

# GBAS/SBAS Implementation Workshop

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## SBAS LPV flight procedure design and implementation **DSNA France**

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# CONTENT OF THE PRESENTATION

- ICAO Annex 10 requirements
- Main design differences SBAS LPV vs. BaroVNAV LNAV/VNAV
- SBAS procedure validation
- Final Approach Segment (FAS) data block
- SBAS channel
- SBAS Status and ATC
- SBAS Notam

# ICAO Annex 10 requirements



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# ANNEX 10 SIS REQUIREMENTS

**Table 3.7.2.4-1 Signal-in-space performance requirements**

Typical operation	Accuracy horizontal 95% (Notes 1 and 3)	Accuracy vertical 95% (Notes 1 and 3)	Integrity (Note 2)	Time-to-alert (Note 3)	Continuity (Note 4)	Availability (Note 5)
En-route	3.7 km (2.0 NM)	N/A	$1 - 1 \times 10^{-7}/h$	5 min	$1 - 1 \times 10^{-4}/h$ to $1 - 1 \times 10^{-8}/h$	0.99 to 0.99999
En-route, Terminal	0.74 km (0.4 NM)	N/A	$1 - 1 \times 10^{-7}/h$	15 s	$1 - 1 \times 10^{-4}/h$ to $1 - 1 \times 10^{-8}/h$	0.99 to 0.99999
Initial approach, Intermediate approach, Non-precision approach (NPA), Departure	220 m (720 ft)	N/A	$1 - 1 \times 10^{-7}/h$	10 s	$1 - 1 \times 10^{-4}/h$ to $1 - 1 \times 10^{-8}/h$	0.99 to 0.99999
Approach operations with vertical guidance (APV-I)	16.0 m (52 ft)	20 m (66 ft)	$1 - 2 \times 10^{-7}$ in any approach	10 s	$1 - 8 \times 10^{-6}$ per 15 s	0.99 to 0.99999
Approach operations with vertical guidance (APV-II)	16.0 m (52 ft)	8.0 m (26 ft)	$1 - 2 \times 10^{-7}$ in any approach	6 s	$1 - 8 \times 10^{-6}$ per 15 s	0.99 to 0.99999
Category I precision approach (Note 7)	16.0 m (52 ft)	6.0 m to 4.0 m (20 ft to 13 ft) (Note 6)	$1 - 2 \times 10^{-7}$ in any approach	6 s	$1 - 8 \times 10^{-6}$ per 15 s	0.99 to 0.99999

# Main Design differences : SBAS LPV vs. BaroVNAV LNAV/VNAV



**APPROCHE AUX INSTRUMENTS**

Instrument approach

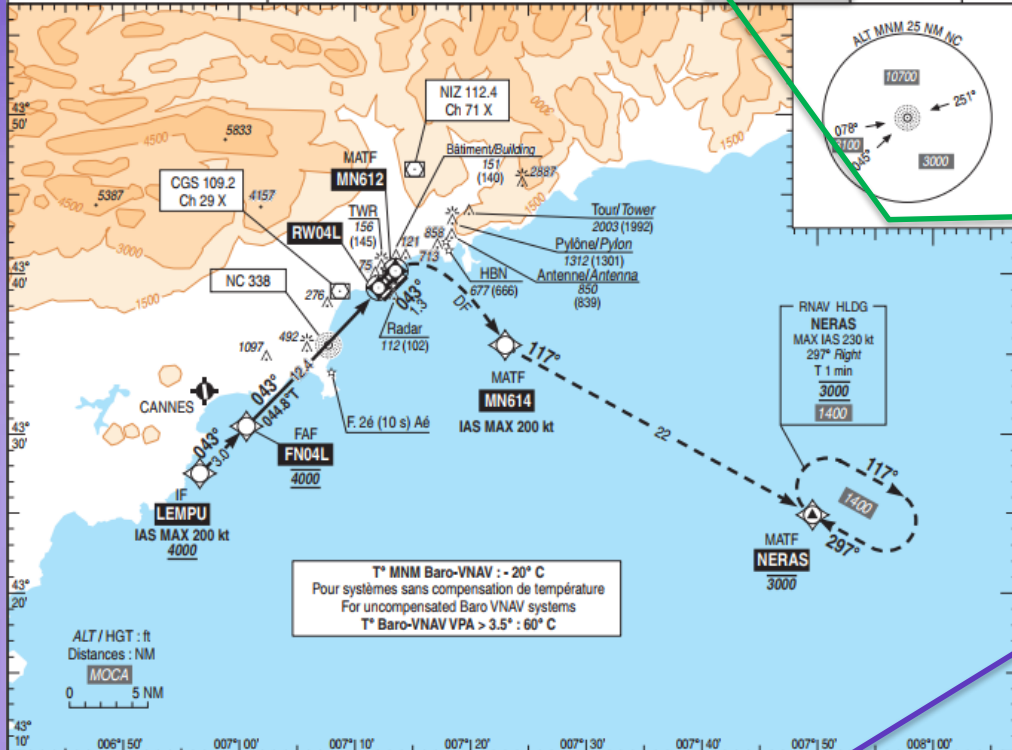
CAT A B C D

ALT AD : 12, THR : 11 (1 hPa)

**NICE COTE D'AZUR**

FNA RNAV (GNSS) Z RWY 04L (LPV, LNAV/VNAV ONLY)

FREQ : Voir / See AD 2 LFMN COM 01	Fonction du FMS permettant d'intercepter l'axe de la piste suite à un guidage radar. FMS function allowing the interception of the runway centerline after radar vectoring.	RNP APCH SBAS requis/required ou/or Baro VNAV requis/required	EGNOS 50045 E04A RDH : 49	VAR 28E (15)
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# APV SBAS AND APV BARO

A single chart :

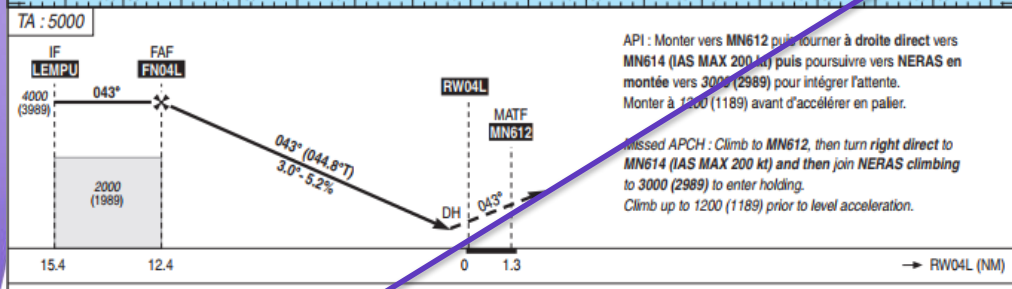
- Same name for AIP and ATCO's clearance
- Same trajectory (same WPs)
- Same vertical depiction (FAF and final slope)

PBN Box requesting onboard

- Either SBAS
- Or BaroVNAV capacity

Different values of operational minima:

- **Lowest OCH for LPV** vs LNAV/VNAV
- No info charted on SBAS performance



MINM AD : distances verticales en pieds, RVR et VIS en mètres / vertical distances in feet, RVR and VIS in metres.

CAT	LPV (1)			LNAV/VNAV (2)			MVL / Circling (1)	
	DA (H)	RVR	OCH	DA (H)	RVR	OCH	MDA (H)	VIS
A	250 (240)	1200	231	600 (590)	1500	582	770 (760)	3500
B	260 (250)	1300	241	610 (600)	1500	594	770 (760)	3500
C	390 (380)	1700	378	630 (620)	2400	614	1700 (1690)	5000
D	400 (390)	1800	388	660 (650)	2400	641	2420 (2410)	5000

Observations / Remarks : (1) MVL interdites au Nord-Ouest des pistes / Circling prohibited North-West of RWY  
 Panne de guidage GNSS lors de l'approche / Loss of GNSS guidance during approach : voir / see AIP ENR 1.5  
 (2) Pour minimums particuliers, voir verso. / For special minima, see overleaf.  
 PAPI RWY04L - portée limitée à 7000 m / scope limited to 7000 m

# APV SBAS VS APV BARO : FLYING FINAL SLOPE

	QNH	Temperature	Radar vector to final
APV SBAS	Not affected	Not affected	Similar to LOC
APV Baro VNAV	Based on QNH	Affected	Constraint (FAF altitude +/- 200 ft)

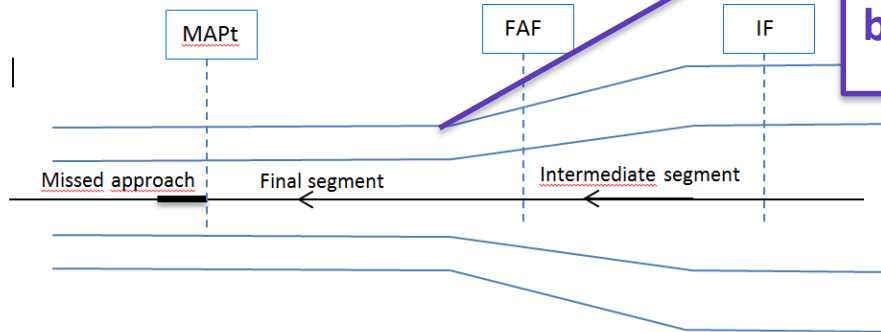
## Pilots feedback:

- APV SBAS final slope often better than ILS glide path (more stable)
- APV Baro VNAV can be affected by temperature (and obviously as well by QNH mis-setting)
  - High temp : too steep
  - Low temp: too low

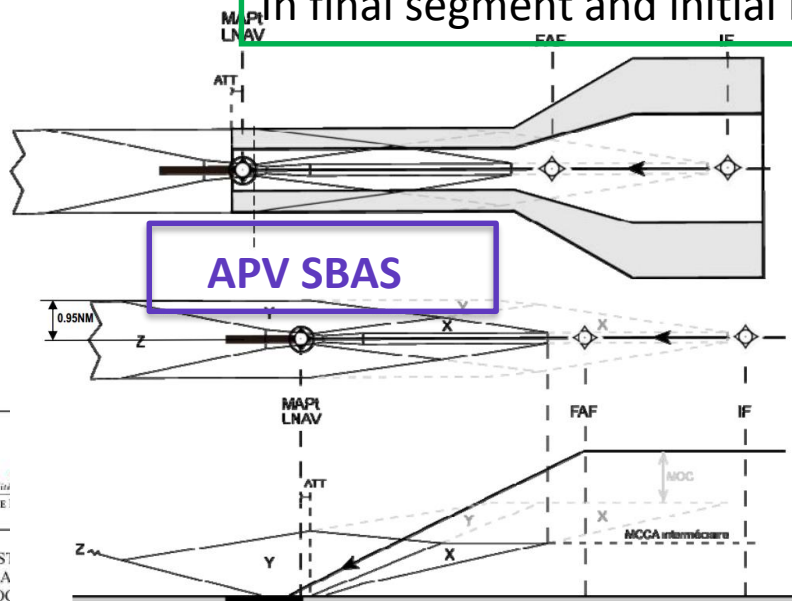


# APV SBAS VS APV BARO : PROTECTION AREAS

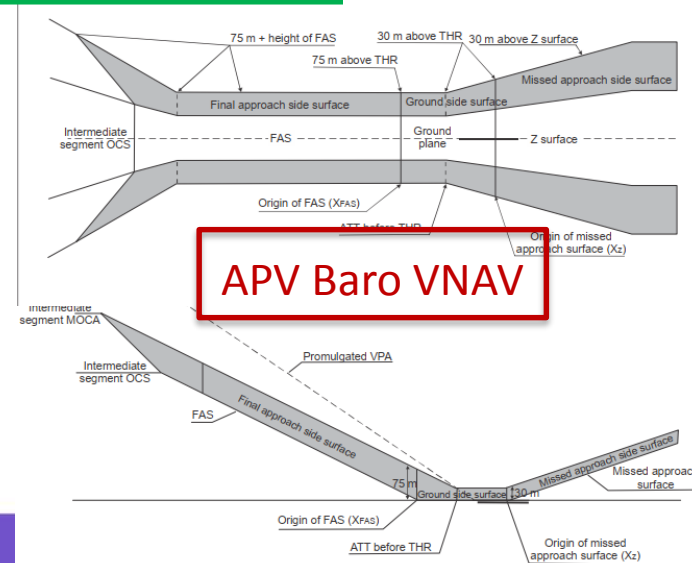
similar lateral protection areas based on LNAV criteria



Different set of vertical surfaces to assess obstacles  
In final segment and initial missed approach



APV SBAS



APV Baro VNAV



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# APV BARO PROCEDURE DESIGN CRITERIA

Design criteria are described in PANS OPS Part III, Section 3, Chapter 4

## Chapter 4

### APV/BAROMETRIC VERTICAL NAVIGATION (BARO-VNAV)

Protection criteria depending on low temperature consideration:

- **Lowest temperature allowed** published

Warning on the effect of high temperature on final slope

DH limited to 250ft

**T° MNM Baro-VNAV : - 20° C**  
Pour systèmes sans compensation de température  
For uncompensated Baro VNAV systems  
**T° Baro-VNAV VPA > 3.5° : 60° C**



# APV SBAS PROCEDURE DESIGN CRITERIA 1/2

Design criteria are described in PANS OPS Part III, Section 3, Chapter 5 very similar to ILS criteria

## Chapter 5

### SBAS NON-PRECISION APPROACH, APPROACH WITH VERTICAL GUIDANCE AND PRECISION APPROACH CATEGORY I PROCEDURES

Two sets of criteria depending on the performances of the SBAS system lead to :

- APV SBAS (minimum DH : 250ft)
- SBAS Cat I (minimum DH : 200ft)
  - **For SBAS Cat I: two design solutions available, but ILS Collision Risk Model generally leads to lowest OCH**

# SBAS procedure validation



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# APV SBAS VS APV BARO VNAV : PROCEDURE VALIDATION

## APV SBAS :

- Ground validation, but no systematic flight validation in France, since a trust process has been built for major items:
  - procedure design
  - aeronautical data bases
  - obstacle data bases
- **FAS DB : key element requiring a specific validation process**
  - See next slides

## APV Baro VNAV :

- Ground validation sufficient
- No specific need for final segment validation (no FAS DB)

# FAS DB : from design to validation and publication



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# LPV FAS Datablock

**TABLE D-1 FINAL APPROACH SEGMENT (FAS)**

<i>Data content</i>	<i>Bits used</i>	<i>Range of values</i>	<i>Resolution</i>
Operation type	4	0 to 15	1
SBAS provider ID	4	0 to 15	1
Airport ID	32	-	-
Runway number ( <i>Note 1</i> )	6	0 to 36	1
Runway letter	2	-	-
Approach performance designator	3	0 to 7	1
Route indicator	5	-	-
Reference path data selector	8	0 to 48	1
Reference path identifier	32	-	-
LTP/FTP latitude	32	$\pm 90.0^\circ$	0.0005 arcsec
LTP/FTP longitude	32	$\pm 180.0^\circ$	0.0005 arcsec
LTP/FTP height	16	-512.0 to 6041.5 m	0.1 m
$\Delta$ FPAP latitude	24	$\pm 1.0^\circ$	0.0005 arcsec
$\Delta$ FPAP longitude	24	$\pm 1.0^\circ$	0.0005 arcsec
Approach threshold crossing height (TCH)	15	0 to 1638.35 m (0 to 3276.7 ft)	0.05 m (0.1 ft)
Approach TCH units selector	1	-	-
Glidepath angle (GPA)	16	0 to $90.0^\circ$	$0.01^\circ$
Course width at threshold ( <i>Note 1</i> )	8	80.0 to 143.75 m	0.25 m
$\Delta$ Length offset	8	0 to 2032 m	8 m
Horizontal Alert Limit (HAL)	8	0 to 51.0 m	0.2 m
Vertical Alert Limit (VAL) ( <i>Note 2</i> )	8	0 to 51.0 m	0.2 m
Final approach segment CRC	32	-	-

*Note 1: When the runway number is set to 00, then the course width field is ignored and the course width is 38 meters.*

**40 bytes**

**12 bytes for Identification**

**22 bytes coding for the Geometry of the Final Approach Segment**

**2 bytes for the required SBAS performances**

**4 byte CRC - integrity**

# FASDB generation tools

**EUROCONTROL SBAS FAS Data Block Tool**  
[About](#) [Disclaimer](#) [Help](#)

Functions : [Encode](#) [Decode](#) [Decode File](#)

**Input Data**

Encoded Block Data

Operation Type	[0] Straight In/offset
SBAS Provider	[1] EGNOS
Airport Identifier	LFPG
Runway	27
Approach Performance Designator	[0] APV
Route Indicator	-blank-
Reference Path Data Selector	0
Reference Path Identifier	E27B
LTP/FTP Latitude	490136.1020N
LTP/FTP Longitude	0023342.0855E
LTP/FTP Ellipsoidal Height (metres)	163.1
FPAP Latitude	490126.7550N
FPAP Longitude	0023048.2055E
Threshold Crossing Height	54.0
Glideslope Angle (degrees)	3.00
Course Width (metres)	105.00
Length Offset (metres)	840
HAL (metres)	40.0
VAL (metres)	35.0
CRC Value	109951C

Required Additional Data (not CRC wrapped)

This additional data are not required for CRC calculation, but they need to be provided to datahouses for procedure coding in ARINC 424 records

ICAO Code	
LTP/FTP Orthometric Height (metres)	

Calculate

- **EUROCONTROL SBAS FAS Data Block Tool**
  - <https://fasdb.eurocontrol.int/fasdb/app/about.htm>
  - Checks for ranges of values
  - Computes CRC
  - Generates .PDF, .TXT, .BIN files
  - DOES NOT check consistency of data

- **CGX AERO GéoTITAN® LPV FAS Data Block module**

- Computes automatically FASDB parameters from LPV design
- Checks for ranges of values
- Computes CRC
- Generates .PDF, .BIN files

Afficher SBAS FAS data block { LFPG }

Prêt à quitter la fenêtre

10 0710060C 5B 00 00 02373205 C5380A15 816F1901 5F1A 05B7FF 92B1FA 1C02 2C01 64 6A C8 FA 7073CF20

N°	Champ	Valeur GTT (Entrée)	Remarque	Valeur FAS (Sortie)	Bits	Valeur Hexa
1a	Type d'opération	Ligne droite	LSB	0	4	0
1b	Source SBAS	EGNOS	MSB	1	4	1
2	Indicateur de l'aérodrome	LFPG	~	LFPG	32	30 60 08 E0
3a	Piste utilisée (Numéro)	27	LSB	27	6	1B
3b	Piste utilisée (Lettre)	R	MSB	R	2	1
4a	Performance d'approche	LPV	LSB	0	3	0
4b	Indicateur de route		MSB		5	20
5	Sélecteur de trajectoire	0	~	0	8	00
6	Identificateur de trajectoire	E27B	~	E27B	32	A0 4C EC 40
7	Latitude du LTP	49° 01' 36.098" N	± 0.0005"	49° 01' 36.0985" N	32	A8 50 DC A3
8	Longitude du LTP	002° 33' 42.080" E	± 0.0005"	002° 33' 42.0805" E	32	80 98 F6 81
9a	Altitude du LTP	119.48 m	~	~	~	~
9b	Valeur du GUND	43.59 m	~	~	~	~
9c	Hauteur ellipsoïdale du LTP	163.07 m	± 0.1 m	163.1 m	16	58 FA
10	Latitude du FPAP	49° 01' 26.757" N	± 0.0005"	49° 01' 26.7570" N	~	~
11	Longitude du FPAP	002° 30' 48.202" E	± 0.0005"	002° 30' 48.2015" E	~	~
12	Ecart de latitude FPAP/LTP	~	± 0.0005"	-9.3415"	24	FF ED A0
13	Ecart de longitude FPAP/LTP	~	± 0.0005"	-173.8790"	24	5F 8D 49
14	Hauteur de passage au seuil	54.0 ft	± 0.1 ft	54.0 ft	16	40 38
15	Angle du VPA	3.00°	± 0.01°	3.00°	16	80 34
16	Demi-largeur au seuil	105.00 m	± 0.25 m	105.00 m	8	64
17	Longueur de décalage	844.08 m	± 9 m	848 m	8	6A
18	Limite d'alarme horizontale	40.0 m	± 0.2 m	40.0 m	8	C9
19	Limite d'alarme verticale	50.00 m	± 0.2 m	50.0 m	8	FA
20	Valeur du CRC	~	~	~	32	70 73 CF 20

Calculer SBAS FAS data block { LFPG }

Prêt à exécuter la commande ...

Paramètres de finale

LFPG THR 27R 119.48 m / 382.0 ft

Finale APV SBAS Final Rwy 27R

3.00° / 5.24% TCH 16.46 m / 54.0 ft

Valeur du GUND 43.59 m / 143.0 ft

Autres paramètres

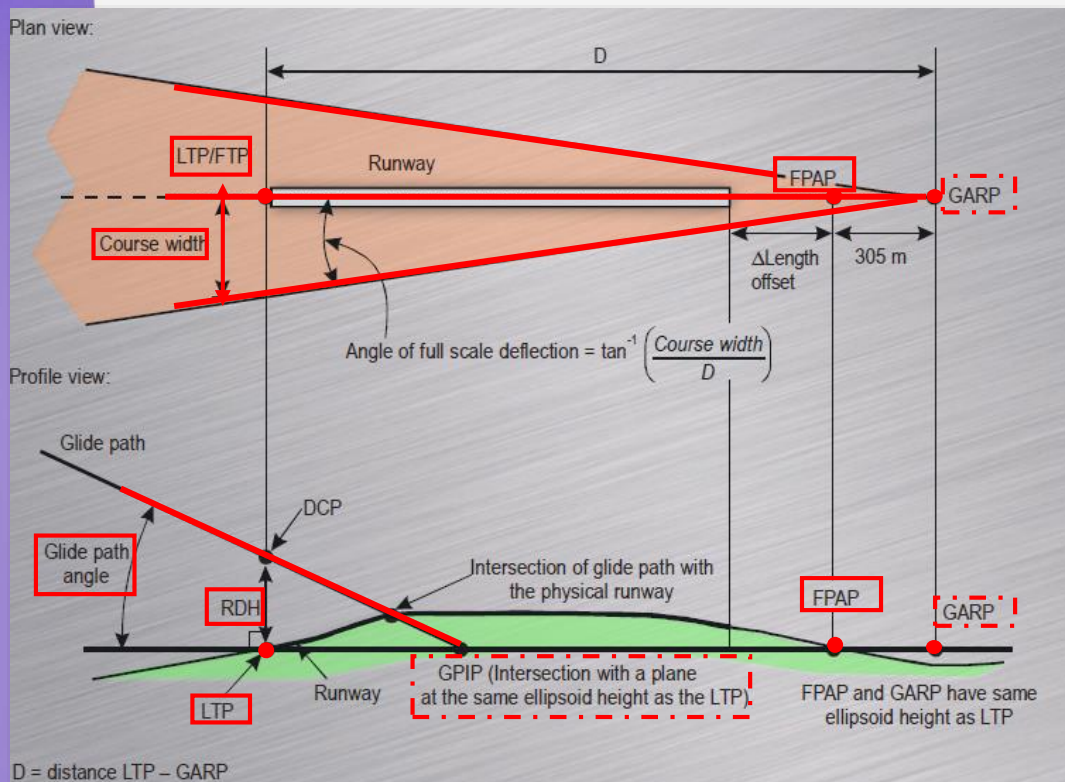
Fournisseur SBAS Indicateur Route Identificateur de trajectoire

EGNOS E 27 B

Calculer Afficher Exé



# FASDB design



Parameters		Value
Operation Type		0
SBAS Provider		1 (EGNOS)
Airport Identifier		LFPG
Runway		27
Runway Letter		1 (Right)
Approach Performance Designator		0
Route Indicator		
Reference Path Data Selector		0
Reference Path Identifier		E27B
LTP/FTP Latitude		490136.1020N
LTP/FTP Longitude		0023342.0855E
LTP/FTP Ellipsoidal Height (metres)		163.1
FPAP Latitude		490126.7550N
Delta FPAP Latitude (seconds)		-9.3470
FPAP Longitude		0023048.2055E
Delta FPAP Longitude (seconds)		-173.8800
Threshold Crossing Height		54.0
TCH Units Selector		0 (feet)
Glidepath Angle (degrees)		3.00
Course Width (metres)		105.00
Length Offset (metres)		840
HAL (metres)		40.0
VAL (metres)		35.0

**Integrity : 10E-8. LTP and FPAP coordinates must be aligned with the runway.**

- **LTP**: at landing threshold; LTP ell. Height is **WGS84** and the **unique** vertical reference, pay attention to datum used when using local references (WGS84)
- **FPAP**: at End of Runway or **computed** (305m in front of LLZ, or placed for 6° aperture)

# FASDB validation

- Each item of the FASDB must be checked for consistency with airport, runway, and designed procedure
  1. By **Ground and Flight Validation** as detailed in ICAO **doc 9906 vol5**
    - Ground Validation: FASDB consistency with procedure design (Identification fields, GPA, HAL,VAL)
    - Flight Validation: flyability, alignment with the underlying FAF-MAPt leg
  2. By **Ground and/or Flight Inspection** as detailed in ICAO **doc 8071 vol2**
    - An **assessment of the accuracy of the LTP and FPAP coordinates** shall be made
      - **Direct** assessment: by a surveyor, *but FPAP is sometimes not a physical point*
      - **Indirect**: by Flight inspection methods using a Flight Inspection aircraft and FIS
    - **In flight:**
      - Computation of **achieved GPA, TCH, alignment** using Truth reference
      - No need to validate SBAS performances (performed by ground segment)
      - but to check the correct reception of SBAS signal of all GEOs and achieved performances compared to foreseen **HAL and VAL** in particular in mountainous regions or close to SBAS coverage borders
    - And GPS L1 interferences free

# DSNA FASDB validation process

- 1/ Ground validation of the FASDB by the DSNA Flight Inspector Engineer:

- FASDB/ Chart consistency
- CRC check
- LTP and FPAP coordinates check versus airport WGS84 database

- **CARNAC** SAFRAN tool used - predefined set of rules
- Computes automatically hor. and vert. errors between LTP, FPAP coordinates and Length Offset vs runway and LLZ coordinates
- Tolerances:

H=1m, V=0.25m  
(from doc 8071vol2)

FASDB Coord.	Latitude ("°")	Longitude ("°")	Altitude	X	Y	Z
LTP/FTP	49°01'36.1020"N	002°33'42.0855"E	163.10	3849.2721	0.000000	-1.159313
GP1P				3535.2119	0.000000	-0.980085
GP2P				3535.2119	-150.000000	-0.980085
OppT	49°01'28.9768"N	002°31'29.4138"E	163.10	1144.9999	0.000000	-0.102578
FPAP	49°01'26.7550"N	002°30'48.2055"E	163.10	305.000000	0.000000	-0.007279
GARP	49°01'25.9472"N	002°30'33.2432"E	163.10	0.000000	0.000000	0.000000

REFERENCE Coord.	Latitude ("°")	Longitude ("°")	Altitude	X	Y	Z
Ldg_THR	49°01'36.1022"N	002°33'42.0855"E	163.10	3849.28099	0.000000	-1.159313
GP1P_c				3535.22075	0.000000	-0.980090
GP2P_c				3535.22075	-150.000000	-0.980090
Opp_THR	49°01'28.9866"N	002°31'29.6106"E	163.10	1149.01802	0.000000	-0.103299
FPAP_c	49°01'26.7538"N	002°30'48.2052"E	163.10	305.000000	0.000000	-0.007279
GARP_c	49°01'25.9460"N	002°30'33.2430"E	163.10	0.000000	0.000000	0.000000
LOC_GPU	49°01'25.9473"N	002°30'33.2428"E	154.89	-0.000018	0.041786	-8.210000

Rule	DSNA	FPAP Const.	3 FTP FPAP Dist (m)	3544.28	Length offset (m)	840.00	
Orientation ("°")	265.306	Sector Width ("°")	3.125	Runway Len(m)	2704.27	LOC_THR1 (m)	1149.02
HD_LTP (m)	0.01	VD_LTP (m)	0.00	HD_GARP(m)	0.04	HD_OPPT(m)	4.01



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# DSNA FASDB validation process



$\Delta hgt = 9.22ft = 2.81m$

2/ taxi the Flight Inspection aircraft along the runway



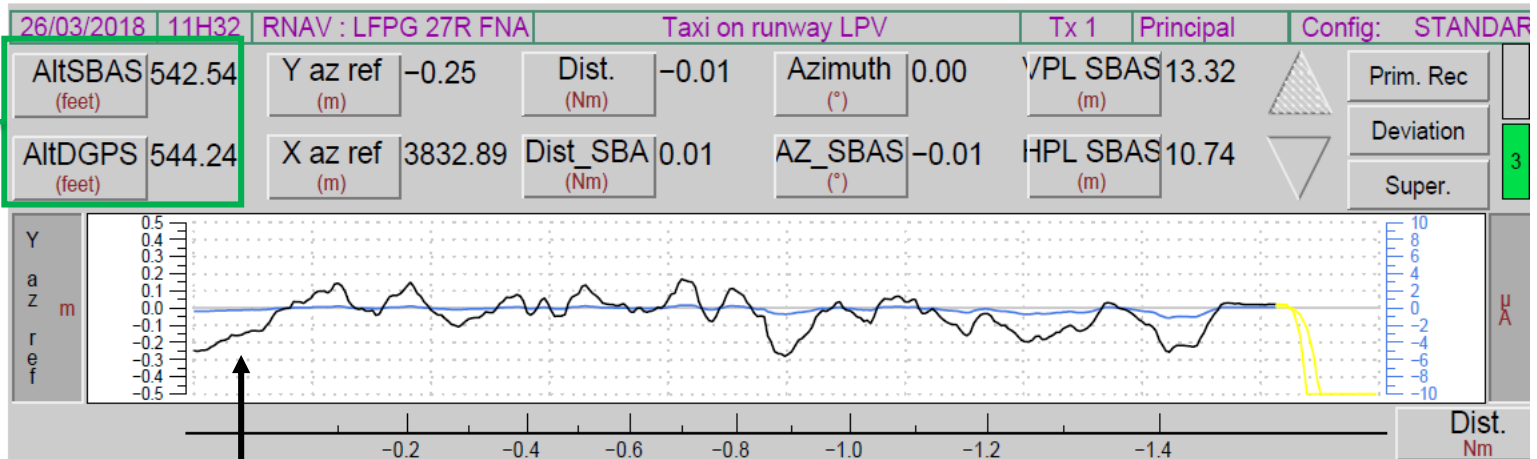
AltDGPS = 544.24ft

$\Delta DGPS < 1ft (0.33m)$

FASDB LTP ell. height + antenna hgt = 163.10m + 2.81m = **544.33ft**

AltSBAS = 542.54ft

$\Delta SBAS < 7ft (\sim 2m)$



**Y\_az\_ref:** Lateral displacement of aircraft from centre line while taxiing from one threshold to the other wrt to LTP-FPAP geodetical line – if it is not biased or divergent and remains <0.5m, LTP and FPAP coordinates considered fully validated



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# SBAS Channel

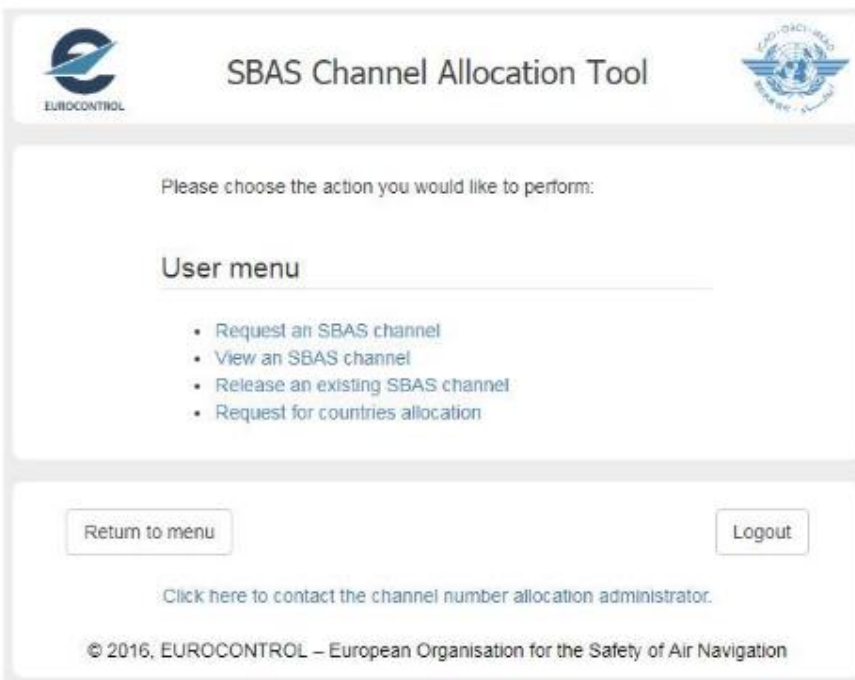


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# SBAS channel allocation

- SBAS Channel numbers range from **40000 to 99999 (single use in the world)**
- **FAA** used to manage the **world Master Database** for ICAO initially
- **At the beginning of EGNOS SoL, a list of 100 channel numbers** were allocated to France, as first European state to publish LPV – today 230 channels used



EUROCONTROL

## SBAS Channel Allocation Tool

ICAO

Please choose the action you would like to perform:

### User menu

- Request an SBAS channel
- View an SBAS channel
- Release an existing SBAS channel
- Request for countries allocation

Return to menu Logout

Click here to contact the channel number allocation administrator.

© 2016, EUROCONTROL – European Organisation for the Safety of Air Navigation

- Since EGNOS LPV have spread in Europe, **EUROCONTROL is now SBAS Channel manager**
- **CTRL** developed a **web based tool**
- **Login** given to 1 nominated state representative
- **To be Replaced by ICAO tool** next summer

# SBAS real-time operational status and ATC



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# LATEST ANNEX 10 AND PBN STATEMENTS

- **PBN status monitoring is an area of work which might require significant resources from States, and where divergence of interpretation had been noted by ICAO in the past**
- **Thus the Navigation System Panel of ICAO has recently proposed updates to ICAO Annex 10 (cf. State letter in progress):**

## CHAPTER 2. GENERAL PROVISIONS FOR RADIO NAVIGATION AIDS

...

### **2.3 Provision of information on the operational status of radio navigation services**

2.3.1 Aerodrome control towers and units providing approach control service shall be provided with information on the operational status of radio navigation services essential for approach, landing and take-off at the aerodrome(s) with which they are concerned, on a timely basis consistent with the use of the service(s) involved.

*Note.— Guidance material on the application of this Standard in the case of PBN-based operations supported by GNSS is contained in the Performance-based Navigation (PBN) Manual (Doc 9613).*

# LATEST ANNEX 10 AND PBN STATEMENTS

- **PBN Manual guidance to be updated in relation with the updated Annex 10 as follows, within the next edition of PBN manual (work in progress by PBN SG):**

« (...)There are a number of specific features of PBN approaches which render operational status monitoring neither practical nor required for PBN operations, whether the service is assessed essential or non-essential (...)”

# SBAS NOTAM



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# NOTAM

## SBAS NOTAM shall be issued by the SBAS service provider

- For any LPV procedure, based on Airport Reference Point location
- Information of predicted unavailability of SBAS service
- In Europe, NOTAM service is available to ANSPs through the EGNOS Working Agreement, built on bilateral basis with ESSP

## ABAS NOTAM required to assess lack of RAIM capability

- EAD European system issues both type of NOTAMs

	ABAS NOTAM	SBAS NOTAM
APV SBAS procedure	✓	✓
APV Baro VNAV procedure	✓	



# SBAS Legal recording



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# LEGAL RECORDING

## Broadcast SBAS signals shall be recorded by the SBAS service provider

- To be used in case of incident/accident where SBAS might have contributed to
- In Europe, the legal recording service is available to ANSPs through an EGNOS Working Agreement, built on bilateral basis with ESSP

# Conclusion

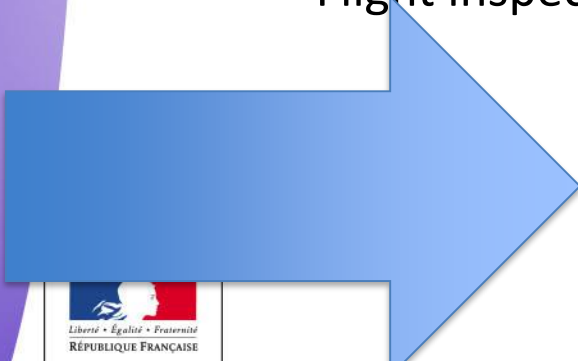




# MULTIDISCIPLINARY APPROACH RECOMMENDED

**DSNA experience was that setting-up a Task Force to support and consolidate the new LPV publication process is the most efficient:**

- Procedure designers
- AIS experts
- GNSS specialists
- Air traffic controllers
- Pilots (test pilots)
- Aircraft / Avionic manufacturers
- Flight inspection specialists



**Implementation of APV SBAS  
procedure from definition to publication  
including training of controllers and designers**

# Complementary slides



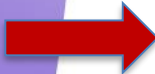
# Use of SBAS information for terminal area trajectories



# IN TERMINAL AREA

For aircraft equipped with SBAS receiver,

- vertical position
  - is computed using SBAS signals **ONLY along the final** segment
  - is provided by the **altimeter** on any other part of the trajectory
- horizontal guidance
  - Is based on **angular deviation** along the final axis
  - Is based on **linear** deviations on any other segment

 The final segment is designed with **geometric vertical guidance**  
Depending on SBAS signal performances, final segment may  
**be similar to ILS** final segment

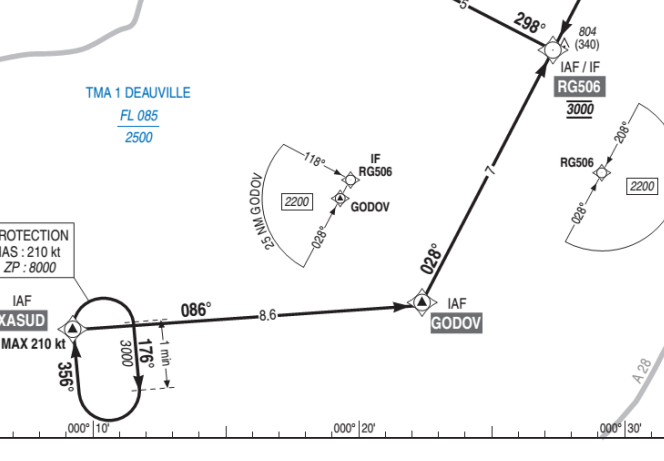
# IN TERMINAL AREA

	Navigation specification	SBAS main benefits
Departure	RNP1, RNAV1	-----
Arrival	RNP1, RNAV1	-----
Approach	RNP APCH	In final approach and straight missed approach



**APPROCHE AUX INSTRUMENTS**

*Instrument approach*  
**CAT A B C D**  
**ALT AD : 479, DTHR : 464 (17 hPa)**  
**ATIS DEAUVILLE : 119.175**  
**APP : DEAUVILLE Approche/Approach**  
**TWR : DEAUVILLE Tour/Tower 118.3**



**TA : 5000**

API : Monter dans l'axe. A **RG510**, en montée vers **3000** (2536), tourner à **gauche** pour rejoindre directement **XASUD** et intégrer l'attente associée (**IAS MAX 210 kt**).  
 Monter à **1300** (836) avant d'accélérer en palier.

*Missed APCH : Climb straight ahead. At **RG510**, up to **3000** (2536), turn **left** to reach directly **XASUD** and join associated holding (**IAS MAX 210 kt**).  
 Climb up to **1300** (836) prior to level acceleration.*

DTHR ← (NM) 0 7.8 12.8

MNM AD : distances verticales en pieds, RVR et VIS en mètres / Vertical distances in feet, RVR and VIS in metres. REF HGT : A

CAT	LPV		OCH LPV		LNAV / VNAV OCH : 412		LNAV OCH : 412		MVL/Circling		T° MNM Baro-VNAV : -15°C					
	DA (H)	RVR	DA (H)	RVR	MDA (H)	RVR	MDA (H)	RVR	MDA (H)	VIS	DIST RW30					
A	730 (260)	800	260						930 (470)	1500	2 7 6 5 4 3 2					
B	740 (270)	900	270						970 (500)	1600	746 2427 2109 1790 1472 1153					
C	750 (280)	900	280		880 (420)	1500	880 (420)	1500	1070 (600)	2400	(2282) (1963) (1645) (1326) (1008) (689)					
D	760 (290)	900	289		1170 (700)	3600			1170 (700)	3600	(1170) (700) (3600)					

Observations/Remarks : Panne de guidage GNSNS lors de l'approche / Loss of GNSNS guidance during approach : voir/see AIP ENR 1.5

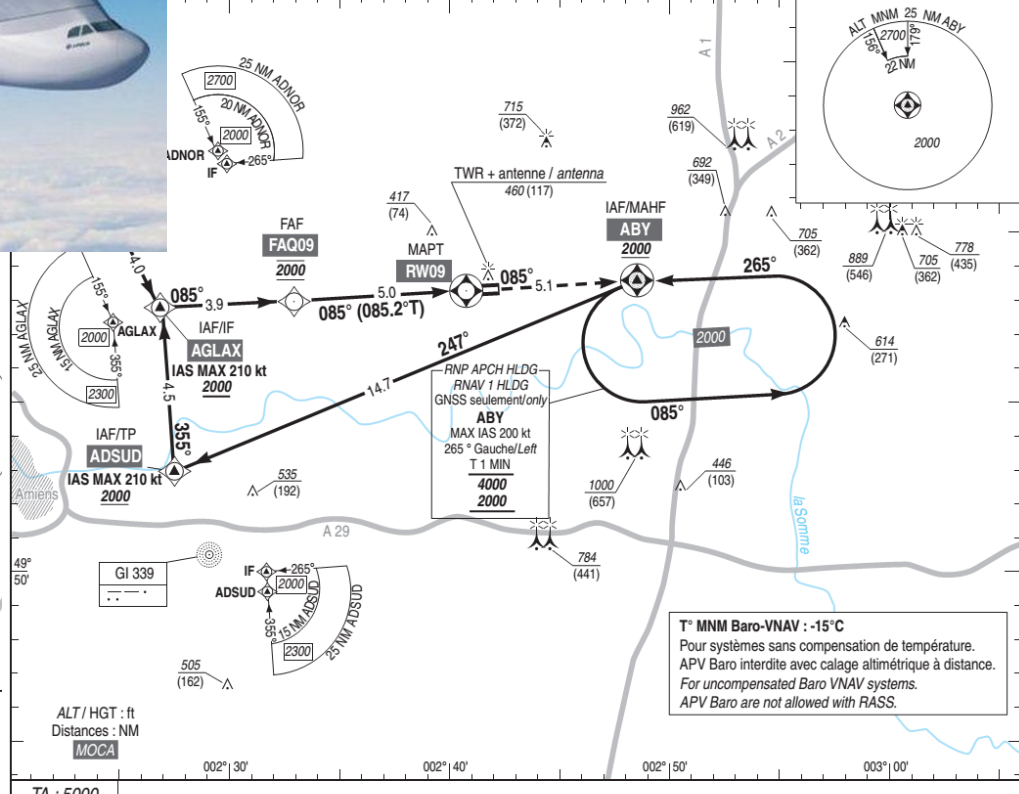
FAF - MAPT	7.8 NM	70 kt 6 min 41	80 kt 5 min 51	90 kt 5 min 12	100 kt 4 min 41	110 kt 4 min 15	120 kt 3 min 54	130 kt 3 min 36	150 kt 3 min 07	170 kt 2 min 45	180 kt 2 min 36
VSP (ft/min)		370	420	480	530	580	640	690	800	900	960

**INSTRUMENTS**

**(12 hPa)**  
 Approach 134.825  
 119.650  
 119.650  
 Élément. Obtenir le QNH de LILLE sur ATIS LILLE 119.325 ou LILLE Approche 134.825.  
 Obtenir LILLE QNH from ATIS LILLE 119.325 or LILLE Approach 134.825.

**RNAV (GNSS) RWY 09**

RNP APCH	EGNOS Ch 43692 E09A	VAR 0° (15)
	RDH : 50	



**TA : 5000**

API : Monter vers **ABY** en montée vers **2000** (1657), puis intégrer l'attente **ABY** ou suivre instructions du contrôle. Monter à **1300** (957) avant d'accélérer en palier.

*Missed APCH : Climb direct to **ABY** climbing up to **2000** (1657), then enter **ABY** holding pattern or proceed according ATC instructions. Climb up to **1300** (957) prior to level acceleration.*

→ THR (NM) 8.9 5.0

MNM AD : distances verticales en pieds, RVR et VIS en mètres / Vertical distances in feet, RVR and VIS in metres. REF HGT : ALT THR

CAT	LPV		OCH LPV		LNAV/VNAV		OCH LNAV		LNAV OCH : 357		MVL/Circling (1)		MVL/Circling (1) absence ATS		DIST RW09				
	DA (H)	RVR	DA (H)	RVR	MDA (H)	RVR	MDA (H)	RVR	MDA (H)	VIS	MDA (H)	VIS	MDA (H)	VIS					
A	650 (300)	1400	248						227	1500	900 (550)	1500	1070 (720)	1500	5 4 3 2 1				
B	258		268		650 (300)	1400	251		239	1500	920 (570)	1600	1090 (740)	1600	1980 1670 1350 1030 710				
C	258		268						251	1600	1090 (750)	2400	1260 (920)	2400	(1637) (1327) (1007) (687) (367)				
D	278		278						271	1600	1110 (770)	3600	1280 (940)	3600					

# Lessons learned



Direction Générale de l'Aviation Civile

Ministère de l'Environnement, de l'Énergie et de la Mer

DSNA



# From pilots and ATC point of view



Direction Générale de l'Aviation Civile

Ministère de l'Environnement, de l'Énergie et de la Mer

DSNA

# PILOTS AND ATCOS

**SBAS procedure allow use of an extended final axis (LOC):**

- VTF function onboard
- Display of the extended final axis for the pilots
- ATCO can use radar instruction to lead aircraft to final axis

**SBAS Final slope can start at the final altitude (not only at FAF)**

- No influence of temperature
- No QNH dependant

**APV Baro Final segment starts only at FAF at promulgated altitude**

# PILOTS AND ATCOS

**ATCO can use radar instruction to lead aircraft to final SBAS axis:**

- As flexible and easy as ILS

**ATCO** deliver a clearance based on « RNAV approach »

- not need realtime information on the SBAS system
- RNAV procedure provided on ATIS message as main procedure in service