INTERNATIONAL CIVIL AVIATION ORGANIZATION

SEVENTH MEETING OF THE PERFORMANCE BASED NAVIGATION TASK FORCE (PBN/TF/7)

Bangkok, Thailand, 1 – 3 September 2010

Agenda Item 4: PBN Implementation Issues

FMS CODING ISSUE ENCOUNTERED DURING THE DEVELOPMENT OF RNP APCH PROCEDURES

(Presented by Japan)

SUMMARY

This WP, in response to WP12 at PBN/TF/6, intends to explain the contents of ARINC424 specification, design of existing FMS and proposes possible solutions.

1. INTRODUCTION

1.1 WP12 at PBN/TF 6 addresses the limitation in FMS onboard. Some FMS can store one RNP approach per runway in its Navigation Data. In the WP, it was stated that this issue was caused by APCH identification with more than 6 digits. However, this statement does not reflect the reality.

1.2 This WP intends to explain the contents of ARINC424 specification, design of existing FMS and proposes possible solutions.

2. DISCUSSION

2.1 According to ARIN424 Specification (Chapter 5, section 5.10, *Approach Route Identifier*), six characters are allocated to Approach Procedure Identifier ("Approach Route Identifier), where only five of them are used currently though. Any APCH ID, regardless of its length, is coded as follows:

Column 1:	Type of Approach (e.g., I = ILS, R = RNAV, etc.)
Column 2 to 3:	RWY Identification (16, 24, etc.)
Column 4:	RWY Designation ("-", L, R, C, etc.)
Column 5:	Multiple Indicator (Alphanumeric)
Column 6:	Blank

Example:	RNAV (GNSS) RWY 36 =	R36
	ILS RWY34L =	I34L
	VOR z RWY22 =	V22-Z
	LOC y RWY16R =	L16RY

(Refer to ARINC 424, section 5.10, item for "Example" for more examples, attached to this WP.)

Therefore, current ARINC424 specification can accommodate multiple approach procedures with same sensor/Navaid for one runway. This capability is not affected by the length of the procedure identification.

Note1: This issue is not specific for RNP APCH. It is a common issue for conventional approaches such as ILS and, VOR.

Note 2: SIDs/STARs ID with more than six characters can be shortened into six characters in accordance with ARINC 424 Section 7.0 "NAMING CONVENTIONS". The Naming conventions provide the algorithm to shorten the name.

2.2 The concept of "Multiple Indicator" was introduced to ARINC 424 from its version 12 in 1994. However, considerable number of FMS was designed in accordance with ARINC424 "Pre-12", and, as they cannot cater for Multiple Indicator, only ONE approach per approach type per runway can be stored in its Nav Database.

2.3 It is to be noted that the problem stated in the original WP can NOT be solved by shortening the approach ID. Current naming convention for approach procedure by PANS-OPS (with suffix z, y, x, …) is NOT the cause of this problem.

2.4 Currently, at least one Data House (Data Coder) company has their own policy to code the primary procedure (approach procedure with suffix "z") for FMS with limited capability.

2.5 Considering the current status of existing FMS, there is no direct solution for this problem. Instead, countermeasures as below can be suggested to minimize the inconvenience:

(1) RNP APCH intended for broad range of users should be named with suffix "z". Then, aircraft with older FMS can utilize this procedure.

(2) RNP AR APCH intended for new-generation aircraft should be named with suffix "y", "x", …. It is expected that such aircraft that could be certified for RNP AR APCH can accommodate "multiple indicator".

Note that the suggestion above meets the existing provision in PANS-OPS Vol. II,

[Part I, Section 4, Chapter 9, para 9.5.3.3]
As some avionics systems are capable of loading only a single approach, States should ensure that the preferred approach is identified using the z suffix.

3. ACTION BY THE MEETING

3.1 Name approach procedures in accordance with PANS-OPS Vol. II, Part I, Section 4, Chapter 9, para 9.5.3.3.

3.2 When publishing multiple RNAV-type approaches to a runway, name RNP APCH intended for broad range of users with suffix "z".

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ATTACHMENT

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5.0 NAVIGATION DATA - FIELD DEFINITIONS

D S = A VOR/DME procedure, using a VORDME or VORTAC Navaid, the DME is required for the procedure, the minimums are straight-in.

V S = A VOR procedure using VOR Navaid with only NAVAID, no DME installed, minimums are straight-in.

V C = A VOR procedure, using a VOR Navaid with no DME capability, the minimums are Circle-To-Land

N S = A NDB procedure, minimums are straight-in.

Q S = A 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.

5.8 Route Identifier (ROUTE IDENT)

Definition/Description: The "Route Identifier" field identifies a route of flight or traffic orientation, using the coding employed on aeronautical navigation charts and related publications.

Source/Content: For Enroute Airways, Route Identifier codes should be derived from official government publications. For Preferred Routes, Route Identifiers may or may not be provided in government publications. Where they are available, they will be used.

For North American Routes for North Atlantic Traffic, "Common Portion" and other similar route system, route identifier code shall be those published in government sources. For the European Traffic Orientation System or other similar route systems such as North American Routes for North Atlantic Traffic, "Non-common Portion," Preferred Routes and Preferential Routes published without official and/or flight plan identifiers, but published as between specific airports or other navigation fixes, route identifiers define the initial fix and the terminus fix idents according to the naming rules in Chapter 7. For routings which do not include a unique initial or terminus fix, rules on creating unique Route Identifiers are also contained in Chapter 7. Those rules have been developed with use of the Geographical Reference Tables (TG). Refer to Chapter 3, Section 3.2.7.2 and Chapter 4, Section 4.1.26 for more detail.

Used On: Enroute Airway, Preferred Route Records and Geographical Reference Table
Length: Enroute Airway - 5 character maximum
Preferred Route - 10 character maximum
Character Type: Alpha/numeric
Examples: Enroute Airway - V216, C1150, J380, UA16, UB414
Preferred Routes - N111B, TOS13, TOS14WK, CYYLCYYC, ARTCOLAR, KZTLKSAV, SCNDICANRY

Refer to Section 7 for specific examples and their meaning.

5.9 SID/STAR Route Identifier (SID/STAR IDENT)

Definition/Description: "The SID/STAR Route Identifier" field contains the name of the SID or STAR, using the basic indicator, validity indicator and route indicator abbreviated to six characters with the naming rules in Chapter 7 of this document.

Source/Content: SID/STAR route identifier codes should be derived from official government publications describing the terminal procedures structure.

Used On: Airport SID/STAR, Heliport SID/STAR and Flight Planning Arrival/Departure Data Records
Length: 6 characters max
Character Type: Alpha/numeric
Examples: DEPU2, SCK4, TRP7, 41M3, MONTH6

5.10 Approach Route Identifier (APPROACH IDENT)

Definition/Description: The "Approach Route Identifier" field contains the identifier of the approach route to be flown. To facilitate the provision of multiple approach procedures of the same type to a given runway, the field also is used to provide a "multiple indicator."

Source/Content:

Runway Dependent Procedure Ident

Column	Contents	
1	Type of Approach-Alpha Character, generally the same as the first column of field 5.7 Route Type **(Note 1)**	
2-3	Runway Identification- Numeric in tens of degrees, valid range 01-36	
4	Runway Designation	
	- (dash)	Place holder if other runway designation codes are not present and multiple indicators required.
	L	Left
	R	Right
	C	Center
	T	Runway oriented to True North
	Blank	Position 5 and 6 must also be Blank
5	Multiple Indicator Alphanumeric or Blank	
6	Blank	

5.0 NAVIGATION DATA - FIELD DEFINITIONS

Circle-to-Land Procedures Identifier

Column	Contents	
1-3	Circling Procedure Ident (See below).	
4	- (dash)	Place holder if a multiple indicator is required
	A thru S, U thru Z	A government source provided procedure suffix that is not a multiple indicator
	T	Runway oriented to True North
	Blank	Position 5 and 6 must also be Blank
5	Multiple Indicator Alphanumeric or Blank	
6	Blank	

Circle-to-Land Route Type Identifier

Route Type Field Content (5.7)	1ST Three Characters of Circling Procedure Identifier
A	(Approach Transitions)
B	LBC
D	VDM
F	FMS
G	IGS
H	RNV
I	(No Circling ILS)
J	GLS
L	LOC
M	MLS
N	NDB
P	GPS
Q	NDM
R	RNV
S	VOR
T	TAC
U	SDF
V	VOR
W	MLS
X	LDA
Y	MLS
Z	(Missed Approach)

Helicopter Approach Procedures to Runways OR Final Approach Course Procedure Identifier

Column	Contents
1	Type of Approach-Alpha Character, generally the same as the first column of field 5.7 Route Type. (Note 1)
2-4	Three digit numeric character representing the runway designation or procedure final approach course, expressed in full degrees
5	Multiple Indicator Alphanumeric or "T" if the procedure approach course is oriented to true north or Blank
6	Blank

Helicopter Approach Procedures to Heliports and Coded to a Specific Pad Identifier

Column	Contents
1	Type of Approach-Alpha Character, generally the same as the first column of field 5.7 Route Type. (Note 1)
2-6	Pad Identification

Note 1: When the Route Type (Section 5.7) is equal to "H" and the column 1 of the Procedure Identifier is also equal to "H", the procedure is a RNAV RNP procedure. Such a procedure would normally have column 1 of the procedure identifier equal to "R." The character "H" is used to indicate that this RNAV procedure has been published with a "RNAV RNP" procedure title in the official government source documents. This allows the explicit identification of RNAV RNP titled procedures.

Used On:	Airport and Heliport Approach Route Records, Flight Planning Arrival/Departure Data, Path Point and Airport, Heliport Localizer, Airport and Heliport TAA, and Simulation Continuation Records.
Length:	6 characters max.
Character Type:	Alpha/numeric
Examples:	
Runway Dependent	I26L, B08R, R29, V01L, N35 L16RA, L16RB, V08-A, V08-B I18L1, I18L2, N08T R35-Y, R35-Z
Circle-To-Land	**VOR, VDM, LOC** **VOR-A, VOR-B, NDB-1, NDB-2 (These are multiple indicators)** **NDBB, VDMA, LOCD, NDBTA (There are source provided procedure suffixes**
Helicopter to Runway	I13L, L040, V17S, N17SB
Helicopter to Helipad	IA127 = ILS Procedure to a pad designated A127 VBRAVO =VOR Procedure to a Pad designated BRAVO N23 =NDB Procedure to a Pad designated 23 RWESTA RNAV Procedure to a Pad designated West Alpha

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