



सत्यमेव जयते

नागर विमानन मंत्रालय, भारत सरकार
MINISTRY OF CIVIL AVIATION, GOVERNMENT OF INDIA



ICAO APAC SBAS-GBAS IMPLEMENTATION WORKSHOP FOR AIRSPACE USERS

"Enhancing airport accessibility and safety on final approach with SBAS and GBAS"

14th to 16th October 2025
Bengaluru, India



MSAS implementation, and airline's feedback

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Presentation Overview

1

MSAS Performances



2

Procedure implementations



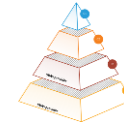
3

PRN code and Satellites



4

message Authentication



5

Airline's feedback



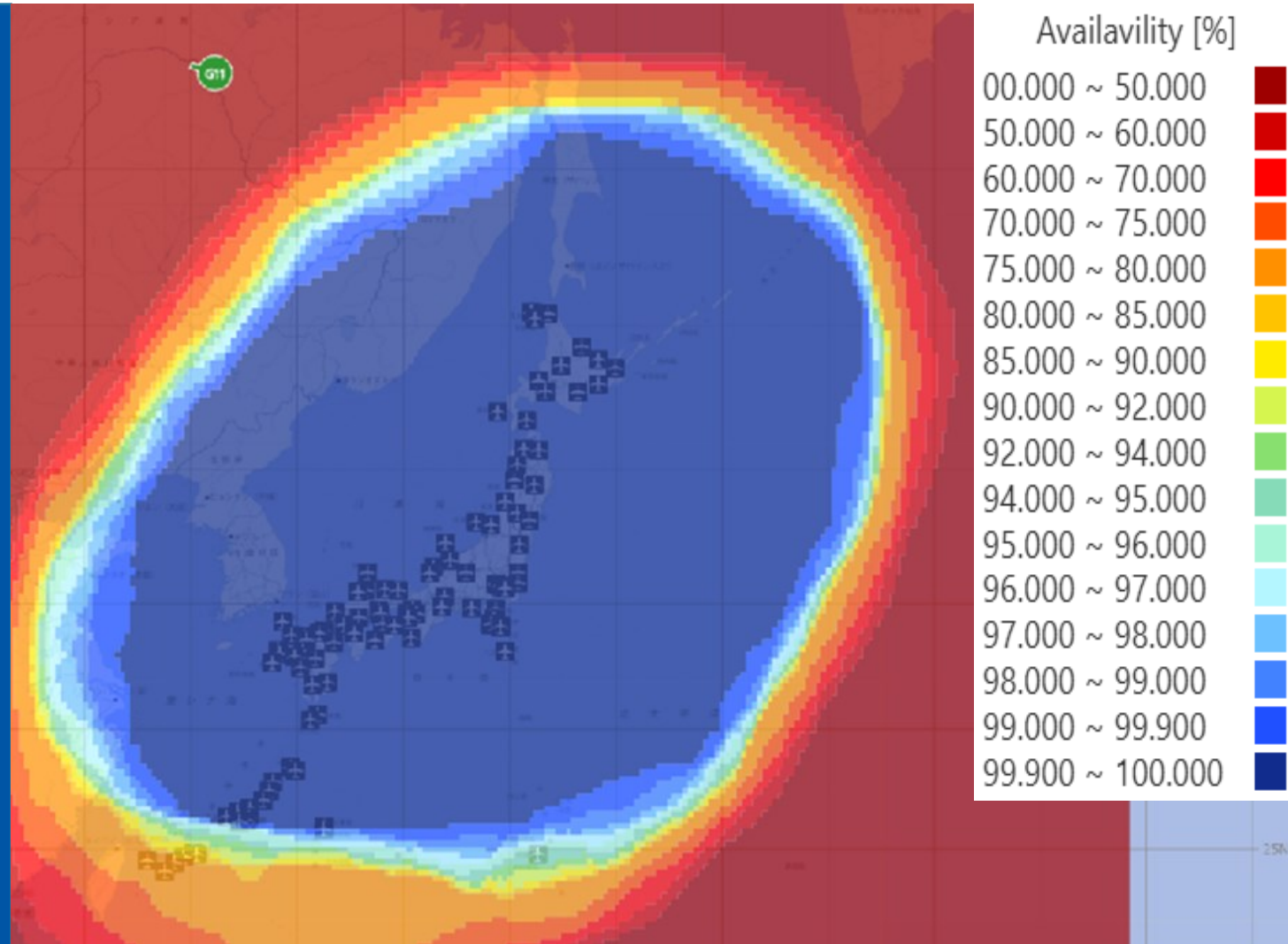
6

SBAS benefits



1 MSAS Performances

LPV250 Availability
of nominal day



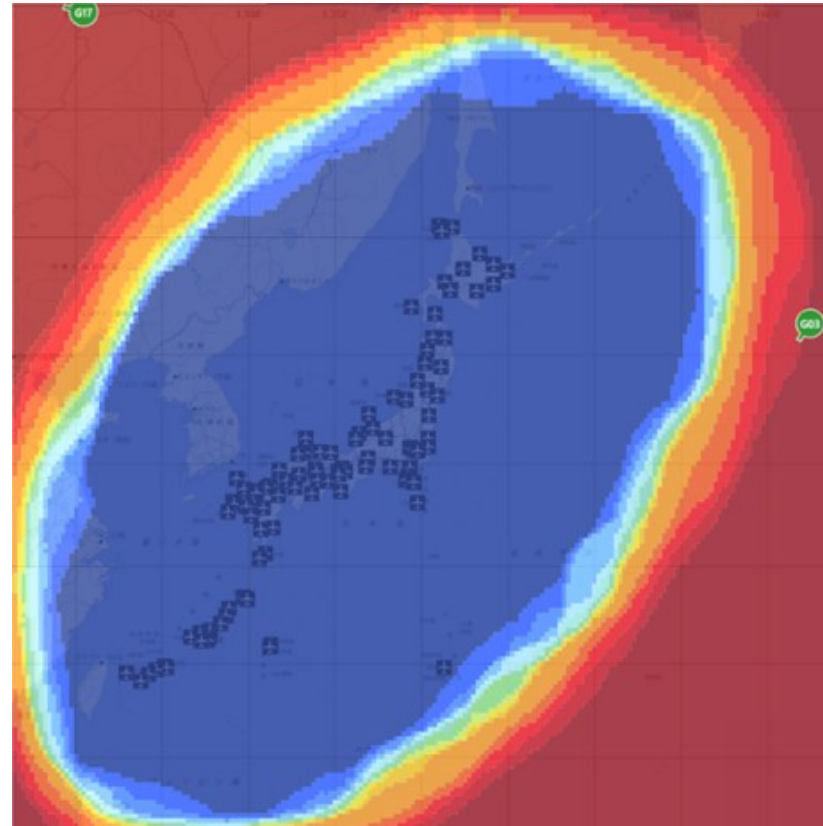
LPV250 Availability (current service level : LPV250)

Ionospheric irregularities can affect LPV250 performance at the areas south of Lat 25N line.

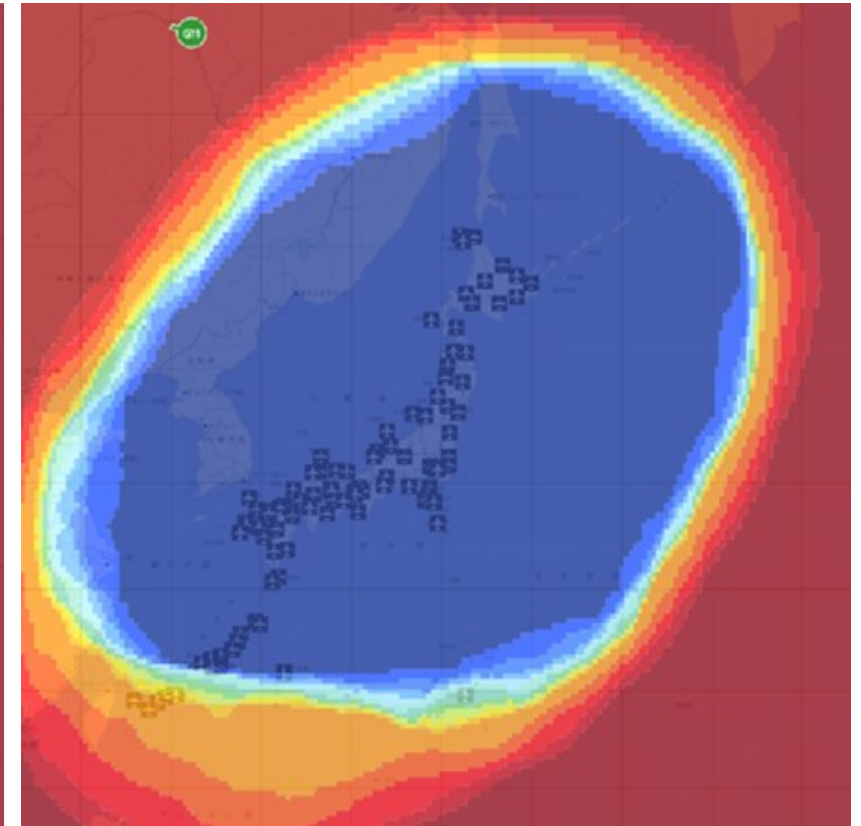
further info avail from <https://msas-raim.mlit.go.jp/gpm/summary.html>

Undertaking a study
on LPV200 (SBAS CAT-I)
service
implementations

Lat 25N▶



June 2025(specific 24h)

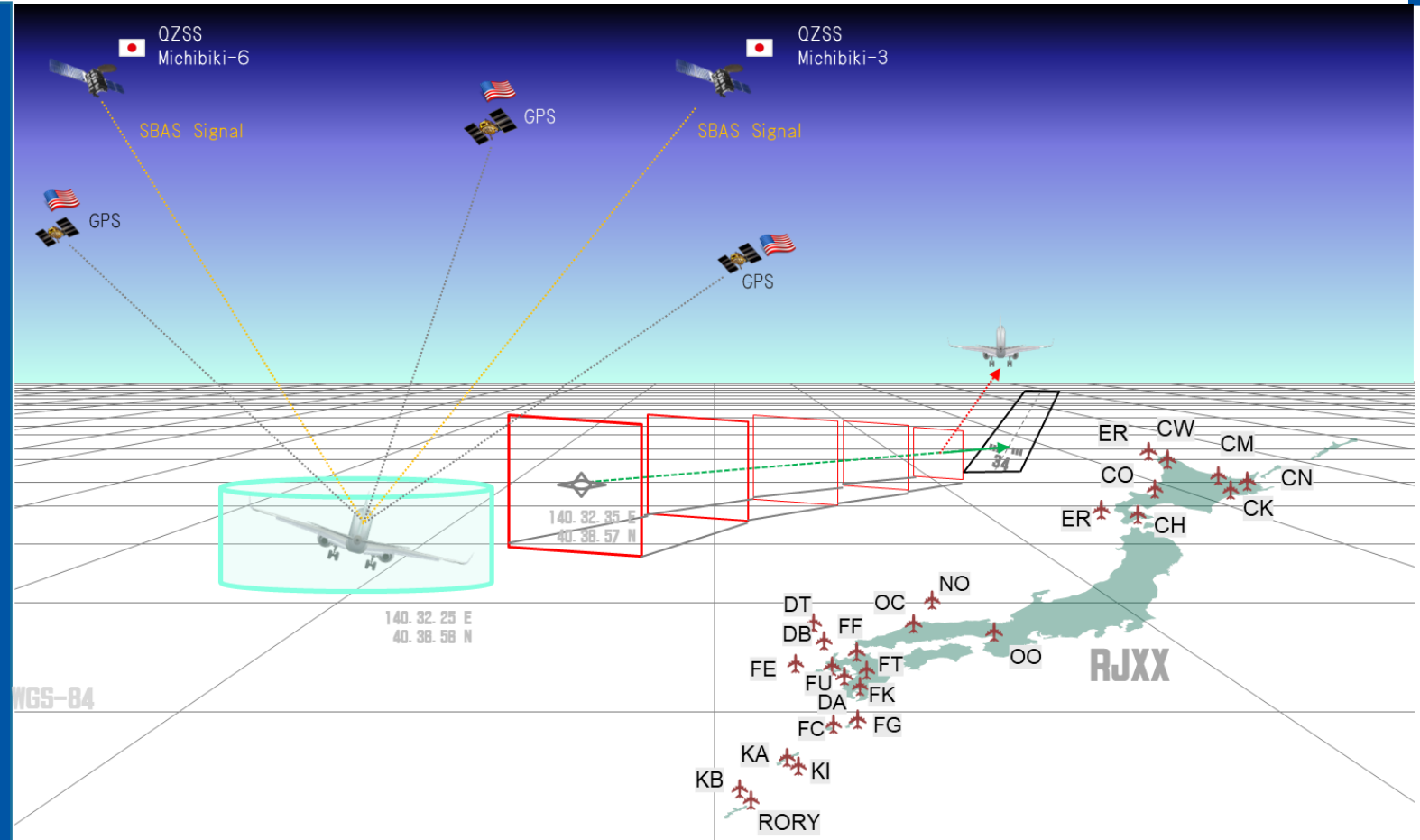


Aug 2025 (specific 24h)

2

Procedure implementations

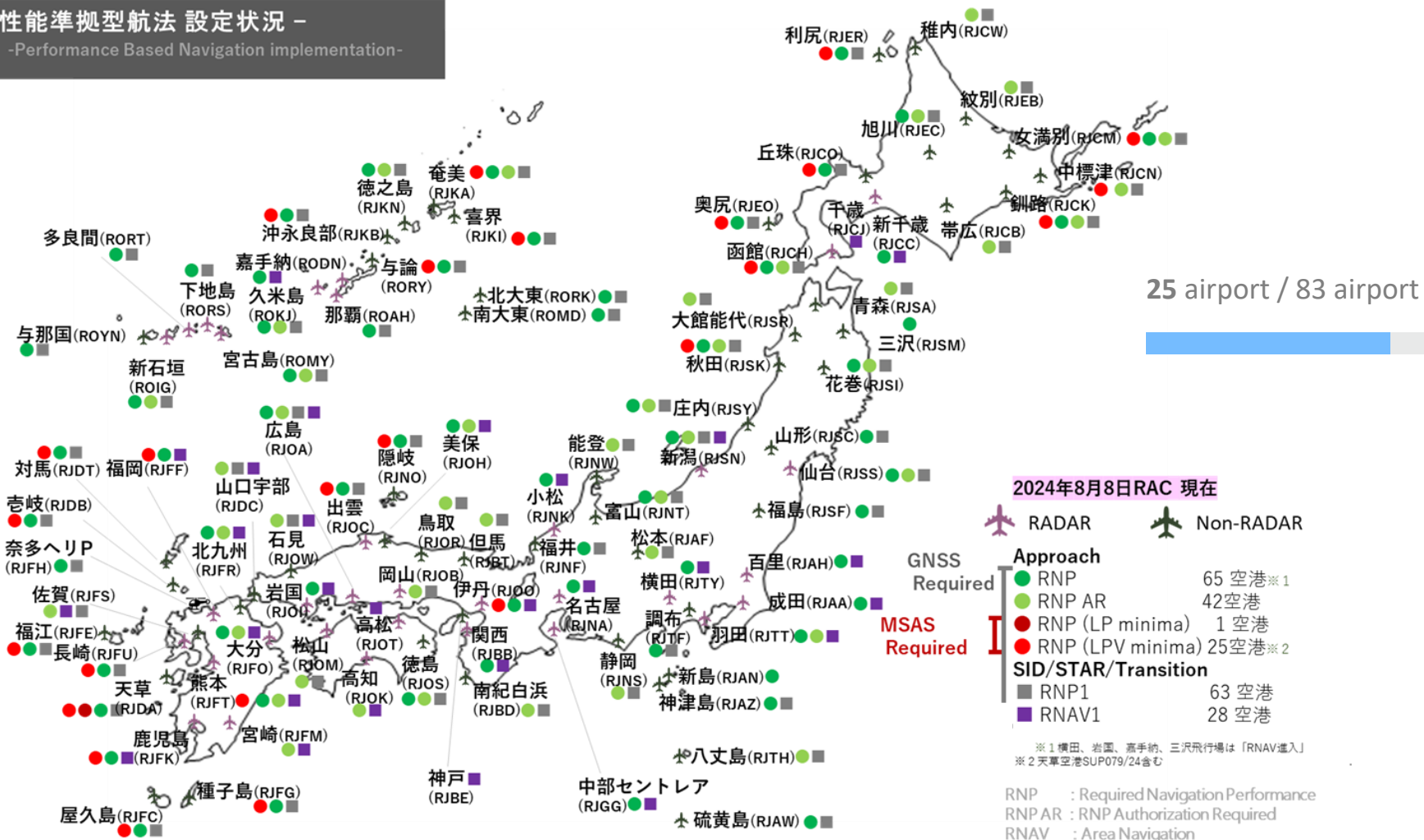
AIP(LPV250)
published at 25
airports

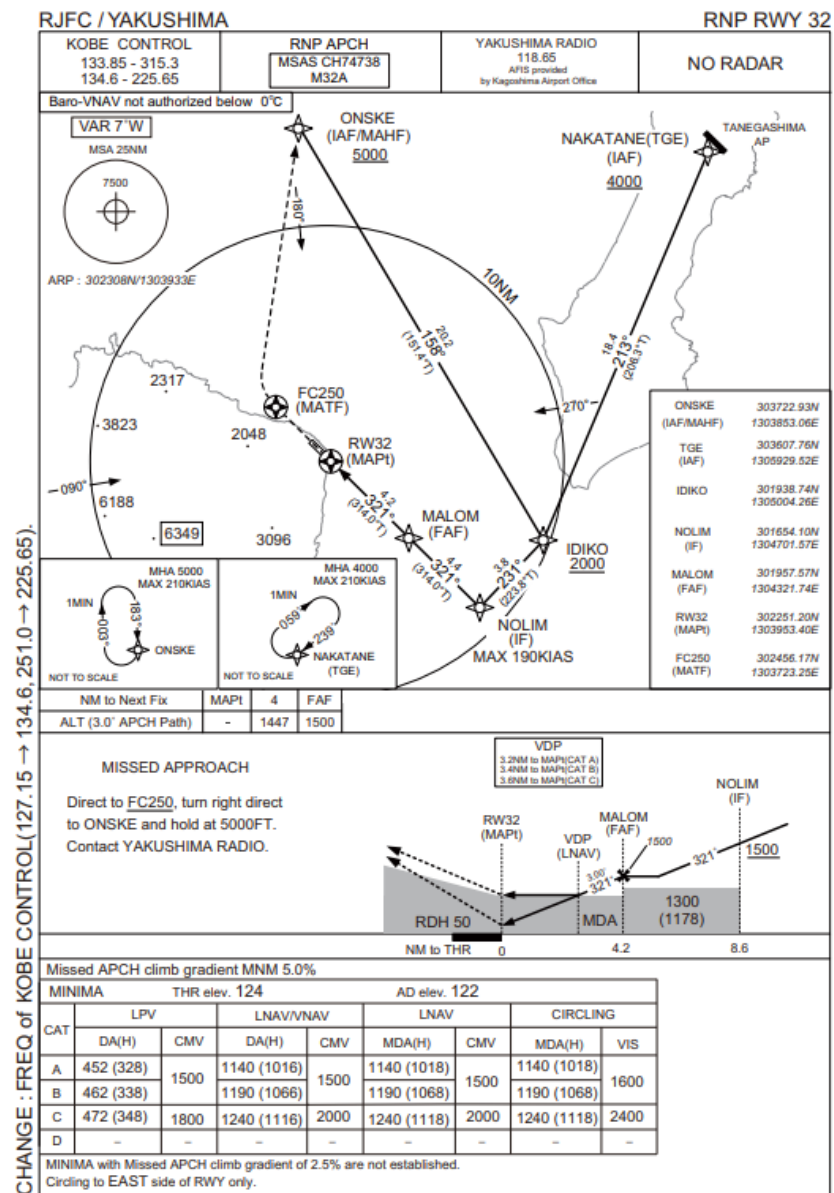


●RNP approach down to LPV250 minima

- 性能準拠型航法 設定状況 -

-Performance Based Navigation implementation-

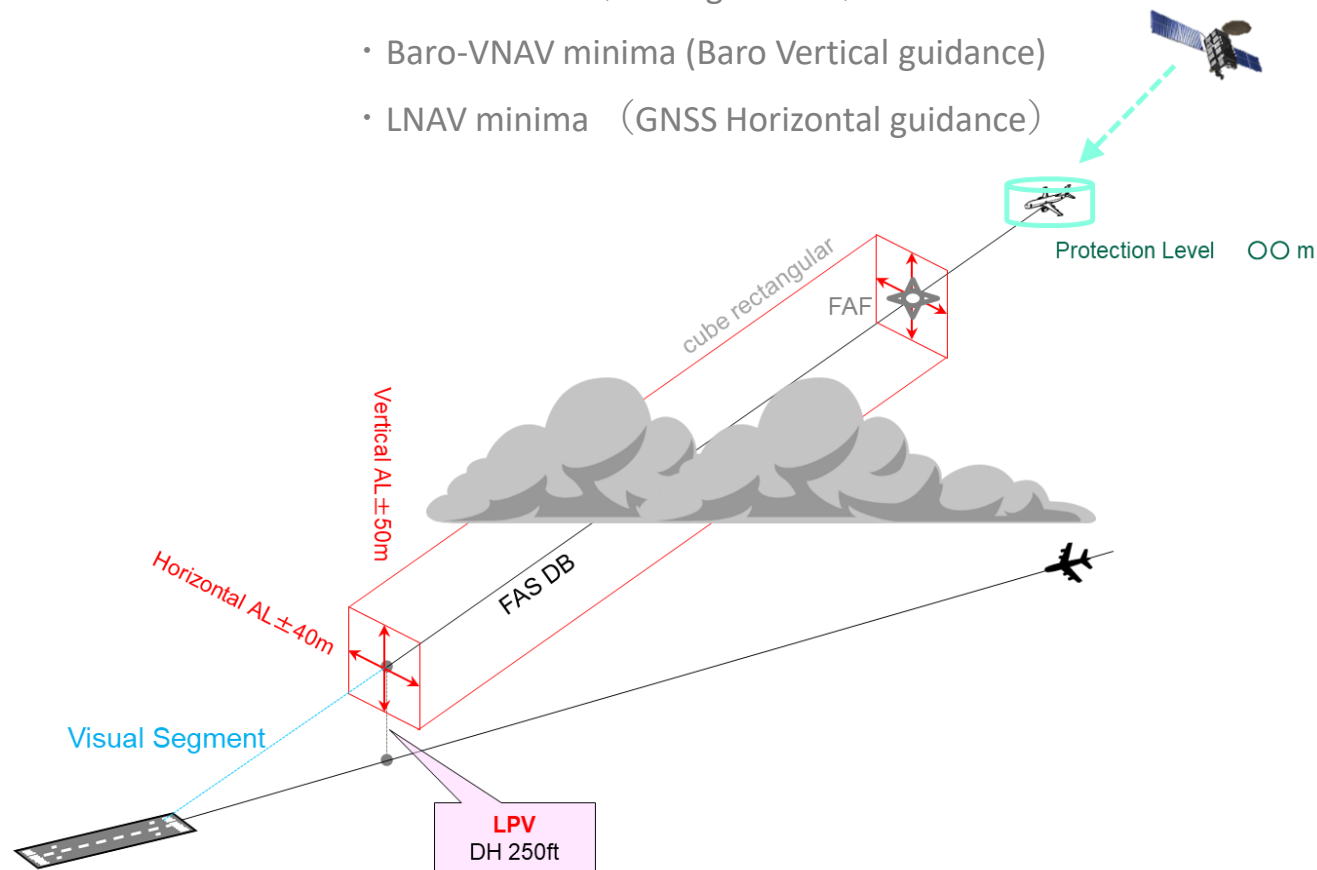


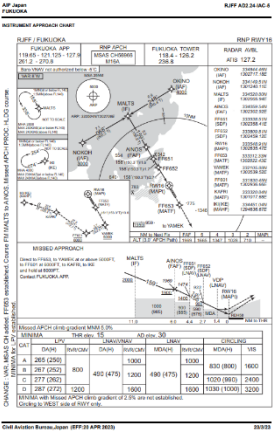


RJFC RNP RWY 32

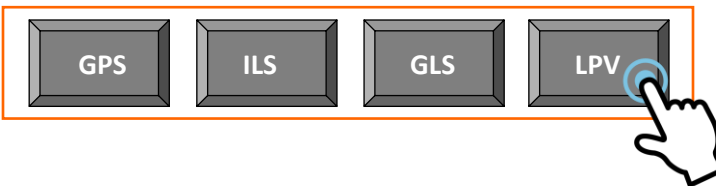
Three types of operation in one chart

- LPV minima (MSAS guidance)
- Baro-VNAV minima (Baro Vertical guidance)
- LNAV minima (GNSS Horizontal guidance)





Annunciator



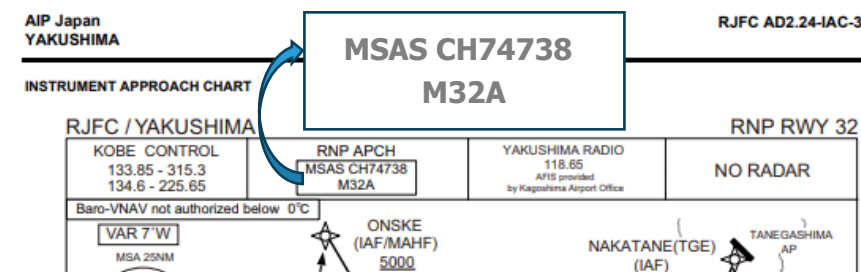
PFD : ILS Look alike (ILS>SLS)



LPV AVAILABLE
LPV NOT INSTALLED
LPV FAIL
DB NOT LOADED
DB EXPIRED
ILS ACTIVE

FAS DB

Final Approach Segment Data Block

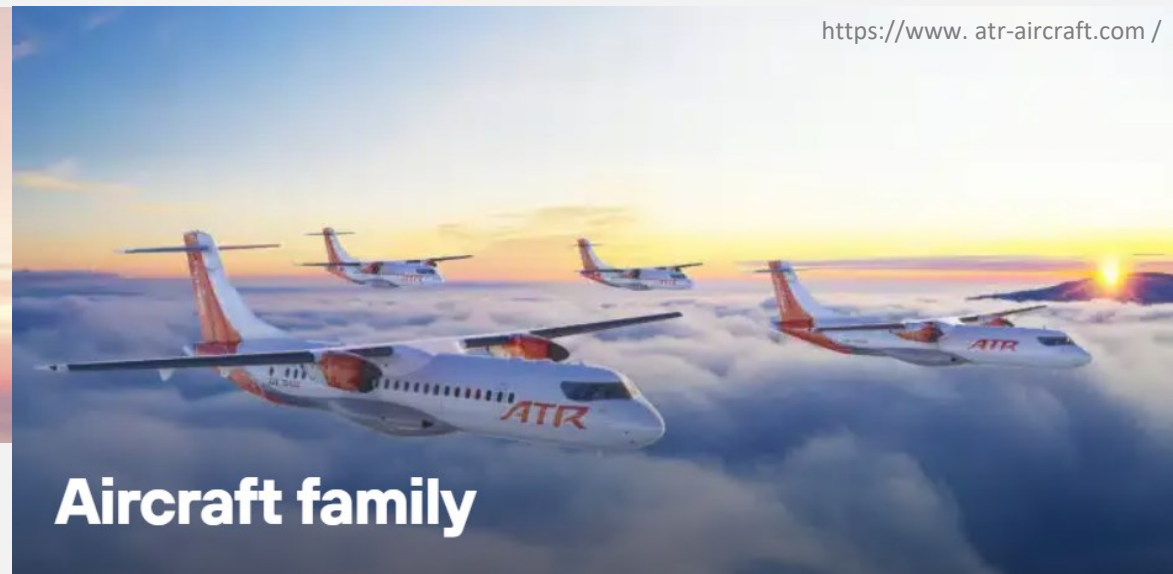


When cleared for the approach, push **APPR/LAND** switch to arm the approach and landing mode.



A350 Family
The Long Range Leader

A350



Aircraft family

ATR

2 aircraft type × 5 Operators

JAL
A350



<http://press.jal.co.jp/ja/release/201310/001842.html>

AHX (Regional)
ATR42-600



<https://www.amx.co.jp/dash/>

ORC (Regional)
ATR42-600



<https://www.orc-air.co.jp/service/seat/>

NTH (Regional) JAL Group
ATR42-600



https://www.info.hac-air.co.jp/wp-content/uploads/2018/07/HAC_ATR_FNL_.pdf

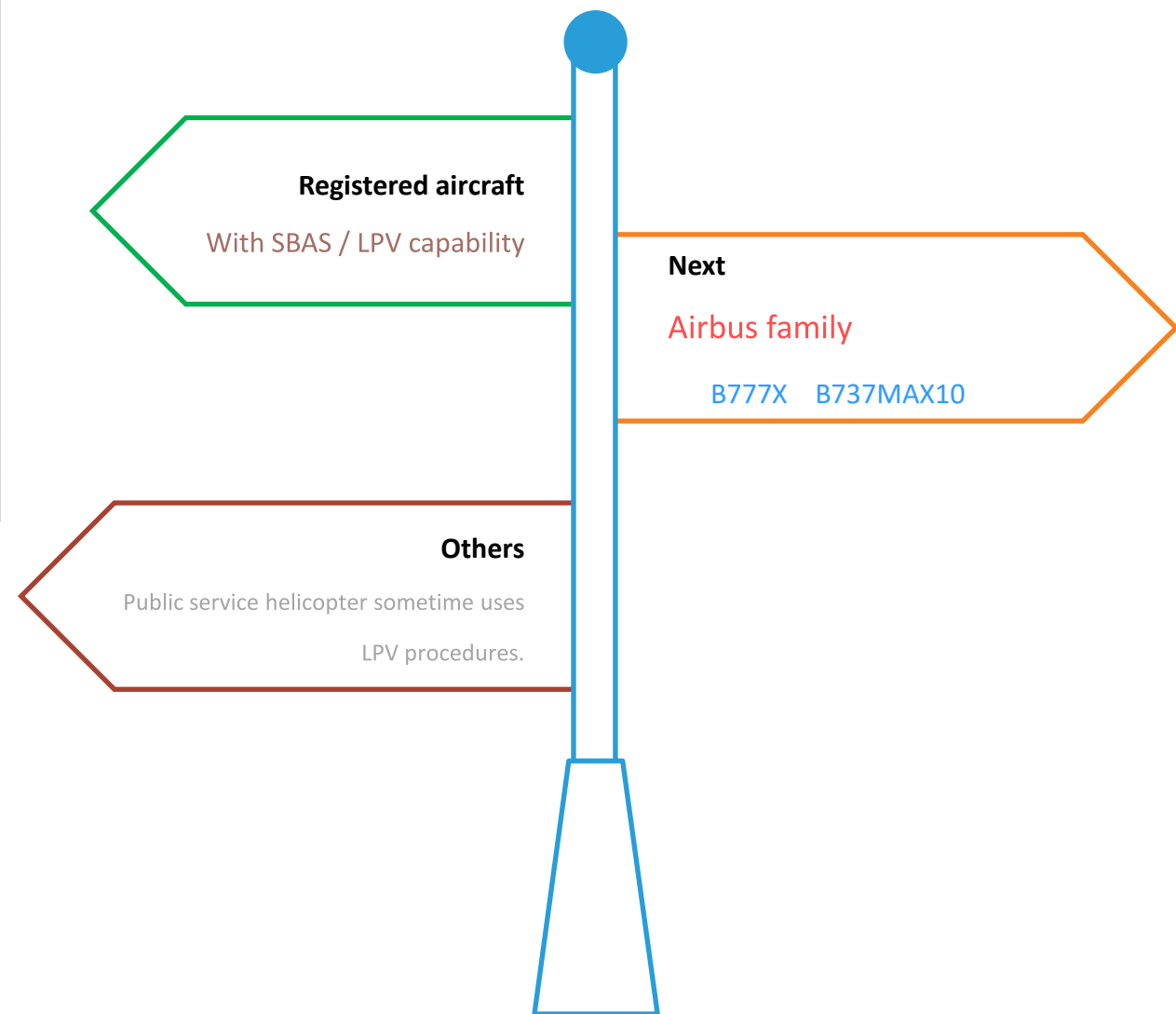
JAC (Regional) JAL Group
ATR42-600



Airline	Model	SBAS	LPV
Hokkaido Air System , HAC	ATR-42-600	4	4
Amakusa Airlines , AHX	ATR-42-600	1	1
Oriental Air Bridge , ORC	ATR-42-600	2	2
Japan Airlines , JAL	A350-900/1000	24	24
	B777-300ER	12	
Japan Air Commuter , JAC	ATR-42/72-600	11	11
New Central Airservice ,CUK	DO-228	5	1
All Nippon Airways , ANA	DHC-8-Q400	24	
IBEX Airlines , IBX	CRJ-700	9	
Fuji Dream Airlines , FDA	ERJ-175L	8	
Ryukyu Air Commuter , RAC	DHC-8-Q400	5	
ANA	B777F/-300ER	15	
As of Aug 2025	Total	120	43

Public service helicopter , business jet etc

Fleet capabilities



3

PRN code and Satellites

PRN 137 Operational

PRN 129 Operational

PRN 139 Next year

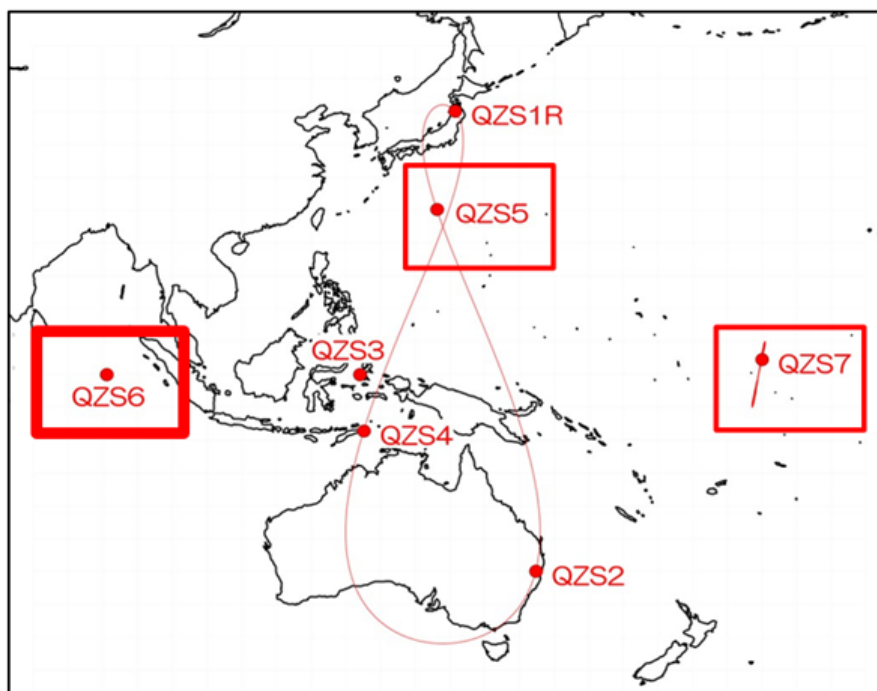


To 7-satellite constellation



14

- **QZS-6 was launched to GEO on 90.5 East Longitude on 2nd Feb, 2025.**
- **Two additional MICHIBIKI(QZS-5,7)** will be placed on an IGSO and a Quasi-Geostationary Orbit on 175 West Longitude, respectively.
- This 7 Satellite constellation aims:
 - To be visible more than four satellites and get better DOP.(PNT)
 - To be visible more than one satellite at high elevation angle.(Augmentation)



Seven-QZS Ground Track

Satellite orbit	Satellite Number	Orbital Position
IGSO (4 satellites)	QZS-1R	133 deg E
	QZS-2	139 deg E
	QZS-4	139 deg E
	QZS-5	139 deg E
GEO (2 satellites)	QZS-3	127 deg E
	QZS-6	90.5 deg E
QGEO (1 satellite)	QZS-7	175 deg W

PRN137

PRN129

PRN139

7 Satellite constellation (4 IGSO + 2 GEO +1 QGEO) will be completed within Japanese FY2025. QZS-5 and 7 will be launched respectively in Late FY2025.

4

message Authentication

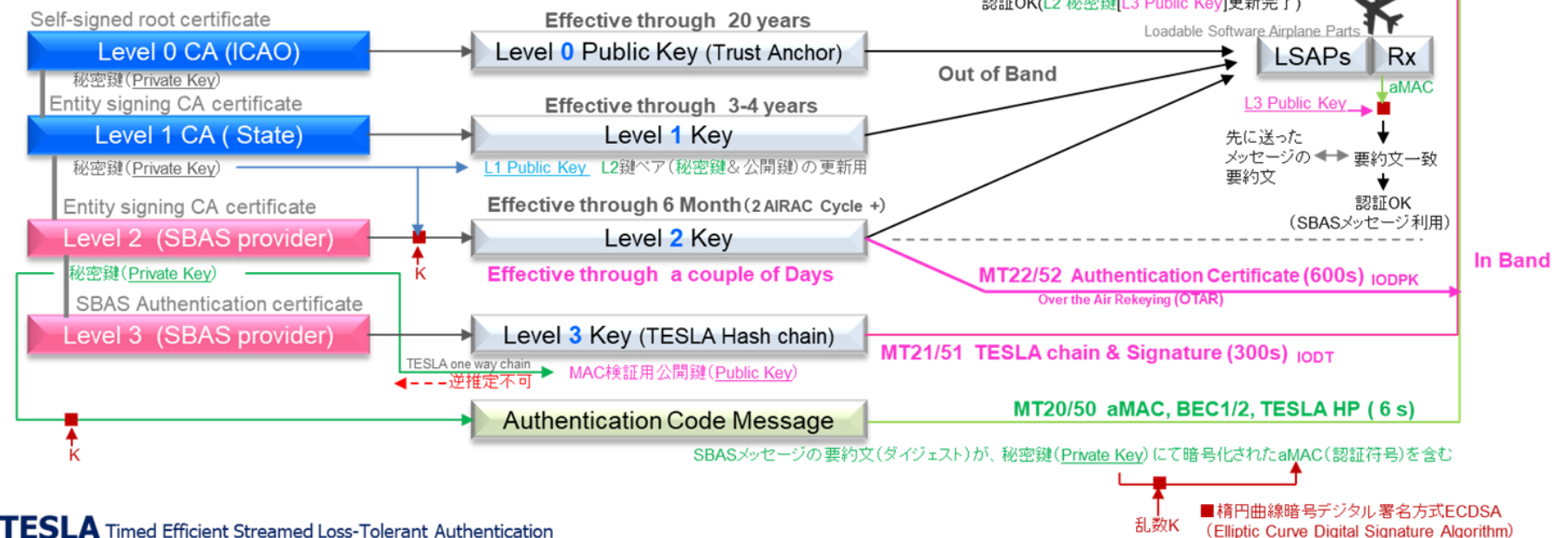
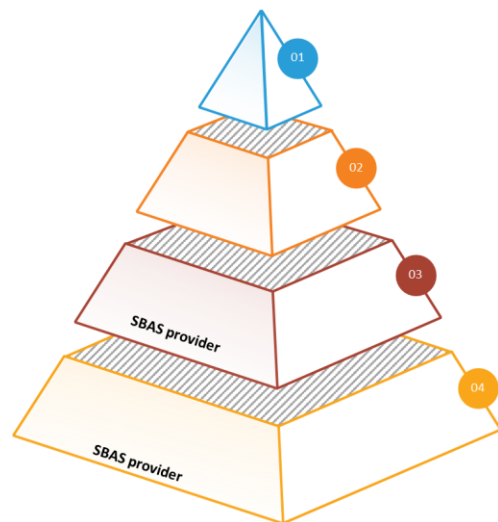
Under phototyping
and SARPs validation



SBAS message Authentication

- SBAS Spoofing detection capability under standardization at ICAO NSP
- The Authentication prevents giving integrity to “the spoofed position (spoofed vertical path)”

PKI based on ACCP Aviation Common Certificate Policy (Doc 10169)



5

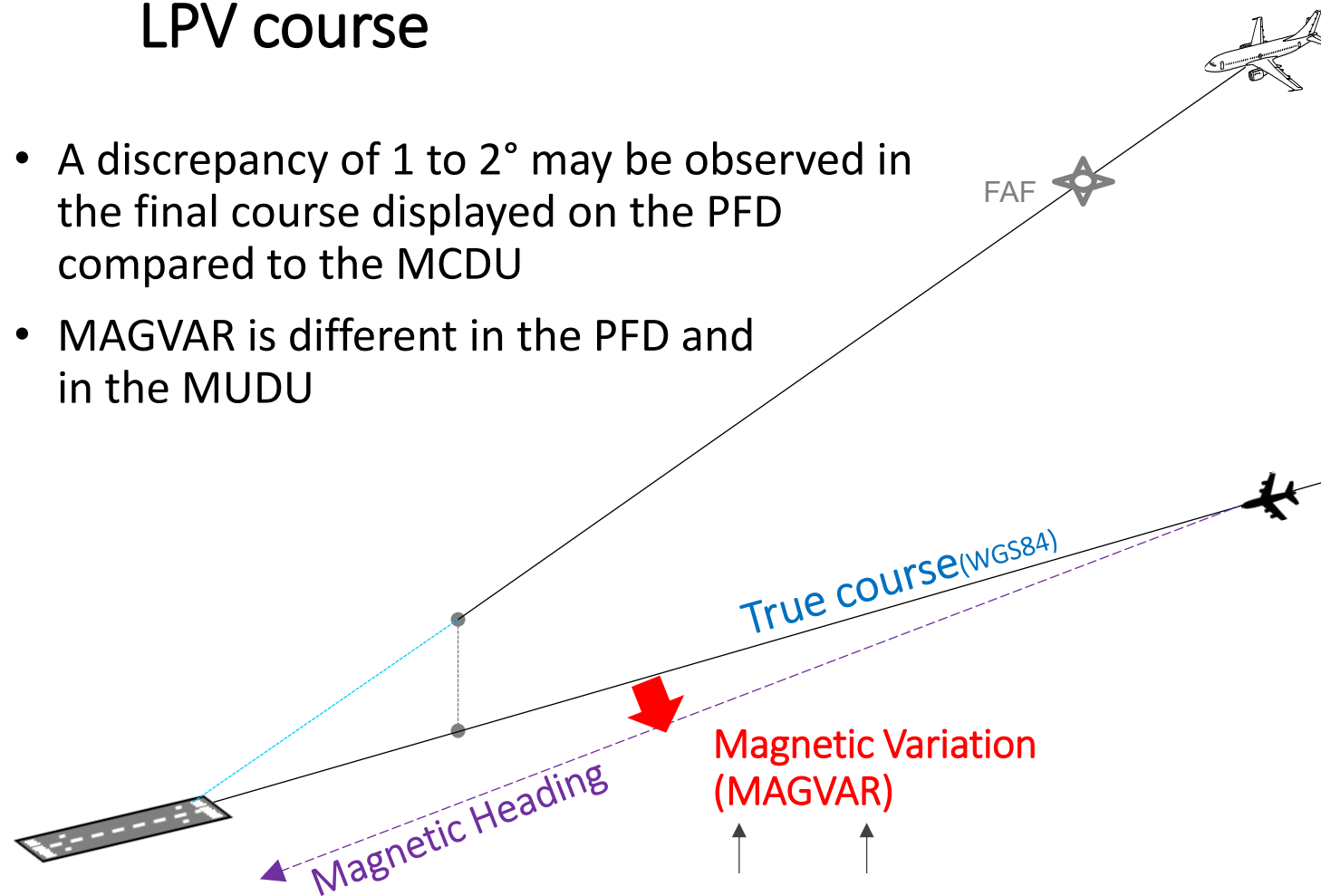
Airline's feedback

Feedback from
operators fly LPV
approaches



LPV course

- A discrepancy of 1 to 2° may be observed in the final course displayed on the PFD compared to the MCDU
- MAGVAR is different in the PFD and in the MCDU

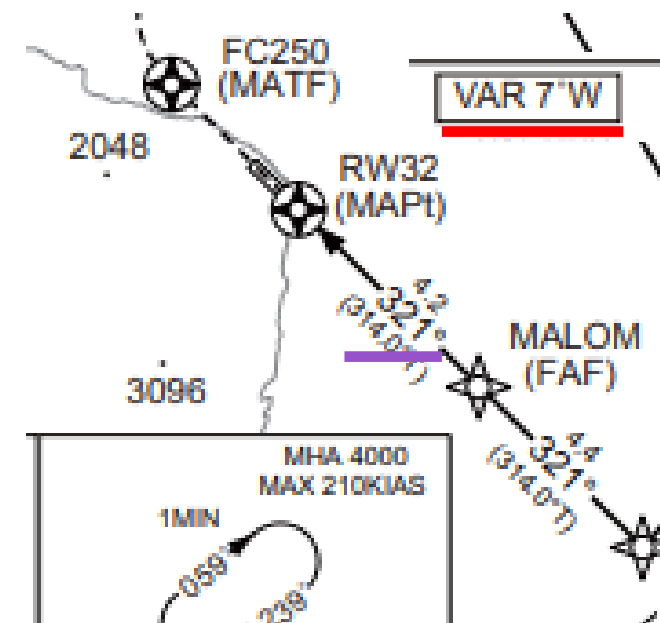


The International Geomagnetic Reference Field



PFD

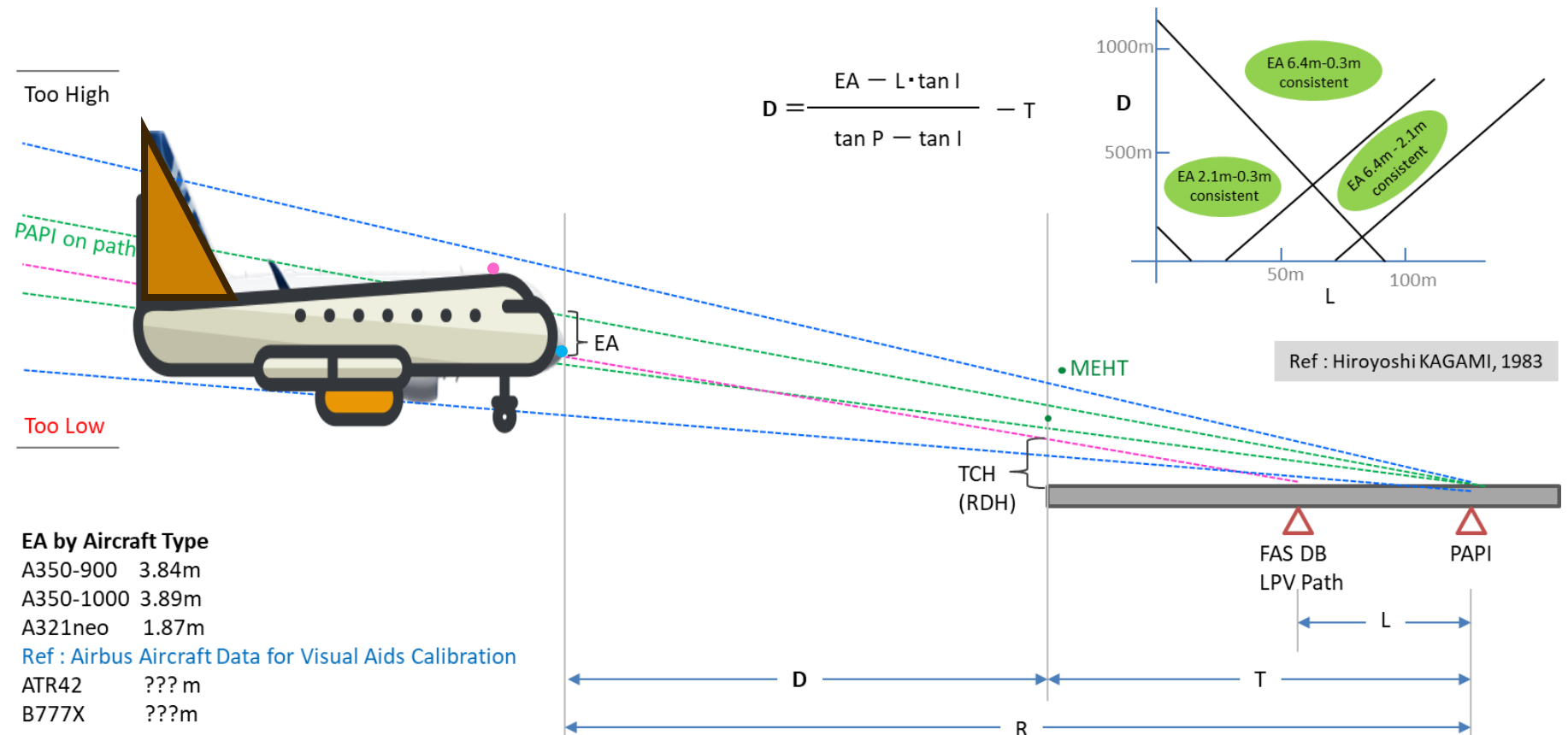
MCDU



LPV - PAPI

- PAPI indicates slightly low at 300ft AGL, low at 200ft AGL. (ATR42 Pilot)
- Eye position – Glideslope ANT (EA) for LPV capable aircraft can be used for LPV path refinement.

a vertical offset to adjust the difference of reference b/w GNSS and ILS antenna



6

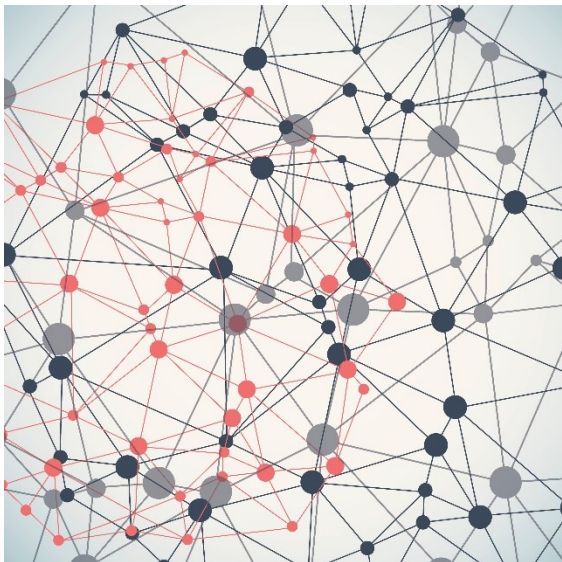
SBAS benefits

PBN based 3D
approaches
everywhere



SBAS benefits

- ✓ **Precision Vertical Guidance** (PBN-based CAT-I minima will support continuous safety)
- ✓ **Vertical path integrity** (In case, QNH miss setting)
- ✓ **Precision Lateral Guidance** (After RF leg flight, No overshoot or undershoot e.g. RNP AR)
- ✓ **No GP Hold line** (Efficient airport operations)
- ✓ **ETOPS Alternate** (Planned-fuel saving)
- ✓ **Flight Regularity** (Networked LPV minima will support flight connections / fleet management)



Questions?





Thank You!