



Federal Aviation Administration

Memorandum

Date: **SEP 24 2010**

To: Chas. Frederic Anderson, Manager, Aeronautical Navigation Services, AJW-37

From: Leslie H. Smith, Manager, Flight Technologies and Procedures Division, AFS-400

Subject: Determining Average Cold Temperature (ACT) for Barometric Vertical Navigation (baro-VNAV) Based Approach Procedures.

Order 8260.54A, United States Standard for Area Navigation (RNAV) and Order 8260.52, United States Standard for Required Navigation Performance (RNP) Approach Procedures with Special Aircraft and Aircrew Authorization Required (SAAAR), support final approach descent guidance based on baro-VNAV. Real-time obstacle protection values vary with temperature deviation from the international standard atmosphere (ISA) temperature for the airport. The difference between the ACT and the airport ISA temperature quantifies the temperature deviation (Δ ISA) on which sufficient protection is based. This memorandum clarifies the intended standard method for determining and documenting ACT.

If historical temperature data is available, determine the ACT as follows:

Note: NOAA is the official government source from which to obtain historical temperature data and may be accessed via the National Climatic Data Center web link at <http://www.ncdc.noaa.gov/oa/climate/stationlocator.html>.

Establish a 5-year history window starting with the most recent year in which history is available for the entire calendar year (CY) (i.e. January 1 – December 31). The earliest year of the reporting window must be within six years of the current year.

Example: The current year is 2010; the allowable reporting period is 2004 thru 2009. Complete data for CY 2009 is not yet available, but complete data is available for CY 2008 and preceding years. Use the complete 5-year history from January 1, 2004 to December 31, 2008 to establish the ACT. If complete data is available for CY 2009 and preceding years dating back to 2004, use the 5-year history from January 1, 2005 to December 31, 2009 to establish the ACT.

If a 5-year history is not available, then use a 4-year history. If a 4-year history is not available, then use a 3-year history. A 3-year history is the minimum history required. The 3 or 4-year history may include any years within the 5-year window defined above provided each of the years contains complete data for the full CY.

Calculate the preliminary ACT as follows:

- (1) Within each of the years used, find the month with the average coldest temperature.

Example:

2004	2005	2006	2007	2008
45.4°F	44.7°F	43.4°F	42.2°F	45.0°F

- (2) Within each of the average coldest months determined in (1), find the coldest day.

Example:

2004	2005	2006	2007	2008
37°F	35°F	35°F	29°F	35°F

- (3) Average the coldest day temperatures.

Example: (°F)
$$\frac{37 + 35 + 35 + 29 + 35}{5} = 34.2$$

Note: If Fahrenheit values are used, convert to Celsius using Order 8260.54A, formula 4-4.

Example:
$$\frac{34.2 - 32}{1.8} = 1.22$$

preliminary ACT = 1.22°C

- (4) Round the Celsius value from (3) to the next warmer whole degree; e.g., -15.00 remains -15; -14.99 becomes -14). The resultant rounded value is the ACT.

Example from (3): ACT = 2°C

For procedure documentation use standard entry on FAA Form 8260-9 (or equivalent):
 “Average Cold Temperature based on (# years used)-year history (inclusive years; e.g., 2004-2008 or if individual years used; e.g., 2004, 2006, 2008)”.

Examples: “Average Cold Temperature based on 5-year history (2004-2008)”
 “Average Cold Temperature based on 3-year history (2004, 2006, 2008)”

If historical temperature data is not available, determine the ACT as follows:

- (1) Determine the temperature deviation from the airport ISA (Δ ISA) using Order 8260.54A, Table 4-1 (values listed below) based on the Airport Reference Point geographical area:

Alaska. -40°C
CONUS. -30°C

Hawaii and U.S. territories. -20°C

- (2) Use Order 8260.54A, Formula 4-3 to calculate the airport ISA in degrees Celsius:

$$ISA_{\text{airport}} := 15 - 0.00198 \cdot \text{airport}_{\text{elevation}}$$

$$\text{Example: } 15 - 0.00198 \cdot 677.4 = 13.66$$

- (3) Use the following formula to calculate the preliminary ACT based on the selected Δ ISA value.

$$\text{Preliminary ACT} = \Delta\text{ISA} + \text{ISA}$$

$$\text{Example: } -30 + 13.66 = -16.34$$

- (4) Round the calculated value to the next warmer whole degree; e.g., -15.00 remains -15; -15.01 thru -15.99 becomes -15). The resultant rounded value is the ACT.

Example from (3): ACT = -16°C

For procedure documentation identify the temperature deviation used to determine the ACT. Use standard entry on FAA Form 8260-9 (or equivalent):

Example: "Average Cold Temperature based on standard -30°C ISA deviation".

If you have any questions, please contact Mr. Harry Hodges, Manager, Flight Procedure Standards Branch, AFS-420, at (405) 954-4164.