**ACCIDENT**

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| **Aircraft Type and Registration:** | DHC-8-402 Dash 8, G-JECN |
| **No & Type of Engines:** | 2 Pratt & Whitney Canada PW150A turboprop engines |
| **Year of Manufacture:** | 2005 (Serial no: 4120) |
| **Date & Time (UTC):** | 2 March 2019 at 1505 hrs |
| **Location:** | Southampton Airport |
| **Type of Flight:** | Commercial Air Transport (Passenger) |
| **Persons on Board:** | Crew - 4 Passengers - 59 |
| **Injuries:** | Crew - None Passengers - None |
| **Nature of Damage:** | Impact marks to the fuselage behind the radome and nose landing gear door. No 2 propeller blades tip strikes |
| **Commander's Licence:** | Airline Transport Pilot's Licence |
| **Commander's Age:** | 59 years |
| **Commander's Flying Experience:** | 12,216 hours (of which 5,601 were on type)<br>Last 90 days - 166 hours<br>Last 28 days - 70 hours |
| **Information Source:** | Aircraft Accident Report Form submitted by the pilot and enquiries made by the AAIB |

## Synopsis

The aircraft had landed at Southampton and was being taxied to its allocated stand. The No 1 engine had been shut down in accordance with the operator's SOPs. As it approached the stand, at walking pace, the commander applied the brakes, which had no effect and the aircraft hit signage and the rotating No 2 (right) propeller struck a nearby ground power unit (GPU). The accident was caused by the aircraft standby (hydraulic) power unit (SPU) not being selected to ON. This selection was normally made during the approach checks. However, on this occasion, the approach checks were not completed prior to landing. This meant that the aircraft mainwheel brakes did not work with the No 1 engine shut down. During the collision the aircraft sustained damage to the nose fuselage behind the radome, a nose landing gear door and right propeller tips. There were no injuries to the passengers or crew.

## History of the flight

The aircraft had arrived at Southampton Airport after completing the fourth and final sector of the day. After touchdown, and as the aircraft slowed to 60 kt, control was handed to the commander. The aircraft continued to slow down to 15 kt before exiting the runway. The aircraft was brought to a stop and the crew completed a routine over-speed governor (OSG) check. Once this was completed the No 1 engine was shut down and the aircraft

was taxied the short distance to Stand 8 for a "nose-in" park. As the aircraft approached the stand at a "walking pace", the commander applied gentle braking, but this did not appear to slow the aircraft and he realised the brakes were not functioning. He increased his force on the brake pedals, but this had no effect and the aircraft continued moving towards the stand signage.

The commander had his hand on the No 2 engine power lever, next to the emergency brake lever, and instinctively applied full reverse thrust. This helped to slow the aircraft but was insufficient to prevent impact with signage damaging the left side of the forward fuselage and right nose landing gear door. At the same time the No 2 propeller tips hit the glass reinforced plastic cover of a GPU parked marginally outside its bay. At this point the co-pilot realised that the STBY HYD PRESS and PTU CNTRL were OFF and immediately switched them ON. The aircraft then rolled back slightly and stopped. The crew shut down the No 2 engine and the commander requested assistance from ATC. He also made a 'resume normal operations' broadcast over the public address system to the cabin crew. The airport fire service attended the aircraft and after an assessment of the situation and consultation with the fire officer, the passengers were allowed to disembark the aircraft. There were no injuries to the passengers or crew; but the aircraft had sustained damage to its left side fuselage and a panel just behind the radome. The right nose landing gear door detached and the propeller tips struck an GPU. The GPU cover was also damaged.

**Systems description**

The Bombardier Q400 aircraft is powered by two Pratt and Whitney 150A turboprop engines driving six-blade variable pitch-propellers. The propeller blades are of composite construction and are 4.1 m in diameter. The aircraft has two 3,000 psi hydraulic systems powered separately by a pump driven by each engine. The No 1 hydraulic system, in normal operation, powers the flying controls, flaps, inboard roll spoilers and wheel brakes. The No 2 hydraulic system also powers the flying controls, in addition, it powers the outboard roll spoilers, nosewheel steering, emergency parking brakes and landing gear.

The No 1 hydraulic system includes a SPU which pressurises the system when the No 1 (left) engine is not running. In between the two systems there is a PTU which consists of a hydraulic motor driven by the No 1 hydraulic system which drives a pump to deliver pressure into the No 2 hydraulic system.

**Events leading to the accident**

The aircraft was on the last of four revenue sectors from Jersey to Southampton. The flight had been routine and uneventful. It was configured by the crew for a Flap 35 landing and was stable at the 1,000 ft approach gate and at the 500 ft landing gate. However, although they had flown a normal approach pattern, neither pilot realised that the approach checklist had not been completed prior to configuring the aircraft for landing. The approach checklist should have been carried out between the altimeter checks and landing checks. Amongst other things, it requires the hydraulic and fuel pumps to be selection ON and then to confirm the SPU and PTU advisory lights are ON. It also requires a check of the cockpit display to ensure that standby hydraulic pressure is reading 2,800 – 3,000 psi. Because

none of these actions were carried out, the backup for the No 1 hydraulic system or the PTU[1] for the No 2 hydraulic system were not available.

In accordance with the operator's SOP, the after-landing checks required the No 1 engine to be shut down and the aircraft taxied to the stand on the No 2 engine. However, the commander had realised, just as the No 1 engine was about to be shut down, that an OSG check was required as it was the last flight of the week[2]. As a result, the after-landing procedure was interrupted. This check would have led the crew to again check that the STBY HYD PRESS and PTU CNTRL advisory lights were ON and that the MFD was indicating a standby hydraulic pressure of 2,800 - 3,000 psi. However, because of the interruption, this was also overlooked. The No 1 engine was shut down after the OSG check and they continued to taxi the aircraft to the stand.

During the short taxi, prior to the OSG check with both engines running, the mainwheel brakes worked normally. However, after the No 1 engine shutdown with the standby system inoperative, hydraulic pressure was no longer being supplied to the No 1 hydraulic system services or the brakes.

Nevertheless, with the No 2 engine running, the emergency parking brake remained available throughout.

## Analysis

There were a series of minor factors which coincided to cause this accident. The landing was the last of a day which had consisted of repeated and routine sectors. The absence of the approach checks meant that the aircraft was not configured correctly in preparation for the operator's SOP in which, after landing, the No 1 engine is shut down and the aircraft taxied to the stand on the No 2 engine. That did not predestine the aircraft to remain in this incorrect configuration. There was a further intervention during the after landing checks with the check of the STBY HYD PRESS and PTU CNTRL advisory light. However, this check was also overlooked when the crew were distracted by remembering that the aircraft required an OSG check after the last flight of the week which then interrupted the after landing checks. After this, there were no other prompts during the remainder of the taxi by which to indentify the situation. When the accident sequence was underway, and the crew realised what was happening, the co-pilot remembered the STBY HYD PRESS and PTU CNTRL were OFF and tried to switch them on, by which time it was too late.

Most of the damage to the aircraft was in the vicinity of the radome. It is not clear whether the propeller would have struck the GPU had it been fully positioned in its dedicated area.

**Footnote**

[1] In this case the PTU not being selected ON did not influence the outcome of this accident. However, it not being selected, along with the fuel pumps during the approach checks, could have caused difficulties had there been an issue with the No 2 engine which required a shutdown and go around. The crew would not have been able to retract the landing gear which would have affected their single engine climb out performance.

[2] The Operator's policy is to conduct an OSG check after the last flight on a Saturday of each week.

**Commander's opinion**

In the opinion of the commander, the cause of the accident was the loss of the main wheel brakes due to not having STBY HYD PRESS selected. When the No 1 engine was eventually shut down, hydraulic power was lost, rendering the brakes inoperative.

The commander identified the following contributory factors which, in his opinion, led to the event.

- Failure to adhere to SOPs. The approach checks were not carried out, possibly due to distraction, and the after-landing checks were interrupted by the OSG test.
- False confirmation. Until the OSG check, the brakes worked as both engines were still running.
- Sequence interruption. The short taxi to stand barely gave time for the after-landing sequence and it was not completed correctly.
- Complacency. This was a return to home base after four sectors. The previous three arrivals and taxi-in phases had all been normal.
- 'Startle factor'. Combined with having his right hand on the No 2 power lever, a 'startle factor' produced an instinctive response in the commander to apply reverse thrust rather than apply the emergency brake.

**Operator's opinion and safety actions**

The Operator considers several safety barriers failed in the lead up and during the accident. The approach checks and after landing checklist should have captured the incorrect aircraft configuration. The use of the emergency brakes may have prevented the outcome.

Because of this event, the Operator has carried out a safety study looking into previous occurrences. This has produced several additional observations to be considered, regarding the approach checklist design and the single engine taxi risk assessment.

In addition, a Notice to Air Crew (NOTAC) has been raised implementing a No 1 hydraulic system check during taxi.