

I GIVE YOU WING ANTI-ICE LATER IN THE CLIMB OUT, RIGHT?



Jet Connection Businessflight AG was a German commercial air transport company operating in the air charter and air ambulance markets. For long-range trips it operated a Challenger CL604 aircraft.

On Christmas day 2007 a German entrepreneur was the only passenger on a flight from Hannover, Germany to Macao, China. Given the distance, the flight was scheduled to perform a fuel stop in Astana, Kazakhstan.

The crew of the flight was composed of the two pilots and the flight attendant.

At around noon on December 25, 2007 D-ARWE, the Challenger 604, took off from Hannover bound for Astana. During the flight the crew was informed that fuel was not available in Astana and they decided to divert the flight to Almaty, where fuel was available.

Due to the eastbound flight and the time elapsed since the departure at noon from Hannover, it was night by the time they arrived in Almaty. Actually, it was already December 26, 2007.

After refueling, the flight was scheduled to continue to Macao at 2:50 am Almaty time on December 26, or, in

UTC, at 8:50 pm on December 25. From here on all times mentioned are in UTC.

In Almaty, the pilot in command supervised the uplift of 6.8 metric tons of fuel. He also accessed online weather services from the German Meteorological Service and from Businessflight's flight planning provider PPS. The PIC was thus aware, from reported weather and from own observations, that Almaty weather presented a typical mountain winter scenario: light Northerly winds, runway visual range oscillating between 1500 and 3000 meters, light snow, mist, overcast at less than 500 feet and a low pressure of around 960 hPa. Runway 05 was in use and covered by dry snow up to 10 mm, with a braking action of 0.32.

At this point it was 8:20 pm.

The PIC ordered the aircraft to be de-iced. Once refueling and de-icing were completed, the PIC performed the pre-flight inspection and monitored the stabilizer and wing anti-icing. All aircraft systems were fully serviceable, as the PIC would later confirm during questioning by the air accident investigators.

Michael R. Grüninger and Capt. Carl C. Norgren examine a Challenger 604 that crashed on take-off near Almaty after the captain failed to turn on the anti-icing protection systems despite the low temperature and presence of snow

So far, everything looked normal and the crew informed ground control that they were ready to start up and taxi right after the completion of the 2 stage de-icing procedure with Type 1 de-icing fluid and Type 2 anti-icing fluid. Later, the air accident investigators would confirm that the fluids were applied in sufficient quantity and met the specifications.

While de-icing was still in progress, the crew received the ATC clearance for departure.

Weather by the time the de-icing procedure was terminated was still more or less the same as before.

By now it was 8:47 pm.

The crew was given the taxi clearance. The crew prepared the aircraft for departure, setting the flaps on the slat-less aircraft and the trim tab at a stabilizer position of -4.7°.

Ready at the holding point, Tower Control instructed the crew to wait until an MD-83 on approach had landed.

Five minutes later, at 8:57 pm, the MD-83 landed and the Challenger 604 was cleared to take-off from Runway 05.

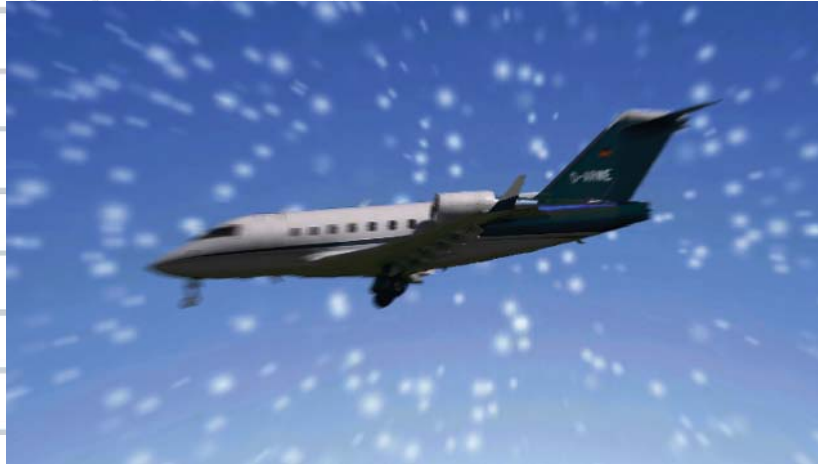
The crew lined-up and applied take-off power to start the take-off roll on the snow-covered runway into the dark night.

Shortly after lift-off the aircraft oscillated vertically at high rate and lift significantly decreased asymmetricaly. While the left wing was still generating lift, the right wing stalled. The aircraft banked uncommanded to the right to about 65 degrees. The wingtip touched the ground and the aircraft tilted into the ground.

The first touch was made by the right wing tip on the line of the runway edge lights 1,640 meters from the threshold. The aircraft then

MANDATORY

Pilots need to know the adverse effects of icing on aircraft systems and procedures to be adopted.



impacted the aerodrome fence and broke into three parts. The subsequent ground fire significantly burned the aircraft.

The co-pilot died from the impact forces. The PIC, the flight attendant and the passenger could escape from the burning wreck with major injuries and burn.

It was 9:02 pm.

Decision Making

Long before the accident, the operator had decided not to include the Cowling and Wing Anti-ice system checks in the abbreviated checklists for short turnarounds. These system checks should have been performed in accordance with the Challenger's Aircraft Flight Manual (AFM). The AFM is published by the manufacturer and is part of the documentation elements of the aircraft type certificate. When the AFM states that certain checklist items should be performed, the certificated level of safety can only be maintained if the manufacturer's recommendations on the operation of the aircraft are followed by the operator. While it is legally permissible, in principle, to alter normal AFM checklists, it is the operator's responsibility to ensure that an equivalent level of safety is maintained by doing so.

The accident report does not provide information on whether the lack of performing the anti-ice system checks contributed to the accident. However, with hindsight, the inclusion of these checks in the operator's abbreviated checklist might have reminded the crew of the AFM requirement to actually engage both Cowling and Wing Anti-

ice protection in the given meteorological situation.

While holding short of the runway waiting for the MD-83 to land prior to their departure, the accident crew had to make decisions on the configuration of the aircraft.

After the accident, the surviving PIC was interviewed by the investigators. He confirmed that prior to line-up, the crew had decided to engage Cowling Anti-ice. The PIC planned to engage Wing Anti-ice during the climb-out. The decision was made based on the assumption that the Type 2 anti-icing fluid applied to the aircraft would provide anti-icing protection for 30 minutes.

The de-icing procedure had started at 9:37 pm, therefore, assuming the full hold over time could be taken advantage of, the anti-ice protection lasted theoretically until 9:07 pm.

The Operating Manual indicated the hold over time for the given fluid type and mixture in combination with the current type of precipitation and temperature to be between 15 and 30 minutes.

In addition, the PIC believed that by not engaging Wing Anti-ice the additional thrust generated would be beneficial for the take-off roll on the contaminated runway.

Thus the PIC decided against engaging the Wing Anti-ice system and for the use of the Cowling Anti-ice system only during take-off.

Ground Effect with Supercritical Wing Profiles without Slats

The Challenger 604 is protected against stalls by a stall protection system. However, the stall protection system warning only kicks in when

the critical angle of attack for a non-contaminated wing is reached. In this accident, as in four previous similar accidents, the stall occurred before the stall protection system was activated. All stalls were followed by uncommanded rolls right after lift-off.

Bombardier has conducted experiments on the behavior of supercritical wing profiles. The results reveal that the ground effect by the time of the lift-off leads to a decrease of the critical angle of attack by up to 4 degrees. On a contaminated wing though, the critical angle of attack decrease is greater. In combination with a high rate of rotation at take-off, the effect is even larger. This explains the vertical oscillation after lift-off and for the lack of a stall protection system warning.

The fast dynamic of these circumstances make it practically impossible for the crew to act upon the wing stall at lift-off.

Taking off with a contaminated wing without engaging the appropriate anti-ice systems as recommended by the AFM and relying on the effectiveness of the ground anti-icing procedure resulted in a stall of the right wing when climbing out of ground effect.

The answer to "I give you Wing Anti-Ice later in the climb out, right?" should have been "No, let's follow the recommended AFM procedure given the current weather situation."

Bankruptcy

The accident put Bussinessflight AG into the limelight. Businessflight's revenue drastically dropped after the accident and it declared bankruptcy within a year after the accident.



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CALAMITY
The accident destroyed the aircraft and killed one member of the crew.