SERIOUS INCIDENT

Aircraft Type and Registration:	Boeing 737-86N, I-NEOT	
No & Type of Engines:	2 CFMI CFM56-7B26 turbofan engines	
Year of Manufacture:	2002 (Serial no: 33004)	
Date & Time (UTC):	1 June 2019 at 1319 hrs	
Location:	Bristol Airport	
Type of Flight:	Commercial Air Transport (Passenger)	
Persons on Board:	Crew - 6	Passengers -167
Injuries:	Crew - None	Passengers - None
Nature of Damage:	None reported	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	55 years	
Commander's Flying Experience:	14,750 hours (of which 10,770 were on type) Last 90 days – 174 hours Last 28 days – 60 hours	
Information Source:	AAIB Field Investigation	

Synopsis

During an unstable approach to Runway 27 at Bristol Airport, I-NEOT descended below the approach path before being instructed to go around by the tower controller. After initially climbing away as expected during the go-around, the aircraft then descended for over 30 seconds reaching a minimum radio altitude of 457 ft. Simultaneously, the crew and the controller realised the aircraft was not climbing away as they expected. The crew corrected the flight path and the aircraft was vectored for a further uneventful approach.

The loss of altitude occurred because the target altitude on the Mode Control Panel was set to the minimum altitude for the approach having not been set to the missed approach altitude before the go-around. Neither crew member noticed initially that the aircraft was descending.

The operator has taken two safety actions as a result of this incident. They have used this incident as part of their annual recurrent ground school to highlight the risks of rushed and unstable approaches. They are also continuing to work on their flight data monitoring programme so that similar approaches will be identified more rapidly and easily in future.

History of the flight

I-NEOT took off from Verona Villafranca Airport at 1135 hrs for a flight to Bristol Airport. At 1313 hrs the crew contacted Bristol Airport radar (callsign Bristol Approach). The crew were advised they had 33 nm to touchdown, and to expect the RNAV (GNSS) Runway 27

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approach[1]. The distance is given to crews to assist them in planning their descent. The controller then offered the crew a shorter routing which would give them a track mileage of around 23 nm to the runway threshold. The crew accepted the offer and were radar vectored accordingly. At the point the new routing was offered the aircraft was at FL100 and a Computed Airspeed (CAS) of 280 kt. Once the aircraft began its descent, the crew set the airport QNH of 1019 hPa[2], deployed the speed brakes and increased the Selected Airspeed to 300 kt. As the aircraft passed through 4,715 ft at a vertical speed of -3,000 ft min, the CAS reached 303 kt before starting to decrease.

The controller routed the aircraft direct to the intermediate fix[3] which was at 9.8 nm from the threshold of the runway. This point was named ELROV and the procedure limited the aircraft to a maximum of 210 kt, with an expected altitude of 2,500 ft or above. I-NEOT crossed ELROV at 3,276 ft and 271 kt CAS. The approach chart from the UK Aeronautical Information Publication is shown in Figure 1.

Approximately 11 nm from Bristol Airport, the crew attempted to engage the autopilot vertical navigation mode (VNAV) to perform the approach but the mode would not remain engaged and instead switched to Level Change mode (LVL CHG).

The aircraft descended along the approach path in LVL CHG mode with idle thrust, approximately 250 ft below the designated path with the speed significantly above that needed to fly a stabilised approach. As the aircraft descended, the Mode Control Panel (MCP) altitude remained set at the approach minima[4] (1,000 ft). This meant that as the aircraft approached 1,000 ft, the autopilot/flight director system (AFDS) entered Altitude Acquire vertical mode (ALT AQ). This mode allows the aircraft to level off at the MCP selected altitude. Although the rate of descent decreased, the aircraft remained significantly below the designated path.

At this point the tower controller was engaged with an aircraft pushing back on the apron, but his attention was drawn to I-NEOT by the assistant who was concerned about its altitude. The controller considered that the aircraft was not in the position he would expect and instinctively instructed the crew to go-around. The aircraft was at 1,071 ft (675 ft radio altitude) and 151 kt CAS. The instruction was acknowledged by the crew.

The PF pressed the TOGA[5] button and requested that the flaps be retracted to the setting required for a go-around. As designed, the autopilot disconnected, and the flight director commanded a pitch up. The PF followed the flight director, flying the aircraft manually, and the aircraft began to climb away as expected. However, the altitude selector on the MCP remained at the altitude the crew had set for the approach (1,000 ft) rather than the

Footnote

[1] See later section: RNAV (GNSS) approaches.
[2] Unless otherwise stated, all vertical points in this report refer to aircraft altitude based on that QNH.
[3] Intermediate fix – a fix which marks the end of an initial segment and the beginning of the intermediate segment of the approach.
[4] Approach Minima –altitude below which the aircraft must not descend unless appropriate visual references are established.
[5] Takeoff/Go-around.

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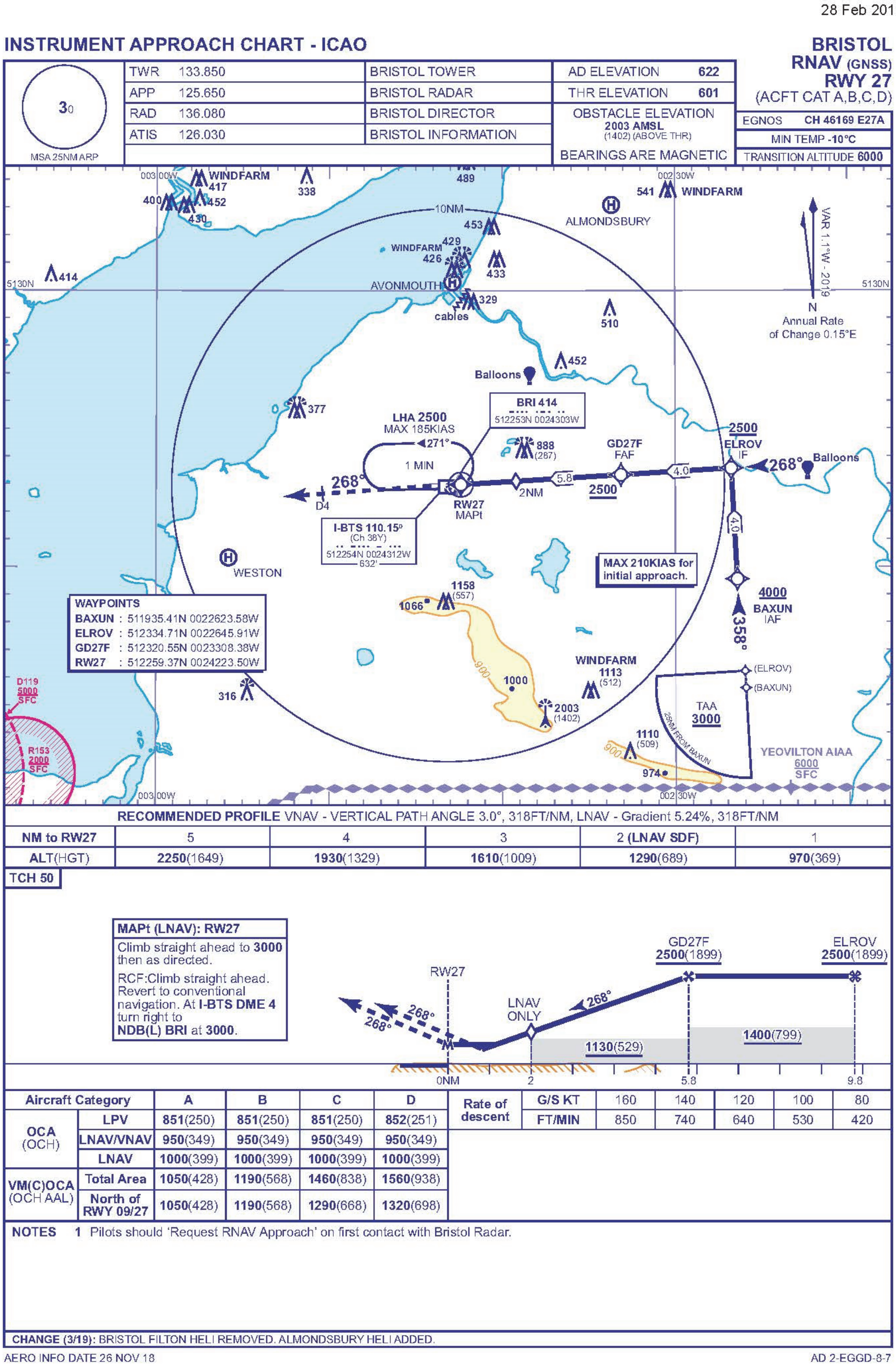

Figure 1

Approach Chart for RNAV (GNSS) Runway 27 go-around altitude (3,000 ft). As a result, the flight director began to command a descent in order to capture the selected altitude, and its vertical mode entered ALT AQ. The aircraft reached 1,302 ft before it began to descend. At some point after this engagement of ALT AQ the crew reselected the correct go-around altitude on the MCP. This action caused the flight director vertical mode to drop out of ALT AQ mode and into vertical speed mode (V/S). This mode maintains the rate of climb or descent of the aircraft at the time that the mode engaged, which in this case was a descent.

The PF followed the flight director, and the aircraft continued to descend for 32 seconds reaching a minimum of 1,047 ft, which was 457 ft radio altitude[6]. The crew then realised that the aircraft was not climbing as expected and adjusted the attitude of the aircraft to begin a climb. Almost at the same time, the tower controller noted that the aircraft was not climbing and instructed I-NEOT to climb to 3,000 ft which was acknowledged by the crew.

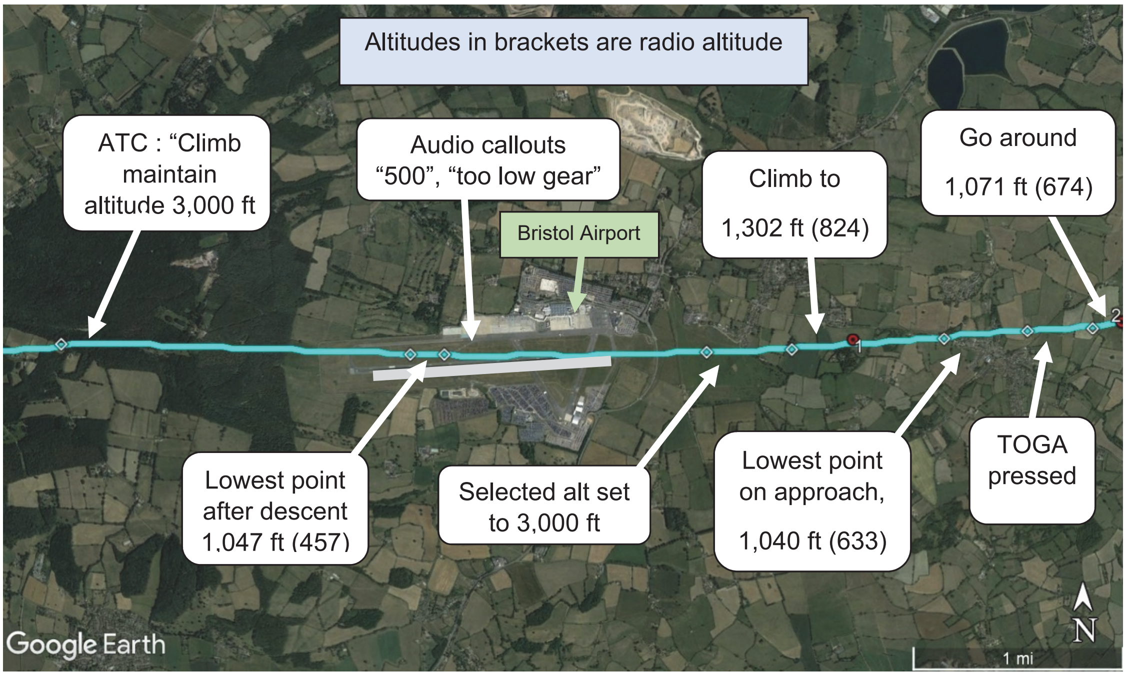

Figure 2
I-NEOT go-around

The crew of I-NEOT was given radar vectors to complete a further approach to landing which was completed without incident.

Airfield information

Bristol Airport is located on a hill to the south of the city of Bristol. The airport elevation is 622 ft amsl, with Runway 27 having a threshold elevation of 602 ft amsl. The airport has a single runway, orientated 09/27 which is 2,011 m long. Runway 27 has a landing distance available of 1,881 m.

Footnote

6 Radio altitude is height above ground level measured by a radio altimeter.

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On the day of the incident, the glide path for the ILS on Runway 27 was not available due to work in progress to the south side of the airfield. The details of this unavailability were issued in a NOTAM that the crew received as part of their pre-flight briefing. The NOTAM instructed the crews to expect radar vectors to an RNAV (GNSS) approach to Runway 27 if the westerly runway was in use.

Meteorology

The weather conditions on the day of the incident were fine with a ridge of high pressure bringing warm, dry and mostly sunny conditions to the area. The wind was southerly with an average wind speed of less than 10 kt. At the time of the approach and go-around the visibility at the airfield was greater than 10 km with the cloud reported as scattered at 3,900 ft aal.

Aircraft information

The Boeing 737-800 (B737-8) auto-flight system has a dual AFDS and an autothrottle (A/T) which are controlled through the MCP and the Flight Management Computer (FMC). The MCP allows for the selection of desired modes for the AFDS and A/T. Mode status is displayed to the pilots at the top of both primary flying displays (PFD). These mode displays show the status of the AFDS, A/T modes, pitch modes and roll modes. Mounted on the thrust levers are two TOGA buttons. Pushing either of these buttons will engage the AFDS and the A/T in either takeoff or go-around mode, depending on the phase of flight, if the A/T has previously been armed.

Unless the aircraft is flying an ILS, only a single autopilot may be engaged at a time. With a single autopilot engaged, it will automatically disengage when a TOGA button is pressed. A go-around flown automatically is only available from an approach with dual autopilot engagement on an ILS.

With the first push on a TOGA button, the AFDS enters TOGA mode. The A/T (if engaged) advances the thrust levers to a reduced go-around setting which produces a 1,000 to 2,000 ft/min rate of climb. A second push of a TOGA button will increase the thrust to the go-around N_1 limit. The autopilot will disengage (if engaged) and the flight director pitch command will provide guidance on the PFD to 15° nose-up. The flight director pitch will maintain this guidance until the programmed rate of climb is reached at which point it will command a target pitch to maintain a pre-programmed airspeed for the current flap setting. TOGA mode will terminate once ALT AQ engages although this does not occur before the aircraft reaches the pre-set rate of climb.

VNAV mode provides guidance commands for the vertical flight path and, for an RNAV approach, guidance is provided relative to a pre-programmed vertical profile. If the flight director is selected, the guidance is displayed on the PFD and, if the autopilot is engaged, the aircraft will automatically follow the guidance. Calculations for VNAV guidance are limited such that if the aircraft cannot converge to the required vertical profile VNAV will not engage.

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A further AFDS pitch mode is LVL CHG. This mode will execute a climb or descent to the MCP selected altitude at the selected or current speed. For a descent in LVL CHG the thrust will be set to idle if the A/T is engaged.

A landing gear configuration warning horn is provided to warn the flight crew when system logic considers a landing is being attempted with the landing gear not extended. This is a steady warning horn which alerts the crew any time the aircraft is in landing configuration and any landing gear is not down and locked. Criteria for triggering this warning horn depends on flap setting, radio altitude and thrust lever position.

The Enhanced Ground Proximity Warning System (EGPWS) also provides an alerting for protection against an unintentional gear-up landing. Mode 4A is active during cruise and approach with the landing gear and flaps not in the landing configuration; if the aircraft is below 500 ft agl and less than 190 kt CAS, a "TOO LOW GEAR" aural alert is provided.

RNAV (GNSS) approaches

An RNAV (GNSS) approach is a three-dimensional approach (ie it has lateral and vertical guidance) which uses a global navigation satellite system (GNSS). Lateral guidance is provided by GNSS, with vertical guidance provided by the flight management system on the aircraft. This vertical guidance is a defined path programmed into the database of the flight management system that is compared with the barometric altimeters in the aircraft. RNAV (GNSS) approaches are one part of Performance Based Navigation (PBN). It is possible to complete the approach using other vertical modes available on the aircraft if VNAV is unavailable. The operator will specify the procedures required to check the aircraft's actual descent path against that required for the approach regardless of the vertical mode in use. Using modes other than VNAV will increase the approach minima.

Operators regulated by EASA require approval for PBN and there are requirements for crew training and checking. The operator had approval for PBN, and the crew were trained and checked in accordance with the requirements.

The operator of I-NEOT required approaches such as this RNAV (GNSS) and other non-precision approaches to be flown using a continuous descent with no level segment at the approach minima.

Stable approaches

Many regulators worldwide have campaigned on the importance of stable approaches for reducing accidents and incidents in the landing phase of flight. The International Air Transport Association demonstrated the importance of this campaign in their report '*Unstable Approaches: Risk Mitigation Policies, Procedures and Best Practices*[7]':

Footnote

7 https://www.skybrary.aero/bookshelf/books/3603.pdf [accessed February 2020]

'During the data period 2011-2015 considered within the following chapters approximately 65% of all recorded accidents occurred in the approach and landing phases of flight, and unstabilized approaches were identified as a factor in 14% of those approach and landing accidents.'

The report goes on to define a stable approach as:

'one during which several key flight parameters are controlled to within a specified range of values before the aircraft reaches a predefined point in space relative to the landing threshold (stabilization altitude or height), and maintained within that range of values until touchdown. The parameters include attitude, flight path trajectory, airspeed, rate of descent, engine thrust and aircraft configuration. A stabilized approach will ensure that the aircraft commences the landing flare at the optimal speed, and attitude for the landing.'

The operator of I-NEOT includes in its Operations Manual procedures that the flight crew must follow to ensure that any approach that continues to land is stable at a pre-determined height. In IMC this height is 1,000 ft aal, in VMC it is 500 ft aal. At this height, if the aircraft does not meet the criteria, the crew must initiate a go-around. The criteria are:

- *'The aeroplane is in the planned landing configuration*
- *The aeroplane is on the correct flight path*
- *The aeroplane is at the target final approach speed -5/+10 kt*
- *The rate of descent is less than 1,000 FPM for a 3° or nominal 3° approach (visual approach)*
- *The aeroplane is on the correct lateral and vertical flight path*
- *Only small changes in heading/pitch are required to maintain correct flightpath*
- *The thrust setting is appropriate for aeroplane configuration and speed (idle thrust must not be used below 500 ft aal)*
- *The checklist must be completed not later than 500 ft aal.'*

For I-NEOT on the day of the incident, the requirement was to meet these criteria at 500 ft aal (1,122 ft amsl). As the aircraft passed this point on the approach, it was 15 kt above the target approach speed, the landing checklist had not been completed and the aircraft was 278 ft below the correct vertical flightpath. Engine thrust was still at idle, the rate of descent was 1,300 ft/min and the flap handle had been used to select landing flap (Flap 40) one second earlier. There was no discussion between the crew approaching this point about the stability of the approach.

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Bristol ATC

Bristol Airport has both a radar-based control service for approach control as well as a tower service. Aircraft are handed over from the area control service (London Air Traffic Control Centre) to Bristol Approach usually around 40 nm from the airport when they are around FL100. The approach radar controllers then give the aircraft descent clearances and routings to position the aircraft for its final approach and landing. These routings will be dependent on other traffic, weather and any congestion at the airport.

At the time of the incident, the controller on Bristol Approach was a trainee who was being supervised by an experienced controller. The initial instructions to the crew of I-NEOT were that they were to expect the RNAV approach for Runway 27, and that they could expect 34 nm to touchdown. About 10 seconds later the trainee controller asked the crew if they could accept a shorter routing, with a track mileage of 23 nm. The crew accepted the shortened routing and the trainee controller routed them direct to ELROV. It remains at the discretion of the crew whether to accept any offer of a shorter routing, or when to ask for a longer routing should the assigned routing not be long enough to allow the aircraft to achieve the right height and speed for the approach. The operator's Operations Manual states that:

> *'If an ATC request (e.g. track shortening) is likely to result in an unstabilised approach, the request shall be declined.'*

As I-NEOT approached ELROV, the aircraft should have been at 210 kt and at or above 2,500 ft. It crossed ELROV at 3,276 ft and 271 kt. As the aircraft approached 8 nm from the runway at a CAS of 242 kt, the approach controller requested I-NEOT to "START REDUCING SPEED PLEASE, 190 KT OR LESS". When passing 7nm, the approach controller handed the aircraft over to Bristol Tower. The tower controller was informed by the approach controller that the aircraft was fast.

The tower controller noted that the aircraft was fast but since the aircraft was number one on the approach he considered that it was safe to allow it to continue. The tower controller and assistant were also attempting to solve a problem that had occurred with a pushback of another aircraft on the ground at the airport. As the controller was busy trying to address the issue on the ground, the assistant noticed that I-NEOT looked low on the approach and brought this to the attention of the controller. The controller felt the aircraft was significantly below where he would expect to see it and immediately instructed the crew to go around.

The Manual of Air Traffic Services (MATS) provides the basis for ATC provision within the UK. It contains *'procedures, instructions and information'*[8] for use by all air traffic service units (ATSUs) within the UK. MATS is split into two parts with Part 1 produced by the CAA containing instructions that apply to all ATSUs in the UK. Part 2 applies to a particular ATSU and is produced by that ATSU although it must be approved by the CAA.

Footnote

[8] MATS Part 1 (CAP 493).

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MATS Part 1 states that the aerodrome controller can instruct an aircraft to go around:

> *'A landing aircraft, which is considered by a controller to be dangerously positioned on final approach, shall be instructed to carry out a missed approach. An aircraft can be considered as dangerously positioned when it is poorly placed either laterally or vertically for the landing runway.'*[9]

The controller did not check the radar readout on the screens in front of him, which could have given him information about the altitude of the aircraft, but reacted instinctively based on his experience and using known visual references. He considered that the aircraft was dangerously positioned in accordance with MATS Part 1.

Controllers are taught to say nothing to the aircraft once the go-around has been acknowledged by the crew due to the expected high workload in the cockpit. The assistant drew the controller's attention back to the aircraft when he perceived that it was not climbing as expected. After a short period, the controller decided to instruct the crew to climb. The controller reported the incident to his watch management.

Recorded information

The aircraft was fitted with an FDR and CVR; both recorders captured both approaches to Bristol Airport. The recorders were recovered to the AAIB and were successfully downloaded. After an initial review of the CVR, it was apparent that an EGPWS warning had been triggered during the go-around. The EGPWS was then recovered to the AAIB for download.

First approach

Having accepted a shorter routing from Bristol Approach, the crew of I-NEOT increased the speed and deployed the speed brake to increase the rate of decent. As they approached ELROV, the PF selected LNAV mode on the MCP which engaged successfully. The aircraft then followed the lateral path of the approach as programmed in the FMC. With the aircraft level at 4,000 ft en route to ELROV, the PF selected a speed of 210 kt on the MCP, although the aircraft was still at a speed greater than 300 kt. The crew were then given a further decent to 2,500 ft and clearance for the RNAV(GNSS) approach to Runway 27.

I-NEOT passed over ELROV at 3,276 ft and 271 kt (61 kt above the procedure limiting speed). The PF engaged VNAV, but it disengaged after approximately 24 seconds, reverting to LVL CHG. When this occurred, the selected airspeed was 207 kt but the CAS was 265 kt with the aircraft descending at idle thrust with the spoilers deployed. The PF made two further unsuccessful attempts to engage VNAV, but the aircraft continued to descend in LVL CHG.

Footnote

[9] MATS Part 1 (CAP 493) Section 2: Chapter 1: Aerodrome Control 19.5.

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The aircraft continued its descent below the 2,500 ft pattern altitude before the final approach fix[10] descent point. This meant it crossed this point 227 ft below the required altitude, 70 kt above the target final approach speed (Figure 3). The aircraft continued to descend below the design 3° approach gradient. Between 5 nm and 2 nm, the aircraft was an average of 249 ft below the required altitude, ranging from between 203 ft and 293 ft below. The speed of the aircraft was reducing slowly. The crew were aware and had commented that the aircraft was high and fast. Table 1 shows the recorded altitude and speed of the aircraft compared to the design profile and the target final approach speed.

Distance from threshold (nm)	5	4	3	2
Profile altitude (ft)	2,250	1,930	1,610	1,290
Aircraft altitude (ft)	2,022	1,711	1,351	1,072
Aircraft speed (kt)	200	185	169	150
Difference to target final approach speed (kt)	+57	+42	+26	+7

Table 1

Height and speed comparison for I-NEOT

The crew progressively selected greater flap/slat settings as the speed reduced, selecting the planned landing flap setting (Flap 40) at 1,147 ft and 156 kt CAS.

During the approach the company Operations Manual requires that the crew announce:

> *'crossing altitudes as published fixes and other designated points are crossed, giving the appropriate altitude or height for the appropriate range as depicted on the chart. The pilot flying shall promptly adjust the rate of descent as appropriate.'*

These checks were not announced, and no adjustment was made to the vertical speed to correct to the correct descent path.

As part of the standard procedures for the aircraft, the MCP altitude was set to the approach minima (rounded up to the nearest 100 ft) in order to allow the aircraft to begin its decent down the approach. The approach minima set on the MCP was 1,000 ft. Once an aircraft is established on the approach in either VNAV or V/S mode and at least 300 ft below the restricting go-around altitude (for the RNAV 27 approach this was 3,000 ft), the MCP altitude should be reset to the go-around altitude. However, had this been done with I-NEOT descending in LVL CHG, rather than VNAV or V/S, the aircraft, with the autopilot engaged, would have climbed to the new selected altitude rather than continued with the descent. Similarly, had the autopilot been disengaged but the flight directors left on, they would have indicated a climb rather than a continuation of the descent.

Footnote

[10] Final approach fix – that fix from or over which the published final IFR approach is executed.

As the aircraft approached 1,000 ft, the AFDS vertical mode became ALT AQ as the system attempted to level off at the selected 1,000 ft. This led to a reduction in the rate of descent, and the aircraft path began to close slightly with the design 3° approach gradient. However, from 5.8 nm to 2 nm on the final approach, the minimum obstacle clearance altitude permitted by the procedure is 1,130 ft (shaded grey in Figure 1). Therefore, from a point 2.34 nm from the threshold until the aircraft passed inside 2 nm from the threshold, I-NEOT was below the minimum obstacle clearance altitude[11] in that segment of the approach.

As the crew reached the approach minima they were instructed to go around by ATC.

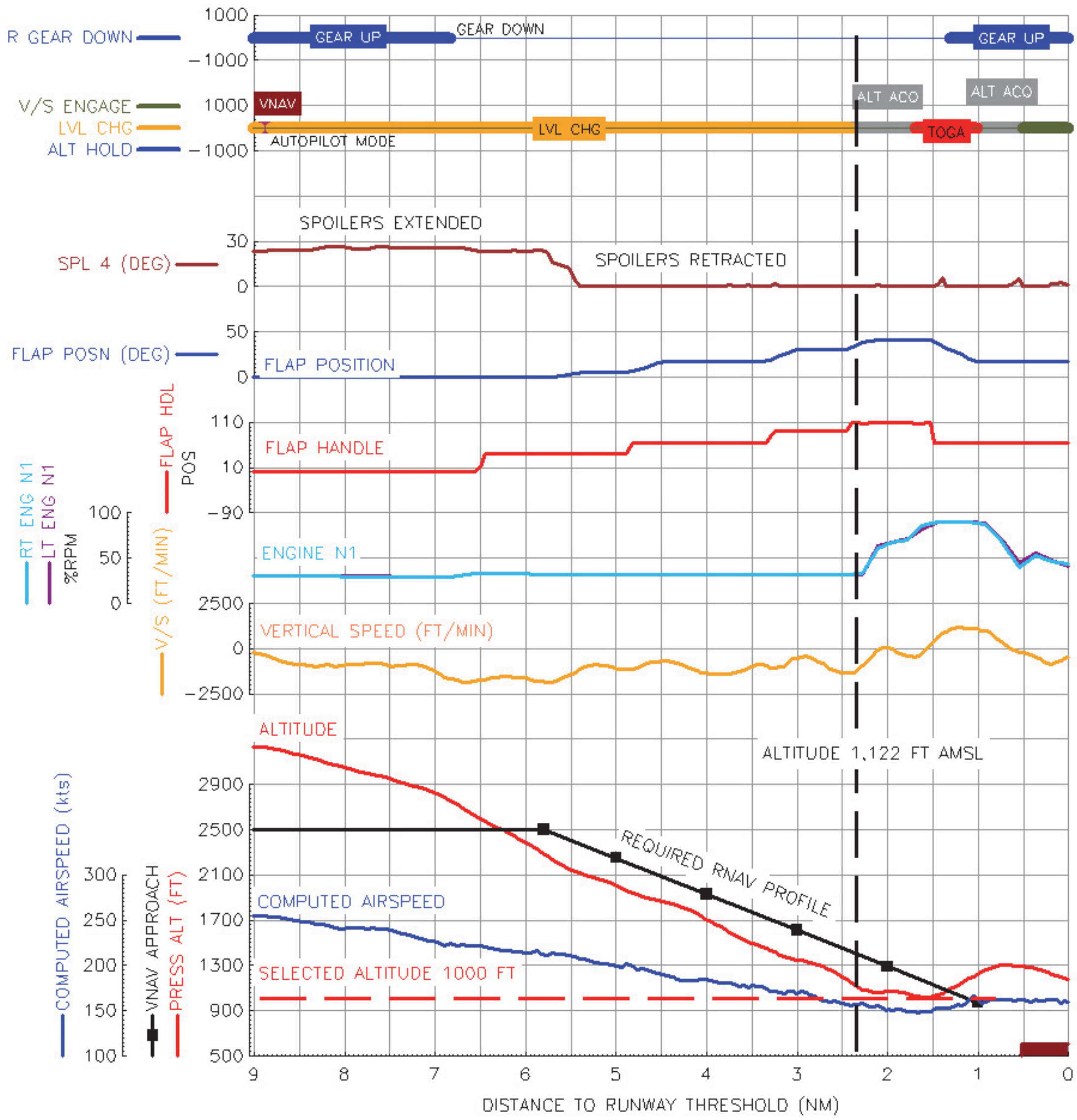

Figure 3

I-NEOT FDR data for initial approach into Bristol Airport

Footnote

11 Minimum Clearance Altitude is defined as a fixed margin to be added to the height of the dominant obstacle in the final approach segment. The minimum obstacle clearance for this approach is 75 m (246 ft) as defined in ICAO Doc 8186, *Aircraft Operations Volume II Construction of Visual and Instrument Procedures,* III-3-3-1. The dominant obstacle in the final approach segment from 5.8 nm to 2 nm stands 888 ft amsl.

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Go-around

The PF pressed the TOGA button and the aircraft AFDS system transitioned into go-around modes (Figure 4, label [A]). The vertical and lateral modes became TOGA and the A/T increased the thrust to the calculated go-around setting. The autopilot disconnected as designed. The PF asked for the standard flap setting for the go-around (Flap 15) which was selected by the PM.

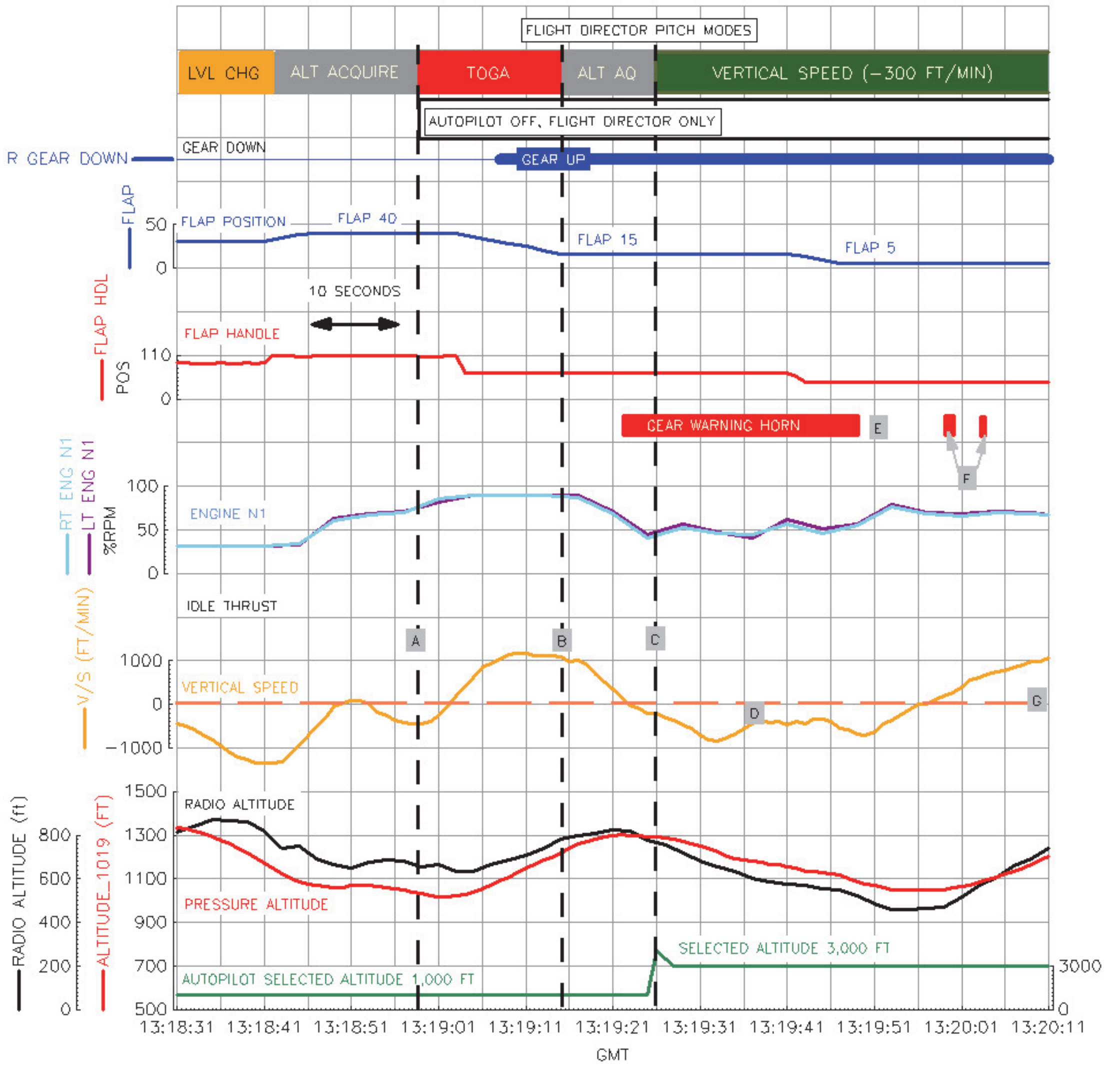

Figure 4

I-NEOT go-around salient parameters

The aircraft pitch began to increase, and the aircraft began to climb. 17 seconds after the PF pressed the TOGA button, the vertical mode changed to ALT AQ as the AFDS attempted to level off at the selected MCP altitude, which had remained at 1,000 ft (Figure 4 [B]). As it did so the A/T mode changed from go-around to a mode which maintains the speed of the aircraft at that moment. This resulted in the thrust levers beginning to reduce towards a lower power setting. As the aircraft was configured with Flap 15, the gear up and a low thrust setting, the gear warning horn sounded. For Flap 15 this requires a thrust lever angle

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of below approximately 20° and the horn cannot be silenced. In normal go-arounds the horn does not sound because the thrust levers are at a high setting (significantly more than 20°).

The crew adjusted the MCP altitude to the actual go-around altitude of 3,000 ft. Mode reversions of the AFDS in the B737-8 mean that this adjustment of the MCP altitude led the vertical mode to change from ALT AQ to V/S. The vertical speed set in the MCP became that which existed at the moment of mode engagement, which in the case of I-NEOT was a descent of -300 ft/min (Figure 4 [C]).

Although 3,000 ft was now set correctly, I-NEOT was descending in V/S mode with the PF following the flight director commands (Figure 4 [D]). The gear warning horn was still active as the A/T continued to manage the speed with the aircraft in the descent and the thrust lever angle below 20°. As the crew reduced the flap setting to Flap 5, further thrust was applied and the gear warning horn, which had operated for 27 seconds, stopped. This was followed by the EGPWS gear warning call "TOO LOW GEAR, TOO LOW GEAR" which was triggered as the aircraft passed 500 ft radio altitude descending (Figure 4 [E]). The aircraft descended for a further 2 seconds.

The crew realised that the aircraft was not climbing. The commander took control and pitched the aircraft to climb (Figure 4 [G]). As the aircraft began to climb, two further short instances of the gear warning horn were triggered (Figure 4 [F]). This coincided with ATC, noticing the aircraft position, transmitting "ALL STATIONS BRISTOL STANDBY". Eighteen seconds later, as the aircraft continued to climb, ATC transmitted "[CALLSIGN] CLIMB MAINTAIN ALTITUDE 3,000 FT QNH 1018".

As the aircraft began to climb away on the go-around track, the vertical mode was changed to LVL CHG, before ALT AQ engaged as the aircraft levelled off at 3,000 ft in accordance with the procedure. I-NEOT was then radar vectored to the south of the airport and onto another RNAV (GNSS) approach from which the aircraft landed without further incident.

During the go-around the crew noted that the message VNAV INVALID-PERF was shown in the FMC. VNAV INVALID–PERF is shown when there is an unhandled software exception error or unresolved decent path construction error. The crew were unable to engage VNAV for the subsequent approach, and the investigation was unable to establish the cause of this message.

Analysis

The incident began when the crew accepted a shortened routing offered by Bristol Approach. This meant the aircraft was above FL100 with less than 25 nm to run to touchdown. Whilst the trainee controller clearly had good intentions in offering the crew the routing, a more experienced controller might not have considered it appropriate given the speed and height of I-NEOT. However, it is the responsibility of the crew to accept or decline any shortcut offered having assessed whether it is suitable. It remains the prerogative of the crew to ask for extra track miles to touchdown any time they consider the current distance to be too short.

As a result of the shorter routing, I-NEOT had too little distance to descend and reduce speed ready for the approach. The speed of the aircraft over ELROV was 61 kt above the procedure limiting speed. As a result, the crew were unable to make use of the VNAV mode of the AFDS and the approach was begun in LVL CHG. Descending down the approach in LVL CHG meant the crew were unable to reset to go-around altitude as directed in the operator's procedures. Had they done so the aircraft would have climbed straight away because the autopilot was engaged.

I-NEOT did not meet the stable approach criteria laid out in the operator's Operations Manual and, in these circumstances, the operator's procedures required the crew to go around. However, the passing of the stable approach barrier went unmentioned by the crew and was followed shortly afterwards by ATC instructing them to go-around.

The instruction to I-NEOT to go-around was based on an instinctive reaction from the tower controller who considered that the aircraft was dangerously positioned in accordance with MATS Part 1. Whilst the crew were not expecting it and could not understand the reason for it, all crews must be prepared to perform a go-around at any time during an approach. In this event, the fact that the MCP altitude remained set at the approach minima rather than the missed approach altitude caused a significant deviation from a normal go-around with the aircraft descending, unnoticed by either crew member, for a significant period. The controller and the crew members realised almost simultaneously that there was a problem and the aircraft began to climb. During the initial go-around the aircraft descended below 500 ft agl.

The crew experienced a technical issue with VNAV after the go-around which meant they were unable to fly the second approach using this mode. However, this issue was not the cause of VNAV disconnecting at the start of the first approach. That was caused by the significant excess speed that the aircraft had at the start of the approach. Regardless of the reason for the disengagement, all crews should be aware that automatic modes will not always be operational and alternatives or reversions, should they be available, should be discussed before the approach begins.

Conclusion

Flying a shortened routing led to a rushed and unstable approach which did not follow the correct vertical flightpath. This was observed by ATC who instructed the aircraft to go around. The crew found themselves performing a go-around unexpectedly but did not know why they had been required to do so. The go-around was conducted with a mis-set altitude on the MCP, and neither crew member noticed for a significant period that the aircraft was descending during the manoeuvre.

Crews should always be ready to perform a go-around because there can be many reasons why they might have to, either internal or external to the aircraft, such as on instruction from ATC.

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Safety actions/Recommendations

The aircraft operator took the following safety action:

- The ground recurrent training syllabus was changed to include stable approach criteria, a review of applicable rules and Flight Data Monitoring (FDM) statistics as well as a presentation of this event.

- The operator improved its FDM system to identify events such as this unstable approach and planned to continue development of the system to make the process easier and more rapid.

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