

Cessna 208B Caravan, LN-PBB

AAIB Bulletin No: 5/2000 Ref: EW/C99/09/02 Category: 1.2

Aircraft Type and Registration:	Cessna 208B Caravan, LN-PBB
No & Type of Engines:	1 Pratt & Whitney PT6A-114 turboprop engine
Year of Manufacture:	1992
Date & Time (UTC):	6 September 1999 at 1034 hrs
Location:	Sumburgh Airport
Type of Flight:	Public Transport (Cargo)
Persons on Board:	Crew - 2 - Passengers - Nil
Injuries:	Crew - Nil - Passengers - N/A
Nature of Damage:	Severe damage to the propeller, all three landing gears and the lower and rear fuselage structures
Commander's Licence:	Commercial Pilot's Licence (Norwegian) with Instrument Rating
Commander's Age:	32 years
Commander's Flying Experience:	1,780 hours (of which 500 hours were on type) Last 90 days - 90 hours Last 28 days - 50 hours
Information Source:	AAIB Field Investigation

History of flight

The operating company were involved in a RoyalMail contract to deliver mail from Aberdeen to Shetland Islands each day. The crew involved in the accident had flown LN-PBB from Stauning Airport in Denmark to Aberdeen in preparation for a two week period of duty delivering the mail; they arrived at Aberdeen at 1700 hrs on 5 September 1999.

The next morning, the crew arrived for duty at approximately 0540 hrs and completed their normal checks of LN-PBB. Shortly after this, the mail arrived and was escorted to the aircraft by the company ground crew. The mail bags were sorted and loaded into the aircraft by the flight and ground crew under the supervision of the commander; the mail had been weighed by Royal Mail

and the commander was given written confirmation of the total weight of 1,196 kg. At the completion of the loading, the commander was satisfied that the load was secure and correctly distributed. Prior to departure for Sumburgh Airport, the commander had checked the weather and was aware that it was 'poor' at Sumburgh but the indications were that it would improve; additionally, the weather at Kirkwall Airport was clear if they needed to divert.

The aircraft appeared fully serviceable during start, taxi and take off from Aberdeen at 0640 hrs; for the flight to Sumburgh, the commander was the handling pilot. Cruise was at Flight Level (FL)90 and, about half way to Sumburgh, ATC advised the crew of the latest weather at Sumburgh which indicated that they would not be able to land there. However, there was a preceding aircraft heading for the same destination and the commander elected to continue towards Sumburgh. Then, once the preceding aircraft crew had declared that they were diverting to Aberdeen, the commander decided to divert to Kirkwall. The diversion was uneventful and the aircraft landed at 0807 hrs.

At Kirkwall, the crew uplifted sufficient fuel to bring the total up to the same with which they had left Aberdeen (1,200lb) and waited for a weather improvement at Sumburgh. By approximately 0930hrs, the crew were advised by Kirkwall ATC that the weather had improved at Sumburgh and they prepared the aircraft for departure. Take off was at 0950 hrs with the co-pilot as handling pilot. Cruise was at FL 70 and was uneventful up to the approach and landing. The airport was using Runway 27 as that is the only runway with full ILS. The ATIS information at 1020 hrs was broadcasting the following information: surface wind 340°/07 kt; 9,000 metres in rain; cloud few at 300 feet, scattered at 1,000 feet and broken at 1,600 feet; temperature 12°, dew point 12°; tempo cloud broken 1,500 feet with a wet runway. In accordance with ATC instructions, the crew commenced their descent to 2,000 feet amsl where they were instructed to intercept the ILS from a heading of 300°. Once fully established on the ILS, the commander noted that the co-pilot was having a little difficulty maintaining the aircraft on both the localiser and glide slope. The co-pilot was not sure of the height at which they broke cloud but the commander estimated that they were at 500 feet agl. At this point, the co-pilot considered that they were slightly high and fast; subsequently, the commander estimated the aircraft airspeed as 140 kt as they became visual with the runway. During the final approach, the air traffic controller gave three separate wind reports of 010°/11 kt, 010°/11 kt and 010°/10 kt; these reports were based on the two minute mean surface winds. As the aircraft crossed the runway threshold, the co-pilot called out that he had too much speed and that "it wasn't going to work". With no reply from the commander, the co-pilot took this lack of response as an indication that the commander was content. For his part, the commander was concentrating on the runway aspect and, although he heard a comment from the co-pilot, did not make any response. The crew considered that touchdown was approximately halfway down the runway and the co-pilot was aware of the aircraft bouncing before a second touchdown; neither pilot could recall the speed at touchdown. Both pilots applied full foot braking but with little apparent result in retardation. Then, as the aircraft approached the end of the runway, the commander took control and applied full power; this was because he was aware of the concrete blocks positioned off the end of the runway as a sea defence and wished to clear them. The aircraft was now yawed slightly left and positioned to the left of the runway centreline. It left the runway surface, travelled across grass and a public road and came to rest on the concrete blocks.

The response of ATC and the RFFS to the emergency was prompt and effective.

Engineering investigation

Examination of the runway could not establish the point where the aircraft first touched down or if a bounce and second touchdown took place. Also, there was no evidence on the runway

of aquaplaning having occurred. Approximately 140 metres from the end of the runway and just to the left of the runway centreline, there was visible evidence of heavy braking from the right main landing gear. There was not the same evidence from the left main landing gear. The evidence of heavy braking on the right main landing gear continued along the runway for approximately 110 metres during which the aircraft veered well to the left of the centreline. In the area of the 09 runway threshold marks, the evidence of heavy braking disappeared. The aircraft continued a further 30 metres before it left the tarmac runway surface and entered the grassy overrun area. There was wheel mark evidence within this grassy area to indicate that all three landing gear wheels were in contact with the ground, the aircraft was yawed to the left and there was no apparent braking taking place. The aircraft then crossed a public highway and entered a second grassy area. Here, there was no evidence of the nose landing gear wheel being in contact with the ground and no evidence of braking taking place. After travelling across the second grassy area, the aircraft crossed approximately 25 metres of tarmac and the concrete sea wall, which was level with the tarmac area. In this area there was good evidence of all three landing gear tyres being in contact with the ground and aquaplaning occurring by the two main landing gear tyres. Finally the aircraft departed the sea wall and descended into an area of sea defences which consisted of approximately 2 metre square concrete blocks. The impact with the concrete blocks brought the aircraft to a rapid halt which prevented it going into the sea. Because the forward fuselage was below the high water mark the airport authority removed the wreckage to a safe location on the airport prior to the arrival of the AAIB. The total distance from the first heavy braking mark to the aircraft's final resting place was approximately 275 metres.

Examination of the wreckage revealed that it impacted the sea defences at about 50 kt, with high power on the propeller, with the propeller blades in a positive pitch position and with the wing flaps retracted. The forward lower area of the fuselage had been severely damaged by the impact which had broken and disrupted the flying control systems and the landing gear hydraulic system. Examination of these systems showed that they had all been intact and functioning correctly prior to the impact. Examination of the main landing gear wheels and brake units showed them to be serviceable and the tyres exhibited damage consistent with the ground marks observed on the runway and in the overrun area.

Eye witnesses

There were numerous eye witnesses to the accident. The air traffic controller estimated that the aircraft landed at the intersection with Runway 15/33, bounced and then touched down again on the touchdown zone markings for Runway 09. The intersection is located some 300 metres from the threshold of Runway 09 and the touchdown markings are located some 170 metres from the same threshold.

Other eye witnesses were located at the traffic lights positioned either side of the runway on the public road close to the threshold of Runway 09. Those positioned to the north of the runway had an uninterrupted view of the latter half of the Runway 27; they considered that the aircraft landed close to the intersection with Runway 15/33.

A video camera was operating at the southern traffic lights and this recorded the aircraft passing the threshold; at that point all three landing gears were on the ground.

Weather information

Prior to departure from Aberdeen, the crew had obtained weather information. The METAR for Aberdeen showed good weather with no cloud below 3,500 feet. The METAR for Sumburgh at 0450 hrs showed a surface wind of 180°/11 kt, visibility of 3,000 metres in rain, cloud broken at 200 feet, temperature of 13° with a dew point of 13°. The METAR for Kirkwall at the same time showed a surface wind of 350°/10 kt, visibility of +10 km in rain, cloud few at 300 feet and broken at 500 feet, temperature of 13° and a dew point of 12°.

There was no TAF for Sumburgh included on the TAF Bulletin 3 but the TAF for Kirkwall from 0600 hrs to 1300 hrs indicated the following weather: 270°/10 kt; visibility of +10 km; cloud few at 1,500 feet, scattered at 2,500 feet and broken at 4,000 feet; TEMPO 7,000 metres in rain; PROB 30 TEMPO 4,000 metres in rain, cloud broken at 700 feet; becoming 340°/10 kt between 0600 hrs and 0900 hrs.

At Kirkwall, the crew received further weather information about Sumburgh. The METAR for 0920 hrs showed a surface wind of 330°/10 kt, visibility of 4,000 metres in rain, cloud few at 300 feet, scattered at 1,200 feet and broken at 2,000 feet. The TAF issued at 0845 hrs and valid between 1000 hrs and 1900 hrs indicated the following weather: 350°/10 kt; visibility of 7,000 metres in rain; cloud scattered 300 feet and broken at 500 feet; TEMPO visibility of 1,000 metres, cloud few at 100 feet and broken at 200 feet; PROB 30 TEMPO visibility +10 km, cloud scattered at 700 feet and broken at 1,500 feet.

The air traffic services assistant located in the Sumburgh Tower took a weather observation immediately after the accident. This was similar to the ATIS at 1020 hrs and was as follows: surface wind 340°/7 kt; visibility of 9,000 metres in moderate rain; cloud few at 300 feet, scattered at 1,000 feet and broken at 1,400 feet; air temperature and dew point of 12°; QNH of 1016 Mb.

Airport information

Runway 27 at Sumburgh has a Landing Distance Available of 1093 metres (3,586 feet). A flight inspection of the ILS had been carried out on 17 and 18 June 1999 and the system conformed to the required standards. Following the accident, a ground inspection of the facility indicated that it was fully serviceable.

There are 3° PAPIs located 198 metres from the displaced threshold of Runway 27. All the runway lights including the PAPIs were on at the time of the accident. Subsequently, the PAPI angles were checked and confirmed as accurate; the crew of LN-PBB could not recall seeing the PAPIs during their approach and landing.

The runway condition had been formally checked on 2 February 1999. At that time, the Mu readings varied between 0.81 and 0.90. Following the accident a further inspection of the runway surface was carried out. This occurred on 8 September 1999 with moisture conditions similar to those existing on the day of the accident; this revealed average readings between 0.68 and 0.75. All these readings indicate good braking action. Additionally during heavy rain, a visual check by AAIB investigators of the last third of the left side of Runway 27 revealed no standing water.

Radar information

Subsequent to the accident, a radar recording of LN-PBB was obtained from Sumburgh Radar. Calculations indicate that the average ground speed of the aircraft from 2,000 feet agl to touchdown was approximately 170 kt; touchdown appeared to be at least 1/2 along the runway. A

further calculation indicated that the average groundspeed from 500 feet agl (height at which the crew became visual with the runway) to touchdown was approximately 140 kt. This last calculation confirmed the crew's recollection of speed as they became visual with the runway.

Company information

The aircraft operating company provided the following information from their operating manuals:

1. The threshold speed for the aircraft was 90 kt.
2. Both the commander and the co-pilot had completed courses in Crew Resource Management although there was no specific national or company requirement to do so.
3. The weather limitations for operating the aircraft in UK was a minimum visibility of 1 nm and a minimum cloud base of 1,000 feet ceiling. Note: Cloud ceiling, as defined in the UK Air Navigation Order (ANO), in relation to an aerodrome means the vertical distance from the elevation of the aerodrome to the lowest part of any cloud visible from the aerodrome which is sufficient to obscure more than one-half of the sky so visible.
4. There was no specific information included within the manuals to require a crew to be stabilised at a specific height during the approach.

Air Navigation Order (ANO)

The aircraft were operating under Article 32A of the UK ANO. This states that:

'An aeroplane which is not registered in the United Kingdom and is powered by one engine only shall not fly for the purpose of public transport at night or when the cloud ceiling or visibility prevailing at the aerodrome of departure and forecast for the estimated time of landing at the aerodrome at which it is intended to land and at any alternative aerodrome are less than 1,000 feet and 1 nautical mile respectively.'

Analysis

The aircraft overran the end of Runway 27 at Sumburgh following a touchdown which was too fast and well down the runway. There was insufficient runway remaining for the aircraft to stop. The landing resulted from a poor approach and no apparent co-operation between the crew. A positive decision from the co-pilot, or better monitoring and an active input from the commander, should have resulted in a go-around and a further approach or a diversion. While this crew may be unusual, it would be appropriate for the operating company to review their procedures to ensure that their crews are operating in a safe manner.

The investigation also reviewed the rules under which the flight was conducted. Examination of the weather information available to the crew indicate doubts as to whether the flight could have been completed within the limitations contained within company manuals. Additionally, Article 32A of the UK ANO is not clear; it could be interpreted as only prohibiting flights when the weather conditions are not met at all of the relevant aerodromes. It would be appropriate for the CAA to review the content of Article 32A to ensure that the intent is clear.

Safety recommendations

It is recommended that:

Recommendation No 2000-20

The Norwegian Authorities require the operating company of LN-PBB to review their operating procedures.

Recommendation No 2000-21

The CAA review the content of Article 32A of the Air Navigation Order and clarify it.