

Fokker F27 Mark 500, G-JEAE, 17 December 1998 at 1448 hrs

AAIB Bulletin No: 4/99 Ref: EW/C98/12/2 Category: 1.1

Aircraft Type and Registration:	Fokker F27 Mark 500, G-JEAE
No & Type of Engines:	2 Rolls-Royce Dart 532-7 turboprop engines
Year of Manufacture:	1984
Date & Time (UTC):	17 December 1998 at 1448 hrs
Location:	Bristol Airport
Type of Flight:	Public Transport
Persons on Board:	Crew - 4 - Passengers - 25
Injuries:	Crew - None - Passengers - 1 (minor)
Nature of Damage:	None detected: No 3 mainwheel and Nos 1 & 2 antiskid units replaced as a precaution
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	31 years
Commander's Experience:	3,240 hours (of which 1,200 were on type) Last 90 days - 185 hours Last 28 days - 96 hours
Information Source:	AAIB Field Investigation

History of flight

The aircraft was on a scheduled flight from Isle of Man (Ronaldsway) Airport to Bristol Airport. The first officer was the handling pilot and the sector was part of his initial line training. The flight was uneventful and the aircraft made an ILS approach to Runway 27. The runway surface was dry and the weather was:

Surface wind 200°/14 kt

Visibility 6,000 metres

Cloud 4 octas stratus base 700 feet

7 octas stratus base 1,000 feet

Temp/DP +9/+8

QNH 1018 mb

The calculated landing weight was 16,876 kg (Max 19,051 kg) which gave a V_{THR} of 95 kt. The crosswind component for landing was 13 kt from the left; the maximum demonstrated crosswind for F27 aircraft is 30 kt.

On the runway, rudder is effective down to about 50 kt and it is stressed that it should be used as long as possible before changing to nosewheel steering. When rudder effectiveness is lost, the handling pilot transfers to nosewheel steering and calls "Your tops". The non-handling pilot then holds the control column and responds "My tops."

The crew reported that the touchdown was normal, at about 95 kt in the correct configuration, and on the runway centreline. As the aircraft slowed, the commander reminded the first officer to make full use of the rudder to keep straight. He noticed that although the first officer had applied into wind aileron initially, the control wheel had returned to about the neutral position. He called "My tops" and reapplied into wind aileron.

Shortly afterwards, at a speed of about 60 kt, the aircraft moved slightly to the right and then swung violently to the left. The commander immediately pushed on the right rudder pedal but it was evident to him that the first officer had already applied full right rudder. He moved his hand to the tiller and steered to the right. The aircraft started to turn right however he was unable to prevent it leaving the paved surface to left.

The aircraft continued to turn right and came to a halt with the left main landing gear on the grass and the right main and nose landing gears back on the paved surface. The shutdown drill was carried out and the commander took stock of the situation. As the AFS was rapidly on the scene and the aircraft occupants appeared to be in no immediate danger, he decided not to order an emergency evacuation. The passenger and crew eventually left the aircraft via steps and were taken to the terminal building.

First officer's flying experience

The first officer was in the final stage of his training on the F27, having joined the company in November after gaining his initial experience as a flying instructor. He had no significant problems during his training. At the time of the incident he had a total of 794 hours, of which 19 were on type.

Flight data recorders

The aircraft was fitted with a 30 minute recycling magnetic tape Fairchild CVR and a 25 hour duration magnetic tape Sundstrand Universal FDR. Both were removed and replayed at the AAIB. The FDR records only seven basic parameters; pressure altitude, airspeed, magnetic heading, flap position, normal acceleration and RT transmission discretes. There is no braking system information recorded. From the FDR the approach and landing appear normal. There are slight oscillations in heading during the landing run of $\pm 2^\circ$ which begin to diverge at around 60 KIAS,

firstly to the right from 265° onto 272° then left onto 241°. The 31° heading change took about 4 seconds. The aircraft then turned right again, and came to rest on a heading of 303°.

Engineering aspects

Runway examination

A detailed examination of tyre marks on the runway and the grass alongside was made during daylight on the morning after the incident. The aircraft wheel track marks were identified equally disposed either side of the runway centreline. They ran straight for about 150 metres and there was a slight move to the right followed by an abrupt swing to the left approximately 180 metres after the start of the marks: the heading changed 30° to the left and the aircraft left the runway. The ground marks showed that the aircraft was turning to the right before it left the runway surface and continued this correction so that, before the aircraft came to rest, the nose leg and right main leg were back on the runway surface. The tyres (Nos 3 and 4) on the right main leg had left distinct and even marks on the runway as they were more heavily loaded in the swerve to the left: in contrast, the No 2 tyre, on the left main leg, had left a heavy mark with the distinctive periodic pulses showing the brake applied and the anti-skid unit operating.

Aircraft examination

The aircraft was examined after the incident, in particular the landing gear, brakes, wheels and nosewheel steering system. There was no apparent fault with any of these systems and, before components were changed, the aircraft was taken for a fast taxi run to 70 kt along the runway, with flaps at 40°, simulating a landing roll. The weather conditions were very similar to those at the time of the incident and the aircraft behaved normally, with no unusual handling characteristics.

Over the following days a number of components were changed as a precaution. Some minor technical discrepancies were noted, none of which would account for the aircraft's excursion from the runway.

Analysis

There was no evidence of any significant malfunction of the braking system but the tyre marks on the runway indicated that the brakes on the left wheels had been applied gradually until the outer wheel was released by the Maxaret anti-skid system.

The tyre marks on the runway and grass were consistent with the flight crew's reports and the FDR data.

It is possible that the first officer, who is taller than average, inadvertently pressed the left brake pedal as the rudder pedal travelled backwards when he applied right rudder. Although the initial brake application may have been quite small, an increase in right rudder would have been needed to counteract it. The situation would have progressed until full right rudder was applied with a large application of left brake.

The rate of change of heading was about 8°/second and it would be unreasonable to expect the commander to have intervened any sooner than he did.

