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AAIB
Air Accidents Investigation Branch

AAIB Bulletin S2/2021 *SPECIAL*

SERIOUS INCIDENT

Aircraft Type and Registration:	Boeing 737-8K5, G-FDZF
No & Type of Engines:	2 CFM56-7B27/3 turbofan engines
Year of Manufacture:	2008 (Serial no: 35138)
Date & Time (UTC):	11 September 2021 at 1240 hrs
Location:	Aberdeen Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 6 Passengers - 67
Injuries:	Crew - None Passengers - None
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	56 years
Commander's Flying Experience:	15,490 hours (of which 1,524 were on type) Last 90 days - 67 hours Last 28 days - 62 hours
Information Source:	AAIB Field Investigation

Introduction

At 1341 hrs on 13 September 2021, the AAIB was informed that a serious incident had occurred to Boeing 737-800, registration G-FDZF, during a go-around at Aberdeen Airport on 11 September 2021. The AAIB began an investigation assisted by the operator, the National Transportation Safety Board in the USA, and the aircraft manufacturer.

During the go-around, which was initiated at 2,250 ft amsl, the aircraft initially climbed, but just before it reached the cleared altitude of 3,000 ft amsl it began to descend. It descended to 1,780 ft amsl (1,565 ft agl) with a peak rate of descent of 3,100 ft/min, and it accelerated to an airspeed of 286 kt (the selected airspeed was 200 kt) before the crew corrected the flightpath.

The pilots of G-FDZF, like many other pilots, had not flown for significant periods during the 18 months before this incident. Although the investigation has not established a link between this incident and a lack of recent line flying, it is clearly a possibility. Therefore, this Special Bulletin is published to raise awareness of this event and to highlight that go-arounds from intermediate altitudes on an approach can provoke errors because they are not practiced frequently.

History of the flight

The crew of G-FDZF had operated a passenger flight from Newcastle International Airport to Palma de Majorca before operating the incident flight from Palma to Aberdeen Airport. The aircraft departed Palma at 1047 hrs with 67 passengers and 6 crew on board. At 1230 hrs the flight crew established contact with Aberdeen Radar for a radar vectored CAT I ILS approach to Runway 34 at Aberdeen. At 1235 hrs, as the aircraft was descending through 5,100 ft amsl, the crew were informed by ATC that there was a possibility that they may have to discontinue the approach, in which case they should expect a climb straight ahead to 3,000 ft amsl. This was because a search and rescue helicopter, which was currently on the ground at the airport, would take priority once airborne.

The crew established the aircraft on the localiser and glideslope at 3,000 ft amsl with the aircraft configured with the gear down and flap 15. A single autopilot was engaged, as was the autothrottle. At 2,600 ft amsl the aircraft was instructed by the radar controller to break off the approach, climb to 3,000 ft and turn left onto a heading of 270°. Eighteen seconds later, at 2,250 ft amsl, the aircraft began to climb towards the cleared altitude and began a left turn towards the heading. As the aircraft approached 3,000 ft amsl, the aircraft began to descend before the criteria were met for the flight director to transition from ALT ACQ[1] to ALT HOLD[2]. Further heading instructions were passed by ATC while the aircraft descended to a minimum altitude of 1,780 ft amsl, corresponding to 1,565 ft agl, after which a climb was re-established. The descent rate peaked at 3,100 ft/min as the aircraft passed 2,160 ft amsl. Figure 1 shows the aircraft's flightpath.

The tower controller noted on the radar repeater in the visual control room that the aircraft was descending unexpectedly and contacted the radar controller to advise him. This prompted the radar controller to contact the crew, instructing them to climb to 3,000 ft amsl. This call came just as the crew began to pitch the aircraft back into a climb. During the recovery the aircraft speed reached 286 KIAS[3], whereas the speed the crew had selected was 200 KIAS. As the aircraft passed through 3,000 ft amsl the crew re-engaged the autopilot and the flight path stabilised. The entire event occurred with the aircraft in IMC.

Footnote

1 ALT ACQ is a transition mode entered automatically from a climb or descent when nearing a selected altitude demand.

2 ALT HOLD commands pitch to hold the selected altitude. Successful engagement of ALT HOLD requires the altitude difference between the selected altitude and the aircraft's actual altitude to be less than 60 ft and the aircraft's rate of climb or descent to be less than 300 ft/min.

3 Aberdeen Control Zone/Area is Class D airspace, and the speed limit is therefore 250 KIAS below FL100 as described in the UK Aeronautical Publications (AIP) Part 2 – En-Route (ENR), Section 1.4, Paragraph 2.4.

The aircraft was then given a further climb, before being radar vectored for another approach to Runway 34. The subsequent approach and landing were completed without further incident.

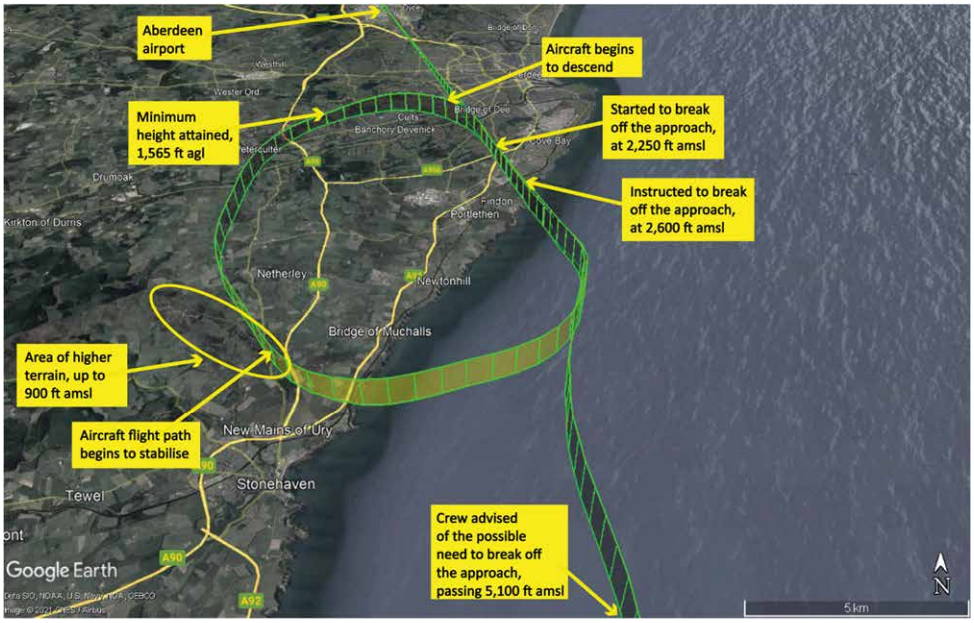

Figure 1

G-FDZF's flightpath into Aberdeen and the unintended descent

B737-800 Go Around Mode

The Boeing 737-800 is a dual autopilot, CAT III capable aircraft. Normal procedures, as outlined by the manufacturer, require the use of a single autopilot on an ILS approach unless the intention is to conduct a CAT II or III approach and landing. Automatic go-arounds are only available from a dual autopilot approach. The autopilot/flight director go-around mode is engaged by pressing the Takeoff/Go-around (TO/GA) switches. Pressing either of the switches when the engagement criteria are met will disconnect the single autopilot (if connected) and place the flight directors in go-around mode. The autothrottle (if engaged) will move to go-around thrust[4], and the flight directors will then command 15º nose-up pitch until the aircraft reaches a programmed rate of climb. Flight director pitch commands then target airspeed for each flap setting, based on a maximum takeoff weight calculation.

Recorded data

The aircraft's Cockpit Voice Recorder had been overwritten because the aircraft remained in service before the AAIB was notified of the event and the investigation began, but the data

Footnote

[4] Below 2,000 ft radio altitude, one press of a TO/GA switch will cause the autothrottle (if engaged) to advance to a power setting for a climb rate between 1,000 and 2,000 ft/min. With two presses of a switch, the autothrottle (if engaged) will advance to the full go-around N1 limit. Above 2,000 ft radio altitude, one press of a TO/GA switch commands thrust to the full go-around N1 limit (although this is not included in the Flight Crew Operating Manual and was unexpected by the crew).

from the operator's flight data monitoring (FDM) provider was available, as well as radar and R/T recordings from Aberdeen. Figure 2 shows a summary of the FDM data for the approach and the subsequent unintended descent. The four shaded areas are described below.

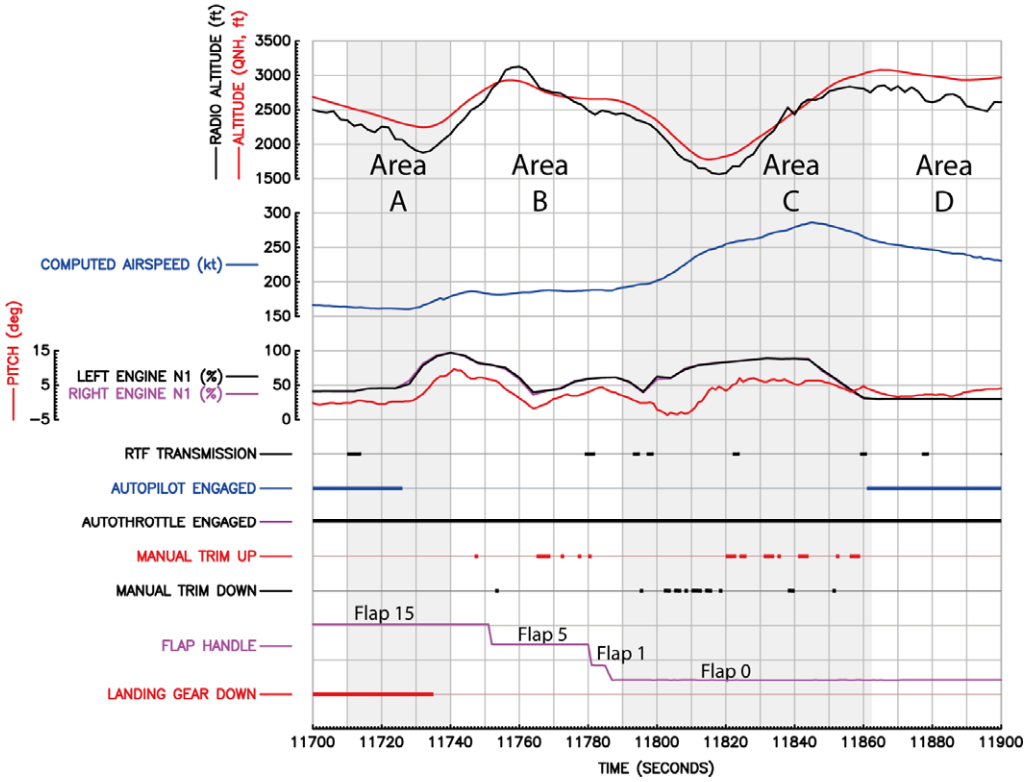

Figure 2

Flight data for the approach and subsequent unintended descent

Area A shows the flightpath from when the crew responded to the ATC instruction to break off the approach and shows the disconnection of the autopilot as the TO/GA mode was activated. It shows that the landing gear was retracted, the thrust increased towards the full go around N1 limit and the aircraft's pitch attitude increased as the aircraft climbed. Note the strong correlation between the changes in the pitch of the aircraft and engine power setting. No manual pitch trim inputs were observed in the data.

Area B shows that as the aircraft approached the selected altitude of 3,000 ft, the pitch of the aircraft decreased and the autothrottle reduced the engine power setting in anticipation of the level-off being commanded by the flight director. As the aircraft reached this point, the flaps were retracted from flap 15 to flap 5 and the aircraft then descended having failed to meet the criteria for the flight director to transition to ALT HOLD. The flaps were then further retracted from flap 5 to flap 1 and from flap 1 to flap 0 during the descent."

Area C shows the lowest altitude reached by the aircraft before it climbed again, and the peak airspeed. The climb occurred at about the same time as the crew replied to the ATC instruction to climb.

Area D shows the autopilot re-engagement and the flight path of the aircraft stabilising.

Crew recency

The crew of G-FDZF differed in their recency levels but both had experienced significant periods without flying in the preceding 18 months. The commander had flown 10 flights during the previous month. For the co-pilot, this was only his fourth flight in nearly 11 months having completed two flights with a trainer seven days before the day of this incident. Both pilots had completed numerous simulator sessions during the 18-month period to gain or retain recency or to complete their annual recurrent check.

Airlines have faced significant challenges in the last 18 months to keep crews current. Whilst there are legal requirements for crews to complete three takeoffs and landings within 90 days, there are no regulatory requirements laid out for crews to have actually operated the aircraft, especially on commercial flights. Operators have had to adapt and develop their own programmes to ensure that crews are prepared and competent to fly, often after significant periods away from the aircraft.

Simulators have been used not just for the takeoff and landing requirements but also to try and maintain crew skill levels when operating in both normal and emergency situations. The challenge has been, and is, to try and represent the real world of flying in a simulated environment. It can be difficult in the simulated environment to replicate moments of high crew workload caused by the effects of ATC instructions and background communications, the presence of other aircraft in the area, poor weather and other operational pressures. The safety benefits of simulator training are well established. However, the real-world environment creates different demands on crews, and it is possible that this event illustrates that lack of recent exposure to the real-world environment can erode crews' capacity to deal effectively with those challenges. Regulators have been concerned that pilots returning to the flight deck following extended periods without flying could be at risk of performing below their normal standard during their first few flights. Although this investigation has not established a link between this event and a lack of line flying, this Special Bulletin is published for awareness and because a link is clearly one possibility.

Other go-around incidents

Two-engine go-arounds can be difficult manoeuvres for crews to fly properly because they are often unexpected and are only encountered infrequently during line flying and simulator training. The AAIB has investigated other go-around incidents which have similarities to G-FDZF[5] and the Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (BEA) recently published a report into a similar incident at Paris Orly Airport[6].

Footnote

[5] Report into the serious incidents involving G-THOF, https://www.gov.uk/aaib-reports/aar-3-2009-boeing-737-3q8-g-thof-23-september-2007 (accessed November 2021), and I-NEOT, https://www.gov.uk/aaib-reports/aaib-investigation-to-boeing-737-86n-i-neot (accessed November 2021).

[6] https://www.bea.aero/en/investigation-reports/notified-events/detail/serious-incident-to-the-boeing-737-registered-7t-vjm-operated-by-air-algerie-on-06-12-2019-at-paris-orly/ (accessed November 2021).

Aircraft deviation from the expected flightpath

The aircraft descended from close to 3,000 ft for 57 seconds before a climb was re-established, and this represented a significant deviation from the crew's expected flightpath. There was a high rate of descent, which was reducing the aircraft's separation from terrain, and an uncommanded and undesirable increase in airspeed that were not corrected in a timely manner.

Further work

The investigation continues to examine all pertinent operational, technical, organisational and human factors which might have contributed to this serious incident. In particular, work will be undertaken to:

- Assess the impact of the lack of recent flying on the actions of the crew.
- Assess the effectiveness of the barriers to crews recognising that there has been a significant deviation from the expected flight path.
- Ensure the flight director behaved as expected.
- Consider the effect of ATC instructions during the go-around and, subsequently, during periods of high crew workload.

Published: 2 December 2021.