



Senior Spud 2.0?

In recent months, several military aircraft across the United States inventory have appeared wearing a highly reflective coating. Is this the re-emergence of Senior Spud? *Aviation News* investigates

On November 19, 2021, USAF Lockheed Martin F-22 Raptor 04-4065/065 became the first in a spate of jets spotted wearing an unusual mirror-like coating. Photographer Santos Caceres captured images of the jet adorned with the reflective finish on its wings and fuselage as it 'flexed' on departure from Nevada's Nellis Air Force Base (AFB). The fifth-generation all-weather stealth (sometime referred to as low observable) platform was participating in an Air Force Weapons School Integration

A few days after the F-117 sighting, aviation photographer Elijah Delgadillo caught a US Navy (USN) Lockheed-Martin F-35C Lightning II – seemingly 168733 XE/100 – on strength with the Air Test and Evaluation Squadron Nine (AIRTEVRON NINE, VX-9 'The Vampires') based out of Naval Air Weapons Station China Lake, sporting a mirror coating while flying low-level through the Sidewinder route in California's Sequoia National Park.

The F-22, F-117 and F-35 aren't the only US types to be seen flying with similar

cost of radar-absorption. It's an approach the USAF has been studying since at least 1993, when it applied a mirror-like material (commonly referred to as 'spectrum tape' or 'rainbow tape') to YF-117A #784 (79-0784) and conducted four trial flights out of Edwards AFB in California alongside the Boeing NKC-135A Flying Infrared Signature Technology Aircraft to evaluate ways of reducing the type's IR signature. The programme was codenamed 'Senior Spud'.

Despite the possible effectiveness of the concept, those flights reportedly

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mission with several other aircraft types. Of note, a second 'Chrome Raptor', serial 04-4070/070, was spotted operating out of Nellis in March. Both '065' and '070' were last noted on strength with the 433d Weapons Squadron.

A couple months later, in mid-January 2022, it was reported that another photographer had caught a still-unidentified Lockheed F-117A Nighthawk flying over the Saline Military Operating Area in California and wearing a similar reflective coating. While the USAF reportedly retired its F-117 as a frontline type back in 2008, it has continued operating some of the first-generation stealth attack jets for both training and research/testing purposes (see *Emerging from the shadows*, p44).

As with the 'Chrome Raptor', the F-117's reflective coating appeared to be made up of a mosaic of metallic tiles/sheets, which allows it to be applied to conform to critical areas and to be arranged around moving parts and apertures.

reflective coatings. In June 2020, Scaled Composites' experimental Model 401 jet appeared over California's Mojave Desert wearing a mirror finish.

The original

It has been suggested that the coating could be the result of a multiple decade-long experiment in reducing the infrared (IR) signature of aircraft with high degrees of radar stealth. The silver finish might also possess anti-laser properties, making it a possible defence against the emerging threat of directed-energy weapons.

There are obvious tactical applications for such a highly reflective coating, especially on a low-observable platform. Stealth types are covered in radar-absorbing materials that capture radiated energy instead of reflecting it back to the sensor. However, that process accumulates heat, which can *increase* the aircraft's infrared signature. With that in mind, a reflective coating could bounce back light, thus mitigating the heat

underscored the downside of the reflective coating: rendering the aircraft highly visible in daylight, meaning the IR benefit of using a mirror-treatment would come at a cost.

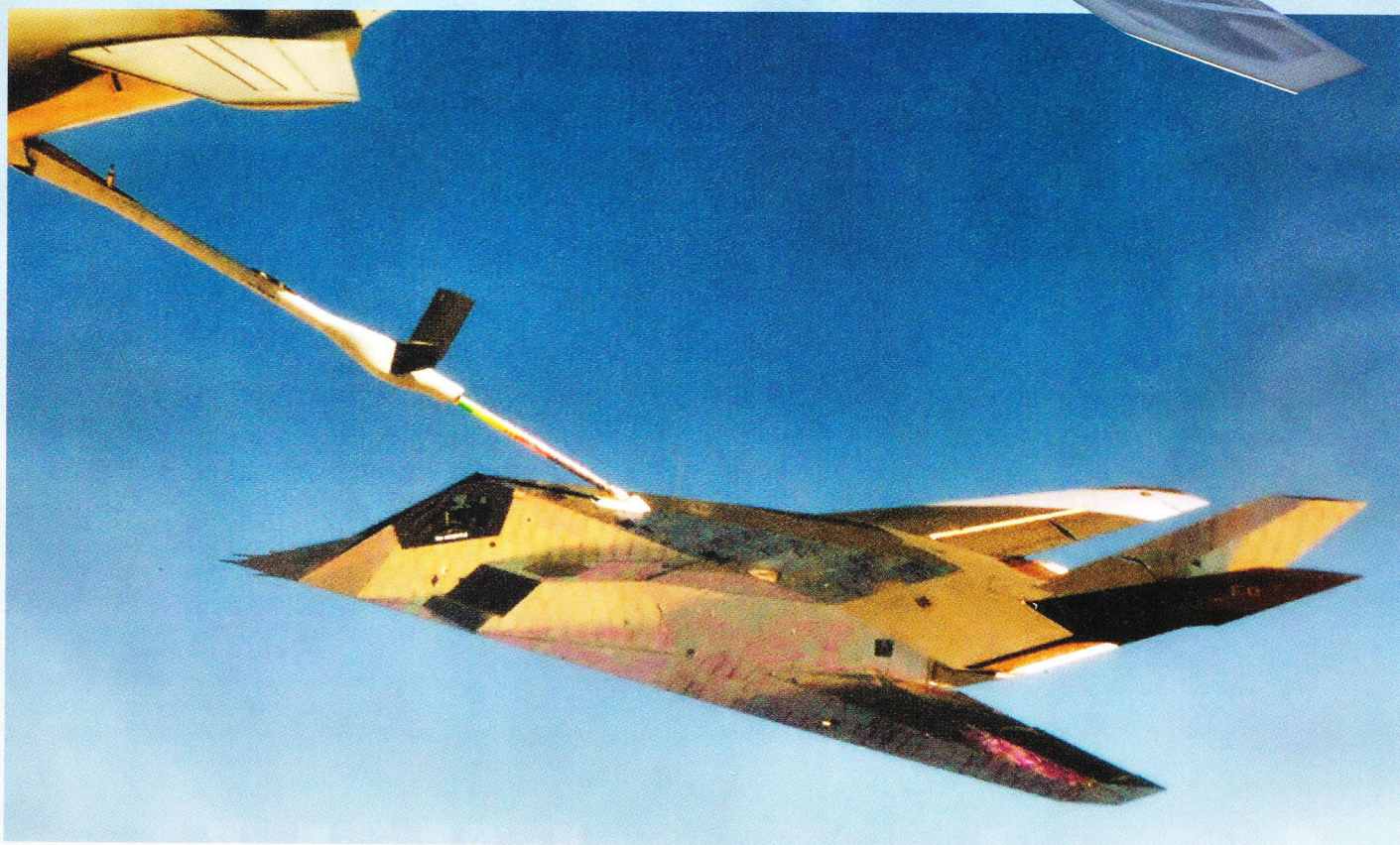
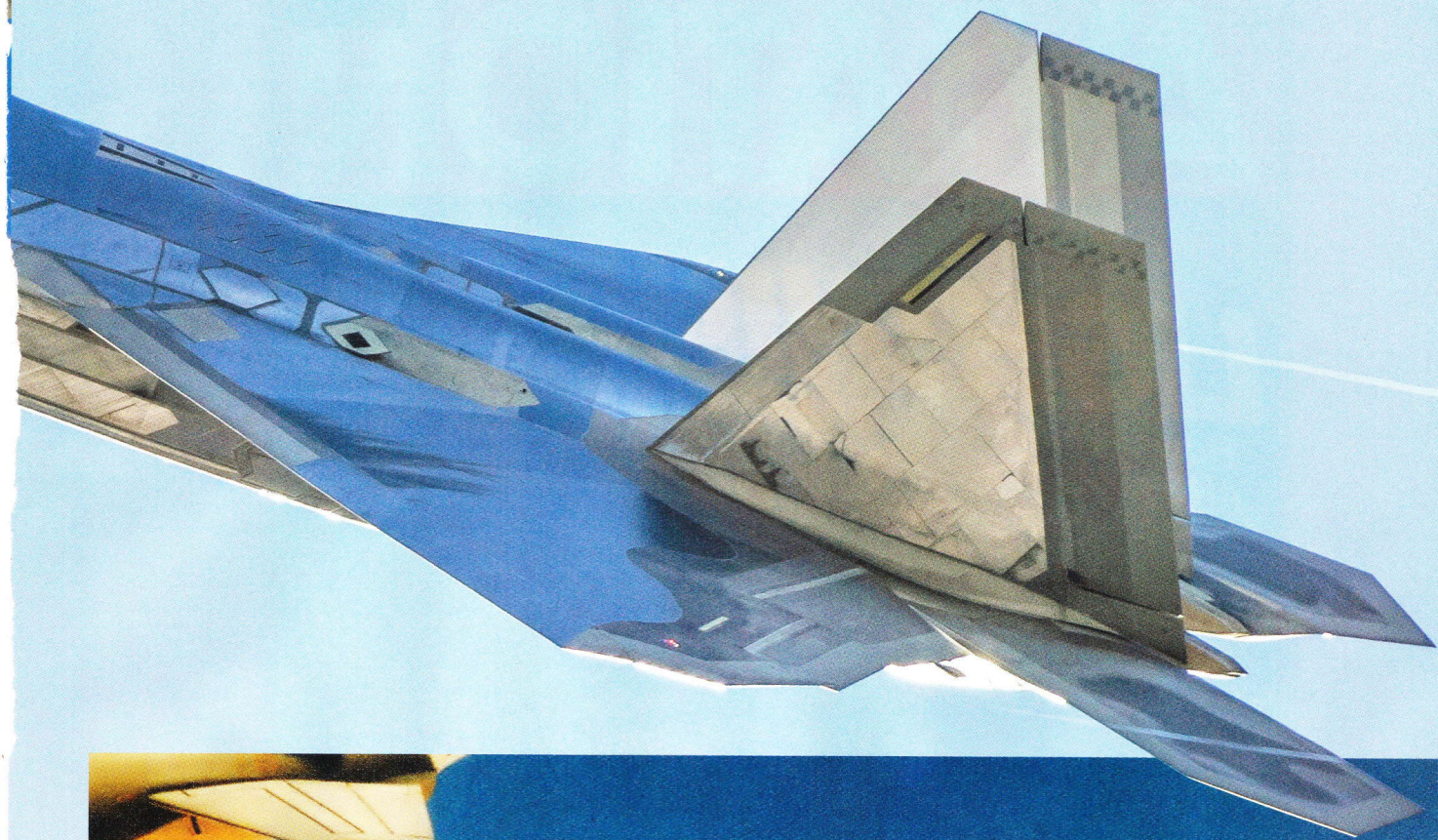
Ultimately, the USAF opted not to transition the Senior Spud technology to the operational F-117 fleet and it was 30 years before the next generation of stealth types gained their own reflective treatments.

Motivational matters

These more recent trials are, like those in 1993, limited in scale and it is not clear whether the USAF or USN plans to apply the coatings to frontline airframes. Still, there is a clear rationale for an eventual, wider roll-out of reflective coatings.

More and more air forces – notably those of Russia and China – are equipping their fighters with passiveIRST (infrared search and track) sensors. These could allow a fighter to detect enemy aircraft, even stealth platforms, without turning on their own radars and giving away their locations. As

Lockheed Martin F-22A Raptor 04-4065/065 'flexing' on departure out of Nellis Air Force Base in Nevada for a Red Flag 22-2 mission on March 14, 2022, wearing its Senior Spud-style reflective coating Matt Mansell



IR becomes a more common method to detect stealth aircraft, avoiding detection on the infrared spectrum becomes essential. The US Department of Defense (DoD) is deploying its own airborneIRST sensors for types including Boeing's F-15 Eagle/Strike Eagle and F/A-18E/F Super Hornet. And there are other benefits besides IR stealth. All the world's leading militaries

Lockheed F-117A #784 (79-0784) wearing a mirrored surface takes on fuel during one of its four sorties supporting the Senior Spud programme led by the 410th Test Squadron out of Edwards in 1993 KEY Collection

are developing directed-energy weapons. Mirror-like surfaces are a proven defence against such laser weapons due to the fact they bounce back most of the directed

energy, rather than absorbing it until it reaches a destructive intensity.

It's worth pointing out that currently no air force deploys laser weapons for air-to-air use, although airborneIRST sensors are commonplace, thus detection via infrared is the most immediate problem. So it makes sense for the US DoD to devote significant resources to testing counter-measures. **AN**