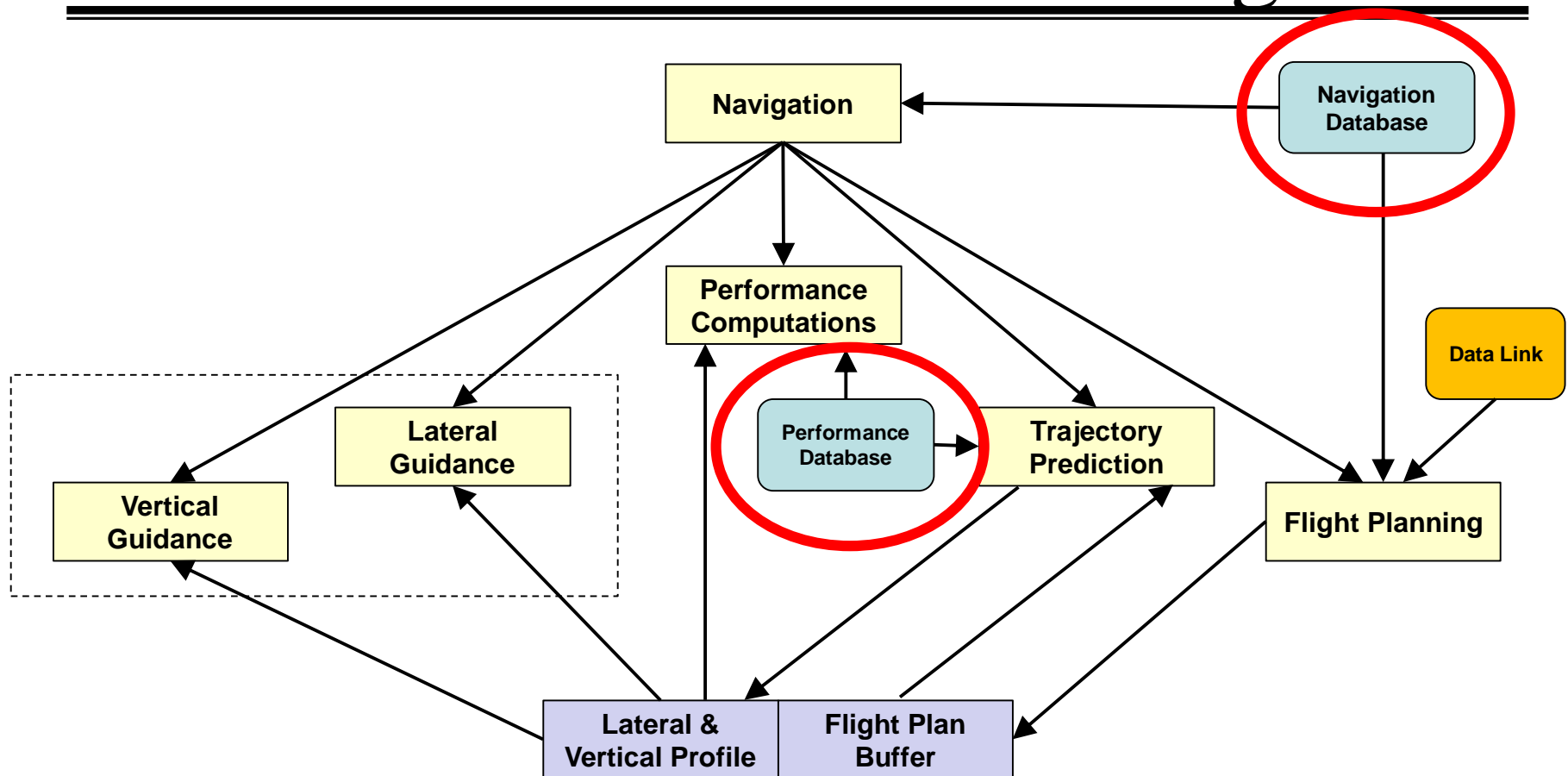


EE6900 Flight Management Systems

“Databases”

Dr. Maarten Uijt de Haag
Ohio University

FMS- Functional Block Diagram



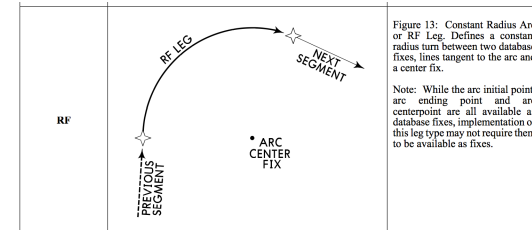
FMC Databases

- Software options database
 - to activate optional functionality on the operation flight program (main program)
- Model and Engine Performance Database
 - contains all the aircraft performance data which allows the FMC to compute fuel burn, optimum altitudes and airspeeds, etc. (see BADA OPF for example)
- Navigation Database (NDB)
 - contains all the information required for building a flight plan and processing that plan when airborne

Navigation Database (NDB)

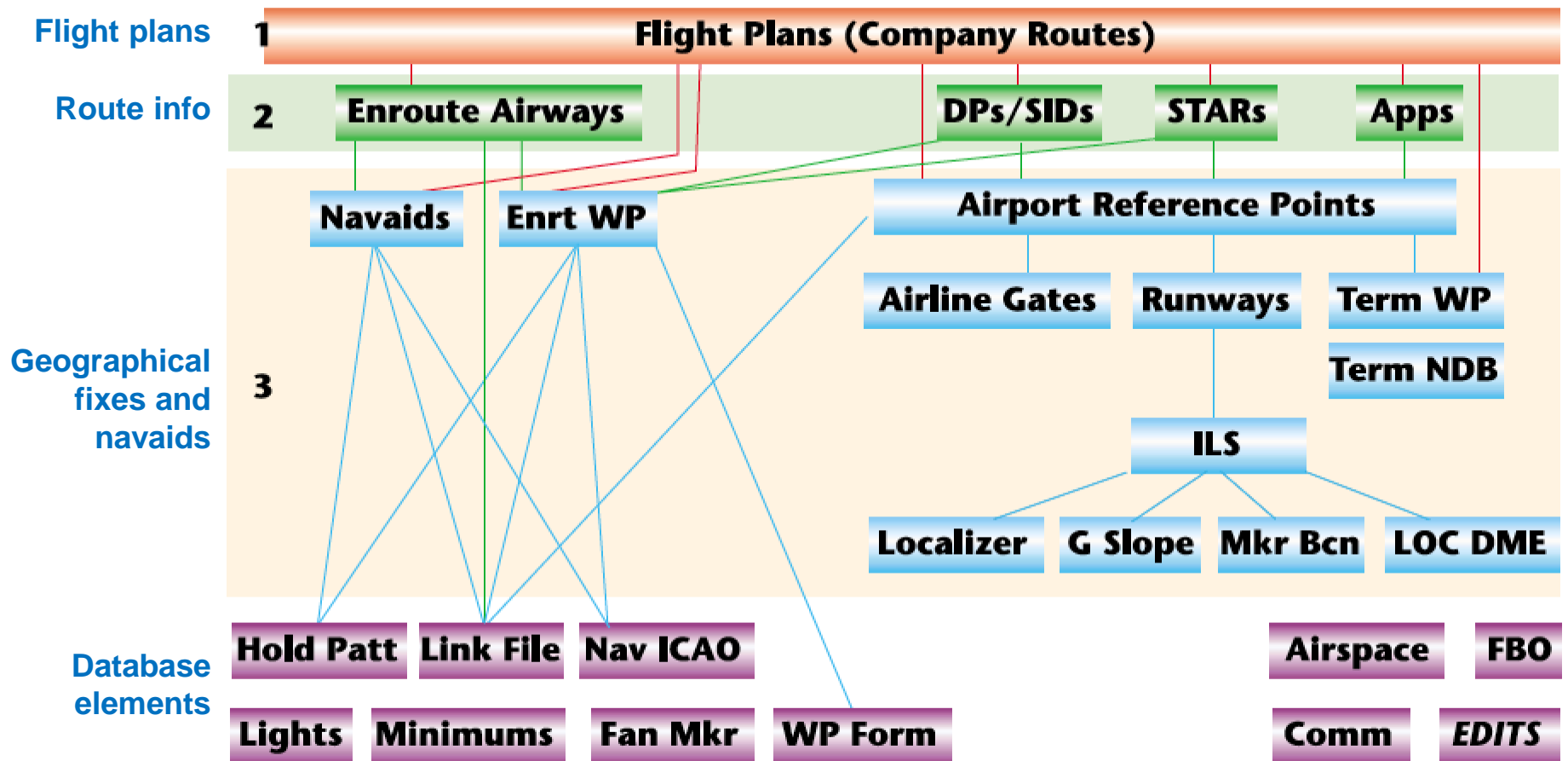
- Contains:

- Terminal and route fixes;
- Waypoints and navigation reference system (NRS) grid points;
- Intersection;
- Airways including “jet” and “victor” airways, “T” routes, “Q” routes and oceanic routes;
- Navigation aids: DME, VOR, TACAN, ILS;
- Standard terminal arrival routes (STAR);
- Standard instrument departures (SID);
- Holding patterns;
- Instrument approaches VOR, non-directional beacon, RNAV, RNP, SBAS, GBAS.



Navigation Database (NDB)

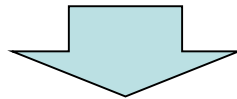
Navigation Database Structure



From: James E. Terpstra, "The Chart Clinic – Database Series"

NDB Providers

- Jeppesen Sanderson in Centennial, Colorado (owned by Boeing)
- Lido/FMS in Zurich (owned by Lufthansa)
- European Aeronautical Group (EAG)



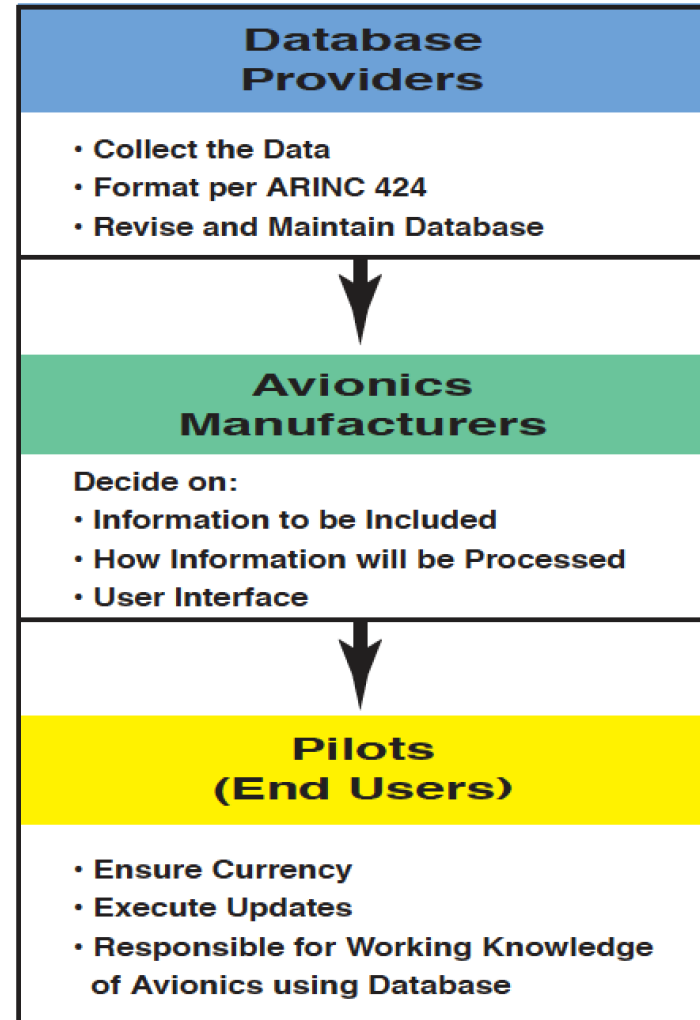
Compile, maintain and update a worldwide navigation database coded into ARINC 424 format (standard). The data is obtained from the Aeronautical Information Publications (AIP) of all the International Civil Aviation Organization (ICAO) States.

NDB Update

- Current high-quality data in the FMC are essential for optimum and safe navigation.
- **Quality** and **integrity** of the data in the United States is governed by Federal Aviation Administration (FAA) Advisory Circular (AC) 20-153A, *Acceptance of Aeronautical Data Processes and Associated Databases*.
 - Refers to RTCA DO-200A, *Standards for Processing Aeronautical Data*
- The data is updated via the commercial 28 day single **Aeronautical Information Regulation and Control (AIRAC)** cycle detailed in ICAO Annex 15, *Aeronautical Information Services (AIS)* document which defines a series of common dates and an associated standard aeronautical information publication procedure for States.

NDB and FMC Manufactures

- The master ARINC 424 file is sold to the flight management computer manufacturers:
 - Typically pack the file in a proprietary format to function in their specific FMCs
 - Honeywell, General Electric (formerly Smiths), Thales, Universal Avionics, Rockwell Collins International, CMC Electronics, Garmen, Avidyne.



FMC NDB Capacity Examples

AIRCRAFT	FMC TYPE/VERSION	CAPACITY “WORDS”	CAPACITY “BYTES”
	<i>DATA FROM AIRCRAFT MANUFACTURERS</i>		
B737-NG	GE U10.6, U10.7, U10.8	4 Mw	8 MB
B737-NG	GE U10.8 with new FMC hardware	8 Mw	16 MB
B747-400	Honeywell 747-4	1 Mw	2 MB
B747-8	Honeywell NextGen	50 Mw	100 MB
B757/767	Honeywell 200K FMC	200 Kw	400 KB
B757/767	Honeywell 700K FMC	700 Kw	1.4 MB
B757/767	Honeywell 1 Meg Non-PIP, PIP	1 Mw	2 MB
B757/767	Honeywell 2 Meg Non-PIP, PIP	2 Mw	4 MB
B757/767	Honeywell Pegasus Pre 2009	2 Mw	4 MB
B757/767	Honeywell Pegasus 2009	3.8 Mw	7.5 MB
B777	Honeywell AIMS 1	1 Mw*	2 MB*
B777	Honeywell AIMS 2	6 Mw	12 MB
B787	Honeywell	15 Mw	30 MB

FMC NDB Capacity Examples

A320	Honeywell Pegasus P1	2 Mw	4 MB
A320	Honeywell Pegasus P1-A	10 Mw	20 MB
A320	Thales FMS1	200 Kw	400 KB
A320	Thales FMS2 REV2+	2.5 Mw	5 MB
A320	Thales FMS2 R1-A	3.5 Mw	7 MB
A330	Thales FMS2 REV2+	2.5 Mw	5 MB
A330	Thales FMS2 R1-A	3.5 Mw	7 MB
A330	Honeywell Pegasus P3	2.7 Mw	5.5 MB
A340	Thales FMS2 REV2+	2.5 Mw	5 MB
A340	Thales FMS2 R1-A	3.5 Mw	7 MB
A340	Honeywell Pegasus P3	2.75 Mb	5.5 MB
A350	TBD	TBD	TBD
A380	Honeywell	10 Mw	20 Mb

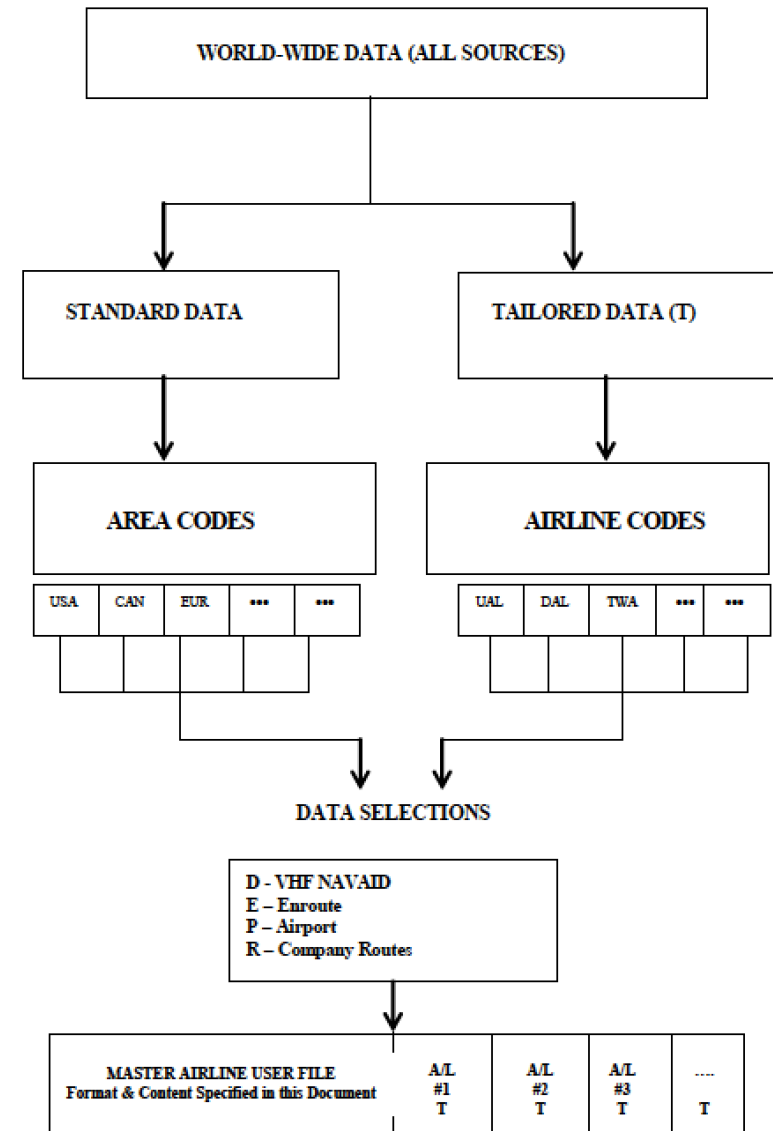
ARINC 424 History

- The requirement for on-board navigation data bases was identified in the 1970s with the development of the first **Flight Management Systems (FMS)**.
- ARINC 424 - first edition was published in May 1975 and adapted by the industry in July 1975. At this stage the ARINC 424 document was developed to support conventional Navigation.
- With the implementation of the area navigation methods, and the capability to use inputs from different sensors, the requirement to have access to a sophisticated on-board navigation data base became mandatory.
- ARINC 424 has been continuously improved and adjusted over the years in order to accommodate new navigational procedures, capabilities, standards and technical characteristics.

From: "Introduction to ARINC 424," RNAV Procedure Coding Workshop, Amsterdam 2005.

ARINC 424 – Record Organization

- Standard records before tailored records
- Standard (“S”) records:
 - by area codes, alphabetically
- Tailored (“T”) records:
 - By airline codes, alphabetically
- After that:
 - Order by sections (VHF nav aids, enroute, airport etc.) alphabetically

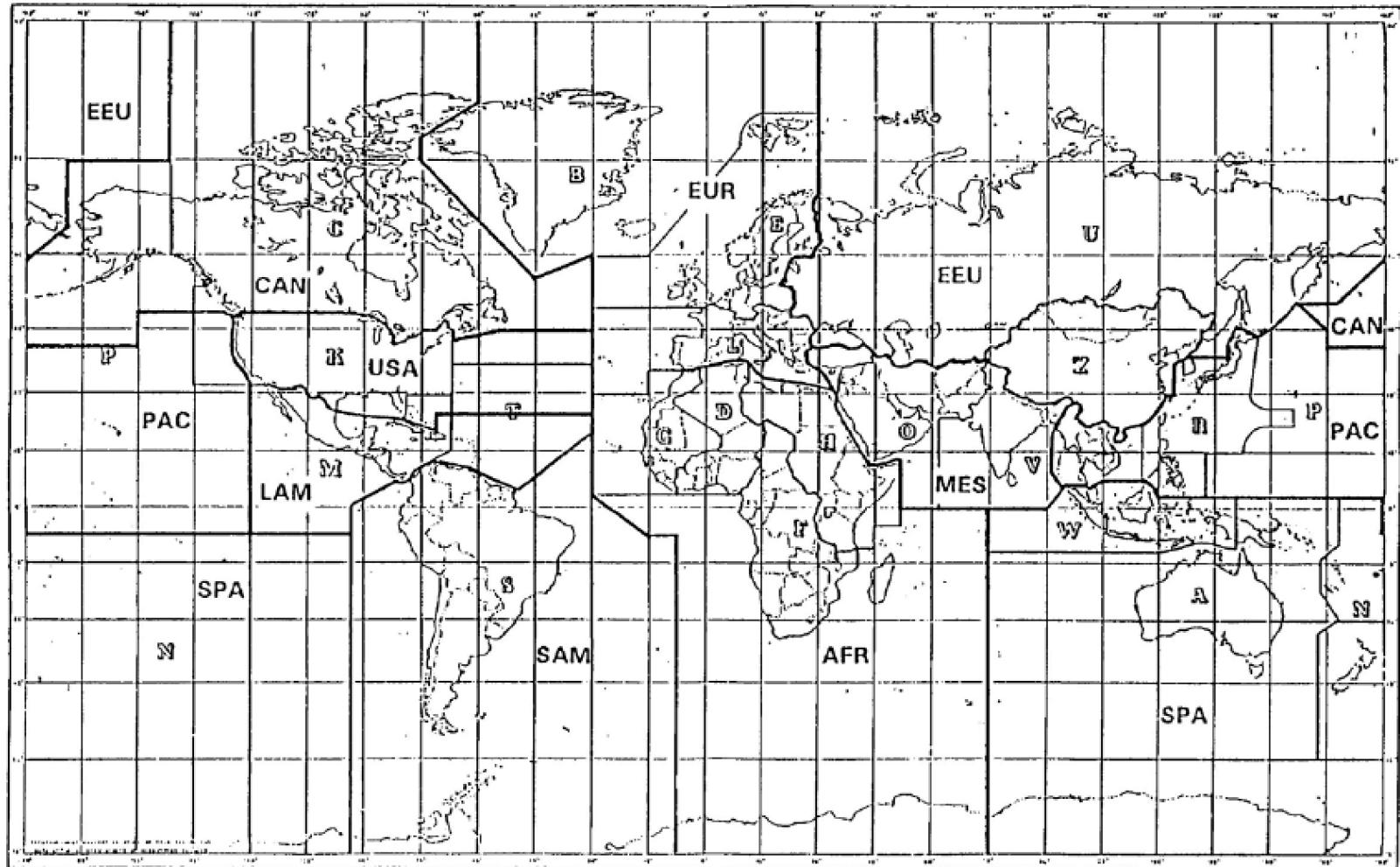


ARINC 424 – Record Organization

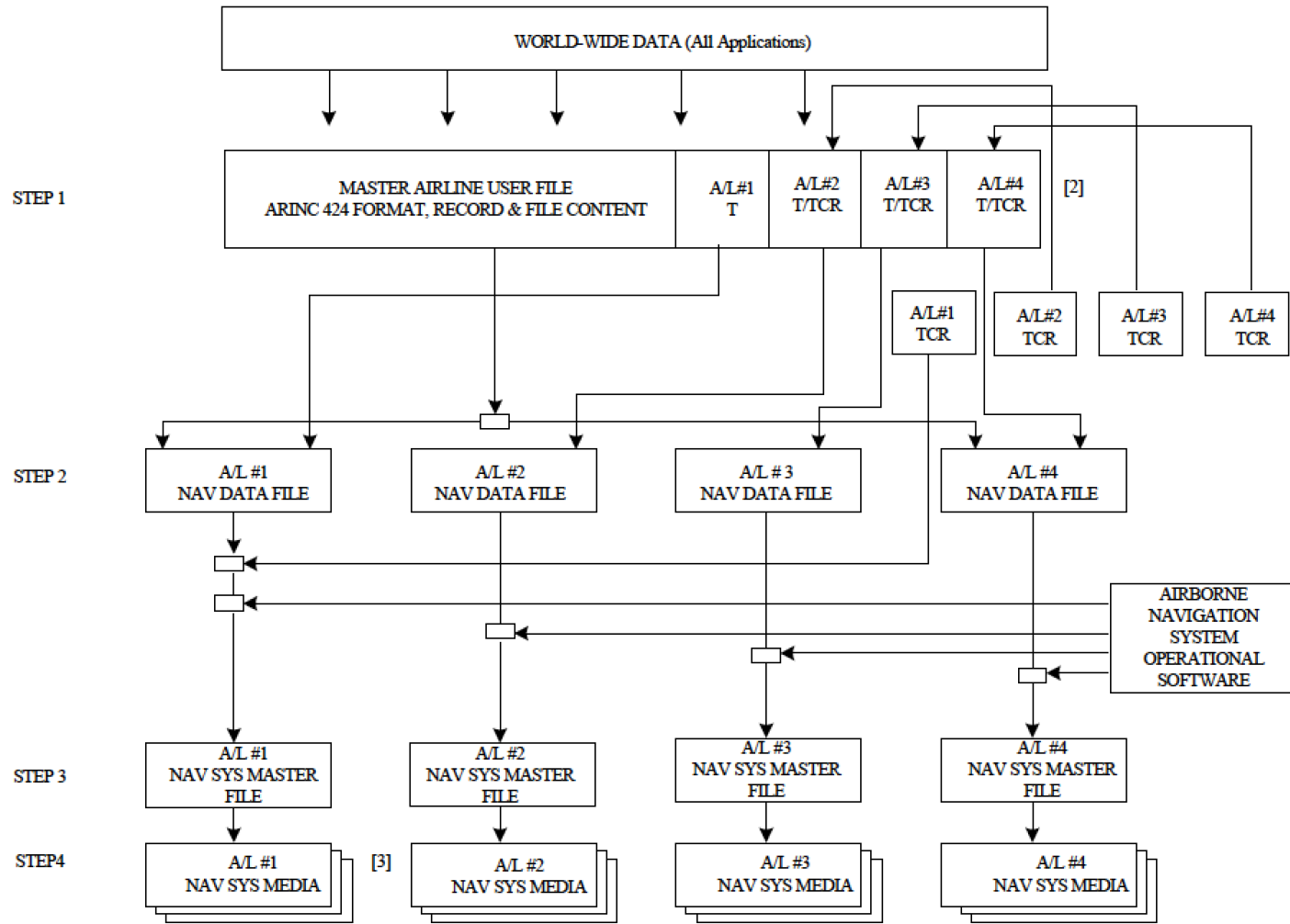
- Individual records divided in sections/sub-sections of max. 132 characters
- **Record:**
 - A single line of computer data made up of the fields necessary to define fully a single piece of information
- **Field:**
 - The collection of characters needed to define one item of information
- Each record uniquely defined and stored in the master user file

				ENROUTE WAYPOINT (EA)					
				(With Flight Planning Continuations)					
SUSAEENRT	26FLW	K21	I D	N36442340W121282270	E0156	NAS	B	FLW306/D126	021528110
SUSAEENRT	26FLW	K22PKZOAKZ0A							021538701
SUSAEENRT	ALFOR	K11	R F L	N44183310W123090510	E0187	NAS	P	ALFOR	021648207
SUSAEENRT	ALFOR	K12PKZSEKZSE							021658613
SUSAEENRT	ALTAM	K21	R Z L	N37484410W121444580	E0160	NAS	P	ALTAM	021668613
SUSAEENRT	ALTAM	K22PKZOAKZ0A							021678701
SUSAEENRT	BRINY	K21	RF L	N37181740W122393800	E0159	NAS	P	BRINY	022408303
SUSAEENRT	BRINY	K22PKZOAKZ0A							022418701
SUSAEENRT	BTG32	K11	I L	N45335140W121524960	E0190	NAS	B	BTG089/DLS234	022488802
SUSAEENRT	BTG32	K12PKZSEKZSE							022498802

Geographical Area Codes

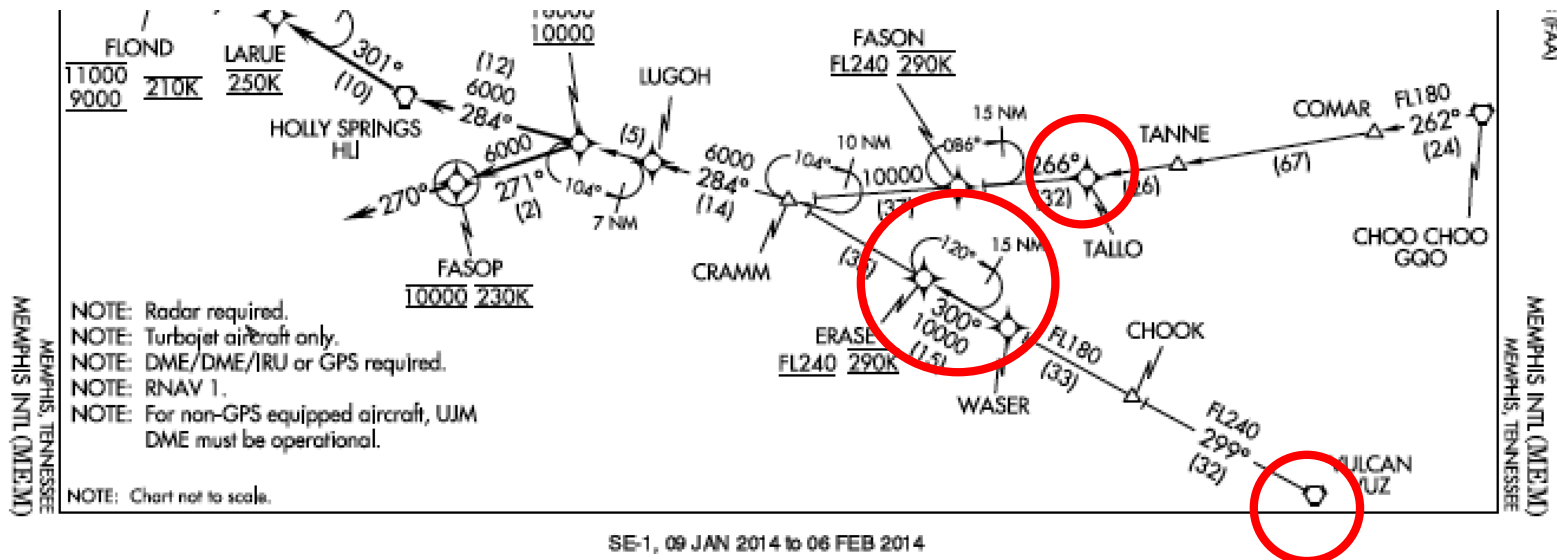


Master Airline User File



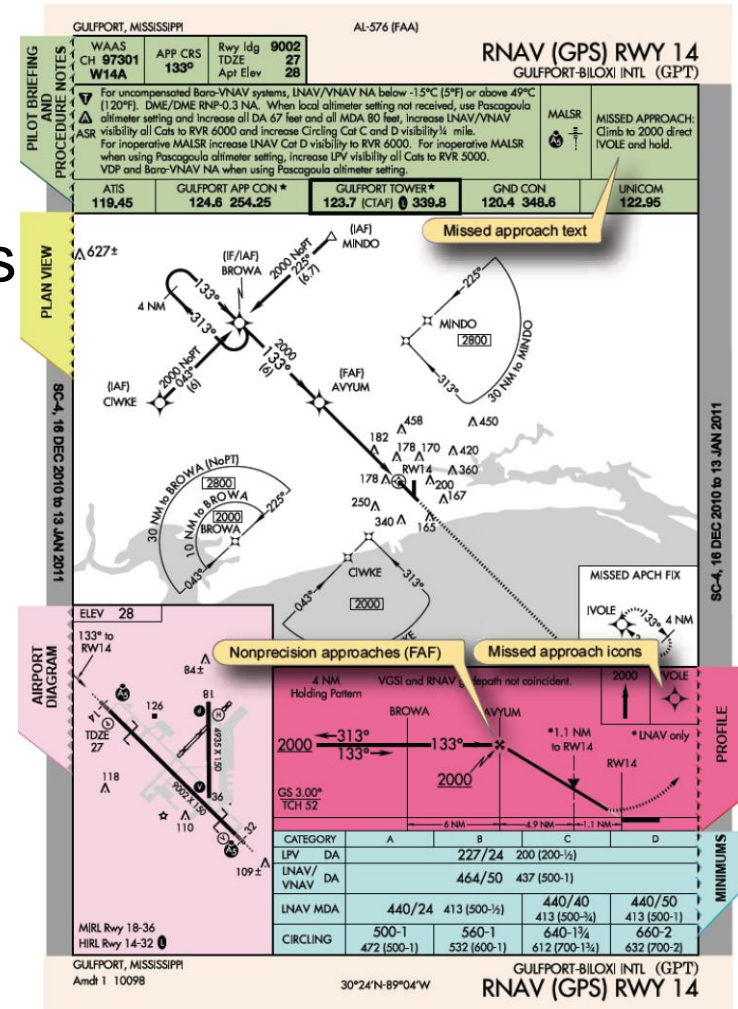
ARINC 424 - Records

- VHF Navaid (VOR/DME)
- TACAN Navaid
- NDB Navaid
- Waypoints
- Holding Patterns



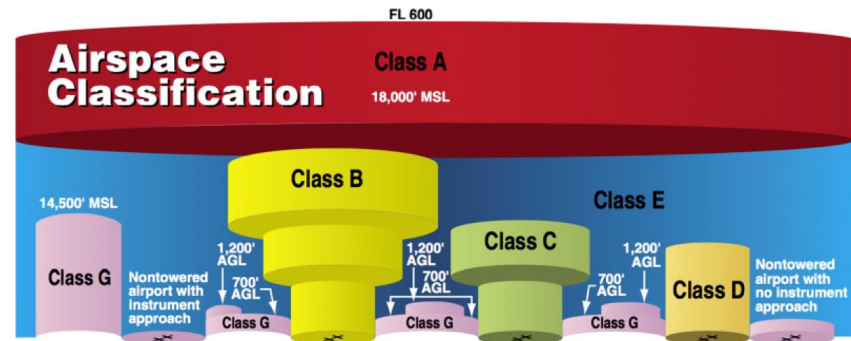
ARINC 424 - Records

- Airports
- Airport gate
- Airport SIDs/STARs/Approaches
- Runway
- Airport localizer & glideslope
- Airport MLS
- Airport markers
- Airport communications
- Path point
- GLS
- Airport TAA



ARINC 424 - Records

- Enroute airways
- Company routes
- Preferred routes
- Enroute airways restriction records
- Enroute communications
- Cruising tables
- Controlled airspace
- Geographical ref.
- Restricted airspace
- Flight planning arrival/departure
- Grid minimum off route altitude (MORA)
- Airport minimum sector altitude
- Preferred routes
- Etc.



Data Record – VHF NAV AID

- Contents:
 - customer/area code,
 - station identifier,
 - navaid name,
 - co-ordinates,
 - frequency,
 - elevation (DME),
 - variation,
 - datum code etc.

Column	Field Name (Length)	Reference
1	Record Type (1)	5.2
2 thru 4	Customer/Area Code (3)	5.3
5	Section Code (1)	5.4
6	Subsection Code (1)	5.5
7 thru 10	Airport ICAO Identifier (4)	5.6
11 thru 12	ICAO Code (2)	5.14
13	Blank (Spacing) (1)	
14 thru 17	VOR Identifier (4)	5.33
18 thru 19	Blank (Spacing) (2)	
20 thru 21	ICAO Code (2)	5.14
22	Continuation Record No. (1)	5.16
23 thru 27	VOR Frequency (5)	5.34
28 thru 32	NAVAID Class (5)	5.35
33 thru 41	VOR Latitude (9)	5.36
42 thru 51	VOR Longitude (10)	5.37
52 thru 55	DME Ident (4)	5.38
56 thru 64	DME Latitude (9)	5.36
65 thru 74	DME Longitude (10)	5.37
75 thru 79	Station Declination (5)	5.66
80 thru 84	DME Elevation (5)	5.40
85	Figure of Merit (1)	5.149
86 thru 87	ILS/DME Bias (2)	5.90
88 thru 90	Frequency Protection (3)	5.150
91 thru 93	Datum Code (3)	5.197
94 thru 118	VOR Name (25)	5.71
119 thru 121	Blank (Spacing) (3)	
122	Route Inappropriate DME (1)	5.297
123	DME Operational Service Volume (1)	5.277
124 thru 128	File Record No. (5)	5.31
129 thru 132	Cycle Date (4)	5.32

Data Record – WAYPOINT

- Contents:
 - Waypoint ID
 - Co-ordinates
 - Type
 - ENR or Terminal
 - RNAV
 - IAF/IF/FACF/FAF/MAP
 - Stepdown (Terminal only)
 - Arc centre (Terminal only)
 - SID/STAR/APP/Multiple
 - Usage
 - RNAV airway
 - Terminal

Column	Field Name (Length)	Reference
1	Record Type (1)	5.2
2 thru 4	Customer/Area Code (3)	5.3
5	Section Code (1)	5.4
6	Subsection Code (1)	5.5 Note 1
7 thru 10	Region Code (4)	5.41 Note 2
11 thru 12	ICAO Code (2)	5.14
13	Subsection (1)	5.5 Note 1
14 thru 18	Waypoint Identifier (5)	5.13
19	Blank (Spacing) (1)	
20 thru 21	ICAO Code (2)	5.14
22	Continuation Record No. (1)	5.16
23 thru 26	Blank (Spacing) (4)	
27 thru 29	Waypoint Type (3)	5.42
30 thru 31	Waypoint Usage (2)	5.82
32	Blank (Spacing) (1)	
33 thru 41	Waypoint Latitude (9)	5.36
42 thru 51	Waypoint Longitude (10)	5.37
52 thru 74	Blank (Spacing) (23)	
75 thru 79	Dynamic Mag. Variation (5)	5.39
80 thru 84	Reserved (Expansion) (5)	
85 thru 87	Datum Code (3)	5.197
88 thru 95	Reserved (Expansion) (8)	
96 thru 98	Name Format Indicator (3)	5.196
99 thru 123	Waypoint Name/ Description (25)	5.43
124 thru 128	File Record No. (5)	5.31
129 thru 132	Cycle Date (4)	5.32

Waypoint Description

ENROUTE WAYPOINT (EA) (With Flight Planning Continuations)

SUSAEENRT	26FLW K21	I D	N36442340W121282270	E0156	NAS	B	FLW306/D126	021528110
SUSAEENRT	26FLW K22PKZOAKZ0A							021538701
SUSAEENRT	ALFOR K11	R F L	N44183310W123090510	E0187	NAS	P	ALFOR	021648207
SUSAEENRT	ALFOR K12PKZSEKZSE							021658613
SUSAEENRT	ALTAM K21	R Z L	N37484410W121444580	E0160	NAS	P	ALTAM	021668613
SUSAEENRT	ALTAM K22PKZOAKZ0A							021678701
SUSAEENRT	BRINY K21	RF L	N37181740W122393800	E0159	NAS	P	BRINY	022408303
SUSAEENRT	BRINY K22PKZOAKZ0A							022418701
SUSAEENRT	BTG32 K11	I L	N45335140W121524960	E0190	NAS	B	BTG089/DLS234	022488802
SUSAEENRT	BTG32 K12PKZSEKZSE							022498802
SUSAEENRT	BTG51 K11	I L	N44522830W122361410	E0189	NAS	B	BTG160/EUG010	022508802
SUSAEENRT	BTG51 K12PKZSEKZSE							022518802
SUSAEENRT	LOFAL K11	R Z L	N47503790W122401980	E0203	NAS	P	LOFAL	025738409
SUSAEENRT	LOFAL K12PKZSEKZSE							025748613
SUSAEENRT	HOGNB K21	N B	N41433840W122285050	E0175	NAS	Q	MONTAGUE	026278110
SUSAEENRT	HOGNB K22PKZOAKZ0A							023858613
SUSAEENRT	ODESS K11	R Z H	N47081310W117582330	E0188	NAS	P	ODESS	026708304
SUSAEENRT	ODESS K12PKZSEKZSE							026718613
SUSAEENRT	SHOEY K21	R Z L	N36444462W122075863	E0157	NAS	P	SHOEY	028438904
SUSAEENRT	SHOEY K22PKZOAKZ0A							028448701

4.0 NAVIGATION DATA - RECORD LAYOUT

ARINC 424 - 19 RECORD FORMAT

Page 2 of 15

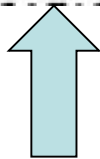
WAYPOINT (EA)(PC)		S.1	S.3	S.4	S.5	S.6	S.7	S.8	S.9	S.10	S.11	S.12	S.13	S.14	S.15	S.16	S.17	S.18	S.19	S.20	S.21	S.22	S.23	S.24	S.25	S.26	S.27	S.28	S.29	S.30	S.31	S.32
4.1.4.1		PRIMARY	CUST AREA	FILE CODE	RECORD CODE	WAYPOINT IDENT	WAYPOINT IDENT	TYPE	USAGE	LATITUDE	LONGITUDE	D MAG VAR	WP ELEV (FEET FOR DIM)	DATUM CODE	NAME IND	NAME/DESC (25)	FILE RECORD NUMBER	CYCLE														

See: ARINC 424 standard

Waypoints - Example

```

SUSAEAENRT 26FLW K21 I D N36442340W121282270
SUSAEAENRT 26FLW K22PKZOAKZOA
SUSAEAENRT ALFOR K11 R F L N44183310W123090510
SUSAEAENRT ALFOR K12PKZSEKZSE
SUSAEAENRT ALTAM K21 R Z L N37484410W121444580
SUSAEAENRT ALTAM K22PKZOAKZOA
    
```



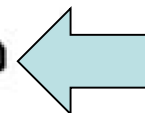
S = Standard
USA = Area
E = Enroute
A = Waypoints
ENRT = Enroute waypoints

Section Code	Section Name	Subsection Code	Subsection Name
A	MORA	S	Grid MORA
D	Navaid	Blank	VHF Navaid
		B	NDB Navaid
		T	TACAN Duplicates
E	Enroute	A	Waypoints
		M	Airway Markers
		P	Holding Patterns
		R	Airways and Routes
		T	Preferred Routes
		U	Airway Restrictions
		V	Communications

5.2	5.3	5.4	5.5	5.41	5.14	5.6	5.13	5.14	5.16	5.42	5.42	5.36	5.37
5	10	15	20	25	30	35	40	45	50				
S/T	CUST/ AREA	SEC CODE	SUBCODE	REGN /ARPT CODE	ICAO CODE	SUBCODE	WAYPOINT IDENT	ICAO CODE	CONTNR	TYPE	USEAGE	LATITUDE	LONGITUDE

Waypoints – Example

```
SUSAEAENRT 26FLW K21 I D N36442340W121282270
SUSAEAENRT 26FLW K22PKZOAKZQA
SUSAEAENRT ALFOR K11 R F L N44183310W123090510
SUSAEAENRT ALFOR K12PKZSEKZSE
SUSAEAENRT ALTAM K21 R Z L N37484410W121444580
SUSAEAENRT ALTAM K22PKZOAKZQA
```



See your X-plane
'earth_fix.dat' file

K2 = ICAO Code

1 = Part of record

(if 2 this record is a continuation)

I D = Waypoint type

ENROUTE AND TERMINAL WAYPOINTS			
Waypoint Type	Column 27	Column 28	Column 29
ARC Center Fix	A	Note 3	Note 3
Combined Named Intersection and RNAV Waypoint	C		
Unnamed, Charted Intersection	I		
Middle or Inner Marker as Waypoint	M		
NDB or Terminal NDB Navaid as Waypoint	N	Note 1	Note 2
Outer or Back Marker as Waypoint	O		
Named Intersection	R		
Uncharted Airway Intersection	U		
VFR Waypoint	V	Note 4	
RNAV Waypoint	W		
Final Approach Fix		A	
Initial Approach Fix and Final Approach Fix		B	
Final Approach Course Fix		C	
Intermediate Approach Fix		D	
Off-Route Intersection		F	
Initial Approach Fix		I	
Final Approach Course Fix and Initial Approach Fix		K	
Final Approach Course Fix and Intermediate Approach Fix		L	
Missed Approach Fix		M	
Initial Approach Fix and Missed Approach Fix		N	
Oceanic Gateway Fix		O	
Unnamed Stepdown Fix		P	
RF Leg Fix Not at Procedure Fix		R	Note 5
Named Stepdown Fix		S	
FIR/UIR or Controlled Airspace Intersection		U	
Latitude/Longitude Fix, Half Degree of Latitude		V	
Latitude/Longitude Fix, Half Degree of Longitude		W	
Published for Use in SID			D
Published for Use in STAR			E
Published for Use in Approach Procedures			F
Published for Use in Multiple Terminal Procedure Types			Z
Source provided Enroute Waypoint			G

Data Record – HOLDING

4.1.5.1 Holding Pattern Primary Records

- Contents:
 - Region Code
 - Fix Identifier
 - Inbound Course
 - Turn Direction
 - Leg Length
 - Leg Time
 - Holding Speed
 - Min Altitude
 - Max Altitude
 - Cycle Date

Column	Field Name (Length)	Reference
1	Record Type (1)	5.2
2 thru 4	Customer/Area Code (3)	5.3
5	Section Code (1)	5.4
6	Subsection Code (1)	5.5
7 thru 10	Region Code (4)	5.41 Note 1
11 thru 12	ICAO Code (2)	5.14 Note 1
13 thru 27	Blank (Spacing) (15)	
28 thru 29	Duplicate Identifier (2)	5.114
30 thru 34	Fix Identifier (5)	5.13
35 thru 36	ICAO Code (2)	5.14
37	Section Code (1)	5.4
38	Subsection Code (1)	5.5
39	Continuation Record No. (1)	5.16
40 thru 43	Inbound Holding Course (4)	5.62
44	Turn Direction (1)	5.63
45 thru 47	Leg Length (3)	5.64
48 thru 49	Leg Time (2)	5.65
50 thru 54	Minimum Altitude (5)	5.30
55 thru 59	Maximum Altitude (5)	5.127
60 thru 62	Holding Speed (3)	5.175
63 thru 65	RNP (3)	5.211
66 thru 71	Arc Radius (6)	5.204
72 thru 74	Vertical Scale Factor (3)	5.293
75 thru 77	RVSM Minimum Level (3)	5.294
78 thru 80	RVSM Maximum Level (3)	5.295
81 thru 98	Reserved (Expansion) (18)	
99 thru 123	Name (25)	5.60
124 thru 128	File Record No. (5)	5.31
129 thru 132	Cycle Date (4)	5.32

Data Record – AIRPORT

4.1.7.1 Airport Primary Records

- Contents:
 - Airport ICAO Identifier
 - ATA/IATA Designator
 - Longest Runway
 - Magnetic Variation
 - Airport Elevation
 - ARP
 - Speed Limit
 - Transition Level/Altitude
 - Airport Name
 - Datum Code etc.

Column	Field Name (Length)	Reference
1	Record Type (1)	5.2
2 thru 4	Customer/Area Code (3)	5.3
5	Section Code (1)	5.4
6	Blank (Spacing) (1)	
7 thru 10	Airport ICAO Identifier (4)	5.6
11 thru 12	ICAO Code (2)	5.14
13	Subsection Code (1)	5.5
14 thru 16	ATA/IATA Designator (3)	5.107
17 thru 18	Reserved (Expansion) (2)	
19 thru 21	Blank (Spacing) (3)	
22	Continuation Record Number (1)	5.16
23 thru 27	Speed Limit Altitude (5)	5.73
28 thru 30	Longest Runway (3)	5.54
31	IFR Capability (1)	5.108
32	Longest Runway Surface Code (1)	5.249
33 thru 41	Airport Reference Pt. Latitude (9)	5.36
42 thru 51	Airport Reference Pt. Longitude (10)	5.37
52 thru 56	Magnetic Variation (5)	5.39
57 thru 61	Airport Elevation (5)	5.55
62 thru 64	Speed Limit (3)	5.72
65 thru 68	Recommended Navaid (4)	5.23
69 thru 70	ICAO Code (2)	5.14
71 thru 75	Transitions Altitude (5)	5.53
76 thru 80	Transition Level (5)	5.53
81	Public/Military Indicator (1)	5.177
82 thru 84	Time Zone (3)	5.178
85	Daylight Indicator (1)	5.179
86	Magnetic/True Indicator (1)	5.165
87 thru 89	Datum Code (3)	5.197
90 thru 93	Reserved (Expansion) (4)	
94 thru 123	Airport Name (30)	5.71
124 thru 128	File Record Number (5)	5.31
129 thru 132	Cycle Date (4)	5.32

Data Record – GATE

- Contents:
 - Airport Identifier
 - Customer Area Code
 - Gate Identifier
 - Latitude
 - Longitude
 - Notes etc.

4.1.8.1 Airport Gate Primary Record

Column	Field Name (Length)	Reference
1	Record Type (1)	5.2
2 thru 4	Customer/Area Code (3)	5.3
5	Section Code (1)	5.4
6	Blank (Spacing) (1)	
7 thru 10	Airport ICAO Identifier (4)	5.6
11 thru 12	ICAO Code (2)	5.14
13	Subsection Code (1)	5.5
14 thru 18	Gate Identifier (5)	5.56
19 thru 21	Blank (Spacing) (3)	
22	Continuation Record No. (1)	5.16
23 thru 32	Blank (Spacing) (10)	
33 thru 41	Gate Latitude (9)	5.36
42 thru 51	Gate Longitude (10)	5.37
52 thru 98	Reserved (Expansion) (47)	
99 thru 123	Name (25)	5.60
124 thru 128	File Record No. (5)	5.31
129 thru 132	Cycle Date (4)	5.32

ARINC 424 Path Terminator Concept




- The Path and Terminator concept is a means to permit coding of Terminal Area Procedures, SIDs, STARs and Approach Procedures
- Charted procedure are translated into a sequence of ARINC 424 legs in the Navigation Database
- Flight plans are entered into the FMS by using procedures from the navigation database and chaining them together

ARINC 424 Path Terminator Concept

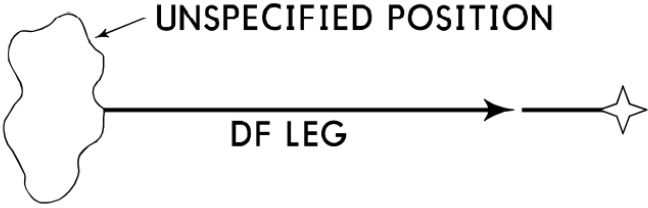
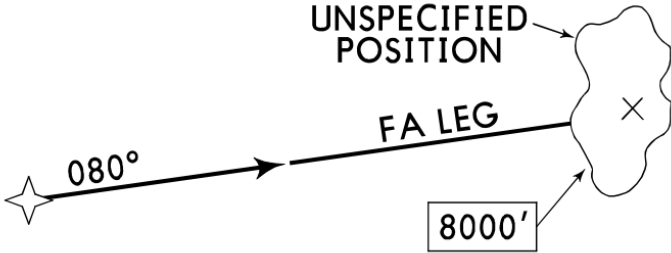

- **23 leg types** have been created to translate into computer language (FMS), procedure designed for clock & compass manual flight
- It's high time to implement RNAV, using only DO236* preferred leg types: **IF, TF, RF** which are fixed and without possible interpretation
- The leg type is specified at the end point : “path terminator concept”

**DO236B, “Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation,” October 2003.*

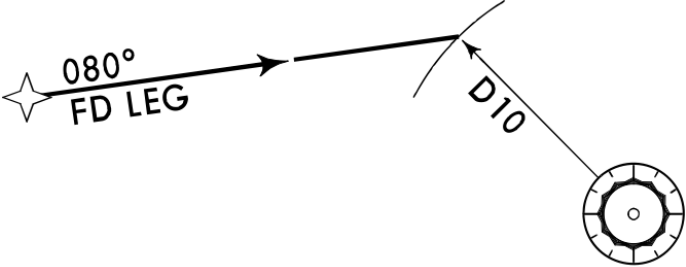

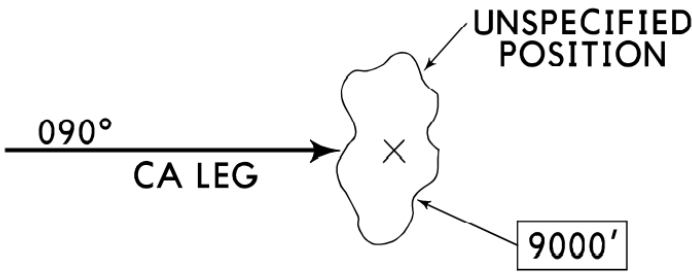
ARINC 424 Leg Types

Leg Code	Example Path	Description
IF		Figure 1: Initial Fix or IF Leg. Defines a database fix as a point in space.
TF		Figure 2: Track to a Fix or TF Leg. Defines a <u>great circle track</u> over ground between two known databases fixes. <div> <p>intermediate and final approach segments should always be TF routes</p> </div>
CF		Figure 3: Course to a Fix or CF Leg. Defines a specified course to a specific database fix.

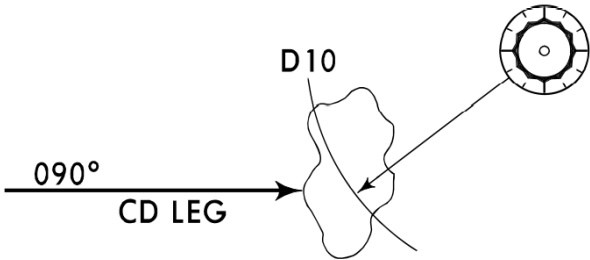
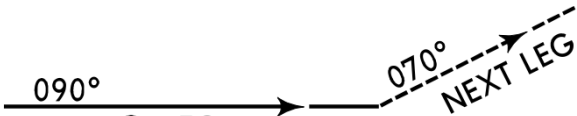
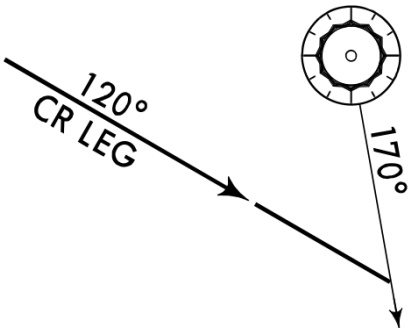
ARINC 424 Legs

DF		<p>Figure 4: Direct to a Fix or DF Leg. Defines an unspecified track starting from an undefined position to a specific database fix. Note: See also Table 1.3, Leg Sequencing, for other uses of the DF Leg.</p>
FA		<p>Figure 5: Fix to an Altitude or FA Leg. Defines a specified track over ground from a database fix to a specified altitude at an unspecified position.</p>
FC		<p>Figure 6: Track from a Fix from a Distance or FC Leg. Defines a specified track over ground from a database fix for a specific distance.</p>

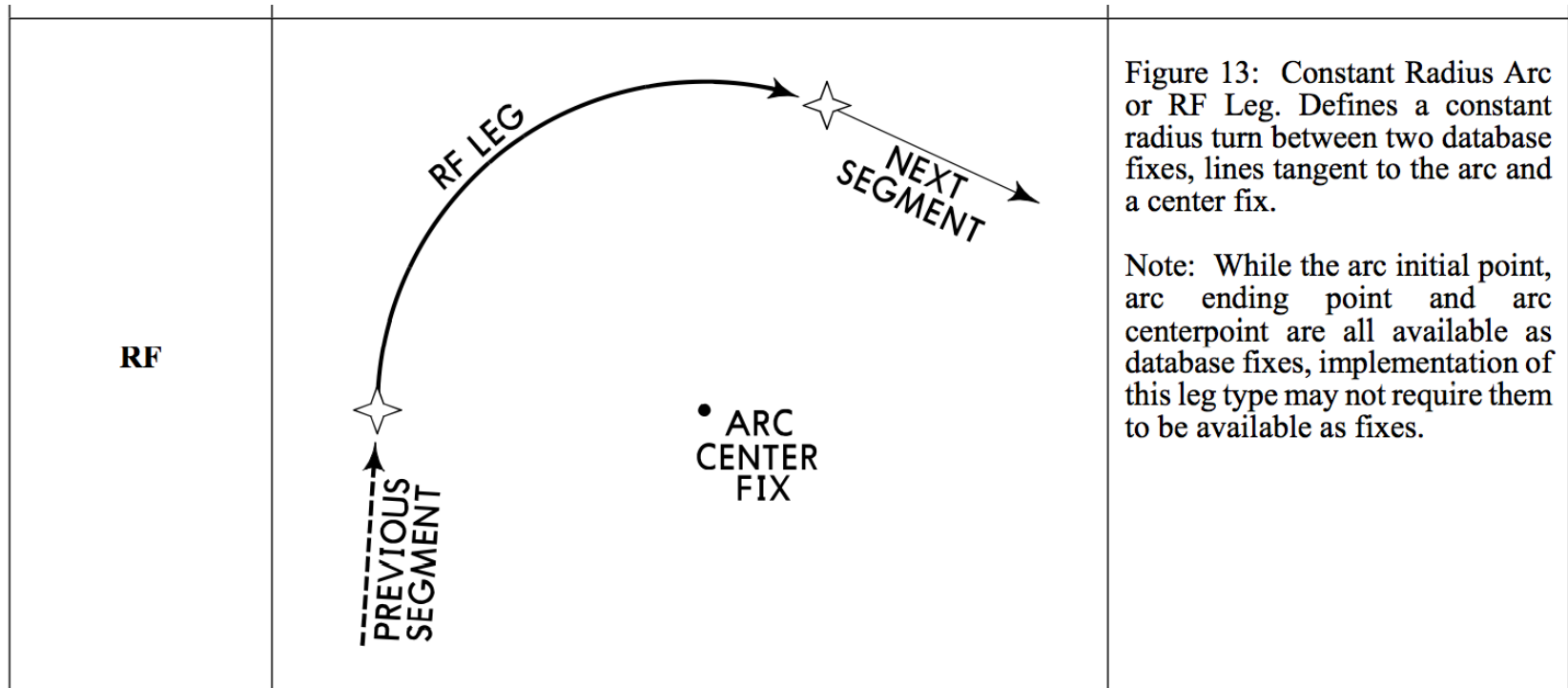
ARINC 424 Legs

FD		<p>Figure 7: Track from a Fix to a DME Distance or FD Leg. Defines a specified track over ground from a database fix to a specific DME Distance which is from a specific database DME Navaid.</p>
FM		<p>Figure 8: From a Fix to a Manual termination or FM Leg. Defines a specified track over ground from a database fix until Manual termination of the leg.</p>
CA		<p>Figure 9: Course to an Altitude or CA Leg. Defines a specified course to a specific altitude at an unspecified position.</p>

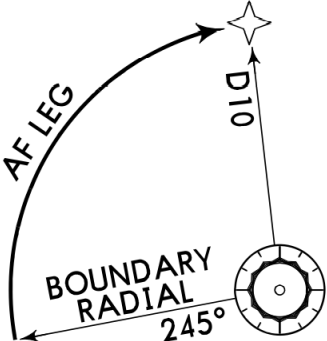
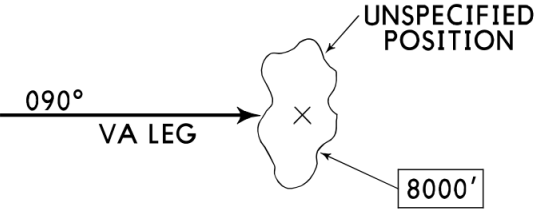
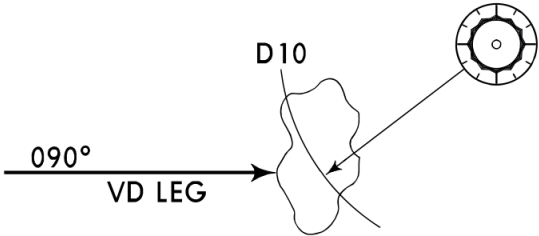
ARINC 424 Legs

CD		<p>Figure 10: Course to a DME Distance or CD Leg. Defines a specified course to a specific DME Distance which is from a specific database DME Navaid.</p>
CI		<p>Figure 11: Course to an Intercept or CI Leg. Defines a specified course to intercept a subsequent leg.</p>
CR		<p>Figure 12: Course to a Radial termination or CR Leg. Defines a course to a specified Radial from a specific database VOR Navaid.</p>


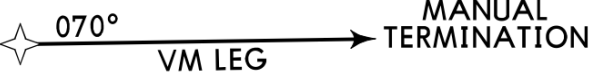
ARINC 424 Legs

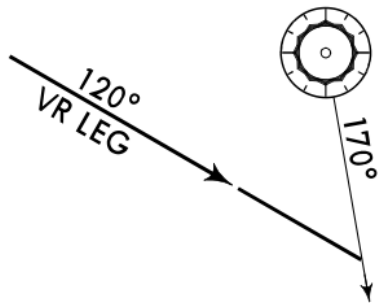


ARINC 424 Legs

AF		<p>Figure 14: Arc to a Fix or AF Leg. Defines a track over ground at specified constant distance from a database DME Navaid.</p>
VA		<p>Figure 15: Heading to an Altitude termination or VA Leg. Defines a specified heading to a specific Altitude termination at an unspecified position.</p>
VD		<p>Figure 16: Heading to a DME Distance termination or VD Leg. Defines a specified heading terminating at a specified DME Distance from a specific database DME Navaid.</p>

ARINC 424 Legs

VI		<p>Figure 17: Heading to an Intercept or VI Leg. Defines a specified heading to intercept the subsequent leg at an unspecified position.</p>
VM		<p>Figure 18: Heading to a Manual termination or VM Leg. Defines a specified heading until a Manual termination.</p>

VR		<p>Figure 19: Heading to a Radial termination or VR Leg. Defines a specified heading to a specified radial from a specific database VOR Navaid.</p>
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ARINC 424 Legs

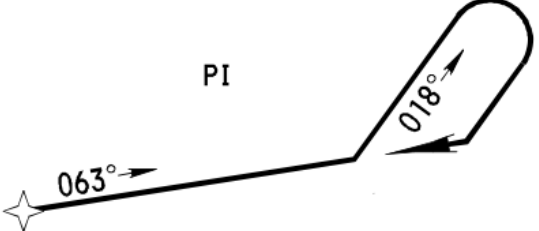
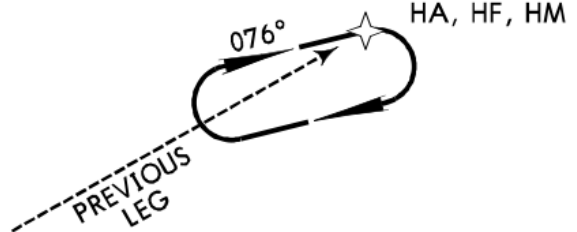
<p>PI</p>		<p>Figure 20: 045/180 Procedure Turn or PI Leg. Defines a course reversal starting at a specific database fix, includes Outbound Leg followed by a left or right turn and 180 degree course reversal to intercept the next leg. A Maximum excursion Time or Distance is included as a data field.</p>
<p>HA, HF, HM</p>		<p>Figure 21: Holding in lieu of Procedure Turn (HF) for Approach Procedures and Mandatory Holds (HA, HM) in SID/STAR and Missed Approach coding. The HA, HF, and HM Leg Types define a holding pattern in lieu of procedure turn course reversal or a terminal procedure referenced mandatory holding pattern at a specified database fix. Leg time or distance is included as a data field.</p> <p>The three codes indicate different path termination types:</p> <p>HA = Altitude Termination</p> <p>HF = Single circuit terminating at the fix.</p> <p>HM = Manual Termination.</p>

Table III-2-5-App-3. Path terminators (Required data)

<i>Path terminator</i>	<i>Waypoint identifier</i>	<i>Flyover</i>	<i>Turn direction</i>	<i>Recommended Navaid</i>	<i>Distance from Navaid</i>	<i>Bearing from Navaid</i>	<i>Magnetic course</i>	<i>Path length</i>	<i>Altitude restriction 1</i>	<i>Altitude restriction 2</i>	<i>Speed limit</i>	<i>Vertical angle</i>	<i>Arc centre</i>
CA			O				✓		6		O		
CF	✓	1	O	✓	✓	✓	✓		O	O	O	O	
DF	✓	1	O	O	O	O			O	O	O		
FA	✓		O	✓	✓	✓	✓		6		O		
FM	✓		O	✓	✓	✓	✓		O		O		
HA	✓		O	O	O	O	✓	✓	6		O		
HF	✓		O	O	O	O	✓	✓	O		O		
HM	✓		O	O	O	O	✓	✓	O		O		
IF	✓			O	O	O			O	O	O		
RF	✓	O	✓	O		2	3	5	O	O	O	O	✓
TF	✓	O	O	O	O	O	O	O	O	O	O	O	
VA			O				4		6		O		
VI		O	O	O			4		O	O	O		
VM	O		O				4		O		O		

✓ — Required

O — Optional

1 — Required for CF/DF and DF/DF combinations only.

2 — Inbound tangential track

3 — Outbound tangential track

4 — Heading not course

5 — Along track distance

6 — Altitude at or above

Data Required *per ICAO*

“**THETA**” is defined as the magnetic bearing to the waypoint identified in the record’s “FIX Ident” field from the NAVAID in the “Recommended NAVAID” field

“**RHO**” is defined as the geodesic distance in nautical miles to the waypoint identified in the record’s “Fix Ident” field from the NAVAID in the “Recommended NAVAID” field

Leg Data Fields Table 3

PT	W/P ID	OVR FLY	HLD	TD	TDV	RMD NAV	THETA	RHO	OBD MAG CRS	TM/ DST	ALT ONE	ALT TWO	SPD LMT (1)	VRT ANG	ARC CTR	COMMENTS
AF	X	O	O	X		X	X	X	R		O	O	O			OB MAG CRS=BNDRY RDL, THETA=FIX RDL
CA				O	O				C		+		O			ALT TERM WILL BE "AT OR ABOVE"
CD				O	O	X			C	D	O	O	O			
CF	X	B	O	O	O	X	X	X	C	F	O	O	O	O		OB MAG CRS IS CRS TO SPECIFIED FIX
CI		O		O	O	O			C		O	O	O			
CR		O		O	O	X	X		C		O	O	O			
DF	X	B	O	O		O	O	O			O	O	O			
FA	X			O	O	X	X	X	C		+		O			ALT TERM WILL BE "AT OR ABOVE"
FC	X	B		O	O	X	X	X	C	P	O	O	O			
FD	X	O		O	O	X	X	X	C	D	O	O	O			
FM	X			O	O	X	X	X	C		O		O			
HA	X	O		X		O	O	O	C	X	+		O			ALT TERM WILL BE "AT OR ABOVE"
HF	X	O		X		O	O	O	C	X	O		O			
HM	X	O		X		O	O	O	C	X	O		O			
IF	X		O			O	O	O			O	O	O			
PI	X			X		X	X	X	C	P	X		O			DIST IS EXCURSION DIST FROM FIX
RF	X		O	X		O	O		O	A	O	O	O	O	X	
TF	X	B	O	O	O	O	O	O	O	O	O	O	O	O		
VA				O	O				H		+		O			ALT TERM WILL BE "AT OR ABOVE"
VD				O	O	X			H	D	O	O	O			
VI		O		O	O	O			H		O	O	O			
VM	O			O	O				H		O		O			FOR W/P ID SEE STAR CODING RULES
VR		O		O	O	X	X		H		O	O	O			

LEGEND:

X = REQUIRED FIELD

R = BOUNDARY RADIAL

D = DME DISTANCE

A = ALONG TRACK DISTANCE

C = COURSE

+ = "AT OR ABOVE" ONLY

O = OPTIONAL FIELD

H = HEADING

SHADED = NOT APPLICABLE FIELD

P = PATH LENGTH

B = "REQUIRED" FOR CF/DF, DF/DF, TF/DF OR FC/DF COMBINATIONS, OTHERWISE "OPTIONAL"

Data Required

per ARINC

"**THETA**" is defined as the magnetic bearing to the waypoint identified in the record's "FIX Ident" field from the NAVAID in the "Recommended NAVAID" field

"**RHO**" is defined as the geodesic distance in nautical miles to the waypoint identified in the record's "Fix Ident" field from the NAVAID in the "Recommended NAVAID" field

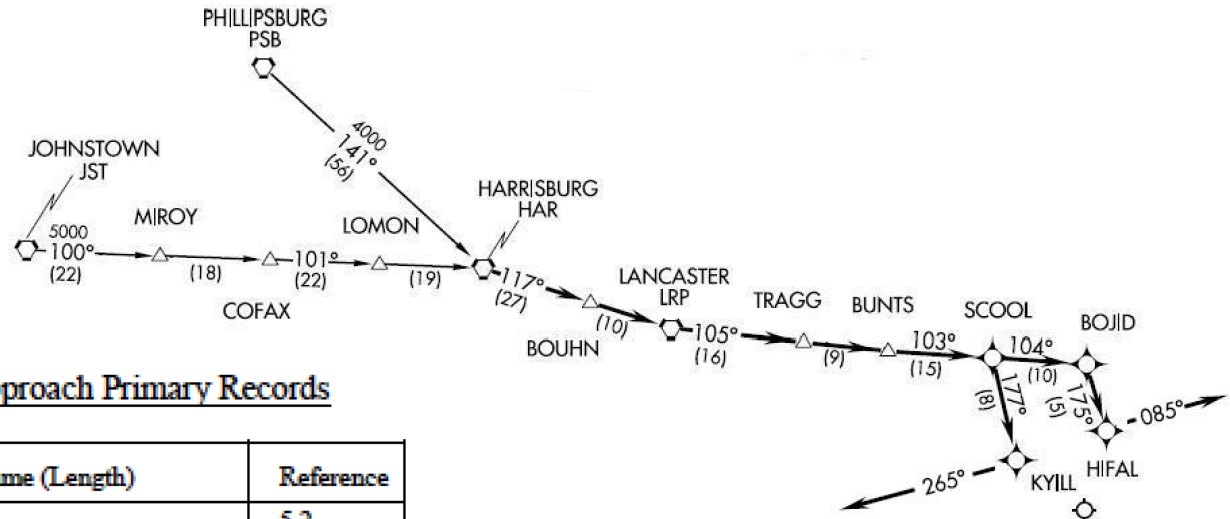
Path Terminators

Table III-2-5-App-1. Initial and final path terminators

<i>RNAV procedure</i>	<i>Initial leg</i>	<i>Final leg</i>
SID	CA, CF, VA, VI	CF, DF, FM, HA, RF, TF, VM
STAR	IF	CF, DF, FM, HM, RF, TF, VM
Approach	IF	CF, TF, RF
Missed approach	CA, CF, DF, FA, HA, HM, RF, VI, VM	CF, DF, FM, HM, RF, TF, VM

Data Record – ARRIVAL

BOJID ONE ARRIVAL (BOJID.BOJID1)



4.1.9.1 Airport SID/STAR/Approach Primary Records

Column	Field Name (Length)	Reference
1	Record Type (1)	5.2
2 thru 4	Customer/Area Code (3)	5.3
5	Section Code (1)	5.4
6	Blank (Spacing) (1)	
7 thru 10	Airport Identifier (4)	5.6
11 thru 12	ICAO Code (2)	5.14
13	Subsection Code (1)	5.5
14 thru 19	SID/STAR/Approach Identifier (6)	5.9, 5.10
	Note 1	
20	Route Type (1)	5.7
21 thru 25	Transition Identifier (5)	5.11

Data Record – ARRIVAL

- Contents:
 - Procedure Identifier
 - Route Type
 - SID/STAR
 - Runway Transition, Enroute Transition, Common Route
 - App
 - App Transition, GPS App, RNAV App, Primary MISAP, Secondary MISAP, Circling App, Straight-in App, Helo to RWY
 - Transition Identifier
 - Sequence Number
 - Waypoint Identifier etc.

4.1.9.1 Airport SID/STAR/Approach Primary Records

Column	Field Name (Length)	Reference
1	Record Type (1)	5.2
2 thru 4	Customer/Area Code (3)	5.3
5	Section Code (1)	5.4
6	Blank (Spacing) (1)	
7 thru 10	Airport Identifier (4)	5.6
11 thru 12	ICAO Code (2)	5.14
13	Subsection Code (1)	5.5
14 thru 19	SID/STAR/Approach Identifier (6) Note 1	5.9, 5.10
20	Route Type (1)	5.7
21 thru 25	Transition Identifier (5)	5.11
26	Blank (Spacing) (1)	
27 thru 29	Sequence Number (3)	5.12
30 thru 34	Fix Identifier (5)	5.13
35 thru 36	ICAO Code (2)	5.14
37	Section Code (1)	5.4
38	Subsection Code (1)	5.5
39	Continuation Record Number (1)	5.16
40 thru 43	Waypoint Description Code (4)	5.17

Data Record – ARRIVAL

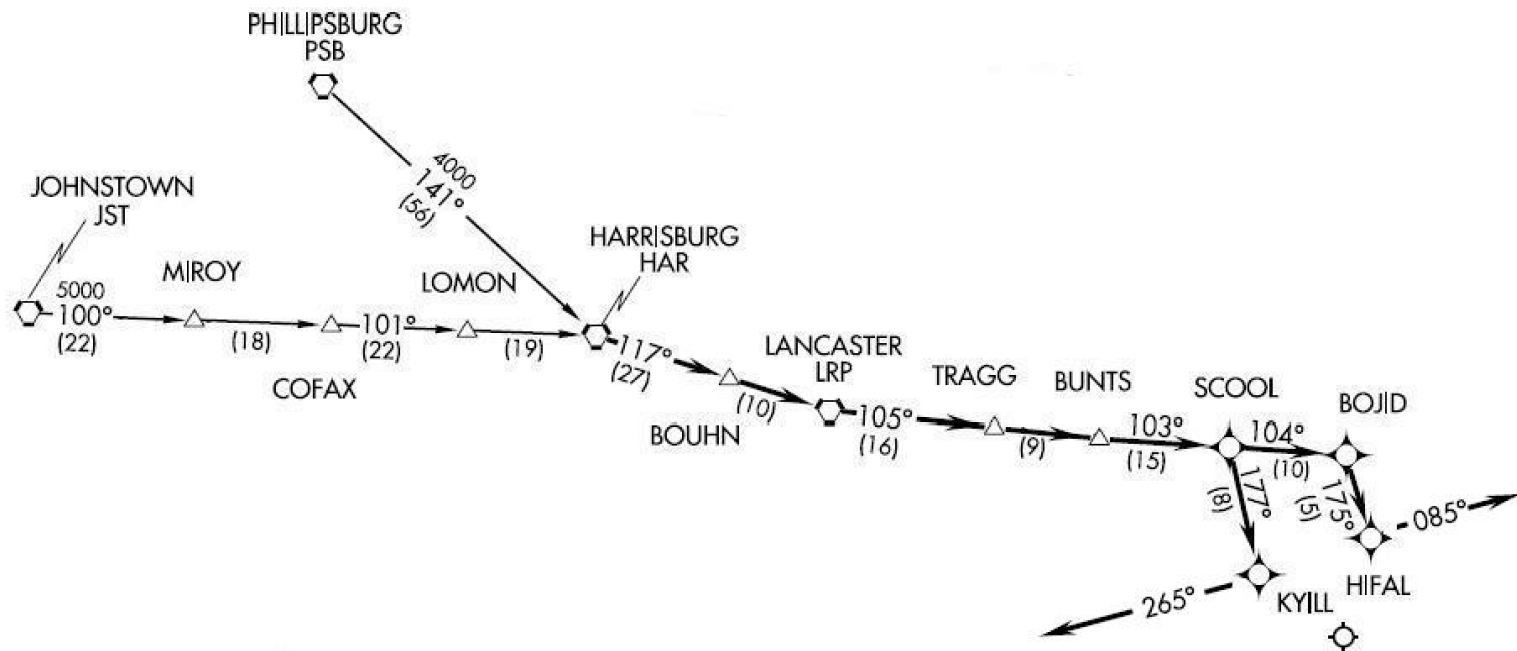
- Contents:

- Waypoint Descriptor
 - Essential
 - Fly-over waypoint
 - Stepdown fix
 - Pathpoint
 - IAF/IF/FAF/FACF/MAP
 - Holding
- Turn Direction
- Path and Termination
- Recommended Navaid
- Arc Radius
- Theta
- Rho
- Magnetic Course
- Route/Holding Distance/Time
- Altitude1, Altitude 2,
- Vertical Angle

44	Turn Direction (1)		5.20
45 thru 47	RNP (3)	Note 4	5.211
48 thru 49	Path and Termination (2)		5.21
50	Turn Direction Valid (1)		5.22
51 thru 54	Recommended Navaid (4)		5.23
55 thru 56	ICAO Code (2)		5.14
57 thru 62	ARC Radius (6)		5.204
63 thru 66	Theta (4)		5.24
67 thru 70	Rho (4)		5.25
71 thru 74	Magnetic Course (4)		5.26
75 thru 78	Route Distance/Holding Distance or Time (4)		5.27
79	RECD NAV Section (1)		5.4
80	RECD NAV Subsection (1)		5.5
81 thru 82	Reserved (expansion) (2)		
83	Altitude Description (1)		5.29
84	ATC Indicator (1)		5.81
85 thru 89	Altitude (5)		5.30
90 thru 94	Altitude (5)		5.30
95 thru 99	Transition Altitude (5)		5.53
100 thru 102	Speed Limit (3)		5.72
103 thru 106	Vertical Angle (4)		5.70
107 thru 111	Center Fix or TAA Procedure Turn Indicator (5)		5.144 or 5.271
112	Multiple Code or TAA Sector Identifier (1)		5.130 or 5.272
113 thru 114	ICAO Code (2)	Note 3	5.14
115	Section Code (1)	Note 3	5.4
116	Subsection Code (1)	Note 3	5.5
117	GNSS/FMS Indication (1)		5.222
118	Speed Limit Description (1)		5.261
119	Apch Route Qualifier 1 (1)	Note 2	5.7
120	Apch Route Qualifier 2 (1)	Note 2	5.7
121 thru 123	Vertical Scale Factor (3)		5.293
124 thru 128	File Record Number (5)		5.31
129 thru 132	Cycle Date (4)		5.32

Data Record – Arrival

BOJID ONE ARRIVAL (BOJID.BOJID1)

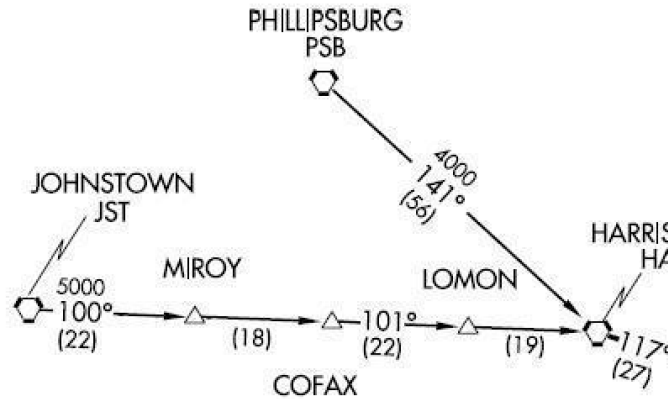




Data Record – Arrival

STAR IDENT	ROUTE TYPE	TRANS IDENT	SEQ	WAYPOINT		DESC CODE	PATH TERM
BOJID1	1	JST	010	JST	K6 D	V _ _ _	IF
BOJID1	1	JST	020	MIROY	K6 EA	E _ _ _	TF
BOJID1	1	JST	030	COFAX	K6 EA	E _ _ _	TF
BOJID1	1	JST	040	LOMON	K6 EA	E _ _ _	TF
BOJID1	1	JST	050	HAR	K6 D	V E _ _	TF
BOJID1	1	PSB	010	PSB	K6 D	V _ _ _	IF
BOJID1	1	PSB	020	HAR	K6 D	V E _ _	TF
BOJID1	2		010	HAR	K6 D	V _ _ _	IF
BOJID1	2		020	BOUHN	K6 EA	E _ _ _	TF
BOJID1	2		030	LRP	K6 D	V _ _ _	TF
BOJID1	2		040	TRAGG	K6 EA	E _ _ _	TF
BOJID1	2		050	BUNTS	K6 EA	E _ _ _	TF
BOJID1	2		060	SCOOOL	K6 EA	E E _ _	TF
BOJID1	3	RW09B	010	SCOOOL	K6 EA	E _ _ _	IF
BOJID1	3	RW09B	020	KYILL	K6 EA	E _ _ _	TF
BOJID1	3	RW09B	030	KPHL	K6 PA	A E _ _	VM
BOJID1	3	RW27B	010	SCOOOL	K6 EA	E _ _ _	IF
BOJID1	3	RW27B	020	BOJID	K6 EA	E _ _ _	TF
BOJID1	3	RW27B	030	HIFAL	K6 EA	E _ _ _	TF
BOJID1	3	RW27B	040	KPHL	K6 PA	A E _ _	VM

Data Record – Arrival

Two transitions from enroute:



Leg Code	Example Path	Description
IF	 IF	Figure 1: Initial Fix or IF Leg. Defines a database fix as a point in space.
TF	 TF LEG	Figure 2: Track to a Fix or TF Leg. Defines a great circle track over ground between two known databases fixes.



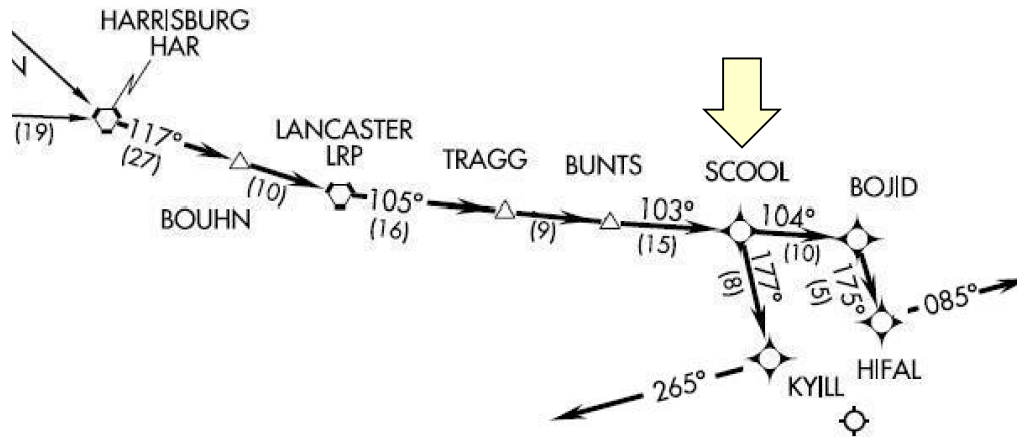
STAR IDENT	ROUTE TYPE	TRANS IDENT	SEQ	WAYPOINT		DESC CODE	PATH TERM
BOJID1	1	JST	010	JST	K6 D	V _ _ _	IF
BOJID1	1	JST	020	MIROY	K6 EA	E _ _ _	TF
BOJID1	1	JST	030	COFAX	K6 EA	E _ _ _	TF
BOJID1	1	JST	040	LOMON	K6 EA	E _ _ _	TF
BOJID1	1	JST	050	HAR	K6 D	V E _ _	TF
BOJID1	1	PSB	010	PSB	K6 D	V _ _ _	IF
BOJID1	1	PSB	020	HAR	K6 D	V E _ _	TF

Waypoints

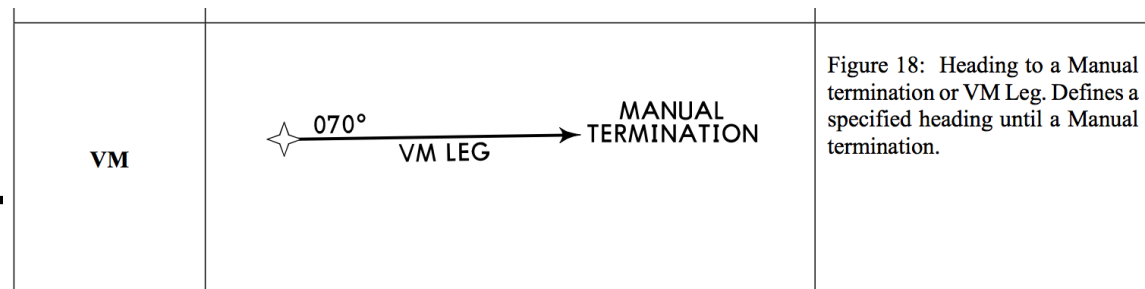
ENROUTE AND TERMINAL WAYPOINTS			
Waypoint Type	Column 27	Column 28	Column 29
ARC Center Fix	A	Note 3	Note 3
Combined Named Intersection and RNAV Waypoint	C		
Unnamed, Charted Intersection	I		
Middle or Inner Marker as Waypoint	M		
NDB or Terminal NDB Navaid as Waypoint	N	Note 1	Note 2
Outer or Back Marker as Waypoint	O		
Named Intersection	R		
Uncharted Airway Intersection	U		
VFR Waypoint	V	Note 4	
RNAV Waypoint	W		
Final Approach Fix		A	
Initial Approach Fix and Final Approach Fix		B	
Final Approach Course Fix		C	
Intermediate Approach Fix		D	
Off-Route Intersection		F	
Initial Approach Fix		I	
Final Approach Course Fix and Initial Approach Fix		K	
Final Approach Course Fix and Intermediate Approach Fix		L	
Missed Approach Fix		M	
Initial Approach Fix and Missed Approach Fix		N	
Oceanic Gateway Fix		O	
Unnamed Stepdown Fix		P	
RF Leg Fix Not at Procedure Fix		R	Note 5
Named Stepdown Fix		S	
FIR/UIR or Controlled Airspace Intersection		U	
Latitude/Longitude Fix, Half Degree of Latitude		V	
Latitude/Longitude Fix, Half Degree of Longitude		W	
Published for Use in SID			D
Published for Use in STAR			E
Published for Use in Approach Procedures			F
Published for Use in Multiple Terminal Procedure Types			Z
Source provided Enroute Waypoint			G

Country	Year	Value
Algeria	2000	0.00
Algeria	2001	0.00
Algeria	2002	0.00
Algeria	2003	0.00
Algeria	2004	0.00
Algeria	2005	0.00
Algeria	2006	0.00
Algeria	2007	0.00
Algeria	2008	0.00
Algeria	2009	0.00
Algeria	2010	0.00
Algeria	2011	0.00
Algeria	2012	0.00
Algeria	2013	0.00
Algeria	2014	0.00
Algeria	2015	0.00
Algeria	2016	0.00
Algeria	2017	0.00
Algeria	2018	0.00
Algeria	2019	0.00
Algeria	2020	0.00
Algeria	2021	0.00
Algeria	2022	0.00
Algeria	2023	0.00
Algeria	2024	0.00
Algeria	2025	0.00
Algeria	2026	0.00
Algeria	2027	0.00
Algeria	2028	0.00
Algeria	2029	0.00
Algeria	2030	0.00
Algeria	2031	0.00
Algeria	2032	0.00
Algeria	2033	0.00
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Algeria	2041	0.00
Algeria	2042	0.00
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Algeria	2044	0.00
Algeria	2045	0.00
Algeria	2046	0.00
Algeria	2047	0.00
Algeria	2048	0.00
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Algeria	2050	0.00
Algeria	2051	0.00
Algeria	2052	0.00
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Algeria	2059	0.00
Algeria	2060	0.00
Algeria	2061	0.00
Algeria	2062	0.00
Algeria	2063	0.00
Algeria	2064	0.00
Algeria	2065	0.00
Algeria	2066	0.00
Algeria	2067	0.00
Algeria	2068	0.00
Algeria	2069	0.00
Algeria	2070	0.00
Algeria	2071	0.00
Algeria	2072	0.00
Algeria	2073	0.00
Algeria	2074	0.00
Algeria	2075	0.00
Algeria	2076	0.00
Algeria	2077	0.00
Algeria	2078	0.00
Algeria	2079	0.00
Algeria	2080	0.00
Algeria	2081	0.00
Algeria	2082	0.00
Algeria	2083	0.00
Algeria	2084	0.00
Algeria	2085	0.00
Algeria	2086	0.00
Algeria	2087	0.00
Algeria	2088	0.00
Algeria	2089	0.00
Algeria	2090	0.00
Algeria	2091	0.00
Algeria	2092	0.00
Algeria	2093	0.00
Algeria	2094	0.00
Algeria	2095	0.00
Algeria	2096	0.00
Algeria	2097	0.00
Algeria	2098	0.00
Algeria	2099	0.00
Algeria	2100	0.00
Algeria	2101	0.00
Algeria	2102	0.00
Algeria	2103	0.00
Algeria	2104	0.00
Algeria	2105	0.00
Algeria	2106	0.00
Algeria	2107	0.00
Algeria	2108	0.00
Algeria	2109	0.00
Algeria	2110	0.00
Algeria	2111	0.00
Algeria	2112	0.00

Data Record – Arrival

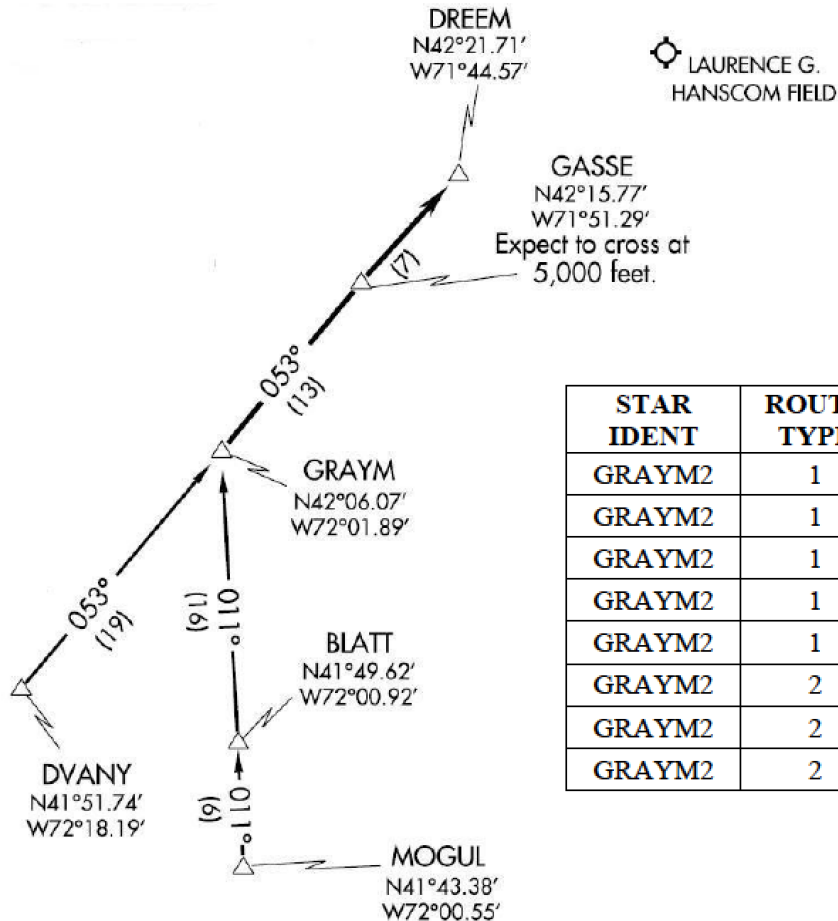


BOJID1	3	RW09B	010	SCOO	K6 EA	E _ _ _	IF
BOJID1	3	RW09B	020	KYILL	K6 EA	E _ _ _	TF
BOJID1	3	RW09B	030	KPHL	K6 PA	A E _ _	VM
BOJID1	3	RW27B	010	SCOO	K6 EA	E _ _ _	IF
BOJID1	3	RW27B	020	BOJID	K6 EA	E _ _ _	TF
BOJID1	3	RW27B	030	HIFAL	K6 EA	E _ _ _	TF
BOJID1	3	RW27B	040	KPHL	K6 PA	A E _ _	VM



Data Record – Arrival

GRAYM TWO ARRIVAL (GRAYM.GRAYM2)



STAR IDENT	ROUTE TYPE	TRANS IDENT	SEQ	WAYPOINT	DESC CODE	PATH TERM
GRAYM2	1	DVANY	010	DVANY K6 EA	E _ _ _	IF
GRAYM2	1	DVANY	020	GRAYM K6 EA	E E _ _	TF
GRAYM2	1	MOGUL	010	MOGUL K6 EA	E _ _ _	IF
GRAYM2	1	MOGUL	020	BLATT K6 EA	E _ _ _	TF
GRAYM2	1	MOGUL	030	GRAYM K6 EA	E E _ _	TF
GRAYM2	2	ALL	010	GRAYM K6 EA	E _ _ _	IF
GRAYM2	2	ALL	020	GASSE K6 EA	E _ _ _	TF
GRAYM2	2	ALL	030	DREEM K6 EA	E E _ _	TF

Data Record - Departure

KATSO TWO DEPARTURE (KATSO2.KATSO)

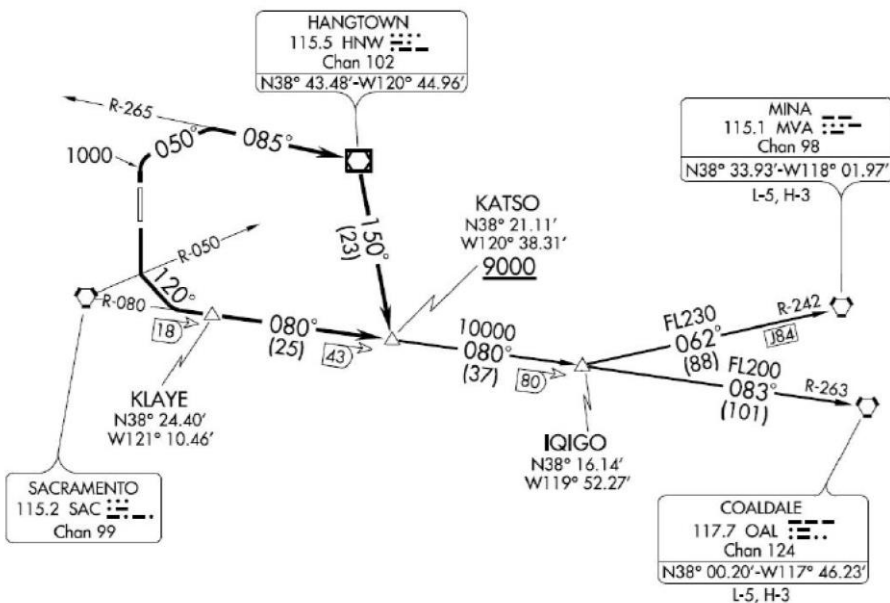


Figure 3: Course to a Fix or CF Leg. Defines a specified course to a specific database fix.

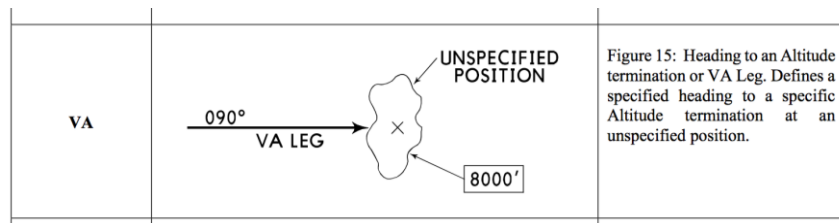
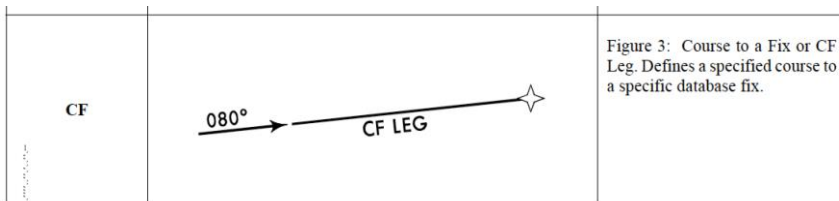


Figure 15: Heading to an Altitude termination or VA Leg. Defines a specified heading to a specific Altitude termination at an unspecified position.

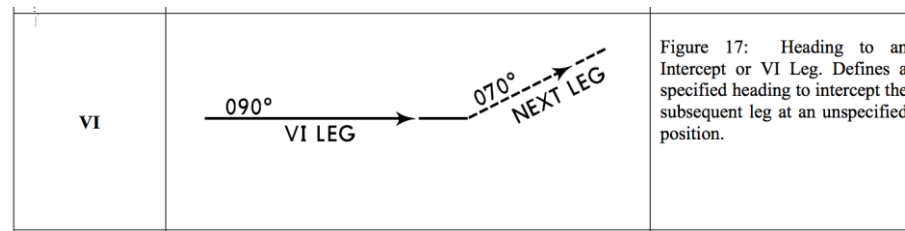


Figure 17: Heading to an Intercept or VI Leg. Defines a specified heading to intercept the subsequent leg at an unspecified position.

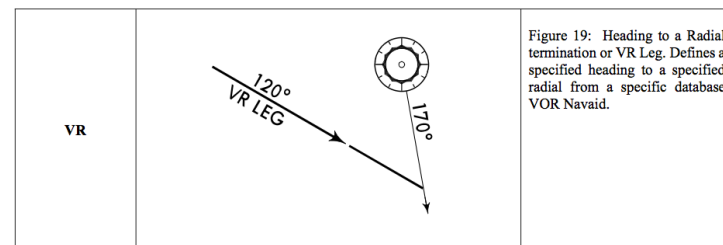


Figure 19: Heading to a Radial termination or VR Leg. Defines a specified heading to a specified radial from a specific database VOR Navaid.

SID IDENT	ROUTE TYPE	TRANS IDENT	SEQ	WAYPOINT		DESC CODE	PATH TERM
KATSO2	1	RW16	010			----	VR
KATSO2	1	RW16	020			----	VI
KATSO2	1	RW16	030	KLAYE	K2 EA	E----	CF
KATSO2	1	RW16	040	KATSO	K2 EA	E E--	TF
KATSO2	1	RW34	010			----	VA
KATSO2	1	RW34	020			----	VI
KATSO2	1	RW34	030	HNW	K2 D	V----	CF
KATSO2	1	RW34	040	KATSO	K2 EA	E E--	TF
KATSO2	2		010	KATSO	K2 EA	E----	IF
KATSO2	2		020	IQIGO	K2 EA	E E--	TF
KATSO2	3	MVA	010	IQIGO	K2 EA	E----	IF
KATSO2	3	MVA	020	MVA	K2 D	V E--	TF
KATSO2	3	OAL	010	IQIGO	K2 EA	E----	IF
KATSO2	3	OAL	020	OAL	K2 D	V E--	TF

Precision Approach Geometry

PRECISION APPROACH PATH POINTS (Straight-In)

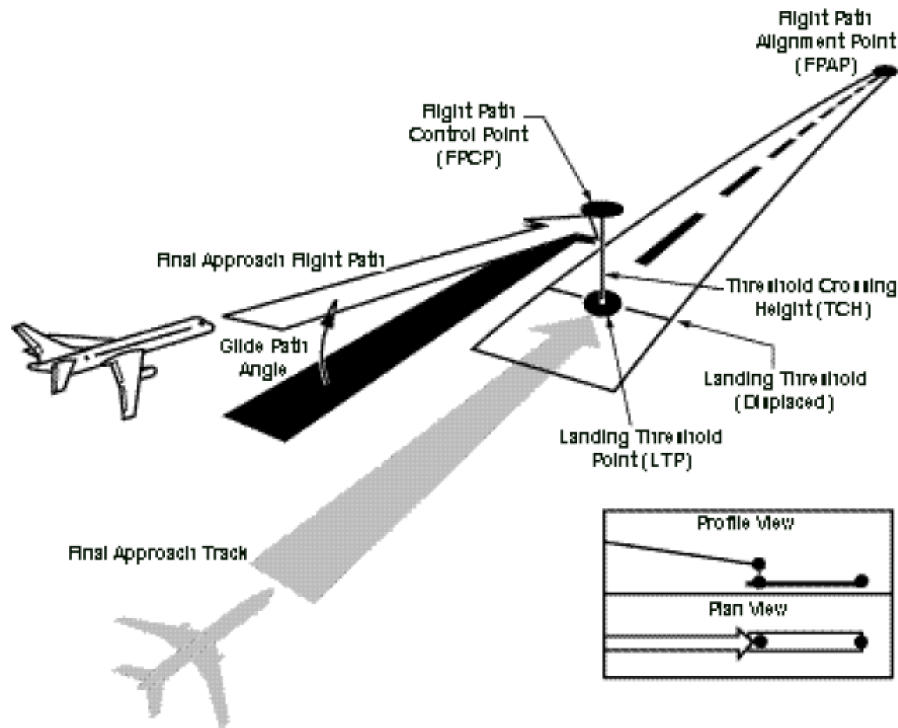
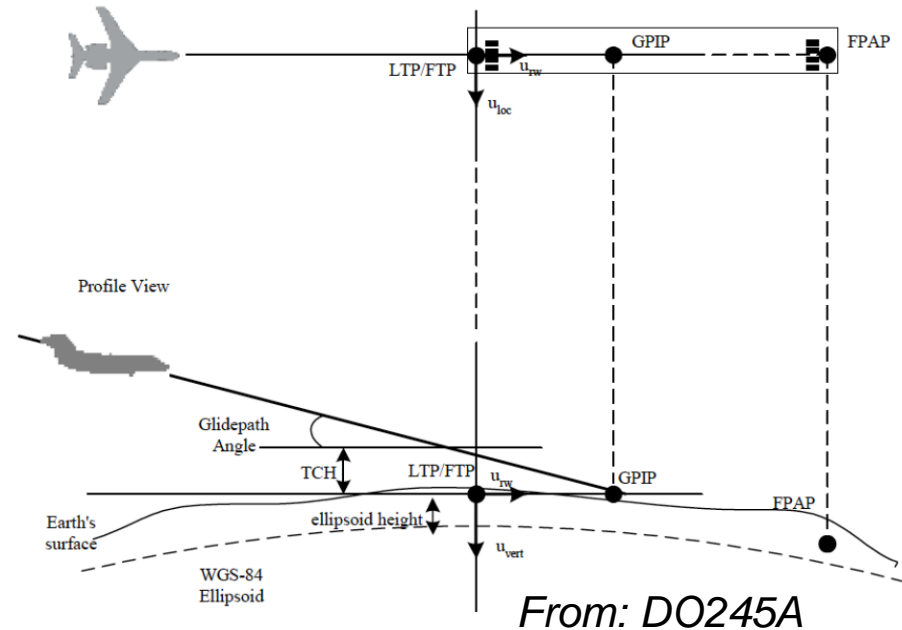


Figure 5-15 Precision Approach Path Points

From: ARINC 424



GPIP: Glide path interception point

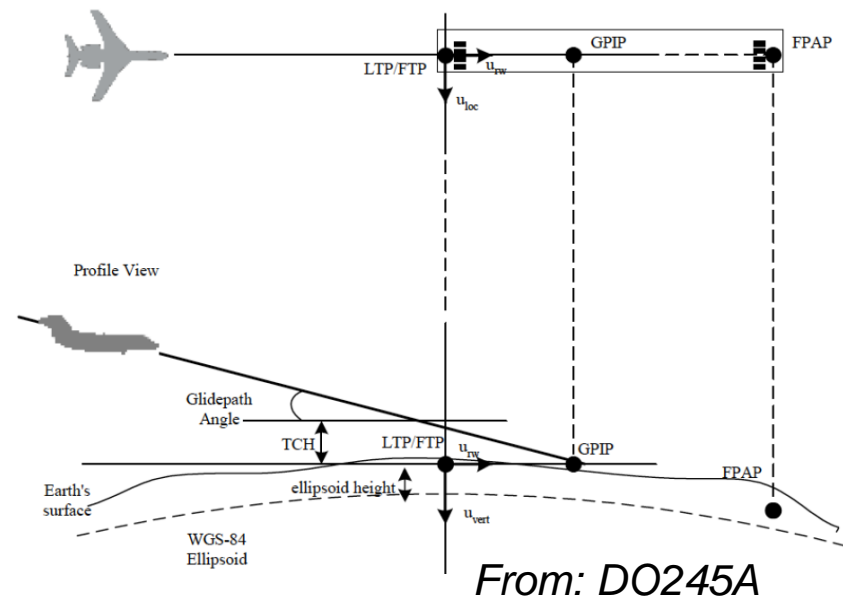
Data Record – PATH

4.1.28.1 Path Point Primary Records

Column	Field Name (Length)	Reference
1	Record Type (1)	5.2
2 thru 4	Customer/Area Code (3)	5.3
5	Section Code (1)	5.4
6	Blank (1)	
7 thru 10	*Airport Identifier (4)	5.6
11 thru 12	ICAO Code (2)	5.14
13	Subsection Code (1)	5.5
14 thru 19	Approach Procedure Ident (6)	5.10
20 thru 24	*Runway or Helipad Identifier (5) Note 3	5.46 or 5.180
25 thru 26	*Operation Type (2)	5.223
27	Continuation Record Number (1)	5.16
28	*Route Indicator (1)	5.224
29 thru 30	*SBAS Service Provider Identifier (2)	5.255
31 thru 32	*Reference Path Data Selector (2)	5.256
33 thru 36	*Reference Path Identifier (4)	5.257
37	*Approach Performance Designator (1)	5.258
38 thru 48	*Landing Threshold Point Latitude (11)	5.267
49 thru 60	*Landing Threshold Point Longitude (12)	5.268
61 thru 66	*(LTP) Ellipsoid Height (6)	5.225
67 thru 70	*Glide Path Angle (4)	5.226
71 thru 81	*Flight Path Alignment Point Latitude (11)	5.267
82 thru 93	*Flight Path Alignment Point Longitude (12)	5.268
94 thru 98	*Course Width at Threshold (5)	5.228
	Note 4	
99 thru 102	*Length Offset (4)	5.259
103 thru 108	*Path Point TCH (6)	5.265
109	*TCH Units Indicator (1)	5.266
110 thru 112	*HAL (3)	5.263
113 thru 115	*VAL (3)	5.264
116 thru 123	SBAS FAS Data CRC Remainder (8)	5.229
124 thru 128	File Record Number (5)	5.31
129 thru 132	Cycle Date (4)	5.32

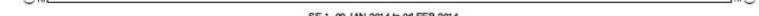
4.1.28.2 Path Point Continuation Records

Column	Field Name (Length)	Reference
1 thru 26	Fields as on Primary Record Type	
27	Continuation Record Number (1)	5.16
28	Application Type (1)	5.91
29 thru 34	(FPAP) Ellipsoid Height (6)	5.225
35 thru 40	(FPAP) Orthometric Height (6)	5.227
41 thru 46	(LTP) Orthometric Height (6)	5.227
47 thru 56	Approach Type Identifier (10)	5.262
57 thru 61	GNSS Channel Number (5)	5.244
62 thru 71	Blank (Spacing) (10)	
72 thru 74	Helicopter Procedure Course (3)	5.269
75 thru 123	Blank (Spacing) (49)	
124 thru 128	File Record Number (5)	5.31
129 thru 132	Cycle Date (4)	5.32



Flight Plan Construction

- Charted procedure are translated into a sequence of ARINC 424 legs in the Navigation Database
- Flight plans are entered into the FMS by calling procedures from the navigation database
- Procedure segments are chained together (or melded) to form the FMS flight plan



Flight Plan Procedure Melding

- Procedures are chained together to form the FMS flight plan. Example :

