INCIDENT

Aircraft Type and Registration:	DHC-8-311, G-WOWA
No & Type of Engines:	2 Pratt & Whitney Canada PW123 turboprops
Year of Manufacture:	1992
Date & Time (UTC):	31 December 2006 at 1250 hrs
Location:	Newquay (Cornwall) Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 3 Passengers - 51
Injuries:	Crew - None Passengers - None
Nature of Damage:	Frangible fairing on 'touched runway' sensor broken, light abrasion damage to underside of rear fuselage
Commander's Licence:	Air Transport Pilot's Licence
Commander's Age:	49 years
Commander's Flying Experience:	7,250 hours (of which 574 were on type) Last 90 days - 48 hours Last 28 days - 21 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and Quick Access Recorder information

Synopsis

Whilst landing at Newquay (Cornwall) Airport in turbulent conditions, the aircraft's tail struck the runway. Flight data information showed that an excessive pitch attitude had been achieved just prior to touchdown, whilst the airspeed was below the intended approach speed.

History of the flight

The aircraft was operating a scheduled service between Dublin Airport and Newquay (Cornwall) Airport. The aircraft departed Dublin at 1225 hrs, with 51 passengers and a crew of three on board. The aircraft commander was the handling pilot for the flight to Newquay, which was uneventful until the landing phase. Approaching Newquay, the crew initially received radar vectors, before flying a visual approach to Runway 12 with the flap set to 15º. There was overcast cloud at 2,100 ft, with smaller amounts reported at 1,200 ft and 700 ft. There was also a strong and gusty surface wind from the south-west, blowing directly across the runway, which gave rise to moderate turbulence on the approach. The commander reported that his target speed for the approach was 10 to 15 kt above the calculated V_{REF} speed, to allow for the gusty conditions.

The crew experienced a significant downdraught when

below 100 ft above the runway, which caused a large speed fluctuation and attitude change. The co-pilot announced the speed loss and the commander corrected the situation. However, this was followed by a further disturbance at about 10 to 15 ft above the runway. The commander reported that the touchdown was smooth, although a caution light illuminated, alerting the crew to a pitch attitude in excess of 6º. A TOUCHED RUNWAY warning light also illuminated during the landing roll, informing the crew that a sensor beneath the aft fuselage had registered a contact with the runway. The commander did not recall an excessively large pitch attitude during the landing.

Meteorological information

A strong south-south-westerly airflow was affecting the area, ahead of a cold front which was approaching at 40 to 55 kt. The forecast, issued at 0730 hrs, was for a surface wind from 200º(M) at 15 kt, gusting to 25 kt, increasing in strength during the morning to 25 kt, gusting to 38 kt. The 0750 hrs weather report for Newquay Airport showed a southerly wind of 16 kt. Immediately after landing, ATC broadcast a surface wind of 25 to 30 kt with a recent gust to 36 kt.

Aircraft information

According to the aircraft load sheet, the landing mass was 41,649 lbs, which was 349 lbs below the maximum permitted for landing. At this mass, the V_{REF} would have been 108 kt with the flaps set to 15º. In accordance with the operator's Standard Operating Procedures, an additional margin should then be added to the V_{REF} to allow for wind effects. This figure would normally be half of the reported steady wind speed, plus the full reported gust factor, with a maximum total additive of 20 kt.

Landings are normally made with the flaps at 15º, although they can be made with flaps at 35º for specific reasons, such as for short runways. With flaps set at 15º for landing, the maximum acceptable wind strength from the reported direction was 31 kt. Aircraft technical publications alerted crews to the possibility of a tailstrike if the pitch attitude exceeded 6º during the landing.

Recorded data

Flight data from the aircraft's Quick Access Recorder showed that the aircraft initially descended to an altitude of about 2,300 ft, before descending further to 1,300 ft (about 1,000 ft aal). After a further 30 seconds the aircraft commenced its final descent, initially at a low rate of between 200 and 300 ft/min. At an altitude of about 800 ft the aircraft crossed the coastline (indicated by a step change of radio altitude) and thereafter flew a steady descent which averaged between 600 and 700 ft/min. This equated to an approach angle of about 3.4º.

The relevant recorded parameters for the latter stages of the approach are shown at Figure 1. As the aircraft descended on final approach, the speed remained at or above the 118 to 123 kt band (V_{REF}+10 to V_{REF}+15 kt) with a pitch attitude of between 2º and 3º. From about 16 seconds before touchdown, the flight data showed increasing pitch excursions which were countered by elevator input. The recorded pitch and elevator signals became out of phase, and both increased in amplitude as the aircraft continued its descent. This divergence culminated in two significant pitch excursions, at 6 and 2 seconds before touchdown. In the first case, the pitch attitude reached a maximum of 10.5º at a radio altitude of 24 ft, even after a significant corrective nose-down elevator input had been made. The pitch attitude then reduced to between 2º and 3º momentarily, before increasing again to reach 10.6º, at a recorded radio altitude of 11 ft.

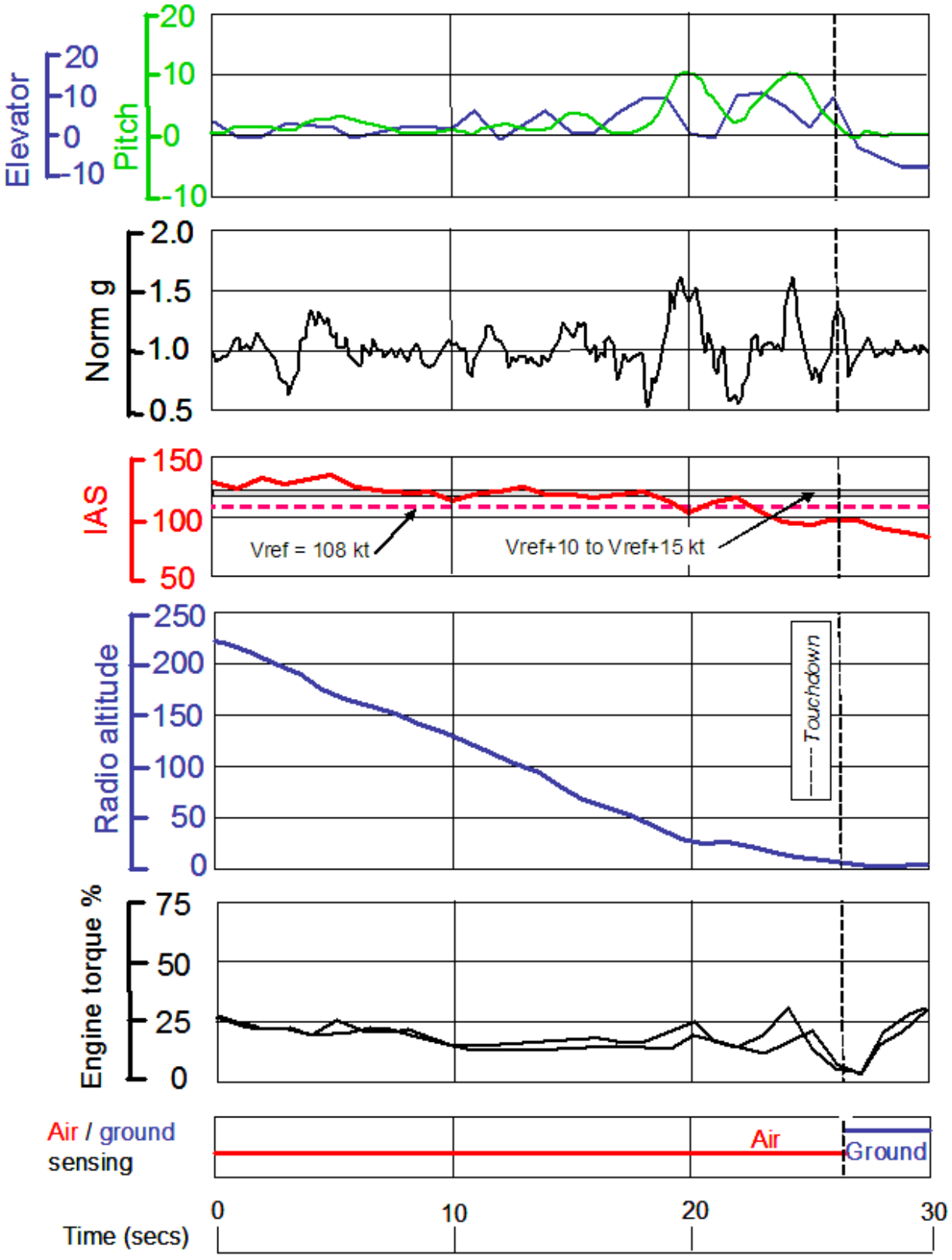

Figure 1

Relevant flight data parameters

During the first significant pitch excursion, the airspeed dropped to 105 kt (V_{REF} -3 kt), before recovering somewhat as the pitch attitude reduced. The airspeed then showed an overall downward trend for the remainder of the landing phase, reducing to 94 kt (V_{REF}-14 kt) at the peak of the second pitch excursion, just prior to the landing. The touchdown itself was recorded with a pitch attitude of 2º to 3º and an airspeed of 98 kt, and the pitch attitude at the point of touchdown was decreasing at a rate of about 5º per second. The peak normal acceleration at touchdown was 1.2 g, which was less than that associated with the two previous pitch excursions (about 1.4 g).

Engine torques remained steady as the aircraft neared the runway, but increased in response to the loss of airspeed associated with each pitch-up event. The maximum torque recorded by either engine below 100 ft was 31.2%. Pitch trim was in use during the approach, varying between 2.7 and 3.8 units of applied trim. During the final 200 ft the pitch trim remained steady at 3.1 units.

Discussion

The flight data showed that a stable approach was achieved initially, but that this became unstable at a late stage, probably due to a combination of the gusty conditions and the associated large control inputs. During the final stage of the approach the airspeed decayed to 94 kt, significantly below both V_{REF} and the target approach speed.

The significant downdraught reported by the commander below 100 ft is likely to be associated with the observed pitch excursion at about 24 ft, and the consequent loss of airspeed. Although some engine thrust was added to counter the speed loss, this was not effective and, after a brief recovery, the speed continued to decay until touchdown. It was during the second pitch excursion, shortly before main wheel touchdown, that the tail most probably contacted the runway. The flight data supports the commander's recollection that the touchdown itself was not at an exaggerated pitch attitude.