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DSAC Symposium

Paris, 13. December 2013

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 precise** 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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Source to Database – General Aspects (2)

- AIP
- AMDT / SUP
- AIC
- NOTAM
- Military AIP
- Internet (electronic 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	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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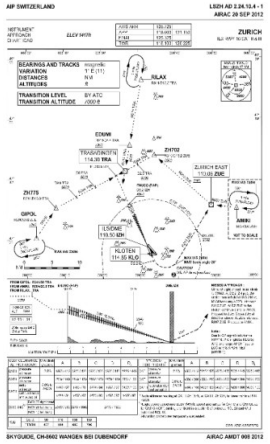
Source to Database – General Aspects (4)

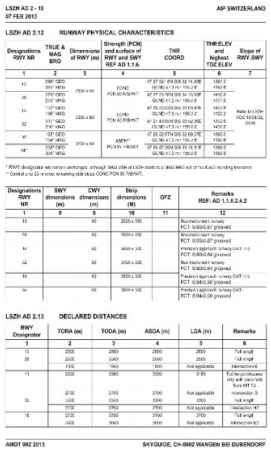
Airport	Type	SubType	Proc ID	Trans	Customer	Rte Type	AC Cat	Q1	Q2	JetProp	TCH	Overlay	ATC	VIS	TA / TL	Dist
LSZH	F	I	I16			I	ABCD		S	A	54		☐	☐		24.4

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									

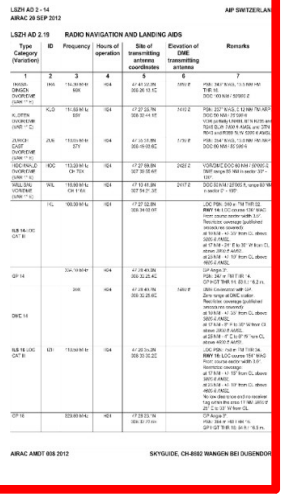
AD 2.24.10.4:
Procedure Chart



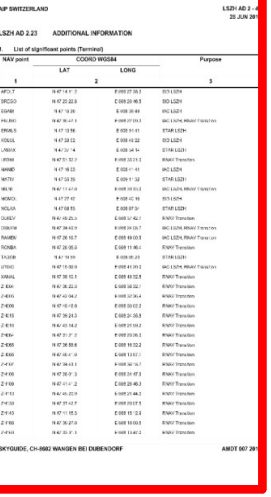
AD 2-10:
Runway data



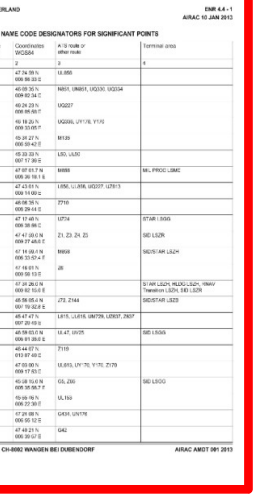
AD 2-14:
Navaid data



AD 2-47:
Terminal WPT



ENR 4.4:
Enroute WPT



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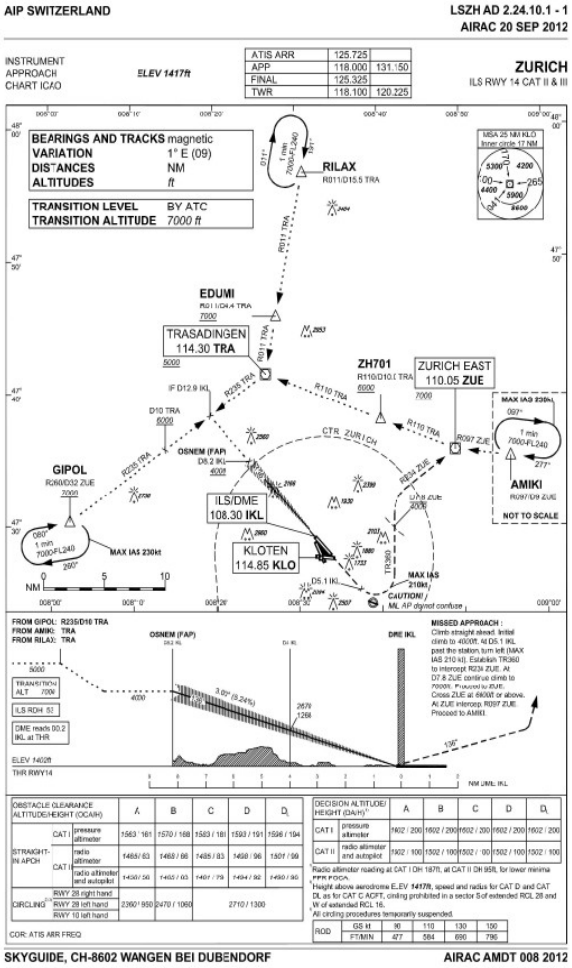
Step 1: Source



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Step 2: Data Maintenance Application

FMS Terminal Procedure

FMS Terminal Procedure

Lufthansa Systems FlightNav

Airport | Type | SubType | Q1 | Q2 | Proc ID | Transition * | Customer

Procedure Name: ILSDME RWY 14 | Transition Name

Zurich - Zurich (ZRH)

Airport	Type	Proc	RT	Q1	Q2	Trans	Cust	ACCAT
LSZH	F	I14	A		S	AMIKI		ABCD
LSZH	F	I14	A		S	GIPOL		ABCD
LSZH	F	I14	A		S	RILAX		ABCD
LSZH	F	I14	I		S			ABCD
LSZH	F	I16	A		S	AMIKI		ABCD

Airport	Type	SubType	Proc ID	Trans	Customer	Rte Type	AC Cat	Q1	Q2	JetProp	TCH	Overlay	ATC	VIS	TA / TL	Dist
LSZH	F	I	I14			I	ABCD		S	A	53		☐	☐		22.3

Validation Info

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__	Radius	Remarks	LastUpdate	by
10	OSNEM	LS	PC	E			I	P	IKL	LS	PI	316.0	9.9	IF				.0	.0		I	04000	04000											24.02.2010	DanielAeschlimann
20	IKL40	LS	PC	E			F		IKL	LS	PI	316.0	5.7	CF				136.0	004.2		G	04000	02670			-3.00								17.02.2010	DanielAeschlimann
30	RW14	LS	PG	G			M		IKL	LS	PI	316.0	1.9	CF				136.0	003.8			01455				-3.00								17.02.2010	DanielAeschlimann
35	RW14	LS	PG	G		M			KLO	LS	D	344.5	1.5	FA				136.0	.0		+	A0400												18.11.2010	DanielAeschlimann
40	IKL51	LS	PC	E	Y							360.0	.0	DF				136.2	5.3															23.04.2008	DanielAeschlimann
60									ZUE	LS	D	360.0	.0	CD		L	Y	360.0	007.8		-	04000					-	210						23.04.2008	DanielAeschlimann
70	ZUE	LS	D	V					ZUE	LS	D	360.0	.0	CF				54.0	007.0		+	06000												23.04.2008	DanielAeschlimann
80	AMIKI	LS	EA	E	E		H		ZUE	LS	D	95.9	9.0	TF				95.9	9.0			07000												17.02.2010	DanielAeschlimann

FMS Navaid

INSERT ROW | ADD ROW | DELETE ROW

MSA:

KLO	A	VOR

Source | Type: AIP Amendment | Remarks

LS 12/10 - 18NOV10

PROFILE

HISTORY | PRINT | CHECK PROC | VISUALIZE | SAVE | DELETE | CLOSE

Last modification 18.11.2010 11:21:34 by DanielAeschlimann
Last validation by
Created 01.03.2000 by Application (Init)

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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
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```


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Step 4: 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

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				
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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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Step 4: Packed FMS Data

Step 5: Data loaded in FMS

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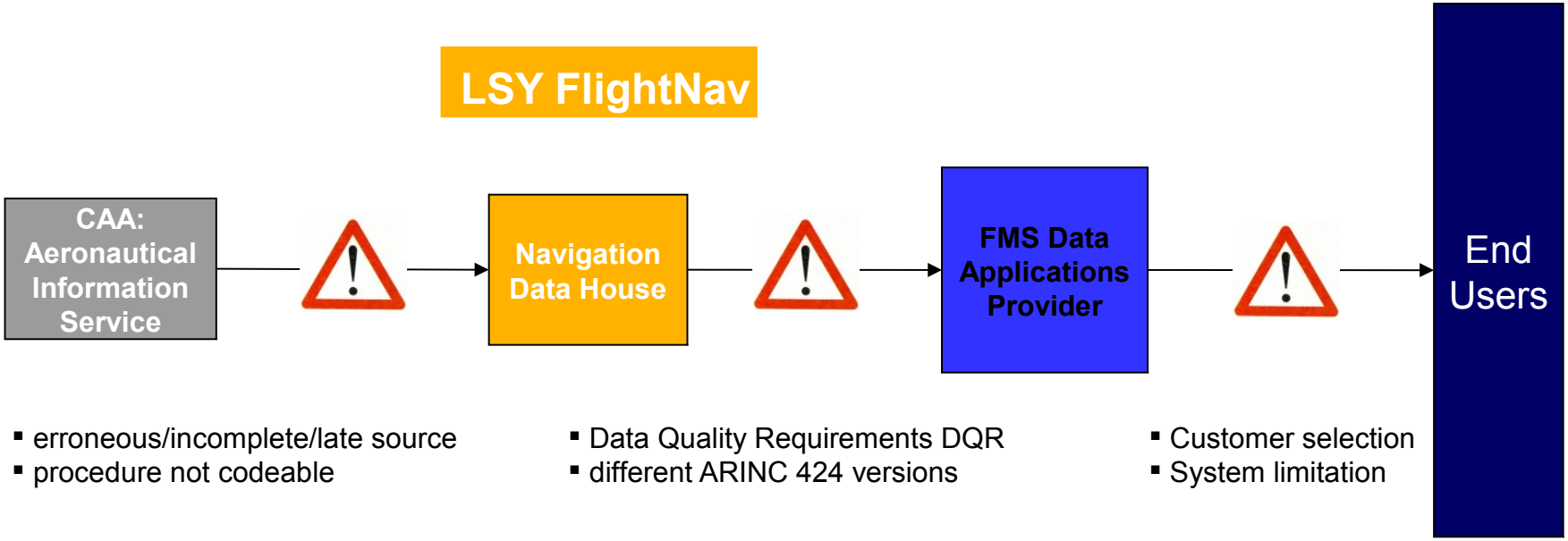
Dataflow and reasons for „missing“ data



- erroneous/incomplete/late source
- procedure not codeable

- Data Quality Requirements DQR
- different ARINC 424 versions

- Customer selection
- System limitation

Dataflow from source to pilot.

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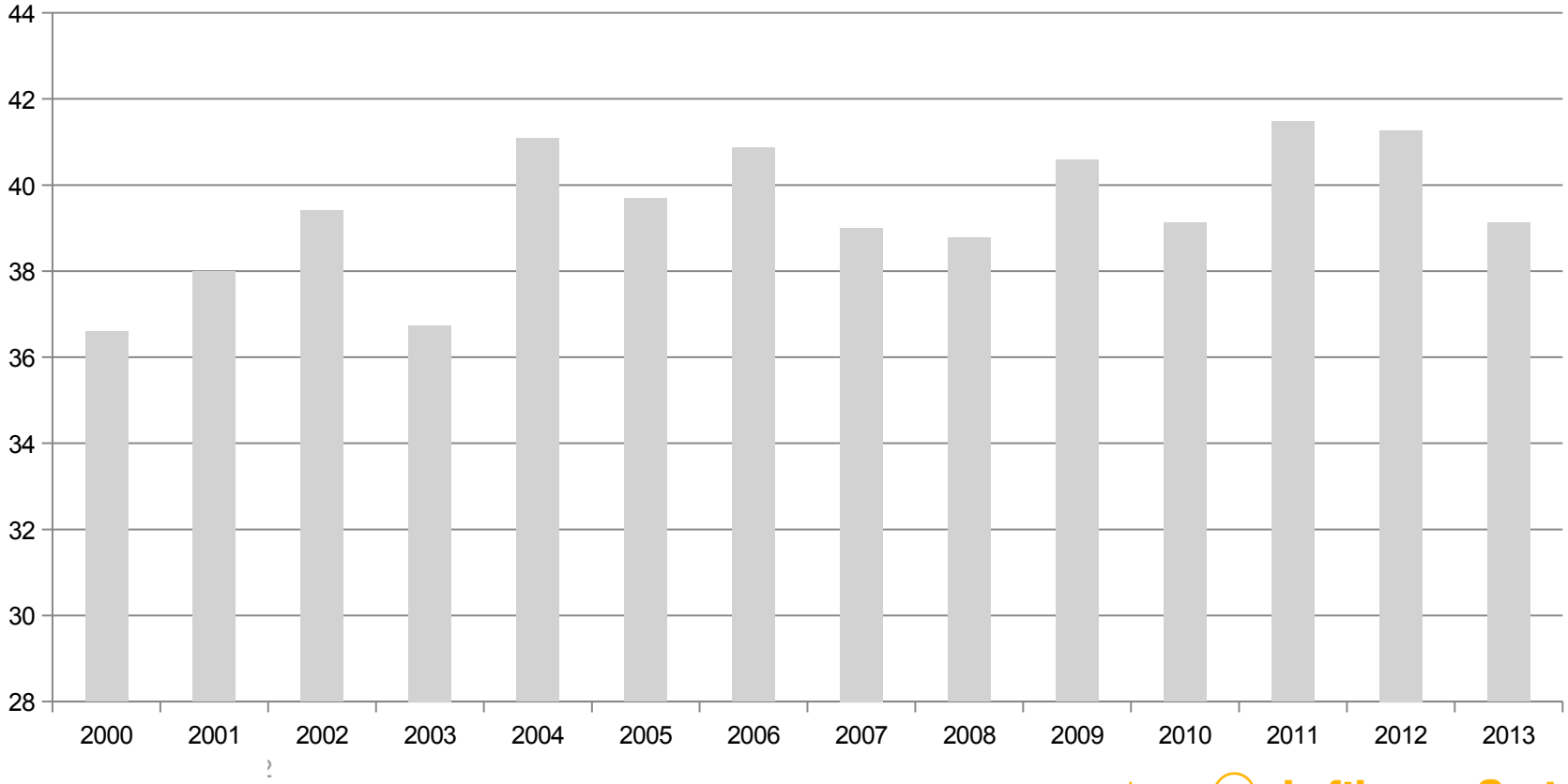
Publication AIP

- Depuis 2000, on a reçu plus de 700 documents AIRAC de la France

Country	Publication	Nr	Year	Received	Effective	Before Effective
LF	AIRAC	05	2013	18-Mrz-13	02-Mai-13	44
LF	AIRAC AD ARR/DEP	05	2013	18-Mrz-13	02-Mai-13	44
LF	AIRAC IAC	05	2013	18-Mrz-13	02-Mai-13	44
LF	AIRAC VAC	05	2013	26-Mrz-13	02-Mai-13	37
LF	AIRAC VAC HELI	05	2013	19-Mrz-13	02-Mai-13	43
LF	AIRAC	06	2013	16-Apr-13	30-Mai-13	44
LF	AIRAC AD ARR/DEP	06	2013	16-Apr-13	30-Mai-13	44
LF	AIRAC IAC	06	2013	16-Apr-13	30-Mai-13	44
LF	AIRAC VAC	06	2013	22-Apr-13	30-Mai-13	38
LF	AIRAC VAC HELI	06	2013	25-Apr-13	30-Mai-13	34
LF	AIRAC	07	2013	21-Mai-13	27-Jun-13	36
LF	AIRAC AD ARR/DEP	07	2013	10-Mai-13	27-Jun-13	47
LF	AIRAC IAC	07	2013	13-Mai-13	27-Jun-13	44
LF	AIRAC VAC	07	2013	21-Mai-13	27-Jun-13	36
LF	AIRAC VAC HELI	07	2013	21-Mai-13	27-Jun-13	36

Publication AIP

- On a reçu les documents 39.5 jours avant la date effective



Modifications temporaire

- Pas de problème si c’est une modifications avec des points ou procédures supplémentaires, ou si c’est une modification qui dure plus longtemps qu’une cycle AIRAC.
- Exemple: un VOR est hors de service pendant 3 mois et remplacé avec un VOR temporaire.

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Modifications temporaire

- Pas de problème si c’est une modifications des points ou procédures existantes, ou si c’est une modification qui dure moins qu’une cycle AIRAC.
- Exemple: le seuil d’une piste est modifiée pour une semaine.

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AIP France

- Nous trouvons toutes les pièces de l'information qui sont nécessaire pour le codage FMS dans l'AIP France

- Sauf…

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AIP France

- Déclinaison magnétique des stations VOR

Station	Service	ID	FREQ	HOR	Position GEO Portée Coverage	ALT	Situation *Location*	exploitant *operator*	Observations *Remarks*
ABBEVILLE	VOR-DME	ABB	108.45 MHz Ch 21Y	H24	50°08'06.5"N 001°51'16.9"E 60NM FL500				
AGEN-Gaudonville	VOR-DME	AGN	114.8 MHz Ch 95X	H24	43°53'16.9"N 000°52'22.3"E 120NM(315°..75°) 100NM FL500	896 ft			

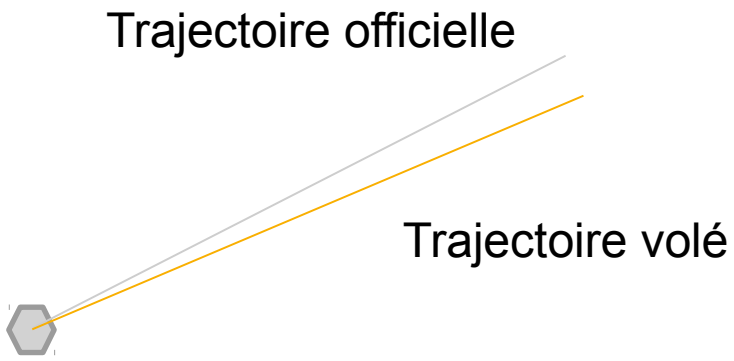
AD 2 LFKJ.1 **Indicateur d'emplacement - nom de l'aérodrome *Aerodrome loca***

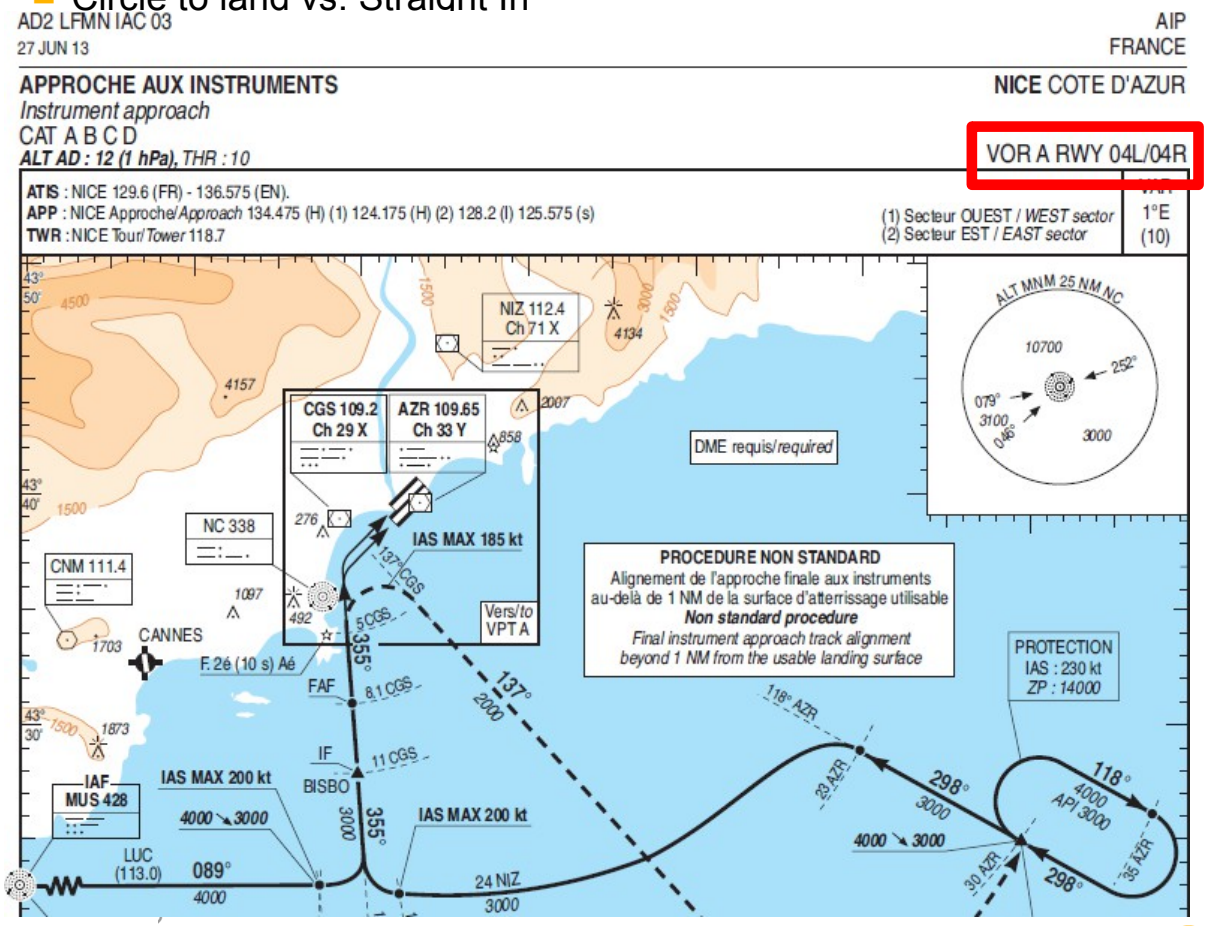
LFKJ - AJACCIO NAPOLEON BONAPARTE

AD 2 LFKJ.2 **Données géographiques et administratives de l'aérodrome *Aerodrome geo***

1	Position GEO ARP	41°55'26"N 008°48'09"E	
	Situation de l'ARP / *ARP location*	Intersection piste 02/20 et TWY H	RW
2	Direction, distance de la ville *Direction, distance from city*	5 km Est d'Ajaccio	5 k
3	Altitude de référence / *Reference elevation*	19 ft	
	Température de référence / *Reference temperature*	27 ° C	
4	Ondulation du géoïde / *Geoid undulation*	157 ft	
5	Déclinaison magnétique / *Magnetic variation*	1°E	
	Année (variation annuelle) / *Year (annual change)*	2010	

- La déclinaison magnétique est utilisée pour construire la trajectoire de la procédure dans le FMS
- Une différence d'une dégrée peut déplacer la trajectoire pour 0.3nm



Exemples of Source

- Circle to land vs. Straight In