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## COLD TEMPERATURE CORRECTION SAFETY ISSUE

### 1 PURPOSE OF THIS AIC

This AIC aims at making operators aware of inconsistencies in regulations concerning cold temperature correction and the possible safety issue that might arise when performing RNP APCH operations to LNAV/VNAV minima or RNP AR APCH operations.

The information presented here is primarily aimed at Commercial Air Transport (CAT) operators but other category operators (NCC, NCO, SPO) are requested to notice the information as well as it is just as applicable to their operation.

### 2 COLD TEMPERATURE COMPENSATION

In aviation operations most of the time altitude (or sometimes height) is measured using barometrics. Baro instruments are calibrated using the International Standard Atmosphere (ISA) model. The effects on measured altitude of a significantly colder vertical temperature lapse, colder than ISA, can be dangerous when not accounted for.

This is the reason why various aviation regulation issuing bodies (EASA & ICAO) provide for mitigations that take these effects into account.

### 3 REQUIREMENTS FOR COLD TEMPERATURE COMPENSATION

Following Commission Regulation (EU) 965/2012, EASA states in AMC2 CAT.OP.MPA.126(d)(2)(i) and AMC2 NCC/NCO/SPO.OP.116(d)(2)(i):

- i. *For RNP APCH operations to LNAV/VNAV minima using Baro VNAV:*
  - a. *the flight crew should not commence the approach when the aerodrome temperature is outside the promulgated aerodrome temperature limits for the procedure unless the area navigation system is equipped with approved temperature compensation for the final approach;*
  - b. *when the temperature is within promulgated limits, the flight crew should not make compensation to the altitude at the FAF; and*
  - c. *since only the final approach segment is protected by the promulgated aerodrome temperature limits, the flight crew should consider the effect of temperature on terrain and obstacle clearance in other phases of flight.*

In addition, ICAO states in Document 8168 "PANS-OPS":

- Volume III Aircraft Operating Procedures, Chapter 4:  
4.3 TEMPERATURE CORRECTION  
4.3.1 Requirement for temperature correction  
*The calculated minimum safe altitudes/heights must be adjusted when the ambient temperature on the surface is much lower than that predicted by the standard atmosphere.*
- Volume I Part II, Section 5, Chapter 5:  
5.4.3.7 Temperature constraints  
5.4.3.7.1 *The pilot shall be responsible for any necessary cold temperature corrections to all published minimum altitudes/heights. This includes:*
  - a) *the altitudes/heights for the initial and intermediate segment(s);*
  - b) *the DA/H or MDA/H; and*
  - c) *subsequent missed approach altitudes/heights.*  
5.4.3.7.2 *Only the FAS VPA of the APV baro-VNAV procedure is safeguarded against the effects of low temperature by the design of the procedure. The minimum temperature on the chart relates to a minimum VPA of 2.5°, and the maximum temperature on the chart relates to a maximum VPA of 3.5°. [...]*

From the ICAO and EASA references above it is not clear whether if it is required to compensate the altitude at the FAF or not. EASA requires that the temperature at the FAF is not compensated when it falls within promulgated limits. But in some cases, the altitude in the intermediate segment can only be compensated by adjusting the altitude at the FAF as well as at the IF. Not correcting the altitude at the FAF may cause a vertical path discrepancy.

Another issue that might occur is that when the altitude in the intermediate segment is compensated, it might still lead to a violation of obstacle clearance, depending on the way the avionics will intercept the final approach segment.

It depends on the avionics whether if these issues arise.

Finally, EU 965/2012 only mentions RNP APCH to LNAV/VNAV minima using APV Baro-VNAV, while the same issues might arise in RNP AR APCH using APV Baro-VNAV.

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#### **4 OPERATORS' AWARENESS AND SOLUTIONS**

This AIC aims at making operators aware of the above issues and urges them to provide their crews with awareness and procedures for these cold temperature approach operations. While remaining in compliance these procedures should provide for a safe transition from the intermediate to the final approach segment and allow for a (continued) stabilized approach. Operators are free to implement solutions they may seem fit.

#### **5 DOCUMENT CONTROL**

AIC-A 11/2019 is cancelled herewith.

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