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Lufthansa Systems FMS Workshop Greater China

Zhuhai 06.03. – 08.03.2013

Martin Zillig
Head of Navigational Data Standards - Lufthansa Systems FlightNav Inc.

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汉莎系统FMS大中华区研讨会

珠海 2013年3月6日－8日

Martin Zillig
导航数据标准室主任– 汉莎系统FlightNav公司

Agenda

Source to Database

- General Aspects
- Data filtering during production
- Identifier of Database Elements – Naming Convention
- Magnetic Bearing and Magnetic Variation

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议程

数据库来源

- 概况
- 生成时的数据过滤
- 数据库元素的标识—命名规则
- 磁方位和磁差

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Source to Database

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Identifier of Database Elements – Naming Convention

Magnetic Bearing and Magnetic Variation

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磁方位和磁差

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Source to Database – General Aspects（1）

- **Sources** to navigation data and related elements are widespread throughout a **wealth of documents**, published at different times in different formats and different languages. Even within one country different authorities and providers may publish information

- Some sources are **not public** (military, domestic AIPs)

- **PBN requires precis**e and **reliable data**. Contrary to conventional procedures, the data houses are not allowed to calculate coordinates for fixes or runway thresholds for RNP or RNP AR approach procedure. **State-provided threshold coordinates are required to ensure required integrity levels for PBN compliant operation!**

- **Timeliness of publication** is **extremely critical** to onboard Navigation Databases due to the production lead time of nearly 28 days (ICAO Annex 15 Rules)

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数据库来源—概况（1）

- 导航数据的来源和相关元素，大量散布在以不同形式和语言、各时间发布的文件中。甚至在同一国家，也可以由不同机构和不同供应者发布信息。
- 有些来源是不公开的（军事，本国**AIP**）
- **PBN**需要精确和可靠的数据。相比传统程序，数据仓库不允许计算定位点、RNP APCH或RNP AR进近程序的跑道入口的坐标。由国家提供的入口坐标，必须保证**PBN**运行的完好性等级。
- 公布信息的时效性对机载导航数据库非常关键，因为制作交付周期约为**28**天（**ICAO**附件**15**规定）。

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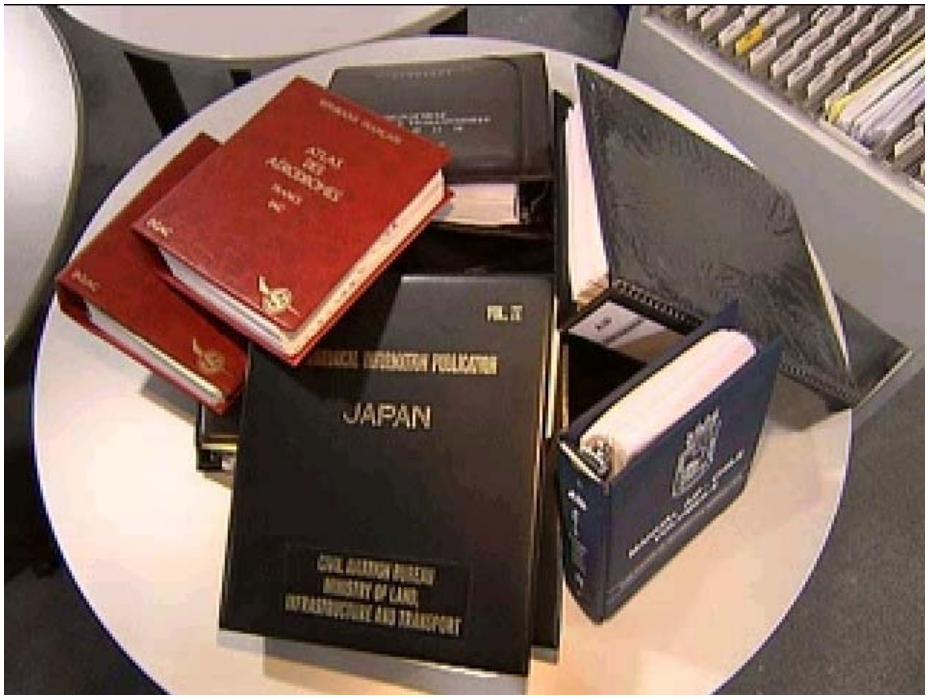
Source to Database – General Aspects（2）

- AIP
- AMDT / SUP
- AIC
- NOTAM
- Military AIP
- Internet (electronic AIP)



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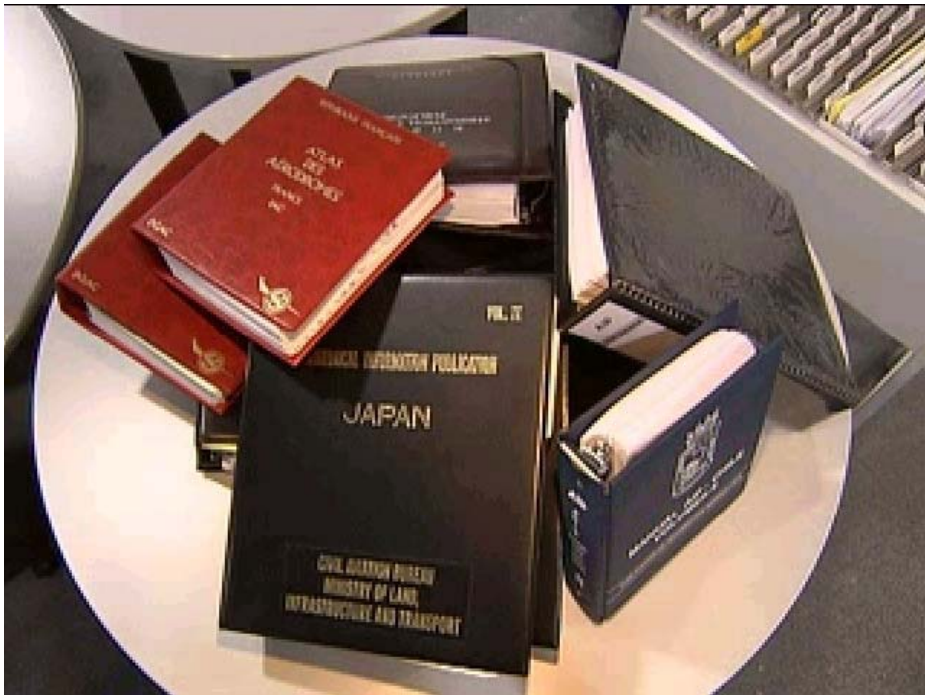
数据库来源—概况（2）

- 航行资料汇编（**AIP**）
- 修订/补充（**AMDT / SUP**）
- 航行资料通告（**AIC**）
- **NOTAM**
- 军事**AIP**
- 因特网(电子**AIP**)



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Source to Database – General Aspects（3）

1 procedure – 5 sources to build it!

Example: ILS/DME approach RWY 16 LSZH

Coding of final and missed approach in LSY FN database:

Airport	Type	SubType	Proc ID	Trans	Customer	Rte Type	AC Cat	Q1	Q2	JetProp	TCH	Overlay	ATC	VIS	TA / TL	Dist
LSZH	F	I	I16			I	ABCD		S	A	54		☐	☐		24.4

Seq	Fix	Ctry	Type	D	E	S	C	_	RecNa	Ctr	Type_	Theta	Rho	PT	RNP	T	V	MagTr	Dist	Ex	Altl	Alt1	Alt2	MEA	MOCA	Angle	SD	SPD	CtrFix	Ctry__	Type__
10	ENUSO	LS	PC	E			I	P	IZH	LS	PI	334.0	10.2	IF				.0	.0		I	04000	04000								
20	IZH03	LS	PC	E			F		IZH	LS	PI	334.0	5.0	CF				154.0	005.2		G	04000	02340			-3.00					
30	RW16	LS	PG	G			M		IZH	LS	PI	334.0	2.2	CF				154.0	002.8			01444				-3.00					
40	IZH22	LS	PC	E	Y	M			KLO	LS	D	148.7	1.3	CF				154.0	002.4		+	A0400									
45												360.0	.0	CI		L	Y	65.0	.0								-	210			
50	ZUE5	LS	PC	E					ZUE	LS	D	215.0	5.0	CF				35.0	009.0		-	05000									
60	ZUE	LS	D	V					ZUE	LS	D	360.0	.0	TF				34.9	5.0		+	06000									
70	AMIKI	LS	EA	E	E		H		ZUE	LS	D	95.9	9.0	TF				95.9	9.0			07000									

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数据库来源—概况（3）

1 个程序 – 5 个来源构建

举例: ILS/DME 进近 RWY 16 LSZH

LSY FN数据库中最后段和复飞进近的编码

Airport	Type	SubType	Proc ID	Trans	Customer	Rte Type	AC Cat	Q1	Q2	JetProp	TCH	Overlay	ATC	VIS	TA / TL	Dist
LSZH	F	I	I16			I	ABCD		S	A	54					24.4

Seq	Fix	Ctry	Type	D	E	S	C	_	RecNa	Ctr	Type_	Theta	Rho	PT	RNP	T	V	MagTr	Dist	Ex	Alt[	Alt1	Alt2	MEA	MOCA	Angle	SD	SPD	CtrFix	Ctry__	Type__
10	ENUSO	LS	PC	E			I	P	IZH	LS	PI	334.0	10.2	IF				.0	.0		I	04000	04000								
20	IZH03	LS	PC	E			F		IZH	LS	PI	334.0	5.0	CF				154.0	005.2		G	04000	02340			-3.00					
30	RW16	LS	PG	G			M		IZH	LS	PI	334.0	2.2	CF				154.0	002.8			01444				-3.00					
40	IZH22	LS	PC	E	Y	M			KLO	LS	D	148.7	1.3	CF				154.0	002.4		+	A0400									
45												360.0	.0	CI		L	Y	65.0	.0								-	210			
50	ZUE5	LS	PC	E					ZUE	LS	D	215.0	5.0	CF				35.0	009.0		-	05000									
60	ZUE	LS	D	V					ZUE	LS	D	360.0	.0	TF				34.9	5.0		+	06000									
70	AMIKI	LS	EA	E	E		H		ZUE	LS	D	95.9	9.0	TF				95.9	9.0			07000									

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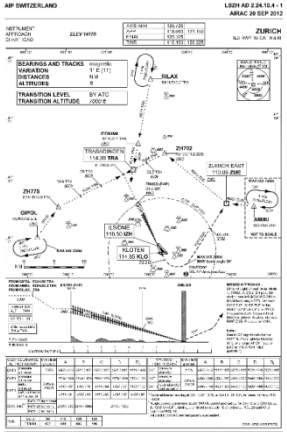
Source to Database – General Aspects（4）

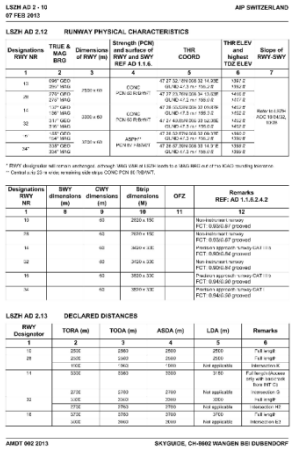
Airport	Type	SubType	Proc ID	Trans	Customer	Rte Type	AC Cat	Q1	Q2	JetProp	TCH	Overlay	ATC	VIS	TA / TL	Dist
LSZH	F	I	I16			I	ABCD		S	A	54		☐	☐		24.4

	Seq	Fix	Ctry	Type	D	E	S	C	_	RecNa	Ctr	Type_	Theta	Rho	PT	RNP	T	V	MagTr	Dist	Ex	Alt[	Alt1	Alt2	MEA	MOCA	Angle	SD	SPD	CtrFix	Ctry__	Type__
▶	10	ENUSO	LS	PC	E			I	P	IZH	LS	PI	334.0	10.2	IF				.0	.0		I	04000	04000								
	20	IZH03	LS	PC	E			F		IZH	LS	PI	334.0	5.0	CF				154.0	005.2		G	04000	02340			-3.00					
	30	RW16	LS	PG	G			M		IZH	LS	PI	334.0	2.2	CF				154.0	002.8			01444				-3.00					
	40	IZH22	LS	PC	E	Y	M			KLO	LS	D	148.7	1.3	CF				154.0	002.4		+	A0400									
	45												360.0	.0	CI		L	Y	65.0	.0								-	210			
	50	ZUE5	LS	PC	E					ZUE	LS	D	215.0	5.0	CF				35.0	009.0		-	05000									
	60	ZUE	LS	D	V					ZUE	LS	D	360.0	.0	TF				34.9	5.0		+	06000									
	70	AMIKI	LS	EA	E	E		H		ZUE	LS	D	95.9	9.0	TF				95.9	9.0			07000									

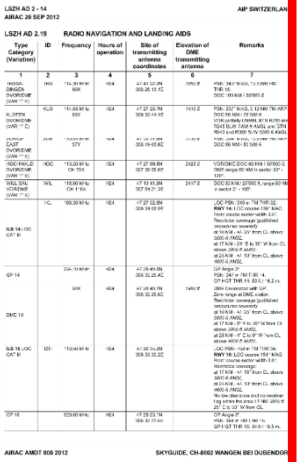
AD 2.24.10.4:
Procedure Chart



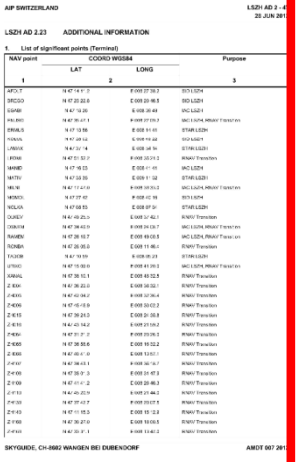
AD 2-10:
Runway data



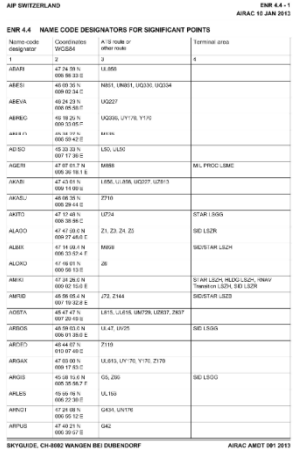
AD 2-14:
Navaid data



AD 2-47:
Terminal WPT



ENR 4.4:
Enroute WPT



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数据库来源—概况（4）

Airport	Type	SubType	Proc ID	Trans	Customer	Rte Type	AC Cat	Q1	Q2	JetProp	TCH	Overlay	ATC	VIS	TA / TL	Dist
LSZH	F	I	I16			I	ABCD		S	A	54		☐	☐		24.4

Seq	Fix	Ctry	Type	D	E	S	C	_	RecNa	Ctr	Type_	Theta	Rho	PT	RNP	T	V	MagTr	Dist	Ex	Alt[	Alt1	Alt2	MEA	MOCA	Angle	SD	SPD	CtrFix	Ctry__	Type__
10	ENUSO	LS	PC	E			I	P	IZH	LS	PI	334.0	10.2	IF				.0	.0		I	04000	04000								
20	IZH03	LS	PC	E			F		IZH	LS	PI	334.0	5.0	CF				154.0	005.2		G	04000	02340			-3.00					
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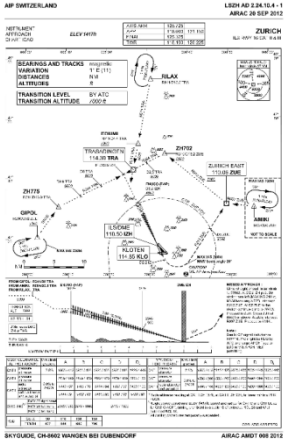
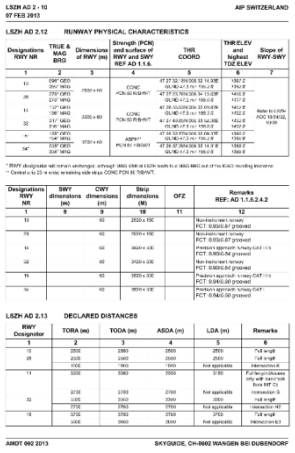
45												360.0	.0	CI		L	Y	65.0	.0								-	210			
50	ZUE5	LS	PC	E					ZUE	LS	D	215.0	5.0	CF				35.0	009.0		-	05000									
60	ZUE	LS	D	V					ZUE	LS	D	360.0	.0	TF				34.9	5.0		+	06000									
70	AMIKI	LS	EA	E	E		H		ZUE	LS	D	95.9	9.0	TF				95.9	9.0			07000									

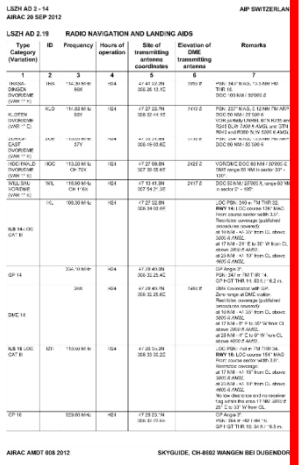
AD 2.24.10.4:
程序图



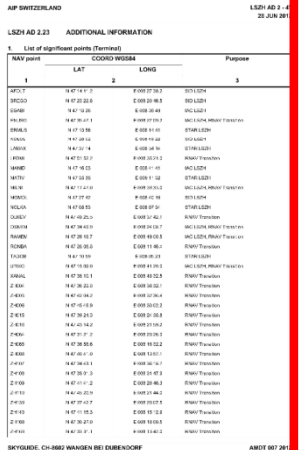
AD 2-10:
跑道数据



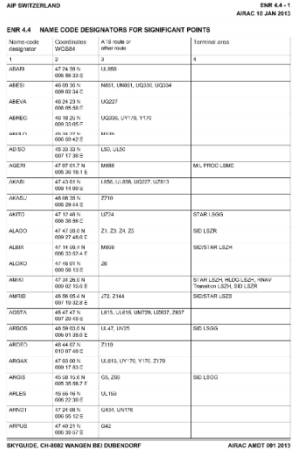
AD 2-14:
导航台数据



AD 2-47:
终端区航路点



ENR 4.4:
航路航路点



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Agenda

Source to Database

- General Aspects
- **Data filtering during production**
- Identifier of Database Elements – Naming Convention
- Magnetic Bearing and Magnetic Variation

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议程

- **数据库来源**
  - 概况
  - **生成时的数据过滤**
  - 数据库元素的标识—命名规则
  - 磁方位和磁差

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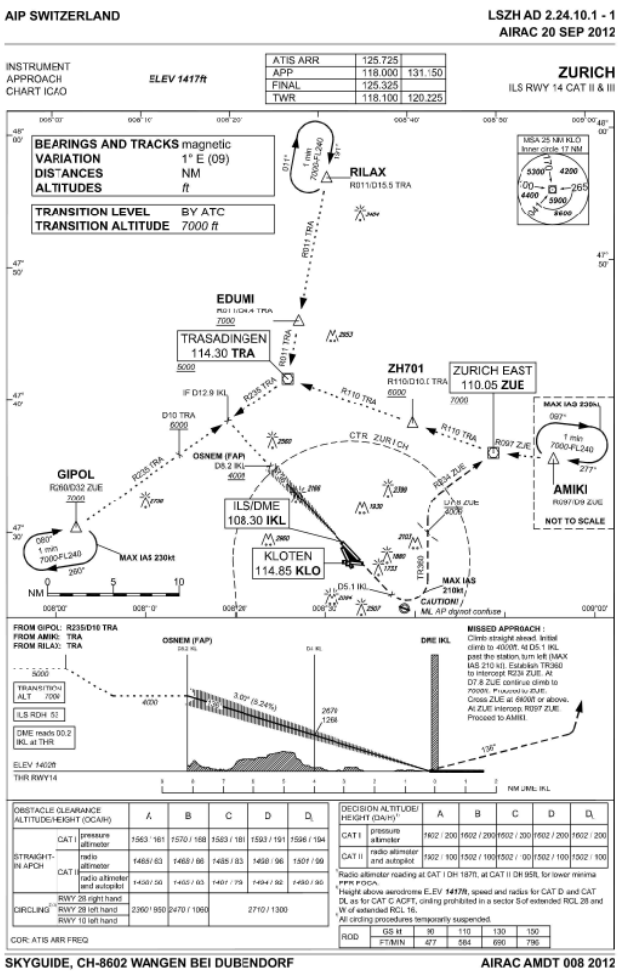
Step 1: Source



AIP SWITZERLAND

LSZH AD 2.24.10.1 - 1
AIRAC 20 SEP 2012

INSTRUMENT APPROACH CHART ICAO

ELEV 1417ft

ATIS ARR	125.725	
APP	118.000	131.150
FINAL	125.325	
TWR	118.100	120.225

ZURICH
ILS RWY 14 CAT II & III

BEARINGS AND TRACKS magnetic
VARIATION 1° E (09)
DISTANCES NM
ALTITUDES ft

TRANSITION LEVEL BY ATC
TRANSITION ALTITUDE 7000 ft

RILAX
R011/D15.5 TRA
1 min 7000-FL240

EDUMI
7000

TRASADINGEN
114.30 TRA
5000

ZH701
R110/D10.1 TRA
6000

ZURICH EAST
110.05 ZUE
7000

IF D12.9 IKL

D10 TRA
6000

OSNEM (FAP)
D8.2 IKL
4000

GIPOL
R060/D32 ZUE
7000

ILS/DME
108.30 IKL

KLOTEN
114.85 KLO

AMIKI
R097/D9 ZUE

MAX IAS 230kt

MAX IAS 210kt

CAUTION! ML AP diginot confuse

NOT TO SCALE

NM 0 5 10

FROM GIPOL: R235/D10 TRA
FROM AMIK: TRA
FROM RILAX: TRA

TRANSITION ALT 7000
ILS RDH 52
DME reads 00.2 IKL at THR
ELEV 1402ft
THR RWY14

MISSED APPROACH : Climb straight ahead, initial climb to 4000ft, til DS.1 IKL, past the station, turn left (MAX IAS 210 kt). Establish TR360 to intercept R234 ZUE. At D7.8 ZUE continue climb to 7000ft. Proceed to ZUE. Cross ZUE at 6600ft or above. At ZUE intercep. R097 ZUE. Proceed to AMIKI.

OBSTACLE CLEARANCE ALTITUDE/HEIGHT (OCA/H)			A	B	C	D	D_L
STRAIGHT-IN APCH	CAT I	pressure altimeter	1563 / 161	1570 / 168	1583 / 181	1593 / 191	1596 / 194
	CAT I	radio altimeter	1465 / 63	1468 / 66	1485 / 83	1498 / 96	1501 / 99
		radio altimeter and autopilot	1460 / 58	1463 / 61	1481 / 79	1494 / 92	1498 / 96
CIRCLING		RWY 28 right hand					
		RWY 28 left hand	2360 / 958	2470 / 1068	2710 / 1300		
		RWY 10 left hand					

COR: ATIS ARR FREQ

DECISION ALTITUDE/ HEIGHT (DA/H)[1]			A	B	C	D	D_L
CAT I	pressure altimeter		1602 / 200	1602 / 200	1602 / 200	1602 / 200	1602 / 200
CAT II	radio altimeter and autopilot		1502 / 100	1502 / 100	1502 / 100	1502 / 100	1502 / 100

[1] Radio altimeter reading at CAT I DH 187ft, at CAT II DH 95ft, for lower minima PER FOCA.
[2] Height above aerodrome ELEV 1417ft, speed and radius for CAT D and CAT DL as for CAT C AOFT, circling prohibited in a sector S of extended RCL 28 and W of extended RCL 16.
[3] All circling procedures temporarily suspended.

ROD	GS kt	90	110	130	150
	FT/MIN	477	584	690	796

SKYGUIDE, CH-8602 WANGEN BEI DUBENDORF

AIRAC AMDT 008 2012

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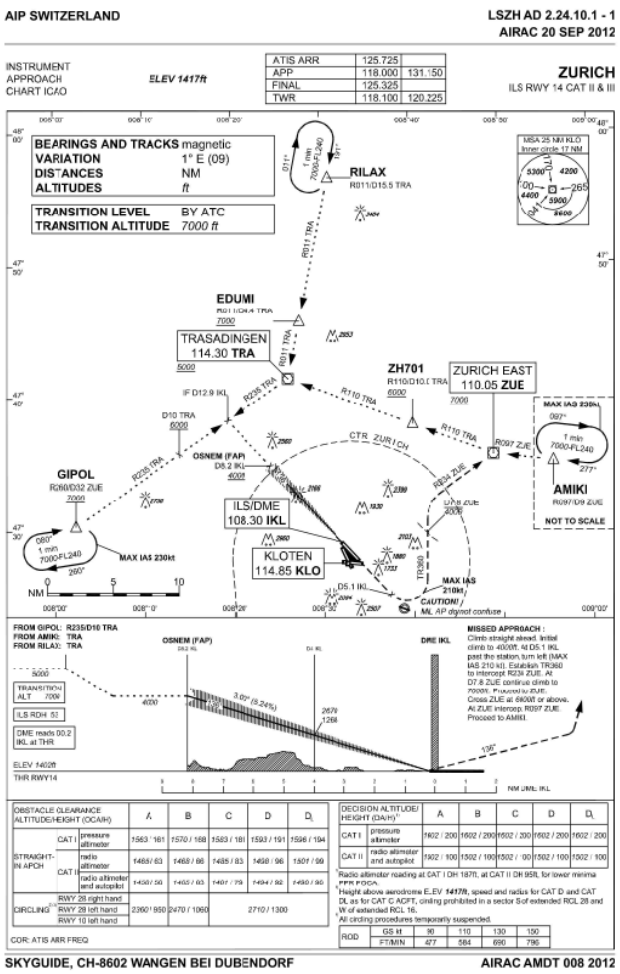
步骤1：来源



AIP SWITZERLAND

LSZH AD 2.24.10.1 - 1
AIRAC 20 SEP 2012

INSTRUMENT APPROACH CHART ICAO

ELEV 1417ft

ATIS ARR	125.725	
APP	118.000	131.150
FINAL	125.325	
TWR	118.100	120.225

ZURICH
ILS RWY 14 CAT II & III

BEARINGS AND TRACKS magnetic
VARIATION 1° E (09)
DISTANCES NM
ALTITUDES ft

TRANSITION LEVEL BY ATC
TRANSITION ALTITUDE 7000 ft

RILAX
R011/D15.5 TRA

EDUMI
7000

TRASADINGEN
114.30 TRA
5000

ZH701
R110/D10.(TRA
6000

ZURICH EAST
110.05 ZUE
7000

IF D12.9 IKL

D10 TRA
6000

OSNEM (FAP)
D8.2 IKL
4000

GIPOL
R060/D32 ZUE
7000

ILS/DME
108.30 IKL

KLOTEN
114.85 KLO

AMIKI
R097/D9 ZUE

MAX IAS 230kt

MAX IAS 210kt

CAUTION!
ML AP glyphd confuse

NOT TO SCALE

FROM GIPOL: R235/D10 TRA
FROM AMIK: TRA
FROM RILAX: TRA

MISSED APPROACH :
Climb straight ahead, initial climb to 4000ft, til DS.1 IKL, past the station, turn left (MAX IAS 210 kt). Establish TR360 to intercept R234 ZUE. At D7.8 ZUE continue climb to 7000ft. Proceed to ZUE. Cross ZUE at 6600ft or above. At ZUE intercep. R097 ZUE. Proceed to AMIKI.

TRANSITION ALT 7000
ILS RDH 52
DME reads 00.2 IKL at THR
ELEV 1402ft
THR RWY14

OBSTACLE CLEARANCE ALTITUDE/HEIGHT (OCA/H)		A	B	C	D	D_L
STRAIGHT-IN APCH	CAT I pressure altimeter	1563 / 161	1570 / 168	1583 / 181	1593 / 191	1596 / 194
	CAT I radio altimeter	1465 / 63	1468 / 66	1485 / 83	1498 / 96	1501 / 99
	CAT I radio altimeter and autopilot	1450 / 50	1453 / 53	1467 / 79	1494 / 92	1490 / 90
CIRCLING	RWY 28 right hand					
	RWY 28 left hand	2360 / 950	2470 / 1060	2710 / 1300		
	RWY 10 left hand					

COR: ATIS AIR FREQ

DECISION ALTITUDE/HEIGHT (DA/H)		A	B	C	D	D_L
CAT I	pressure altimeter	1602 / 200	1602 / 200	1602 / 200	1602 / 200	1602 / 200
CAT II	radio altimeter and autopilot	1502 / 100	1502 / 100	1502 / 100	1502 / 100	1502 / 100

Radio altimeter reading at CAT I DH 187ft, at CAT II DH 95ft, for lower minima see FPF PDGA.
Height above aerodrome E.EV 1417ft, speed and radius for CAT D and CAT DL as for CAT C AOFT, circling prohibited in a sector S of extended RCL 28 and W of extended RCL 16.
All circling procedures temporarily suspended.

ROD	GS kt	90	110	130	150
	FT/MIN	427	584	690	796

SKYGUIDE, CH-8602 WANGEN BEI DUBENDORF

AIRAC AMDT 008 2012

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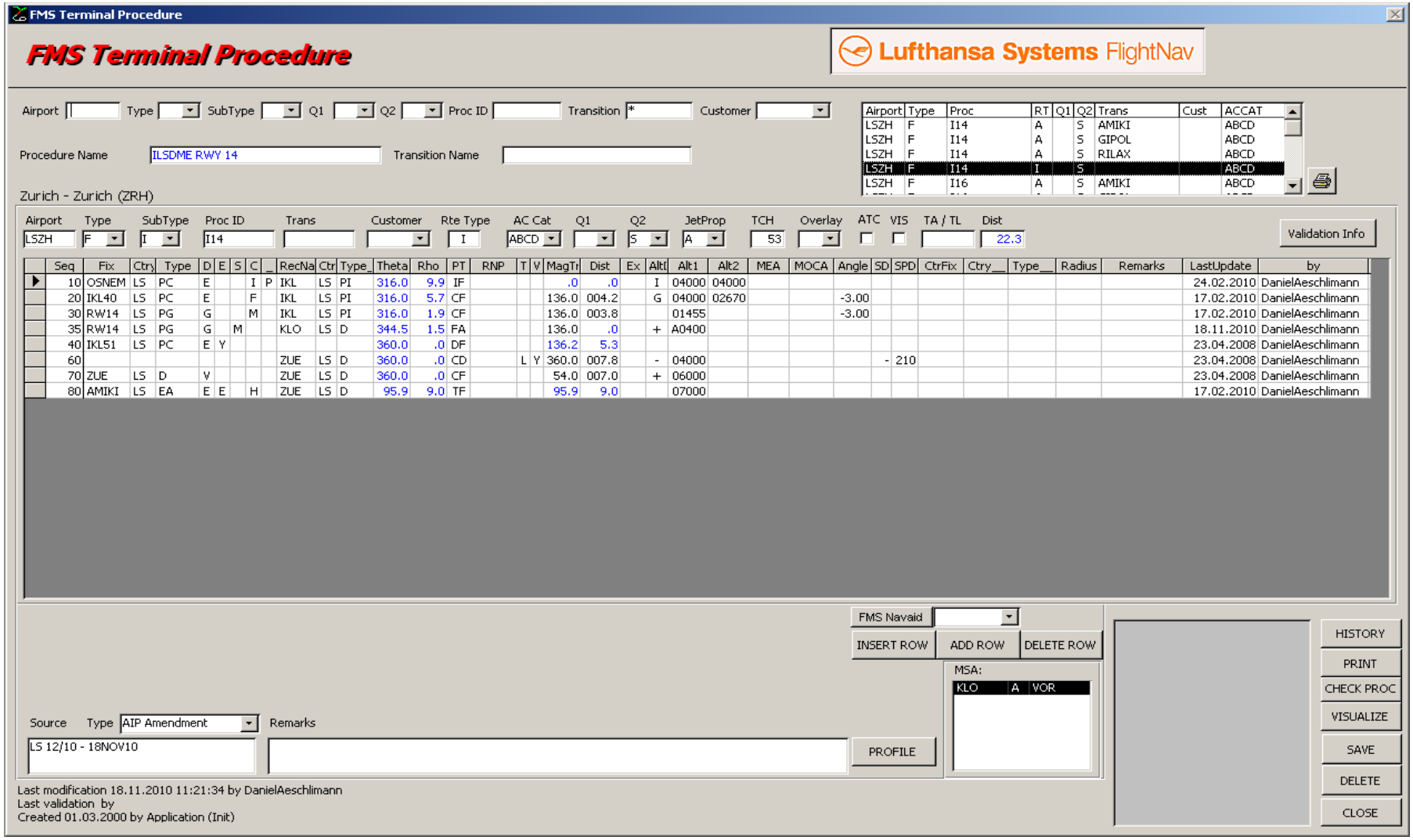
Step 2: Data Maintenance Application



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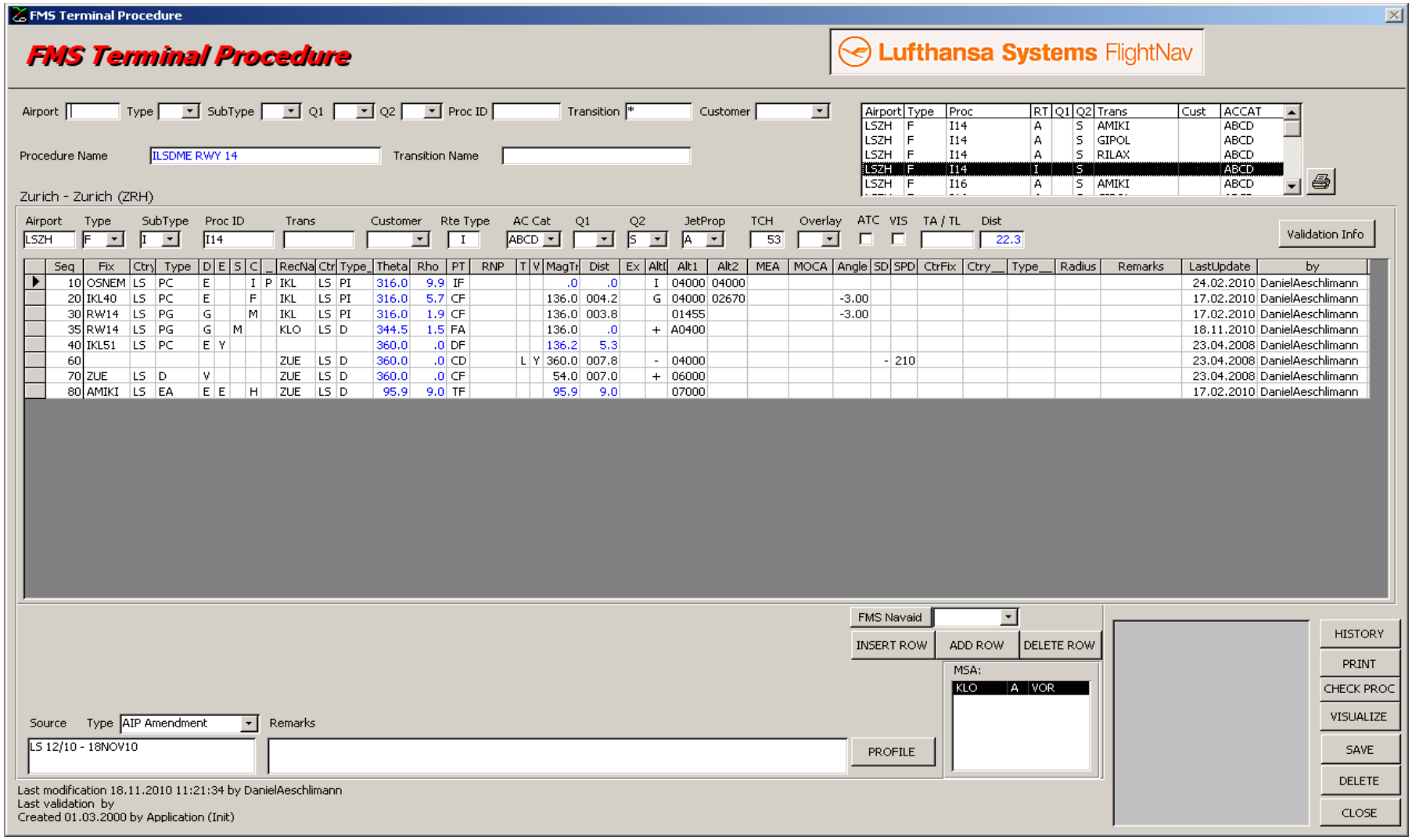
步骤2：数据维护应用



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Step 3: ARINC 424 File

```
SEURP LSZHLSFI14   AAMIKI 010AMIKILSEA0E  H    IF                                                                  U  S   648321109
SEURP LSZHLSFI14   AAMIKI 020ZUE  LSD 0V       TF                                  + 07000                         U  S   648331109
SEURP LSZHLSFI14   AAMIKI 025ZH701LSPC0E       TF                                  + 06000                         U  S   648341109
SEURP LSZHLSFI14   AAMIKI 027TRA  LSD 0V       TF                                  + 05000                         U  S   648351109
SEURP LSZHLSFI14   AAMIKI 030IKL13LSPC0E       TF                                                                  U  S   648361109
SEURP LSZHLSFI14   AAMIKI 040OSNEMLSPC0EE      CF IKL LS      0010001013600047PI   + 04000                         U  S   648371109
SEURP LSZHLSFI14   AGIPOL 010GIPOLLSEA0E  H    IF                                  + 07000                         U  S   648381109
SEURP LSZHLSFI14   AGIPOL 020TRA10LSPC0E       TF                                  + 06000                         U  S   648391109
SEURP LSZHLSFI14   AGIPOL 030IKL13LSPC0E       TF                                                                  U  S   648401109
SEURP LSZHLSFI14   AGIPOL 040OSNEMLSPC0EE      CF IKL LS      0010001013600047PI   + 04000                         U  S   648411109
SEURP LSZHLSFI14   ARILAX 010RILAXEDEA0E  H    IF                                                                  U  S   648421109
SEURP LSZHLSFI14   ARILAX 015EDUMIEDEA0E       TF                                  + 07000                         U  S   648431109
SEURP LSZHLSFI14   ARILAX 020TRA  LSD 0V       TF                                  + 05000                         U  S   648441109
SEURP LSZHLSFI14   ARILAX 030IKL13LSPC0E       TF                                                                  U  S   648451109
SEURP LSZHLSFI14   ARILAX 040OSNEMLSPC0EE      CF IKL LS      0010001013600047PI   + 04000                         U  S   648461109
SEURP LSZHLSFI14   I      010OSNEMLSPC0E  I    IF IKL LS      00100010        PI   I 0400004000                    U  S   648471004
SEURP LSZHLSFI14   I      020IKL40LSPC0E  F    CF IKL LS      0010001013600042PI   G 0400002670        -300        U  S   648480806
SEURP LSZHLSFI14   I      030RW14 LSPG0G  M    CF IKL LS      0010001013600038PI     01455             -300        U  S   648490806
SEURP LSZHLSFI14   I      035RW14 LSPG0G M     FA KLO LS      001000101360    D    + 01817                         U  S   648501109
SEURP LSZHLSFI14   I      040IKL51LSPC0EY      DF                                                                  U  S   648510809
SEURP LSZHLSFI14   I      060         0    L   CDYZUE LS              36000078D    - 04000          210            U- S   648520809
SEURP LSZHLSFI14   I      070ZUE  LSD 0V       CF ZUE LS      0010001005400070D    + 06000                         U  S   648530809
SEURP LSZHLSFI14   I      080AMIKILSEA0EE H    TF                                    07000                         U  S   648541003
SEURP LSZHLSFI16   AAMIKI 010AMIKILSEA0E  H    IF                                                                  U  S   648551109
SEURP LSZHLSFI16   AAMIKI 020ZUE  LSD 0V       TF                                  + 07000                         U  S   648561109
SEURP LSZHLSFI16   AAMIKI 030ZH702LSPC0E       TF                                  + 06000                         U  S   648571109
SEURP LSZHLSFI16   AAMIKI 035TRA25LSPC0E       TF                                  + 05000                         U  S   648581109
SEURP LSZHLSFI16   AAMIKI 036TRA  LSD 0V       TF                                                                  U  S   648591109
SEURP LSZHLSFI16   AAMIKI 037IZH13LSPC0E       TF                                                                  U  S   648601109
SEURP LSZHLSFI16   AAMIKI 040ENUSOLSPC0EE      CF IZH LS      0010001015400053PI   + 04000                         U  S   648611109
SEURP LSZHLSFI16   AGIPOL 010GIPOLLSEA0E  H    IF                                  + 07000                         U  S   648621109
SEURP LSZHLSFI16   AGIPOL 020ZH775LSPC0E       TF                                                                  U  S   648631109
SEURP LSZHLSFI16   AGIPOL 030TRA98LSPC0E       TF                                  + 06000                         U  S   648641109
SEURP LSZHLSFI16   AGIPOL 035TRA06LSPC0E       TF                                  + 05000                         U  S   648651109
SEURP LSZHLSFI16   AGIPOL 040IZH13LSPC0E       TF                                                                  U  S   648661109
SEURP LSZHLSFI16   AGIPOL 050ENUSOLSPC0EE      CF IZH LS      0010001015400053PI   + 04000                         U  S   648671109
SEURP LSZHLSFI16   ARILAX 010RILAXEDEA0E  H    IF                                                                  U  S   648681109
SEURP LSZHLSFI16   ARILAX 020EDUMIEDEA0E       TF                                  + 07000                         U  S   648691109
SEURP LSZHLSFI16   ARILAX 025TRA  LSD 0V       TF                                  + 05000                         U  S   648701109
SEURP LSZHLSFI16   ARILAX 040ENUSOLSPC0EE      CF IZH LS      0010001015400040PI   + 04000                         U  S   648711109
SEURP LSZHLSFI16   I      010ENUSOLSPC0E  I    IF IZH LS      00100010        PI   I 0400004000                    U  S   648721004
SEURP LSZHLSFI16   I      020IZH03LSPC0E  F    CF IZH LS      0010001015400052PI   G 0400002340        -300        U  S   648730708
SEURP LSZHLSFI16   I      030RW16 LSPG0G  M    CF IZH LS      0010001015400028PI     01444             -300        U  S   648740708
SEURP LSZHLSFI16   I      040IZH22LSPC0EYM     CF KLO LS      0010001015400024D    + 01817                         U  S   648751109
```


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步骤3：ARINC 424 文件

```
SEURP LSZHLSFI14   AAMIKI 010AMIKILSEA0E  H    IF                                                                  U  S   648321109
SEURP LSZHLSFI14   AAMIKI 020ZUE  LSD 0V       TF                                  + 07000                         U  S   648331109
SEURP LSZHLSFI14   AAMIKI 025ZH701LSPC0E       TF                                  + 06000                         U  S   648341109
SEURP LSZHLSFI14   AAMIKI 027TRA  LSD 0V       TF                                  + 05000                         U  S   648351109
SEURP LSZHLSFI14   AAMIKI 030IKL13LSPC0E       TF                                                                  U  S   648361109
SEURP LSZHLSFI14   AAMIKI 040OSNEMLSPC0EE      CF IKL LS      0010001013600047PI   + 04000                         U  S   648371109
SEURP LSZHLSFI14   AGIPOL 010GIPOLLSEA0E  H    IF                                  + 07000                         U  S   648381109
SEURP LSZHLSFI14   AGIPOL 020TRA10LSPC0E       TF                                  + 06000                         U  S   648391109
SEURP LSZHLSFI14   AGIPOL 030IKL13LSPC0E       TF                                                                  U  S   648401109
SEURP LSZHLSFI14   AGIPOL 040OSNEMLSPC0EE      CF IKL LS      0010001013600047PI   + 04000                         U  S   648411109
SEURP LSZHLSFI14   ARILAX 010RILAXEDEA0E  H    IF                                                                  U  S   648421109
SEURP LSZHLSFI14   ARILAX 015EDUMIEDEA0E       TF                                  + 07000                         U  S   648431109
SEURP LSZHLSFI14   ARILAX 020TRA  LSD 0V       TF                                  + 05000                         U  S   648441109
SEURP LSZHLSFI14   ARILAX 030IKL13LSPC0E       TF                                                                  U  S   648451109
SEURP LSZHLSFI14   ARILAX 040OSNEMLSPC0EE      CF IKL LS      0010001013600047PI   + 04000                         U  S   648461109
SEURP LSZHLSFI14   I      010OSNEMLSPC0E  I    IF IKL LS      00100010        PI   I 0400004000                    U  S   648471004
SEURP LSZHLSFI14   I      020IKL40LSPC0E  F    CF IKL LS      0010001013600042PI   G 0400002670        -300        U  S   648480806
SEURP LSZHLSFI14   I      030RW14 LSPG0G  M    CF IKL LS      0010001013600038PI     01455            -300        U  S   648490806
SEURP LSZHLSFI14   I      035RW14 LSPG0G M     FA KLO LS      001000101360    D    + 01817                         U  S   648501109
SEURP LSZHLSFI14   I      040IKL51LSPC0EY      DF                                                                  U  S   648510809
SEURP LSZHLSFI14   I      060         0    L   CDYZUE LS              36000078D    - 04000          210            U- S   648520809
SEURP LSZHLSFI14   I      070ZUE  LSD 0V       CF ZUE LS      0010001005400070D    + 06000                         U  S   648530809
SEURP LSZHLSFI14   I      080AMIKILSEA0EE H    TF                                    07000                         U  S   648541003
SEURP LSZHLSFI16   AAMIKI 010AMIKILSEA0E  H    IF                                                                  U  S   648551109
SEURP LSZHLSFI16   AAMIKI 020ZUE  LSD 0V       TF                                  + 07000                         U  S   648561109
SEURP LSZHLSFI16   AAMIKI 030ZH702LSPC0E       TF                                  + 06000                         U  S   648571109
SEURP LSZHLSFI16   AAMIKI 035TRA25LSPC0E       TF                                  + 05000                         U  S   648581109
SEURP LSZHLSFI16   AAMIKI 036TRA  LSD 0V       TF                                                                  U  S   648591109
SEURP LSZHLSFI16   AAMIKI 037IZH13LSPC0E       TF                                                                  U  S   648601109
SEURP LSZHLSFI16   AAMIKI 040ENUSOLSPC0EE      CF IZH LS      0010001015400053PI   + 04000                         U  S   648611109
SEURP LSZHLSFI16   AGIPOL 010GIPOLLSEA0E  H    IF                                  + 07000                         U  S   648621109
SEURP LSZHLSFI16   AGIPOL 020ZH775LSPC0E       TF                                                                  U  S   648631109
SEURP LSZHLSFI16   AGIPOL 030TRA98LSPC0E       TF                                  + 06000                         U  S   648641109
SEURP LSZHLSFI16   AGIPOL 035TRA06LSPC0E       TF                                  + 05000                         U  S   648651109
SEURP LSZHLSFI16   AGIPOL 040IZH13LSPC0E       TF                                                                  U  S   648661109
SEURP LSZHLSFI16   AGIPOL 050ENUSOLSPC0EE      CF IZH LS      0010001015400053PI   + 04000                         U  S   648671109
SEURP LSZHLSFI16   ARILAX 010RILAXEDEA0E  H    IF                                                                  U  S   648681109
SEURP LSZHLSFI16   ARILAX 020EDUMIEDEA0E       TF                                  + 07000                         U  S   648691109
SEURP LSZHLSFI16   ARILAX 025TRA  LSD 0V       TF                                  + 05000                         U  S   648701109
SEURP LSZHLSFI16   ARILAX 040ENUSOLSPC0EE      CF IZH LS      0010001015400040PI   + 04000                         U  S   648711109
SEURP LSZHLSFI16   I      010ENUSOLSPC0E  I    IF IZH LS      00100010        PI   I 0400004000                    U  S   648721004
SEURP LSZHLSFI16   I      020IZH03LSPC0E  F    CF IZH LS      0010001015400052PI   G 0400002340        -300        U  S   648730708
SEURP LSZHLSFI16   I      030RW16 LSPG0G  M    CF IZH LS      0010001015400028PI     01444            -300        U  S   648740708
SEURP LSZHLSFI16   I      040IZH22LSPC0EYM     CF KLO LS      0010001015400024D    + 01817                         U  S   648751109
```


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Step 4: Packed FMS Data

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步骤4:打包的 **FMS** 数据

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Step 5: Packed FMS Data

Main Data Report
Approaches

DLH8091101 1
SEP24OCT21/09 - OCT22NOV18/09

Rte Id	Seq No.	PT	Fix Id	FAF MAP	Fix Latitude	Fix Longitude	FO	TD	Mag Crs	Alt Cd	Alt A	Alt B	Vert Ang	RNP	Spd Lmt	Rec Nav	Ds/Tm/ Rho	Theta	MSA Ctr	R T Alt	P T Alt	Eff Cycle
AMIKI	40	TF	TRA		N47-41-22.17	E008-26-13.02				+	5000					TRA						Both
AMIKI	50	TF	IKL13		N47-38-13.09	E008-19-24.45										TRA						Both
AMIKI	60	CF	IKL82		N47-34-46.25	E008-24-08.25			136.0							IKL						Both
GIPOL	10	IF	GIPOL		N47-30-18.97	E008-02-26.92				+	7000					TRA					7000	Both
GIPOL	20	TF	TRA10		N47-35-43.00	E008-14-01.26				+	6000					TRA						Both
GIPOL	30	TF	IKL13		N47-38-13.09	E008-19-24.45										TRA						Both
GIPOL	40	CF	IKL82		N47-34-46.25	E008-24-08.25			136.0							IKL						Both
RILAX	10	IF	RILAX		N47-56-33.97	E008-30-48.95										TRA					7000	Both
RILAX	20	TF	EDUMI		N47-45-40.95	E008-27-30.96				+	7000					TRA						Both
RILAX	30	TF	TRA		N47-41-22.17	E008-26-13.02				+	5000					TRA						Both
RILAX	40	TF	IKL13		N47-38-13.09	E008-19-24.45										TRA						Both
RILAX	50	CF	IKL82		N47-34-46.25	E008-24-08.25			136.0							IKL						Both

Airport Id/ProcId: LSZH I16 std

Rte	Seq	PT	Fix Id	FAF	Fix	Fix	FO	TD	Mag	Alt	Alt	Alt	Vert	RNP	Spd	Rec	Ds/Tm/ Theta	MSA	R T	P T	Eff
				MAP					Crs	Cd	A	B	Ang		Lmt	Nav	Rho	Ctr	Alt	Alt	Cycle
																				7000	Both
																					Both
																					Both
																					Both
																					Both
																					Both
																					Both
																					Both
																				7000	Both
																					Both
																					Both
																					Both
																					Both
																					Both
																					Both
																				7000	Both
																					Both
																					Both
																					Both
																					Both
																					Both
																				7000	Both
																					Both
																					Both
																					Both
																					Both
																					Both

Rte	Seq	PT	Fix Id	FAF	Fix	Fix	FO	TD	Mag	Alt	Alt	Alt	Vert	RNP	Spd	Rec	Ds/Tm/ Theta	MSA	R T	P T	Eff
				MAP					Crs	Cd	A	B	Ang		Lmt	Nav	Rho	Ctr	Alt	Alt	Cycle
																				7000	Both
																					Both
																					Both
																					Both
																					Both

EK20911.001 - Procedures - Approaches For Airport LSZH

Apt	Proc	R	C	Via	Rwy	TrAlt	Fix	Type	T	PT	O	M	Cs/Hd	Alt 1	Alt 2	Dist	Rad	Nav
LSZH	ILS14	B	N	APP	14		IKL82	WPT		IF	N	N		4000				
LSZH	ILS14	B	N	APP	14		IKL40	WPT		CF	N	N	136.0	2670		4.20		IKL
LSZH	ILS14	B	N	APP	14		RW14	RWY		CF	N	N	136.0	1460		3.80		IKL
LSZH	ILS14	B	N	APP	14		RW14	Latitude:N47-28-55.54			N	Y	136.0	1920A				KLO
LSZH	ILS14	B	N	APP	14		IKL51	Longitude:E008-32-09.88			Y	N						
LSZH	ILS14	B	N	APP	14		-----		L	CD	N	N	360.0	4000B		7.80		ZUE
LSZH	ILS14	B	N	APP	14		ZUE	VOR		CF	N	N	54.0	6000A		7.00		ZUE
LSZH	ILS14	B	N	APP	14		AMIKI	WPT		TF	N	N		7000				
LSZH	AMIKI	B	N	APPTRN	14		AMIKI	WPT		IF	N	N						
LSZH	AMIKI	B	N	APPTRN	14		ZUE	VOR		TF	N	N		7000A				
LSZH	AMIKI	B	N	APPTRN	14		ZH701	WPT		TF	N	N		6000A				
LSZH	AMIKI	B	N	APPTRN	14		TRA	VOR		TF	N	N		5000A				
LSZH	AMIKI	B	N	APPTRN	14		IKL13	WPT		TF	N	N						
LSZH	AMIKI	B	N	APPTRN	14		IKL82	WPT		CF	N	N	136.0			4.70		IKL
LSZH	GIPOL	B	N	APPTRN	14		GIPOL	WPT		IF	N	N		7000A				
LSZH	GIPOL	B	N	APPTRN	14		TRA10	WPT		TF	N	N		6000A				
LSZH	GIPOL	B	N	APPTRN	14		IKL13	WPT		TF	N	N						
LSZH	GIPOL	B	N	APPTRN	14		IKL82	WPT		CF	N	N	136.0			4.70		IKL
LSZH	RILAX	B	N	APPTRN	14		RILAX	WPT		IF	N	N						
LSZH	RILAX	B	N	APPTRN	14		EDUMI	WPT		TF	N	N		7000A				
LSZH	RILAX	B	N	APPTRN	14		TRA	VOR		TF	N	N		5000A				

NavDB File Size: 1289472 | NavDB Format: Extended OneMeg | 22 Oct 2009 To 19 Nov 2009 | # of R

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步骤5:打包的 FMS 数据

Main Data Report
Approaches

DLH8091101 1
SEP24OCT21/09 - OCT22NOV18/09

Rte Id	Seq No.	PT	Fix Id	FAF MAP	Fix Latitude	Fix Longitude	FO	TD	Mag Crs	Alt Cd	Alt A	Alt B	Vert Ang	RNP	Spd Lmt	Rec Nav	Ds/Tm/ Rho	Theta	MSA Ctr	R T Alt	P T Alt	Eff Cycle
AMIKI	40	TF	TRA		N47-41-22.17	E008-26-13.02				+	5000					TRA						Both
AMIKI	50	TF	IKL13		N47-38-13.09	E008-19-24.45										TRA						Both
AMIKI	60	CF	IKL82		N47-34-46.25	E008-24-08.25			136.0							IKL						Both
GIPOL	10	IF	GIPOL		N47-30-18.97	E008-02-26.92				+	7000					TRA					7000	Both
GIPOL	20	TF	TRA10		N47-35-43.00	E008-14-01.26				+	6000					TRA						Both
GIPOL	30	TF	IKL13		N47-38-13.09	E008-19-24.45										TRA						Both
GIPOL	40	CF	IKL82		N47-34-46.25	E008-24-08.25			136.0							IKL						Both
RILAX	10	IF	RILAX		N47-56-33.97	E008-30-48.95										TRA					7000	Both
RILAX	20	TF	EDUMI		N47-45-40.95	E008-27-30.96				+	7000					TRA						Both
RILAX	30	TF	TRA		N47-41-22.17	E008-26-13.02				+	5000					TRA						Both
RILAX	40	TF	IKL13		N47-38-13.09	E008-19-24.45										TRA						Both
RILAX	50	CF	IKL82		N47-34-46.25	E008-24-08.25			136.0							IKL						Both

Airport Id/ProcId: LSZH I16 std

Rte	Seq	PT	Fix Id	FAF	Fix	Fix	FO	TD	Mag	Alt	Alt	Alt	Vert	RNP	Spd	Rec	Ds/Tm/ Theta	MSA	R T	P T	Eff
				MAP					Crs	Cd	A	B	Ang		Lmt	Nav	Rho	Ctr	Alt	Alt	Cycle
																				7000	Both
																					Both
																					Both
																					Both
																					Both
																					Both
																					Both
																					Both
																				7000	Both
																					Both
																					Both
																					Both
																					Both
																					Both
																					Both
																				7000	Both
																					Both
																					Both
																					Both
																					Both
																					Both
																				7000	Both
																					Both
																					Both
																					Both
																					Both

Ds/Tm/ Rho	Theta	MSA Ctr	R T Alt	P T Alt	Eff Cycle
				7000	Both
					Both
					Both
					Both
					Both

EK20911.001 - Procedures - Approaches For Airport LSZH

Apt	Proc	R	C	Via	Rwy	TrAlt	Fix	Type	T	PT	O	M	Cs/Hd	Alt 1	Alt 2	Dist	Rad	Nav
LSZH	ILS14	B	N	APP	14		IKL82	WPT		IF	N	N		4000				
LSZH	ILS14	B	N	APP	14		IKL40	WPT		CF	N	N	136.0	2670		4.20		IKL
LSZH	ILS14	B	N	APP	14		RW14	RWY		CF	N	N	136.0	1460		3.80		IKL
LSZH	ILS14	B	N	APP	14		RW14	Latitude:N47-28-55.54			N	Y	136.0	1920A				KLO
LSZH	ILS14	B	N	APP	14		IKL51	Longitude:E008-32-09.88			Y	N						
LSZH	ILS14	B	N	APP	14		-----		L	CD	N	N	360.0	4000B		7.80		ZUE
LSZH	ILS14	B	N	APP	14		ZUE	VOR		CF	N	N	54.0	6000A		7.00		ZUE
LSZH	ILS14	B	N	APP	14		AMIKI	WPT		TF	N	N		7000				
LSZH	AMIKI	B	N	APPTRN	14		AMIKI	WPT		IF	N	N						
LSZH	AMIKI	B	N	APPTRN	14		ZUE	VOR		TF	N	N		7000A				
LSZH	AMIKI	B	N	APPTRN	14		ZH701	WPT		TF	N	N		6000A				
LSZH	AMIKI	B	N	APPTRN	14		TRA	VOR		TF	N	N		5000A				
LSZH	AMIKI	B	N	APPTRN	14		IKL13	WPT		TF	N	N						
LSZH	AMIKI	B	N	APPTRN	14		IKL82	WPT		CF	N	N	136.0			4.70		IKL
LSZH	GIPOL	B	N	APPTRN	14		GIPOL	WPT		IF	N	N		7000A				
LSZH	GIPOL	B	N	APPTRN	14		TRA10	WPT		TF	N	N		6000A				
LSZH	GIPOL	B	N	APPTRN	14		IKL13	WPT		TF	N	N						
LSZH	GIPOL	B	N	APPTRN	14		IKL82	WPT		CF	N	N	136.0			4.70		IKL
LSZH	RILAX	B	N	APPTRN	14		RILAX	WPT		IF	N	N						
LSZH	RILAX	B	N	APPTRN	14		EDUMI	WPT		TF	N	N		7000A				
LSZH	RILAX	B	N	APPTRN	14		TRA	VOR		TF	N	N		5000A				

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Step 6: Data loaded in FMS

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步骤6:加载数据至FMS

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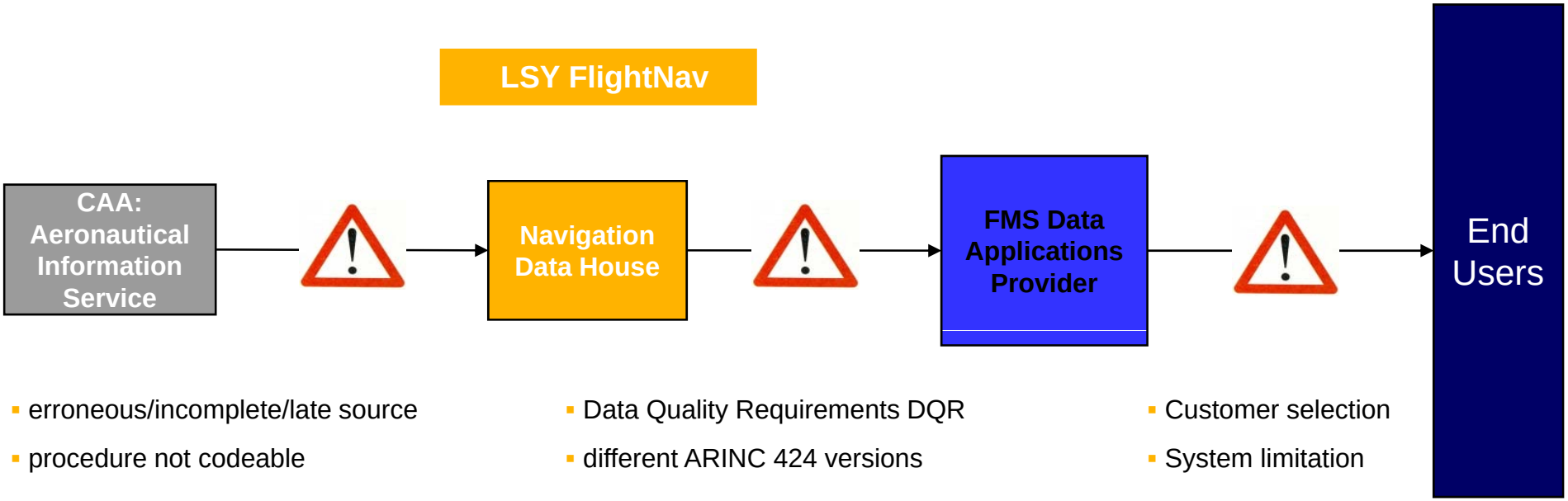
Dataflow and reasons for “missing”data

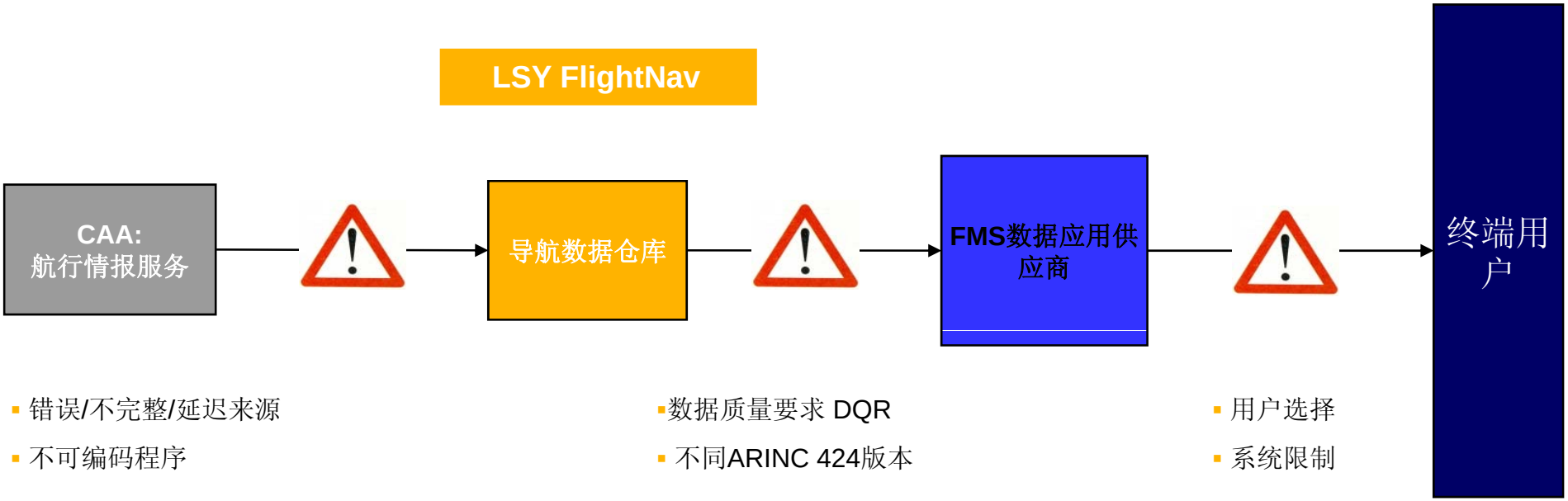


- erroneous/incomplete/late source
- procedure not codeable

- Data Quality Requirements DQR
- different ARINC 424 versions

- Customer selection
- System limitation

数据流和“丢失”数据的原因

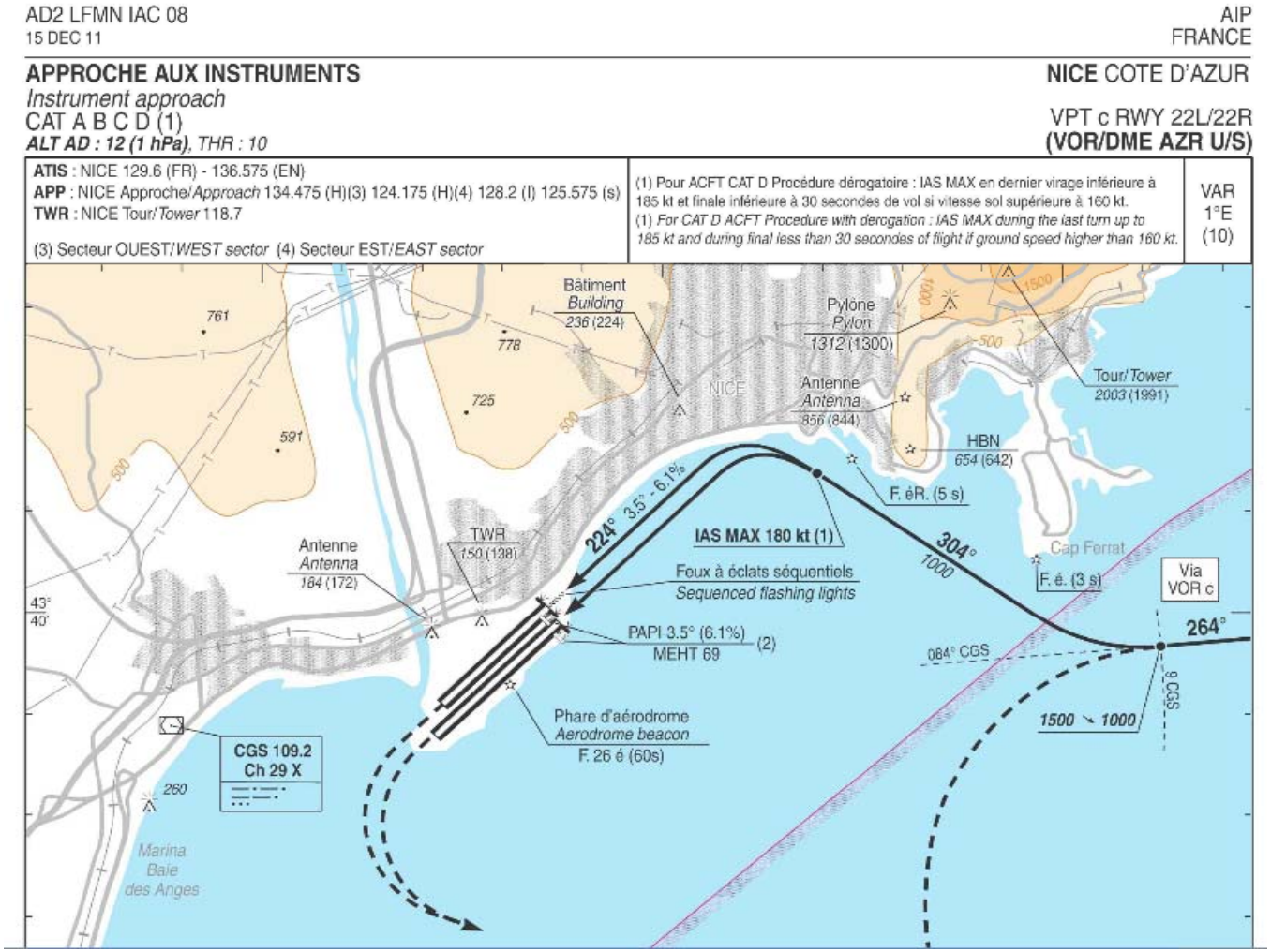


- 错误/不完整/延迟来源
- 不可编码程序

- 数据质量要求 DQR
- 不同ARINC 424版本

- 用户选择
- 系统限制

Example 1: LFMN, VPT RWYs 22L/R



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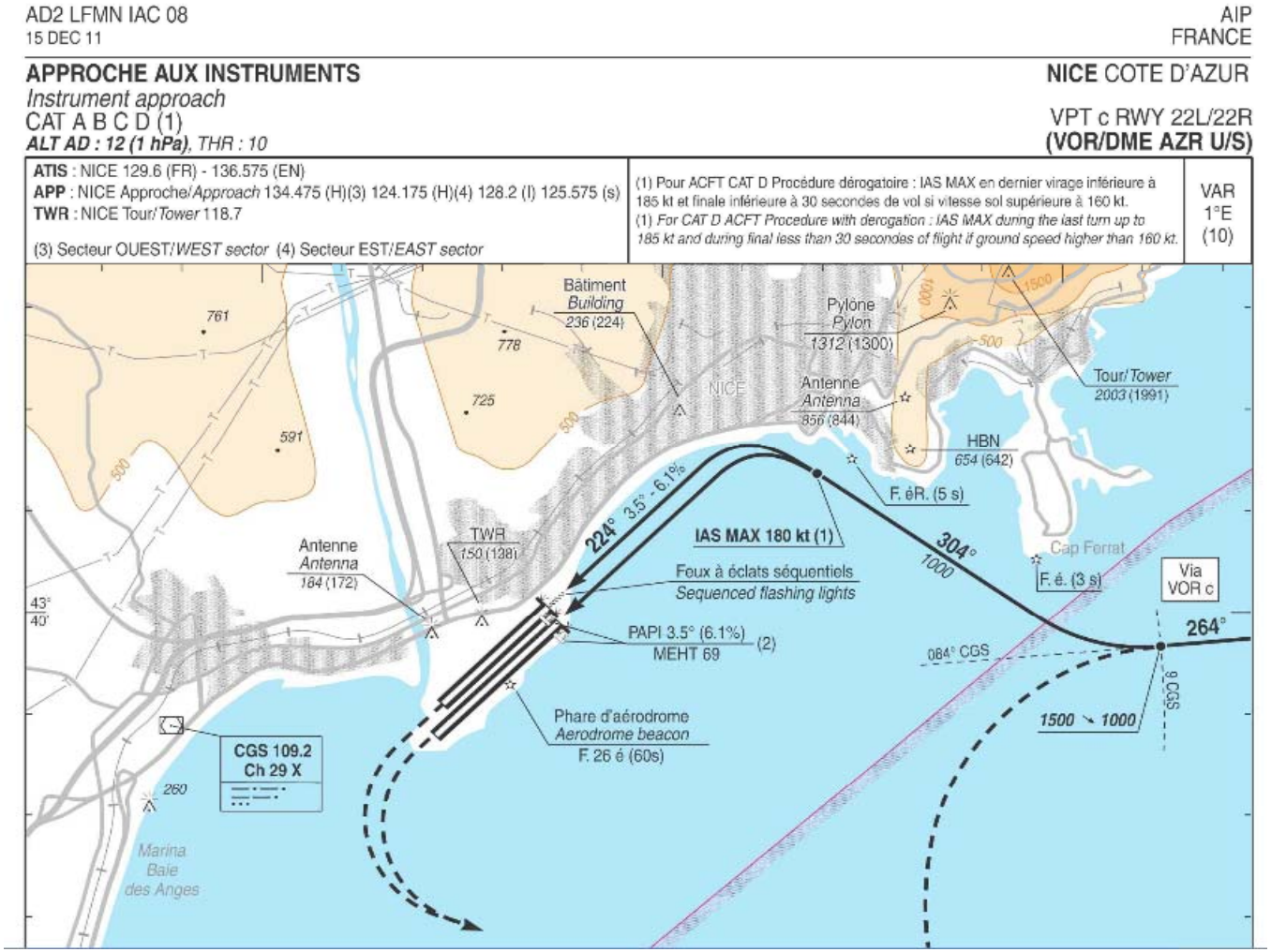
例 1: LFMN机场, VPT 22L/R跑道



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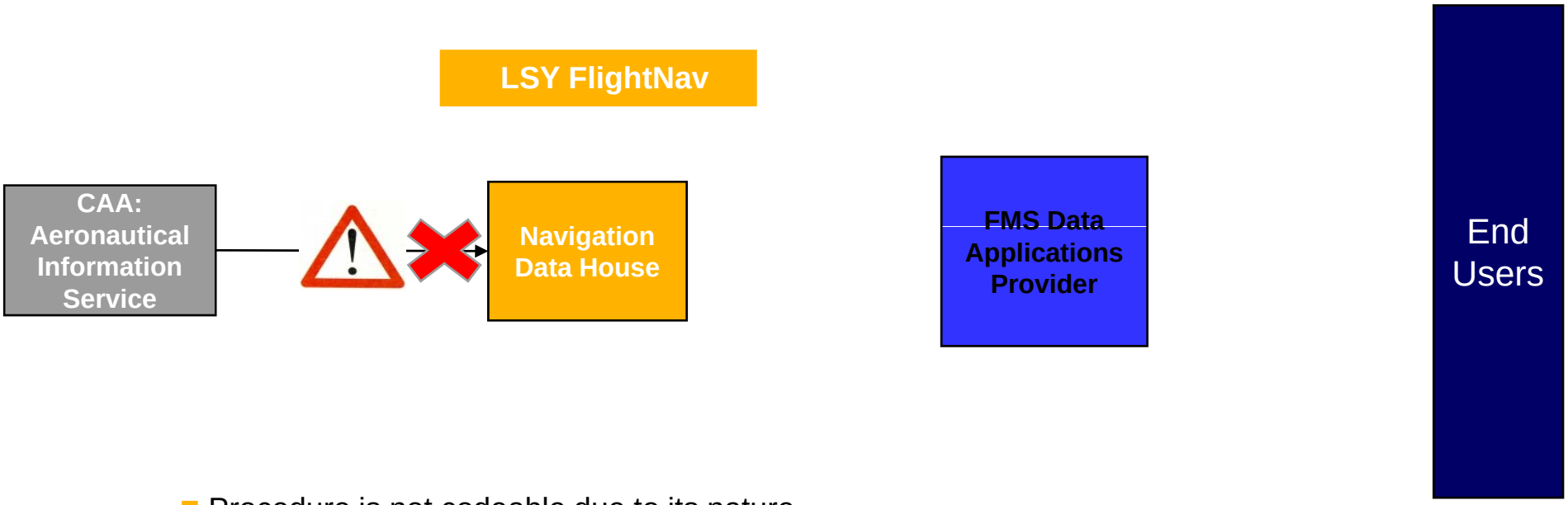
Example 1: LFMN, VPT RWYs 22L/R



- Procedure is not codeable due to its nature
- Procedure is not included in LSY FN database

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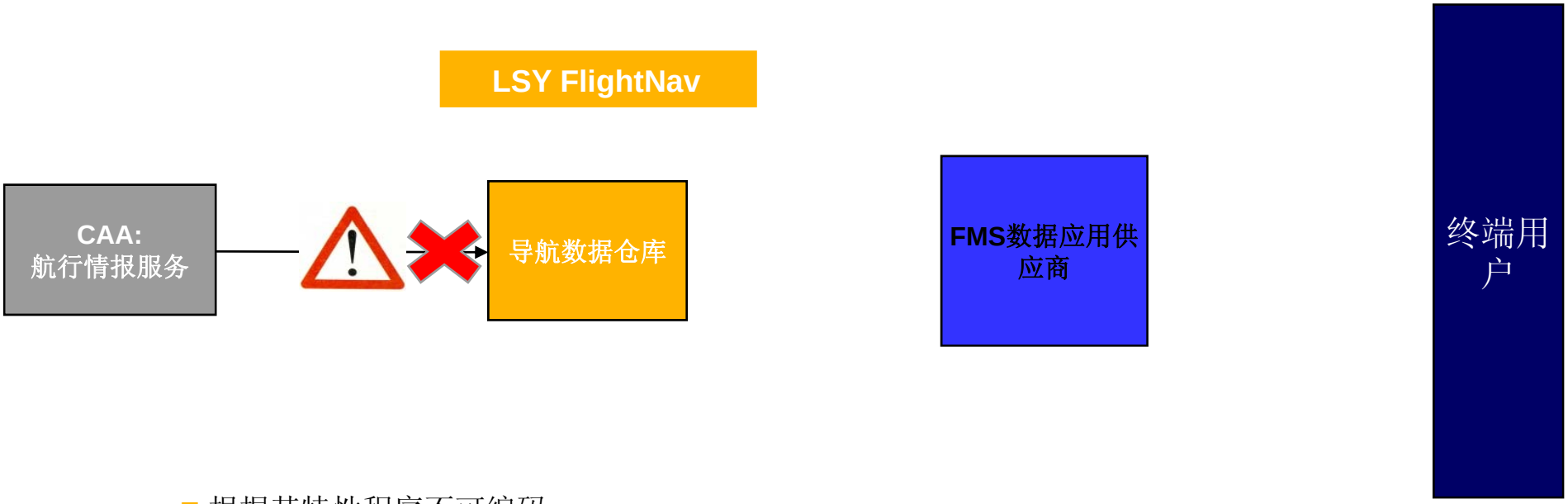
例 1: LFMN机场, VPT 22L/R跑道



- 根据其特性程序不可编码
- 程序不包含在LSY FN数据库中

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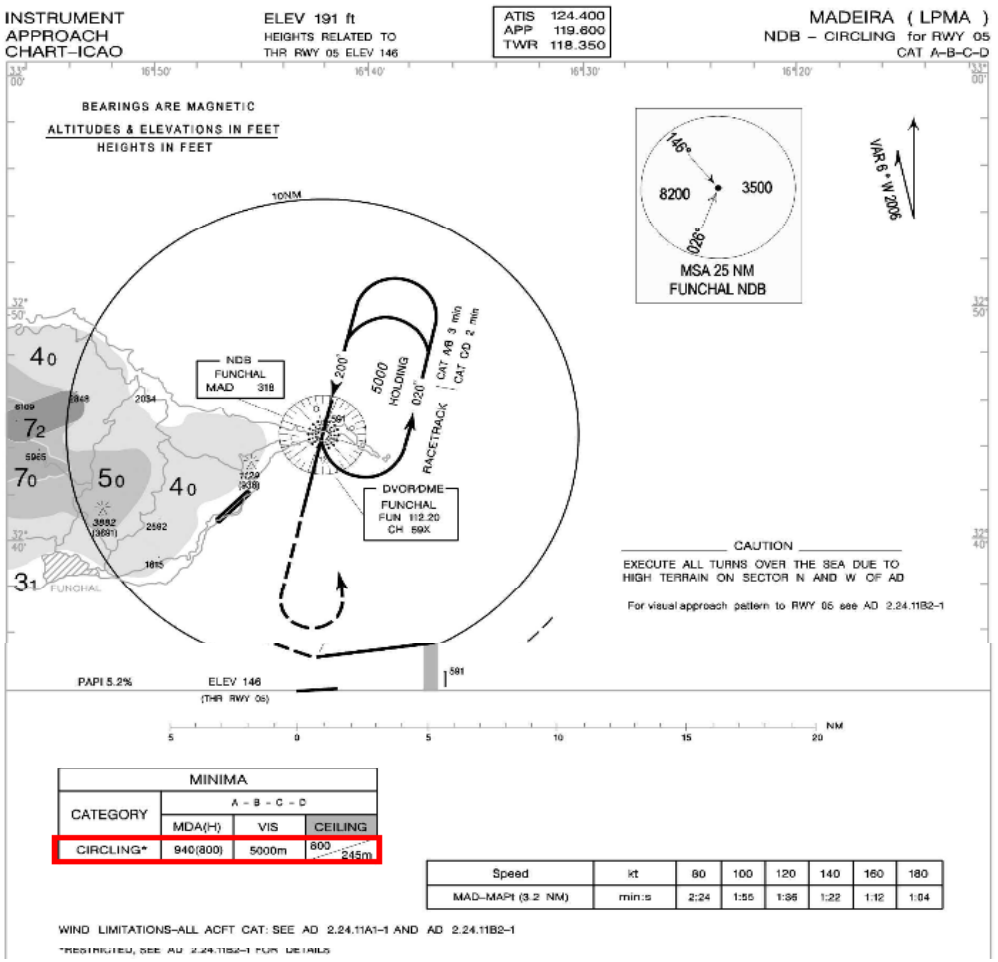
Example 2: LPMA, NDB 05, Circling approach



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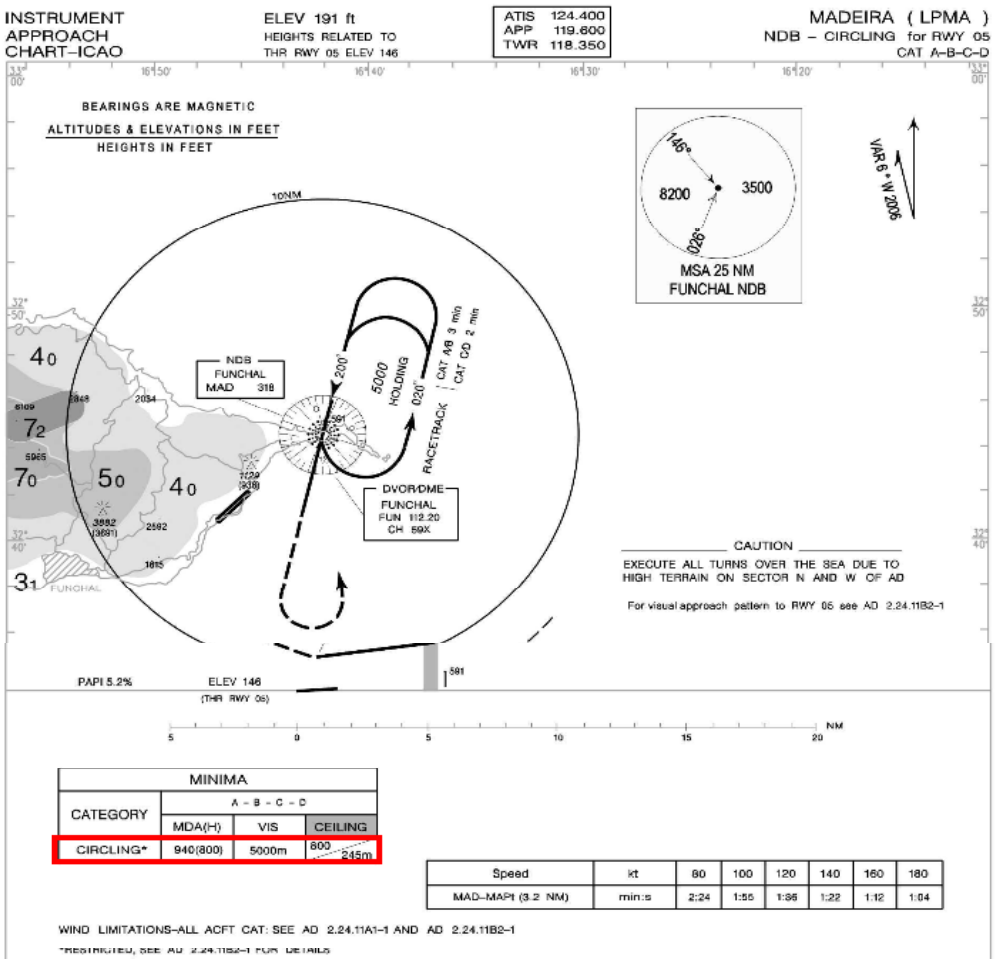
例 2: LPMA机场, 05跑道NDB进近, 盘旋进近



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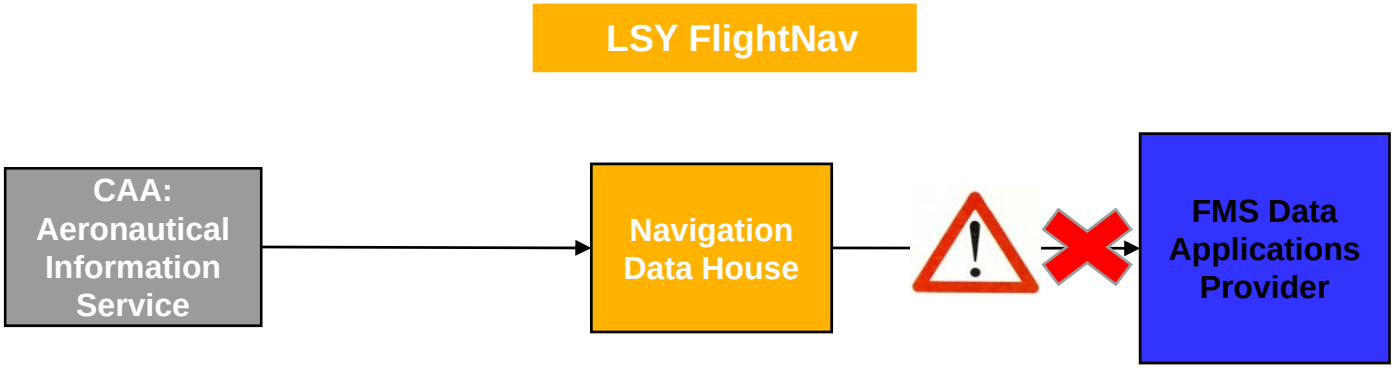

End Users

- Procedure is codeable per ARINC 424

Airport	Type	SubType	Proc ID	Trans	Customer	Rte Type	AC Cat	Q1	Q2	JetProp	TCH	Overlay	ATC	VIS	TA / TL	Dist
LPMA	F	N	N05			N	ABCD	N	C	A	50					3.6

Seq	Fix	Ctry	Type	D	E	S	C	_	RecNa	Ctr	Type_	Theta	Rho	PT	RNP	T	V	MagTr	Dist	Ex	Alt[	Alt1	Alt2	MEA	MOCA	Angle	SD	SPD	CtrFix	Ctry__	Type__
5	MAD	LP	DB	N			F	F	MAD	LP	DB	360.0	.0	IF				.0	.0			01430									
10	36FUN	LP	PC	E			M		MAD	LP	DB	199.7	3.6	TF				199.7	3.6			00940				0.00					
40						M						360.0	.0	CA				200.0	.0		+	04500									
50	MAD	LP	DB	N								360.0	.0	DF		L		.0	.0			05000									
60	MAD	LP	DB	N	E		H	Y				360.0	.0	HM		L		200.0	T01.0												

- DQR excludes Circling approaches (Q2 = C) to be delivered

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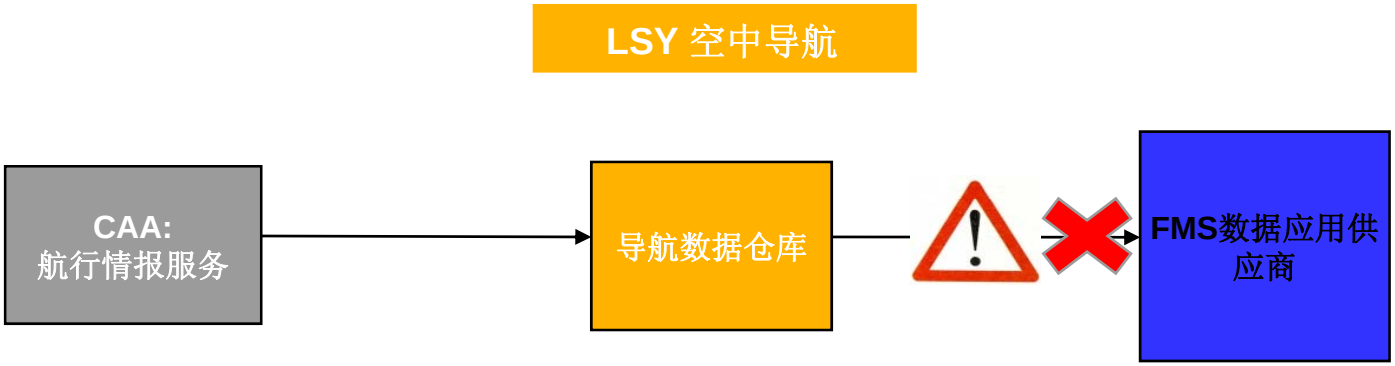
例 2: LPMA机场, 05跑道NDB进近, 盘旋进近



终端用户

- 按ARINC 424 程序是可编码

Airport	Type	SubType	Proc ID	Trans	Customer	Rte Type	AC Cat	Q1	Q2	JetProp	TCH	Overlay	ATC	VIS	TA / TL	Dist
LPMA	F	N	N05			N	ABCD	N	C	A	50					3.6

Seq	Fix	Ctry	Type	D	E	S	C	_	RecNa	Ctr	Type_	Theta	Rho	PT	RNP	T	V	MagTr	Dist	Ex	Alt[	Alt1	Alt2	MEA	MOCA	Angle	SD	SPD	CtrFix	Ctry__	Type__
5	MAD	LP	DB	N			F	F	MAD	LP	DB	360.0	.0	IF				.0	.0			01430									
10	36FUN	LP	PC	E			M		MAD	LP	DB	199.7	3.6	TF				199.7	3.6			00940				0.00					
40						M						360.0	.0	CA				200.0	.0		+	04500									
50	MAD	LP	DB	N								360.0	.0	DF		L		.0	.0			05000									
60	MAD	LP	DB	N	E		H	Y				360.0	.0	HM		L		200.0	T01.0												

- 移交的DQR排除将盘旋进近 (Q2 = C)

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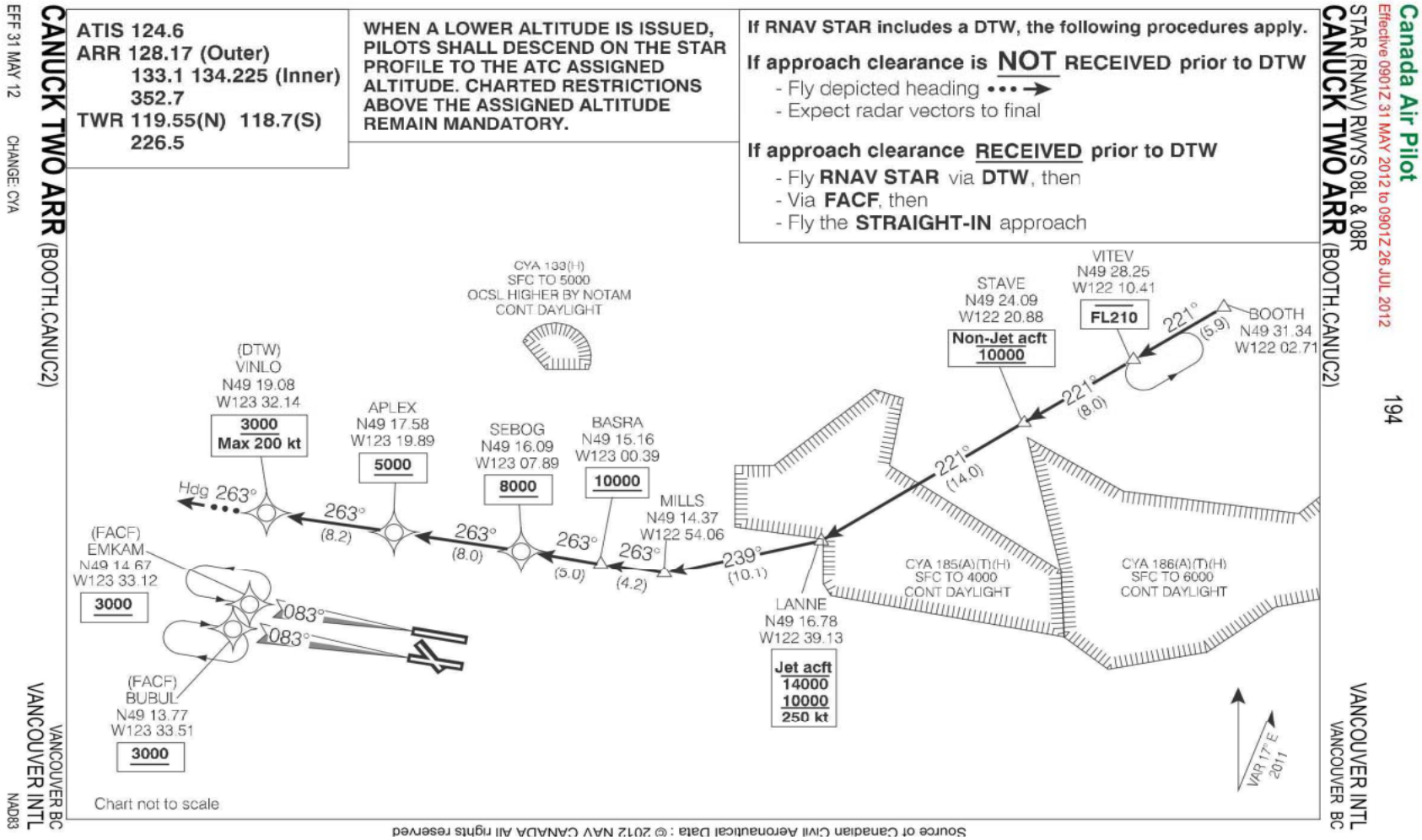
Example 3: CYVR, STAR CANUC2, Route Type 3



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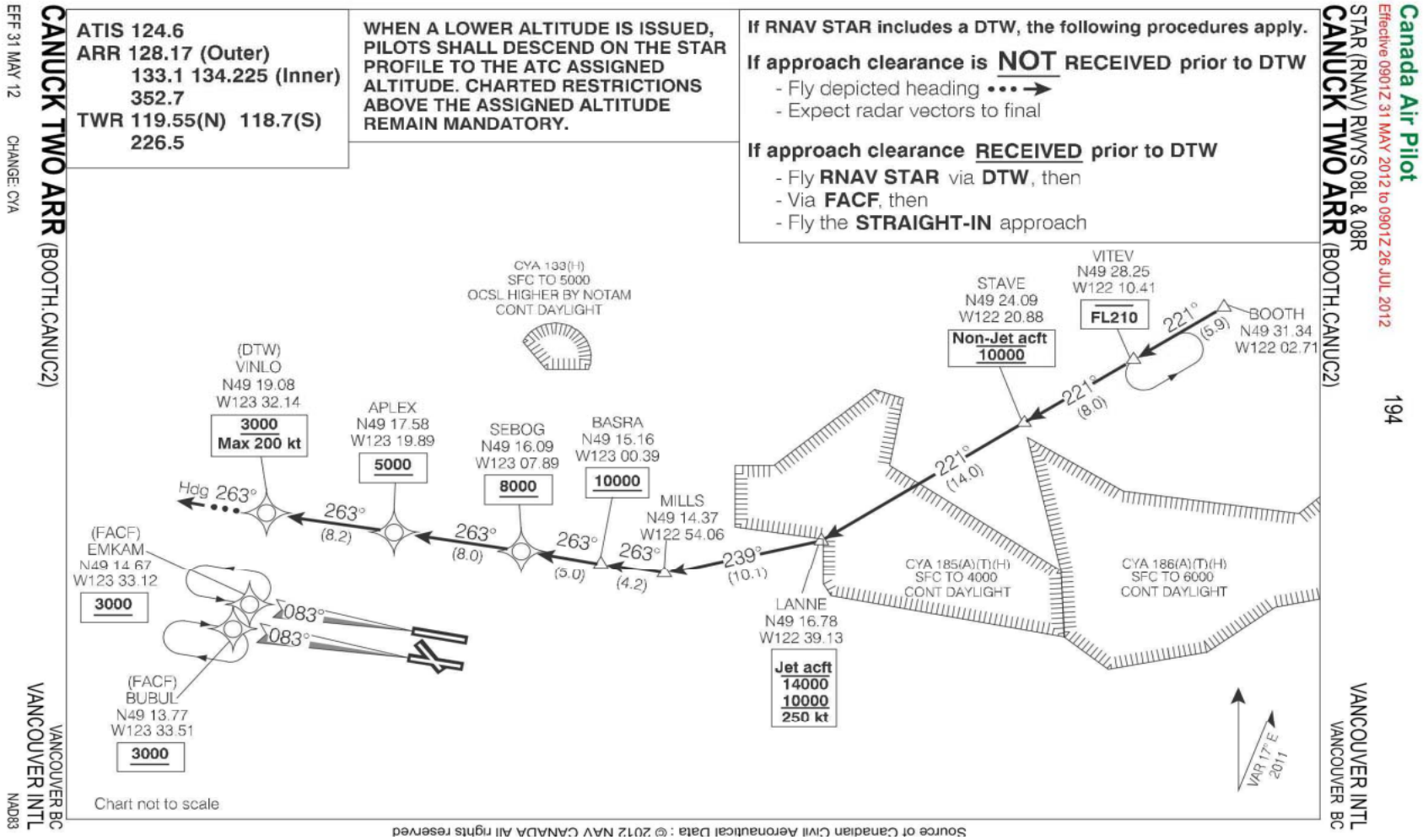
例 3: CYVR机场, CANUC2 STAR程序，航路类型3



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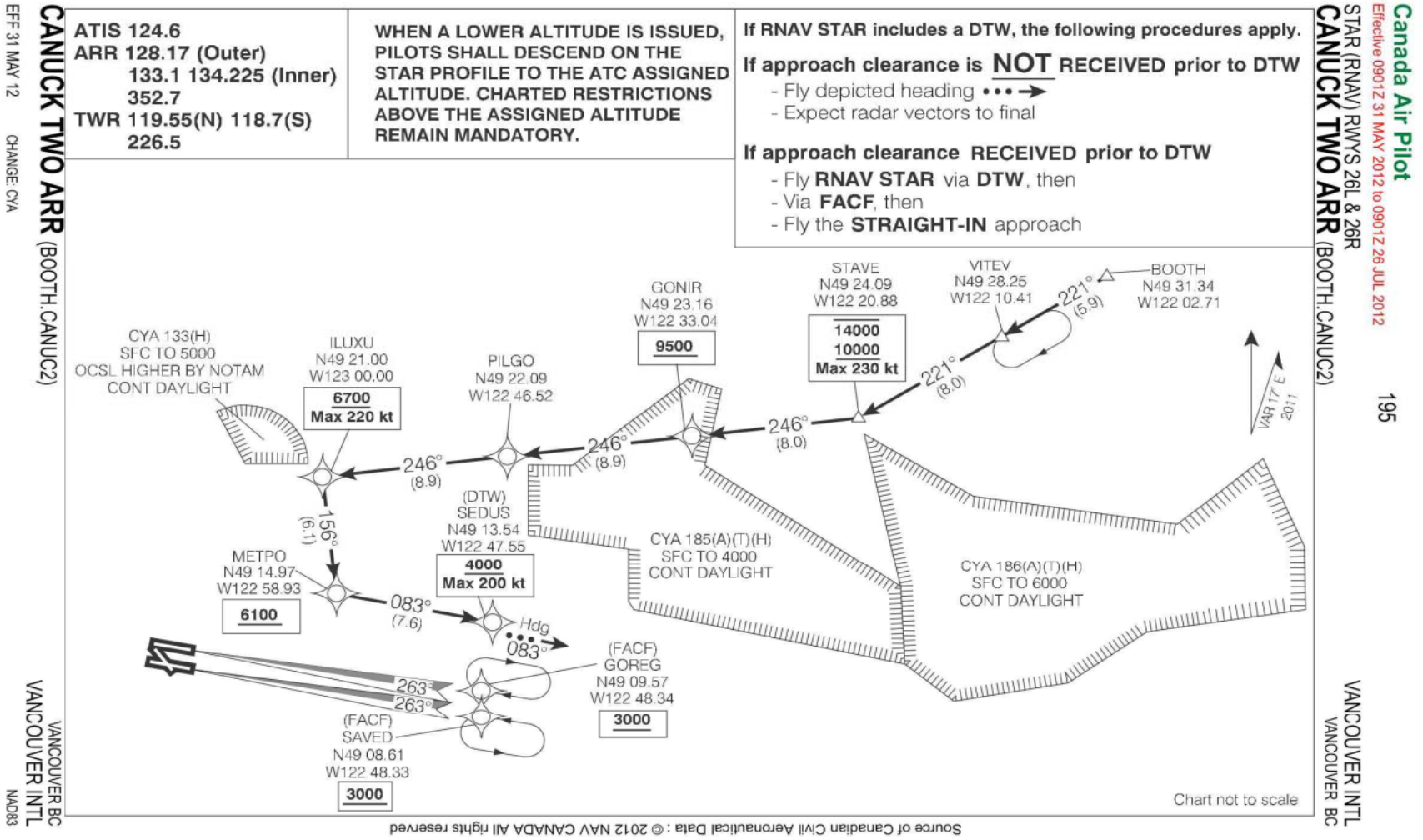
Example 3: CYVR, STAR CANUC2, Route Type 3



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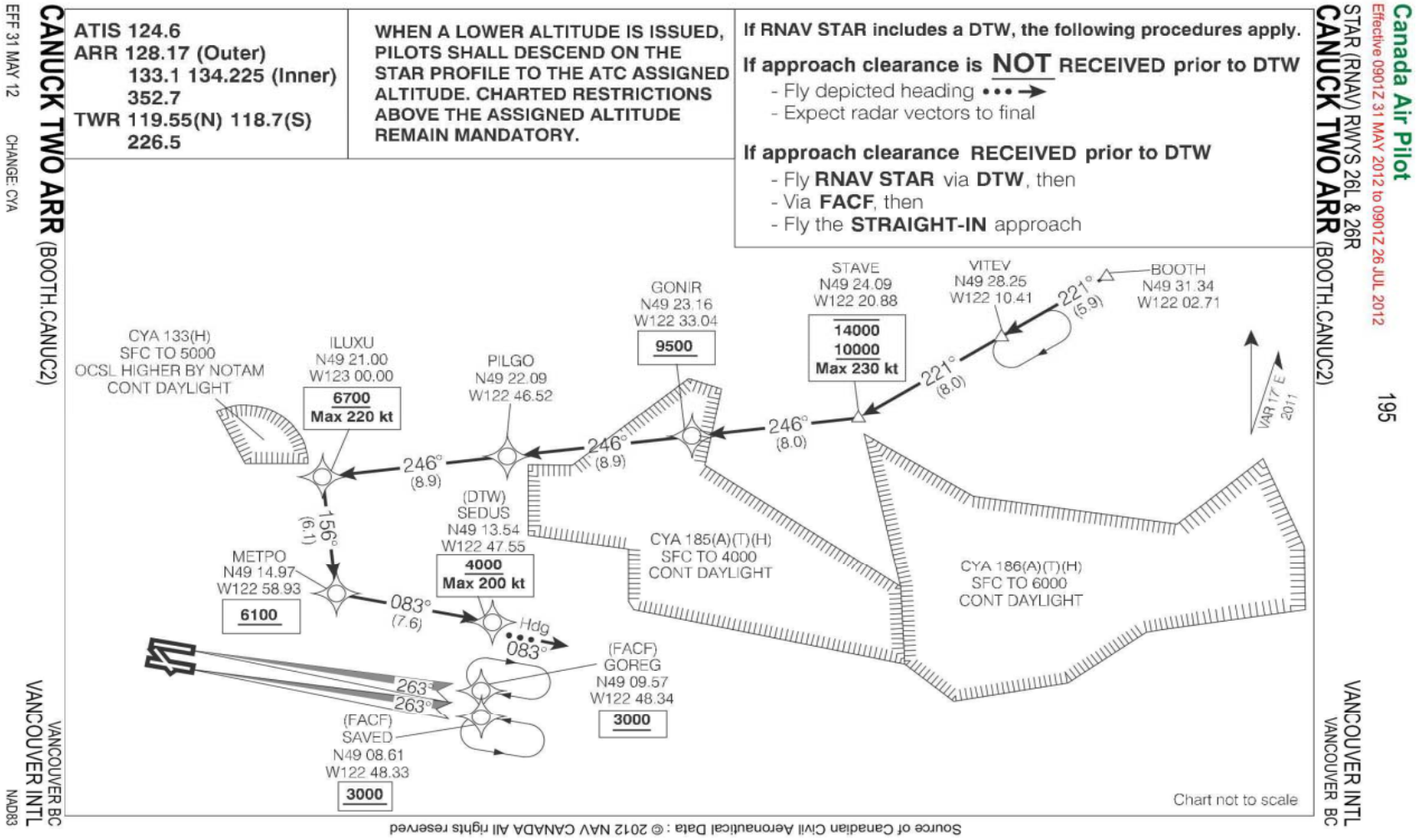
例 3: CYVR机场, CANUC2 STAR程序，航路类型3



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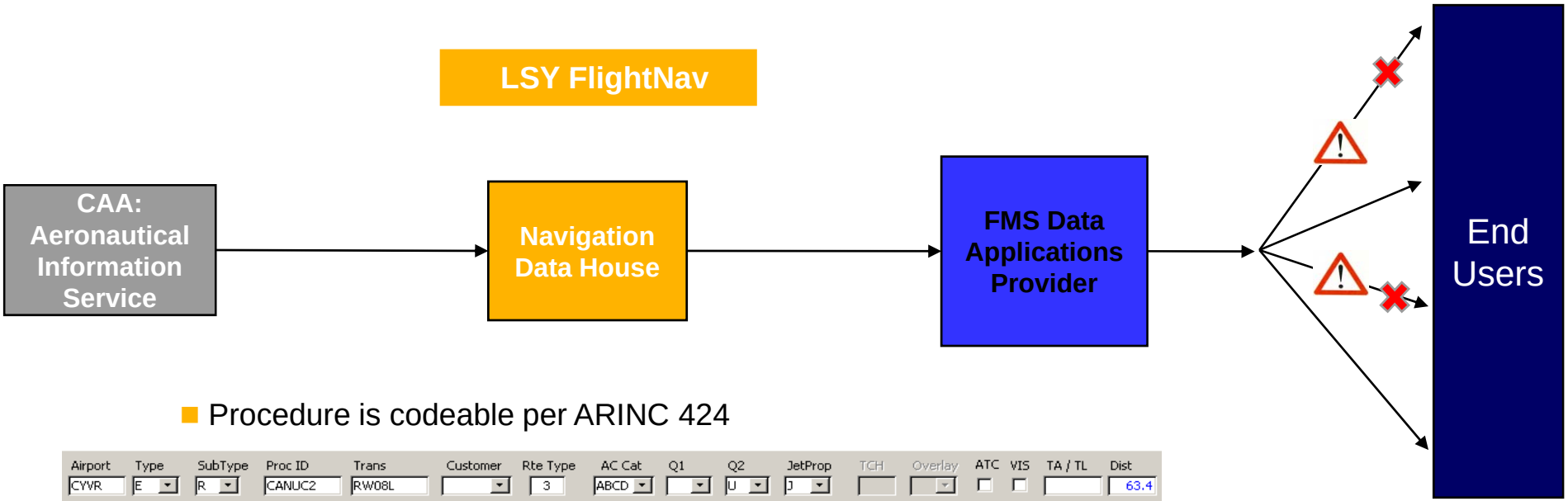
Example 3: CYVR, STAR CANUC2, Route Type 3



- Procedure is codeable per ARINC 424

Airport	Type	SubType	Proc ID	Trans	Customer	Rte Type	AC Cat	Q1	Q2	JetProp	TCH	Overlay	ATC	VIS	TA / TL	Dist
CYVR	E	R	CANUC2	RW08L		3	ABCD		U	J						63.4

Seq	Fix	Ctry	Type	D	E	S	C	_	RecNa	Ctr	Type_	Theta	Rho	PT	RNP	T	V	MagTr	Dist	Ex	Alt	Alt1	Alt2	MEA	MOCA	Angle	SD	SPD	CtrFix	Ctry__	Typ
7	BOOTH	CY	EA	E								360.0	.0	IF				.0	.0												
15	VITEV	CY	EA	E			H					360.0	.0	TF				221.4	5.9		-	FL210									
30	STAVE	CY	EA	E								360.0	.0	TF				221.7	8.0												
40	LANNE	CY	EA	E								360.0	.0	TF				221.6	14.0		B	14000	10000					250			
50	MILLS	CY	PC	E								360.0	.0	TF				239.2	10.1												
55	BASRA	CY	EA	E								360.0	.0	TF				263.9	4.2		+	10000									
57	SEBOG	CY	PC	E								360.0	.0	TF				263.8	5.0		+	08000									
58	APLEX	CY	PC	E								360.0	.0	TF				263.9	8.0		+	05000									
60	VINLO	CY	PC	E								360.0	.0	TF				263.7	8.2		+	03000					-	200			
70												360.0	.0	VM				263.0	.0												
80	EMKAM	CY	PC	E	E		H		YVR	CY	D	285.5	18.8	CF		L	Y	83.0	003.0		+	03000									

- Procedure is not compatible with all systems and is subject to filtering at the Processor

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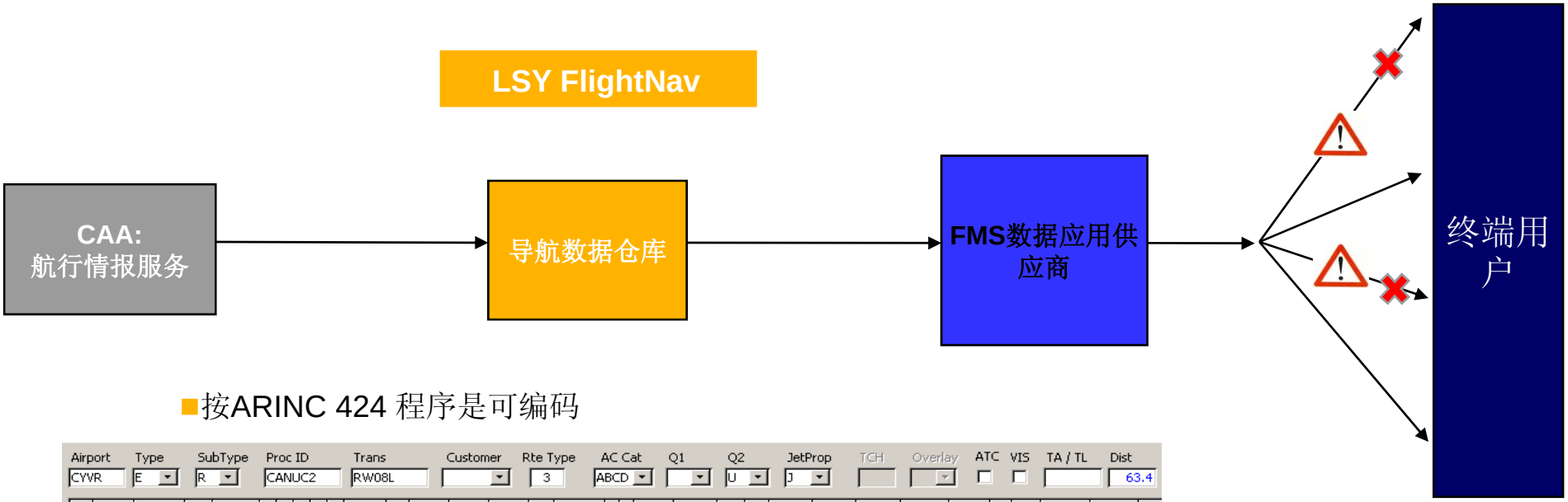
例 3: CYVR机场, CANUC2 STAR程序, 航路类型3



- 按ARINC 424 程序是可编码

Airport: CYVR | Type: E | SubType: R | Proc ID: CANUC2 | Trans: RW08L | Customer: | Rte Type: 3 | AC Cat: ABCD | Q1: | Q2: U | JetProp: J | TCH: | Overlay: | ATC: ☐ | VIS: ☐ | TA / TL: | Dist: 63.4

Seq	Fix	Ctry	Type	D	E	S	C	_	RecNa	Ctr	Type_	Theta	Rho	PT	RNP	T	V	MagTr	Dist	Ex	Alt	Alt1	Alt2	MEA	MOCA	Angle	SD	SPD	CtrFix	Ctry__	Typ
7	BOOTH	CY	EA	E								360.0	.0	IF				.0	.0												
15	VITEV	CY	EA	E			H					360.0	.0	TF				221.4	5.9		-	FL210									
30	STAVE	CY	EA	E								360.0	.0	TF				221.7	8.0												
40	LANNE	CY	EA	E								360.0	.0	TF				221.6	14.0		B	14000	10000					250			
50	MILLS	CY	PC	E								360.0	.0	TF				239.2	10.1												
55	BASRA	CY	EA	E								360.0	.0	TF				263.9	4.2		+	10000									
57	SEBOG	CY	PC	E								360.0	.0	TF				263.8	5.0		+	08000									
58	APLEX	CY	PC	E								360.0	.0	TF				263.9	8.0		+	05000									
60	VINLO	CY	PC	E								360.0	.0	TF				263.7	8.2		+	03000					-	200			
70												360.0	.0	VM				263.0	.0												
80	EMKAM	CY	PC	E	E		H		YVR	CY	D	285.5	18.8	CF		L	Y	83.0	003.0		+	03000									

- 程序不是跟所有系统兼容，并且在处理器处受到过滤

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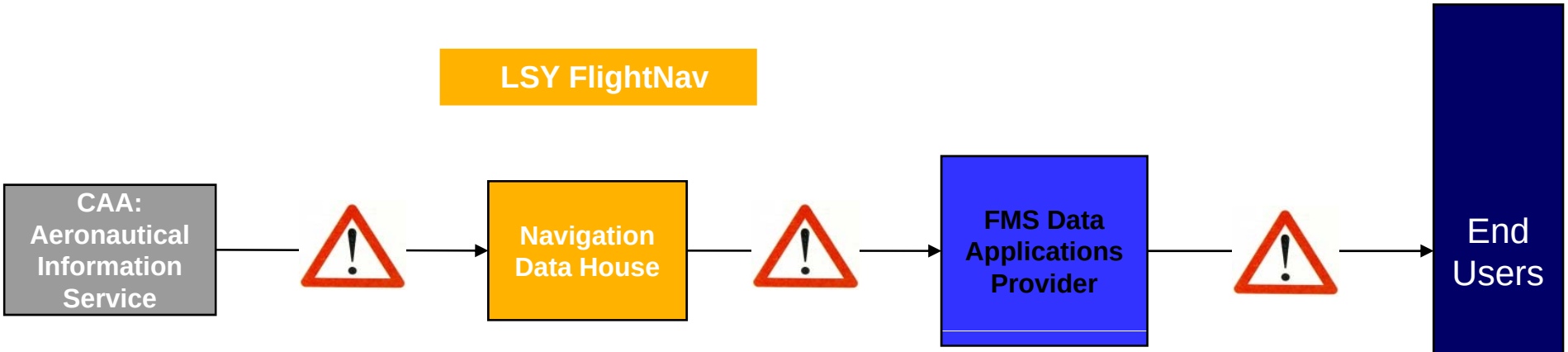
Information flow and Area of Responsibility



Dataflow from source to pilot.

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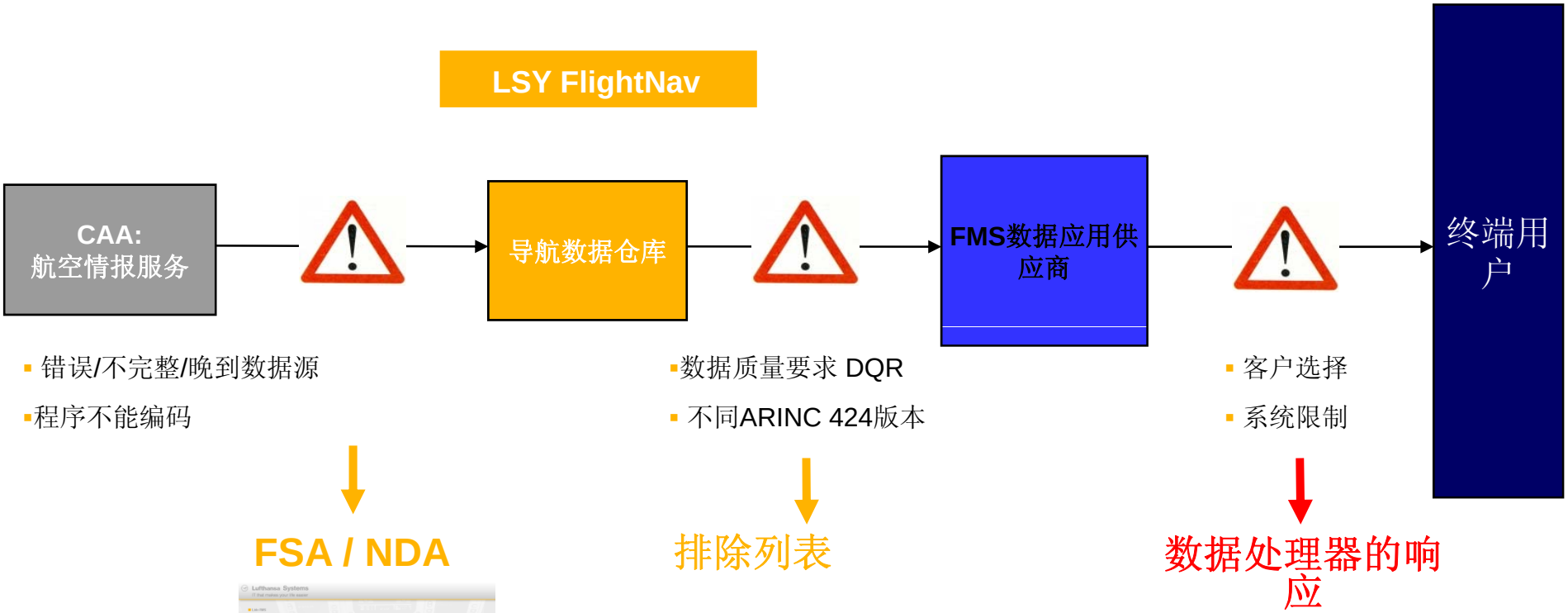
信息流和响应区



Dataflow from source to pilot.

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Conclusion

- The ARINC-424 file is an extract of the LSY database fitted to the needs of the FMS packer
- The packed FMS database is produced according the design specification of the respective FMS Type
- During each step, data may be adapted or removed to meet the intended function
- LSY informs about removal of officially published procedure each cycle with a detailed “Exclusion List”

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结论

- ARINC-424文件摘取LSY数据库，并使之适合于FMS打包需求。
- 根据与FMS类型设计规范，来生成打包FMS数据库。
- 在每一步中，可修改或删除数据来满足预期功能。
- 在每个数据库周期中，用详细的“排除列表”形式，LSY通报官方发布程序的改动。

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Agenda

Source to Database

- General Aspects
- Data filtering during production
- **Identifier of Database Elements – Naming Convention**
- Magnetic Bearing and Magnetic Variation

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议程

- **数据库来源**
  - 概况
  - 生成时的数据过滤
- **数据库元素的标识—命名规则**
  - 磁方位和磁差

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Source to Database – Identifier of Database Elements

- **Each Database Element has an identifier**
- **Identifier of certain elements are unique worldwide (e.g. airport ICAO code)**
- **Identifier of other elements must be unique within the same country/FIR (e.g. enroute waypoints, Navaids)**
- **For each database element, the identifier consists of a limited number of characters**:

  - SID/STAR: max 6 characters (e.g. GOLF1K)
  - APPROACH: max 5 character (e.g. I18, L36R, R08LY)
  - Waypoint (Term/Enrt): max. 5 characters (e.g. ALPHA)
  - Navaid: max. 4 characters (e.g. KLO, ZUH, R, TIKX)
  - Airway: max. 5 characters (e.g. N851, UM113, Z15)

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数据库来源—数据库元素的标识

- 每个数据库元素都有一个标识
- 一些元素的标识是全球唯一的**(**例如 机场**ICAO**代码**)**
- 其他元素的标识在同一国家**/FIR**内，必须是唯一的**(**例如 航路上的航路点，导航台**)**
- 每个数据库元素，标识由有限的字符组成:

  - SID/STAR: 最多6字符(例如 GOLF1K)
  - 进近:最多5字符(例如 I18, L36R, R08LY)
  - 航路点 (终端/航路):最多5字符(例如 ALPHA)
  - 导航台:最多4字符(例如 KLO, ZUH, R, TIKX)
  - 航线:最多5字符(例如 N851, UM113, Z15)

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Source to Database – Naming Convention (1)

- To **fit into the maximum character limitations**, many published identifier **have to be modified**. A **naming convention** has been established to unify the techniques used to establish database identifier. Nevertheless, in certain scenarios ARINC 424 still gives the data houses **a degree of freedom** to establish identifier, especially when no official identifier is published

- The goal is to **allow crews to correctly identify** a data element in a reasonable amount of time and enhance the **situational awareness**

- On the following slides, **examples from ARINC 424** are given **how to establish identifier** in common scenarios:

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数据库来源—命名规则(1)

- 为满足最多字符限制，很多已公布的标识都必须修改。为了将已创建的数据库标识统一起来，必须建立一套命名规则。但是在一些情况下，在创建标识时ARINC 424仍然赋予数据仓库一定的自由度，特别是没有官方公布的标识时。
- 目的是让机组在一定时间内，正确识别数据元素，增强情景意识。
- 在以下幻灯片中，举例说明ARINC 424 中通常如何创建标识符：

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Source to Database – Naming Convention (2)

ONE-WORD NAMES

A. If five or less characters are involved, use the full name.

Examples:

Facility	Fix Field Entry
DOT becomes	DOT
ACRA becomes	ACRA
LOGAN becomes	LOGAN

B. If the name is more than five characters, reduce to five characters with one or more of the following methods.

1. Eliminate double letters

Examples:

Waypoint Name	Fix Field Entry
KIMMEL becomes	KIMEL
COTTON becomes	COTON
RABBITT becomes	RABIT

2. Keep the first letter, first vowel, and last letter. Drop other vowels starting from right to left.

Examples:

Waypoint Name	Fix Field Entry
ADOLPH becomes	ADLPH
BAILEY becomes	BAILY
BURWELL becomes	BURWL

3. Drop consonants, starting from right to left

Examples:

Waypoint Name	Fix Field Entry
ANDREWS becomes	ANDRS
BRIDGEPORT becomes	BRIDT

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数据库来源—命名规则(2)

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Source to Database – Naming Convention (3)

MULTIPLE WORD NAMES

Use the first letter of the first word and shorten the last word using the rules for One-Word names to reduce it four characters, for a total of five characters.

Examples:

Waypoint Name	Fix Field Entry
CLEAR LAKE becomes	CLAKE
ROUGH AND READY becomes	RREDY

PHONETIC LETTER NAMES

When an ICAO phonetic alpha character is used as a waypoint name (Alpha, Bravo, Charlie, etc.), use the rules established in One-Word Names. When more than one waypoint in a country has the same phonetic name, obtain uniqueness by applying Duplicate Identifier rules below.

Examples:

Waypoint Name	Fix Field Entry
ALPHA becomes	ALPHA
NOVEMBER becomes	NOVMR
CHARLIE becomes	CHARE

Two waypoints having the same Waypoint Identifiers within the same country two-letter ICAO, for example, CHARLIE, would become CHAR1 and CHAR2.

When a double phonetic, such as TANGO INDIA, is used as the waypoint name, use the rules established under Multiple Word Names. For example, TANGO INDIA becomes TINDA.

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数据库来源—命名规则(3)

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Agenda

Source to Database

- General Aspects
- Data filtering during production
- Identifier of Database Elements – Naming Convention

Magnetic Bearing and Magnetic Variation

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议程

数据库来源

- 概况
- 生成时的数据过滤
- 数据库元素的标识符—命名规则

磁方位和磁差

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Source to Database – Magnetic Bearing & Magnetic Variation (1)

- RNAV equipment **displays directional guidance in terms of magnetic tracks** and bearings
- **ARINC 424 records** always include the **magnetic variation associated with fixed points**
- There are **three types** of magnetic variation fields:

  - measured **Magnetic Variation**, used for physical location records, such as airports
  - **Station Declination**, used for VORs, which is the measured difference between true north and the 360 radial of the VOR
  - **Dynamic Magnetic Variation**, used for RNAV waypoints, which is derived from a computer model rather than actual measurement

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数据库来源 – 磁方位和磁差 (1)

- 按照磁航迹和磁方位，RNAV设备显示方向指引
- **ARINC 424记录通常包括与定位点相关的磁差**
- 有三类变化磁差：
  - 测量的磁差，用于物理位置记录，比如机场
  - 导航台磁差，用于VOR台，为VOR台的真北和360°径向线之差
  - 动态磁差，用于RNAV航路点，来源于计算模型而非实际测量值

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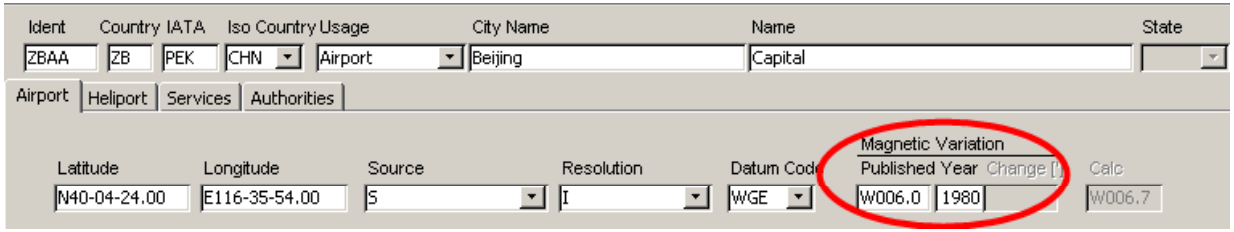
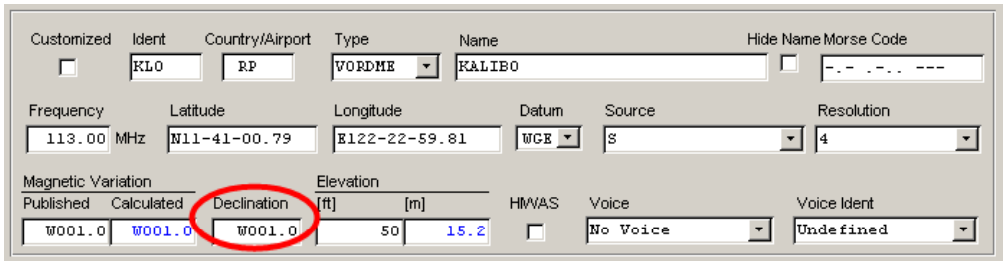
Source to Database – Magnetic Bearing & Magnetic Variation (2)

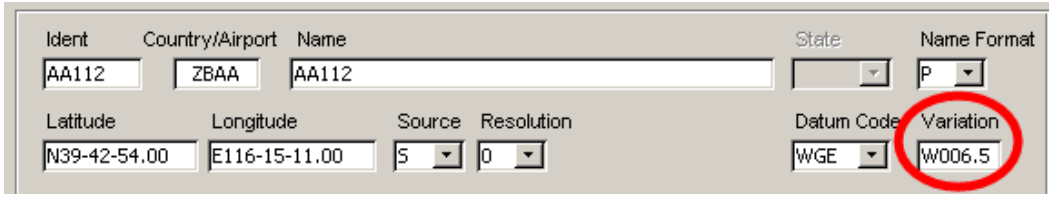
- **Magnetic Variation** on an airport record



- **Station Declination** on a VHF Navaid



- **Dynamic Magnetic Variation** on a waypoint record



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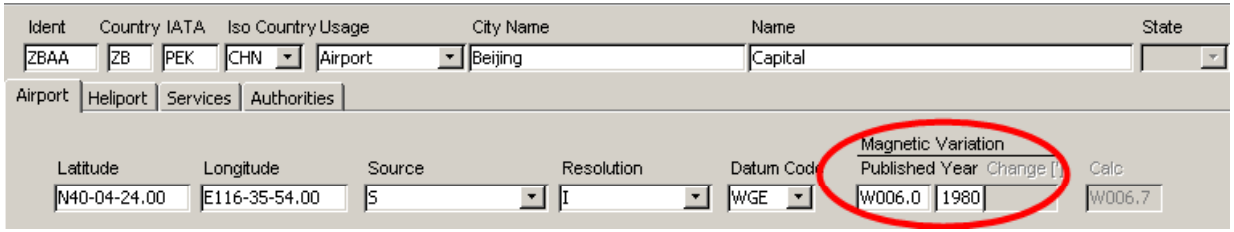
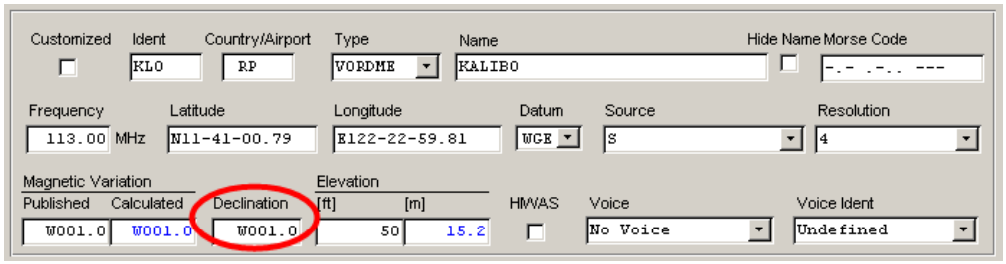
数据库来源 – 磁方位和磁差 (2)

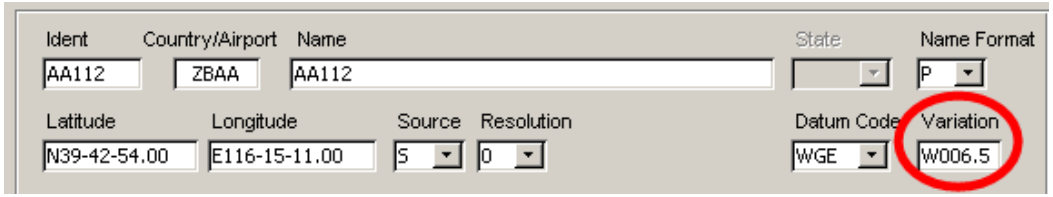
- 在机场记录中的磁差



- 在VHF导航台的磁差



- 在航路点记录中的动态磁差



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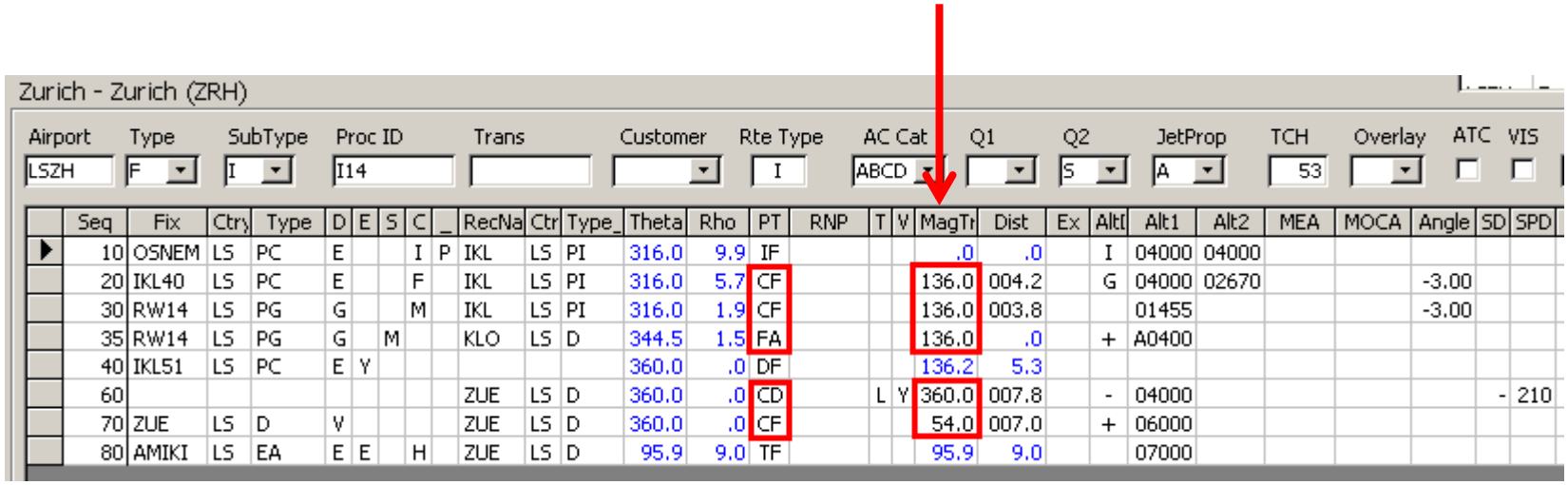
Source to Database – Magnetic Bearing & Magnetic Variation (3)

- **Heading and tracks in Path Terminators** are all coded with **reference to magnetic north**



Seq	Fix	Ctry	Type	D	E	S	C	_	RecNa	Ctr	Type_	Theta	Rho	PT	RNP	T	V	MagTr	Dist	Ex	Altl	Alt1	Alt2	MEA	MOCA	Angle	SD	SPD
10	OSNEM	LS	PC	E			I	P	IKL	LS	PI	316.0	9.9	IF				.0	.0		I	04000	04000					
20	IKL40	LS	PC	E			F		IKL	LS	PI	316.0	5.7	CF				136.0	004.2		G	04000	02670			-3.00		
30	RW14	LS	PG	G			M		IKL	LS	PI	316.0	1.9	CF				136.0	003.8			01455				-3.00		
35	RW14	LS	PG	G		M			KLO	LS	D	344.5	1.5	FA				136.0	.0		+	A0400						
40	IKL51	LS	PC	E	Y							360.0	.0	DF				136.2	5.3									
60									ZUE	LS	D	360.0	.0	CD		L	Y	360.0	007.8		-	04000					-	210
70	ZUE	LS	D	V					ZUE	LS	D	360.0	.0	CF				54.0	007.0		+	06000						
80	AMIKI	LS	EA	E	E		H		ZUE	LS	D	95.9	9.0	TF				95.9	9.0			07000						

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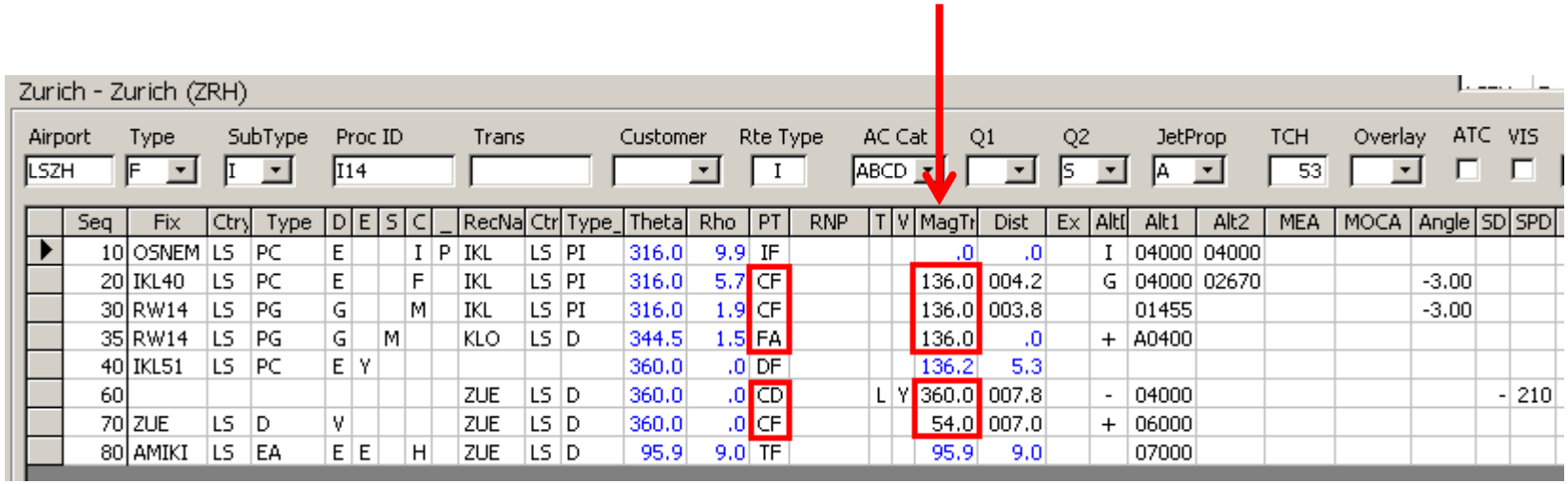
数据库来源 – 磁方位和磁差 (3)

- 航径终结码中的航向和航迹，均参考磁北来编码



Zurich - Zurich (ZRH)

Airport	Type	SubType	Proc ID	Trans	Customer	Rte Type	AC Cat	Q1	Q2	JetProp	TCH	Overlay	ATC	VIS
LSZH	F	I	I14			I	ABCD		S	A	53		☐	☐

Seq	Fix	Ctry	Type	D	E	S	C	_	RecNa	Ctr	Type_	Theta	Rho	PT	RNP	T	V	MagTr	Dist	Ex	Altl	Alt1	Alt2	MEA	MOCA	Angle	SD	SPD
10	OSNEM	LS	PC	E			I	P	IKL	LS	PI	316.0	9.9	IF				.0	.0		I	04000	04000					
20	IKL40	LS	PC	E			F		IKL	LS	PI	316.0	5.7	CF				136.0	004.2		G	04000	02670			-3.00		
30	RW14	LS	PG	G			M		IKL	LS	PI	316.0	1.9	CF				136.0	003.8			01455				-3.00		
35	RW14	LS	PG	G		M			KLO	LS	D	344.5	1.5	FA				136.0	.0		+	A0400						
40	IKL51	LS	PC	E	Y							360.0	.0	DF				136.2	5.3									
60									ZUE	LS	D	360.0	.0	CD		L	Y	360.0	007.8		-	04000					-	210
70	ZUE	LS	D	V					ZUE	LS	D	360.0	.0	CF				54.0	007.0		+	06000						
80	AMIKI	LS	EA	E	E		H		ZUE	LS	D	95.9	9.0	TF				95.9	9.0			07000						

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Source to Database – Magnetic Bearing & Magnetic Variation (4)

RNAV Calculation and display of magnetic tracks

- Whenever the path terminator requires the coding of a magnetic track or bearing, this magnetic track will be displayed on the CDU

Zurich - Zurich (ZRH)

Airport	Type	SubType	te Type	AC Cat	Q1	Q2	JetP
LSZH	D	R	2	ABCD	E	5	A

	Seq	Fix	Ctry	Type	PT	RNP	T	V	MagTr	Dist	Ex	Alt	Alt1
▶	10	KLO23	LS	PC	CF				275.0	002.0			
	15				CI				205.0	.0			
	20	BREGO	LS	PC	CF				235.0	007.8		+	05000
	25	ZH554	LS	PC	TF	5.0			241.5	4.5		+	06000
	30	ZH558	LS	PC	TF	5.0			241.4	4.8		+	07000
	50	VEBIT	LS	EA	TF	5.0			241.4	6.4			

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数据库来源 – 磁方位和磁差 (4)

RNAV磁航迹计算和显示

- 无论航迹终结码是否要求磁航迹或磁方位编码，磁航迹都要在CDU上显示。

Zurich - Zurich (ZRH)

Airport	Type	SubType	te Type	AC Cat	Q1	Q2	JetP
LSZH	D	R	2	ABCD	E	5	A

	Seq	Fix	Ctry	Type	PT	RNP	T	V	MagTr	Dist	Ex	Alt	Alt1
▶	10	KLO23	LS	PC	CF				275.0	002.0			
	15				CI				205.0	.0			
	20	BREGO	LS	PC	CF				235.0	007.8		+	05000
	25	ZH554	LS	PC	TF	5.0			241.5	4.5		+	06000
	30	ZH558	LS	PC	TF	5.0			241.4	4.8		+	07000
	50	VEBIT	LS	EA	TF	5.0			241.4	6.4			

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Source to Database – Magnetic Bearing & Magnetic Variation (4)

RNAV Calculation and display of magnetic tracks

- Whenever the **path terminator does not require** the coding of a **magnetic track** or bearing, **the RNAV system will calculate the** magnetic track based on the **latitude and longitude of waypoints** and the **magnetic variation** along the route segment.
- This **calculated track may "jump" by 1 degree** along relatively short route segments due to rounding and changes in magnetic variation
- The **magnetic variation used** for such calculations **may be derived from** the waypoints' associated magnetic variation in the **database** or from the RNAV System's **internal magnetic variation model (MagVar DB)**
- This internal MagVar database is usually **updated every 5 years**, including a model to calculate the changes within the next 5 years

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数据库来源 – 磁方位和磁差 (4)

RNAV 磁航迹计算和显示

- 无论航迹终结码是否要求磁航迹或磁方位编码，RNAV系统都要根据航路点经纬度和沿杭路段的磁差，计算磁航迹。
- 沿相关的短航路段磁差取整和取舍，计算的磁航迹可能会发生1°“跳变”，
- 用来自于导航数据库中、或者RNAV系统内置磁差模型（磁差数据库）中与航路点相关的磁差，来进行磁航迹计算。
- 内置磁差数据库，以及计算下5年变化的模型，通常每5年更新一次。

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Source to Database – Magnetic Bearing & Magnetic Variation (4)

RNAV Calculation and display of magnetic tracks

- example of coded and FMS self-calculated tracks on B737 CDU

London - Heathrow (LHR)

Airport: EGLL | Type: D | SubType: C | te Type: 2 | AC Cat: ABCD | Q1 | Q2 | JetP: A

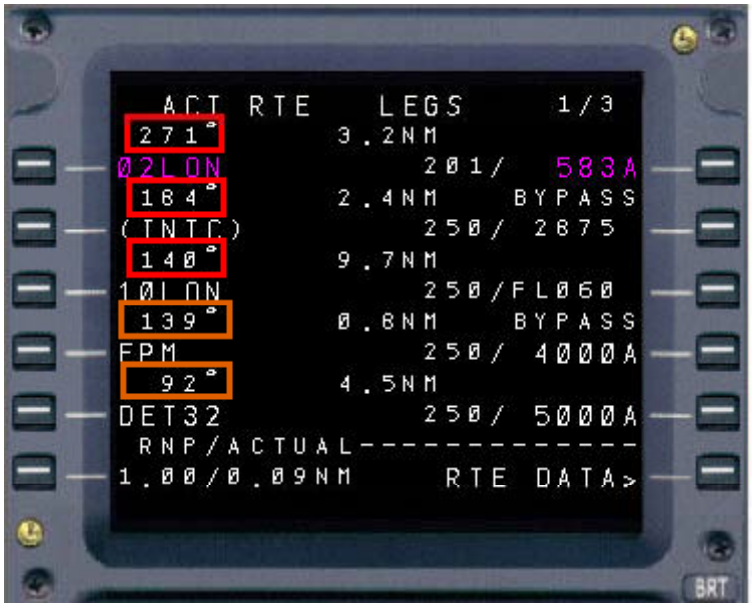
	Seq	Fix	Ctry	Type	PT	RNP	T	V	MagTr	Dist	Ex	Alt[	Alt1
	10	02LON	EG	PC	CF				271.0	002.0		+	00583
	20				CI		L	Y	184.0	.0			
	25	10LON	EG	PC	CF				140.0	010.0			
	30	EPM	EG	DB	TF				138.0	.8		+	04000
▶	40	DET32	EG	PC	TF				92.5	4.5		+	05000
	50	29DET	EG	PC	TF				92.5	3.0			06000
	60	DET5	EG	PC	TF				92.5	24.0			06000
	70	DET	EG	D	TF				93.0	5.0			

coded courses

(see „Cx“ Path Terminator)

self-calculated by FMS

(see „TF“ Path Terminator)



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数据库来源 – 磁方位和磁差 (4)

RNAV 磁航迹计算和显示

- 编码实例和在B737 CDU上FMS自身计算的航迹

London - Heathrow (LHR)

Airport: EGLL | Type: D | SubType: C | te Type: 2 | AC Cat: ABCD | Q1 | Q2 | JetP: A

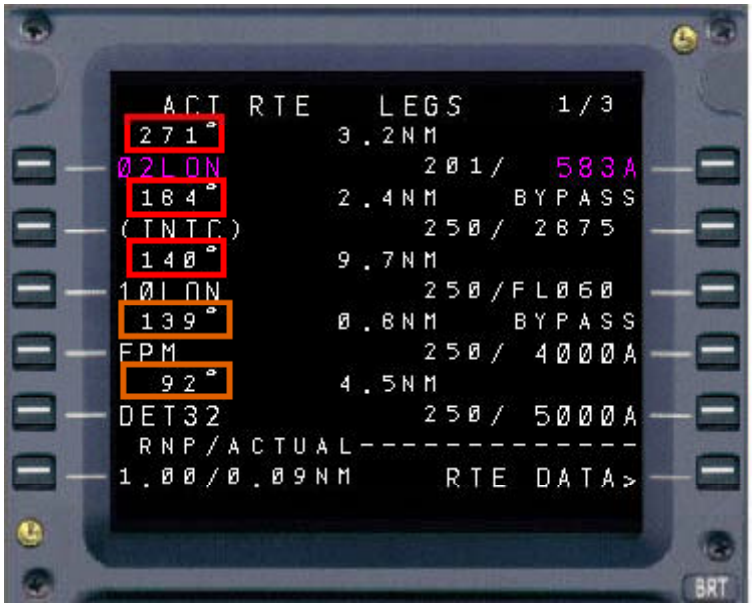
	Seq	Fix	Ctry	Type	PT	RNP	T	V	MagTr	Dist	Ex	Alt[	Alt1
	10	02LON	EG	PC	CF				271.0	002.0		+	00583
	20				CI		L	Y	184.0	.0			
	25	10LON	EG	PC	CF				140.0	010.0			
	30	EPM	EG	DB	TF				138.0	.8		+	04000
▶	40	DET32	EG	PC	TF				92.5	4.5		+	05000
	50	29DET	EG	PC	TF				92.5	3.0			06000
	60	DET5	EG	PC	TF				92.5	24.0			06000
	70	DET	EG	D	TF				93.0	5.0			

已编的磁航迹

(参看“Cx”航迹终结码）

FMS自身计算的结果

（参看“TF”航迹总结码）



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Source to Database – Magnetic Bearing & Magnetic Variation (5)

Other Issues related to Magnetic Variation

- to ensure **database integrity**, a newly established magnetic variation for an airport must trigger the issuance of **completely updated charts/procedures** for the **entire airport –** often state sources updates the magnetic variation for an airport, but not the SID/STAR/Approach plates, localizer bearing or runway data, causing uncertainty about tracks and bearings

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数据库来源 – 磁方位和磁差 (5)

与磁差相关的其他问题

- 为确保导航数据库的完好性，对一个机场新确定的磁差，将引起航迹和方位的不确定性变化，必须对整个机场的航图/程序进行更新。通常用国家数据源更新一个机场的磁差。

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