U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

CHANGE 8260.44A CHG 2

Effective Date:
11/6/06

SUBJ: CIVIL UTILIZATION OF AREA NAVIGATION (RNAV) DEPARTURE PROCEDURES

1. PURPOSE. This change updates criteria for RNAV departure procedures and transmits revised pages to Order 8260.44A.

2. DISTRIBUTION. This order is distributed in Washington Headquarters to the branch level in the Offices of Airport Safety and Standards and Communications, Navigation, and Surveillance Systems; Air Traffic Organization, Technical Operations Service, and Flight Standards Services; to the National Flight Procedures Office and the Regulatory Standards Division at the Mike Monroney Aeronautical Center; to branch level in the regional Flight Standards and Airports Divisions, Technical Operations Service Areas, and Air Traffic Service Areas; special mailing list ZVS-827, and to Special Military and Public Addressees. This change will be available through the Flight Standards Information Management System (FSIMS) at http://fsims.avr.faa.gov.

3. EXPLANATION OF CHANGES:

a. Paragraph 6.1. Updates the definitions for VA leg, DF leg, TF leg, OCS, reference line, reference waypoint (WP), turn anticipation, and turn waypoint (TWP).

b. Paragraph 7.1. Changes the previous references to equipment suffixes (/E, /F, /G, and /R) to refer to the “Type A” or “Type B” descriptions of aircraft systems and flight procedures, as defined in AC 90-100, U. S. Terminal and En Route Area Navigation (RNAV) Operations, and Order 8260.46, Departure Procedure (DP) Program.

c. Paragraph 8.1.2. Adds obstacle clearance and special use airspace to the list of reasons why RNAV departure procedures are developed.

d. Paragraph 9.1. Makes editorial changes, adds the option to depict fix displacement as a circle, clarifies that speed restriction is one of the reasons to establish a fix/WP, adds guidance regarding use of computer model assessment, adds guidance regarding minimum altitudes for the use of RNAV for departures, and adds design guidance for the portion of procedures below the minimum altitude for RNAV.

e. Paragraph 9.2. Removes references to charting based on aircraft flight plan suffixes and instead refers to Order 8260.46, Departure Procedure (DP) Program, which already describes how to chart RNAV departure procedures.

4. DISPOSITION OF TRANSMITTAL. This transmittal sheet must be retained until it is canceled by a new directive.

PAGE CONTROL CHART

Remove Pages	Dated	Insert Pages	Dated
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Original Signed By
Roger Forshee

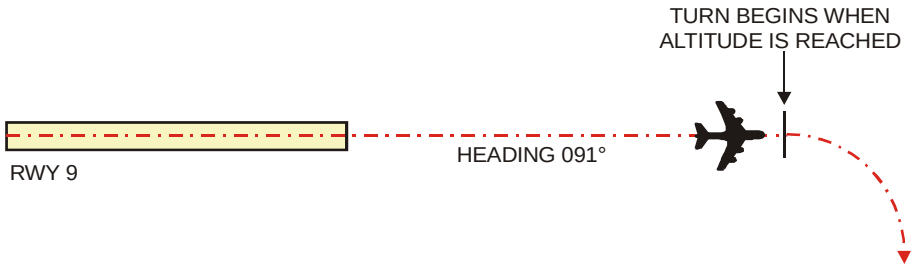
James J. Ballough
Director, Flight Standards Service

6.1.11 **Leg (Segment) Types.** The RNAV leg/segment types used in this Order are:

6.1.11 **a. Heading to an Altitude (VA).** A segment for aircraft to climb to an altitude on a specified heading (figures 1 and 2). The VA segment terminates at a specified altitude without a terminating position defined. For example, a segment allowing aircraft to make an initial climb to 700 feet MSL after departing Runway 9 on the runway heading of 091° is a VA leg (see figure 1). *ARINC Specification 424, attachment 5 states "Heading to an Altitude termination or VA Leg. Defines a specified heading to a specific Altitude termination at an unspecified position."*

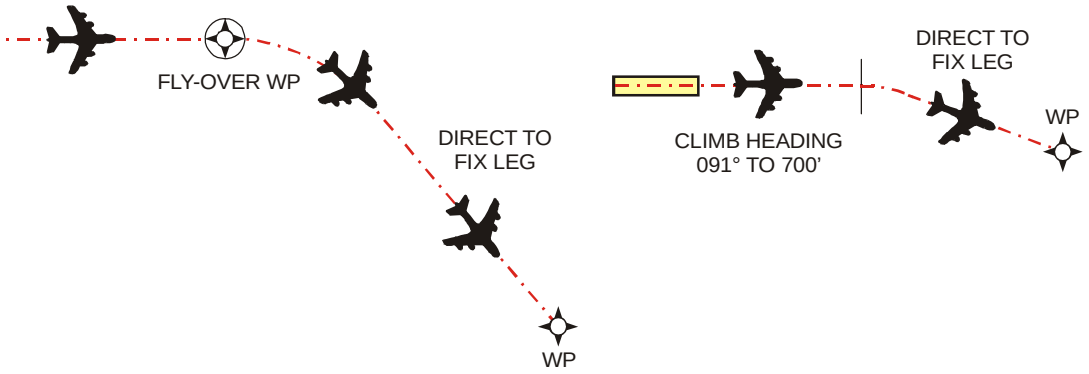
NOTE: VA legs do not provide positive course guidance (PCG) and the aircraft will be subject to wind drift.

Figure 1. VA Leg Example



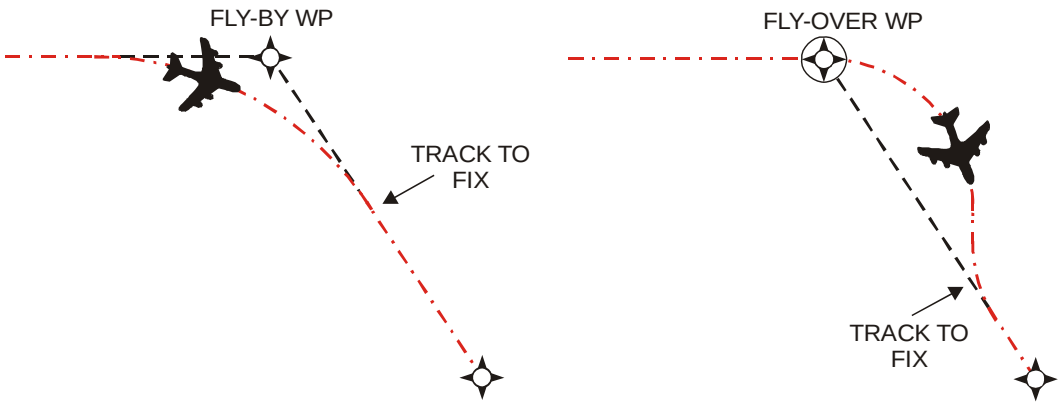
6.1.11 **b. Direct to Fix (DF).** A segment following a fly-over fix/WP, climb to an altitude on a specified heading, or radar vector, in which the aircraft's track is direct to the next fix/WP. A DF route segment begins at an aircraft's present position, or at an unspecified position, and extends to a specified fix/WP (see figure 2). *ARINC Specification 424, attachment 5 states "Direct to a Fix or DF leg. Defines an unspecified track starting from an undefined position to a specific database fix."*

Figure 2. DF Leg Examples



6.1.11 **c. Track to Fix (TF).** A geodesic path, or track, between fixes/WPs which is intercepted and acquired as the flight track to the following fix/WP. TF applies to fly-by and fly-over fixes/WPs as shown in figure 3. *ARINC Specification 424, attachment 5 states "Track to a Fix or TF leg. Defines a great circle track over ground between two known database fixes."*

Figure 3. TF Leg Examples



6.1.12 **Obstacle Clearance Surface (OCS).** A surface, either inclined or level, where obstacle penetrations are not allowed. Also see Orders 8260.3, Volume 4 and 8260.53, Standard Instrument Departure that Use Radar Vectors to Join RNAV Routes. Examples of OCS are as follows:

6.1.12 **a. Inclined surface OCS.** For a segment with obstacle penetrations of the standard 40:1 obstacle identification surface (OIS), if a climb gradient of 400 ft/NM is used to mitigate the OIS penetrations, the OCS is an inclined surface at 20:1.

6.1.12 **b. Level surface OCS.** For a segment with a minimum altitude of 3000 MSL and a ROC of 1000, the OCS is a level surface at 2000 MSL.

6.1.13 **Reference Line.** A line parallel to the course line, following a turn fix/WP, used to construct an additional set(s) of expansion arcs.

6.1.14 **Reference Fix/Waypoint.** A point of known location used to geodetically compute the location of another fix/WP.

6.1.15 **Turn Anticipation.** The capability of RNAV airborne equipment to determine the location of the point along a course, prior to a "fly-by" fix/WP which has been designated a turn fix/WP, where a turn is initiated to provide a smooth path to intercept the succeeding course.

6.1.16 **Turn Fix/Waypoint (TWP).** A fly-by or fly-over fix/WP denoting a course change.

7.1 LEVELS OF CRITERIA.

RNAV departure criteria, for public use procedures, are divided into two levels: Level 1 and Level 2. Use of each level is described in Order 8260.46, appendix 2.

7.1.1 **Level 1 Criteria. Use of terminal level 1 criteria** requires approval from Flight Standards Service for the following: an en route procedure, the en route portion of a terminal procedure, or for the portion of a departure beyond 30 NM of the departure airport. Approval is based on the navigation system and procedures used. Approval from Flight Standards Service is not required for use of terminal level 1 criteria for a terminal procedure route within 30 NM of the departure airport.

7.1.2 **Level 2 Criteria. Level 2 criteria shall be applied** unless the use of levels 1 or 3 is required. See Order 8260.46, appendix 2.

7.1.3 **Level 3 Criteria. For special use procedures only**, an additional level of criteria is level 3, which has narrower evaluation area widths. Level 3 procedures are for navigation systems that update at the runway prior to departure. See Order 8260.40, Flight Management System (FMS) Instrument Procedures Development.

NOTE: Use of levels 1 or 3 will exclude some RNAV-equipped aircraft.

SECTION 1. GENERAL CRITERIA

8.1 APPLICATION.

8.1.1 **Diverse Departure Criteria.** Apply diverse departure criteria to determine if departure procedures are required to avoid obstacles. (See Order 8260.3, Volume 4, chapter 2).

8.1.2 **Develop RNAV departure procedures** as needed to satisfy operational, air traffic, obstacle clearance, special use airspace, and/or environmental requirements.

9.1 CRITERIA DESIGN STANDARDS.

Use these standards to develop RNAV instrument departure procedures. They provide some flexibility so the procedure designer can select an appropriate level of criteria (see paragraph 7.1), waypoint type (fly-by, fly-over), and leg types (DF, TF, VA, etc.). For standard design, use only leg types specified in Order 8260.46, Table A2-1; if another leg type is needed, prepare a request to waive Order 8260.46, appendix 2, paragraph 5.

9.1.1 **Fix Use.** To the extent practical and efficient, use existing fixes/WPs/NAVAIDs.

9.1.2 **Fix Displacement Tolerance (FDT)** values for RNAV departures are in table 1.

Table 1. Fix Displacement Tolerance

Level 1 Criteria:	En Route FDT (NM)	Terminal FDT (NM)
XTRK	2	1
ATRK	0.5	0.5

Level 2 Criteria:	En Route or Terminal FDT (NM)
XTRK	2.8
ATRK	2

9.1.2 **a. For level 1 criteria,** use *terminal* FDT where the plotted position of the fix is at or within 30 NM straight-line measurement of the departure airport's reference point (ARP). En route FDT applies beyond 30 NM from the ARP, including succeeding fixes/WPs that may lie within 30 NM of the ARP should the route return to the area. When the departure reaches the en route portion of the procedure, en route FDT applies to all fixes/WPs. Also see paragraph 7.1.2 regarding the approved use of levels 1 and 2 criteria.

9.1.2 **b. For level 2 criteria,** use *en route* FDT throughout the procedure.

9.1.2 **c. For levels 1 and 2 criteria**, the fix displacement area must not overlap the plotted position of the adjacent fix/WP along the same route/course. However, the fix displacement area may overlap part of an adjacent fix displacement area.

9.1.2 **d. For obstacle clearance area construction,** the FDT values must be used for obstacle evaluation as indicated in paragraphs 12 through 17. Fix displacement areas are depicted either as rectangles or as circles. When depicted as a rectangle, the "ATRK" value is used before and after the fix/WP and is measured along the designated flight track. The "XTRK" value is measured perpendicular left and right of the designated flight track. When depicted as a circle, the "ATRK" value is used as the radius and the area is centered on the plotted fix/WP. The depiction as a circle is the new standard and the depiction as a rectangle is planned to be phased out.

9.1.2 **e. For minimum segment length,** the FDT values are not required to be included in the segment length calculations (see paragraph 9.11.1).

9.1.3 **RNAV Fixes/Waypoints.** Establish "fly-by waypoints" in most situations. Use "fly-over waypoints" only when operationally necessary or for obstacle clearance. Establish fixes/WPs to designate restrictions/changes to course, speed, and/or altitude.

9.1.4 **Guidance for Determining RNAV Minimum Altitudes.**

A minimum altitude is required to use RNAV fixes/WPs, TF legs, CF legs, or DF legs. Determine the altitude as the higher of the following:

9.1.4 **a. RNAV Engagement Altitude.** For "Type A" departure procedures, use a height of 2,000 ft above airport elevation. For "Type B" departure procedures or for "RNAV 1" departure procedures, use a height of 500 ft above airport elevation. Procedure "types" are defined in Order 8260.46 and/or AC 90-100.

9.1.4 **b. Altitude/Height Indicated by a Computer Model Assessment**. The current FAA computer model assessment tool is RNAV-Pro. The assessment is not applicable when the procedure is designated as "GPS Required".

9.1.4 **c. Altitude Based on Obstacle Clearance.** Use inclined required obstacle clearance (ROC) and/or level ROC, as applicable.

9.1.4 **d. Altitude Based on Airspace Analysis.** Use Order 8260.19, Flight Procedures and Airspace, and Order 7400.2, Procedures for Handling Airspace Matters, to determine the minimum altitude based on airspace analysis.

9.1.4 **e. Altitude Based on Other Operational Factors.** Other operational factors include air traffic control (ATC) requests, minimum crossing altitude (MCA), radar and/or communications coverage, noise abatement, national security, or environmental.

9.1.4 **f. Altitude Based on Flight Inspection.** If the flight inspection indicates a higher altitude is required, use that altitude. An example would be to recommend an increase based on precipitous terrain.

9.1.5 Guidance for Rounding RNAV Minimum Altitudes.

9.1.5 a. Within the ICA, round RNAV minimum altitudes to the next higher 1-ft increment, if requested. Otherwise, round to the next higher 20-ft MSL increment.

9.1.5 b. Beyond the ICA, round RNAV Minimum altitudes to the next higher 100-ft MSL increment.

9.1.5 c. An exception to the requirement to round to higher increments may be made when the determining factor in the RNAV Minimum Altitude is airspace (paragraph 9.1.4d) or "other operational factors" (paragraph 9.1.4e). You may round to the nearest increment unless it decreases required obstacle clearance.

9.1.6 Procedure Design Below the RNAV Minimum Altitude.

9.1.6 a. Prior to reaching the RNAV minimum altitude (paragraph 9.1.4), use heading legs or radar vectors. Both ODPs and SIDs allow heading legs, using paragraphs 12.4 and 15. Radar must not be used in ODP design; however, radar may be used in SID design. See Order 8260.53, Standard Instrument Departures that Use Radar Vectors to Join RNAV Routes.

9.1.6 b. Existing SIDs, designed under previous criteria and not meeting the provisions of this paragraph, may remain in effect until a change is needed.

9.1.6 c. ODPs that do not conform with this paragraph must be corrected as soon as possible.

9.2 CHARTING INSTRUCTIONS. See Order 8260.46.

9.3 WAYPOINT DEFINITION. Define departure WPs on runway centerline extended by establishing coordinates using the reciprocal of the opposite direction runway true bearing and the appropriate distance applied from the DER (reference point). Where two or more segments are aligned along a continuous geodetic line, align and construct all succeeding WPs based on a true bearing and distance from the first reference waypoint in the sequence. Where turns are established, use the TWP as the reference WP to construct succeeding WPs and segments aligned on a continuous geodetic line following the turn (see figure 4).