Federal Aviation Administration

Memorandum

Date: **MAR 1 2013**

To: Debra Sullivan, Acting Director, Aeronautical Products, AJV-3
Elizabeth Ray, Vice-President, Mission Support Services, AJV-0

From: Bruce DeCleene, Manager, Flight Technologies and Procedures Division,
AFS-400

Subject: Clarification to Order 8260.58, United States Standard for Performance Based
Navigation (PBN) Instrument Procedure Design

The purpose of this memorandum is to provide clarification to Order 8260.58, United States
Standard for Performance Based Navigation (PBN) Instrument Procedure Design, related to
the items listed in attachment 1.

This memorandum will be incorporated into the directive in a subsequent revision. If you
have any questions, please contact Mr. Richard Dunham, Manager, Flight Procedure
Standards Branch, AFS-420, at (405) 954-4164.

Federal Aviation Administration

Memorandum

Date: **MAR 1 2013**

To: Lt. Col Richard A. Kahne, United States Air Force Flight Standards Agency, Director Airfield Operations
Daniel E. Lehmen, United States Naval Flight Information Group
Kevin Smith, United States Coast Guard C-130H Platform Manager
James M. Foster, United States Army Instrument Procedures Branch Manager

From: Bruce DeCleene, Manager, Flight Technologies and Procedures Division, AFS-400

Subject: Clarification to Order 8260.58, United States Standard for Performance Based Navigation (PBN) Instrument Procedure Design

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U.S. Department
of Transportation

**Federal Aviation
Administration**

800 Independence Ave., SW.
Washington, DC 20591

MAR 1 2013

Steve Hickock
Hickock and Associates, Inc.
32910 Marlin Key Drive
Orange Beach, AL 36561

Dear Mr. Hickock, *Steve*

The purpose of this letter is to provide clarification to Order 8260.58, United States Standard for Performance Based Navigation (PBN) Instrument Procedure Design, related to the items listed in attachment 1.

This letter will be incorporated into the directive in a subsequent revision. If you have any questions, please contact Mr. Richard Dunham, Manager, Flight Procedure Standards Branch, AFS-420, at (405) 954-4164.

Sincerely,

G.L. Powellfor

Bruce DeCleene
Manager, Flight Technologies and Procedures Division

MAR 1 2013

Jeff Bruce
Airspace Design and Simulation, Jeppesen Sanderson, Inc.
5155 Clipper Drive
Atlanta, GA 30349

Dear Mr. Bruce, Jeff

The purpose of this letter is to provide clarification to Order 8260.58, United States Standard for Performance Based Navigation (PBN) Instrument Procedure Design, related to the items listed in attachment 1.

This letter will be incorporated into the directive in a subsequent revision. If you have any questions, please contact Mr. Richard Dunham, Manager, Flight Procedure Standards Branch, AFS-420, at (405) 954-4164.

Sincerely,

Gary Powell Jr

Bruce DeCleene
Manager, Flight Technologies and Procedures Division

MAR 1 2013

Giovanni Spitale
General Manager
Naverus-GE Aviation, PBN Services
20415 72nd Avenue South Suite 300
Kent WA 98032

Dear Mr. Spitale,

The purpose of this letter is to provide clarification to Order 8260.58, United States Standard for Performance Based Navigation (PBN) Instrument Procedure Design, related to the items listed in attachment 1.

This letter will be incorporated into the directive in a subsequent revision. If you have any questions, please contact Mr. Richard Dunham, Manager, Flight Procedure Standards Branch, AFS-420, at (405) 954-4164.

Sincerely,

Bruce DeCleene
Manager, Flight Technologies and Procedures Division

U.S. Department
of Transportation

**Federal Aviation
Administration**

800 Independence Ave., SW.
Washington, DC 20591

MAR 1 2013

Greg Keller
Satellite Technologies International (STI), Inc.
366 Glascock Street. Suite 205
Alcoa, TN 37701

Dear Mr. Keller,

The purpose of this letter is to provide clarification to Order 8260.58, United States Standard for Performance Based Navigation (PBN) Instrument Procedure Design, related to the items listed in attachment 1.

This letter will be incorporated into the directive in a subsequent revision. If you have any questions, please contact Mr. Richard Dunham, Manager, Flight Procedure Standards Branch, AFS-420, at (405) 954-4164.

Sincerely,

Bruce DeCleene
Manager, Flight Technologies and Procedures Division

Attachment 1.

1. **Volume 1.**

a. Paragraph 1.3.1 failed to include Order 8260.40B *Flight Management System (FMS) Instrument Procedures Development.* This Order must be considered cancelled.

Rationale: All of the content is either obsolete or has been replaced by Order 8260.58.

b. Paragraph 1.3.2 did not include AFS memorandum dated October 19, 2010 subject: *Harmonized Flight Instrument Procedure Design Calculations* but this memorandum must be considered cancelled.

Rationale: All of the applicable content has been incorporated into Order 8260.58. References to conventional instrument procedure design may be disregarded and will be addressed in a future revision to Order 8260.3.

c. Paragraph 2.1 specifies calculation requirements and accuracy standards that are not reflected in the algorithms/calculators specifying a "round" function in the rest of the directive. This paragraph must be interpreted to indicate that values greater than indicated/output by these calculators may be required when paragraph 2.1 applies.

Rationale: Clarification of inconsistent guidance.

d. Paragraph 2.1.1a implies only WGS-84 coordinates may be specified in procedure documentation. The paragraph must be interpreted to apply to all latitude/longitude coordinates, regardless of datum.

Rationale: Not all coordinates associated with instrument procedures are required to be specified in WGS-84 (e.g. obstacles).

e. Paragraphs 2.1.3, third sentence and 2.1.3.c(1) second sentence imply that the geodesic path associated with OEA construction/obstacle evaluation must always be relative to the WGS-84 ellipsoid. These sentences must be interpreted to mean that the geodesic path must be relative to the WGS-84 ellipsoid or FAA-approved equivalent.

Rationale: For the purposes of procedure design, NAD-83/NAVD-88 data may be considered equivalent to WGS-84 where the vertical path resulting from its use falls within flight inspection TCH tolerance (+/-3 ft). This policy supersedes all previous guidance on the subject, including the August 28, 2012 AFS-400 memorandum subject: *Landing Threshold Geodetic Datum.*

f. Paragraphs 3.1.7, 3.1.34, 3.1.39, 3.1.40, 3.1.48, 3.1.59, 3.1.74, and Appendix 1.0 imply that PBN procedure design elements may only be established relative to WGS-84 geographic positions. These references must be interpreted to mean that the applicable procedure design elements must be relative to WGS-84 or FAA-approved equivalent geographic position.

Rationale: For the purposes of procedure design, NAD-83/NAVD-88 data may be considered equivalent to WGS-84 where the vertical path resulting from its use falls within flight inspection TCH tolerance (+/-3 ft). This policy supersedes all previous guidance on the subject, including the August 28, 2012 AFS-400 memorandum subject: *Landing Threshold Geodetic Datum.*

g. Paragraph 3.1.65. Maximum Allowable Descent Rate (MDR) no longer determines high temperature limit. Disregard the provision that Baro-VNAV approaches be limited to an MDR of not more than 1000 ft per minute.

Rationale: Volume 6, paragraph 3.3.3 of this order establishes high temperature limits based solely on MDR_{angle}. This paragraph incorporates guidance from the AFS memorandum dated June 6, 2012 subject: *Low/High Temperature Limits for Barometric Vertical Navigation (Baro-VNAV) Based Approach Procedures.*

2. **Volume 3.**

   a. Implementation of this volume is conditional on the development of Companion Software Requirements Specifications that fully address applicable construction/design rules. Previous manual application may be grandfathered until automation can be fully implemented.

   Rationale: Some elements of RNAV departure design were not fully addressed and requires manual applications.

   b. Paragraph 1.5.1 implies that the minimum leg length standard only applies to departure procedures. This paragraph should be interpreted to apply to all PBN leg lengths.

   Rationale: Clarification of scope of this standard.

   c. Paragraph 4.0, second sentence and Figure 4-1 describe/illustrate an unnecessarily demanding evaluation for obstacles outside of the ICA. The sentence must be interpreted as "Measure section 1 obstacles outside of the ICA to the centerline of the runway from DRP to DER and to the closest point on the ICA boundary past DER. The Section 1 OCS begins at the MSL elevation of the OCS at the ICA end line". Disregard all illustrations of obstacle measurement in the figure.

   Rationale: For consistency with diverse departure and conventional departure route evaluations.

   d. Paragraph 3.1 does not specify tolerance for the maximum allowable course change/magnitude of heading change limit. This paragraph must be interpreted to specify 70/90 degrees (as applicable) within 0.03 degrees.

   Rationale: For consistency with Volume 6, paragraph 1.2.

3. **Volume 4.** Paragraph 1.1.1 does not specify tolerance for the maximum intercept angle limit. This paragraph must be interpreted to specify 60/90 degrees (as applicable) within 0.03 degrees.

Rationale: For consistency with Volume 6, paragraph 1.2.

4. **Volume 5.**

a. Table 2-1 note 2 must be considered rescinded by paragraph 2.4.1.

Rationale: Correction to an obsolete requirement.

b. Paragraph 2.4.1, the sub-paragraph is not properly numbered and includes an incomplete statement related to deceleration segment. This sub-paragraph must be interpreted to be paragraph 2.4.1a and indicate that the deceleration segment requirement is only applicable to the intermediate segment (see Vol. 6 paragraph.1.5.4).

Rationale: Correction to an administrative error.

c. Paragraph 2.6.1 does not specify tolerance for turn limits. This paragraph must be interpreted to specify 70/90 degrees (as applicable) within 0.03 degrees.

Rationale: For consistency with Volume 6, paragraph 1.2.

d. Paragraphs 3.4.1 and 3.4.2a imply that PFAFs may only be established relative to WGS-84. These paragraphs must be interpreted to mean that the PFAF location must be relative to WGS-84 or FAA-approved equivalent.

Rationale: For the purposes of procedure design, NAD-83/NAVD-88 data may be considered equivalent to WGS-84 where the vertical path resulting from its use falls within flight inspection TCH tolerance (+/-3 ft). This policy supersedes all previous guidance on the subject, including the August 28, 2012 AFS-400 memorandum subject: *Landing Threshold Geodetic Datum.*

e. Calculator 3-8 requires input of the variable ACT (°C), which must be interpreted to be the "NA_{below} (°C)" output from Volume 6, Calculator 3-4.

Rationale: Correction to an ambiguous variable.

f. Paragraph 3.5.1 does not define D_{DA} and calculator 3-10 does not correctly calculate DA in all cases. D_{DA} must be interpreted to be the minimum distance from LTP/FTP to DA. Calculator 3-10 DA output must be disregarded, and the minimum DA calculated using:

$$DA = \text{ceiling}\left[\left(\tan\left(0° \times \frac{\pi}{180}\right) \times D_{DA}\right) + TCH\right]$$

$$where \quad D_{DA} = calculator\ 3\text{-}10\ output$$

Rationale: The Order 8260.52 requirement that D_{DA} be greater than or equal to the distance from LTP to OCS origin (D_{VEB}) was replaced with a requirement that D_{DA} be greater than or equal to D_{VEB} plus length of missed approach section 1a. This change was the result of an issue raised in the Instrument Flight Procedures Knowledge Repository (issue FAA_00000386). The resolution to the issue was included in the Required Navigation

Performance (RNP) Special Aircraft and Aircrew Authorization Required (SAAAR) Companion Software Requirements Specification paragraph 3.2.1 and intentionally incorporated into Order 8260.58.

g. Paragraph 4.2 incorrectly included the phrase "...or a conventional TERPS MAS". This is not currently an available option for MAS leg types; therefore the phrase must be disregarded.

Rationale: Clarification of a confusing requirement.

h. Paragraph 4.3, calculators 4-6 and 4-8 do not account for earth curvature which is inconsistent with our previous responses to issues in the FAA Knowledge Repository (e.g. FAA_P00001201). The ideal implementation accounts for earth curvature, but since the differences are expected to be relatively small we accept either implementation until this is addressed in the next change to the directive.

Rationale: Clarification of inconsistent policy.

5. **Volume 6.**

a. Paragraph 1.2.1 includes a description of the standard design bank angle with the following statement in parenthesis, "14 degrees for CAT A-only procedures". This requirement is no longer applicable and the note must be disregarded.

Rationale: This note originally applied to Order 8260.54A formula 2-3c but was deleted by the following; AFS memorandum dated October 19, 2010, subject: *Harmonized Flight Instrument Procedure Design Calculations*; AFS memorandum dated July 15, 2011 subject: *Performance Based Navigation (PBN) Fly-By (FB)/Radius-to-Fix (RF) Turn Maximum Bank Angle Limits*, and; AFS memorandum dated October 3, 2011, subject: *Revised Performance Based Navigation (PBN) Fly-By (FB)/Radius-to-Fix (RF) Turn Maximum Bank Angle Limits; Omni-Directional Tailwind Requirements; and Minimum Initial Departure Leg Segment Length Design Criteria.*

b. Paragraph 1.2.1 RF turn rule includes the note, "*15 degrees for CAT A and B-only procedures". This requirement is no longer applicable and the note must be disregarded.

Rationale: This note originally applied to Order 8260.54A table 2-8 but was deleted by the following; AFS memorandum dated October 19, 2010, subject *Harmonized Flight Instrument Procedure Design Calculations*; AFS memorandum dated July 15, 2011 subject *Performance Based Navigation (PBN) Fly-By (FB)/Radius-to-Fix (RF) Turn Maximum Bank Angle Limits*, and; AFS memorandum dated October 3, 2011, subject *Revised Performance Based Navigation (PBN) Fly-By (FB)/Radius-to-Fix (RF) Turn Maximum Bank Angle Limits; Omni-Directional Tailwind Requirements; and Minimum Initial Departure Leg Segment Length Design Criteria.*

c. In paragraph 1.2.1, the section "Determine the highest altitude within a turn by:" in the sub-section "For Missed Approach", the second sentence incorrectly indicates that it only applies to turn-at-altitude construction. The policy must be interpreted to apply to both turn-at-altitude and turn-at-fix construction.

Rationale: This question was addressed in the FAA Knowledge Repository issue FAA_P00000330 (Prod#00000902).

d. Paragraph 1.2.2, Step 3, Note 1. Associate of the rule limiting the sum of $V_{KTAS} + V_{KTW}$ to 500 kts to FB turns only is incorrect. The note must be interpreted to apply to both FB and FO turns.

Rationale: Same as item 4a above.

e. Paragraph 1.2.2, Step 3, Note 2. Association of the 5 degree bank limit to FB turns only is incorrect. This statement must be interpreted to apply to both FB and FO turns. The remainder of the note applies to FB turns only.

Rationale: Same as item 4a above.

f. Paragraph 1.2.2, Step 3, algorithm (2). Disregard the statement in parenthesis, "14 degrees for CAT A-only procedures".

Rationale: Same as item 4a above.

g. Paragraph 1.5 does not specify tolerance for the maximum course change limit. This paragraph must be interpreted to specify 70/90 degrees (as applicable) within 0.03 degrees.

Rationale: For consistency with Volume 6, paragraph 1.2.

h. The first sentence of Paragraph 1.5.2 is inconsistent with Volume 6 paragraph 1.1 and Table 1-2. Disregard the sentence and refer to paragraph 1.1 and Table 1-2.

Rationale: Paragraph 1.1 and Table 1-2 rules for OEA width apply.

i. Paragraph 1.5.4, second bullet provides ambiguous guidance when the "deceleration segment" must be constructed and implies that it can only apply to the initial segment only. The second sentence of this bullet must be interpreted to mean where the descent gradient of any leg in the intermediate segment exceeds 240 ft/NM due to terrain or obstacles, a deceleration segment must be constructed in the intermediate and/or initial segment leg(s) immediately preceding that leg (not applicable to procedures limited to CAT B or lower minimums or other procedures when approved by Flight Standards).

Rationale: Sentence does not account for intermediate segments with multiple legs with different descent gradients and does not clearly describe authorized exceptions.

j. Paragraph 1.5.4 and Paragraph 1.10 both include a table labeled Table 1-4. For clarity, the table associated with paragraph 1.5.4 must be considered Table 1-4a and the one associated with paragraph 1.10 must be considered Table 1-4b. The references in Volume 5, Table 2.1 must be corrected Table 1-4a and the one in paragraph 3.2 must be to Table 1-4b. The references in Volume 6, paragraph 1.5.4 must be corrected to Table 1-4a and in paragraphs 1.10 and 4.5 is to Table 1-4b.

Rationale: Correction of an administrative/format error.

k. Paragraph 1.8, last sentence incorrectly references paragraph 1.6.4. The reference must be interpreted to indicate paragraph 1.5.4.

Rationale: Correction of a typographical error.

l. Paragraph 1.8.1 does not specify tolerance for the maximum course change limit. This paragraph must be interpreted to specify 70/90 degrees (as applicable) within 0.03 degrees.

Rationale: For consistency with Volume 6, paragraph 1.2.

m. Paragraph 1.8.2 does not specify tolerance for the maximum course change limit. This paragraph must be interpreted to specify 90 degrees within 0.03 degrees.

Rationale: For consistency with Volume 6, paragraph 1.2.

n. Paragraph 1.8.5 does not account for required adjustments. This paragraph must be interpreted to mean that 1000 ft ROC plus adjustments apply over the highest obstacle in the OEA.

Rationale: Required clarification.

o. Paragraphs 1.8.6 (a) and (b) do not specify tolerance for the maximum offset limit. These paragraphs must be interpreted to specify 90 degrees within 0.03 degrees.

Rationale: For consistency with Volume 6, paragraph 1.2.

p. Calculator 1-12b variable "adj" must be interpreted to mean Order 8260.3B, Vol 1, paragraph 3.2.2 adjustments.

Rationale: Corrects an ambiguous reference.

q. Paragraph 1.9.5. Calculator 1-13 does not correctly calculate the minimum IF to LTP/FTP distance in all cases. For runways longer than 12,366 ft. disregard the calculator 1-13 output and determine the distance using:

$$d_{IF} = 0.3 \times \frac{d}{a} - \frac{d}{fpnm}$$

> where d = distance (ft) from FPAP to LTP/FTP
> a = Calculator 1-14 Width$_{feet}$ output

Rationale: This to account for cases where FAS data course width at threshold is greater than 350 ft.

r. Paragraph 1.12, last sentence incorrectly defines the Offset Length value. The sentence must be interpreted to mean that the Offset Length value is the distance between the departure end of runway and the FPAP.

Rationale: Correction of a typographical error.

s. Paragraph 1.12 implies that FPAP may only be established relative to WGS-84. This paragraph must be interpreted to mean that the FPAP location is relative to WGS-84 or FAA-approved equivalent.

Rationale: For the purposes of procedure design, NAD-83/NAVD-88 data may be considered equivalent to WGS-84 where the vertical path resulting from its use falls within flight inspection TCH tolerance (+/-3 ft). This policy supersedes all previous guidance on the subject, including the August 28, 2012 AFS-400 memorandum subject: *Landing Threshold Geodetic Datum.*

t. Paragraph 2.2.1 and figure 2-1 do not provide consistent guidance relating to the end of the LNAV final segment when the MAP is specified prior the LTP/FTP. This paragraph and figure must be interpreted to mean that the LNAV final segment OEA ends at the final segment ATT past the MAP.

Rationale: Correction to inconsistencies in guidance and illustrations

u. The variable "W_S" is not equal to the width of the secondary area as implied. Per paragraph 2.3.2 "W_S" is the perpendicular distance from the course centerline to the outer boundary of the secondary area (full OEA width). Calculator 2-4 requires input of variable "W_S" but does not specify a clear definition. This value is not the same as the "W_S" output from calculator 2-3. For the purposes of calculator 2-4, "W_S" must be interpreted to be equal to the total width of the secondary area measured from the edge of the primary area. However for calculator 2-7b, the "W_S" output from calculator 2-3 can be used.

Rationale: Clarification of a confusing variable applying to multiple calculators.

v. Calculator 2-6 does not identify what value is used for V_{KIAS} when determining the Flat Surface Length. The paragraph must be interpreted to mean that V_{KIAS} is the appropriate final approach speed from Volume 6, Table 1-3 for each category."

Rationale: Provides clarification caused by omitted information.

w. Paragraph 2.7 does not specify whether final or missed approach ATT is applied at the beginning of MA section 1. This paragraph must be interpreted to specify that the beginning of MA section 1 uses the applicable final segment ATT from Volume 1, Table 2-1.

Rationale: Provides clarification caused by omitted information.

x. Paragraph 2.7.2b incorrectly indicates that the CD line is 0.3 NM prior to the MAP. This paragraph must be interpreted to indicate that the CD is 131.23 ft (40m) prior to the MAP.

Rationale: For consistency with Volume 1, Table 2-1; Volume 6, paragraph 2.7.1a(2) and FAA Knowledge Repository issue FAA_P00000539 (Prod#000001195).

y. Calculator 2-7b includes undefined variable. Replace variable "W_P" with "$1/2W_P$" output from calculator 2-2.

Rationale: Corrects typographical error.

z. Calculator 3-6 requires input of the variable ACT (°C), which must be interpreted to be the "NA_{below} (°C)" output from Volume 6, Calculator 3-4.

Rationale: Correction to an ambiguous variable.

aa. Paragraph 3.3.5.c. The variable "DA_{LS}" is an error. The paragraph must be interpreted to mean that the published DA is the higher of DA_{ROC} output from calculator 3-8 or the DA_{OCS} output from calculator 3-10."

Rationale: Correction of a typographical error.

bb. Paragraph 4.1 incorrectly states that the OEA always extends to a point ≈131 ft (40m ATT) beyond the GPIP determined using calculator 1-15a, regardless of the type of procedure. This is inconsistent with paragraph 1.13. This paragraph must be interpreted to mean that the OEA extends to a point ≈131 ft (40m ATT) beyond the GPIP or PFAF as applicable (see paragraph 1.13).

Rationale: Clarification of confusing requirement.

cc. Paragraph 5.2 failed to address determining the minimum leg length for a VA-DF leg combination in the missed approach. The paragraph must be interpreted to mean that for VA-DF missed approach, Volume 3, Chapter 5 also applies except that the origin for distances is the end of section 1, and origin for elevations is the aircraft elevation at the end of section 1.

Rationale: Correction of a missing requirement.

dd. Paragraph 5.2.2(b) does not specify tolerance for the absolute maximum turn limit. This paragraph must be interpreted to specify 90 degrees within 0.03 degrees.

Rationale: For consistency with Volume 6, paragraph 1.2.

ee. Paragraph 5.3.1 does not specify tolerance for the maximum turn angle limit. This paragraph must be interpreted to specify 90 degrees within 0.03 degrees.

Rationale: For consistency with Volume 6, paragraph 1.2.

ff. Paragraph 5.3.2 does not specify tolerance for the maximum turn angle limit. This paragraph must be interpreted to specify 90 degrees within 0.03 degrees.

Rationale: For consistency with Volume 6, paragraph 1.2.