

Fokker F27 Mark 050, G-UKTI

AAIB Bulletin No: 5/2001 **Ref:** EW/G2000/11/11 **Category:** 1.1

Aircraft Type and Registration: Fokker F27 Mark 050, G-UKTI

No & Type of Engines: 2 Pratt & Whitney Canada PW-125B turboprop engines

Year of Manufacture: 1993

Date & Time (UTC): 24 November 2000 at 0630 hrs

Location: Teeside Airport, Co Durham

Type of Flight: Public Transport (non revenue positioning)

Persons on Board: Crew - 4 - Passengers - None

Injuries: Crew - None - Passengers - N/A

Nature of Damage: None

Commander's Licence: Airline Transport Pilot's Licence

Commander's Age: 36 years

Commander's Flying Experience: 3,300 hours (of which 930 were on type)

Last 90 days - 150 hours

Last 28 days - 68 hours

Information Source: Aircraft Accident Report Form submitted by the pilot and telephone enquiries by the AAIB

History of the flight

As the aircraft climbed through 1000 feet agl shortly after take off on a positioning flight for Amsterdam, the flight deck door was opened and the commander was informed by a member of the cabin crew that the cabin was filling with smoke. The commander looked back, but was unable to see further than some 1.5 metres past the cabin crew member due to the density of the smoke. The flight deck then also began to fill with smoke, which was coming through the air vents and the open flight deck door. The commander transmitted a Mayday call to ATC and was cleared to return to land. The first officer turned the aircraft downwind to perform a left hand visual circuit at 1700 feet agl and both air conditioning packs, bleeds and re-circulation fans were turned OFF. Both pilots donned their oxygen masks and actioned the Emergency Checklist. After the air conditioning system had been switched off, the smoke stopped entering the cabin. Both cabin crew members also donned their smoke hoods, but the density of the smoke in the cabin was such that they had experienced difficulty in seeing the tear seals on the silver protective bags containing the smoke

hoods. The aircraft landed successfully on Runway 23 and was stopped on the runway, with the Airport Fire Service in attendance, and the engines were shut down.

The commander commented in his report that there had been a communication problem between the cabin crew and the flight crew. The No 1 cabin crew member had been unable to contact the flight deck on the interphone system to inform the commander about the smoke situation and had to release her seat belt and open the flight deck door in order to communicate directly. Use of the interphone system normally sounds a buzzer on the flight deck, but the buzzer is inhibited above a speed of 80 kt, for a period of 40 seconds; during this period on take off when the buzzer is inhibited, an interphone light is illuminated instead and this is located in the area of the centre pedestal on the flightdeck. However, this light was not within the normal visual scan of the flight crew so that they were not aware of the attempt to communicate via the interphone.

Previous incidents

This incident occurred on the 24 November, two days after this aircraft had arrived at Humberside. After that arrival, a large amount of oil had been observed on the lower engine cowl of the right engine, aft of the spinner, and around the engine intake. Upon inspection, the reduction gearbox propeller shaft seal was thought to have failed. The operator had experienced similar leaks around this seal on another type of aircraft which was fitted with the same engine type. Oil leakage could occur from the propeller shaft seal in the reduction gearbox due to this seal wearing a 'groove' in the seal runner, which secures the seal, allowing oil to escape past the seal. The right propeller was therefore removed, a new reduction gearbox shaft seal fitted and the propeller refitted. Engine ground runs were then performed satisfactorily and the aircraft was returned to service.

On the following day, the 23 November, the aircraft had been scheduled for a passenger flight to Amsterdam. However, during the take off run the first officer noticed thick smoke seeping through from the cabin onto the flight deck and the take off was therefore aborted. The aircraft was brought to a halt on the runway, the air conditioning bleed air was switched OFF, and the smoke disappeared. The aircraft then returned to the stand where the passenger disembarked normally. The commander's report commented that the cabin crew could not inform the flight deck of the problem due to the inhibition of the interphone system during the take off phase.

Engine ground runs were subsequently performed at full power and the air conditioning system checked, but the defect could not be reproduced. A trace of oil was found under the right engine nacelle, but this was thought to be residue from the previous work. However, since oil in this area was likely to be injected through the air intake, it could have contaminated the compressor air bleed for the air conditioning system and thus have caused the smoke to appear within the cabin. The oil was therefore cleaned away and an entry made in the Technical Log for the engine nacelle to be checked for oil traces and cleaned after every flight. The aircraft was then returned to service and during a positioning flight the incident in question then occurred.

Engineering investigation

Examination of the aircraft by engineering personnel after the incident on 24 November showed that there were further traces of oil beneath the right engine. The reduction gearbox propeller shaft seal was again replaced. However, on this occasion an additional oil leak was also found in the area of the air intake, emanating from the rear of the propeller feathering pump. The propeller feathering pump was therefore changed. Later strip examination of the feathering pump confirmed that it was

defective and leaked oil. The operator had not experienced any previous problems with this type of feathering pump.

High speed taxi runs were then performed. There was further evidence of oil traces on the right engine cowlings and right hand side of the fuselage. These oil deposits were cleaned and another engine ground run performed at 80% torque for 5 minutes. There were no further oil leaks observed and the aircraft was then returned to service.

Discussion

Source of the smoke

The source of the oil leak appeared to have been misidentified initially as emanating from the reduction gearbox propeller shaft seal. Since such seals are damaged by the process of removal, it was not possible to substantiate that this seal had been leaking when installed. Previous experience on the same engine type fitted to another type of aircraft had shown that this particular seal could leak oil, although there had been no history of such seal problems on this particular aircraft type. It appeared that the propeller feathering pump oil leak problem which was latterly identified had been the reason for the previous oil leaks. The feathering pump is exercised prior to the first flight of the day as part of flight crew checks. This check was performed prior to the incident flight in question and prior to the incident on 23 November. This defective pump would have leaked oil into the right engine intake prior to each of the incident take offs, causing the oil to be mixed with the hot compressed air bled into the air conditioning system, producing the oil 'smoke/mist' in the cabin. The feathering pump would not normally have been exercised as part of the engineering ground runs. This might have accounted for the failure of these engine ground runs to reproduce the reported oil smoke/mist effects. The airline's engineering contractor has since issued Engineering Bulletin (EB) 161 on 8 March 2001 to highlight this aspect.

Interphone inhibition

The communication problem between the cabin crew and flight crew was due to the designed inhibition of the interphone system audio alert, for a period of 40 seconds, during take off when the airspeed exceeds 80 kt. The related concept of the 'sterile cockpit' has been developed with the intention that flight deck crew are not distracted unnecessarily by non-critical messages during certain phases of flight. On this aircraft type, there are a number of other messages and cautions which are also inhibited.

These communication difficulties were discussed with CAA, which commented:

'The intercom system is designed in this way to ensure that the flight crew are not distracted during the critical take off phase, either on the runway or during the initial climb. This being so, many aircraft types have similar systems which suppress alerts which could result in an unwarranted rejected take off from speeds near V1 or result in excessive distraction to the crew during the critical time immediately after lift-off. This period of time is typically between thirty and fifty seconds, starting from a speed

somewhat below V1. The duration of the alert suppression is based on the length of time taken for an aircraft to become airborne and climb away from the airport.'

Cabin crews are trained to alert the flight deck crew of an emergency and had endeavoured to do so in this incident. However, the cabin crew were not expecting the audio alert inhibition and therefore when the interphone system did not elicit a response from the flight deck, the No 1 cabin crew member released her seat belt in order to open the flight deck door and inform the flight crew of the smoke problem. The operator did report that the interphone inhibit function was covered during cabin crew training, but accepted that the cabin crew were taken by surprise in this incident.

The Operator has since issued a revised 'Notice to Cabin Crew' which describes the operation of the interphone inhibit and instructs:

'If you attempt to call the flight deck during this time and there is no response initially, wait at least 40 seconds and try again. However, in the event of a serious emergency, eg: fire or severe smoke, developing during the time that the communication system is inhibited, the IFS should unstrap and enter the flight deck to communicate.

There is no inhibit function during the landing phase of flight.'