Federal Aviation Administration

Memorandum

Date: February 3, 2006

From: Manager, Flight Procedure Standards Branch, AFS-420

To: Manager, National Flight Procedures Group, AJW-32

Prepared by: Jack Corman, Flight Procedure Standards Branch, AFS-420

Subject: Clarification #4 to FAA Order 8260.52, United States Standard for Required Navigation Performance (RNP) Approach Procedures with Special Aircraft and Aircrew Authorization Required (SAAAR)

This memorandum consolidates guidance contained in clarification memorandums #1 dated July 6, 2005 and #2 dated July 13, 2005; therefore, memorandums #1 and #2 are canceled.

1. Paragraph 1.9 is revised as follows to provide clarification of its intent.

> "Title RNP procedures "**RNAV (RNP) RWY XX.**" Where more than one RNAV approach is developed to the same runway, identify each with an alphabetical suffix beginning at the end of the alphabet. Title the procedure with the lowest minimums with the "Z" suffix, etc.
>
> **Examples**
>
> **RNAV (RNP) Z RWY 13L** (lowest HAT: example 250 ft)
> **RNAV (RNP) Y RWY 13L** (2nd lowest HAT: example 300 ft)
> **RNAV (GPS) X RWY 13L** (3rd lowest HAT: example 350 ft)"

2. The following sentence is added to the end of paragraph 1.14 to clarify limitations on calculated visibility.

> "... The minimum attainable visibility is ½ mile, RVR 2400."

3. Paragraph 3.5 is expanded as follows to provide clarification of its intent.

> "The final segment OEA beings 1×RNP prior to the PFAF and extends to the LTP/FTP. The final segment OEA contains the evaluation surfaces for final approach and landing: VEB OCS which is evaluated to establish the DA point; the visual segment OIS to identify noteworthy obstructions between the DA point and the LTP; and the GQS which limits the height

of obstructions in the vicinity of centerline between the DA point and the LTP. The OEA area between the DA and LTP is also evaluated for missed approach as described in chapter 4. The OCS origin distance from LTP ($\mathbf{D_{VEB}}$) and its slope are determined through application of the Vertical Error Budget (VEB). The VEB provides origin and slope values for both TF and RF based final segments. Origin values are further divided into two categories: aircraft with wingspans ≤ 262 feet, and aircraft with wingspans ≤ 136 feet. Develop procedures using the value for wingspans ≤ 262 feet. *(Where the DA can be reduced by at least 50 feet or visibility reduced by ¼ mile, the approach may be developed using the value for wingspans ≤ 136 feet; HOWEVER, the procedure must be* ***restricted*** *for use by aircraft with wingspans ≤ 136 feet only).* The VEB calculations require input of values for two variables: final segment RNP value and temperature (°C) deviation ($\Delta\mathbf{ISA_{LOW}}$) below the airport ISA temperature. A link to a Microsoft Excel spread sheet that performs the VEB calculations is available on the internet at the following address: http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs400/afs420/ under the label "RNP SAAAR Worksheet". See figure 3-2. Calculate the MSL elevation of the OCS at any distance '**d**' from RWT using formula 3-17."

4. In chapter 1, Table 1-2 lists the indicated airspeed values for use in procedure construction. The original table did not address altitudes above 10,000 feet. The following revised table provides airspeed values for those altitudes.

Table 1-2. Indicated Airspeed (Knots)

Segment		Indicated Airspeed by Aircraft Category				
		Cat A	Cat B	Cat C	Cat D	Cat E**
Initial Intermediate	Above 10,000	180	250	300	300	350
	At/Below 10,000	150		240	250	250
Final		90	120	140	165	As Specified
Missed Approach (MA)		110	150	240	265	As Specified
Minimum Airspeed Restriction*	Initial	110	140	210		As Specified
	Intermediate	110	140	180		As Specified
	Missed	100	130	165	185	As Specified

5. Aircraft manufacturers have updated their "track-hold" stabilization time requirements following radius-to-fix (RF) turns in RNP final approach segments. The attached document contains revised pages 3-6 and 3-7 for order 8260.52 reflecting the updated times. These pages are effective immediately and replace the original pages.

6. Formula 3-11 is a revised formula for the calculation of the final approach fix for vertically guided approach procedures. Use this formula for all vertically guided approach procedures. Implementation of the revised formula requires the following EXCEPTION: Where an RNP SAAAR procedure is designed to overlay another vertically guided approach procedure with the same TCH, glidepath angle, intercept altitude, and a named PFAF, (i.e., LNAV/VNAV), the coordinates of the underlying procedure PFAF should be revised to be consistent with the SAAAR procedure. If this is not possible during SAAAR procedure design, the coordinates of the underlying procedure PFAF may be used for SAAAR construction. Where this option is used, annotate the remarks section of the form 8260-9 to indicate the PFAF coordinates are based on TERPS change 19, volume 3, paragraph 2.9. When either procedure is reviewed or amended, revise the PFAF location to be compliant with the new revised formula.

7. The learning experience of developing the first few RNP SAAAR procedures leads us to remove the non-RNP option for missed approach construction. Paragraph 4.0 is revised as follows to provide clarification of its intent.

4.0 GENERAL.

These criteria are based on the following assumptions:

- Aircraft climb at a rate of at least 200 ft/NM (3.29%) in the missed approach segment.
- The OEA expansion where FAS RNP levels less than RNP-1 are continued into the MAS is based on IRU drift rates of 8 NM per hour.
- For RNP levels less than 1, turns are not allowed below 500 ft measured AGL
- A 50-ft height loss is inherent in MA initiation.

The standard MA construction is a continuation of the final approach course. The OEA expands at a 15° splay relative to course from the width of the FAS RNP value to an RNP value of 1.0. The MA OCS slope ratio is 40:1. Design RF turns that require speed limitations using a maximum bank angle of 15°.

If you have questions, please contact Jack Corman at (405) 954-0012.

Donald P. Pate

3.3 TURNS IN THE FAS.

Fly-by turns are not allowed in the FAS. Where turns are necessary, use an RF leg. Design procedures that incorporate an RF turn in the final segment to establish the aircraft on a straight segment aligned with the runway centerline prior to reaching DA. The Final Rollout Point (FROP) is the initial fix of the straight segment (see figure 3-1). Locate the FROP at the greatest distance resulting from application of formulas 3-9 and 3-10A/B as appropriate.

Apply formula 3-9 to assure rollout occurs at least 500 ft above LTP elevation.

Formula 3-9 (500' above LTP)

$$D_{500} = \frac{500 - TCH}{\tan(\theta)}$$

where θ = glidepath angle

Example

$$D_{500} = \frac{500 - 52}{\tan(3)} = 8548.35'$$

where $\theta = 3°$

TCH = 52 feet

Apply formula 3-10A where the initial MAS RNP value is standard (RNP 1.0).

Formula 3-10A (15 sec stabilization)

$$D_{15sec} = \frac{HAT - TCH}{\tan(\theta)} + (V_{TAS} + 15) \times 25.32$$

where θ = glidepath angle

V_{TAS} = final segment true airspeed

Example

Cat D 165 Kts, Altitude 2000, θ=3°, TCH=52, HAT=300'

$$V_{TAS} = 165 \left[1 + (2000 \times 0.00002)\right] = 171.60$$

$$D_{15sec} = \frac{300 - 52}{\tan(3)} + (171.60 + 15) \times 25.32 = 9456.83$$

Apply formula 3-10B where the initial MAS RNP value is restricted to less than 1.0.

Formula 3-10B (50 sec stabilization)

$$D_{50sec} = \frac{HAT - TCH}{tan(\theta)} + (V_{TAS} + 15) \times 84.39$$

where θ = glidepath angle

V_{TAS} = final segment true airspeed

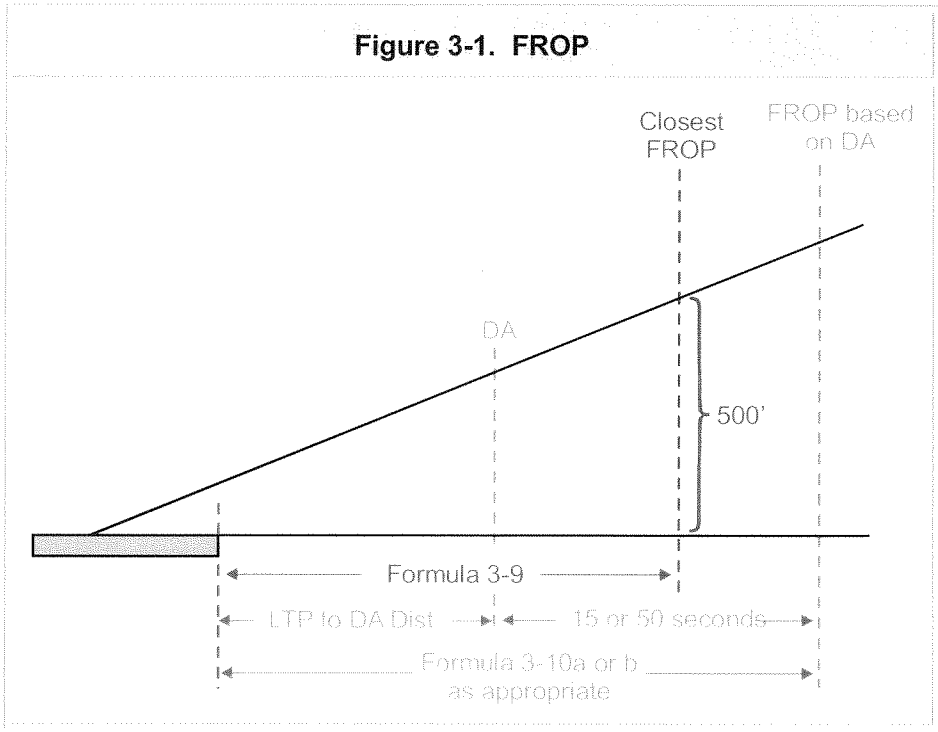
Example

Cat D 165 Kts, Altitude 2000, θ=3°, TCH=52, HAT=300

$V_{TAS} = 165 \left[1 + (2000 \times 0.00002)\right] = 171.60$

$$D_{50sec} = \frac{300 - 52}{tan(3)} + (171.60 + 15) \times 84.39 = 2047.30$$

Figure 3-1. FROP



3.4 DETERMINING PFAF LOCATION. (In all cases, the PFAF will be identified as a named fix.)

The OPTIMUM alignment is a TF segment straight in from PFAF to LTP on runway centerline extended. If necessary, the TF course may be offset by up to 3°. Where the course is offset, it must cross runway centerline extended at least 1500 out from LTP. A final segment may be designed using an RF leg segment