ORDER

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

7100.9D

12/11/03

SUBJ: **STANDARD TERMINAL ARRIVAL PROGRAM AND PROCEDURES**

1. PURPOSE. This order provides guidance and standardization for procedures development and management of the Standard Terminal Arrival (STAR) program.

2. DISTRIBUTION. This order is distributed in Washington headquarters at the division level of Flight Standards, branch level of Air Traffic, the offices of Airport Safety and Standards and Communications, Navigation, and Surveillance Systems, the National Flight Procedures Office (NFPO); the Regulatory Standards and Compliance Division at the Mike Monroney Aeronautical Center; regional Flight Standards and Air Traffic Divisions (ATD), all air traffic field offices and facilities, and special military and public addresses.

3. CANCELLATION. This order cancels Order 7100.9C, Standard Terminal Arrival, dated November 14, 2001.

4. EFFECTIVE DATE. This order is effective December 15, 2003.

5. BACKGROUND. The STAR program was developed to reduce pilot/controller workload and air/ground communications by providing a preplanned arrival procedure published in graphic form. STARs should be simple, understandable, and applicable to current air traffic control (ATC) radar/nonradar operations. This order provides guidelines that standardize the development and publication of conventional and area navigation (RNAV) STAR procedures.

6. EXPLANATION OF CHANGES. This order has been revised and updated to reflect the most current STAR program information and has been harmonized with Order 8260.46, Departure Procedure Program, dated January 2, 2003, to the greatest extent possible.

a. Related publications have been referenced, including the notices to airmen and Flight Management System instrument procedures development orders, Federal Aviation Administration (FAA) air traffic noise screening model user manual, International Civil Aviation Organization (ICAO) documents, and Radio Technical Commission for Aeronautics (RTCA) publication on Required Navigation Performance (RNP) for RNAV Minimum Aviation Systems Performance Standards (MASPS).

b. The format has been revised to clarify the conventional and RNAV STAR development processes.

c. Roles are clearly defined, responsibility details are expanded to emphasize specific processing responsibilities, and the Regional Airspace Procedures Team (RAPT) was added.

d. Requirements for visual flight rules (VFR) sectional charts and notices to airmen (NOTAM) have been clarified.

e. Figures have been added to Appendix 2, Guidelines for Design of Standard Terminal Arrivals, of this order to visually identity RNAV STAR transitions. Forms 7100-3, RNAV STAR (Data Record), and 7100-4, STAR Standard Terminal Arrival, and their associated instructions, have been modified and are contained in Appendix 3, Instructions for Completing RNAV Star Form 7100-3, and Appendix 4, Instructions for Completing Form 7100-4, respectively. "Guidelines for Implementing Terminal RNAV Procedures" is included in Appendix 5, Guidelines for Implementing Terminal RNAV Procedures.

f. Adds distance measuring equipment (DME) assessment requirement.

g. Simplifies procedures by limiting segments to en route and common route, and eliminating runway transitions.

7. DEFINITIONS. Appendix 1, Acronyms, Terms, and Definitions, contains a glossary of additional terms, abbreviations, and acronyms used in this order.

8. RELATED PUBLICATIONS.

a. Order 1050.1, Policies and Procedures for Considering Environmental Impacts

b. Order 7130.3, Holding Pattern Criteria

c. Order 7400.2, Procedures for Handling Airspace Matters

d. Order 7930.2, Notices to Airmen (NOTAM)

e. Order 8260.3, United States Standard for Terminal Instrument Procedures (TERPS)

f. Order 8260.19, Flight Procedures and Airspace

g. Order 8260.40, Flight Management System (FMS) Instrument Procedures Development

h. Order 8260.43, Flight Procedures Management Program

i. Order 8260.44, Civil Utilization of Area Navigation (RNAV) Departure Procedures

j. Order 8260.46, Instrument Departure Procedure (DP) Program

k. FAA-EE-99-01, ATNS, Air Traffic Noise Screening Model, Version 2.0, User Manual

l. ARINC Specification 424, Navigation System Databases

m. ICAO Annex 11, Air Traffic Services

n. ICAO ATM 4444, PANS OPS

o. RTCA DO-236A, MASPS: RNP for RNAV

9. FORMS. Appendix 3 contains Form 7100-3 and Appendix 4 contains Form 7100-4.

10. REGIONAL STAR PROCEDURES PROCESSING AND CANCELLATIONS.

a. General. The following guidance outlines procedures for STAR requests, processing, and cancellations:

STAR Requests. STARs are typically requested by the responsible air route traffic control center (ARTCC) servicing the terminal area approach control for the area/airport(s) affected, by the terminal radar approach control facility, or by other proponents. These requests shall be routed to the RAPT for processing in accordance with Order 8260.43.

b. The proponent's request shall include:

(1) Expected benefits to include advantages resulting from the implementation of a STAR such as fuel savings from reduced flight tracks and time, reduced inter/intra-facility coordination, reduced communications, increased airspace flexibility, management and sectorization, or other similar benefits to users or providers.

(2) Description of the STAR, including the proposed ground track with navigational aids (NAVAID)/fixes, waypoints (WP), courses, radials, and altitudes/speeds.

c. STAR Processing (following RAPT authorization):

(1) For RNAV STARs, the regional ATD shall form an RNAV working group in accordance with this order. The working group shall use "Guidelines for Implementing Terminal RNAV Procedures" (included in Appendix 5) and the Terminal Area Route Generation, Evaluation, Traffic Simulation (TARGETS) design tool.

(2) Conventional STARs are the responsibility of the controlling ARTCC for procedure design, development, and implementation in accordance with this order.

(a) TARGETS may be used for procedure design.

(b) Altitude and speed assignments must be designed and coordinated with the lead operator and the ATC facilities having jurisdiction for the airspace affected.

d. Cancellation. A proponent's recommendation for cancellation shall include notification to the ATC facilities impacted. STARs may be canceled by ATC or military service, as appropriate, after coordination with the RAPT.

11. ROLES AND RESPONSIBILITIES.

a. The ATD shall:

(1) For RNAV STAR development:

(a) Designate a project facilitator and a TARGETS operator.

(b) Direct the formation of an RNAV Implementation Working Group with stakeholder representation as identified in Table 1 of Appendix 5, Guidelines for Implementing Terminal RNAV Procedures.

(2) For RNAV or conventional STAR development:

(a) Use the information contained in Appendix 2 for guidance on STAR design and development.

(b) Ensure coordination with affected ATC facilities. Provide assistance to ATC facilities where local training and resources are not available.

(c) Review each new or revised STAR to ensure accuracy and compliance with the provisions of this order.

(d) Use the information contained in Appendix 5 for guidance in review and approval of environmental data and documentation. Send the preliminary environmental package to the air traffic environmental specialist for review to ensure that proper environmental guidance has been applied to the proposed procedure, unless the AT environmental specialist is part of the RNAV Implementation Working Group.

(e) Send procedure documentation to the Flight Procedures Office (FPO). The documentation includes the following:

1. Original signed Form 7100-4 and two additional copies.

2. Form 7100-3 (for RNAV STARs).

3. Two copies of each Form 8260-2, Data Worksheet.

4. TARGETS Distribution Package (for RNAV STARs).

5. RNAV-Pro Output Package (for RNAV STARs).

6. The results of the regional environmental review.

7. The VFR sectional charts depicting the STAR route, the route protected areas, and the controlling obstructions for each segment. For conventional STARs, provide only for off airway routing.

8. The air traffic facility point of contact.

(f) After receipt of completed documentation from the NFPO forward copies to all affected ATC facilities.

(g) Subsequent modification of the procedure requires forwarding of the appropriate 7100 series form to effect permanent charting changes.

b. The ATC facility shall, for RNAV or conventional STAR development:

(1) When requested by the RAPT and/or ATD, provide assistance to determine the STAR operational feasibility and verify expected benefits.

(2) When requested, provide the working group with information pertaining to traffic flows and operational constraints; i.e., arrival/departure routes, aircraft types and characteristics, minimum instrument flight rules (IFR) altitudes, airspace boundaries, sector requirements, and standard operating procedures (SOP).

(3) Where local training and resources permit, when directed by the RAPT or ATD, provide personnel and resources to support the STAR development and implementation. Seek assistance from the ATD where training and resources are not available.

(4) Provide Automated Radar Terminal System (ARTS) or Standard Terminal Automation Replacement System (STARS) data and identify required video maps if necessary. ARTS/STARS data should be provided during all phases of the design process as necessary; i.e., design, testing, implementation, etc.

(5) Coordinate with other ATC facilities concerning letters of agreement, handoff procedures, controller notifications and SOPs.

(6) Review automation requirements; i.e., Host Computer System (HCS), ARTS/STARS, update cycles, moratoriums, coding options, etc., and coordinate with adjacent facilities regarding HCS automation changes.

(7) Serve as the focal point for all ATC related coordination and provide assistance in resolving problems identified during the development process.

(8) Ensure that the proposed procedure has been evaluated for potential environmental impacts in accordance with Order 1050.1 in order to meet the requirements of the National Environmental Policy Act. An approved environmental checklist and the Air Traffic Noise Screening (ATNS) Model shall be used for this purpose. Close coordination is required with the terminal procedures specialist and regional air traffic environmental specialist to ensure compliance with applicable environmental laws, regulations, and policies.

(9) Name all fixes and WPs in a STAR. Coordinate with the controlling ARTCC to obtain the five-letter pronounceable names. Complete Form 8260-2 in accordance with Order 8260.46 for each fix or WP being established, modified, or canceled and submit to ATD.

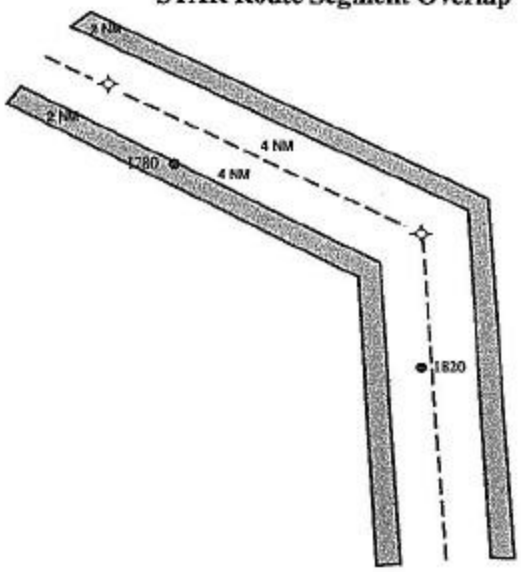
(10) Depict each RNAV STAR or off airway conventional STAR procedure on a VFR aeronautical sectional chart(s) for each segment at or below flight level (FL) 180 in the contiguous United States and at or below FL 230 for Alaska and Hawaii (other approved electronic/digital mapping tools may be used; e.g., TARGETS).

(a) The depiction will include the STAR primary (4 nautical miles [NM]) and secondary (2 NMs) obstruction areas on either side of course centerline (refer to Orders 8260.44 and 8260.3) and must include identification of the obstacle used to establish the minimum en route IFR altitude for each segment. Where two segments are joined, no turning area is required (see figure 1).

(b) Coordinate with the FPO for application of appropriate orders and assistance developing chart depictions.

NOTE–
The purpose of this requirement is to enable NFPO to verify that minimum en route altitudes (MEA) meet minimum required obstruction clearance altitude, minimum reception altitude, communication and airspace requirements.

FIG 1
STAR Route Segment Overlap



(11) Shall complete an initial DME/DME screening using the RNAV-Pro modeling tool. Assistance in completing the DME/DME screening is available from the regional ATD. Forward the RNAV-Pro Output with the submission package.

(a) Unless a satisfactory assessment of the DME NAVAID infrastructure is obtained, the procedure must be annotated "GPS Required." The assessment ensures that adequate NAVAID availability/coverage exists to support navigation along the published route.

(b) If, following the flight inspection, any DME facility limitations are identified, a final run of RNAV-Pro will be conducted with the DME limitations included.

(c) When required, request Expanded Service Volume (ESV) through the ESV Management System (ESVMS). The ESVMS is accessible via the Spectrum Assignment and Engineering Division, ASR-100.

(12) In collaboration with the RNAV working group, complete and forward the applicable forms, environmental checklist, and annotated VFR sectional chart(s) to the ATD. The applicable form for a conventional STAR is Form 7100-4 and the applicable forms for an RNAV STAR are Forms 7100-3 and 7100-4 (see appendixes 3 and 4).

(13) Conduct, as a minimum, a biennial review of existing STARs for accuracy, simplicity, standardization, obsolescence, and adherence to criteria in this order and the latest edition of Orders 8260.3 and 8260.19. Forward changes or updates to the ATD.

(14) When it is necessary to cancel a STAR, process appropriate Forms 7100-4 and 8260-2. After completion distribute to RAPT, ATD, National Flight Data Center (NFDC) , NFPO and affected ATC facilities.

c. The RNAV Implementation Working Group shall:

(1) Follow "Guidelines for Implementing Terminal RNAV Procedures" in Appendix 5.

(2) Follow "Guidelines for Design of Standard Terminal Arrivals" in Appendix 2.

d. The FPO shall:

(1) Provide technical assistance on STAR development and review procedure design for compliance with criteria.

(2) Review STAR documentation. The review shall include, as a minimum, the following:

(a) Evaluation for impact by current or proposed obstacle evaluations/airport airspace analysis, facilities and equipment, national change proposals or other applicable projects.

(b) Conduct database integrity checks (WP, fix, etc.) to ensure accuracy of the data, coordination of WP/fix names, and to confirm no other fixes or WPs are located at the same geographic location.

(3) The FPO shall contact the submitting ATC facility to resolve any problems found during the review. The working group and ATC shall be responsible for additional coordination of changes identified during the review process.

(4) Facilitate discussion of the STAR at the RAPT.

(5) Transmit the STAR documentation to the NFPO.

e. The All Weather Office (AWO) shall:

(1) Provide technical assistance on STAR development.

(2) Provide assistance in determining the equivalent level of safety required for any flight standards waivers needed.

f. The NFPO shall:

(1) Review STAR documentation and conduct data integrity check for existing facilities (WP, fix, etc.) against the data contained in the approved database for continuity. This is to ensure accuracy of the data, coordination of names, and to confirm no other fixes or WPs are located at the same geographic location.

(2) Review the STAR for MEA and bearing/distance between fixes/WP.

(3) After the package is complete, forward STAR documentation to Flight Inspection Central Operations for coordination of the flight inspection.

(4) Complete Form 8260-2 based on the submitted worksheets.

(5) Forward documentation of flight inspection and original forms to the NFDC for further processing and a copy to the regional ATD. Critical DME facilities, as identified by flight inspection, shall be annotated on the Form 7100-4 in block 15.

g. The NFDC shall:

(1) Conduct a prepublication review of submitted forms to ensure compliance with applicable directives and resolve data conflicts, form discrepancies, etc., with the NFPO and regional ATD.

(2) Verify that WP names are not duplicated.

(3) Assign an effective date and publish the STAR and associated fixes/WP in the National Flight Data Digest (NFDD) authorizing charting agencies to publish the STAR.

(4) File and maintain the original signed copy of the forms.

(5) When a STAR or WP is cancelled, ensure names are made available for future use.

h. The NACO shall:

(1) Advise the RAPT and ATD of any charting issues or publication delays.

(2) Publish the STAR on the effective date assigned by NFDC.

12. ACCURACY VERIFICATION AND RESPONSIBILITIES. Users of this order shall notify the NFDC, flight service station, or local air traffic unit for possible NOTAM action whenever errors are discovered in the NFDD or when reviewing a STAR.

a. STAR NOTAM Issuance.

(1) Order 7930.2 prescribes procedures used to obtain, format, and disseminate information on unanticipated or temporary changes to components of or hazards in the National Airspace System until the associated aeronautical charts and related publications have been amended. The NOTAM system should not be used to advertise data already published or charted.

(2) When changes occur so rapidly that time does not permit issuance on a chart or in an appropriate publication, they are publicized as NOTAMs. Originators of airmen information are expected to inform the NFDC in sufficient time before the effective dates of changes to permit publishing of aeronautical data on the various charts or in the appropriate publications.

(3) Information pertaining to temporary changes in published STARs and profile descent procedures shall be submitted to the United States NOTAM Office (USNOF) for dissemination as NOTAM D.

EXAMPLE–
!USD XX/XXX BOS SCUPP THREE ARRIVAL...RAALF TRANSITION: DELETE SEGMENT FROM JFK VOR/DME TO RAALF INT, CHANGE INITIAL ROUTING TO READ FROM OVER RAALF INT VIA ORW VOR/DME R-261 TO ORW VOR/DME, REST OF ROUTE UNCHANGED.

(4) Changes to STARs requiring immediate dissemination shall be originated by the affected ARTCC and submitted to the USNOF for issuance as a NOTAM D.

b. Permanent Changes. Appropriate Forms 7100-4 and 7100-3 must be submitted to effect permanent charting changes. NOTAMs on STARs will be carried on the system until published. Upon formal publication of the amended STAR, the facility that submitted any applicable NOTAMs shall ensure they are cancelled through the USNOF.

13. MILITARY STARS. Military STARs are developed and published in the same manner as civil STARs and shall comply with the criteria outlined in this order. Military proponents are responsible for ensuring coordination with the RAPT and affected ATC facilities. The FAA will develop STARs at joint-use airfields.

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Director of Air Traffic

APPENDIX 1. ACRONYMS, TERMS, AND DEFINITIONS

Acronym/Term	Definition
AAO	Adverse assumption obstacle - The means by which an obstruction is identified when no man-made obstruction is recorded or identified.
APP CON	Approach control
Area Navigation (RNAV)	A method of navigation that permits aircraft operation on any desired flight path within the coverage of station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of these. (See Pilot Controller Glossary.)
ARTCC	Air route traffic control center
ARTS	Automated Radar Terminal System
ATC	Air traffic control
ATCT	Airport traffic control tower
ATD	Air Traffic Division
ATIS	Automated Terminal Information System
ATNS	Air Traffic Noise Screen model
AWO	All weather operations
AWOS	Automated Weather Observation System
CF	Course to fix RNAV Leg type
Common Route	The segment of a STAR between the en route transition end point and the final point on a STAR.
DF	Direct to fix RNAV leg type
DME	Distance measuring equipment
En Route Transition	A published segment that connects one or more en route airway/jet route to the STAR.
FAA	Federal Aviation Administration

Fix	A generic term used to define a predetermined geographical position used for route definition. A fix may be a ground-based NAVAID, a waypoint, or defined by reference to one or more radio NAVAIDs.
FB	Fly-by waypoint - Requires the use of turn anticipation to avoid overshoot of the next flight segment.
FO	Fly-over waypoint - Precludes any turn until the waypoint is overflown and is followed by an intercept maneuver of the next flight segment.
FMS	Flight Management System
FPNM	Feet per nautical mile
FPO	Flight Procedures Office (An element of the National Flight Procedures Office located at each FAA regional headquarters.)
FSS	Flight service station
GPS	Global Positioning System
HCS	Host Computer System
IF	Path terminator denoting the initial fix of an RNAV route leg. See "path and terminator."
IFR	Instrument flight rules
KIAS	Knots indicated airspeed
KTS	Knots
Lead Operator	An operator that has agreed to serve as the focal point for the development of STARs at a specific airport. The lead operator agrees to help develop the STAR and ensure fly-ability by all aircraft expected to use the STAR.
Leg Type	See "path and terminator."
LOA	Letter of agreement
MEA	Minimum en route IFR altitude
MSL	Mean sea level
NACO	National Aeronautical Charting Office
NAVAID	Navigational aid

NEPA	National Environmental Policy Act
NFDD	National Flight Data Digest
NFDC	National Flight Data Center
NFPO	National Flight Procedures Office
NOTAM	Notice to airmen
NM	Nautical mile
NRP	North American Route Program
Path and Terminator	An ARINC 424 term that is defined as a set of two alphabetic characters. The first identifies the type of flight path and the second indicates where the route leg terminates; e.g., TF, DF, CF, VM.
Proponent	The originator of a STAR requirement. This may include an individual, user group, ATC, NFPO, or other appropriate government agency.
RAPT	Regional Airspace Procedures Team
RNP	Required navigation performance. A statement of the navigational performance accuracy necessary for operation within defined airspace.
SIAP	Standard instrument approach procedure
Significant Benefits	Tangible or intangible advantages resulting from the implementation of a STAR such as fuel savings from reduced flight tracks and time, reduced inter/intra facility coordination, reduced communication between ATC and pilots, increased flexibility of airspace management and sectorization due to more predictable ground tracks, or other similar benefits to users or ATC.
SOP	Standard operating procedures
STAR	Standard Terminal Arrival - A preplanned instrument flight rule (IFR) air traffic control arrival procedure published for pilot use in graphic form. STARs provide transition from the en route structure to an outer fix or an instrument approach fix/arrival waypoint in the terminal area.
TARGETS	Terminal Area Route Generation, Evaluation, Traffic Simulation tool
TERPS	Terminal instrument procedures
TF	Track to fix

TRACON	Terminal radar approach control facility
Transitions	See "common route" and "en route transition."
VFR	Visual flight rules
VM	Heading to a manual termination (specified as a heading until a manual termination).
WP	Waypoint - A predetermined geographical position used for route/instrument approach definition, progress reports, published VFR routes, visual reporting points, or points for transitioning and/or circumnavigating controlled and/or special use airspace that is defined relative to a VORTAC station or in terms of latitude/longitude coordinates.

APPENDIX 2. GUIDELINES FOR DESIGN OF STANDARD TERMINAL ARRIVALS

1. GENERAL. Safety is a primary concern in the design of Standard Terminal Arrival (STAR) routes. A STAR will not be established solely for the purpose of noise abatement, but existing noise abatement procedures should be considered in the STAR's design. In addition, all procedures shall be evaluated for possible environmental effects in accordance with Order 1050.1, Policies and Procedures for Considering Environmental Impacts, to ensure that the requirements of the National Environmental Policy Act have been met. An environmental checklist and the Air Traffic Noise Screening model shall be used for this purpose. Close coordination is required with the terminal procedures specialist and regional air traffic environmental specialist to ensure compliance with applicable environmental laws, regulations, and policies.

a. STARs shall:

(1) Be simple and easily understood.

(2) Commence at an en route fix; e.g., navigational aid (NAVAID), intersection, distance measuring equipment (DME) fix, or waypoint.

(3) Be compatible with local air traffic control (ATC) standard operating procedures (SOP) and traffic flow management procedures.

(4) Include in the graphic depiction, holding patterns referenced in the narrative of the STAR.

(5) Be designed to Level 2 criteria as defined in Order 8260.44, Civil Utilization of Area Navigation (RNAV) Departure Procedures, (RNAV only).

(6) Shall not require automated vertical navigation.

(7) Depict a minimum en route altitude (MEA) for each segment of an arrival in accordance with Order 8260.3, United States Standard for Terminal Instrument Procedures. The MEA of each segment shall not be higher than the preceding segment. In mountainous areas, obstacle clearance may be reduced from 2,000 feet to 1,000 feet when necessary to achieve compatibility with the associated instrument approach procedures (IAP), with approval from the National Flight Procedures Office.

(8) Terminate at an initial approach fix for a standard instrument approach procedure (SIAP) or at a point in space defined by a fix or waypoint. An RNAV STAR shall terminate at a point from which radar vectors may be initiated. For airports served by a radar approach control, terminate at a point within the terminal airspace.

(9) When terminating at a point in space that is not associated with an IAP, be charted with air traffic vectors and lost communication instructions if lost communications procedures differ from 14 Code of Federal Regulations (CFR) 91.185.

(10) Not combine conventional and RNAV STARs on the same chart.

(11) Use procedural data notes when limitations are necessary; e.g., services to be provided in conjunction with the procedure, designated aircraft equipment capability, etc. Do not include items of an ATC clearance in notes.

Example–
"RADAR REQUIRED," or "FOR USE BY /E, /F, /G, and /R (RNP-2.0) EQUIPPED AIRCRAFT ONLY."

b. STARs should:

(1) Be developed to accommodate as many different types of aircraft as possible.

(2) Provide for a significant user/system benefit.

(3) Reduce pilot/controller communications and workload.

(4) Use only the minimum number of fixes/waypoints, turns, and speed or altitude changes to depict the route.

(5) Avoid the use of DME arcs.

(6) Establish crossing altitudes for traffic separation and/or obstacle clearance.

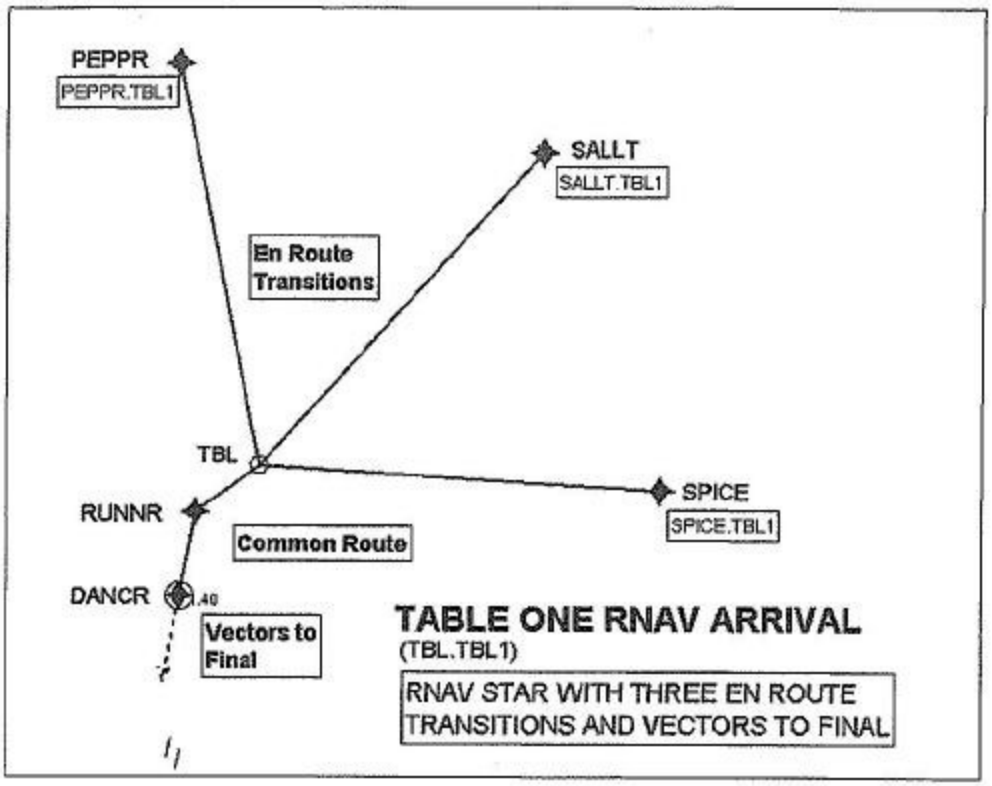
c. STARs may:

(1) Serve multiple airports.

(2) Be designed to overlay the vector procedure from an en route fix to a point in space or SIAP fix.

2. RNAV STARs. This section describes the elements specific to RNAV STAR procedures. The design of an RNAV STAR may include two segment types; en route transitions and a single common route (see figure 1). These segments will be depicted with fly-by (FB)/fly-over (FO) waypoints (that may have associated altitude and speed requirements) and leg types.

FIG 1
RNAV STAR Example



a. Waypoints. An RNAV STAR must be designed using waypoints. This provision does not preclude the use of an existing NAVAID/fix. FB waypoints shall be used, except the last waypoint shall be coded as a FO waypoint.

(1) Design STARs using the fewest number of waypoints.

(2) Names assigned for waypoints shall consist of a single five-letter pronounceable name.

(3) Use existing NAVAIDs, fixes, or waypoints whenever possible. Waypoints that are co-located with existing NAVAIDs shall use the NAVAID three-letter location identifier.

(4) Waypoints may be assigned crossing altitudes and speeds to optimize the descent and deceleration profiles. Waypoint crossing assignment types shall be defined as "at," "at or above," "at or below," or "expect."

(a) Limit the number of altitude and speed requirements to the minimum necessary. Altitude assignments shall not include both "at or above" and "at or below" in the same procedure. "Expect" altitudes or airspeeds will not be coded into an aircraft navigation database.

(b) Avoid the use of multiple altitude or speed restrictions at same waypoint; e.g., cross XRAY at 9,000 feet when Runway 27 in use but cross XRAY at 11,000 feet when Runway 9 is active. When multiple restrictions cannot be avoided at a particular waypoint, use "expect" altitudes or speeds. This does not prohibit the combined use of a single altitude and a single speed assignment for a waypoint.

b. Leg type (path terminator). The following table shows permissible leg types for use with RNAV STARs (refer to Order 8260.44 for leg-type definitions and examples).

TBL 1
Leg-Type Example

From Waypoint	Via (leg type)	To Waypoint
FB	TF[1], CF	FB/FO
IF[2]	TF, CF, DF	FB/FO
FO	VM[3]	

(1) Track to fix (TF) is the preferred leg type from an FB to a FB/FO.

(2) An IF is used to designate the first waypoint of a STAR transition.

(3) A heading until a manual termination (VM) leg may be used only after the last waypoint. A VM leg shall be "at/above" the minimum vectoring altitude.

c. Leg Length.

(1) Use the longest legs possible. The designer must consider speed and course changes when determining minimum leg length (refer to Order 8260.44 for specific minima).

(2) The maximum leg length for straight-line paths is 260 miles to ensure the geodesic path does not exceed the protected airspace for a great circle path.

d. Turn Angle.

(1) For a track change at a FB waypoint below flight level (FL) 195, avoid turn angles of greater than 120 degrees.

(2) For a track change at a FB waypoint at or above FL 195, avoid turn angles of greater than 70 degrees.

e. Descent Gradients and Deceleration Segments.

(1) STAR procedures should be designed to standardize descents from the high-altitude en route stratum down to the terminal environment.

(2) A descent gradient of 318 feet per nautical mile (FPNM) (a 3-degree vertical path angle [VPA]), should be used from the en route environment to 10,000 feet mean sea level (MSL). Below 10,000 feet MSL, the descent gradient should not exceed 330 FPNM (a 3.1-degree VPA).

Note–
Based on ATC SOPs, RNAV STARs may require descent gradients that exceed the 330 FPNM. A descent gradient greater than 330 FPNM may require manual speed intervention by the pilot and deceleration segments may need to be increased to compensate.

(3) The STAR designer shall allow for a deceleration at any waypoint that has a speed restriction. The operational requirements of affected operators should be considered. As a general deceleration guideline, the leg distance between the waypoints should be increased at least 1 nautical mile (NM) per 10 knots (KTS) of deceleration required.

Example–
An RNAV STAR begins at waypoint ALPHA at 17,000 feet MSL and 310 KTS. This STAR requires the aircraft to descend to and cross waypoint BRAVO at 9,000 feet MSL at 240 KTS. The minimum leg length between ALPHA and BRAVO would be computed as follows:

(17,000 - 9,000) ÷ 318 = Minimum leg length using a 3-degree descent gradient
8,000 ÷ 318 = 25.157 NM

plus

(310 - 240) ÷ 10 = Deceleration segment
70 ÷ 10 = 7 NM
7 = 32.157 NM (round to 32.16)

(4) STAR design should account for the deceleration necessary to slow the aircraft to 250 KTS at 10,000 feet MSL. If the STAR ends within 20 miles of a landing runway, the STAR should also provide a deceleration segment that allows for a speed reduction from 250 KTS to 200 KTS.

f. Levels of criteria. (For RNAV STAR development use Level 2 criteria only.)

(1) Level 2 criteria correspond to a level of aircraft performance. The following RNAV equipment suffixes, defined in the Aeronautical Information Manual, indicate aircraft that are capable of Level 2 STARs:

(a) /E - Dual FMS equipped aircraft.

(b) /F - Single FMS equipped aircraft without a moving map display.

(c) /G - Global Positioning System equipped aircraft.

(d) /R - (RNP 2.0): Aircraft approved for required navigation performance (RNP) operations of RNP 2.0 or less.

(e) Include the standard note "For use by /E, /F, /G, or /R (RNP 2.0) equipped aircraft only" in the remarks section of Form 7100-4, STAR – Standard Terminal Arrival.

g. RNP: Reserved.

h. STAR Naming and Computer Code Identification.

(1) A STAR shall be named to correspond with a NAVAID, fix, or waypoint identifier on the common route, normally where the common route begins. An RNAV STAR will include the term RNAV in the name; e.g., "TOEZZ ONE RNAV ARRIVAL."

(2) STARs shall not be given a name that implies a direction; e.g., north, east, south, west, etc.

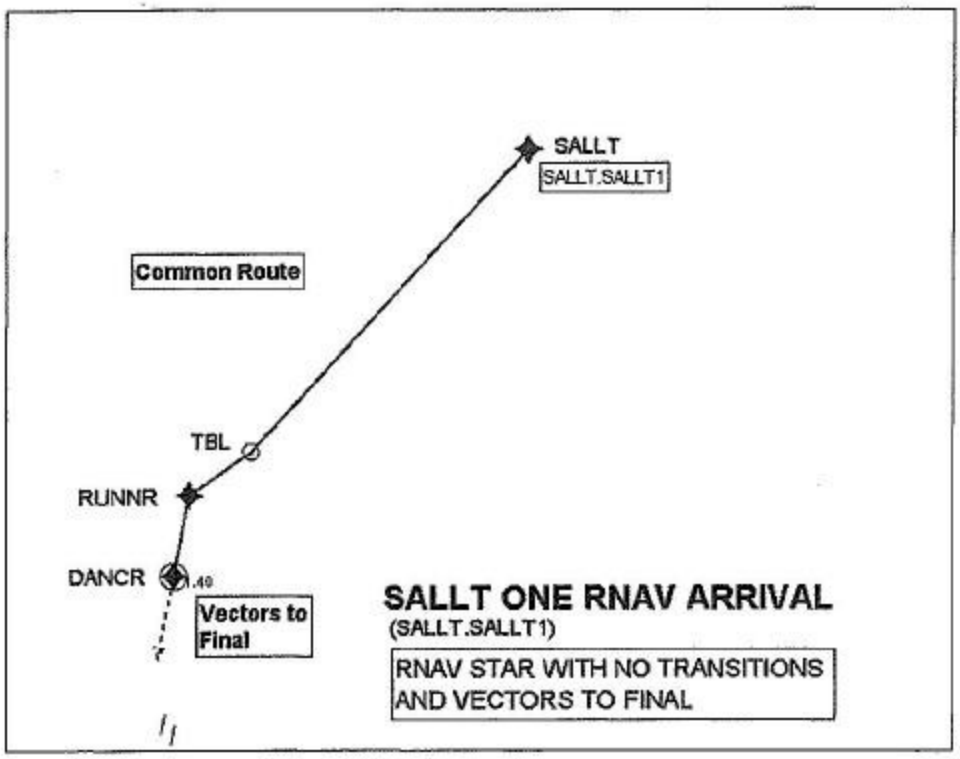
(3) STAR names shall not be duplicated. STAR designers should also avoid the use of similar sounding STAR names.

(4) Number each original STAR "ONE;" e.g., "DLBRT ONE RNAV ARRIVAL." Number subsequent revisions in numerical sequence through "NINE" and then restart at "ONE." Renumber STARs whenever a revised FAA 7100 series form is required.

(5) The STAR computer code will be assigned by using the NAVAID, fix, or waypoint identifier where the STAR common route begins, followed by a dot, then the identifier associated with the name of the procedure, followed by a revision numeral (1-9).

(6) En route transitions also require a computer code. En route transitions are assigned by using the NAVAID, fix, or waypoint identifier name where the en route transition begins, separated by a dot, followed by the identifier/name of the STAR, and suffixed with a numeral (1-9). The STAR naming and computer-coding conventions are illustrated in figures 1 and 2.

FIG 2
RNAV STAR Example



i. Fix, Waypoint, Holding Pattern, and Communication (CHARTING). Information that is charted in graphic form should not be duplicated in a textual description on the chart.

(1) Fixes, waypoints, and associated holding patterns should be published on en route low-altitude and high-altitude charts when they are used for en route ATC.

(2) Fixes, waypoints, and holding patterns should be published on arrival charts when they are used for the control of arrival traffic into a specified area.

(3) A published holding pattern depicted at a fix or waypoint on a low/high altitude en route chart or area chart shall be published on any arrival chart that depicts the same fix or waypoint.

(4) Refer to Order 8260.19, Flight Procedures and Airspace, for use of magnetic variance in the development of holding patterns and point-to-point navigation for RNAV versus conventional NAVAIDs.

(5) For RNAV STARs that terminate at a point in space, annotate on the chart that radar vectors will be provided; e.g., expect radar vectors to final, and annotate the chart with the lost communication procedure if lost communications procedures differ from 14 CFR 91.185.

(6) Chart at least one very high frequency (VHF), one ultra high frequency (UHF), (where available) and the Automated Terminal Information System at each airport served by the STAR.

(7) The maximum number of airport frequencies that may be charted shall not exceed one VHF and one UHF (where available) for tower and ground control.

(8) Include one VHF and one UHF air route traffic control center frequency only when there is no terminal facility involved.

(9) Control frequencies shall not be included in the arrival text.

APPENDIX 3. INSTRUCTIONS FOR COMPLETING RNAV STAR FORM 7100-3

BLOCK 1. FIX/NAVAID. Enter the name of the fix or navigational aid (NAVAID) in one of the following two formats: (1) five-letter pronounceable name and type or (2) three-letter facility identification plus facility type; e.g., TBL VOR, SPICE WP.

BLOCK 2. LAT/LONG. Enter the north latitude followed by the west longitude (separated by a "/") associated with the item listed in block 1 in degrees, minutes, seconds, and hundredths of a second; e.g., 401900.22/0785030.21.

BLOCK 3. C (chart). Enter a "Y" (yes) if the item in block 1 is to be charted. Enter an "N" (no) if charting is not required.

Note–
All fixes or NAVAIDs requiring a change in altitude, speed, or direction (heading), require charting.

BLOCK 4. FLY-BY/FLY-OVER. Enter "FB" to indicate a fly-by waypoint or "FO" to indicate a fly-over waypoint.

BLOCK 5. LEG TYPE. Enter the two-letter leg-type code.

BLOCK 6. TC (true course). Enter the true course to the nearest hundredth of a degree; e.g., 164.12.

BLOCK 7. DIST (distance). Enter the distance to the nearest hundredth of a nautical mile; e.g., 24.64.

BLOCK 8. ALTITUDE. Enter altitude rounded to the nearest 100 feet or flight levels (FL) above FL 180 where necessary for traffic flow requirements and vertical descent profile. Label each altitude/FL entered with the appropriate indicator.

BLOCK 9. SPEED. Enter knots indicated airspeed where necessary for procedure containment or traffic flow requirements. Label each speed restriction with the appropriate indicator.

TBL 1
Altitude Indicator

Altitude	Indicator	Example
At or Above	+	+8000
At	(blank)	6000
At or Below	-	-5000

TBL 2
Speed Indicator

Speed	Indicator	Example
At or Above	+	+230
At	(blank)	240
At or Below	-	-220

BLOCK 10. REMARKS. Enter the en route transition computer code (see Appendix 2) and any other pertinent information that would clarify the reason for a data entry; e.g., airspeed restriction required for turn radius. Enter expect altitudes and airspeeds in this block.

BLOCK 11. ARRIVAL NAME. Enter name of Standard Terminal Arrival (STAR) route (see Appendix 2).

Example–
"TINKR THREE RNAV ARRIVAL" is entered as "TINKR RNAV."

BLOCK 12. NUMBER. Enter STAR revision number (see Appendix 2); e.g., EIGHT.

BLOCK 13. STAR COMPUTER CODE. Enter computer identification code (see Appendix 2).

BLOCK 14. SUPERSEDED NR. STAR revision number superseded by this STAR. If original, insert "none."

BLOCK 15. DATED. Published or revision date of superseded STAR; e.g., 17 NOV 02.

BLOCK 16. EFFECTIVE DATE. Completed by the National Flight Data Center.

US Department of Transportation
Federal Aviation Administration

RNAV STAR (Data Record)

(1) FIX/NAVAID	(2) LAT/LONG	(3) C	(4) FO/FB	(5) LEG	(6) TC	(7) DIST	(8) ALTITUDE	(9) SPEED	(10) REMARKS
En Route Transitions									
PEPPR WP	400016.44 / 0774039.26	Y		IF					PEPPR.TBL1
TBL VOR	392444.02 / 0772230.49	Y	FB	TF	158.38	38.17		-250	Expect 10000
SALLT WP	395759.06 / 0765527.80	Y		IF					SALLT.TBL1
TBL VOR	392444.02 / 0772230.49	Y	FB	TF	212.29	39.24		-250	Expect 10000
SPICE WP	392901.00 / 0763435.00	Y		IF					SPICE.TBL1
TBL VOR	392444.02 / 0772230.49	Y	FB	TF	263.68	37.37		-250	Expect 10000
Common Route									
TBL VOR	392444.02 / 0772230.49	Y		IF				-250	Expect 10000
RUNNR WP	391927.58 / 0772918.33	Y	FB	TF	225.05	7.45			
DANCR WP	391127.22 / 0772929.10	Y	FO	TF	181.00	8.00	6000		

(11) Arrival Name	(12) Number	(13) STAR Computer Code	(14) Superseded Nr.	(15) Dated	(16) Effective Date
TABLE RNAV	ONE	TBL.TBL1	NONE		

FAA Form 7100-3 (9/02)

APPENDIX 4. INSTRUCTIONS FOR COMPLETING FAA FORM 7100-4

BLOCK 1a. TRANSITION NAME(S). Enter the name of each en route transition according to the name of the fix or navigational aid (NAVAID) where the en route transition(s) begins; e.g., for a transition starting at the TNP VOR, enter "Twenty Nine Palms" as the transition name. Do not include the word "transition."

BLOCK 1b. TRANSITION COMPUTER CODES. Enter computer code (see Appendix 2).

BLOCK 1c. FROM FIX/NAVAID. Enter the name and type of fix/NAVAID where each en route transition begins. Use the following to identify type: WP, INT, VORTAC, etc.; e.g., GFE VORTAC, GOINN INT, GETIT WP.

BLOCK 1d. TO FIX/NAVAID. Enter the name(s) and type(s) of all fix/NAVAID(s) that describe the en route transition after the first point, to and including the common point; e.g., GFE VORTAC, GOINN INT, GETIT WP.

Note–
If a transition has multiple segments, use one line for each segment.

BLOCK 1e. MAG COURSE/DISTANCE. Enter the magnetic course and distance for each transition segment. Specify the magnetic course to the hundredth of a degree; e.g., 354.24; and distance to the hundredth of a mile; e.g., 72.48. The National Aeronautical Charting Office (NACO) will round entries to the nearest whole degree for publication.

BLOCK 1f. MEA. Enter the minimum en route altitude (MEA) along each en route segment. En route transitions sharing a common segment should have the same MEA. If it is the intention to have different MEAs on a common segment, note this in block 14, Remarks.

BLOCK 1g. MOCA. Enter the minimum obstruction clearance altitude (MOCA) along the route.

BLOCK 1h. MAA. Enter the maximum authorized altitude (MAA) along each en route transition.

BLOCK 1i. CROSSING ALTITUDE/FIXES. Enter altitude rounded up to the nearest 100 feet or flight levels (FL) above FL 180 where necessary for traffic flow requirements and vertical descent profile (see Appendix 3).

BLOCK 2. ARRIVAL ROUTE DESCRIPTION. Provide a textual description of the Standard Terminal Arrival (STAR) route from the common route starting point to the ending point of the STAR. Document all courses, headings, tracks, and distances to the nearest hundredth unit of measurement. In parenthesis, list the MEA and/or MOCA for each segment as required; e.g., MEA 5000; MOCA 2500.

Note–
Block 2 entries will be published verbatim on the NACO chart, with the exception of courses, headings, and tracks, which will be rounded by NACO to the nearest whole degree.

Area navigation (RNAV) STARs: The textual description of an RNAV STAR requires specific narrative wording to match the leg type information depicted on associated Form 7100-3, RNAV STAR (Data Record), (see table 1 for required wording). Ensure courses, tracks, headings, and distances entered on Form 7100-4, STAR – Standard Terminal Arrival, match the equivalent true values and distances entered on Form 7100-3. In addition, turn directions shall be specified as either "left" or "right" as follows:

Direct to fix (DF) legs: All course changes.

Course to fix (CF) and track to fix (TF) legs: All course changes exceeding 90 degrees.

Note–
If the STAR is or becomes a series of consecutive TF legs with turns less than or equal to 90 degrees, a complete textual description from that point is not necessary. State "...thence as depicted..."

TBL1
Leg Type Wording and Required Information

7100-3 Leg Type	7100-4 Wording	7100-4 Required Information
TF	"Track"	Course/distance/turn direction
DF	"Direct"	Turn direction /distance
CF	"Course"	Course/ distance/ turn direction
VM	"Heading"	Heading

Example–
A TF leg followed by a heading until a manual termination (VM) leg via 070.11 track to TALKN WP, then via 090.12 heading. Expect radar vectors.

A CF leg followed by a DF leg via 320.22 course to cross WALKN WP at/above 10,000 feet, then right turn direct TRYNN WP.

Consecutive TF legs via 270.11 track to DRYVN, thence as depicted to FLYYN WP.

BLOCK 3. PROCEDURAL DATA NOTES. Enter any information that will appear in note form on the published chart; e.g., distance measuring equipment (DME) required; RADAR required. Also list any altitude/speed restrictions not associated with a particular waypoint (WP)/fix. Notes should be clear and easily understood by pilots using the procedure. For landing flow, use landing direction not traffic flow direction.

For RNAV STARs, procedures intended for use by /E, /F, or /R, regardless of required navigation performance (RNP) accuracy, must include the note "GPS required" unless a satisfactory DME/DME assessment is completed and documented in block 15.

BLOCK 4. FIXES AND/OR HOLDING PATTERNS. Enter those fixes or NAVAIDs for which holding is required and enter the applicable holding instructions. Ensure the accompanying Form 8260-2, Data Worksheet, contains the same charting instructions for holding patterns supporting the STAR.

BLOCK 5. COMMUNICATION. Enter the name all of radio communications to be charted; e.g., ATIS, AWOS, APP CON. Specify the frequencies only if different than what is currently published for the facility.

BLOCK 6. ARRIVAL NAME. Enter name of STAR (see Appendix 2); e.g., "CHARLOTTE EIGHT ARRIVAL" is entered as "CHARLOTTE;" "TINKR THREE RNAV ARRIVAL" is entered as "TINKR RNAV."

BLOCK 7. NUMBER. Enter STAR revision number (see Appendix 2); e.g., EIGHT.

BLOCK 8. STAR COMPUTER CODE. Enter computer identification code (see appendix 2).

BLOCK 9. SUPERSEDED NR. STAR revision number superseded by this STAR. If original, enter "none."

BLOCK 10. DATED. Published or revision date of superseded STAR; e.g., 17 NOV 02.

BLOCK 11. EFFECTIVE DATE. Completed by the National Flight Data Center.

BLOCK 12. AIRPORTS SERVED. Enter all airports served by the STAR. List the city and two-letter state code for each airport listed.

BLOCK 13. LOST COMMUNICATION PROCEDURE. Enter lost communications procedure, if required, to be included in the textual description. Leave blank when procedures are the same as 14 Code of Federal Regulations 91.185.

BLOCK 14. REMARKS. List information/data that is not to be charted; e.g., administrative data or notes for controller information (requested by air traffic control). These items will not be seen in the National Flight Data Digest.

BLOCK 15. ADDITIONAL FLIGHT DATA. List any additional charting instructions, items essential to clarify charting, or information a specialist has determined needs charting as other than a note. Data may include terrain features, additional airports, Special Use Airspace, or landing obstacles.

For RNAV STARs place the reference (arrival airport) magnetic variation of record used to develop the STAR in this block; e.g., REFERENCE MAG VAR: KNTW 10W/00.

The National Flight Procedures Office will enter one of the following after completion of the flight inspection:

a. "DME/DME Assessment: SAT (RNP 2.0)" indicates a successful assessment to the RNP value specified.

b. "DME/DME Assessment: DME limitations" identifies specific DME facilities with limitations.

c. "DME/DME Assessment: UNSAT" indicates an unsuccessful assessment to RNP 2.0. If the DME/DME assessment indicates "UNSAT," the note "GPS required" must be entered in block 3.

Note–
The DME/DME assessment process is covered in separate guidance.

BLOCK 16. CONTINUATION. Use this area of the sheet to complete any data block from previous pages. Indicate block number and title being continued.

BLOCK 17. CHANGES. List changes relating to data entries.

BLOCK 18. REASONS. List reasons for changes identified in block 17.

BLOCK 19. GRAPHIC DEPICTION. Include a graphic depiction of the STAR. Identify on the depiction the magnetic and true course between fixes, intersections, waypoints, or very-high-frequency omnidirectional ranges (VOR), and list any required altitudes and speeds.

US Department of Transportation
Federal Aviation Administration

STAR – Standard Terminal Arrival

1. Bearings, headings, courses and radials are listed to the nearest hundredth (e.g. 360.00)
2. Distances are in nautical miles to nearest hundredth (e.g. 00.00)
3. Altitudes are minimum altitudes unless otherwise indicated

(1) Transition Routes (Graphic Depiction Only)

(a) Transition Name	(b) Transition Computer Codes	(c) From RNAV WP/ Fix/NAVAID	(d) To RNAV WP/ Fix/NAVAID	(e) Mag Course/Distance	(f) MEA	(g) MOCA	(h) MAA	(i) Crossing Altitudes/Fixes
PEPPR	PEPPR.TBL1	PEPPR WP	TBL VOR	168.38/38.17	8,000		FL210	
SALLT	SALLT.TBL1	SALLT WP	TBL VOR	222.29/39.24	8,000		FL210	
SPICE	SPICE.TBL1	SPICE WP	TBL VOR	2763.68/37.37	8,000		FL210	

(2) Arrival Route Description: From TBL VOR via 235.05 track to RUNNR WP, thence as depicted to cross DANCR WP at 6,000 (MEA 5,000). Expect radar vectors to final approach course.

(3) Procedural Data Notes: Radar required. This STAR applicable to turbojet aircraft only. Expect to cross TBL at 10,000. Cross TBL at or below 250 KTS. Cross DANCR at 6,000.

(4) Fixes and/or Holding Patterns: Chart LAT/LONG coordinates for TABLE.

(5) Communications: NWT ARRIVAL ATIS FREQ 115.7/134.82, NEWTOWN CENTER FREQ 132.52, NEWTOWN APPROACH CONTROL 126.7/123.95.

(6) Arrival Name	(7) Number	(8) STAR Computer Code	(9) Superseded Nr.	(10) Dated	(11) Effective Date
TABLE RNAV	ONE	TBL.TBL1	NONE	DD/MO/YR	

FAA Form 7100-4 (7/02)

(12) Airports Served	
Airport Name Newtown International	City/State Newtown, NJ
Airport Name	City/State
Airport Name	City/State
Airport Name	City/State
Airport Name	City/State
Airport Name	City/State

(13) Lost Communications Procedure:

(14) Remarks: REFERENCE MAG VAR: KNTW 10W/00

(15) Additional Flight Data:

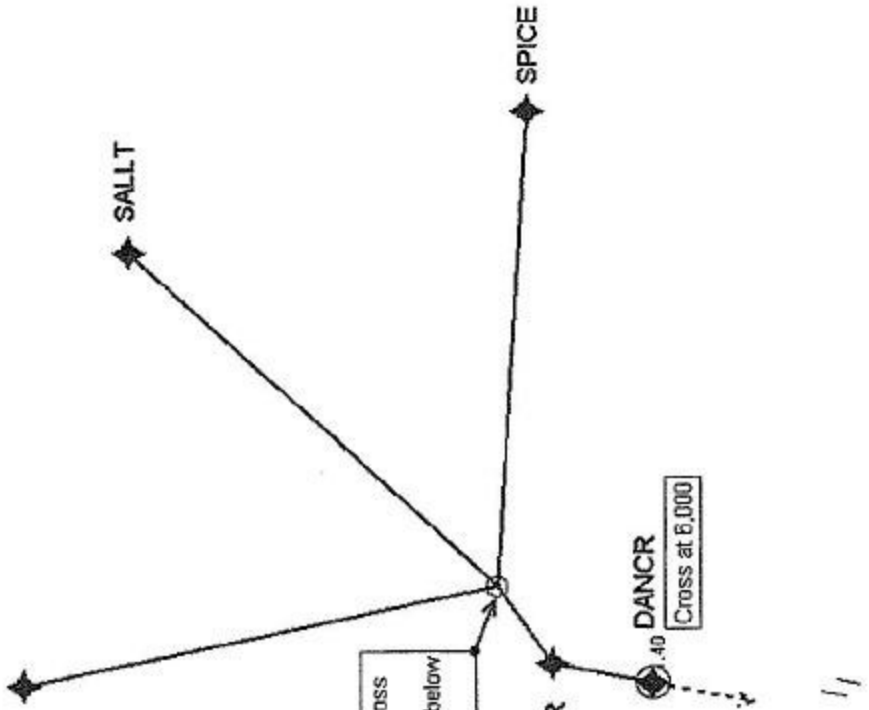
(6) Arrival Name	(7) Number	(8) STAR Computer Code	(9) Superseded Nr.	(10) Dated	(11) Effective Date
TABLE RNAV	ONE	TBL.TBL1	NONE	DD/MO/YR	

FAA Form 7100-4 (7/02)

(16) Continuation:					
(17) Changes:					
(18) Reasons for Changes:					
Developed By	Name *(Typed and Signed)*, Title and Organization			DATE	
	Example: John Smith Support Specialist, Washington Center				
Approved	NFPO				
	Reg. ATD				
(6) Arrival Name TABLE RNAV	(7) Number ONE	(8) STAR Computer Code TBL.TBL1	(9) Superseded Nr. NONE	(10) Dated DD/MO/YR	(11) Effective Date DD/MO/YR

FAA Form 7100-4 (7/02)

(19) Graphic Depiction:



FAA Form 7100-4 (7/02)

APPENDIX 5. GUIDELINES FOR IMPLEMENTING TERMINAL RNAV PROCEDURES

INTRODUCTION.

This document is a standardized, systematic process for the development of terminal area navigation (RNAV) arrival and departure procedures (DP). This process is designed to be used by members of the RNAV Implementation Working Group (see table 1) with the goal to publish an RNAV arrival or DP. The guidance in this document incorporates past lessons learned and references material used to accomplish the project objectives. The process is known as "Guidelines for Implementing Terminal RNAV Procedures" (guidelines) and must be used in conjunction with Order 8260.43, Flight Procedures Management Program, and other applicable Federal Aviation Administration (FAA) orders governing terminal RNAV procedure design.

The guidelines provide the RNAV Implementation Working Group with a tracking mechanism to expedite the development, review, and implementation of a terminal RNAV procedure. This is accomplished by providing instructions that separate design and implementation into manageable items that are mapped as closely as possible to the anticipated sequential order of RNAV procedure development. However, due to the dynamic nature of RNAV procedure development, guideline items may be completed concurrently or in an order different than that presented in the guidelines. Additionally, if during the development of a procedure changes to the design are required, the working group must revisit all applicable items in the guidelines to ensure all changes have been addressed.

It is important to remember that during the project duration, maintaining a committed working group is critical to the project's success. A key element of this collaborative process is the sharing of information. The guidelines play a significant role in this process by providing a medium by which information regarding resource requirements and specific user roles may be identified and shared among team members.

GUIDELINE ITEMS.

1. Kickoff Meeting.

This item describes the activities involved in planning, conducting, and administering an RNAV Implementation Working Group kickoff meeting, which includes preliminary design of an RNAV procedure. Additionally, this item provides guidance on managing regularly scheduled working group conference calls (telcons).

a. Project Facilitator.

(1) Premeeting requirements.

(a) Schedule a kickoff meeting that brings together the members of the working group (see table 1).

(b) Determine need for working group participation by individuals/organizations not listed in table 1. Arrange for their participation as necessary.

(c) Advise RNAV procedure proponent(s) to be prepared to present their proposals.

(d) Advise Terminal Area Route Generation, Evaluation, and Traffic Simulation (TARGETS) tool operator to complete guideline item 2, Adaption of TARGETS. Adapt TARGETS and be prepared to present a demonstration of TARGETS as needed.

(2) Initial meeting.

(a) Introduce the "Guidelines for Implementing Terminal RNAV Procedures" to include the participant's roles and responsibilities from table 1.

(b) Provide an overview of any ongoing RNAV development projects at the air traffic control (ATC) facility or elsewhere in the region.

(c) Develop a mission statement that provides clear direction for the working group. The mission statement should identify the project's goal.

Example–
Define, develop, and implement RNAV procedures and profiles in the New York Terminal Radar Approach Control (TRACON) facility airspace to increase safety, reduce communications, improve user/provider efficiencies, and improve air transportation service to the traveling public at the John F. Kennedy International Airport.

(3) Administrative activities.

(a) Develop a point of contact list using Form 4, Working Group Contact List.

(b) In coordination with the Flight Procedures Office (FPO), establish a schedule for guideline item completion that meets the publication date. TARGETS contains a Microsoft project template of critical path and average timeline schedule for each item.

(c) Establish telcon schedule.

Note–
After the kickoff meeting, telcons are the primary method by which the working group meets. They are used to coordinate activities, ensure timely completion of project items, refine issues, verify completion of required work, and to track remaining items and critical schedule dependencies.

(d) Identify the organization (usually the FAA regional office) responsible for establishing the telcon bridge. Obtain the telephone number and access code.

(4) Post meeting requirements.

Create and begin regular (as needed) distribution of project documentation to the working group. This will generally consist of some or all of the following:

(a) An e-mail documenting meeting or telcon attendees, minutes of the previous meeting or telcon, and the next meeting or telcon agenda.

(b) An updated list of action items and the guideline index.

(c) The TARGETS RNAV distribution package, which includes a PowerPoint diagram of the procedure and a waypoint data table depicting the latitude/longitude coordinates, FAA leg types, and when assigned, altitude/speed for each waypoint.

(d) Additional documentation as needed.

Note–
It is imperative that individuals with decisionmaking authority participate in telcons. In certain cases, it may be prudent to cancel a telcon or even terminate a telcon in progress when key participants are not available. This will reduce the need for post telcon coordination, assist in consensus building, and help to ensure all aspects of important issues are fully addressed.

b. TARGETS Operator.

(1) Conduct demonstration of TARGETS if necessary.

(2) Operate TARGETS during preliminary and subsequent procedure design activities.

2. Adaptation of TARGETS.

This item describes the activities required to prepare TARGETS for the site-specific procedure design. The TARGETS operator shall acquire and install the following data elements into TARGETS.

a. Navigation Data.

Provided by the National Flight Data Center (NFDC) on CD-ROM.

b. Video Maps.

Digital maps provided in digital DAT format by the National Aeronautical Charting Office (NACO).

c. Automated Radar Terminal Systems (ARTS)/Standard Terminal Automation Replacement System (STARS) Data.

ATC facility management provides ARTS/STARS data. This data is used in TARGETS to confirm existing traffic flows. This data may also be used in the construction of scenarios for controller familiarization and evaluation. Sufficient track data should be installed to adequately characterize the traffic flows for the particular airport/runway configuration of interest.

d. Aircraft Performance Data.

TARGETS is preconfigured with a set of "generic" aircraft performance that is used for the flyability evaluations. In addition, specific aircraft performance data can be entered in TARGETS.

3. Reserve Waypoint Names.

This item describes the steps necessary to reserve waypoint names and to reduce the possibility of duplicated name assignments.

a. ATC Facility Management.

(1) Coordinate with the appropriate air route traffic control center (ARTCC) to reserve a block of waypoint names for the project.

(2) Verify with the NFDC that the names have not already been used.

b. TARGETS Operator.

Enter waypoint names into TARGETS.

c. Lead Operator.

Verify with charting and navigation database supplier(s) that the names have not already been used.

4. Design of Procedure.

The item provides guidance for designing the procedure. However, it is imperative that procedure designers consult the most current edition of the appropriate references before and during the design process.

a. ATC Facility Management.

(1) Design considerations.

(a) Follow the design guidance listed in the following applicable FAA orders: Order 8260.44, Civil Utilization of RNAV Departure Procedures; Order 8260.46, Departure Procedure Program; and/or Order 7110.9, Standard Terminal Arrival, when defining the procedure. Additional guidance can be obtained from the regional project facilitator or the Regional Airspace Procedures Team (RAPT).

(b) Assign procedure and waypoint names in accordance with the naming conventions outlined in the applicable FAA order.

(c) The procedure must pass a TARGETS flyability evaluation and comply with minimum segment length requirements. If unable to comply, coordination with the FPO is necessary.

(2) Air traffic considerations.

(a) Ensure all waypoints that are located near airspace boundaries are positioned to comply with required separation standards. Waypoints located less than 40 miles from the radar antenna must be at least 3.5 nautical miles (NM) from the boundary and greater than 40 miles from the antenna must be at least 4.5 NMs.

(b) Consider possible traffic conflicts; e.g., piggybacks, letters of agreement [LOA] routings, other airport flows, etc.

(c) For departures, where required, ensure an interim altitude is given for each runway/transition in the chart narrative; e.g., MAINTAIN 3,000 feet; expect filed altitude 10 minutes after departure.

(d) For procedures designed to overlay historical tracks/patterns, check against the plotted ARTS/STARS data to verify that the procedure's lateral track complies with current traffic flows.

(e) Controller simulations using the TARGETS simulation function may be used to identify potential traffic conflicts or design issues. See item 5, Simulator Evaluations.

(f) Consider lost communication procedures and phraseology necessary for the procedure.

(g) Solicit feedback from facility controllers on the procedure's design and potential operational impacts.

b. FPO. Verify Airport Magnetic Variation Being Used for Project.

c. TARGETS Operator.

(1) Prior to submitting the documentation to the FPO, apply ATC facility selected names to all waypoints associated with the procedure.

(2) Ensure that the TARGETS has the correct magnetic variation for the airport.

(3) Build proposed RNAV procedure in TARGETS and perform flyability evaluation(s).

(4) Create and distribute the TARGETS RNAV distribution package to the project facilitator for subsequent distribution to the remainder of the working group.

d. Lead Operator.

(1) Obtain input on procedure design and navigation coding from a charting and database supplier.

(2) Advise the principal operating inspector (POI) of the procedure design.

(3) Identify and address flight deck human factors (HF) issues. Consider the impact of lateral navigation (LNAV) and vertical navigation (VNAV) procedure components on a variety of aircraft configurations.

(4) For DPs, coordinate with local air traffic management to identify and create runway position updating quick align (QA) waypoints. Coordinate QA waypoint information with the regional 520s/530s. Advise charting and database supplier for updates.

5. Simulator Evaluations.

This item provides guidance for simulator evaluations. The purpose of aircraft simulator evaluations is to identify and resolve navigation database, FAA leg type, autoflight capabilities, and HFs issues. The purpose of ATC facility simulation is to identify and resolve communication or operational impacts. Simulator evaluations are not required, but are strongly recommended. They may occur anytime and should be repeated as necessary.

a. All Participants.

Identify any special test conditions based on the procedures design or prevailing operating conditions that the lead operator should simulate; e.g., if the first leg of the procedure is a heading leg, the working group may want to simulate crosswind conditions during takeoff.

b. Lead Operator.

(1) Obtain a database with coded procedure.

(2) Evaluate the procedure in the simulator. Alert the working group if it is necessary to evaluate the procedure in a simulator type not available to the lead operator.

(3) Complete the output requirements for aircraft simulations, Form-5, RNAV Flight Simulator Worksheet, and distribute the results to the working group.

(4) Report flyability or operational issues to the working group.

Note–
Coordinate simulator evaluation with the Policy and Standards Branch, AVN-230.

c. ATC Facility Management.

(1) Evaluate the procedure using TARGETS and/or the Enhanced Target Generator (ETG) as required.

(2) Report any operational issues to the team for review.

6. Working Group Review of Procedure.

This item is intended to allow the entire RNAV Implementation Working Group an opportunity to review the procedure design from the TARGETS distribution package prior to completing and submitting the procedure documentation to the FPO.

a. All Participants.

(1) Review the procedure to ensure it meets the mission statement developed during the kickoff meeting.

(2) Ensure that the procedure passes a TARGETS flyability evaluation and complies with minimum segment length requirements. If unable to comply, redesign the procedure or discuss waiver options with the FPO.

b. ATC Facility Management.

(1) Review airspace issues, waypoint placement in relationship to airspace boundaries, crossing restrictions, traffic conflicts, and LOA routings.

(2) Review the RNAV procedure for automation impacts (see item 9, Automation).

c. Lead Operator.

(1) Review navigation system, database, or operational issues.

(2) Ensure any issues identified during simulator evaluations have been addressed (see item 5).

d. FPO/All Weather Operations (AWO).

(1) Perform an initial Terminal Instrument Procedure (TERPS) and flyability assessment. If the procedure does not comply with TERPS criteria or the flyability assessment, the following actions need to occur as appropriate:

(a) Advise the working group of the failure.

(b) In coordination with the working group, revise the procedure.

(c) Consider making the procedure a "special" and/or apply for waivers to the criteria with equivalent levels of safety defined.

(d) Coordinate with the Flight Standards Service (AFS) regarding changes to design criteria.

(2) Ensure that latitude/longitude values generated by TARGETS are identical to the Aviation System Standards (AVN) AirNav database values. If database differences are discovered, coordinate with AVN for final determination. Advise the TARGETS operator of the correct coordinates to use.

Note–
The possibility exists that the AirNav database may reflect different coordinates than the NFDC database because of recent changes or revisions.

(3) Provide written/verbal authorization to the working group to continue with procedure development.

e. TARGETS Operator.

(1) Update the procedure design to incorporate feedback from the working group review.

(2) After modifications are complete, distribute the TARGETS RNAV distribution package to the project facilitator.

f. ATC Facility Management/Regional 520s/530s.

Determine the extent of the environmental reviews required (reference Order 1050.1D, Policies and Procedures for Considering Environmental Impacts).

7. Process of Decision.

This item is a key decision point. The working group must reach consensus concerning whether to conduct flight trials or to proceed directly to public charting.

a. All Participants.

(1) Determine the need to conduct flight trials (specials). Consider route complexity; e.g., overlay versus nonoverlay, route compliance with applicable FAA orders, ATC facility, and lead operator comfort level.

(2) For flight trials:

(a) Create procedure documents associated with a "special" as directed by the FPO.

(b) Follow guidance for preparing and conducting lead operator flight trials provided in item 16, Lead Operator Flight Trials.

b. Direct to Public. Close item 16.

8. Procedure Documentation.

This step provides guidance for completion and submission of the required documentation to be submitted to the FPO for review and processing. Procedure documentation must be submitted to the FPO in accordance with the Operational Evolution Plan (OEP) RNAV prioritization list to allow processing to be completed prior to the publication date.

a. ATC Facility Management.

(1) Confirm the waypoint names listed in the TARGETS distribution package are the same as the waypoints selected by ATC facility management.

(2) Confirm the name of the procedure is in accordance with the applicable FAA order.

(3) Upon completion of guideline item 6, Working Group Review of Procedure, use the current TARGETS distribution package to complete and submit appropriate documentation, in accordance with applicable FAA orders, to the regional Air Traffic Division (ATD).

Note 1–
For a Standard Terminal Arrival (STAR), complete the forms, worksheets, sectional charts, and TARGETS distribution package as directed in FAAO 7100.9

Note 2–
For a DP, complete the worksheets and TARGETS distribution package as directed in FAAO 8260.46.

b. Regional ATD.

(1) Review procedure documentation and submit to the FPO.

(2) If the documentation requires any modification, coordinate with the working group prior to making changes.

(3) After completing procedure documentation review, forward to the FPO for further processing.

c. FPO/AWO.

(1) Review the procedure documentation.

(2) If the documentation requires any modification, coordinate with the working group prior to making changes.

(3) For procedures intended for use by /E, /F, and/or /R, regardless of Required Navigation Performance (RNP) accuracy, conduct a distance measuring equipment (DME)/DME assessment.

(4) After completing procedure documentation review, forward to the National Flight Procedures Office (NFPO) for further processing.

9. Automation.

This item provides guidance on automation activities that should be completed prior to procedure implementation.

a. ATC Facility Management.

(1) Ensure coordination occurs between all effected facilities, including first and second tier facilities. Determine each participating facility's specific automation requirements. Reach consensus among the facilities as to how the procedure will be coded in the Host Computer System (HCS). HCS coding options include:

(a) For departures: preferred departure routes (PDR), preferred departure and arrival routes (PDAR) or standard instrument departure (SID) route records.

(b) For arrivals: preferred arrival routes (PAR) or STAR route records.

(2) Ensure that data tags and scratch pad requirements have been identified and addressed. Close coordination between adjoining facilities is required to ensure the fix-pair information agrees at all facilities.

(3) Review interfacility/intrafacility handoff procedures for possible modifications to HCS or ARTS/STARS.

(4) Evaluate the impact of the new procedure on ARTCC HCS and flight plan filing systems. Ensure that any identified issues have been resolved.

b. Lead Operator.

Identify necessary updates to the flight planning system database. If an update is required, identify the format requirements.

Note-
Automation update cycles may have a significant impact on the flight trial and public charting implementation timelines.

10. Environmental Review.

ATC Facility Management/Regional 520s/530s.

Complete required environmental reviews.

Note-
An environmental review must be completed for all proposed procedures. For those reviews that confirm the proposed change overlays existing flight paths,no further environmental review is required. However, the appropriate documentation should be prepared and included in the official file.

11. Advise Industry of Project Development.

a. Regional 520s/530s.

(1) Advise industry groups (Air Transport Association, Regional Airlines Association, National Business Aircraft Association, etc.) of new procedure development and forward TARGETS distribution package.

(2) Inform industry of any newly created runway position updating points (QA waypoints). See Form-6, Industry Notification.

b. Lead Operator.

Brief development status, issues, and lessons learned at Air Transport Association RNAV task force meetings.

12. AVN Flight Check.

This item provides guidance to ensure the AVN flight check is satisfactorily completed and the working group reviews the results.

a. AVN.

(1) After the NFPO has completed a TERPS evaluation and quality control review complete a flight check.

(2) Distribute any flight crew feedback on the procedure to the working group.

b. NFPO.

Upon completion of a satisfactory flight check, complete the appropriate forms. Forward documentation of flight inspection and original forms to the NFDC for further processing and a copy to the regional ATD. SID forms will be processed and sent directly to the NFDC for publication.

c. ATC Facility Management.

(1) Capture flight check ARTS/STARS track for review in TARGETS.

(2) Document controller feedback.

d. All Participants.

(1) Upon completion of the flight check, review the recorded flight check tracks in TARGETS.

(2) Review the flight check crew and controller feedback.

13. Video Maps.

This item provides guidance to ATC facility management to ensure that video maps have been updated to accommodate the new procedure.

a. Determine if video map updates are required. Be sure to consider all associated facilities.

b. If video maps require updating, submit change requests to NACO at least 30 days prior to either procedure implementation or flight trials. This allows sufficient time for procurement and installation.

Note–
Overlay procedures that follow established traffic flows may not require this item.

14. Training and Notifications.

This item provides guidance for notifying and training pilots, dispatchers, and controllers.

a. ATC Facility Management.

(1) Provide notice to controllers as required by the collective bargaining agreement between the National Air Traffic Controller's Association (NATCA) and FAA.

(2) Conduct impact and implementation (I&I) with NATCA in accordance with Article 7 of the collective bargaining agreement between NATCA and the FAA. Ensure training and I&I will be completed prior to the start of the flight trials or procedure implementation.

(3) Use TARGETS or ETG for controller familiarization with the new procedure.

(4) Controller training material should include, but not be limited to the following:

a. Automated Terminal Information System (ATIS) verbiage, phraseology, and procedural changes necessary for the new procedure.

b. Lead Operator.

(1) Prepare and distribute pilot/dispatcher training aids and materials.

(2) Distribute internal notification as required.

(3) Additional guidance material should be provided for aircraft operating without VNAV capabilities on procedures with assigned altitudes.

15. Process Verification.

This item ensures all action items are completed prior to implementing the new procedure.

a. ATC Facility Management.

(1) For overlay procedures check final procedure design against plotted ARTS/STARS to verify the procedure matches the current flows.

(2) Confirm I&I with NATCA is completed and controller concerns/issues have been resolved.

(3) Confirm automation and handoff issues have been resolved (predeparture clearance [PDC], handoff, strip handling, etc.).

(4) Confirm video map updates have been installed.

(5) Coordinate with the David J. Hurley Air Traffic Control System Command Center (ATCSCC) and consider the need for a National Airspace System (NAS) bulletin and/or updates to the National Route Program. This coordination is critical for "special" procedures.

b. Regional 520s.

Ensure all environmental requirements have been met and the appropriate environmental documentation is part of the official file.

c. FPO/AWO.

(1) Confirm all required forms have been completed and submitted.

(2) Confirm AVN flight check has been completed.

d. Lead Operator.

(1) Ensure all company issues; e.g., POI, Ops Spec, flight planning system, navigation database, training, etc., are resolved.

(2) If QA waypoints are required, ensure they are available in the database prior to procedure implementation.

16. Lead Operator Flight Trials.

This item provides guidance for preparing and conducting lead operator flight trials. The purpose of the flight trials is to evaluate the procedure design and provide an opportunity for a large sample of controllers and pilots to become familiar with the RNAV procedure. Lead operator flight trials are revenue flights, in which aircraft are assigned the procedure prior to public implementation. Flight trials will be conducted as FAA "specials" only after having met all safety requirements, AVN flight check, and receiving AFS/POI approvals as required.

a. All Participants.

(1) Establish flight trial dates. When establishing the start date, consideration must be given to pilot, dispatcher and controller training requirements, charting and database cycles (add seven day buffer for distribution), flight planning systems impacts, etc.

(2) The flight trials should be scheduled over an established period of time; e.g., 60, 90, 120 days.

(3) Based on the results of the flight trials, make decisions regarding the procedure design and/or implementation date. Consult item 18, Post Procedure Implementation Analysis.

(4) Confirm item 15, Process Verification, has been completed prior to start of flight trials.

(5) Conduct analysis per item 18.

Note–
If all parties agree, the lead operator may continue to use the "special" procedure while the public charting process is completed.

b. Lead Operator.

(1) Develop a tailored chart and navigation database for use during the flight trials. (Provide working group with copies of chart).

(2) Receive POI approval prior to the start of flight trials.

(3) Develop pilot questionnaires for distribution during the flight trials.

(4) Ensure flight planning system updates have been completed and dispatchers are prepared prior to the start date.

c. ATC Facilities.

(1) Training and notification must be completed 30 days prior to the beginning of flight trials.

(2) Collect ARTS/STARS data from these flights, and using TARGETS, compare to the procedure.

17. Publish Procedure for Public Use.

a. AVN/ATD.

Complete final procedure documentation and forward to NACO for publication.

b. All Participants.

Confirm that navigation database coding of the procedure matches the charted depiction and/or intent of the procedure. The working group should contact a charting provider and the National Imagery and Mapping Agency (NIMA) to ensure that database coding meets operational needs prior to publication.

18. Post Procedure Implementation Analysis.

This item provides guidance for the working group to collect and analyze data from the new procedure.

a. ATC Facility Management.

(1) Establish a system for documenting and reporting instances when procedure irregularities occur. Include the following:

(2) Aircraft identification (ID), date, time, and person reporting.

(3) A brief description of where the aircraft deviated from the published flight path.

(4) If possible, archive the voice tapes and ARTS/STARS tracks for future evaluation.

(5) Collect and evaluate controller feedback.

(6) Assess controller workload.

(7) Identify operational issues and advise the working group of required changes to the procedure

b. All Participants.

(1) Review and analyze data collected by the ATC facility.

(2) If necessary, follow guidance in applicable FAA orders to modify the procedure.

c. Lead Operator.

(1) Collect and evaluate pilot feedback (interview pilots as needed).

(2) Assess pilot workload.

(3) Identify operational issues and advise the working group of required changes to the procedure.

Table 1. RNAV Implemenation Working Group

The following is a list of participants that must be represented on the RNAV Implementation Working Group and some of their associated responsibilities.

1. Project Facilitator.

a. Designated by regional ATD, following RAPT procedure prioritization process.

b. Focal point for coordinating working group activities.

c. Lead telcon discussions, update project schedule, and maintain all project documentation.

d. Assign and track open/completed issues and tasks using the implementation guidelines.

e. Ensure working group consensus on open items in the guidelines prior to closure. Provide updates to the working group on procedure status as needed.

f. Provide assistance to air traffic management in the completion and submission of required worksheets/forms.

2. TARGETS Operator.

a. Acquire and install video maps, ARTS/STARS data, and NFDC navigation data.

b. Maintain the most recent version of TARGETS with an updated NFDC database.

c. Maintain the procedure design in a TARGETS file. Each update to the file should be saved with a unique, easy to understand name that indicates chronological order of the project design; e.g., CLT_NALEY_9-20-02. Save and maintain all files.

d. Perform flyability evaluations and create simulations as needed.

3. Regional FPO/AWO.

a. Provide input on route design and review procedure design for compliance with criteria.

b. If, due to local air traffic or environmental reasons, the route cannot be designed to conform to current criteria, request assistance from AVN/AFS concerning additional route design options, or begin waiver process if necessary.

c. Ensure waypoint latitude/longitude positions are correct.

d. Provide an initial route design authorization to the working group.

e. Review and forward procedure documentation to the NFPO.

4. Regional 520s/530s.

a. Provide support and resources required for procedure development.

b. Appoint a project facilitator for working group.

c. Provide a telcon bridge for working group telcons.

d. Assign an environmental specialist to review the proposed route for environmental impact, provide guidance on completion of required paperwork and forms (environmental checklist, etc.) for submission of the route, and participate as part of the working group

e. Provide coordination regarding all regional activities and assist with FPO/AWO coordination.

f. Brief the RAPT, flight teams, headquarters, etc, as required or requested.

5. AVN/AFS.

a. Support regional FPO/AWO personnel as requested.

b. The FPO/AWO may request guidance if a procedure does not meet criteria. If due to local air traffic or environmental reasons the route cannot be designed to conform to current criteria, provide guidance on waiver options and assist in completion

6. Lead Operator.

a. Provide feedback on procedure design, route flyability, and potential navigation database design requirements. The lead operator's expertise with navigation systems is critical for successful procedure design.

b. If the lead operator has the capability, be prepared to conduct simulation and/or flight trials of the procedure's flyability. This may require obtaining an updated navigation database and tailored chart.

c. When simulator testing is accomplished, record performance data utilizing Form 5, RNAV Flight Simulator Worksheet.

d. When necessary, provide procedure data to other operators for testing in additional aircraft types.

e. If the lead operator is an air carrier, coordinate with the FAA POI.

7. ATC Facility Management/NATCA.

a. Provide the working group with information regarding traffic flows and operational considerations; e.g., existing routes, minimum instrument flight rules (IFR) altitudes, facility/sector lateral and vertical airspace boundaries, and airspeed restrictions.

b. Provide data depicting current or anticipated flight operations in order to define flight path/altitudes, profiles/speeds, arrival departure separation procedures, terminal/en route information exchange, and timing of control actions.

c. Ensure that all ATC concerns are addressed regarding procedure design, implementation timetable, and communication requirements.

d. Complete and submit required procedure documentation.

e. If required, update video maps at least 30 days prior to the start of the flight trials or public charting.

f. Complete all controller notifications and training prior to start of the flight trials or public charting.

8. ARTCC Management/NATCA.

a. Provide the proponent and participating facility with information regarding traffic flows and operational considerations.

b. Review handoff procedures, crossing restrictions, airspace boundary issues, waypoint placement in relationship to airspace boundaries, crossing restrictions, traffic conflicts, and any LOA routings which may affect procedure design or implementation.

c. Provide names for waypoints created for the procedure.

d. Coordinate automation updates for the filing of STARs and DPs as required.

e. Ensure that all known controller concerns regarding design, implementation timetable, and working procedures are resolved.

9. Airport Authority.

a. Provide input on procedure design and impacts to airport.

b. Assist in reviewing impacts to noise sensitive areas surrounding the airport.

c. Provide information concerning planned airport construction that may impact procedure implementation.

Note–
Any other parties determined to have a potential interest in the procedure may be included in the working group; e.g., user groups,FMS manufacturers, charting and database suppliers, etc.

Table 2. Acronyms, Terms, and Definitions

Acronym	Definition
AFS	Flight Standards Service
ALT	Airspace Liaison Team
ARTCC	Air Route Traffic Control Center
ARTS	Automated Radar Terminal Systems
ATA	Air Traffic Airspace Management
ATC	Air Traffic Control
ATCSCC	Air Traffic Control System Command Center
ATCT	Airport Traffic Control Tower
ATD	Air Traffic Division
ATIS	Automated Terminal Information System
AVN	Aviation System Standards
AWO	All Weather Operations (associated with AFS)
DME	Distance Measuring Equipment
DP	Departure Procedure
ETG	Enhanced Target Generator
FAA	Federal Aviation Administration
FMS	Flight Management System
FPO	Flight Procedures Office
GPS	Global Positioning System
HCS	Host Computer System
HF	Human Factor
I&I	Impact and Implementation
ID	Identification
IFR	Instrument Flight Rules
IRU	Inertial Reference Unit
LNAV	Lateral Navigation
LOA	Letter of Agreement
NACO	National Aeronautical Charting Office
NAS	National Airspace System
NATCA	National Air Traffic Controller's Association
NAVAID	Navigational Aid
NFDC	National Flight Data Center
NFPO	National Flight Procedures Office
NIMA	National Imagery and Mapping Agency
OEP	Operational Evolution Plan
Ops Specs	Operations Specifications
PAR	Preferred Arrival Route
PDAR	Preferred Departure and Arrival Route
PDC	Predeparture Clearance
PDR	Preferred Departure Route
POI	Principal Operating Inspector
QA	Quick Align
RAPT	Regional Airspace Procedures Team

REGIONAL 520/530	FAA Regional Office – Airspace Plans and Procedure
RNAV	Area Navigation
RNP	Required Navigation Performance
SID	Standard Instrument Departure
STAR	Standard Terminal Arrival
STARS	Standard Terminal Automation Replacement System
TARGETS	Terminal Area Route Generation, Evaluation, and Traffic Simulation Tool
TERPS	Terminal Instrument Procedures
TRACON	Terminal Radar Approach Control
VNAV	Vertical Navigation
VORTAC	Collocated VOR and TACAN

Term	Definition
FAA Leg Type	The defined standard for aeronautical navigation databases that translates text and route information into computer readable code.
Fix	A generic term used to define a predetermined geographical position used for route definition. A fix may be a ground-based Navigational Aid (NAVAID), a waypoint, or defined by reference to one or more radio NAVAIDs.
Fly-By Waypoint	A fly-by waypoint requires the use of turn anticipation to avoid overshoot of the next flight segment.
Fly-Over Waypoint	A fly-over waypoint precludes any turn until the waypoint is over flown and may be followed by an intercept maneuver of the next flight segment.
Guidelines	Guidelines for Implementing Terminal RNAV Procedures.
Lead Operator	An operator that has agreed to serve as the focal point for the development of DP/STARs at a specific airport.
Ops Specs	Airline's FAA approved Ops Specs governs the type of operations the airline is approved for and how the airline will comply with the FAA regulations.
STAR	Standard Terminal Arrival - A preplanned IFR ATC arrival procedure published for pilot use in graphic and/or textual form. STARs provide transition from the en route structure to the terminal area.
STAR Transition	A published segment used to connect one or more en route airways/jet routes to the basic STAR.
Telcon Bridge	A conference call that has a number of phone lines available. Participants of the call must dial a designated phone number. In the RNAV process the appropriate region office will create the telcon bridge when requested to do so by the RNAV Implementation Working Group.
Waypoint	A predetermined geographical position that is defined in terms of latitude/longitude coordinates.

Form-1 Project Summary

Project Name:		**Proposed Publication Date:**	
Procedure Proponent(s):			
Airports Served:			
Type:	**Arrival:** ☐	**Departure:** ☐	**Other:** ☐
Runway(s):			
Transition(s):			
Mission Statement:			

Telcon Phone Number:		**Access Code:**	
Telcon Schedule:			

Waypoint Names							
Name	Used	Name	Used	Name	Used	Name	Used
	☐		☐		☐		☐
	☐		☐		☐		☐
	☐		☐		☐		☐
	☐		☐		☐		☐
	☐		☐		☐		☐
	☐		☐		☐		☐
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Form-2 Guideline Item Index

Item #	Item Name	Start Date	Close Date	Status
	Kickoff Meeting			
	Adapt TARGETS			
	Reserve Waypoint Names			
	Design the Procedure			
	Simulator Evaluation			
	Working Group Review of Procedure			
	Process Decision			
	Procedure Documentation			
	Automation			
	Environmental Review			
	Advise Industry of Project Development			
	AVN Flight Check			
	Video Maps			
	Training and Notification			
	Process Verification			
	Lead Operator Flight Trials			
	Publish Procedure for Public Use			
	Post Procedure Implementation Analysis			

Form-3 Project Action Items

Action Item	Assigned To	Assign Date	Closed Date	Notes

Form-4 Working Group Contact List

Name	Organization	Phone Number	E-Mail

Form-5 RNAV Flight Simulator Worksheet

(1) Operator Name:			See attachment for completion instructions.
(2) Procedure Name:		(3) Date:	
(4) Type (e.g., CARJ/F):		(5) LNAV/VNAV Engage Point:	
(6) FMS/GPS Manufacturer:		(7) FMS/GPS Software Version:	

(8) Initial Wind Setup:

10 KTS or Maximum allowable tailwind on surface increasing to 30 KTS at 1,000 feet, then increase by 10 KTS every 2,000 feet until reaching 80 KTS.

Task	Run 1	Run 2	Run 3	Run 4	Run 5
(9) Runway and En Route Transition Flown:					
(10) Max allowable Takeoff Weight of Aircraft:					
(11) Takeoff Thrust used:					
(12) Max Surface Tailwind (SID only):					
(13) Temperature (ISA):					
(14) Type of Guidance:					
(15) Navigation Source:					
(16) Other:					

(17) Remarks:			
(18) Completed By:		(19) Phone Number:	

(20) Attach a print out of the FAA leg-type coding and a copy of the lateral and vertical track from the procedure flown.

Form-5 RNAV Flight Simulator Worksheet (Continued)

(2) Procedure Name:		Run #:		**Complete for Each Run**
(21) Waypoint Name:	(22) Altitude:	(23) Airspeed/Groundspeed:	(24) Turn Anticipation Distance:	(25) Wind:

Instructions for Completing RNAV Flight Simulator Worksheet:

1) Enter the operator name.
2) Enter the RNAV procedure name (e.g., PAIGW RNAV five departure).
3) Enter the date simulations were accomplished.
4) Enter the aircraft type and equipment suffix (e.g., CARJ/F).
5) For standard instrument departures (SID), enter the point at which LNAV/VNAV is engaged (as specified in operator operations manual).
6) Enter the FMS or GPS stand-alone manufacturer's name (e.g., Honeywell, Smiths, etc.).
7) Enter the FMS or GPS stand-alone software version.
8) Use an in-flight tailwind of 30 KTS at 1,000 feet and increase by 10 KTS every 2,000 feet until reaching 80-KT tailwind (record wind used in block 25). (Additionally, for SIDs use crosswind bearing opposite of first turn).
9) Enter the runway and en route transition flown.
10) Enter the takeoff weight – fly procedures at maximum allowable takeoff weight.
11) Enter the takeoff thrust used – list either reduced or maximum takeoff setting used (max allowable per conditions).
12) Enter the surface tailwind – initiate takeoff with 10-KT tailwind component.
13) Enter the ISA temperature – fly the procedure at average max summer temperature for the airport and use indicated climb gradients.
14) Enter the type of flight guidance used. The preferred flight guidance is the autopilot. List other if used (e.g., flight director or CDI).
15) Enter the navigation sensor referenced while flying the procedure (e.g., GPS, IRU/DME/DME, DME/DME).
16) Enter any working group specified conditions (e.g., crosswind component).
17) Enter any remarks about the procedure design or flyability.
18) Enter the name of person completing the form.
19) Enter an appropriate contact phone number of the person completing form.
20) Attach a print out of the leg-type coding and lateral / vertical track for each run flown.
21) Enter the name of waypoint passed by the aircraft (complete sheet for each run completed).
22) Enter the aircraft altitude passing the waypoint listed in box 21.
23) Enter the aircraft air/ground speed passing the waypoint listed in box 21.
24) Enter the aircraft turn anticipation distance passing the waypoint listed in box 21.
25) Enter the wind direction and velocity passing the waypoint listed in box 21.

*U.S. Government Printing Office: 2004—302-334/80128

Form-6 Industry Notification

Airport:	Procedure Type:		
	STAR ☐	SID ☐	Other ☐
Procedure Name:	**Expected Publication Date:**		
Procedure Description/Comments:			
Quick Align Waypoint Data: (list name, latitude/longitude)			
Distribution List:			
AOPA ☐ ATA ☐ NBAA ☐ RAA ☐ Other ☐ _____			
Note: Attach TARGETS distribution package with this notification.			