Serious Incident

Aircraft Type and Registration:	Boeing 767-316F, G-DHLS	
No & Type of Engines:	2 General Electric Co CF6-80C2B6F turbofan engines	
Year of Manufacture:	2012 (Serial no: 42213)	
Date & Time (UTC):	9 October 2025 at 1841 hrs	
Location:	Scottish Flight Information Region	
Type of Flight:	Commercial Air Transport (Cargo)	
Persons on Board:	Crew - 2	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	None	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	47 years	
Commander's Flying Experience:	8,968 hours (of which 670 were on type) Last 90 days - 22 hours Last 28 days - 11 hours	
Information Source:	AAIB Field Investigation	

Synopsis

During a flight from Iceland to the UK, it was likely that ice formed somewhere on the aileron control system causing a jam in roll control. The crew were still able to control the aircraft longitudinally and descended to FL200. A significant, joint, input by the crew on the controls released the jam and normal roll control was regained. The rest of the flight was completed without further incident.

The Boeing 767 has experienced previous occurrences of roll control jams due to ice formation. Several modifications and inspections have been mandated due to previous events, all of which had been completed as required on G-DHLS before this event.

History of the flight

The aircraft had arrived in Keflavik Airport, Iceland around 10 hours before it was due to depart on the incident flight. The outbound cargo consisted of fresh goods surrounded by frozen sealed gel packs on pallets. These pallets were loaded onto the aircraft ready for the departure which was scheduled at 1655 hrs. The flight departed Keflavik at 1707 hrs with the co-pilot as PF and the first 1:30 hours of the flight proceeded without incident. As the aircraft was approaching to the west of Glasgow at FL350, the EICAS caution for the Autopilot activated. At the same time the crew were instructed to turn onto a radar heading by ATC. The PF selected heading mode on the autopilot but the aircraft did not turn as expected and again the EICAS Autopilot caution activated. The PF selected a different

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autopilot, but this also did not result in the aircraft turning onto the required heading. The PF then disconnected the autopilot but discovered that there was little, if any, movement of the control wheel in roll. Neither crew member had any roll control through the control wheel, although they had normal control of the aircraft in pitch and yaw. The commander made a MAYDAY call to ATC and requested a descent down to FL200.

During the descent, the crew discussed the Quick Reference Handbook (QRH) for jammed controls. The commander instructed the jumpseat passenger, who was also a pilot, to check that the circuit breakers accessible from the cockpit had not tripped off, with nothing found. Having levelled at FL200, the crew performed the actions required by the QRH which was to overpower the jammed or restricted system using maximum applied force. Both pilots moved the control wheel to the left with force at the same time. The co-pilot described feeling like something broke and immediately the roll control returned to normal.

The crew then re-engaged the autopilot and continued to East Midlands Airport where they landed without further incident.

Recorded information

Figure 1 plots the inner aileron deflection, with the autopilot on, recorded on the flight data recorder, for the 75 minutes the aircraft was at FL350. Prior to this period and during the 52 hours of recorded data from the previous 22 flights, both ailerons moved in equal but opposite amounts about a nominal position. However, Figure 1 shows that at the beginning of this period, the right aileron was starting to move more than the left aileron, and this differential in movement grew to over four times the amount by the end.

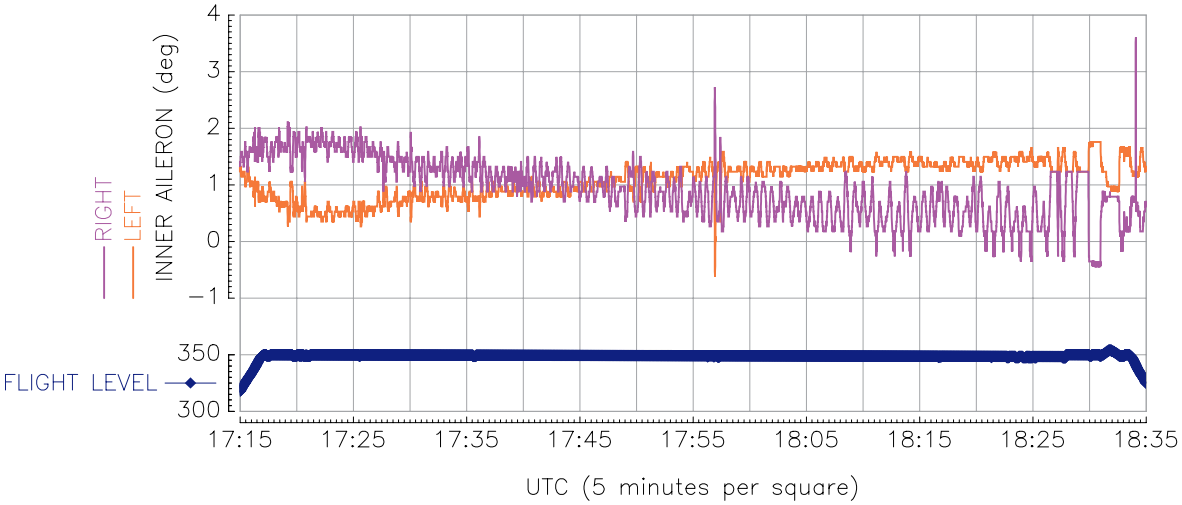

Figure 1

Inner aileron deflection during flight while at FL350

Figure 2 plots the force applied to the control wheel versus the angular movement of the control wheel with the autopilot off. The dark blue points (labelled 'NORMAL') are for the previous 22 flights and the light blue points (labelled 'DURING EVENT') are for the event

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flight during the descent from FL350 to FL200. The figure shows that the force required to move the wheel during the event was 15 times more than 'NORMAL'.

The maximum recorded force was 76.6 lbf after which the force required to move the wheel returned to those in the 'NORMAL' region.

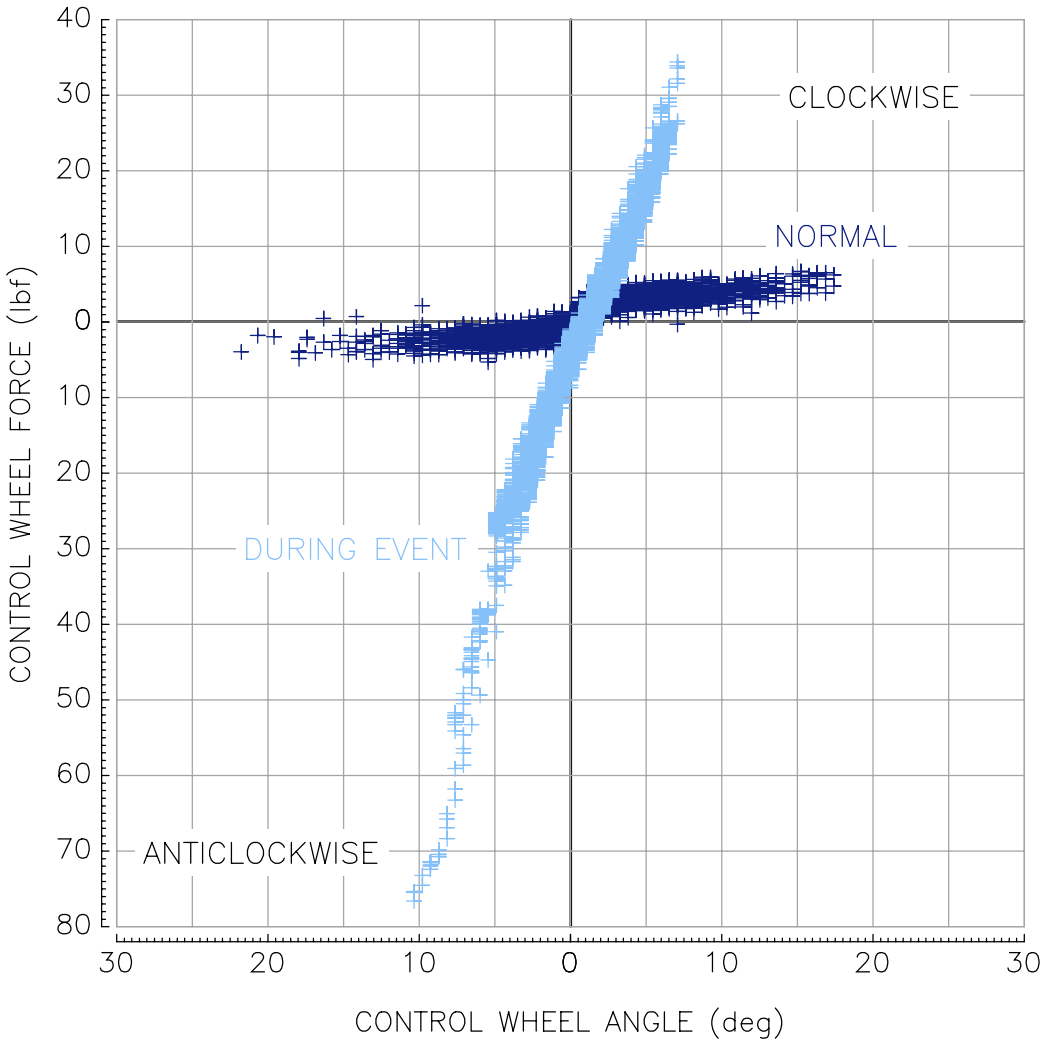

Figure 2

Control wheel force versus control wheel angle

Meteorology

The weather in Keflavik during the period between the arrival of G-DHLS and its departure was largely wet with rain and drizzle. The temperature reached a maximum of 9°C with the dew point matching the temperature from 1500 hrs onwards. The crew commented that the majority of the pallets had been loaded before they reached the aircraft to prepare for the flight but that the remaining ones were wet from the rain when they were loaded.

The OAT at FL350 was -54°C and the temperature at FL200 once they had descended was -15°C.

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Aircraft information

G-DHLS was originally built in 2012 as a Boeing 767-300 (B767) passenger aircraft. It was purchased by the operator in 2023 and converted to freighter configuration. The aileron control system on the B767 is a mechanical system consisting of control cables with hydraulic power assistance. The design incorporates multiple control path redundancies to mitigate the risk of individual components jamming.

Aileron system – normal operation

The B767 has inboard and outboard ailerons which are operated by control inputs either manually by the pilots or from the autopilot. There are two manual control wheels in the flight deck which can rotate up to 65° left or right. The left control wheel in the flight deck is connected to the upper of two cable drum assemblies under the floor; this assembly is then replicated for the right control wheel. The two upper cable drums are connected by a bus rod and in normal operation, move together. There is a force transducer on the left wheel's cable drum which measures the force being applied by the pilots on the control wheels. Beneath the upper cable drums are lower cable drums. The left side operates the primary control cables, which run underneath the main cargo deck along the left side of the fuselage. The right side lower drum operates a second set of backup control cables, which run down the right side of the fuselage, under the main deck. The primary and backup control cables then turn through 90° and pass through the canted pressure deck under the floor. The primary cables exit into the left main gear wheel well and the backup cables into the right wheel well.

There are multiple aileron control components mounted on the rear face of the wing spar, in the wheel wells and along the back of each wing to the inboard ailerons. There are two sets of ailerons. The inboard ailerons are always active in flight. The outboard ailerons lockout above a set airspeed. The primary cables terminate at the left control quadrant in the left gear well, there is also a right quadrant in the right gear well. The quadrants are connected by a set of cables called the aft bus input cables. In normal operation the primary cables drive both the right and left quadrants through this connection.

The left quadrant is attached to a control feel, centering and trim system. This returns the control wheel to centre once a control input is removed, it allows the pilots to trim the centre position of the control wheel, and it also provides a resistive force on the controls. As the pilot's control input increases in magnitude, the resistive force increases proportionally to give the pilots a sense of feel to the controls, replicating what would exist without hydraulic assistance, but scaled down to an appropriate level.

The control quadrants on each side are connected respectively to torque tubes, these have input rods which connect to the input servos of three hydraulic actuators called Lateral Central Control Actuators (LCCAs). There are two actuators attached to the left torque tube called the left and centre LCCAs, the right LCCA is attached to the right torque tube. The LCCAs also receive an input from the three respective autopilot channels. When the autopilot provides the control inputs, the pilot's controls are back driven to move as well. The hydraulic output of the LCCAs moves output quadrants, one on the left and one on the right.

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The left and centre LCCAs are connected to the left quadrant. This arrangement allows either of these LCCAs to independently drive the left output quadrant. The left quadrant is also attached via the aft power bus cables to the right output quadrant, to drive that as well. The right output quadrant is connected directly to the right LCCA. Right and left wing cables are attached to the right and left quadrants respectively. These run along the rear wing spar via droop mechanisms to the ailerons. Each aileron has two hydraulic Power Control Actuators (PCA) one on each of the separate hydraulic systems. The wing cables drive the servos for these actuators; the output then moves the aileron surface itself. Either PCA can independently move the aileron if required. There is also a position transmitter on each aileron.

In normal manual operation the two LCCAs on the left system drive the left wing cables directly and the right wing cables via the aft power bus cables. Similarly, the right LCCA can achieve this in the opposite direction. As such, all the ailerons can be moved by any one of the three LCCA's independently, which is the case when the LCCA output is controlled by an autopilot channel.

Aileron system – abnormal operation

The upper control drums below the pilot's control wheels are connected by a bus rod. There are load limiters fitted to both sets of drums which consist of a cam, follower and spring. If the left control wheel jams, once the difference in force being applied to the right control wheel exceeds 26 lb (11.8 kg) the cam follower will unseat, allowing the right control wheel to move just the backup control cables rather than the primary cables. If the right control wheel jams, above this force the left wheel will move separately continuing to drive the primary cables. If the differential control force is reduced below the threshold, the cam and follower reengage and the bus rod connection is reinstated.

If two of the LCCAs fail, all the ailerons can still be operated by the remaining LCCA. If an LCCA control valve jams a breakout operates at 160 in lbs (18.08 Nm) allowing the other two LCCAs to continue to operate normally. If either pilot manually operates the controls whilst the autopilot is operating this will create an input disagreement and the autopilot will disengage, triggering a master warning.

The backup cables terminate at the right output quadrant. The right torque tube can be operated by an override mechanism located in the backup system, ensuring the right and left torque tubes can be operated by either the primary or backup cables. There is also a shear out allowing continued operation in the event of an override mechanism jam. If the right torque tube becomes jammed, an input from the backup cables will override it and move the output quadrant allowing the right wing cables to operate.

If either PCA loses hydraulic pressure, the remaining one will continue to operate the aileron.

Water drain system

The B767 has a canted pressure deck under the main deck floor. The deck slopes from the front and rear of the aircraft down to a lowest point above the main gear wheel wells.

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There are drains on the main deck floor which divert liquid down to the canted deck where it accumulates at the lowest point. Pressure differential drains located at this point remove any liquid through the pressure deck into the wheel wells and down flexible hoses attached to the rear face of the wing spar to exit overboard via drain holes in the bottom skin of the aircraft. The primary and backup cables also route through the pressure deck at this point but do so at a level higher than the lowest point where liquid accumulates. They are also routed through sealed guide tubes.

In 1997 Boeing issued Service Letter 767-SL-27-116. This stated:

> *'Icing of the lateral flight control cables in the wheel well requires three "ingredients" in order to occur – a water source in the overwing/canted pressure deck area, leak path through the canted pressure deck and freezing temperatures in the main landing gear wheel well.'*

It advised that the drains in the canted deck should be routinely cleaned and the deck itself checked for leaks. It also stated that:

> *'If the canted pressure deck cannot contain standing water it will become an uncontrolled drain or leak path. As the airplane is pressurized this uncontrolled leakage can manifest itself as a pressurized spray. Effectively, it does not matter how many drains are installed in the overwing area if the canted pressure deck is allowed to leak water into the wheel well. Service experience has shown that missing fasteners, sealant, and cracks have contributed to lateral flight control icing. We recommend operators pay particular attention to the pressure web of the canted pressure deck. The pressure pans and closeout panels installed in the canted pressure deck have been known to crack and should be repaired or replaced.'*

Finally, it stated that cargo handling operations should ensure that cargo handling guidelines are followed to remove excess water or snow from cargo before it is loaded into the aircraft.

In 1998, the manufacturer issued an Alert Service Bulletin (SB) 767-51A0020, which was then revised in 2003. This introduced a modification of the canted pressure deck to avoid blockage of the drains leading to unintended fluid ingress into the main wheel well. It advised that should this occur, it could result in ice accretion on aileron control cables causing a restriction in movement. The bulletin referred to three previous events, two of which resulted in the autopilot being unable to move the ailerons, with manual operation of the controls requiring higher than normal control forces to free the cables and restore normal operation. The Federal Aviation Authority issued Airworthiness Directive (AD) 2000-22-11 in 2000 which mandated embodiment of this Service Bulletin.

A further Service Bulletin SB-767-51A0023 was issued in 2001, which introduced a repetitive inspection and unblocking as required of the drains in the canted pressure deck. The FAA issued AD 2003-19-09 in 2003 mandating the inspection requirement introduced by the Service Bulletin. G-DHLS had been manufactured with the modified drainage system and the operator stated that it had undergone all the inspections required at the time of the incident.

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Previous events

The manufacturer stated that from 1990, there were three events that had occurred involving reports of icing affecting aileron functionality. One of those three events involved blocked drains in areas that had improved design features incorporated in production that included the event airplane. The investigation was able to find reports from two NTSB investigations of subsequent events. One in 2000[1] where it was identified that SB 767-51A0020 had not been embodied, allowing blockage of the canted deck drains. A further event in 2022[2], where the toilet drain mast heater circuit breakers had been left in a "tripped" off condition, thus removing power to the heater, led to ice forming on the forward drain mast. This caused water to back up the drain lines until it flooded the canted pressure deck. The operator identified a damaged seal in the canted pressure deck which had then allowed water to leak into the main landing gear wheel well. This water likely froze on one or more components of the aileron control system. In both cases the crew were able to fly the aircraft manually, releasing the control restriction through increased force on the control wheels.

The manufacturer also reported two further events in 2014 and 2020, where aileron control restriction was identified during pre-flight checks and was a result of inclement weather. In the first incident snow and ice had been blown into the wheel well before departure, in the second rainwater had leaked through loose fitting seals on the upper wing surface.

QRH checklist

The B767 QRH checklist for *Jammed or Restricted Flight Controls* requires the crew to overpower the jammed or restricted control using increased force including the combined efforts of both pilots if required. The checklist suggests that if the crew believe frozen water is the cause that they should consider descending to warmer air before trying to override the jam again.

Flight crew response

The co-pilot was PF when the jam became evident on disconnection of the autopilot. He reported that he felt he had a very small amount of left and right movement in the control wheel. He also said it felt like a jammed control event in the simulator which he had recently experienced. The commander took control for a short period in the descent down to FL200. He commented that he felt there was a bolt through the control wheel which was locking it in place allowing him literally no movement left or right.

When the crew identified the jam, the commander suggested that the co-pilot continue to fly the aircraft as this would allow him some time to locate the checklist, confirm its contents and check whether there was anything else in the flight deck that could be the cause. The co-pilot was able to control the aircraft in pitch and the wings remained roughly level throughout the event. Both pilots confirmed with each other what action they would take to

Footnote

[1] https://data.ntsb.gov/carol-main-public/basic-search [report ref: CHI00IA152, published 06/09/2001, accessed May 2026].

[2] https://data.ntsb.gov/carol-main-public/basic-search [report ref: DCA22LA179, published 20/04/2023, accessed May 2026].

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level the wings should it be needed. Both pilots were aware of the more restricted operating envelope at FL350 and felt that it would be better to descend before attempting to break out the jam in case this resulted in an aircraft upset.

The flight was carrying a jumpseat passenger who was also a pilot with another operator. Although the passenger was not a B767 pilot he was familiar with the flightdeck. The commander used him to check the circuit breakers and other systems. During the descent to FL200, the commander reviewed the QRH checklist with the co-pilot so that both were clear what actions they would take. Once the aircraft was level at FL200, the commander and co-pilot both moved their control wheels to the left with significant force and full roll control was regained.

The co-pilot, after discussion with the commander, then engaged the autopilot and the flight continued normally. As a precaution against further restrictions, the crew decided to fly a longer final approach to land than normal, with an early configuration and performed in manual flight. The crew felt this would give them the earliest indication of any further control problems.

Aircraft examination

Following the incident, the aircraft was extensively examined by the operator under the supervision of the AAIB. The fault codes related to the EICAS Autopilot cautions inflight were confirmed and identified as having been triggered by a discrepancy between the commanded input to the LCCA and the achieved output. This issue was present on both autopilot control channels that were selected by the crew, confirming it had been replicated on two separate LCCAs. No physical restrictions or defects within the system were found and there was no evidence that the override mechanism had been activated. Examination of the canted pressure deck lowest point under the main cargo deck floor did not reveal any accumulated water or any signs that there had been a significant amount of water present. The panels and seals visually appeared in good condition, with no evidence of any unintended leak paths into the landing gear wheel wells. All the drains were clear of debris and there was no evidence that they would not operate as expected. A test flight (without cargo) to replicate the conditions of the incident flight was performed with no adverse findings.

Analysis

About 1:30 hours into the flight from Keflavik to East Midlands an Autopilot caution warning was triggered and the crew of G-DHLS found that they were unable to make aileron control inputs either manually or using the autopilot, due to what appeared to be a control jam. After descending to FL200, the crew were able to free the controls by jointly applying force in the same direction on the control wheel. The rest of the flight continued without further incident and with both manual and autopilot controls functioning normally. Post-flight checks identified no physical faults, restrictions or damage in the lateral control system. There was also no evidence that any override in the system had been activated during the flight. The investigation concluded that it was likely ice had formed somewhere on the aileron control system and this had restricted movement of the pilots' controls and notably the left aileron.

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The B767 has experienced previous incidents of ice restricting movement in the lateral control system. Various actions were taken in response by the manufacturer, which were then mandated by the regulator, to address the issue. G-DHLS complied with the modifications and inspections required by these actions. The investigation considered the most likely cause of the event was the formation of ice, but by the time the aircraft landed it was not possible to locate the source of any water coming into contact with the control system nor identify specifically where on the control system the ice was likely to have formed.

The crew dealt with the incident calmly, descending first before applying force to the control wheels and releasing the jam. Previous simulator training had provided them with experience of a jammed control which proved accurate and useful. The well-known possibility of ice also meant the crew had a good plan for how to tackle the jam.

Conclusion

During the flight from Iceland, it was likely that ice formed on the aileron control system, restricting movement in roll. Despite extensive inspections of the aircraft, it was not possible to identify the source of any water/fluid nor where it had formed ice to create the jam. The crew handled the emergency well with good planning, briefing and co-ordinating throughout the event. They were able to successfully release the jam using the actions in the QRH and the aircraft landed safely without further incident.

Published: 4 June 2026.

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