Extracts from DDAAFS Safety Magazine
"SIFTING THROUGH THE EVIDENCE"
(RAAF F-111 aircraft and crew losses)

28 April 1977 (F-111C A8-136) – 1st F-111 accident – inflight fire and ejection near Tamworth

During an emergency diversion following a right engine oil hot indication, the aircraft suffered a severe internal explosion. The engine throttles jammed in their selected position, the right engine fire light illuminated and could not be extinguished, and shortly thereafter the pilot could not retain control of the aircraft. An ejection was initiated and the aircraft crashed 14 nm north of Armidale, NSW. The ejection was successful, with the crew suffering minor injuries as a result of crew module ground impact forces.

The incident crew were conducting a day single-ship sortie that was to include maritime operations, automatic terrain following (TF) flight, simulated landstrike target attacks and practice bombing at Evans Head air weapons range.

Crew

Pilot: Cat B – 2493.2 hrs total time / 1624.6 hrs F-111; current (USAF Exchange Officer)

Navigator: Cat C – 4662.4 hrs total time / 292.7 hrs F-111; current

Wreckage site – aircraft A8-136

Accident summary

During the approach to the second landstrike target with military (non-afterburner) power selected, the right engine oil hot caution lamp illuminated. The pilot immediately retarded the right throttle to idle. In accordance with the extant checklist procedures, the pilot then advanced the right throttle into minimum afterburner (Zone 2) to enhance engine oil cooling. The caution lamp immediately went out. The pilot decided to divert to Amberley rather than Williamtown (the aircraft was approximately 70 nm northwest of Williamtown) as the checklist actions appeared to work and the flight time difference was only 10 minutes.

During the climbing turn back to Amberley the pilot deselected afterburner. Ten seconds later the right engine oil hot caution lamp illuminated for a second time, and was again extinguished by advancing the throttle into afterburner. The crew discussed shutting down the engine, but decided against it as all other engine indications were normal. Twice more, the caution lamp illuminated approximately 10 seconds after selection of military power and was able to be extinguished with reselection of afterburner. With afterburner selected, the caution lamp again illuminated and the pilot had to advance the throttle to Zone 4[1] to extinguish the light. Approximately 30 seconds later the crew heard and felt a loud explosion (14 minutes after the initial engine oil hot indication). The pilot attempted to close the right throttle but could not move either throttle. The pilot then noticed that the landing gear warning lamp and right engine fire warning lamp were illuminated. The right engine fire warning pushbutton was depressed which extinguished the light.[2] The pilot then tried to force the right throttle closed but both throttles were locked solid. The right engine fire warning lamp illuminated a second time at which time the pilot actuated the agent discharge switch but the fire light remained on. A mayday was declared and a decision to divert to the nearest suitable airfield (Coffs Harbour) was made. The aircraft then commenced an uncommanded roll to the right that quickly developed into a hard yaw to the right. The pilot was unable to regain control so he initiated ejection at an altitude of 9000 ft AMSL. During the descent, the pilot noticed that the right side of the aircraft was enveloped in fire.

Wreckage analysis, including that collected 7 miles short of the aircraft ground impact point, indicated that the inflight explosion blew off the upper surface of the rear left hand saddle fuel tank and also probably ruptured the forward main fuel tank.

Board findings

The Board made the following findings:

1. The primary cause of the accident was attributed to an undetermined technical defect or defects (probably a mechanical component within the right hand engine nacelle).

[1] Zone 5 is maximum afterburner power in the F-111.

[2] Depressing either of the two F-111 engine fire warning pushbuttons closes the engine fuel shutoff valve, the utility and primary hydraulic shutoff valves for the respective engine, and arms the extinguishing agent discharge switch to that engine. The agent discharge switch must be held to the AGENT DISCH position to activate the one-shot extinguishing agent.

2. The most probable cause of the accident was considered to be an engine bleed air duct failure.[3]

3. The secondary cause of the accident was an internal, rear-fuselage explosion which caused fire, structural damage and loss of control.

4. The crew acted in accordance with published flight manual and checklist procedures.

5. The extant F-111C flight manual procedures for engine oil hot occurrences were found to be deficient as it did not provide for occurrences other than as a result of power reductions during periods of aerodynamic heating caused by supersonic flight.

6. There was no formal administration process for the receipt, control and actioning of USAF F-111 Safety of Flight Supplements received by Headquarters Support Command. Additionally, these supplements did not include reasoning for the change, therefore further clarification was often sought from the USAF before deciding whether the change was applicable to RAAF F-111C operations. [A supplement relating to cautionary oil hot procedures during steady state (subsonic flight) conditions had been received prior to the accident, however, further information was being followed up with the USAF. Had the change been introduced, the incident crew probably would have acted on the new information and shut down the engine after illumination of the oil hot light.]

Recommendations

Board recommendations included:

1. The USAF F-111 modification for 'Improved Fire Detection System' be installed on RAAF F-111C as a matter of urgency.

2. Introduction of formal procedures for the rapid handling of flight manual and Safety of Flight Supplement changes received from the USAF.

Changes attributable to this accident

Changes to F-111 procedures and aircraft modifications that were more than likely influenced by this accident included further amendment of the checklist actions for F-111 engine oil hot caution lamp illumination, to include actions to retard the throttle of the affected engine to idle and to close the engine bleed air shut-off valves.

[3] The BOI noted a deficient maintenance practice discovered one month after the accident could have caused similar outcomes as experienced by the incident crew. During a routine servicing of an F-111 aircraft approximately one month after the accident, it was found that the right hand engine nacelle heat shields were improperly installed. An inspection of the F-111 fleet revealed four separate cases of incorrectly installed engine nacelle heat shields including one case of complete omission of a section of heat shielding. Had this not been discovered it is probable that the flailing heat shield (caused by nacelle cooling airflow) would have penetrated the 16th stage bleed duct, which would have disintegrated the heat shield with the high pressure/temperature bleed air impinging directly on to the exposed aft fuel tank side wall.