BEA
Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile
www.bea.aero
@BEA_Aero

SAFETY INVESTIGATION

Final report summary

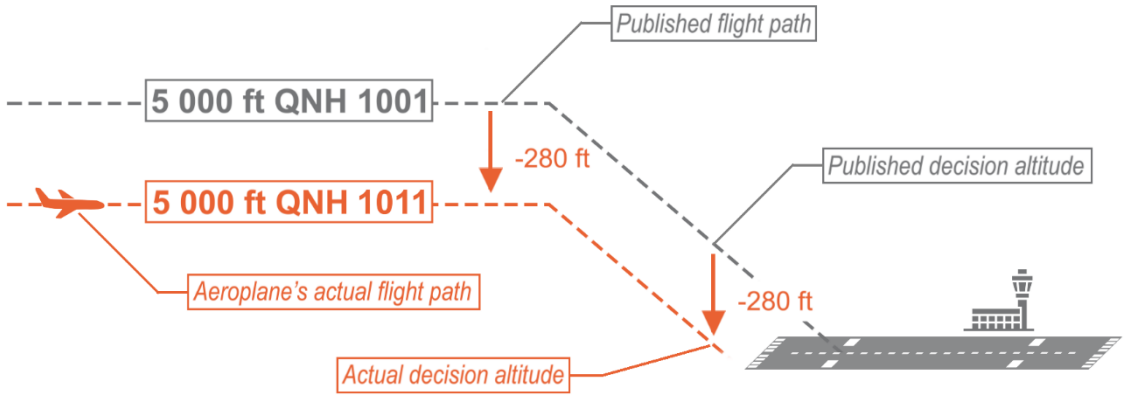
Serious incident to the AIRBUS A320 registered 9H-EMU and operated by Airhub Airlines on Monday 23 May 2022 on approach to Paris-Charles de Gaulle airport (Val-d'Oise)

Transmission of incorrect altimeter setting (QNH) by air traffic service, near-collision with ground during satellite approach procedure with barometric vertical guidance

The crew of the Airbus A320 registered 9H-EMU were carrying out scheduled flight NSZ4311 between Stockholm Arlanda airport (Sweden) and Paris-Charles de Gaulle airport (CDG). Work was being carried out on the ILS for runway 27R at CDG, so the crew carried out a satellite approach with barometric vertical guidance (RNP APCH down to LNAV/VNAV minima).

During the approach, in a rain shower which severely impaired visibility, the crew were given an incorrect altimeter setting (QNH) by the air traffic service with a difference of 10 hPa (1011 hPa instead of 1001).

An error in the altimeter setting will mean that the aeroplane's actual altitude does not correspond to the altitude displayed. For approaches with barometric vertical guidance, the vertical profile and the associated vertical guidance are thus affected. Using a QNH value 10 hPa higher than the actual value resulted in the approach being flown on a vertical profile that was parallel to but around 280 ft (85 m) below the published vertical profile.



Impact of an incorrect altimeter setting on the vertical profile (source: BEA)

The design of the IFR procedures is based on normal operations and thus does not take into account an incorrect altimeter setting. The crews' operating procedures and those of the air traffic controllers did not prevent the use of an incorrect altimeter setting. Furthermore, neither the aeroplane's instruments nor the air traffic controller's tools were designed to detect this type of error.

At low height, a ground proximity warning (MSAW) was triggered in the control tower. Several seconds later, the air traffic controller informed the crew of the situation using an incorrect and inappropriate phraseology. The crew did not hear this announcement and continued their descent.

After reaching the indicated altitude corresponding to the chosen minima, the crew carried out a go-around because they had not acquired the visual references needed to continue the landing. During the manoeuvre, the minimum recorded and corrected radio-altimeter height was 6 ft, i.e. about 2 m, when the aeroplane was about 0.9 NM from the runway threshold, outside the limits of Paris-Charles de Gaulle airport. As per design, there was no on-board ground proximity alert (TAWS) during the event. In their statements, the crew indicated that they had not been aware of this proximity with the ground.

The second approach was also carried out with the same incorrect QNH. This time, the crew acquired visual contact with the ground, at a height of more than 600 ft. The PF corrected the flight path and landed without further incident.

This near collision with the ground was due to a barometric approach being carried out with an incorrect altimeter setting (QNH) leading to a vertical profile around 280 ft below the published vertical profile, in a rain shower with no external visual references, without the crew being aware of this.

The following factors contributed to two barometric approaches being flown with an incorrect altimeter setting:

- human error in the exchanges communicating the QNH, the probability of which can never be reduced to zero;
- operating procedures for crews and air traffic controllers that are not very robust, or even ineffective against this threat;
- on-board and ground systems that are not very robust, or even ineffective against this threat.

The following factors contributed to the aeroplane descending to a near collision with the ground (near-CFIT):

- the approach lights not being illuminated;
- the absence of an on-board ground proximity warning, even though the TAWS system was operating in accordance with its design;
- the late triggering of the Minimum Safe Altitude Warning (MSAW) system, even though the system was operating in accordance with its design;
- a late and inadequate reaction by the air traffic controller to the triggering of this MSAW alert. The insufficient training of controllers with respect to the actions to be taken in response to this alert contributed to this inappropriate reaction.

The CFIT risk linked to an incorrect altimeter setting during a barometric approach has been known about for decades. However, the widespread use of ILS approaches probably helped to mask this threat and its consequences for a long time. More recently, satellite approaches with barometric vertical guidance have been promoted to increase the level of safety where previously only non-precision approaches existed. However, the increased use of these satellite approaches with barometric vertical guidance, in particular as a replacement for ILS approaches, has not led the aviation community to question the impact on safety levels, even though overall safety requirements are increasingly stringent.

The findings of this investigation suggest that, in the absence of a clear change of direction in Europe between now and 2030, in connection with Implementing Regulation (EU) 2018/1048 known as "IR-PBN", there will be a substantial decline in the level of safety on approach, due to the transfer of a sizeable proportion of the approaches currently flown using ILS to baro-VNAV approaches with a lower level of safety, in the absence of sufficient deployment of the LPV capability. In PBN, LPV is the only option that enables CAT I precision approaches to be flown with a safety level equivalent to that of ILS or GLS approaches, where the vertical profile is not affected by an incorrect altimeter setting.

The BEA has issued twelve safety recommendations, six safety recommendations were issued when the preliminary report was published on 11 July 2022, and six additional safety recommendations accompany the publication of this report. These latter recommendations concern:

- the overall reassessment of the Controlled Flight Into Terrain (CFIT) risk and the associated mitigation measures in relation to the threat of an incorrect altimeter setting for baro-VNAV approach operations;
- maintaining the safety level of approach operations in Europe in 2030, in connection with the regulation "IR-PBN";
- ground systems for detecting an incorrect altimeter setting;
- onboard Terrain Awareness Warning Systems (TAWS);
- air traffic controller training in response to a MSAW alert;
- the DSNA safety management system.