiometer switch, radar switch, emergency brakes control, air refueling amplifier reset switch, air ignite switch, exterior light switch, and reticle slew encoder with thumbwheel control. Throttle lever movement controls the position of the control cambox, starter crank circuits, and engine ignite circuit. The friction lever provides a means of throttle friction adjustment. A link assembly connects the throttle lever to the bellcrank assembly. Connected to the bellcrank is the push-pull control assembly, which extends aft through the seat bulkhead to the engine control adapter in the engine compartment. The engine control adapter includes a lever assembly, trunnion, and coupling. Refer to T.O. 1A-7D-2-5 for description and operation of the control cambox.

25-3. OPERATION.

25-4. Fore and aft movement of the throttle lever (figures 25-1 and 25-2) controls the setting of the control cambox. Lateral movement of the throttle lever actuates the crank and ignite switches. When the throttle lever is moved fore or aft, motion is transmitted through an adjustable connecting link and bellcrank to the throttle push-pull control assembly (controlex). The controlex assembly is a flexible, push-pull, linear motion transmitting device. Motion is transmitted from the throttle through the center ribbon of the controlex to the engine control adapter. The adapter pivots on the support to change linear motion to rotary motion and operate the control cambox. The adapter acts as a universal joint. The friction lever adjusts the friction on the throttle. When the lever is placed in the full aft position, the throttle friction is reduced to a minimum. When the friction lever is moved forward, the hub is threaded onto the throttle lever shaft. This action forces the friction disks and spacers closer together, increasing throttle lever friction.

25-5. COMPONENTS.

25-6. For a list of system components, their locations (accesses), and functions, refer to table 25-1.

Table 25-1. Engine Control System Components

Component	Access	Function
Adapter, engine control	5222-2	Transmits push-pull control movement to engine control cambox.
Bellcrank	1221-1	Connects throttle lever to push-pull control assembly.
Push-pull control assembly (controlex)	1221-1 and 5222-2	Transmits motion of throttle lever to engine control adapter.
Quadrant, throttle	Left console and 1221-1	Mechanically actuates bellcrank and engine control switches.

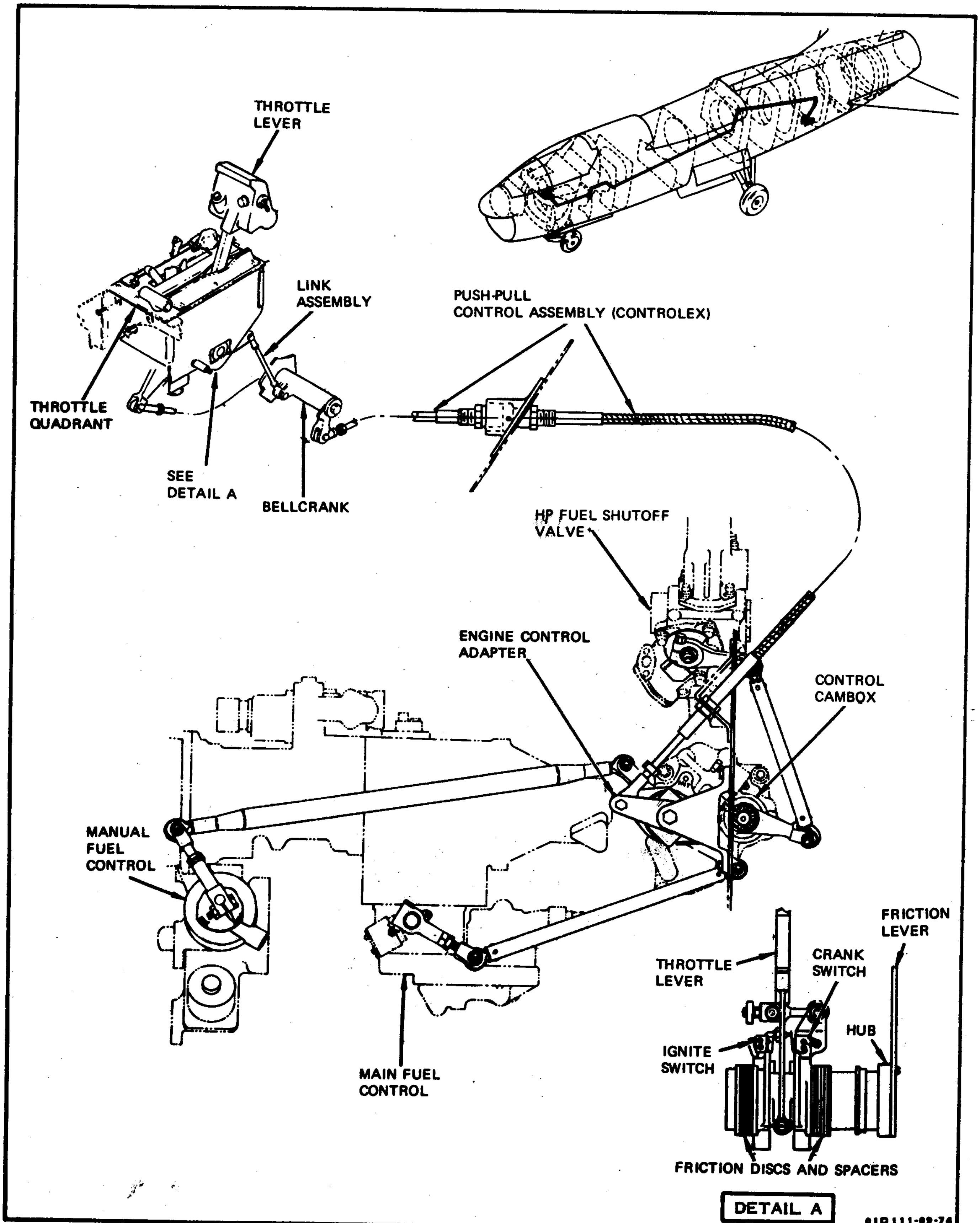

Figure 25-1. Engine Control System Arrangement

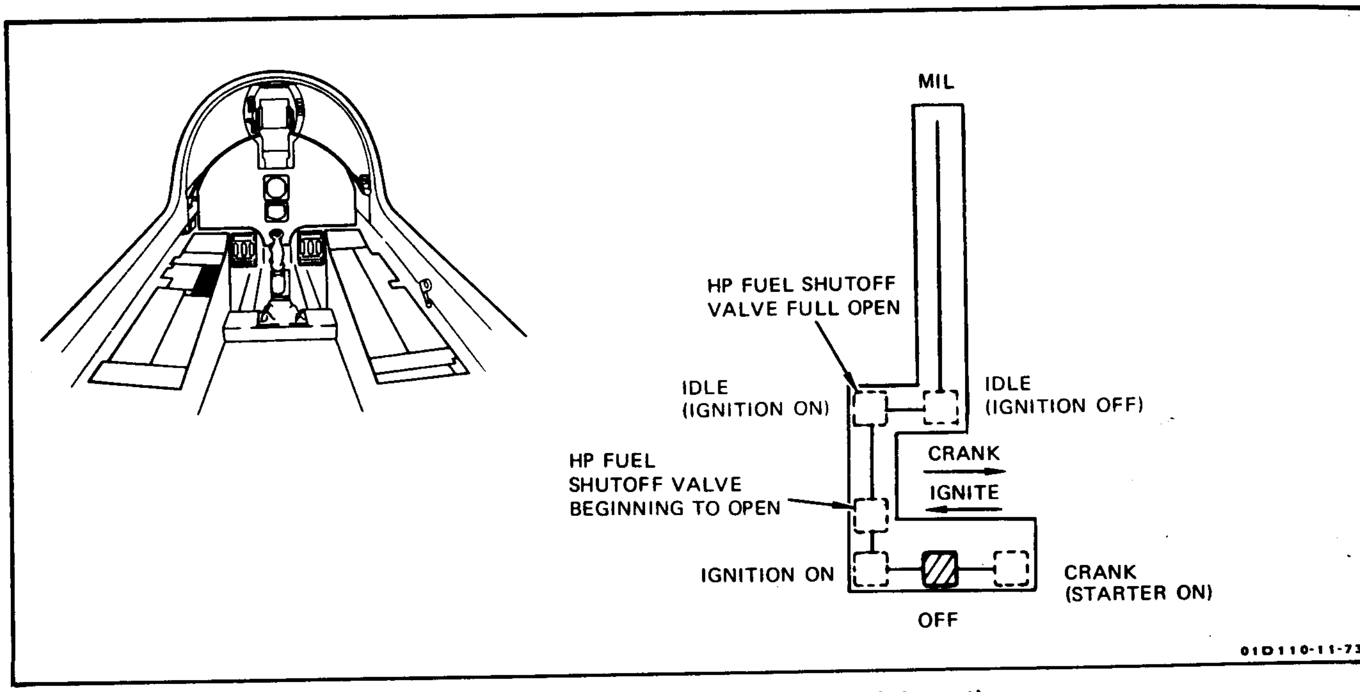

Figure 25-2. Throttle Lever Quadrant Schematic

25-7. OPERATIONAL CHECKOUT.

Test Equipment Required

Figure & Index No.	Name	AN Type Designation	Use and Application
-	Spring scale, 0 to 50 pounds	0013	Measure force.

NOTE

A number, or numbers, enclosed in braces at the end of a step in the following checkout is a reference to a corresponding number in troubleshooting figure 25-3.

a. Open access 5222-2.

b. Place battery switch in OFF.

c. With friction lever fully aft, position throttle lever to MIL, IDLE, and OFF. Check that movement is smooth with no binding or excessive changes in operating forces. {1, 2}

d. Position throttle lever fully aft to OFF. Check that HP fuel shutoff valve lever indicates SHUT. {3}

e. Place throttle in IDLE. Check that HP fuel shutoff valve lever indicates OPEN. {4}

f. Position throttle lever fully forward to MIL position. Visually check that engine internal maximum power stop has been contacted by checking INT rigging pin holes on cam box for alignment. {5}

g. Check throttle lever force as follows:

1. Attach spring scale 0.88 (±0.12) inch below top of throttle lever knob.

2. Holding spring scale perpendicular to throttle lever, pull aft. Check that force required to start throttle lever movement does not exceed 7 pounds. Check that force required to sustain throttle lever motion does not exceed 6 pounds. {1}

3. With throttle lever aft and holding spring scale perpendicular to throttle lever, pull forward. Check that force required to start throttle movement does not exceed 7 pounds and force required to sustain movement does not exceed 6 pounds. {1}

4. Position friction lever fully forward and check that force required to start throttle lever movement is 17 (+10, −0) maximum pounds force to (+0.5) minimum pounds force required to move throttle lever as friction lever is moved from maximum to minimum friction position.

h. Place friction lever fully aft.

i. Place throttle lever in outboard IDLE position. Measure idle detent lateral load as follows:

1. Check force required to move lever from outboard IDLE to inboard IDLE position. The force should be 7 to 10 pounds as measured at 10.4-inch radius (top of handle). {7}

2. Check force required to move lever from inboard IDLE to outboard IDLE position. The force should be 7 to 10 pounds as measured at 10.4-inch radius (top of handle). {7}

j. Place throttle lever in OFF.

k. Close access 5222-2.

25-8. TROUBLESHOOTING.

25-9. See figure 25-3 for troubleshooting information. Malfunctions are listed numerically and are related to a corresponding number, or numbers, following a step in the operational checkout.

25-10. RIGGING. (See figure 25-4.)

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	GGG-W-686	Torque wrench, 10 to 150 pound-inches	Measure torque.
	215-00110-3	Rigging pin No. 51	Rig engine control system.
	215-00110-4	Rigging pin No. 50	Rig engine control system.

a. Open accesses 1123-1, 1221-1, and 5222-2.

b. Remove UHF and Radar Control Panel (T.O. 1A-7D-2-12).

c. Disconnect rod end from throttle lever bellcrank (3) by removing self-retaining bolt (paragraph 25-25).

WARNING

To prevent possible injury to personnel and damage to airplane, ensure that fuel master control lever is OFF before moving throttle from OFF position.

d. Place throttle lever (3) in IDLE.

e. Insert rigging pin No. 50 in rigging hole.

f. Loosen locknut at rod end (1). Adjust link until hole in rod end is aligned with hole in throttle lever bellcrank (3). Tighten locknut.

g. Secure link assembly to throttle lever bellcrank (3) with self-retaining bolt (paragraph 25-25).

h. Disconnect rod end (4) from bellcrank (2) by removing self-retaining bolt (paragraph 25-25).

i. Disconnect rod end (5) from engine control adapter (6) by removing self-retaining bolt (paragraph 25-25).

j. Cut lockwire securing two keys to checknuts at support (7). Remove two keys and back off checknuts approximately 1 inch from support bearings.

k. Cut lockwire securing two keys to checknuts at support (8). Remove two keys and back off checknuts approximately 1 inch from support bearings.

l. Manually stroke control assembly through several full cycles. Motion shall be free and smooth with a minimum stroke of 4.25 inches.

NOTE

If operation is not completely free and smooth, check entire length of control for proper installation or damage to outer casing.

m. Loosen locknut at rod end (4).

CAUTION

When adjusting rod ends and tightening locknuts in following steps, hold wrench flats with wrench and do not allow sliding member to rotate. Rotation will result in permanent damage to control assembly.

n. Adjust rod end (4) until 1.00 (±0.06) inch of thread is exposed and rod end is aligned with fork of bellcrank (2). Tighten locknut.

o. Remove rigging pin No. 50 and position throttle lever (3) to OFF.

p. Manually stroke rod end (4) in aft direction until control assembly bottoms internally.

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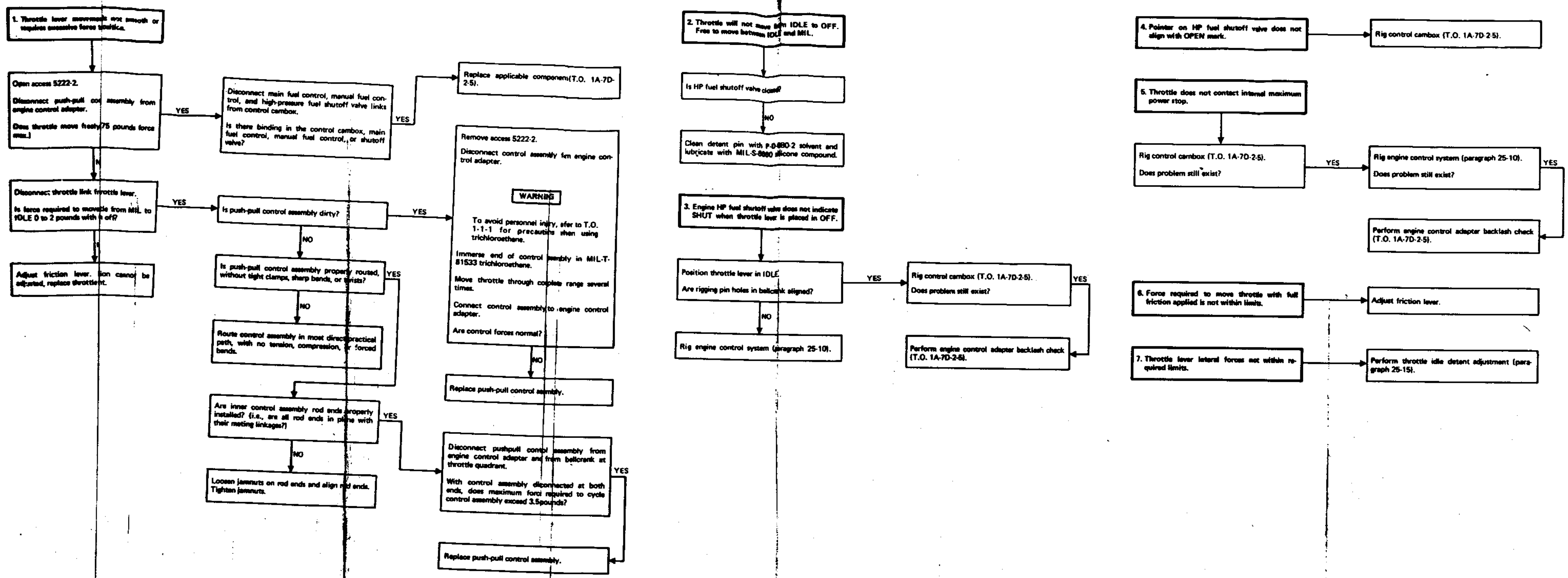


Figure 25-3. Engine Control System Troubleshooting

CAUTION

To prevent damage to control assembly, ensure that the control assembly cannot be bottomed internally in either direction. The engine throttle control lever shall provide stops for the control system.

q. Position control assembly (9) in support assembly (7) so bolthole in rod end (4) is 0.12 (±0.03) inch aft of hole in bellcrank (2).

r. Tighten checknuts at support (7) to 35 (±5) pounds-inches torque.

s. Install keys and secure checknuts with MS20995C32 lockwire.

t. Secure rod end (4) to bellcrank (2) with self-retaining bolt (paragraph 25-25).

u. Place throttle lever (3) in IDLE and insert rigging pin No. 50 in rigging hole.

v. Move engine throttle lever until rigging pin No. 51 can be inserted in control cambox IDLE rigging pin hole.

w. Loosen locknut at rod end (5).

x. Adjust rod end (5) until locknut is 0.30 (±0.06) inch from end of wrench flats. Tighten locknut.

y. Position control assembly (9) in support assembly (8) so boltholes in rod end (5) and lever (6) align. Do not install self-retaining bolt.

z. Tighten checknuts at support (8) to 35 (±5) pound-inches torque.

aa. Install keys and secure checknuts with MS20995C32 lockwire.

ab. Remove rigging pins No. 50 and No. 51.

ac. Manually rotate engine throttle control lever (6) as shown and determine rise and fall of lever.

ad. Adjust control assembly clamp (10), and others if required, so rod end (5) and control slider will lay at an angle that approximately splits lever rise and fall as shown.

CAUTION

The rod end of throttle controlex should not be twisted, even slightly, while being installed on engine throttle control lever. If rod end does not align for installation, loosen checknut and rotate rod end about slider for desired alignment.

ae. Secure rod end (5) to engine throttle control lever (6) by installing self-retaining bolt (paragraph 25-25).

af. Ensure all clamps are secure and do not bind control assembly.

ag. Check that bends in control assembly are the required distance from control slider (paragraph 25-17).

ah. Verify all throttle control system attachments are secured.

ai. Perform engine control system operational checkout (paragraph 25-7).

aj. Install UHF and Radar Control Panel (T.O. 1A-7D-2-12).

ak. Close accesses 1123-1, 1221-1, and 5222-2.

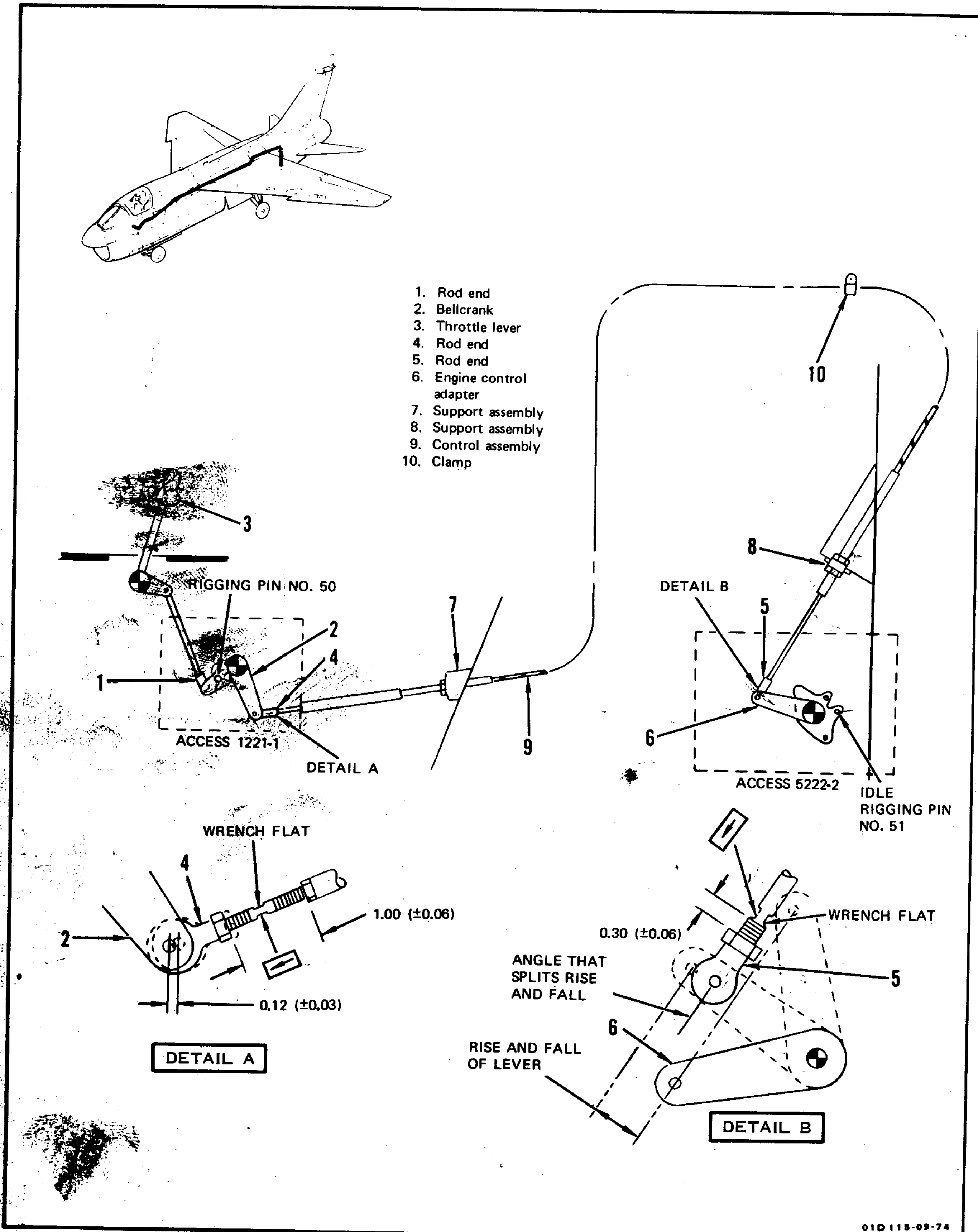


Figure 25-4. Engine Control System Rigging

25-11. THROTTLE QUADRANT REMOVAL AND INSTALLATION.

25-12. REMOVAL. (See figure 25-5)

a. Remove ejection seat (T.O. 1A-7D-2-2).

b. Open access on inboard side of left console adjacent to throttle quadrant.

c. Open access 1221-1.

WARNING

Ensure that electrical power is not connected to the airplane and that battery switch is in OFF before disconnecting electrical connector to prevent injury to personnel or damage to equipment.

d. Disconnect electrical connector (1) from throttle quadrant (2).

e. Remove cotter pin (3), nut (4), two washers (5), and bolt (6) securing emergency brake cable (7) to emergency brake lever (8).

f. Remove cotter pin (9), nut (10) two washers (11), and bolt (12) securing rod end (13) to fuel master control lever (14).

g. Disconnect link assembly (20) from hub (21) by removing cotter pin (15), nut (16), counterbored washer (17), self-retaining bolt (18), and washer (19). Refer to paragraph 25-25 for removal of self-retaining bolts.

h. On airplanes AF69-6197 and subsequent, perform the following:

1. Pull air refueling receptacle door release handle (29) up. Cut lockwire securing adapter (30) to panel and remove adapter from housing (31).

2. Push adapter (30) up and remove control assembly (32) from handle shaft (33).

i. Perform generator control panel removal procedures as required to allow panel to be lifted out of console (T.O. 1A-7D-2-11).

j. Remove two screws (22) securing forward end of throttle quadrant to console.

k. Remove four fasteners securing radar control panel to left console. Lift radar control panel from console to gain access to two screws (23).

l. Remove two screws (23) securing aft end of throttle quadrant to console.

m. Remove screws (24) securing inboard side of throttle quadrant to console.

n. Remove six fasteners securing fuel control panel to left console. Slide fuel control panel outboard approximately 1.5 inches to allow clearance for bolt (25).

o. Lift throttle quadrant from console.

p. Remove cotter pin (26), nut (27), and washer (28) securing emergency brake lever (8) to bolt (25).

25-13. INSTALLATION. (See figure 25-5)

a. Secure emergency brake lever (8) to bolt (25) with washer (28), nut (27), and new cotter pin (26).

b. Position throttle quadrant in console.

c. Secure fuel control panel to console with six fasteners.

d. Secure inboard side of throttle quadrant to console with two screws (24).

e. Secure aft end of throttle quadrant to console with two screws (23).

f. Secure radar control panel to console with four fasteners.

g. Secure forward end of throttle quadrant to console with two screws (22).

h. Install generator control panel (T.O. 1A-7D-2-11).

i. On airplanes AF69-6197 and subsequent, raise release handle up, and connect handle shaft (33) to control assembly (32). Install adapter (30) on housing (31) and secure with MS20995C32 lockwire.

j. Secure link assembly ~~(20) to hub~~ (21) with self-retaining bolt (18), washer (19), counterbored washer (17), nut (16), and new cotter pin (15). Refer to paragraph 25-25 for installation of self-retaining bolt.

k. Secure rod end (13) to fuel master control lever (14) with bolt (12), two washers (11), nut (10), and new cotter pin (9).

l. Secure emergency brake cable (7) to emergency brake lever (8) with bolt (6), two washers (5), nut (4), and new cotter pin (3).

m. Connect electrical connector (1) to throttle quadrant (2).

n. Perform engine control system operational checkout (paragraph 25-7).

o. Perform emergency brake system operational checkout (T.O. 1A-7D-2-7).

p. Perform AN/ARC-164 UHF radio set operational checkout (T.O. 1A-7D-2-12).

q. Perform speed brake operational checkout (T.O. 1A-7D-2-8).

r. Deleted.

s. On airplanes AF69-6197 and subsequent, perform the following:

1. Perform A/R receptacle system checkout (T.O. 1A-7D-2-6) except do not fuel airplane.

2. Check A/R receptacle push-pull control rigging (T.O. 1A-7D-2-6).

t. On airplanes before T.O. 1A-7-530, perform AN/APQ-126(V)8 radar set operational checkout (T.O. 1A-7D-2-14).

u. On airplanes after T.O. 1A-7-530, perform AN/APQ-126(V)11 radar set operational checkout (T.O. 1A-7D-2-14).

v. Perform exterior lighting system operational checkout (T.O. 1A-7D-2-11).

w. Perform AFCS yaw axis operational checkout (T.O. 1A-7D-2-9).

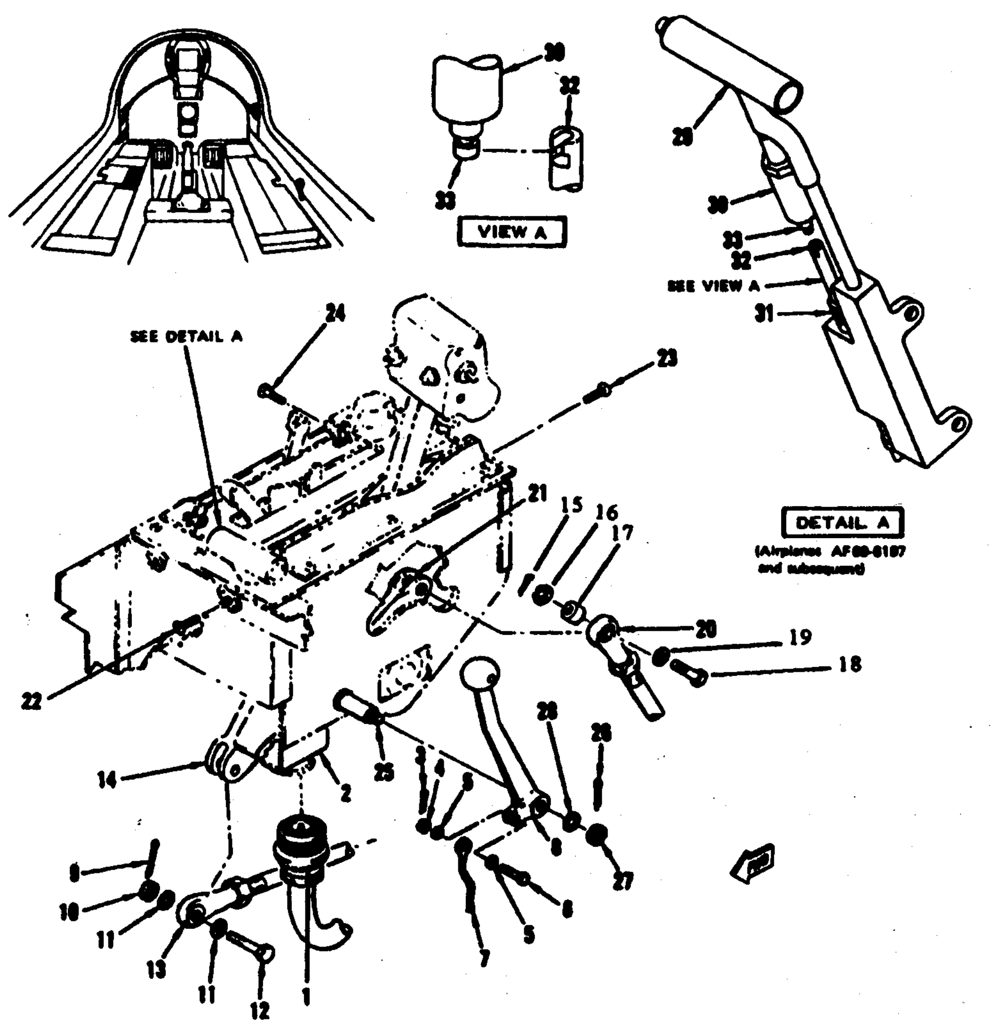
x. Perform ignition and starting system operational checkout (T.O. 1A-7D-2-5).

y. Perform AN/ALE-40(V)-11 countermeasures dispensing system operational checkout (T.O. 1A-7D-2-15).

z. Close access 1221-1.

aa. Close access on inboard side of left console.

ab. Install ejection seat (T.O. 1A-7D-2-2).



1. Electrical connector
2. Throttle quadrant
3. Cotter pin
4. Nut
5. Washer
6. Bolt
7. Emergency brake cable
8. Emergency brake lever
9. Cotter pin
10. Nut
11. Washer
12. Bolt
13. Rod end
14. Fuel master control lever
15. Cotter pin
16. Nut
17. Counterbored washer
18. Self-retaining bolt
19. Washer
20. Link assembly
21. Hub
22. Screw
23. Screw
24. Screw
25. Bolt
26. Cotter pin
27. Nut
28. Washer
29. Release handle
30. Adapter
31. Housing
32. Control assembly
33. Handle shaft

Figure 25-5. Throttle Quadrant Removal and Installation

25-14. THROTTLE FRICTION LEVER ADJUSTMENT.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	0013	Spring scale, 0 to 50 pounds	Measure force.

a. Remove ejection seat (T.O. IA-7D-2-2).

b. Open access on inboard side of left console adjacent to throttle quadrant.

c. Place friction lever in midquadrant.

d. Remove three screws securing friction lever to throttle quadrant (figure 25-6).

e. Looking outboard, rotate friction lever counterclockwise one screw hole to increase friction or clockwise to decrease friction. Secure friction lever to throttle quadrant with three screws.

f. Pull friction lever fully aft.

g. Position throttle lever to inboard IDLE position and check that throttle lever force is as follows:

1. Attach spring scale 0.88 (±0.12) inch below top of throttle lever knob.

2. Holding spring scale perpendicular to throttle lever, pull forward. Check that force required to start throttle lever movement does not exceed 7 pounds. Check that force required to sustain throttle lever motion does not exceed 6 pounds.

3. Position friction lever fully forward and check that force required to start throttle lever movement is 17 (+10, -0) maximum pounds force to (+0.5) minimum pounds force required to move throttle lever as friction lever is moved from maximum to minimum friction position.

4. Place friction lever fully aft.

5. Repeat adjustment if required.

6. Position throttle lever to OFF.

h. Close access on inboard side of left console.

i. Install ejection seat (T.O. IA-7D-2-2).

25-15. THROTTLE IDLE DETENT ADJUSTMENT.

Tools Required

Figure & Index No.	Part Number	Nomenclature	Use and Application
	0013	Spring scale, 0 to 50 pounds	Measure force.

a. Place friction lever in full aft position and throttle in outboard IDLE position.

NOTE

Position spring scale at 10.4-inch radius (top of handle) when making lateral force checks.

b. Check that force required to move throttle lever from outboard IDLE to inboard IDLE and from inboard IDLE to outboard IDLE is 7 to 10 pounds.

c. If lateral throttle forces are not within tolerance, adjust idle detent setscrews (figure 25-6). Adjust setscrews clockwise to increase force and counterclockwise to decrease force; Adjust both setscrews equally and ensure that outer end of each setscrew does not extend more than 1 1/2 threads from idle detent spring housing after adjustment.

d. Place throttle lever in OFF.

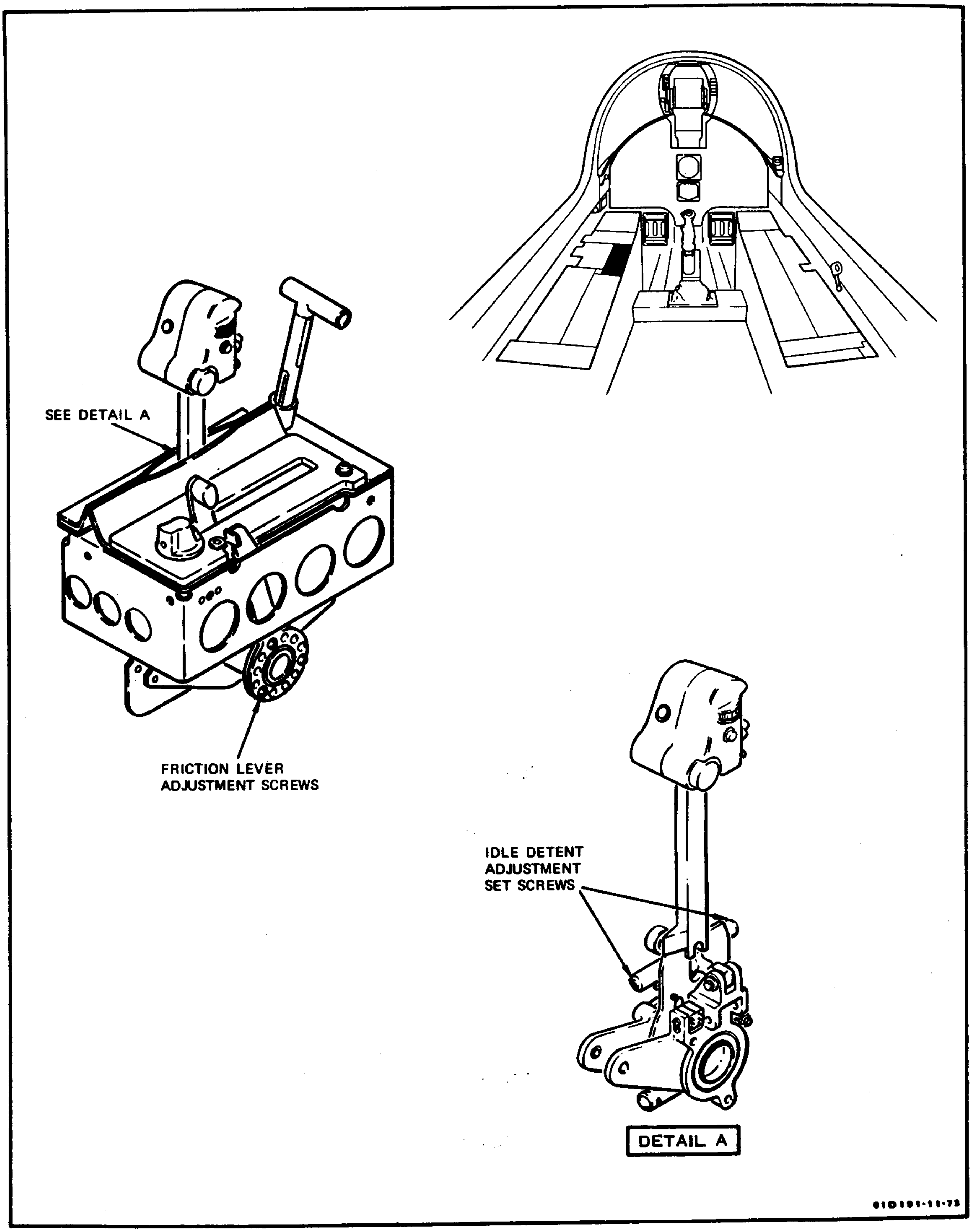


Figure 25-6. Throttle Friction Lever and Idle Detent Adjustment

25-16. CONTROLEX HANDLING PRECAUTIONS.

CAUTION

To prevent damage to controlex, the following precautions must be observed when removing, installing, handling, and rigging throttle controlex.

a. Pliers or similar devices must not be used to grip any surface of controlex.

b. Controlex must be uncoiled by keeping the entire controlex in the flat plane of a figure 8 (figure 25-7).

c. If controlex will not lay flat after uncoiling, the ribbon must be straightened before coiling.

d. Do not apply lubricants to any portion of controlex.

e. Do not force or slam slider against internal stops.

f. Do not twist, crimp, dent, apply side loads, or stand on controlex.

g. Controlex must be coiled in a figure 8 for installation.

h. When installing controlex, hold the loops in flat plane of a figure 8 and feed controlex through the airplane.

i. During installation, ensure that controlex does not become twisted.

j. Controlex will bend easily in a plane determined by ribbon in controlex. Change plane of bend by allowing controlex to helix into new plane.

k. Radius of controlex bends must be at least 6 inches or larger.

l. Wrenches must be used on wrench flats of controlex sliders and housing when torquing nuts or attaching hardware.

m. Controlex slider and rod end must approximately split the rise and fall of arm.

n. Do not apply vertical or lateral loads on controlex rigid components (slider, rod end, etc) after installation. Bending of rigid components will result in controlex binding.

o. Contact of controlex with adjacent structure, equipment, plumbing, etc is allowed under following conditions:

1. Contact is light and the controlex is not deflected from its natural path.

2. The contact surface is flat or curved with no sharp edges contacting the controlex.

3. No relative motion exists between the controlex and the contact surface.

4. Contact surfaces do not obtain high temperatures (125°F maximum).

p. Controlex must be free to move through support clamps.

q. Controlex must be coiled in a figure 8 for storage.

NOTE

Some assemblies have an arrow inscribed on the fixed race side of wrench flats.

r. When routing controlex, make the first bend toward index mark on wrench flats.

25-17. PUSH-PULL CONTROL ASSEMBLY (CONTROLEX) REMOVAL AND INSTALLATION (Airplanes Before T.O. 1A-7-622).

CAUTION

To prevent damage to controlex unit, observe controlex handling precautions (paragraph 25-16) when removing and installing the control assembly.

NOTE

Black shrink fit tubing is installed on throttle controlex for the sole purpose of easing controlex installation. Damage to the tubing is not cause for controlex rejection. Reject assemblies where damage to housing causes an increase in controlex operating force.

25-18. REMOVAL. (See figure 25-9.)

NOTE

For detail clamping and routing, see figure 25-10 or 25-11.

a. Open accesses 1221-1, 1123-1, 1121-8, 1123-3, 1123-4, 1132-1, 5112-1, 5112-2, 5122-6, 5222-2, 5111-2, 5111-4, and 3233-4.

NOTE

The push-pull control assembly can be removed with the engine installed by removing the battery and battery case (T.O. 1A-7D-2-11) allowing access to support clamp aft of engine bay bulkhead at FS 526.5.

Removal and installation of the control assembly may be made easier by using locally fabricated adapter. See figure 25-8.

b. Remove engine (T.O. 1A-7D-2-5) or battery and battery case (T.O. 1A-7D-2-11).

c. Remove plastic gun gas shroud.

d. Remove ammunition feed and return chutes (T.O.1A-7D-2-13).

e. Disconnect outboard rod end of spoiler/deflector load-limiting link (T.O. 1A-7D-2-8). Move link aft to provide clearance for removal/installation of the controlex.

f. Holding throttle controlex slider at wrench flats, loosen checknut (1).

g. Disconnect rod end (2) from bellcrank by removing the self-retaining bolt (paragraph 25-25).

h. Holding throttle controlex slider at wrench flats, remove rod end (2) and checknut (1) from slider.

i. Cut lockwire. Hold slider and overshaft (3) at wrench flats and remove checknut (4) and lockwasher (5).

j. Hold slider at wrench flats and loosen overshaft (3). Remove overshaft.

k. Cut lockwire and remove keys (6).

l. Hold controlex housing at wrench flats and loosen checknut (7).

m. Remove checknut (7) and spacer (8) from forward end of controlex housing.

n. Remove support clamps (9).

o. Pull controlex aft until clear of forward support bearing.

p. Remove spacer (10) and checknut (11).

q. Remove sealant from around controlex housing at top of left side of engine bay bulkhead at FS 526.5.

r. Disconnect rod end (12) from trunnion by removing self-retaining bolt (paragraph 25-25).

s. Hold slider at wrench flats and remove rod end (12) and checknut (13).

t. Remove bolts and washers securing aft support bearing (14) to bracket.

u. Pull controlex, with support bearing, through bracket to gain access to checknuts.

v. Cut lockwire and remove keys (15).

w. Remove checknut (16) and spacer (17) and remove aft support bearing (14).

x. Remove spacer (18) and checknut (19).

CAUTION

To prevent damage to controlex, do not use force during removal from airplane.

y. Carefully remove throttle controlex through access 1123-1.

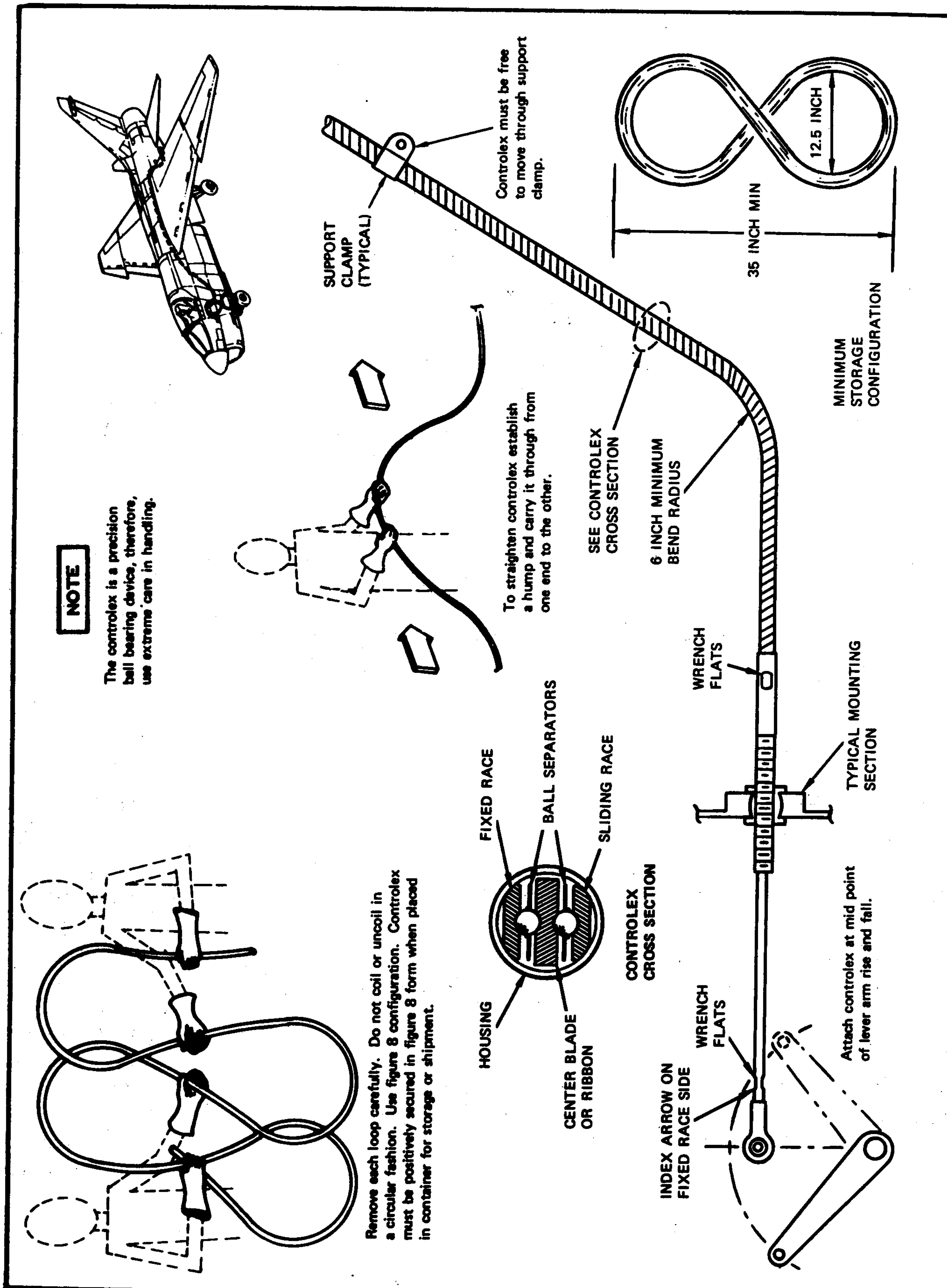


Figure 25-7. Controlex Handling Precautions (Sheet 1)

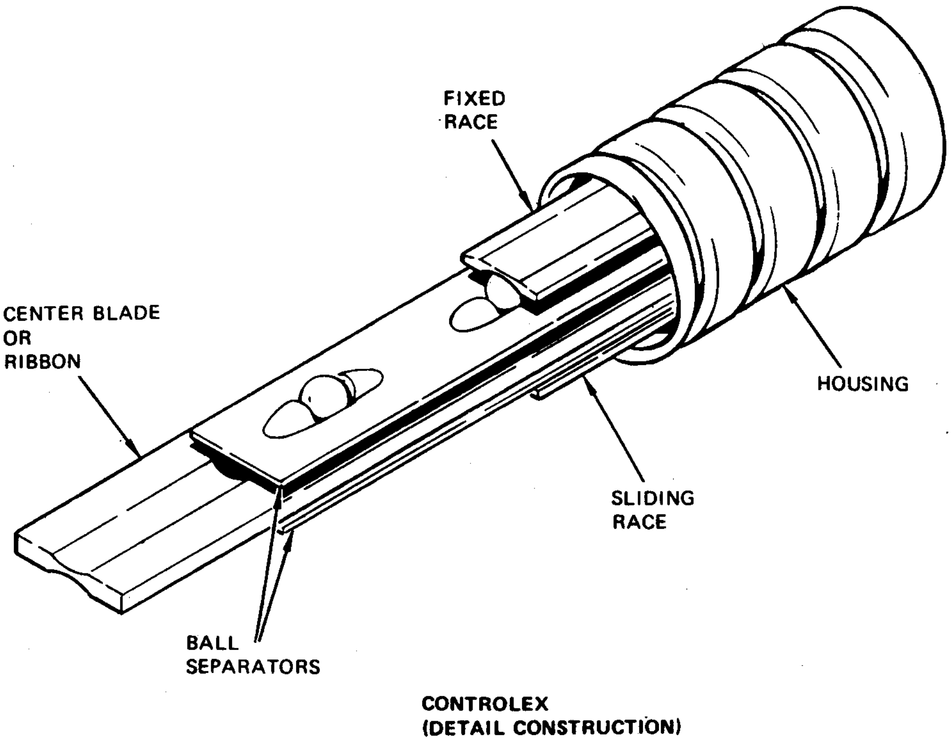


Figure 25-7. Controlex Handling Precautions (Sheet 2)

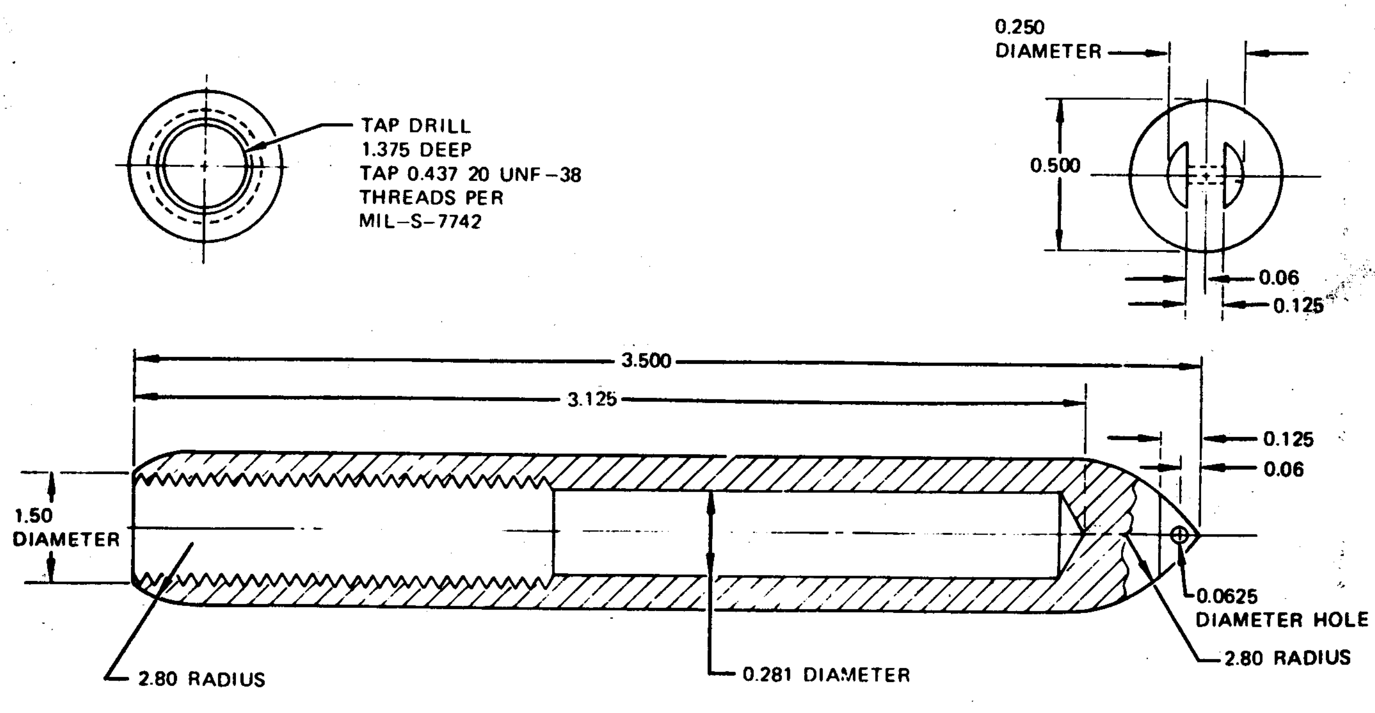


Figure 25-8. Adapter

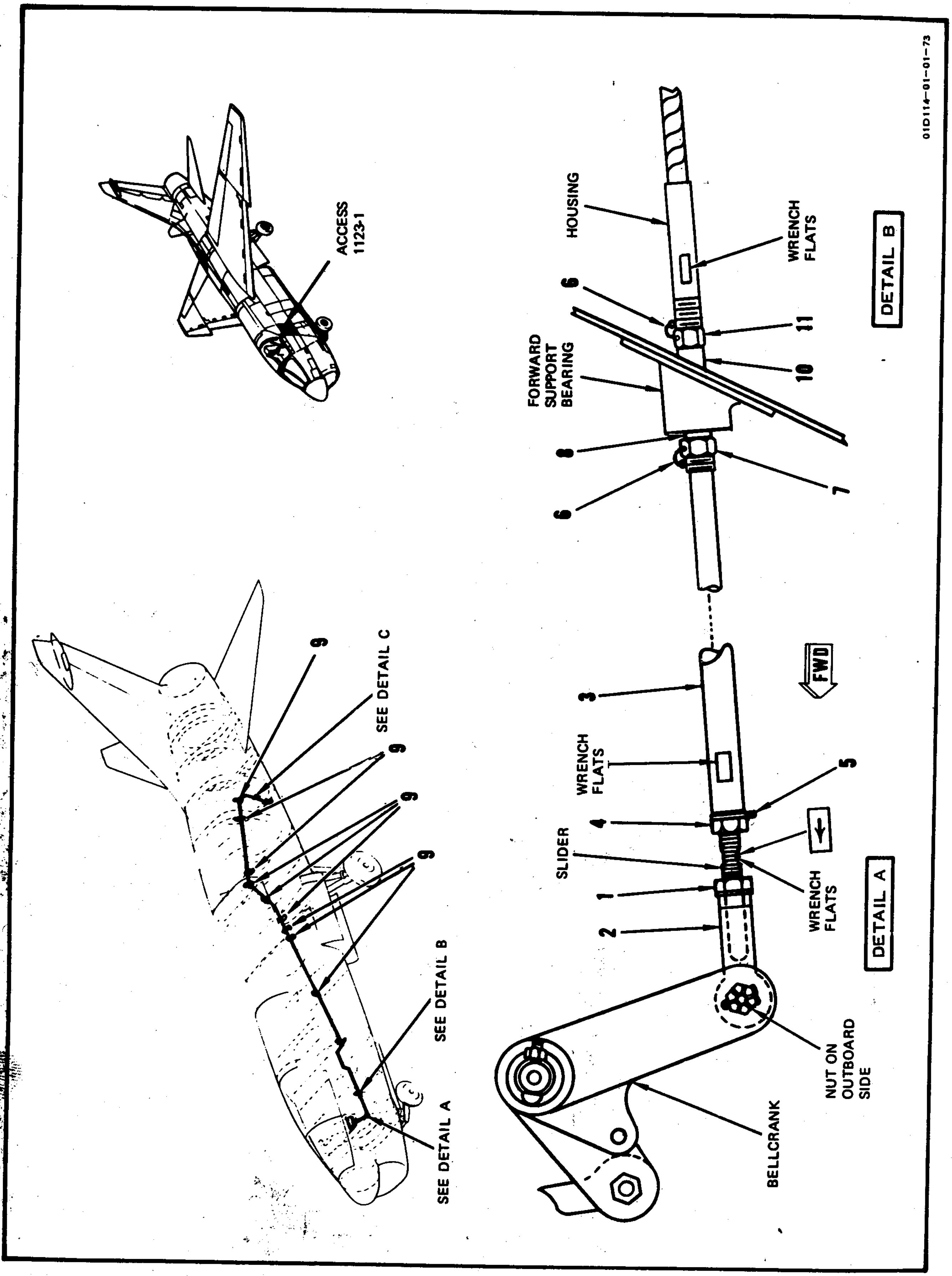
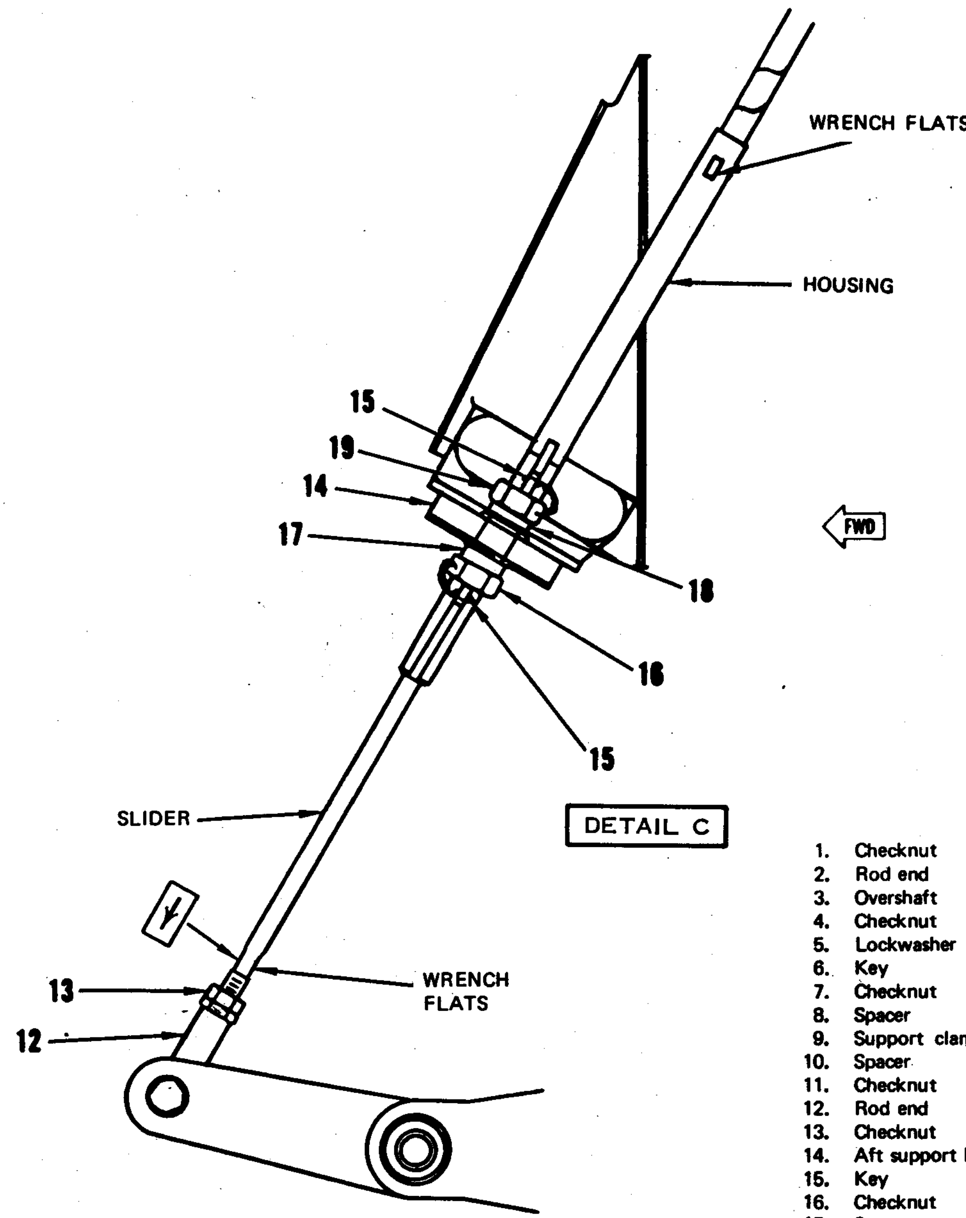


Figure 25-9. Push-Pull Control Assembly (Controlex) Removal and Installation (Sheet 1)



DETAIL C

1. Checknut
2. Rod end
3. Overshaft
4. Checknut
5. Lockwasher
6. Key
7. Checknut
8. Spacer
9. Support clamp
10. Spacer
11. Checknut
12. Rod end
13. Checknut
14. Aft support bearing
15. Key
16. Checknut
17. Spacer
18. Spacer
19. Checknut

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Figure 25-9. Push-Pull Control Assembly (Controlex) Removal and Installation (Sheet 2)

25-19. INSTALLATION. (See figure 25-9.)

NOTE

For detail clamping and routing, see figure 25-10 or 25-11.

a. Carefully uncoil new throttle controlex and lay out on clean, flat surface.

NOTE

After the controlex is uncoiled and straightened out, an aid to installation can be achieved by marking a straight, white line on the cover of the controlex with a grease pencil or chalk. The line should be marked on the quadrant of the controlex which allows the easiest bending. This reference line should permit easier routing through difficult areas and provide a quick check of any twisting which may be occurring while routing.

b. Stroke slider back and forth through controlex housing. Check that slider moves freely.

c. Carefully coil controlex into a figure 8.

CAUTION

To prevent chafing of control assembly on aft wing attach casting, ensure that the assembly is routed through the MIL-I-3190 fiberglass tubing at approximately FS 480.0.

d. Carefully thread controlex (with index arrow on wrench flat near end of slider in a down position) through access 1123-1, keeping loops in a vertical plane and allowing controlex to assume natural contours as it is uncoiled and guided into position.

e. Move controlex back and forth several times to assist in adjustment to natural contours. Stroke slider back and forth through housing a minimum of six times to permit opposite end to seek most natural position. At this time slider should move freely without binding or requiring any noticeable force.

CAUTION

On airplanes having throttle controlex with fixed race identified by arrow index on wrench flat, ensure that arrow is generally on inside of bend radius at engine end of controlex.

f. Install checknut (19) and screw onto housing to approximate limit of threads.

g. Install spacer (18) and slide into contact with checknut.

h. Place aft support bearing (14) on controlex and slide into contact with spacer (18).

CAUTION

Do not rotate cable end housing when securing cable to support bearing connection. Secure cable in place by turning checknuts only.

i. Install spacer (17) and checknut (16). Screw checknut onto housing to fully engage threads.

j. Hold slider at wrench flats and loosen overshaft (3). Remove overshaft.

k. Install checknut (11) and screw on to approximate limit of threads.

l. Install spacer (10) and slide into contact with checknut.

m. Carefully insert controlex through forward support bearing.

CAUTION

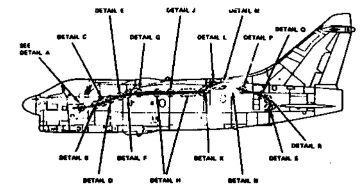
Do not rotate cable and housing when securing cable to support bearing connection. Secure cable in place by turning checknuts only.

n. Install spacer (8) and checknut (7). Screw checknut onto housing to fully engage threads.

o. Thread overshaft (3) onto slider until 2.00 (±0.03) inches of slider protrude from forward end of overshaft.

p. Install lockwasher (5) and checknut (4) on slider. Engage locking tab on washer with groove in overshaft and screw checknut lightly against lockwasher.

q. Hold slider at wrench flats and tighten checknut (4).



NOTE

1. DO NOT ALLOW CONTROLEX TO ROTATE. TIGHTEN CHECKNUTS TO 30-40 POUND-INCHES TORQUE.
2. AFTER THROTTLE CONTROL IS RIGGED (PARAGRAPH 25-18), OPERATE THROTTLE FROM "IDLE" TO "MIL" POSITIONS WHILE INSPECTING FOR INTERFERENCE BETWEEN CONTROLEX AND FS 180 FEED-THROUGH. IF MINIMUM CLEARANCE OF 0.070 IN. DOES NOT EXIST, REMOVE EDGING, IF INSTALLED, AND TRIM WEB/DOUBLER AS REQUIRED. TRIM LIMITS ARE CONTROLLED BY ADJACENT STRUCTURE IN ANY DIRECTION. EDGING NEED NOT BE INSTALLED. REFINISH REWORK AREA (T.O. 1A-7D-3).
3. IF ONE OF THE FOUR RIVETS EDGE DISTANCE IS REDUCED BELOW MINIMUM, REMOVE RIVET AND FAIR HOLE. REMOVAL OF ONLY ONE OF THE FOUR RIVETS IS ACCEPTABLE.
4. REMOVE SEALANT TO REMOVE THROTTLE CONTROLEX. CLEAN SURFACES AND REPLACE SEALANT (MIL-S-8802) AFTER THROTTLE CONTROL IS RIGGED AND ALL CLAMPS ARE INSTALLED. CONTROLEX MUST BE FREE AT ALL CLAMP POSITIONS.
5. TO FEED THROTTLE CONTROLEX THROUGH TUBING, SLIDE TUBING AFT TO A POINT WHERE CONTROLEX BUNDLE IS STRAIGHT. REPOSITION TUBING PRIOR TO INSTALLING CLAMPS SHOWN.

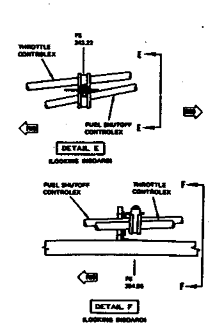
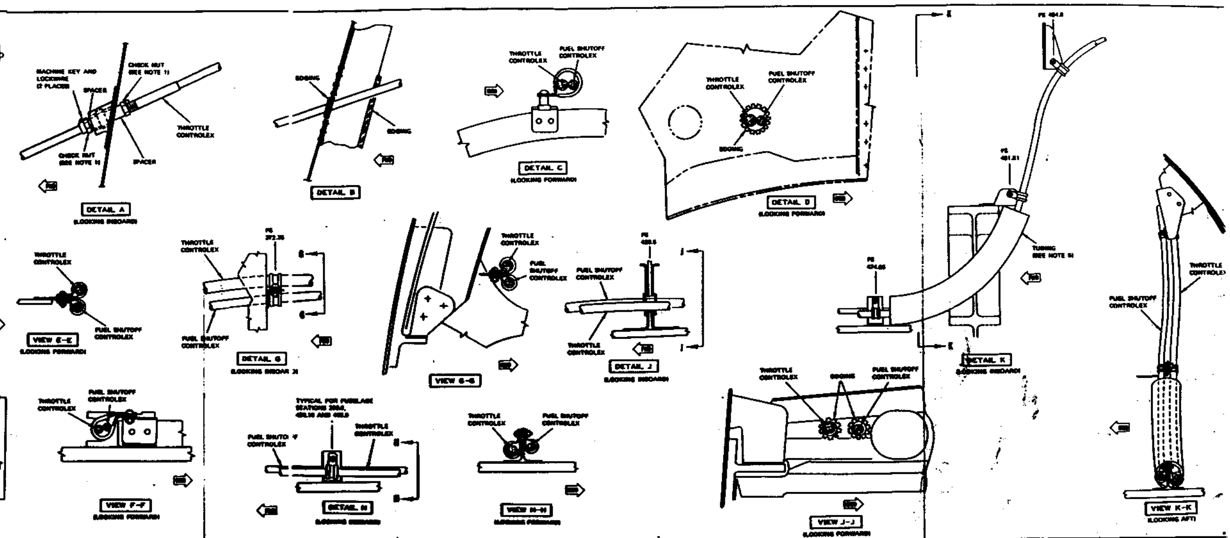



Figure 25-16. Clamping and Routing of Push-Pull Control Assembly (Airplanes Through AF69-6188) (Sheet 1)

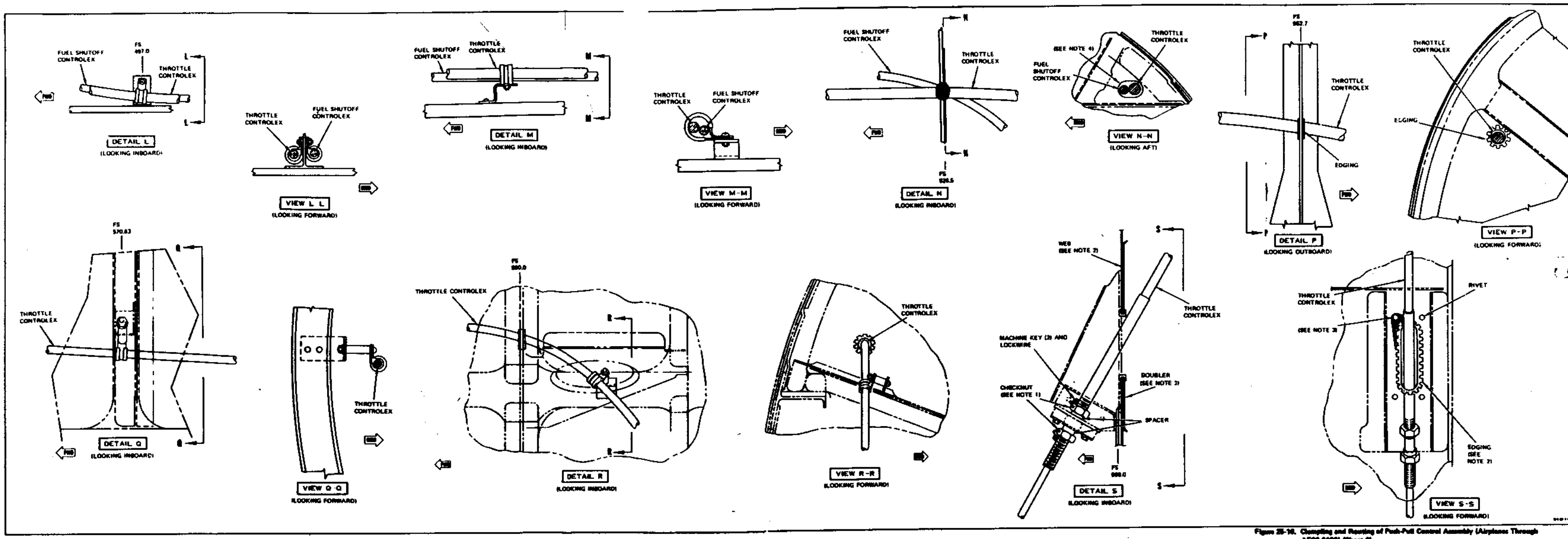
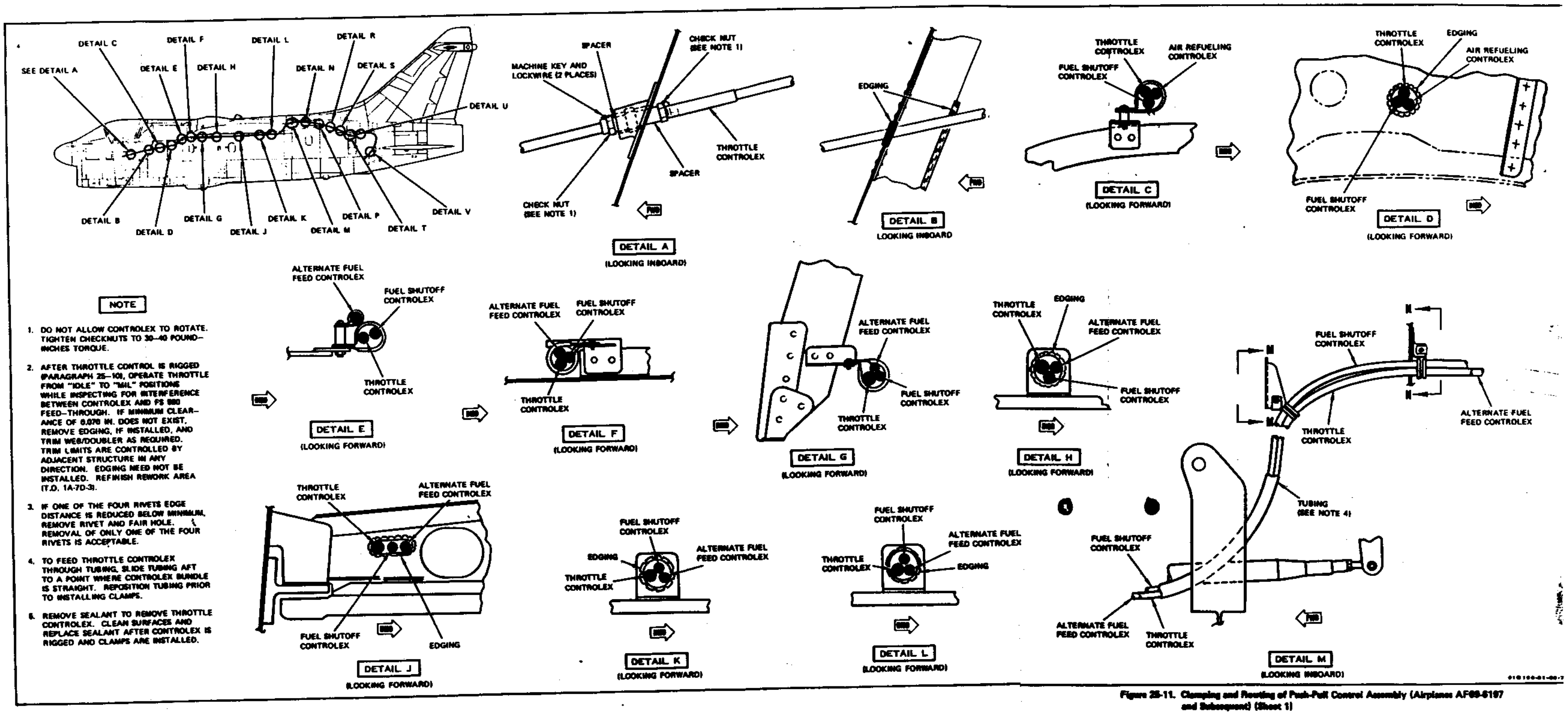


Figure 25-16. Clamping and Routing of Push-Pull Control Assembly (Airplanes Through AF[illegible]) (Sheet 2)



NOTE

1. DO NOT ALLOW CONTROLEX TO ROTATE. TIGHTEN CHECKNUTS TO 30–40 POUND-INCHES TORQUE.
2. AFTER THROTTLE CONTROL IS RIGGED (PARAGRAPH 25–101), OPERATE THROTTLE FROM "IDLE" TO "MIL" POSITIONS WHILE INSPECTING FOR INTERFERENCE BETWEEN CONTROLEX AND FS 980 FEED–THROUGH. IF MINIMUM CLEARANCE OF 0.070 IN. DOES NOT EXIST, REMOVE EDGING, IF INSTALLED, AND TRIM WEB/DOUBLER AS REQUIRED. TRIM LIMITS ARE CONTROLLED BY ADJACENT STRUCTURE IN ANY DIRECTION. EDGING NEED NOT BE INSTALLED. REFINISH REWORK AREA (T.O. 1A-7D-3).
3. IF ONE OF THE FOUR RIVETS EDGE DISTANCE IS REDUCED BELOW MINIMUM, REMOVE RIVET AND FAIR HOLE. REMOVAL OF ONLY ONE OF THE FOUR RIVETS IS ACCEPTABLE.
4. TO FEED THROTTLE CONTROLEX THROUGH TUBING, SLIDE TUBING AFT TO A POINT WHERE CONTROLEX BUNDLE IS STRAIGHT. REPOSITION TUBING PRIOR TO INSTALLING CLAMPS.
5. REMOVE SEALANT TO REMOVE THROTTLE CONTROLEX. CLEAN SURFACES AND REPLACE SEALANT AFTER CONTROLEX IS RIGGED AND CLAMPS ARE INSTALLED.

Figure 25-11. Clamping and Routing of Push-Pull Control Assembly (Airplanes AF69-6197 and Subsequent) (Sheet 1)

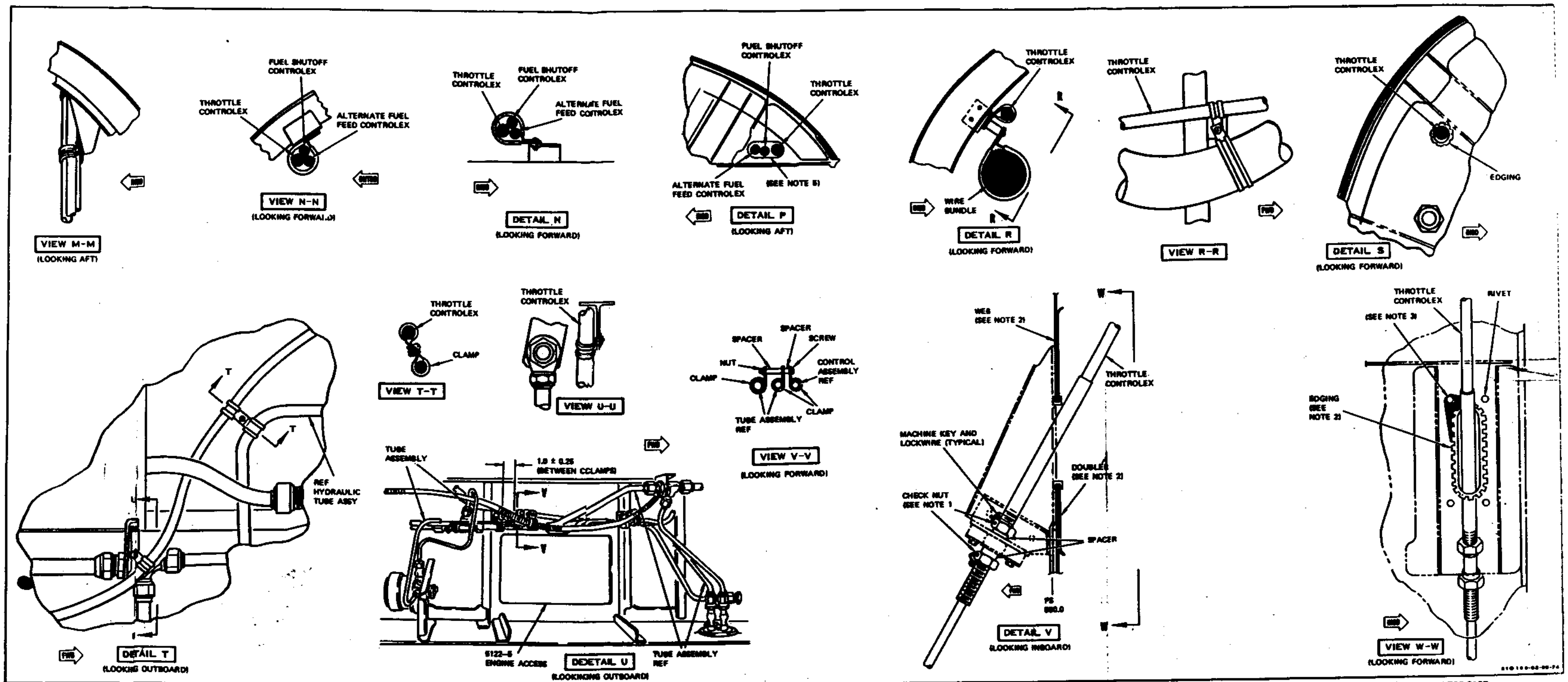


Figure 25-11. Clamping and Routing of Push-Pull Control Assembly (Airplanes AF69-6197 and Subsequent) (Sheet 2)

r. Check that distance from forward end of checknut to forward end of slider is 1.70 (±0.06) inches. If distance is not within limits, adjust position of overshaft.

s. Secure checknut (4) to lockwasher (5) with MS20995C32 lockwire.

t. Stroke slider back and forth through housing and check that slider moves freely without binding.

NOTE

Clamps are used for support only. Controlex housing must be free to move through clamps. Incorrect clamping may cause restricted slider travel and may result in high control forces.

u. Install support clamps (9). Check that each support clamp will allow controlex housing to move back and forth.

v. Check that radius of bends in controlex housing is not less than 6 inches.

w. Check that controlex is not twisted or binding.

x. Stroke slider back and forth through housing and check for smooth operation.

y. Install checknut (1) and rod end (2).

z. Install checknut (13) and rod end (12).

aa. Install engine (T.O. 1A-7D-2-5).

NOTE

Checknuts (1 and 13) will be tightened and keys (6 and 15) will be installed and lockwired in rigging procedure (paragraph 25-10).

ab. Rig engine control system (paragraph 25-10).

ac. Apply MIL-S-8802 heat resistant sealing compound around controlex housing at top left side of bulkhead at FS 526.5.

ad. Reconnect outboard rod end of spoiler/deflector load-limiting link (T.O. 1A-7D-2-8).

ae. Install ammunition feed and return chutes (T.O. 1A-7D-2-13).

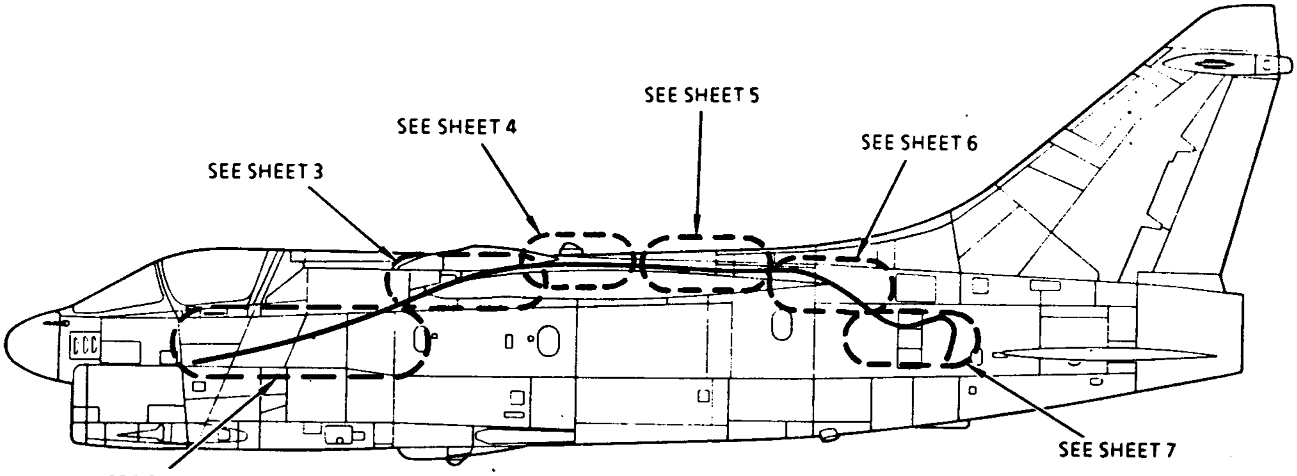
af. Install plastic gun gas shroud.

ag. Install battery and battery case (T.O. 1A-7D-2-11) if removed.

ah. Close accesses 1221-1, 1123-1, 1121-8, 1123-4, 1123-3, 1132-1, 5112-1, 5112-2, 5122-6, 5111-2, 5111-4, 5222-2, and 3233-4 and check for security.

25-19A. PUSH-PULL CONTROL ASSEMBLY (CONTROLEX) REMOVAL AND INSTALLATION (Airplanes After T.O. 1A-7-622).

25-19B. Figure 25-11A shows routing of throttle controlex cable for airplanes after T.O. 1A-7-622.



NOTE

1. COMMERCIAL PRODUCTS SHALL BE EQUAL TO AND INTERCHANGEABLE WITH PART NUMBERS SPECIFIED.

   A J & H PRODUCTS INC, BURBANK, CA. CAGE NO. 22175.

   B GENERAL ELECTRIC CO, AIRCRAFT ENGINE GROUP, CINCINNATI, OH.

2. PART NO. OF VOUGHT AERONAUTICS DIV. LTV AEROSPACE CORP. DALLAS, TEXAS. CAGE NO. 80378.
3. MINIMUM BEND RADIUS OF THROTTLE CABLE IS 6 IN.
4. FINISH ALL BARE ALUMINUM ALLOY IAW MIL-STD-1516 CODE CC2304. WHERE AIR POLLUTION REGULATIONS REQUIRE, USE PRIMER MIL-P-85582 TYPE I CLASS 2.
5. INSTALL DOUBLER AND PERMANENT FASTENERS USING MIL-S-81733 SEALANT.
6. ELONGATE DOWNWARD EXISTING HOLE AS SHOWN.
7. ALL DIMENSIONS ARE IN INCHES.

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Figure 25-11A. Throttle (Controlex) Cable Overwing Reroute and Clamping (Airplanes After T.O. 1A-7-622) (Sheet 1)

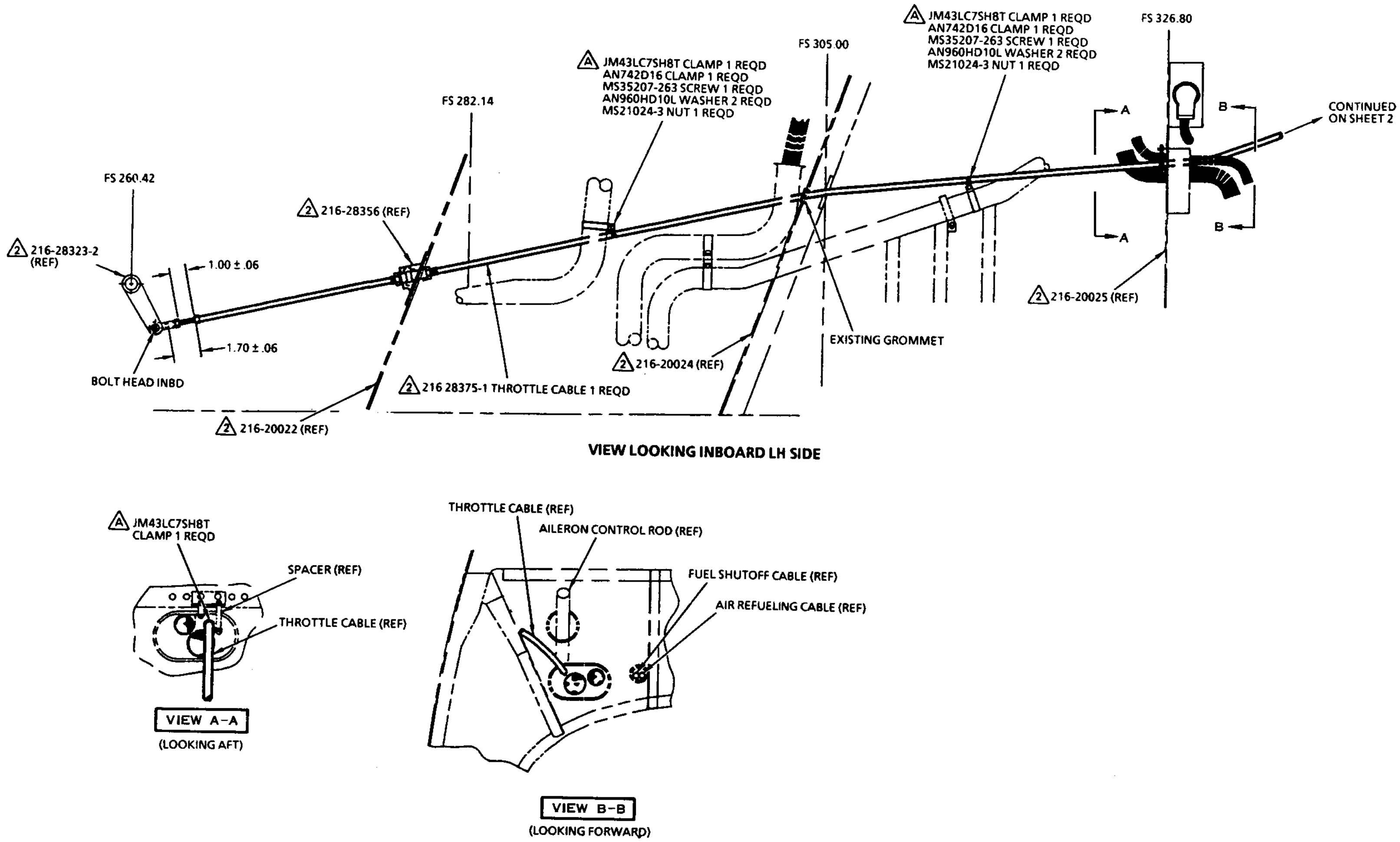

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Figure 25-11A. Throttle (Controlex) Cable Overwing Reroute and Clamping (Airplanes After T.O. 1A-7-622) (Sheet 2)

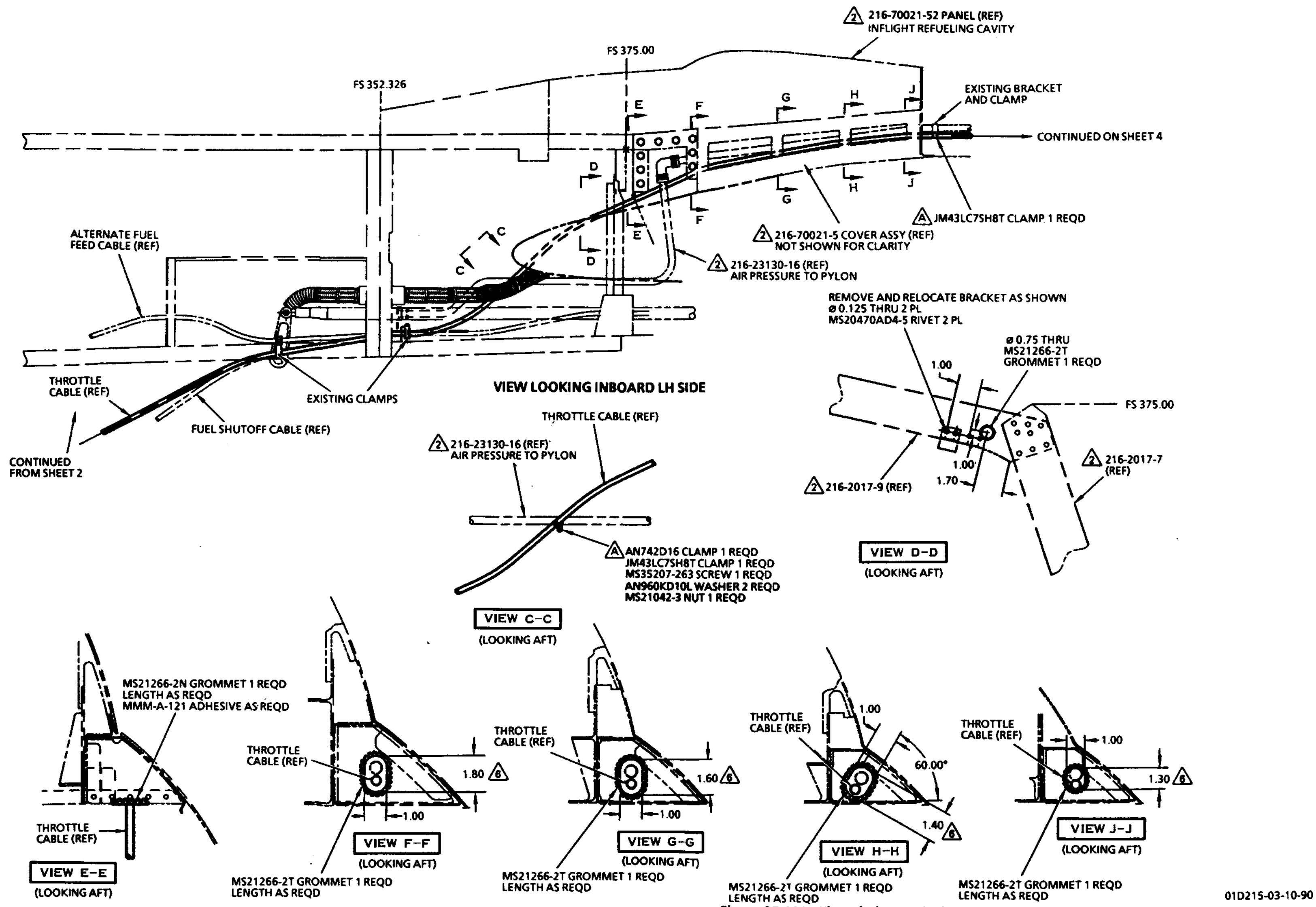

Figure 25-11A. Throttle (Controlex) Cable Overwing Reroute and Clamping (Airplanes After T.O. 1A-7-622) (Sheet 3)

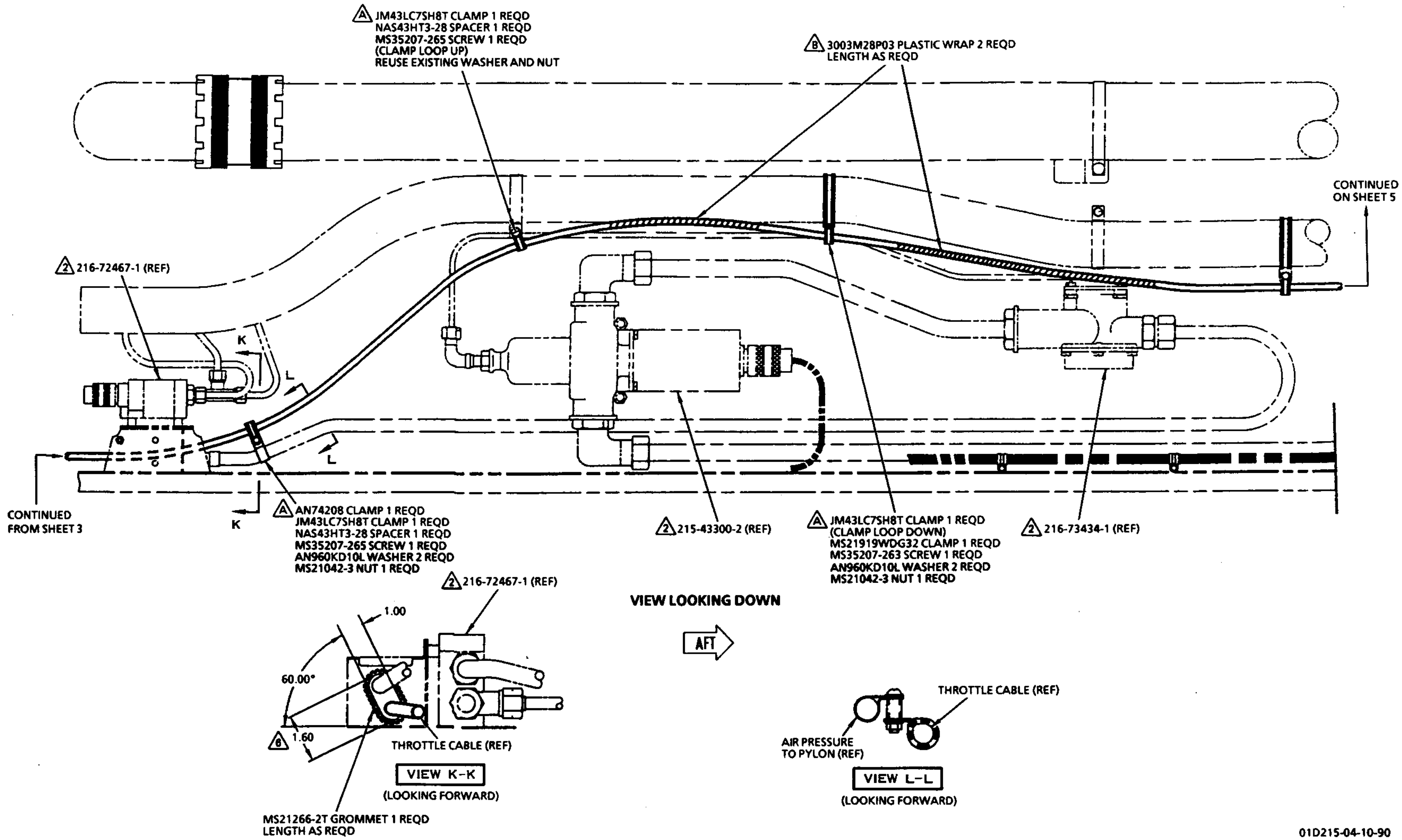

Figure 25-11A. Throttle (Controlex) Cable Overwing Reroute and Clamping (Airplanes After T.O. 1A-7-622) (Sheet 4)

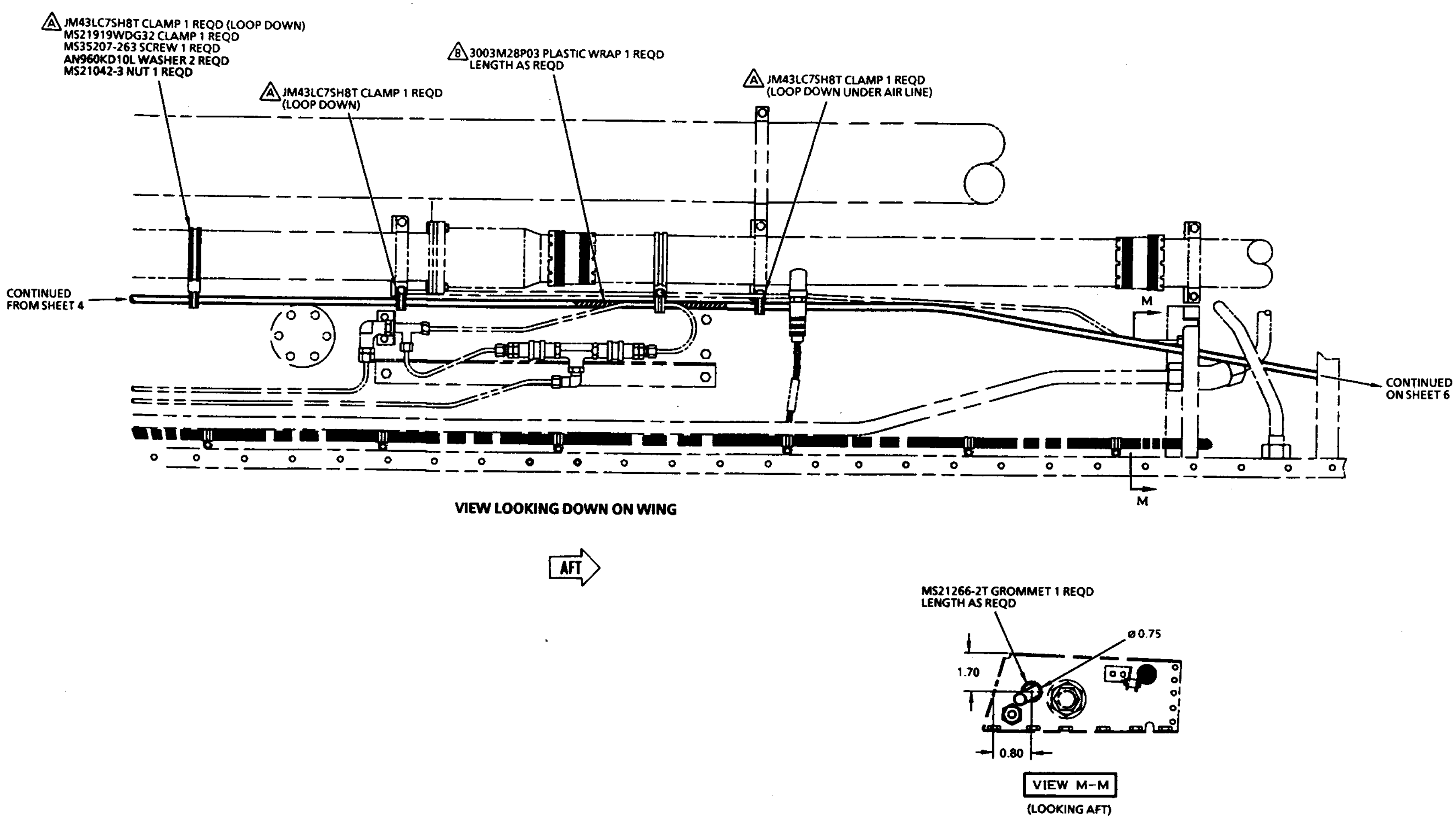

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Figure 25-11A. Throttle (Controlex) Cable Overwing Reroute and Clamping (Airplanes After T.O. 1A-7-622) (Sheet 5)

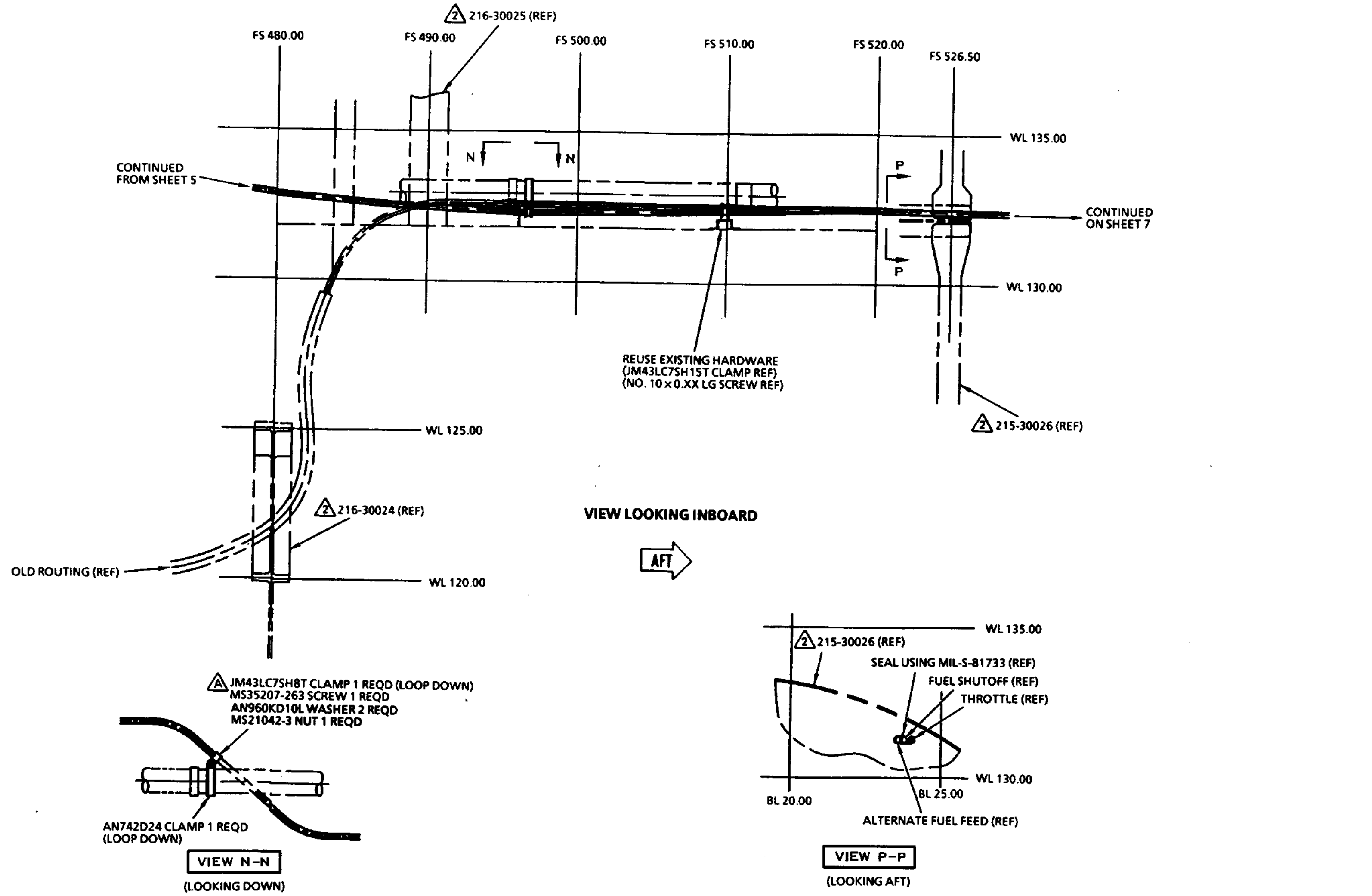


Figure 25-11A. Throttle (Controlex) Cable Overwing Reroute and Clamping (Airplanes After T.O. 1A-7-622) (Sheet 6)

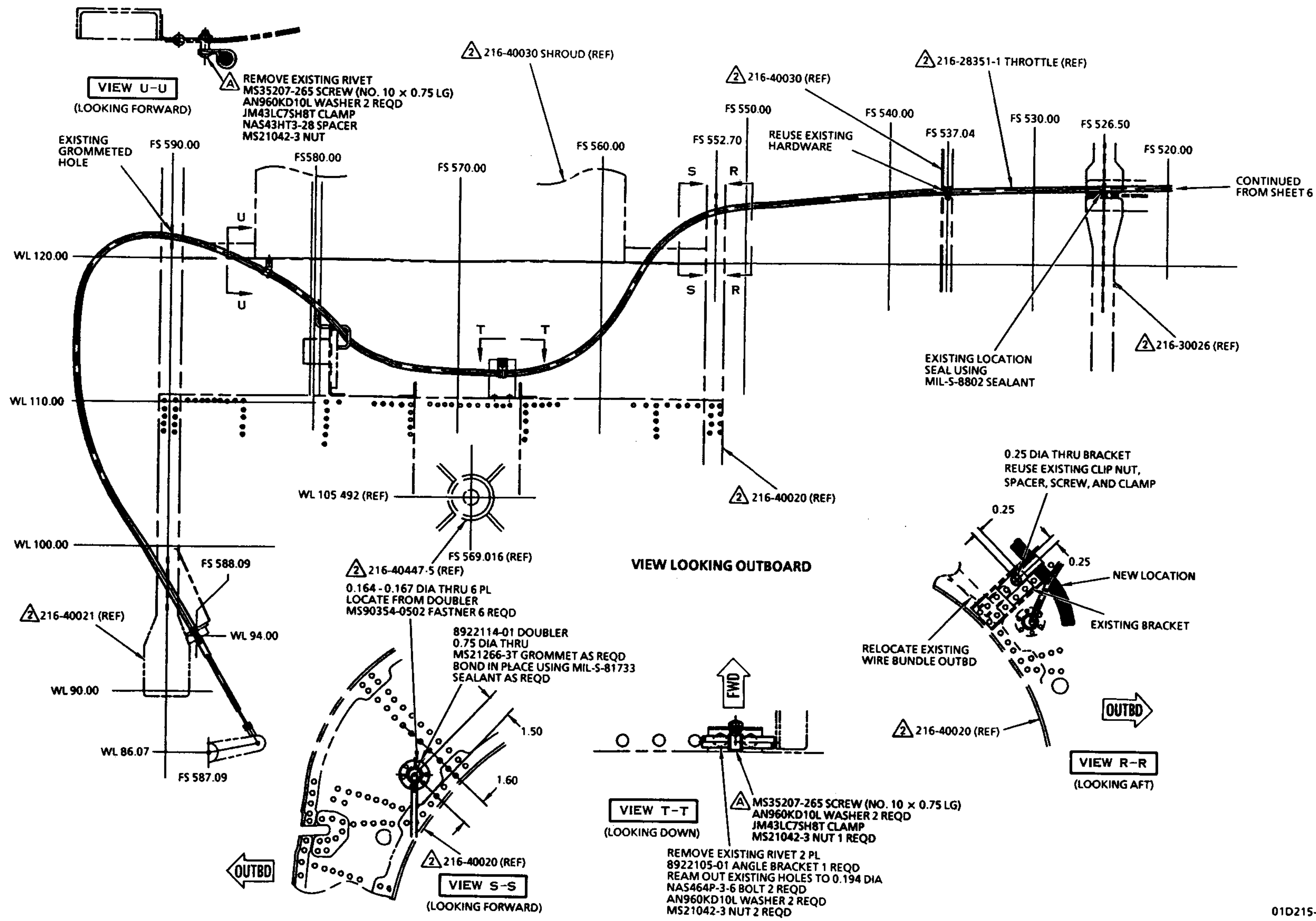
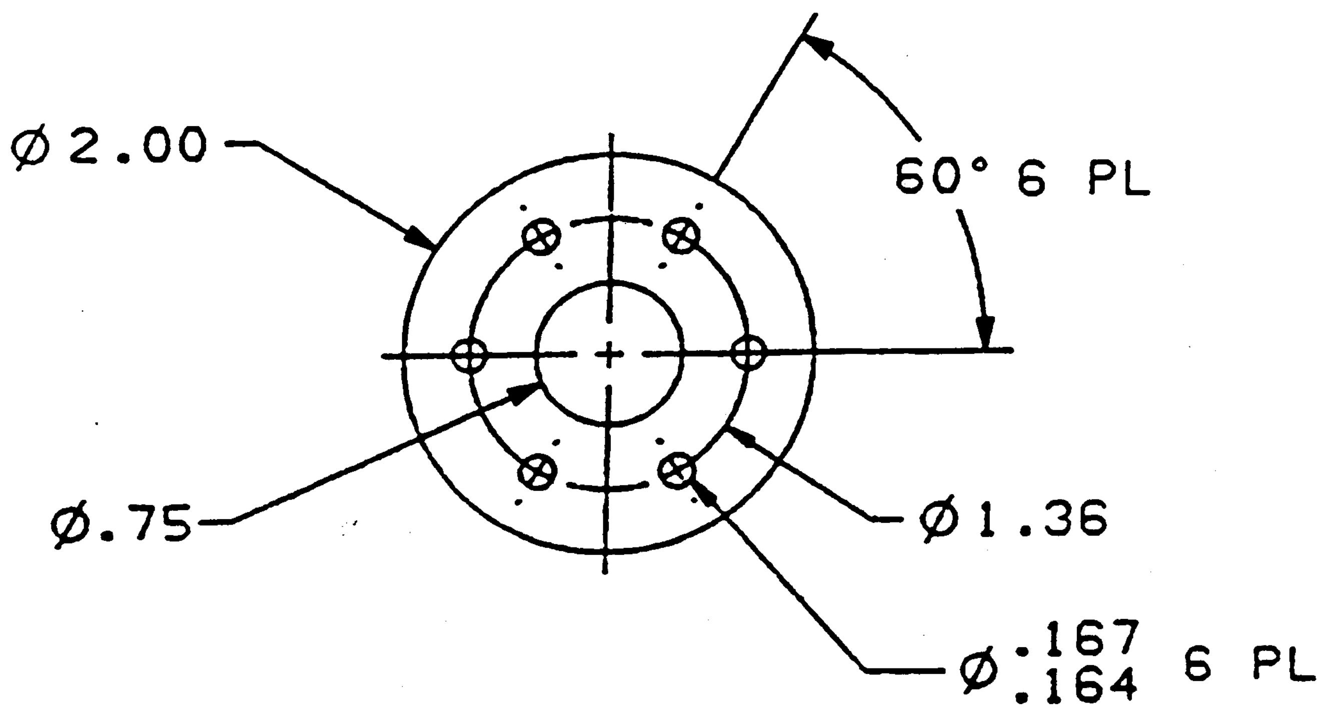


Figure 25-11A. Throttle (Controlex) Cable Overwing Reroute and Clamping (Airplanes After T.O. 1A-7-622) (Sheet 7)

NOTE

1. REMOVE ALL BURRS AND SHARP EDGES.
2. FINISH SHALL BE PER MIL-STD-1516 CODE CC2304. WHERE AIR POLLUTION REGULATIONS REQUIRE,USE PRIMER MIL-P-85582 TYPE I CLASS 2.
3. IDENTIFY WITH PART NUMBER PER MIL-STD-130 (INK STAMP).
4. ALL DIMENSIONS ARE IN INCHES.



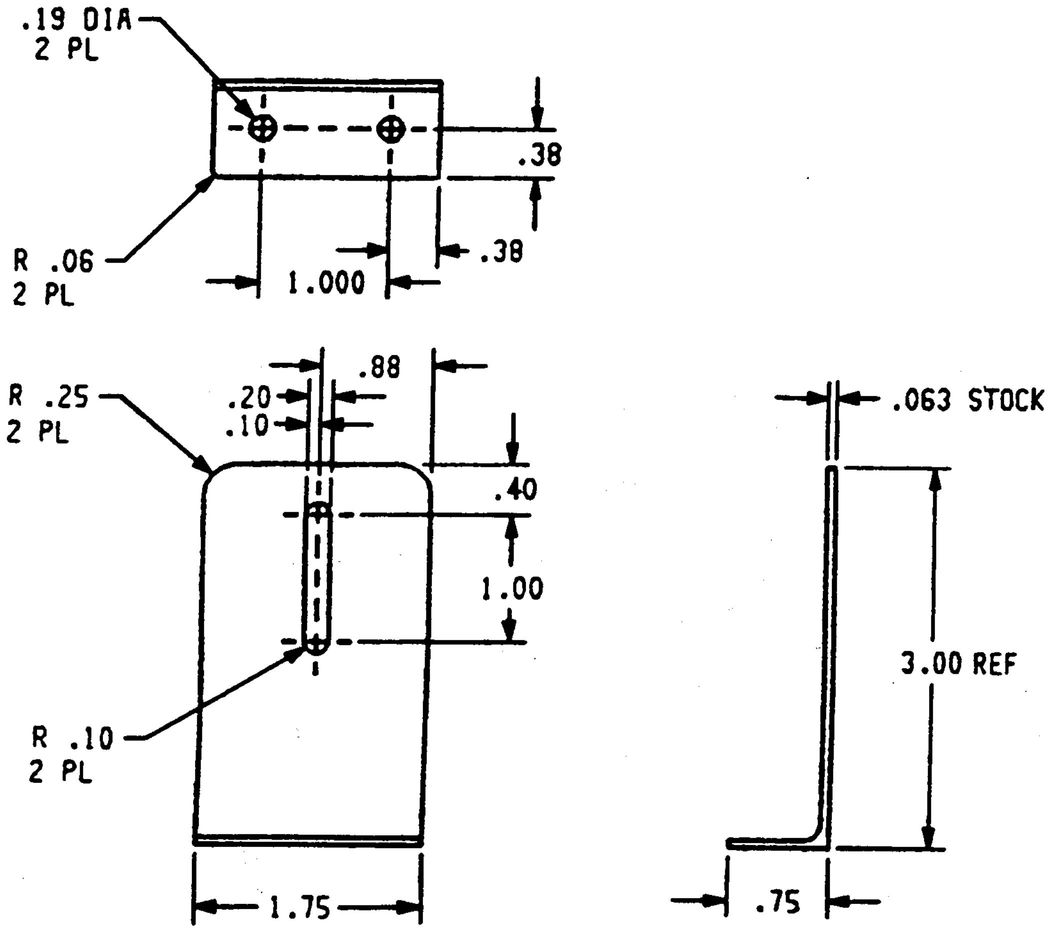
DOUBLER

01D215-08-10-90

Figure 25-11A. Throttle (Controlex) Cable Overwing Reroute and Clamping (Airplanes After T.O. 1A-7-622) (Sheet 8)

NOTE

1. REMOVE ALL BURRS AND SHARP EDGES.
2. FINISH SHALL BE PER MIL-STD-1516 CODE CC2304. WHERE AIR POLLUTION REGULATIONS REQUIRE, USE PRIMER MIL-P-85582 TYPE I CLASS 2.
3. IDENTIFY WITH PART NUMBER PER MIL-STD-130 (INK STAMP).
4. ALL DIMENSIONS ARE IN INCHES.



ADJUSTABLE BRACKET

01D215-09-10-90

Figure 25-11A. Throttle (Controlex) Cable Overwing Reroute and Clamping (Airplanes After T.O. 1A-7-622) (Sheet 9)

25-20. BELLCRANK REMOVAL AND INSTALLATION.

25-21. REMOVAL. (See figure 25-12.)

a. Open access 1221-1.

NOTE

Refer to paragraph 25-25 for removal of self-retaining bolts.

b. Disconnect rod end (1) from bellcrank (2) by removing cotter pin (3), nut (4), counterbored washer (5), self-retaining bolt (6), and washer (7).

c. Disconnect rod end (8) from bellcrank (2) by removing cotter pin (9), nut (10), counterbored washer (11), self-retaining bolt (12), and washer (13).

d. At inboard end of bellcrank, remove nut (14) and screw (15) securing tube (16) to rod (17).

e. Remove tube.

f. Slide rod (17) outboard until bellcrank (2) is free for removal. Remove bellcrank.

25-22. INSTALLATION. (See figure 25-12.)

a. Position bellcrank (2) in place and slide rod (17) inboard until holes in tube (16) and rod are aligned.

b. Connect tube to rod with screw (15) and new nut (14).

NOTE

Refer to paragraph 25-25 for installation of self-retaining bolts.

c. Connect rod end (8) to bellcrank (2) with washer (13), self-retaining bolt (12), counterbored washer (11), nut (10), and new cotter pin (9).

d. Connect rod end (1) to bellcrank (2) with washer (7), self-retaining bolt (6), counterbored washer (5), nut (4), and new cotter pin (3).

e. Perform throttle control system operational checkout (paragraph 25-7).

f. Close access 1221-1.

25-23. THROTTLE QUADRANT REPAIR.

NOTE

For additional throttle quadrant repair, remove quadrant from airplane and refer to T.O. 16R1-3-32-3.

25-24. PUSHBUTTON SWITCHES. The air ignite, microphone, radar range, and air refueling reset switches mounted in the throttle grip and air refueling door release handle are secured by press fit. In the event one or more of the pushbutton switches become loose in the housing, the switch ~~may be~~ secured with an adhesive as specified in the following procedure:

a. Secure loose pushbutton switches as follows:

1. Carefully pull switch from throttle grip or refueling handle sufficiently to apply adhesive to body of switch.

2. Apply a bead of MIL-A-5092A, Type II (3M No. 2141) adhesive around body of switch.

3. Seat switch in throttle grip/refueling handle and remove excess adhesive.

4. Allow adhesive to cure.

b. Perform operational checkout of equipment associated with secured switch(es).

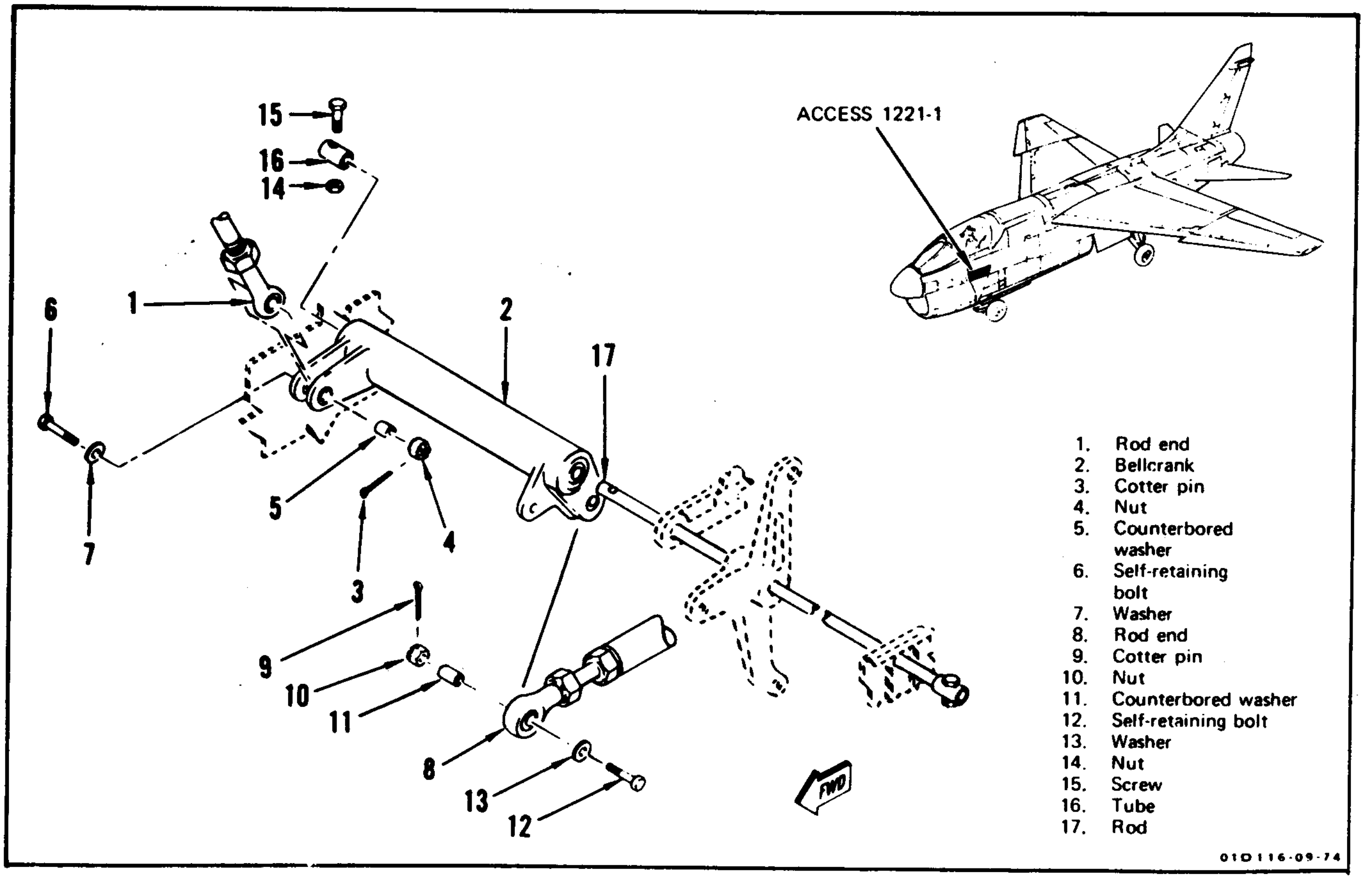


Figure 25-12. Bellcrank Removal and Installation

25-25. SELF-RETAINING BOLT REMOVAL AND INSTALLATION.

25-26. REMOVAL. (See figure 25-13.)

a. Remove cotter pin (1), self-locking castellated nut (2), and counterbored washer (3).

b. Press locking plunger in bolthead to release locking balls in bolt shank. Remove self-retaining bolt (4) and washer (5).

25-27. INSTALLATION. (See figure 25-13.)

a. Press locking plunger in bolthead to release locking balls and install washer (5). Insert bolt through linkage and check for 0.010-inch clearance between washer and adjacent surface as shown in step 1 of figure 25-13.

b. Check maximum clearance (dimension X) of locking balls to ensure counterbored washer will not bear against locking balls as shown in step 2 of figure 25-13.

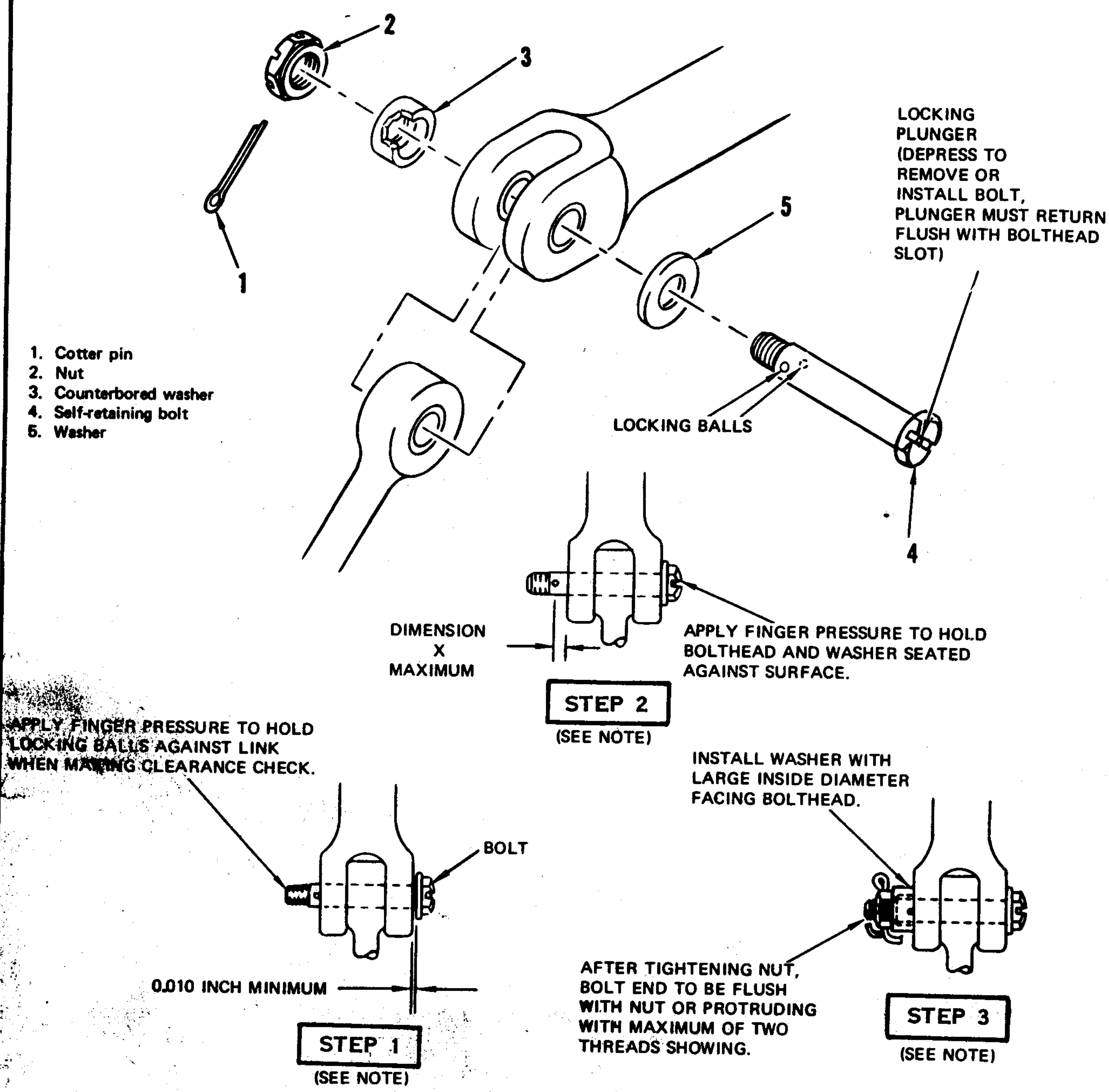
CAUTION

Improper installation of counterbored washer will cause loss of locking feature and possible damage to locking balls.

c. Install counterbored washer (3) with large inside diameter facing bolthead and new self-locking castellated nut (2).

d. Tighten nut to torque specified in figure 25-13.

e. Install new cotter pin (1).



1. Cotter pin
2. Nut
3. Counterbored washer
4. Self-retaining bolt
5. Washer

NOTE

Selection of proper grip length and use of washers under bolthead will be used to control clearances. No more than two washers shall be used.

BOLT SIZE	DIMENSION X MAX. (INCH)	TORQUE (POUND-INCHES)
10-32	0.094	12 TO 15
1/4-28	0.125	30 TO 40
5/16-24	0.156	60 TO 85
3/8-24	0.171	95 TO 110
7/16-20	0.202	270 TO 300
1/2-20	0.234	290 TO 410
9/16-10	0.265	480 TO 600

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Figure 25-13. Self-Retaining Bolt Removal and Installation

ALPHABETICAL INDEX

Subject	Paragraph, Figure or Table Number

INDEX - Continued

INDEX - Continued