

Fokker F27-500, G-JEAG, 17 December 1995

AAIB Bulletin No: 5/96 Ref: EW/C95/12/4 Category: 1.1

INCIDENT

Aircraft Type and Registration:Fokker F27-500, G-JEAG

No & Type of Engines:2 Rolls Royce Dart Mk 532-7 turboprop engine

Year of Manufacture:1982

Date & Time (UTC):17 December 1995 at 1352 hrs

Location:Leeds Bradford Airport

Type of Flight:Passenger

Persons on Board:Crew - 4 Passengers - 37

Injuries:Crew - None Passengers - None

Nature of Damage:No 1 engine combustion can failure

Commander's Licence:Airline Transport Pilot's Licence

Commander's Age:33 years

Commander's Flying Experience:

Last 90 days - 192 hours

Last 28 days - 62 hours

Information Source:AAIB Field Investigation

As the aircraft was passing through FL 035 on departure from Leeds Bradford Airport, the flight crew became aware of a strong burningsmell on the flight deck; shortly after this they received anaural/visual warning of a No 1 engine fire. The commander calledfor engine fire drill No 1 engine, disconnected the autopilotand prepared for a return to the departure aerodrome. When featheringhad been confirmed as completed, the engine fire extinguisher'shot one' was fired and the engine fire warning ceased. Thecommander reported that some time had been wasted trying to breakthe safety wire on the engine fire extinguisher switch guard. ATC were informed and provided vectoring for a return to visualright base Runway 14.

The No 1 cabin attendant came to the flight deck for briefingduring the shutdown, but the commander was unable to brief atthat time so she left and returned to the flight deck after the shut

down was complete. Given the minimal time available prior to landing the commander authorised a full emergency landing brief, and when good visual contact with the airfield had been established, he made a short public address announcement to the passengers. On final approach the commander informed the No 1 cabin attendant that passengers were not required to brace for landing and not to evacuate unless instructed to do so, however by this time the passengers were already briefed and were therefore left in the brace position.

A single engine landing was carried out, and, when the aircraft had been brought to a stop, the commander saw smoke coming from the No 1 engine intake and immediately ordered an evacuation to starboard and feathered the No 2 propeller. Shortly after the evacuation had commenced he noticed that passengers were exiting from the port side, and accordingly questioned a fireman (outside his side window) who stated that as smoke was also coming from the starboard brakes, the cabin staff were advised to evacuate the passengers from the aft port side. Communication difficulties were experienced throughout the emergency due to the intermittent failure of the captain's transmit facility, poor R/T and flight deck intercom bias which could not be adjusted to an acceptable level, and poor flight deck - cabin crew interphone.

Subsequent examination of the No 1 engine revealed that the No 2 combustion chamber had failed, causing damage to the intermediate magnesium casing and the No 3 combustion chamber, see photograph. The No 2 combustion chamber was sent to the AAIB for a visual examination at DRA Pyestock, from whence it was taken back to the aircraft operator's engineering facility where it, and the other combustion chambers, were examined by AAIB, the operator, the engine manufacturer and the repair agency. From there it was sent to the engine manufacturer for a detailed metallurgical examination.

The No 2 combustion chamber had failed after use following a second repair, whereas the remaining combustion chambers in the set were only on their first repair. The No 2 combustion chamber therefore had a flametube barrel that had accumulated approximately 3,000 hours more than the other six combustion chambers. Most gas turbines will show a range of combustion chamber lives and it is not uncommon for there to be a factor of four between the shortest and longest life flametube, and although the level of damage in the No 2 combustion chamber was unusually high, at least one of the 'younger' flametubes had already started to show considerable distress.

The examination of a number of Dart combustion chambers showed that the common forms of deterioration were:

Overheating and cracking of the flametube in the region of the secondary holes;

Cracking of the suspension bridge attachment areas;

Localised destruction of cooling strips with associated cracks linking the cooling air feed holes.

It is possible that these various forms of damage combined to create a large hole in the No 2 combustion chamber. The combustion chamber had a large number of cracks distributed around the barrel in the region of the secondary holes, so that it was not likely that the hole was caused by poor flame distribution; water spray testing of the fuel nozzle did not show any degradation of the spray pattern which would have caused the flame to impinge on one side of the combustion chamber.

The metallurgy report concluded that: *'The failure of the flame tube was considered to have occurred primarily by thermal fatigue propagation from pre-existing bridge piece repair weld defects which had resulted in holing of the centre section. The precise failure origin could not be identified due to post failure oxidation/burning and loss of centre section material.'*

A number of other cracks were evident at the two remaining weld repaired bridge piece locations. These had occurred by thermal fatigue propagation from weld defects.

The standard of repair welding at the bridge piece locations and at air hole positions was considered to be of extremely poor quality.'

The appropriate agencies have liaised to ensure the achievement of improved quality standards at the repair agency.

The interphone communication difficulties were partially caused by a the load shedding procedure used by the crew during the emergency which temporarily interrupted communication power. The operator is investigating possible modification action to rectify this problem, and Flight Deck Procedures have been reviewed.