

# **ARINC 424 NDB**

**Draft 1 of Supplement 23  
Proposal**

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## **RF.TF CONCURRENT OPERATIONS**

**V 3.1**

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<b>SUMMARY</b>
<p>This paper proposes a change to ARINC 424 to allow use of TF leg-based overlays of RF legs to code a curved path in a single procedure.</p> <p>The paper also corrects and makes consistent the notes section for table 5.9.</p>

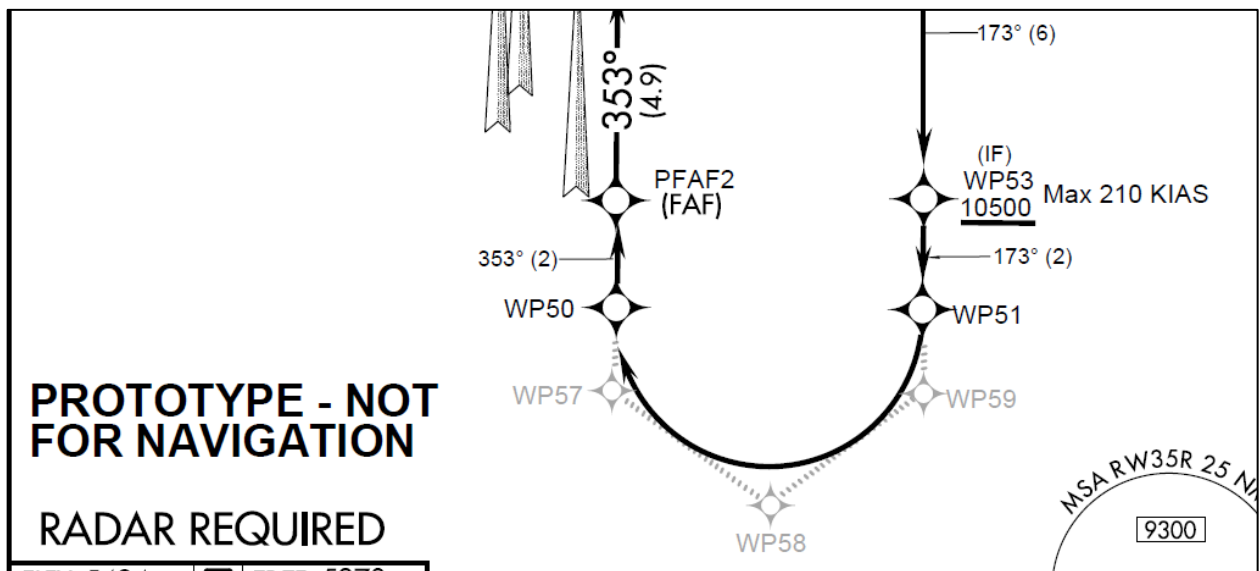
## 1.0 INTRODUCTION/ BACK GROUND

The following proposal follows the discussion paper originally presented to the ARINC 424 WG in Phoenix in January 2018.

As a recap to that discussion, there is activity within the FAA's Performance Based Operations Aviation Rulemaking Committee (PARC), to demonstrate the methods that would enable operators to implement and fly curved paths using either an RF leg **OR** TF leg implementation of the same IAP.

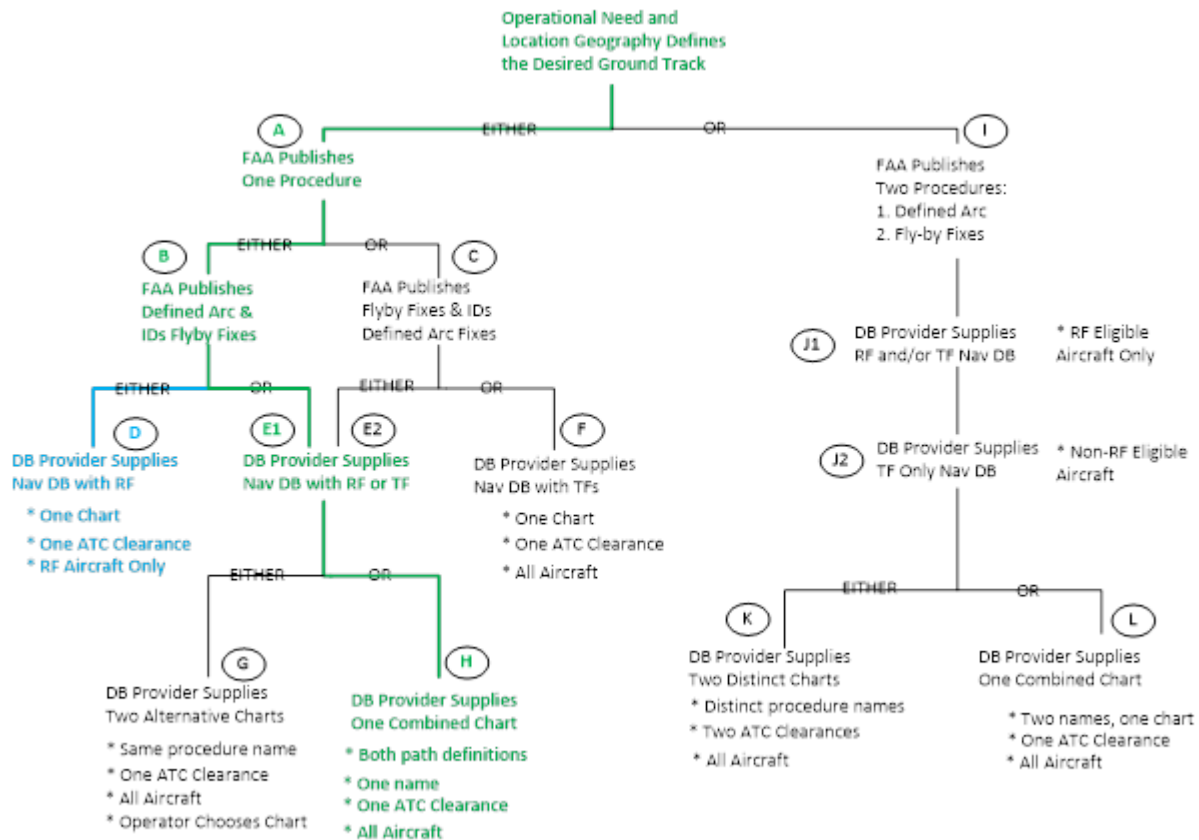
By providing such an option, the FAA would enable more aircraft (including those not certified to fly RF) to fly the procedures/transitions transparently to air traffic. Essentially the method is to allow either implementation of a single procedure name and chart, so that ATC only clears for the approach without needing to know which implementation is being flown.

The following is one of the FAA charting options which helps to illustrate the concept. This example shows the curved path (RF, start at WP51, end at WP50) and the flyby (TF) waypoints (WP59, 58 & 57) on the same chart. There are other charting options, but this exemplifies the method



The FAA would like to increase the utilization of FAA procedures that contain RF legs by allowing the alternative coding with flyby fixes where the ground tracks can be made to nearly match.

The Navigation WG identified all possible options, then recommended the options path highlighted in Green.



This paper also corrects and makes consistent the notes section for table 5.9 initiated by an errata report from Pavel Tsukanov of Avia Briefing, LLC.

## 2.0 DISCUSSION

During the January 2019 kick-off of the PARC RF.TF concurrent ops Action Team meeting in Atlanta, GA, OEMS and Jeppesen met to discuss the various options to enhance future ARINC versions to provide RF and TF implementations in the same procedure according to path A-B-E1-H above. That group considered the pros and cons of those multiple options.

After consultation with the ARINC 424 NDB Working Group, the consensus is to code approach transitions with RF legs and TF overlays as two separate transitions in the ARINC 424 database, one RF version and one TF version. An additional approach transition Route Type of “Y” will be used to distinguish the TF-based transition from the RF transition containing RF legs.

This will allow the FMS to display the appropriate transition for the aircraft capabilities based on the Route Type, and will allow air traffic controllers always to clear for R28R regardless of FMS capability.

**3.0 Changes as depicted (Track Changes is Helpful)**

**Table 5-8 – Airport Approach (PF) and Heliport Approach (HF) Records**

Approach Route Type Description	Route Type Field Content
Approach Transition	A
Localizer/Backcourse Approach	B
VORDME Approach	D
Flight Management System (FMS) Approach	F
Instrument Guidance System (IGS) Approach	G
Area Navigation (RNAV) Approach with Required Navigation Performance (RNP) Approach (Note 1)	H
Instrument Landing System (ILS) Approach	I
GNSS Landing System (GLS) Approach	J
Localizer Only (LOC) Approach	L
Microwave Landing System (MLS) Approach	M
Non-Directional Beacon (NDB) Approach	N
Global Positioning System (GPS) Approach	P
Non-Directional Beacon + DME (NDB+DME) Approach	Q
Area Navigation (RNAV) Approach (Note 1)	R
VOR Approach using VORDME/VORTAC	S
TACAN Approach	T
Simplified Directional Facility (SDF) Approach	U
VOR Approach	V
Localizer Directional Aid (LDA) Approach	X
Approach Transition with TF-based Construction of RF Turns (Note 2)	Y
Missed Approach	Z

The listing above for Approach Route Type is alphabetical and does not represent any kind of priority.

Note 1: Route Type R indicates a procedure titled RNAV, e.g., RNAV (GPS) or RNAV (RNP). Route Type H indicates a procedure titled RNP.

**COMMENTARY:**

The Route Types H and R are coded to differentiate between the approach procedure titles published in state source. The words in brackets will not be considered for the coding of the Route Type. While according to the PBN manual there is no RNAV approach specification, many approaches are still published using an RNAV title. Additionally, there are still non PBN RNAV approaches published, e.g., VOR/DME RNAV.

The following old titles will be coded with a Route Type R:  
 RNAV (GPS) RWY 09  
 RNAV (GNSS) RWY 09  
 RNAV (RNP) RWY 09

The following new titles will be coded with Route Type H:  
 RNP RWY 09  
 RNP RWY 09 (AR)

The following new titles will be coded with Route Type R:

RNAV RWY 09

RNAV RWY 09 (AR)

Note 2: Route Type Y is only used to identify transitions with the same path as an Approach Transition with RF legs, but with TF legs used to reconstruct the RF leg paths. These Route Type Y transitions must have the same transition identifier as the corresponding transition with RF legs. The transition with the RF legs will be coded with a Route Type of A.

**Table 5-9 – Airport Approach (PF) and Heliport (HF) Records**

Qualifier Description	Qualifier 1 Field Content (Note 1)	Qualifier 2 Field Content Note 1	Qualifier 3 Field Content (Note1)
RNAV 1 PBN Nav Spec			X (Note 8)
RNP 1 PBN Nav Spec			E (Note 8)
RNP APCH PBN Nav Spec			H (Note 8)
RNP 0.3 PBN Nav Spec			G (Note 8)
A-RNP (Advance RNP) PBN Nav Spec			A (Note 8)
RNP AR PBN Nav Spec			F (Note 8)
RNAV Visual Procedure			B (Note 2)
DME Required for Procedure	D (Note 5)		
GPS (GNSS) required, DME/DME to RNP xx.x not authorized	J (Note 2)		
DME Not Required for Procedure	N (Note 5)		
GNSS Required	P (Note 2)		
GPS (GNSS) or DME/DME to RNP xx.x required	R (Note 2)		
DME/DME Required for Procedure	T (Note 2)		
RNAV or RNP, Sensor Not Specified	U (Note 2)		
VOR/DME RNAV	V (Note 2)		
Procedure that Requires SBAS FAS Data Block	W (Note 4)		
Primary Missed Approach		A (Note 6)	
Secondary Missed Approach		B (Note 6)	
Engine Out Missed Approach		E (Note 6)	
Procedure with Circle-to-land Minimums		C (Note 3)	
Helicopter with Straight-in Minimums		H (Note 6, 7)	
Helicopter with Circle-to-land Minimums		I (Note 7)	
Helicopter with Helicopter Landing Minimums		L (Note 6, 9)	
Procedure with Straight-in Minimums		S	
Procedure with VMC minimums		V (Note 10)	
PinS Procedure - Proceed Visually		W (Note 11)	
PinS Procedure - Proceed VFR		X (Note 11)	

Not all Qualifiers will apply to all Route Types, see notes below. Qualifier fields may be blank where their use is not required by source documentation.

*Note 1: Qualifier 1 and 2 are carried on each sequence of every transition for Approach Procedure Coding (Approach Transition, Final Approach and Missed Approach) and will be identical for each sequence in a specific transition. Qualifier 2 will be different between Approach Transitions/Final approach coding where S, C, H, I, L, V, W, or X will be used and Missed Approaches where A, B, or E will be used (See Note 6). Qualifier 3 will be coded where applicable and will be identical for each sequence in a specific transition but may be different between transitions.*

*Note 2: Route Type R is used for all procedures titled RNAV. Route Type H is used for all types of RNP procedure coding titled RNP. The type of RNAV or RNP procedure is further defined through the content of Qualifier 1.*

- a. Conventional Area Navigation Approach Procedures using RHO-RHO or RHO-THETA equipment are coded as Route Type H or R and Qualifier 1 coded as T or V.
- b. GNSS based RNP Approach Procedures are coded as Route Type H or R with Qualifier 1 coded as J, R, P, or U as required by source publications and mapped to this table.

*Note 3: In Approach Transition and Final Approach Coding, Qualifier 2 is set to indicate the type of minimums applicable to the coding as indicated in the table. A Qualifier 2 code of S or H means the procedure has been coded as straight-in. There may also be circle-to-land minimums for the same procedure. Qualifier 2 is required for all Route Types and is independent of the content of Qualifier 1.*

*Note 4: A Qualifier 1 code of W is used to indicate that the Procedure is authorized for SBAS navigation (vertical and lateral, or lateral-only) and requires the ARINC 424 Path Point with the Final approach Segment (FAS) Data Block. No other navigation sensors are authorized for these procedures.*

*Examples:*

Note 4: An Approach Procedure is authorized for SBAS navigation only (vertical and lateral, or lateral-only) and requires the FAS Data Block. The Route Type would be coded as H or R and Qualifier 1 would be coded as W. The associated GNSS/FMS Indicator (Section 5.222) would be set to indicate that SBAS-based vertical navigation is authorized. A Path Point Record carrying the FAS Data Block would be provided for the procedure. A Procedure Data Continuation Record would be provided and would be used to define the Levels of Service authorized and the official government source documentation Names for these Services.

Note 2: An Approach Procedure is authorized for SBAS navigation (lateral and/or vertical) and for single or multiple sensors other than SBAS. The Route Type would be coded as H or R and Qualifier 1 would be coded as J, P, or R, as appropriate. The setting of the GNSS/FMS Indicator would be appropriate to the level of authorization. A Path Point Record would or would not be provided, according to government source publications. A Procedure Data Continuation Record would be provided and would be used to define the Levels of Services authorized for SBAS and the official government source documentation Names for these Services.

Note 2: An Approach Procedure is authorized for a single or multiple sensors other than SBAS; SBAS-based vertical navigation is not authorized. The Route Type would be coded as H or R and Qualifier 1 would be coded as J, R, L, U, or P as appropriate. The setting of the GNSS/FMS Indicator would be appropriate to the level of authorization. No Path Point Record would be provided. No Procedure Data Continuation Record would be provided.

*Note 5: The Qualifier 1 codes of D and N are not used on RNAV and RNP Procedures (Route Type H and R) of any kind. Additionally, these codes are not used in conjunction with Route Types that provide a DME Option of a procedure; specifically, they are not used in conjunction with the Route Types D and Q.*

*Note 6: The Qualifier 2 codes of A, B and E can only be used in conjunction with a Route Type of Z, Missed Approach. Qualifier 2 codes of C, S, H, I, and L can be used in conjunction with any Route Type except Z.*

*Note 7: The Qualifier 2 code of H or I is only used with Airport Approach (PF) Records.*

*Note 8: The Qualifier 3 code of F indicates that the approach is an RNP AR (Authorization Required) procedure. The Qualifier 3 code of A indicates an A-RNP procedure without an AR requirement. The Qualifier 3 code of H indicates that the approach procedure is a basic RNP procedure not requiring any further capabilities. Qualifier 3 codes of E and X – representing RNP 1 and RNAV 1 respectively - may be coded on transitions for any approach route type.*

*Note 9: The Qualifier 2 code of L is used with Airport Procedure (PF) Records and Heliport Procedure (HF) Records and only for those government sources that provide Helicopter Minimums without specifying Straight-In or Circle-To-Land.*

*Note 10: The Qualifier 2 code of V is used only in conjunction with a Qualifier 3 code of B.*

*Note 11: The Qualifier 2 codes W and X are used only in conjunction with a Qualifier 1 coded as J, P, R, U, V, or W. Qualifier 2 is to be coded as H, I, or L when the procedure chart is not annotated with Proceed Visually or Proceed VFR.*

Used On: Enroute Airways, Airport and Heliport SID/STAR/Approach, Preferred Route and Company Route Records and Helicopter Operations Company Route Records.

Length: 1 character for Enroute Airways and Preferred Routes. 1 character for Airport and Heliport SID/STAR/Approach Records; however, only complete when read in conjunction with Qualifier 1, 2, and 3 of the same record, which are in a different location in the Records.

Character Type: Alpha/numeric

Approach Examples: LDC = A Localizer-based procedure, for localizer only, no glideslope, with DME required, Circle-To-Land Minimums.

LNC= A Localizer-based procedure, for localizer only, no glideslope, DME not required, Circle-To-Land Minimums



- SNS = A VOR procedure, using VORDME or VORTAC Navaid, the DME is not required for the procedure, the minimums are straight-in.
- SDC = A VOR procedure, using VORDME or VORTAC Navaid, the with a DME required note for the procedure, the minimums are Circle-To-Land
- D S = A VOR/DME procedure, using a VORDME or VORTAC Navaid, the DME is required for the procedure, the minimums are straight-in.
- VNS = A VOR procedure using VOR Navaid with only NAVAID, no DME installed, minimums are straight-in.
- VDC = A VOR procedure, using a VOR Navaid with a DME required note, the minimums are Circle-To-Land
- N S = An NDB procedure, minimums are straight-in.
- Q S = An NDB + DME procedure, the DME is required, the minimums are straight-in.
- I\_H = ILS procedure, no DME requirements, procedure is designed for Helicopter operations to a runway at an airport, records are contents in Airport Approach (PF) file section.
- I\_\_ = ILS Procedure, no DME requirements, procedure is designed for Helicopter operations to a helipad at a heliport, records are contents in Heliport Approach (HF) file section.