F-15C fires an AIM-120 AAMRAM Missile

RIAC Success Story

F-15 Wing Metallographic Analysis

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Customer:	United States Air Force, Air Force Material Command, Warner Robins Air Logistics Complex Eagle Division
Challenge:	The F-15 Eagle is an all-weather, extremely maneuverable tactical fighter that has permitted the Air Force to gain and maintain air supremacy over the battlefield since the 1970s. The F-15's superior maneuverability and acceleration are achieved through high engine thrust-to-weight ratio and low wing loading. Low wing loading (the ratio of aircraft weight to its wing area) is a vital factor in maneuverability and, combined with the high thrust-to-weight ratio, enables the aircraft to turn tightly without losing airspeed. Based on recommendations from both the Fleet Viability Board and the Joint Assessment Team, the F-15 System Program Manager (SPM) pursued a teardown of multiple sets of F-15 wings and other structures to determine the effects of current usage on the F-15 fuselage and wing structure. The analysis was used to develop an effective Force Structural Maintenance Plan (FSMP) by reducing the number of inspections and increasing the number of aircraft available to support daily flying/training requirements.
Approach:	RIAC was tasked to perform microscopic examination of the ~850 specimens containing non-destructive inspections (NDI) indications that were excised from target parts. RIAC first excised the selected specimens from the parent part. We then bisected and broke open the fastener holes with indications at the defect site, allowing us to examine and measure the crack or defect. Microscopy enabled us to identify 140 potential fatigue cracks, 200 holes with corrosion pitting and 416 holes with mechanical damage.
Value:	The inspection results provided the USAF valuable data points for determining the effects of current usage on the F-15 airframe. This high-resolution inspection discovered and documented microscopic defects. Few of these defects will affect original design life structural integrity, but awareness of them becomes invaluable when extending the service of the F-15 fleet until 2025. This analysis augments the Force Structural Maintenance Plan (FSMP) and supports current and ongoing structural inspections and tests with potential savings of up to $30M per aircraft.

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