

United States Air Force Abbreviated Accident Investigation Board Report

Class-A Mishap, Nellis AFB, NV, 1 November 2007

EXECUTIVE SUMMARY

On 1 Nov 07 at approximately 1630 hours Pacific Daylight Time, at Nellis Air Force Base, NV, it was discovered that the #2 (right) engine of F-22A, S/N 00-4015, belonging to the 422d Test and Evaluation Squadron, 53d Test and Evaluation Group, 53d Wing, sustained foreign object damage while conducting a routine training mission. The mishap aircraft landed safely and caused no injuries to personnel or damage to other military or civilian property.

An engine analysis performed after the accident revealed that the foreign object damage occurred when a 6 x 8 inch piece of Low Observable (LO) material separated from the right engine inlet and was ingested by the engine. LO materials are the aircraft surface coatings comprised of multiple layers (stack-ups) of fill and fairing compound, primer, paint and adhesives. The analysis further revealed that this event most likely occurred during the takeoff phase of flight. After a momentary performance dip, the right engine recovered and continued to perform throughout the remainder of the flight, with no observed reduction in performance.

The mishap pilot noted the LO material missing from the inlet during his post-flight walk-around. The engine was borescoped and the jet was impounded. The engine was subsequently removed from the aircraft for teardown and analysis and impounded as well. Visible damage is extensive, affecting every stage of the compressor section and is estimated at \$1,198,153.00.

The Board President found that the cause of the mishap, shown by clear and convincing evidence, was an unrecognized delamination of LO material in the right inlet area within the layer of C493 fill and fairing material. This material liberated from the inlet during takeoff, inducing pieces of the first stage engine fan blades to break away, which in turn caused further damage throughout the engine.

The use of C493 during production was a substantial contributing factor to the mishap. C493 is a fill and fairing material, used on F-22A aircraft S/Ns 99-4011 through 02-4040, that was found to have poor cohesive strength. The deficiencies of this material were identified by the manufacturer and it was replaced by another material on subsequent aircraft, however all 30 of the affected aircraft remain in service.

A second substantial contributing factor to the incident was a lack of sanctioned tools and clear technical order guidance available to maintenance personnel to quickly and precisely identify disbanded LO material within the inlet and intake areas. Over time, maintenance personnel have developed informal techniques in an attempt to overcome this shortfall.

Under 10 U.S.C. 2254(d) any opinion of the accident investigators as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report may not be considered as evidence in any civil or criminal proceeding arising from the accident, nor may such information be considered an admission of liability of the United States or by any person referred to in those conclusions or statements.