

INCIDENT

Aircraft Type and Registration:	Reims Cessna F406 Caravan II, G-FIND	
No & Type of Engines:	2 Pratt & Whitney Canada PT6A-112 turboprop engines	
Year of Manufacture:	1989 (Serial no: 0045)	
Date & Time (UTC):	25 September 2016 at 1540 hrs	
Location:	En route cruise	
Type of Flight:	Training	
Persons on Board:	Crew - 2	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	None notified	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	52 years	
Commander's Flying Experience:	15,000 hours (of which 389 were on type) Last 90 days - 87 hours Last 28 days - 13 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and information supplied by the aircraft operator	

Synopsis

While in cruising flight with the autopilot engaged, the aircraft suddenly pitched nose down. The handling pilot had difficulty controlling the aircraft until the autopilot was disengaged and the pitch trim, which had run significantly nose down, was returned to a normal setting. The autopilot was not re-engaged and the aircraft landed without further incident.

History of the flight

On the day of the incident, the aircraft was flying a series of four training flights for the purpose of conducting Proficiency Checks on two company pilots. On board were the aircraft commander, who was the examining pilot, and the two pilots undergoing check. Between flights, the occupants changed seats as necessary to meet the check requirements.

While carrying out control checks before takeoff on the second of the series of flights, the crew noticed that the pitch trim wheel operated and the pitch trim ran forward (nose down sense). The crew were unsure if the movement, which appeared to be in three separate bursts, had been the result of inadvertent operation of the electric trim switch during the control checks. They therefore repeated the control checks three times before takeoff while monitoring the pitch trim, with no movement or other unusual indications evident. The aircraft then completed the second and third flights without incident.

The fourth flight originated at Coventry Airport and was to include a visual circuit at Coventry with one engine simulated inoperative. This was to be followed by restoration of normal engine power and a transit to East Midlands Airport (where the aircraft was based), where the proficiency check profile would be completed. The pilot under check occupied the right hand seat for the flight.

Following the circuit at Coventry, the aircraft started a climb to 3,000 ft for the transit. The autopilot was engaged at 1,500 ft but, on passing 2,500 ft, it disconnected, accompanied by associated audio and visual warnings. The climb to 3,000 ft was completed manually and the autopilot re-engaged once in stable, cruise flight. It was engaged in 'HEADING' and 'ALTITUDE HOLD' modes.

As the aircraft neared East Midlands, the aircraft suddenly pitched nose-down. The handling pilot reported that he immediately tried to correct the nose down pitch by pulling back on his control wheel and pressing the autopilot disconnect button mounted on it. Neither pilot heard an aural warning that would have indicated that the autopilot had disengaged, and increasing back pressure was required on the control wheel as the aircraft continued to pitch nose down. The handling pilot therefore reached across and operated the disconnect button on the left control wheel and also set the autopilot master switch on the main instrument panel to OFF. Again, neither pilot recalled hearing the autopilot disconnect aural warning.

The aircraft was by this stage in a 10° nose-down pitch attitude with increasing airspeed. The handling pilot placed both hands on the control wheel and commented that he was having difficulty flying the aircraft. The commander noticed an abnormally forward pitch trim indication, so manually reset the trim to the takeoff setting (between one and a half and two revolutions of the pitch trim wheel were required). This allowed the handling pilot to fly the aircraft normally while making his own manual pitch trim inputs. Neither pilot had noticed the pitch trim in motion before or during the incident. The remainder of the flight was flown manually without further incident.

Previous occurrences

G-FIND, 6 September 2007 (AAIB Bulletin 6/2008)

G-FIND was involved in an earlier incident which bore some similarities with this incident and which was the subject of an AAIB field investigation. In that incident, which also occurred during a crew training flight, control restrictions were encountered. Although the technical investigation was inconclusive, it was considered likely that an accidental and undiagnosed autopilot engagement had occurred during what was intended to be manual flight.

G-TWIG, 22 October 2004 (AAIB Bulletin 7/2006)

In this fatal accident, G-TWIG deviated suddenly from controlled flight and struck the ground in a steep dive and at high speed. There was extreme fragmentation of the wreckage and, although major airframe and power plant failures were discounted, there was insufficient evidence to draw firm conclusions about the reasons for the accident.

The investigation included a detailed examination of pitch trim system components, and concluded that the trim setting at the time of the accident equated to an almost fully nose down trim condition. The investigation could not discount the possibility of an electric trim malfunction, although flight tests carried out as part of the investigation indicated that the control forces associated with such a nose-down trim condition *'could be overcome with little difficulty'*.

The investigation also considered the possibility of an autopilot malfunction. Specifically, a spurious nose down input followed by failure of a safety system which was intended to disengage the autopilot if the nose-down pitch angle exceeded 21°. It was determined that the control forces to counter to failure may have been significant, but that the expected response would have been to switch off the autopilot and manually re-trim the aircraft.

Action by the aircraft operator

The Air Data Computer and Autoflight Computer were removed from G-FIND and replacement units installed. The operator did not intend to refit the original units, but they were returned to the manufacturer for strip down and fault diagnosis. At the time of writing, the operator was awaiting reports on this work.

As a result of the G-FIND incident of September 2007, the aircraft operator contracted an approved design organisation to develop an autopilot system modification. The modification introduced a prominent autopilot disconnect switch and warning light, allowing a pilot to isolate the autopilot servos and trim actuator to quickly establish manual flight if necessary.

The switch introduced by the modification had been used successfully in the incident of 25 September 2016. As a result, three newly acquired F406 aircraft were being similarly equipped at the time of writing.