

AAIB Bulletin S1/2021

SPECIAL

ACCIDENT

Aircraft Type and Registration:	Boeing 787-8, G-ZBJB	
No & Type of Engines:	2 Rolls-Royce Trent 1000-AE3 turbofan engines	
Year of Manufacture:	2013 (Serial no: 38610)	
Date & Time (UTC):	18 June 2021 at 0651 hrs	
Location:	London Heathrow Airport Stand 583	
Type of Flight:	Commercial Air Transport (Cargo)	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - 1 (Minor)	Passengers - N/A Other - 1 (Minor)
Nature of Damage:	Damage to lower forward fuselage, engine cowlings and separation of passenger cabin door	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	47 years	
Commander's Flying Experience:	8,364 hours (of which 587 were on type) Last 90 days – 26 hours Last 28 days – 0 hours	
Information Source:	AAIB Field Investigation	

Synopsis

Whilst the aircraft was being loaded with cargo in preparation for a flight to Frankfurt, and whilst carrying out a Dispatch Deviation Guide (DDG) procedure to clear maintenance messages relating to an existing Acceptable Deferred Defect (ADD), the Nose Landing Gear (NLG) retracted. This caused damage to the lower nose, NLG doors and engine cowlings. Door 2 left (Door 2L) struck the top of the mobile steps which resulted in the door separating from the fuselage and one person, operating the cargo loader positioned at the forward cargo hold, received minor injuries.

This Special Bulletin contains facts which have been determined up to the time of issue. It is published to inform the aviation industry and the public of the general circumstances of accidents and serious incidents and should be regarded as tentative and subject to alteration or correction if additional evidence becomes available.

The DDG procedure required the cockpit landing gear selection lever to be cycled with hydraulic power applied to the aircraft. To prevent the landing gear from retracting, the procedure required pins to be inserted in the nose and main landing gear downlocks. However, the NLG downlock pin was installed in the NLG downlock apex pin bore which was adjacent to the correct location to install the downlock pin. When the landing gear selector was cycled the NLG retracted.

An Airworthiness Directive had been issued, with a 36-month compliance from 16 January 2020, to install an insert over the apex pin bore to prevent incorrect installation of the downlock pin, but this had not yet been implemented on G-ZBJB.

Sequence of events

The aircraft was on stand being prepared for a cargo flight from London Heathrow to Frankfurt. At approximately 0620 hrs the crew arrived at the aircraft and found three ground engineers on the flight deck engaged in maintenance activity to clear three status messages associated with an ADD for a NLG door-closed solenoid valve. The crew discussed the situation with the engineers and established that the rectification work would take approximately 40 minutes to complete. Consequently, the off blocks time was revised to 0725 hrs. The commander, the Overseas Engineer (OSE) positioning with the aircraft, and two ground engineers left the flight deck, leaving the co-pilot in the right seat and the lead ground engineer in the left seat.

The commander performed a walk-round inspection of the aircraft and returned to the forward cabin along with the dispatcher and a ground technician, the fourth member of the ground engineering team. The ground technician reported to the Lead Engineer that the walk-round inspection of the aircraft had been completed and then sat in the forward cabin to observe proceedings. The OSE was in the mid-galley.

Throughout the preparations for the flight, cargo loading was progressing with one of the four personnel from the cargo loading team working on the aircraft pallet loader positioned under the forward cargo door on the right side of the aircraft. One of the loading team was at the rear of the aircraft pallet loader operating the Tarmac Transfer Vehicle (TTV), used to transfer cargo and unit load devices (ULDs) onto the pallet loader. A third team member was supervising the onload and assisting with the transfer of cargo onto the TTV. The fourth team member was tasked with opening the rear cargo hold doors.

The lead ground engineer sat in the left seat on the flight deck was working through the NLG status messages on the ground maintenance laptop. In order to defer the three defects highlighted by the status messages, the DDG for the aircraft required hydraulic pressure to be applied and the cockpit landing gear lever to be cycled from down to up then returned to down. The Lead Engineer instructed the lead mechanic (Mech 1) and another mechanic (Mech 2) to fit the landing gear locking pins. This would prevent the landing gear retracting when the landing gear lever was cycled. They were also instructed to attach the ground communications headset to the external connection in the NLG bay. Mechs 1 and 2 located the five landing gear locking pins and proceeded to the NLG to fit the first pin. As Mech 1 was not tall enough to reach the NLG locking pin hole without steps, he

pointed to the location of the hole and Mech 2 fitted the NLG locking pin. As Mech 1 and 2 proceeded to the right main landing gear (MLG), Mech 1 informed the load team member on the pallet loader that they were going to apply hydraulic power to the aircraft and he should stand clear of the aircraft and lower the pallet loader to prevent contact with the cargo door. The application of hydraulics causes the aircraft to move slightly and can result in control surfaces and landing gear doors moving suddenly as the system is pressurised.

With the aid of some portable steps, Mech 1 fitted the two right MLG downlock pins before repeating the process on the left MLG as Mech 2 observed. Mech 1 returned to the flight deck to inform the Lead Engineer that the pins had been fitted. Mech 1 and Mech 2 then walked to the left of the NLG and Mech 1 plugged in the ground headset. The Lead Engineer requested further confirmation from Mech 1, through the headset, that the landing gear pins were fitted. Mech 1 confirmed that the pins were fitted. Mech 2 then stepped away from the aircraft and walked to nearby vehicles to observe.

The Lead Engineer was reading the appropriate section of the Aircraft Maintenance Manual (AMM) on the maintenance laptop when he received confirmation that the landing gear pins were fitted. The Lead Engineer applied hydraulic power but before selecting the landing gear lever he requested final confirmation, through the headset, from Mech 1 that the ground locking pins were in place and the aircraft loading team was clear of the aircraft. From his position next to the NLG on the left side of the aircraft, Mech 1 visually checked that he could see the warning flags for each of the landing gear locking pins. His view of the pallet loader was limited to just above the load platform, so he checked that no feet were visible to indicate the load team were clear. He then confirmed to the Lead Engineer that the pins were fitted and that the pallet loader was clear of personnel. On pressing LOCK OVRD and selecting the landing gear lever to UP, the NLG retracted, and the aircraft nose struck the ground.

Injuries and aircraft damage

One of the ground loading team who was on the pallet loader and under the cargo door was slightly injured as the door moved down with the fuselage (Figure 1). The co-pilot, sat in the cockpit received a minor injury and the three personnel who were stood in the forward cabin and galley fell to the floor but were otherwise uninjured.



Figure 1

Pallet cargo loader positioned at the forward cargo door

The aircraft's nose came to rest on the articulated arm of a ground power unit, crushing the cable arm. The aircraft sustained damage to the lower forward fuselage, NLG doors and both engine cowlings, which had also struck the ground. Door 2L had been severely damaged by contact with the stairs positioned at the door aperture as the aircraft sank onto its nose (Figure 2). The door hinges and actuating mechanism had failed and the door, which was resting on the top platform of the stairs, remained attached to the fuselage by the remains of its wiring loom.



Figure 2

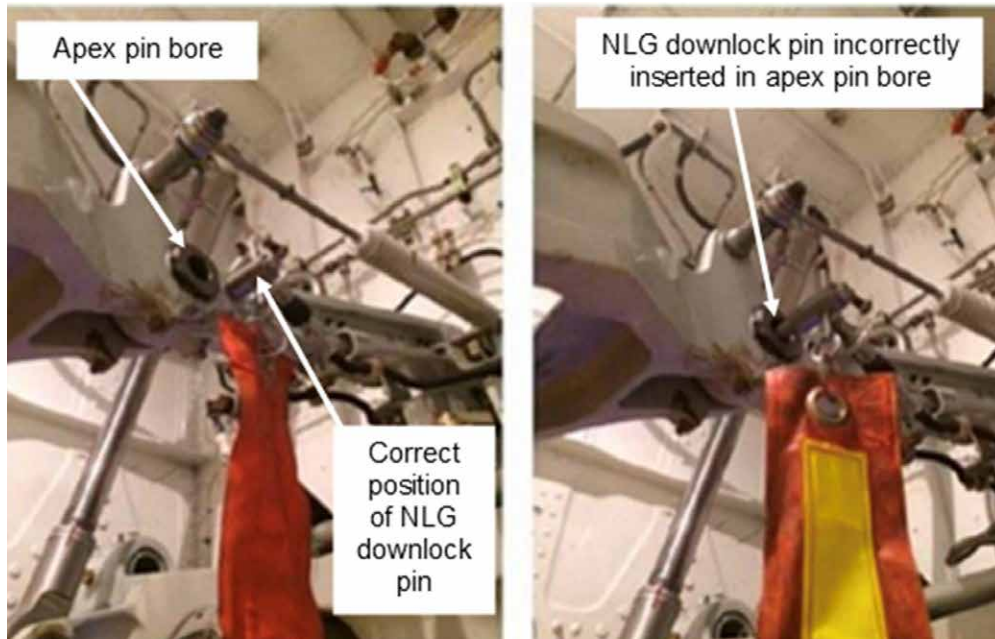
G-ZBJB with stairs in position at Door 2L

When the aircraft nose was lifted, during the recovery operation, the NLG was examined and the NLG downlock pin was found fitted in the NLG apex pin bore (Figure 3). With the downlock pin inserted in this position, when the LOCK OVRD is pressed and the landing gear lever selected to UP with hydraulic power applied, the NLG will retract.

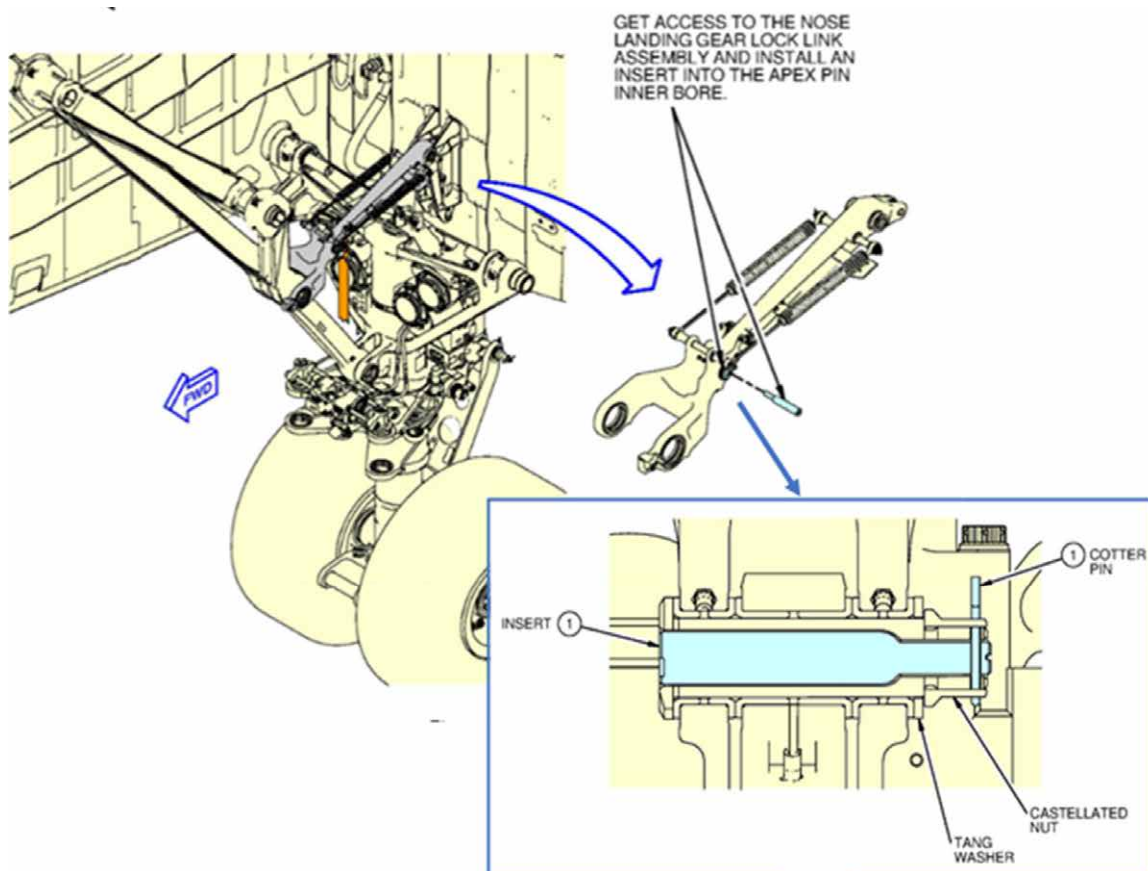
Previous event and preventative measures

In 2018, another Boeing 787 experienced a retraction of the NLG while the aircraft was on the ground which had been caused by the NLG downlock pin being accidentally installed in the apex pin inner bore, which is adjacent to the correct hole for the downlock pin in the NLG lock link assembly (Figure 3).

As a result of this event the aircraft manufacturer published Issue 01 of Service Bulletin (SB) B787-81205-SB320040-00 on 12 March 2019. The SB provides instructions to install an insert into the NLG lock link apex pin inner bore (Figure 4). The insert prevents the NLG downlock pin from being inserted in the apex pin bore instead of the adjacent NLG downlock pin hole. Issue 02 of the SB was subsequently published on 23 October 2020.

**Figure 3**

Illustrative image of the correct and incorrect installation of NLG downlock pin

**Figure 4**

Installation diagram of NLG apex pin inner bore insert

Incorporation of SB B787-81205-SB320040-00 was subsequently mandated by FAA Airworthiness Directive (AD) 2019-23-07, published on 16 January 2020. The AD specified a compliance time of 36 months from the date of publication. This had not yet been implemented on G-ZBBB.

Safety actions

The operator had issued a Technical News leaflet 10279007 – ‘787 NLG Downlock Pin Installation’ on 9 April 2020 which showed the correct and incorrect position of the NLG downlock pin and referenced the FAA AD and the SB. The leaflet included the illustrations in Figure 4 taken from AMM task B787-A-32-00-30-00A-720A-A – ‘*Landing gear downlock pin installation.*’ The Technical News was re-issued on 9 December 2020 with an expiry date of 9 June 21.

As a result of this accident the operator re-issued Technical News leaflet 10279007 on 19 June 2021. The operator is now planning to expedite the incorporation of AD 2019-23-07.

Further investigation

The investigation continues and will consider the safety procedures associated with landing gear maintenance, and the factors which may have contributed to the NLG downlock pin being incorrectly installed in the apex pin inner bore. A final report will be published in due course.

Published 14 July 2021.

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