De Havilland DHC-6 Twin Otter, VP-FBB

AAIB Bulletin No: 3/2004	Ref: EW/G2003/11/05	Category: 1.2
Aircraft Type and Registration:	De Havilland DHC-6 Twin Otter, VP-FBB	
No & Type of Engines:	2 PT6A-27 turboprop engines	
Year of Manufacture:	1982	
Date & Time (UTC):	7 November 2003 at 2040 hrs	
Location:	Rothera, Adelaide Island, British Antarctic Territory	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - 1 (Minor)	Passengers - 1 (Minor)
Nature of Damage:	Nose cone crushed, nosewheel detached, wing, fuselage and vertical stabilizer moderate damage, propellers and engines severe damage	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	43 years	
Commander's Flying Experience:	9,420 hours (of which 1,854 were on type)	
	Last 90 days - 164 hours	
Information Source:	Last 28 days - 67 hours Aircraft Accident Report Form submitted by the pilot and a report from the Operator	

Synopsis

Rothera is an airfield where the winds are known to be markedly affected by the local topography. Control of the aircraft was lost during the landing roll on the second attempt at landing in a strong easterly wind, and the aircraft came to rest inverted. The pilot's relative lack of recent experience on the aircraft type and his decision not to use full reverse thrust on landing (in the event that a go-around was necessary) were considered by both the pilot and his Chief Pilot as two of the main causal factors. Subsequent to the accident, the Operator has conducted a review of currency requirements, crosswind landing techniques and the local wind effects at Rothera.

History of the flight

The aircraft was returning to Rothera after a flight to Fossil Bluff, a forward logistic facility about 225 nautical miles to the south. Rothera Airfield is located on the coast of Adelaide Island and has a gravel runway orientated 18/36. Recent snow had been cleared from the runway, but a thaw had left the surface somewhat softer than normal. It was daylight and the weather conditions were fine.

High ground to the east of the airfield significantly affected local winds. About half an hour before the aircraft's arrival the wind had changed suddenly from a light westerly to an easterly at 20 kt gusting to 30 kt. This sudden wind change was a well known phenomenon caused by katabatic flow

from the surrounding mountains. The facilities for wind measurement at the airfield were slightly unusual. An anemometer was located roughly in the centre of the airfield, but was in the lee of buildings and of the high ground to the east. Consequently, in an easterly wind the airfield anemometer was not a particularly reliable source of information for the likely wind on the approach, but it provided useful data on the winds likely to be experienced during the landing roll. A second anemometer, located on the hill to the east, provided more reliable information on the wind affecting the general area. There were also two windsocks located one at either end of the runway.

The return flight from Fossil Bluff was uneventful until the approach for landing at Rothera. The wind for the approach was reported as 360°/10 kt at the runway anemometer and 070°/20 kts at the area anemometer. The pilot was familiar with this type of condition and decided to make an approach to Runway 36 using 20-25 degrees of flap. There was some turbulence on the approach and after landing the pilot had difficulty maintaining directional control and carried out a go-around from the runway. During the approach the pilot had noted from the sea surface that the wind was roughly easterly, and a discussion over the radio with a pilot on the ground confirmed that the windsock near the end of Runway 18 also indicated an easterly wind. The pilot therefore decided to make an approach to Runway 18, and if necessary, carry out another go-around.

The second approach to Rothera appeared normal and touchdown was about 200 metres along the runway. After touchdown the pilot applied some braking, full right rudder, and full left aileron to keep the aircraft straight and the wings level. Bearing in mind that he might have to carry out another go-around from the runway, the pilot used little or no reverse thrust. Initially directional control appeared adequate, but as the aircraft approached the mid-point of the runway it started to veer to the left and at some point the pilot attempted to use nosewheel steering to assist with directional control. Shortly thereafter he decided to carry out a go-around, but the aircraft veered further left. The nosewheel detached and the aircraft tipped to the right to the point where the right wing touched the runway surface and the aircraft flipped over in a forward somersault pivoting about the nose and the right wing tip. The aircraft rapidly came to a halt, inverted, about 520 metres from the runway threshold. The pilot and his passenger, who was seated in the right pilot's seat, attempted without success to shut down the engines using the fuel levers. They vacated the aircraft through the right cockpit window having suffered minor abrasions and some bruising. The emergency services arrived rapidly on the scene, shutdown the right engine using the fuel cut off switch and applied a foam blanket to the aircraft to prevent fire.

Ground marks examination

The operator examined the witness marks on the runway. These revealed that the aircraft started to veer to the left about 300 metres from the runway threshold roughly abeam the airfield hangar. Marks left by the right mainwheel and nose wheel indicated that there was very little weight on the left mainwheel. The nosewheel marks became deeper as it rolled along the runway, and there were indications that it was travelling sideways with the edge of the nose ski (which surrounds the nosewheel and can be lowered for snow landings) also contacting the runway surface just before the nosewheel detached. Witness marks left by the right main wheel also showed signs of sideways movement, and about 13 metres before the aircraft finally came to a halt, the right wing tip contacted the runway. All the indications pointed to the aircraft travelling very slowly when it somersaulted.

Operational aspects

The pilot and the Operator provided very full and frank reports. They made the following observations regarding the accident:

The use of flap settings beyond 20° reduce aileron effectiveness and increase the time between the aircraft touching down and the full weight of the aircraft being on the wheels. Flap settings beyond 20° are not normally advised in strong cross winds.

Because he was concerned that he might have to carry out another go-around, the pilot did not immediately apply full reverse thrust on landing. As a result the aircraft's deceleration was

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slower than normal and this would have delayed the aircraft weight settling on to the wheels. Moreover it would have extended the landing roll into an area of the runway where the surface wind changed direction and strength. The Chief Pilot considered that not bringing the aircraft to a halt quickly was the most significant causal factor.

The decision to go-around was late.

The runway was softer than normal which allowed the landing gear to dig in more readily.

There was a suitable alternate with a snow landing strip available.

Asymmetric thrust could have been used to assist with directional control.

Although legally within his currency requirements, the pilot's recent flying had been on the De Havilland Dash 7. The accident flight was his first on the Twin Otter for some months, and in retrospect both he and his Chief Pilot considered that in coming to a decision to carry out a second approach in the demanding conditions the lack of type currency should have been given more emphasis.

In addition to the above comments, the Aircraft Flight Manual for the Twin Otter cautions that the nosewheel steering should not be used until the aircraft has reached taxi speed. The Chief Pilot also explained that it was difficult to apply full into wind aileron whilst using the nosewheel steering, due to the control being mounted on the nosewheel steering control yoke. An examination of the fractured nose oleo by the Operator's engineers concluded that there had been no pre-existing fatigue.

Subsequent to this accident the Operator has conducted a review of currency requirements, crosswind landing techniques and the local wind effects at Rothera.