ACCIDENT

Aircraft Type and Registration:	Beechcraft 200, G-GHSV	
No & Type of Engines:	2 Pratt & Whitney Canada PT6A-61 turboprop engines	
Year of Manufacture:	1980 (Serial no: BB-622)	
Date & Time (UTC):	3 January 2022 at 1118 hrs	
Location:	Exeter Airport, Devon	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Damage to cargo pod, fuselage, belly ribs, gear doors and flaps	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	66 years	
Commander's Flying Experience:	16,300 hours (of which 2,000 were on type) Last 90 days - 50 hours Last 28 days - 18 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot with additional enquiries by the AAIB	

Synopsis

The aircraft had diverted to Exeter due to having an unsafe left main landing gear indication when it was lowered during approach to Alderney, the original destination. After a flypast of Exeter tower, observers confirmed the gear was down, so the pilot continued to land. During the landing roll the left main landing gear collapsed. It was likely that the left main landing gear down-lock system had lost adjustment. This resulted in the drag brace folding and loading the landing gear actuator, causing it to buckle.

History of the flight

The pilot was positioning the aircraft from Lydd to Alderney. As he approached Alderney he selected the landing gear down and heard the gear lowering as normal, but once the cycle had completed the left main landing gear green light, which indicates that the gear is down and locked, did not illuminate.

The pilot confirmed that the bulb worked before re-cycling the landing gear. Again, the left main landing gear green light did not illuminate. A go-around was undertaken and the pilot decided to divert to Exeter, where the aircraft was maintained, and alerted air traffic of his intensions. The pilot retracted the landing gear with no apparent issues.

The aircraft was cleared to FL100 and given direct passage to Exeter. The pilot declared a MAYDAY, advising ATC of the unsafe gear indication. He completed a flypast of the tower and observers on the ground confirmed that the left main landing gear was lowered. The pilot made a normal approach and landing on Runway 26. He recalled that he touched down softly and as the aircraft weight was taken by the landing gear, he could feel the left main gear collapse. He reported that he held the left wing up as long as possible, but eventually the wing and belly pod contacted the runway. The tips of the left propeller also struck the runway. Once the aircraft had come to rest the pilot shut down the right engine and made the aircraft safe before exiting.

Aircraft information

The Beechcraft 200, a member of the Super King Air family of aircraft, is a pressurised twin turboprop powered utility aircraft. It has a retractable tricycle landing gear with the main gear positioned below each engine. G-GHSV was fitted with an electro-mechanical landing gear system[1], which was controlled by a switch on the pilot's right sub panel. The system incorporates an electric motor which drives torque shafts to ball screw actuators positioned on the left and right main gear, duplex chains drive a ball screw actuator which moves nose gear (Figure 1).

A manual gear extension handle, situated in the cockpit, can be used to lower the landing gear in the event of a fault.

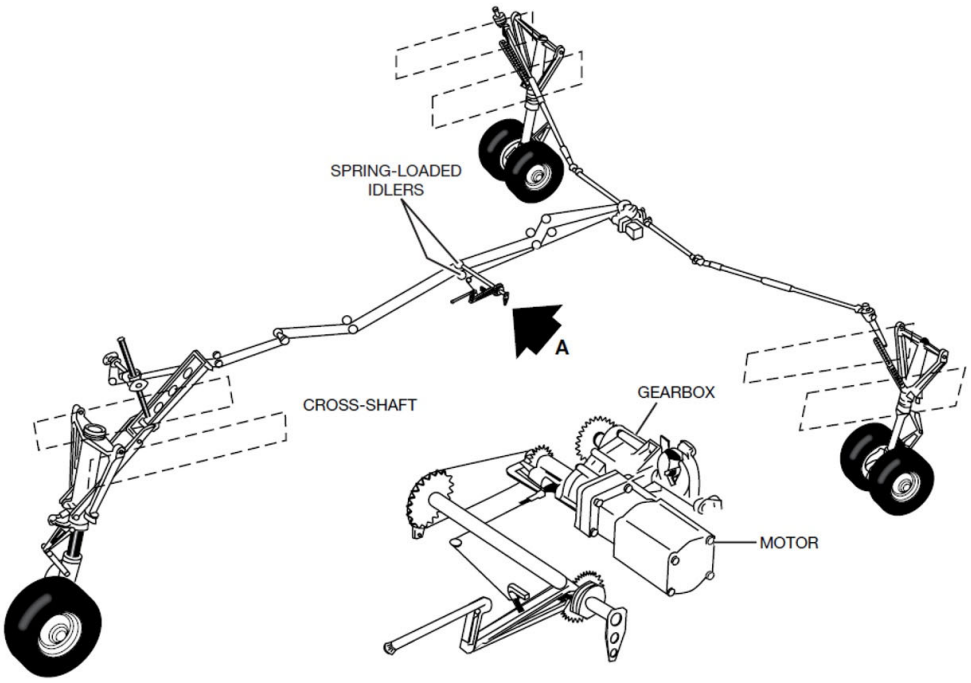

Figure 1

Super King Air electro-mechanical landing gear arrangement showing manual lowering system

Footnote

[1] Other King Air aircraft use a hydraulic landing gear system.

Main landing gear down-locks are provided by notched hook and plate attachments on the drag braces (Figure 2). As the landing gear extends, a link mechanism, connected to the actuator, positions the notched hook to engage with the plate attachment at the extent of travel. When the gear is down and locked the notched hook contacts a down-lock indicator switch which when depressed illuminates its respective green landing gear light in the cockpit.

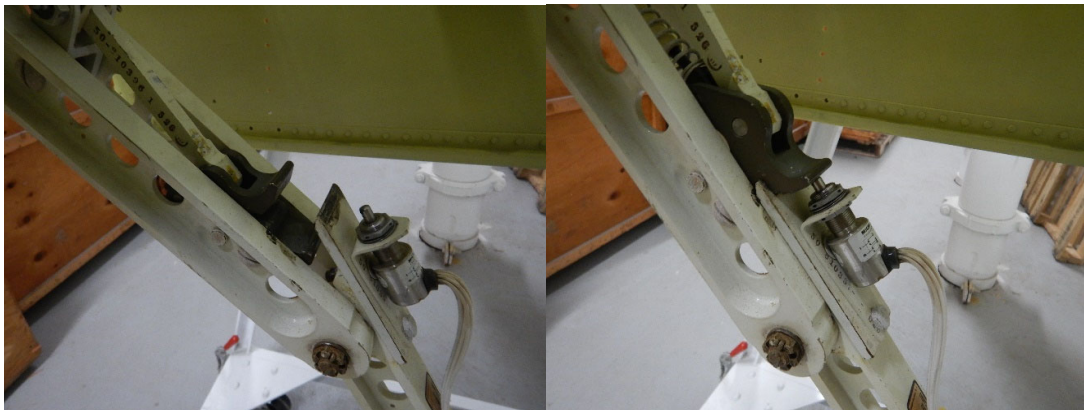

Figure 2

Beechcraft 200 landing gear mock-up showing down-lock operation;
Left image: during travel right image: locked

G-GHSV had been fitted with overhauled landing gear actuators in February 2020, 170 flying hours before the accident. At the time they were fitted, the down-lock rigging was set. No further maintenance of the actuation system was required until 30 months after the installation, which would have been in August 2022.

At the time of the accident the aircraft's certificate of airworthiness was valid and its airworthiness review certificate was in date.

Aircraft examination

The aircraft was recovered to a maintenance facility where the landing gear could be examined. With the aircraft jacked, the left main landing gear lowered under gravity revealing that the actuator shaft had failed close to rod end clevis. The down-lock mechanism was also damaged and was missing the hook and lever attachment on the notched hook (Figure 3). The missing components from the down-lock mechanism were not recovered after the accident.

The damaged actuator was removed from the aircraft and examined in a laboratory where it was discovered that the actuator shaft had failed in buckling around its thinnest section. The actuator shaft had also bent where it exited the actuator body when fully extended. The actuator trunnions had fractured (Figure 4).

The fractures on the down-lock notched hook were assessed to have been in sheer overload with no evidence of pre-existing cracks (Figure 5).

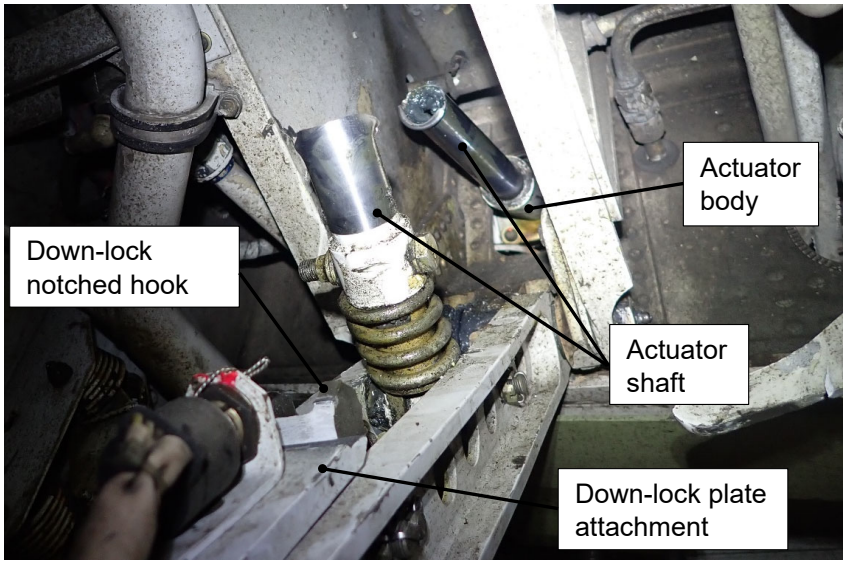

Figure 3

Left main gear fracture actuator and damaged down-lock

Figure 4

Left main landing gear actuator with actuator shaft removed form actuator body

Figure 5

Damaged notched hook

Analysis

The damage to the down-lock mechanism suggests that when the landing gear was lowered the locking plate did not fully engage with the notched hook and therefore the landing gear remained in an unlocked condition. When the aircraft landed, the unlocked drag brace started to fold. As it did so it forced the locking plate through the partially engaged hook, causing the hook to fracture. The drag brace continued to fold loading the actuator, causing it to buckle. This loaded the lever attachment of the notched hook, causing it to fail as the gear continued to collapse.

It is likely that the down-lock rigging had lost adjustment which manifested itself in the left main gear down-lock not fully engaging. This, in turn, resulted in the left main gear green light not illuminating, as the hook did not contact the indicator switch.

Due to the damage to the components, the cause of the loss of rigging adjustment could not be established. The rigging had been set at the time the actuator had been installed some 170 hours before the accident. It is therefore unlikely that it had been incorrectly rigged at the time of installation.