सत्यमेव जयते

नागर विमानन मंत्रालय, भारत सरकार

MINISTRY OF CIVIL AVIATION, GOVERNMENT OF INDIA

भारतीय विमानपत्तन प्राधिकरण

AIRPORTS AUTHORITY 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

GBAS and SBAS STATUS UPDATE IN CHINA

Wei Tong

Senior Engineer of the Southwest ATMB

CHINA

ICAO

GBAS Status Update in China

GBAS Certification in China

SBAS Status Update in China

GBAS Status Update in China

ICAO

GBAS Status in China 1/2

3 GBAS ground stations were deployed at Tianjin Airport, Zhoushan Airport as well as Lasha Airport.

The minimum DH are 60m(200 ft) and GP angle are 3 degrees for Tianjin and Zhoushan Airport, and the GLS flight procedures are overlap with the ILS CAT I flight procedure.

GBAS Status in China 2/2

There is ILS flight procedure for RWY 28,and no approach procedure for RWY 10 in Lasha Airport due to valley terrain and 3500 meters altitude.

GLS flight procedures are designed for RWY 28 and RWY 10 to overcome the terrain,RWY10 GLS approach helps to promote the capacity of airspace and efficiency greatly.

The DH 60m(200ft) and GP angle 3 degrees for RWY 10R and 10L runway as well as GP 3.1 degrees configuration in Lasha Airport, the higher GP angle with a longer IF segment, which is more safety in the valley terrain.

The outcomes of flight inspection based on two different GP angles are meet the requirements of GAST C.

GBAS Flight Inspection in Lasha Airport

GBAS Flight Inspection in Lasha Airport: VDB and RTK Station

飞行校验报告

Flight Inspection Report

报告编码/ Report No： GZULSA10A20250413

4.6 进近飞行检测结果

Testing Results of Approach

一号机 Tx.1												
开始距离 [NM] Start Range [NM]	5.79				开始高度 [m] Start Altitude [m]				4000			
VDB 最小信号强度[dBm] VDB Min AGC [dBm]	-65.30				VDB 最小信号强度至入口距离 [NM] VDB Min AGC Range To LTP [NM]				0.05			
可见卫星数量 Sats Num Visible	12				可用卫星数量 Sats Num Tracked				10			
航向校直 [°/μA] LOC Alignment [°/μA]	-0.00/-0.33				航向结构/距离 [μA/NM] Structure/Range [μA/NM]		1/5.78		1/0.72		1/0.56	
下滑角/入口高度 [°/m] GP Angle/TCH [°/m]	3.00/16.39				下滑结构/距离 [μA/NM] Structure/Range [μA/NM]		1/5.38		4/0.57		5/0.57	
卫星编号 Sat Num	07	30	17	01	14	02	22	08	13	19		
信噪比 Sat SNR	47	48	49	47	48	48	48	46	47	46		

飞行校验报告

Flight Inspection Report

报告编码/ Report No： GZULSA10F20250413

4.6 进近飞行检测结果

Testing Results of Approach

一号机 Tx.1												
开始距离 [NM] Start Range [NM]	5.77				开始高度 [m] Start Altitude [m]				4000			
VDB 最小信号强度[dBm] VDB Min AGC [dBm]	-70.30				VDB 最小信号强度至入口距离 [NM] VDB Min AGC Range To LTP [NM]				0.07			
可见卫星数量 Sats Num Visible	12				可用卫星数量 Sats Num Tracked				10			
航向校直 [°/μA] LOC Alignment [°/μA]	-0.01/-0.91				航向结构/距离 [μA/NM] Structure/Range [μA/NM]			1/5.58	1/0.61		1/0.16	
下滑角/入口高度 [°/m] GP Angle/TCH [°/m]	3.10/15.80				下滑结构/距离 [μA/NM] Structure/Range [μA/NM]			1/4.27	4/0.91		6/0.15	
卫星编号 Sat Num	30	07	17	01	14	02	22	19	08	13		
信噪比 Sat SNR	48	47	48	47	48	48	47	48	46	45		

02

GBAS Certification in China

The Regulation of CNS/ATM Equipment Certification

The certification mechanic of CNS/ATM equipment and systems was established by CAAC in 2002.

Guidance for Procurement and certification of CNS/ATM Services and Systems by ICAO APAC was published in 2019.

CNS Units in China are prohibited from using uncertificated equipment to put into operation.

类别	名称	适用范围	包含要素
导航类	无方向信标（NDB）	适用于民用航空地基无线电近程振幅测角导航。	功放型号 发射功率
导航类	卫星导航地基增强系统（GBAS）	适用于民用航空GNSS精密进近着陆导航。	天线型号 卫星导航基准信号 VDB型号
监视类	一次监视雷达（PSR）	适用于民用航空机场或航路的监视。	天线型号 旋转铰链型号 发射/接收机型号 数据录取器型号 波段
监视类	二次监视雷达（SSR）	适用于民用航空机场或航路的监视。	天线型号 旋转铰链型号 发射/接收机型号 数据录取器型号 询问模式
监视类	二次监视雷达测试应答机（RTT）	适用于民用航空二次监视雷达的监测。	天线型号 发射机型号 接收机型号 模式

The categories and scope of communication, navigation, and surveillance equipment subject to licensing management are periodically published by CAAC in the *Directory of Certification Approval of Civil Aviation Communication, Navigation, and Surveillance Equipment*.

The Category of Certification of CNS/ATM

The certification of CNS/ATM are divided into provisional certificate of approval and certificate of approval .

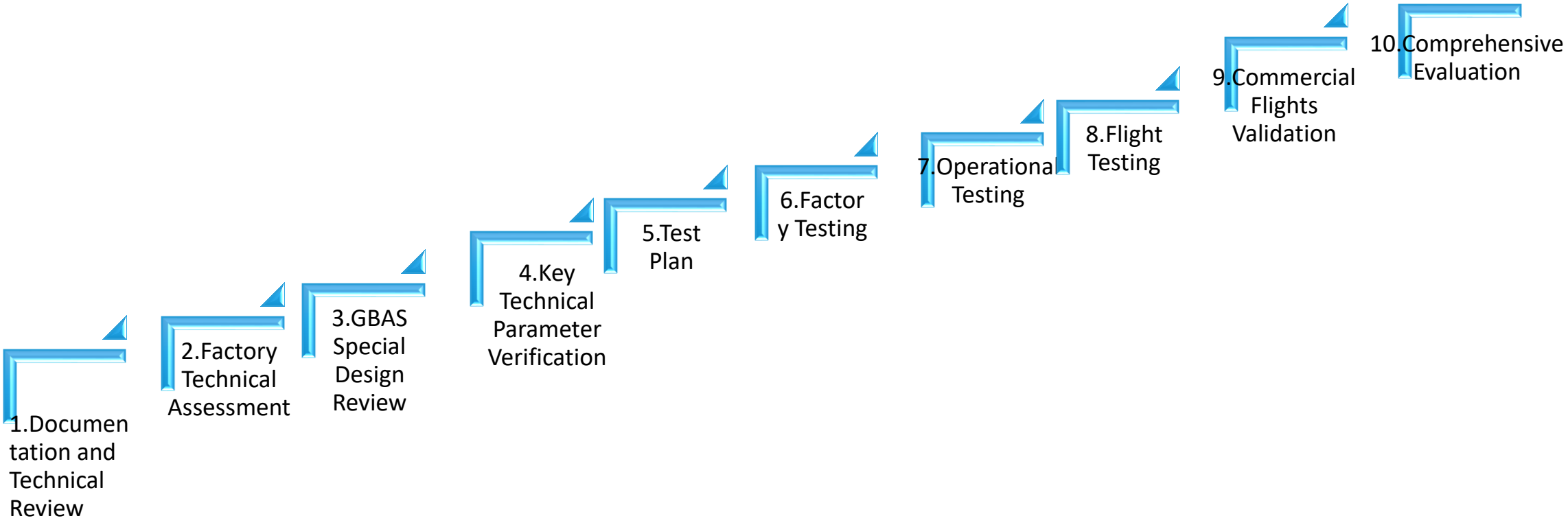
(1)Provisional certificate of approval : To apply a certificate of approval for the operation of CNS/ATM equipment in civil aviation, the Original Equipment Manufacturer (OEM) must first apply for a provisional certificate of approval to verify the performance, function, safety and reliability of the CNS/ATM equipment and system.

(2) Certificate of approval : If a CNS/ATM equipment and system with a provisional certificate of approval was put into operation and the reliability verification was passed, a certificate of approval will be available, and the certificated type of CNS/ATM equipment can put into operation in the next 5 years.

The Workflow of Certification

Type Certification

The type of CNS/ATM equipment and system must be certificated by an authorized certification body before the provisional certificate of approval by CAAC.



Factory Type Testing

Factory Type Testing refers to system-level, configuration item-level, and component unit-level tests conducted on the equipment. It includes the following testing:

Hardware Testing

Reference receivers, VDB transmitters, VDB receivers, antennas, processing subsystems, monitoring and maintenance subsystems, tower control and display systems.

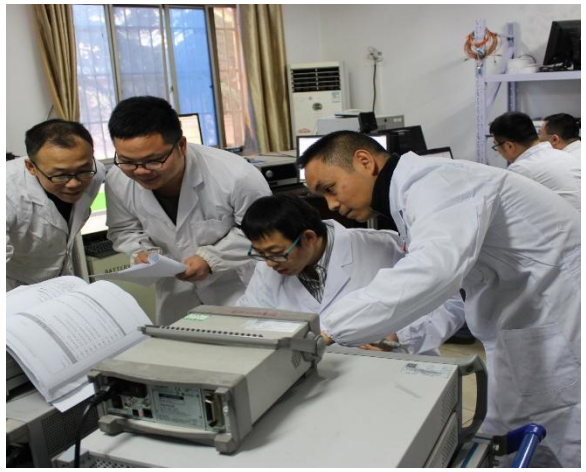
Software Testing

Processing subsystems, processing capability, data parameters, data broadcasting, functional testing.

Free Testing

Factory Type Testing

Factory Type Testing in Xian



Factory Type Testing in Xian

Factory Type Testing in TianJin

Operational Environment Testing

The testing period for GBAS operational environment testing is typically no less than 8 months.

Flight inspection tests should be conducted no less than twice, once before the operational environment testing period begins and once after it concludes the accuracy, Availability , Continuity and Integrity check.

Operational Testing in Tianjin

Flight Testing

Orbit flight testing: Fly at altitudes of 1,500 m and 3,000 m with a radius of 20 NM to check VDB signal coverage and interference.

Arc flight testing: Fly arcs with a radius of 15/20 NM and a 35° left/right arc.

Level flight testing: Fly along the runway centerline from 10 NM (600 m Height), 15 NM (900 m Height), and 20 NM (1,200 m Height) from the runway threshold, ending 2.5 NM from the opposite side of the runway.

Approach flight testing: Conduct checks at 20 NM, 15 NM, and 10 NM from the threshold (or the farthest point of the approach procedure).

Commercial Flights Validation

Utilize commercial flights to perform takeoff and approaching along the approach directions of each runway, checking signal quality and flyability.

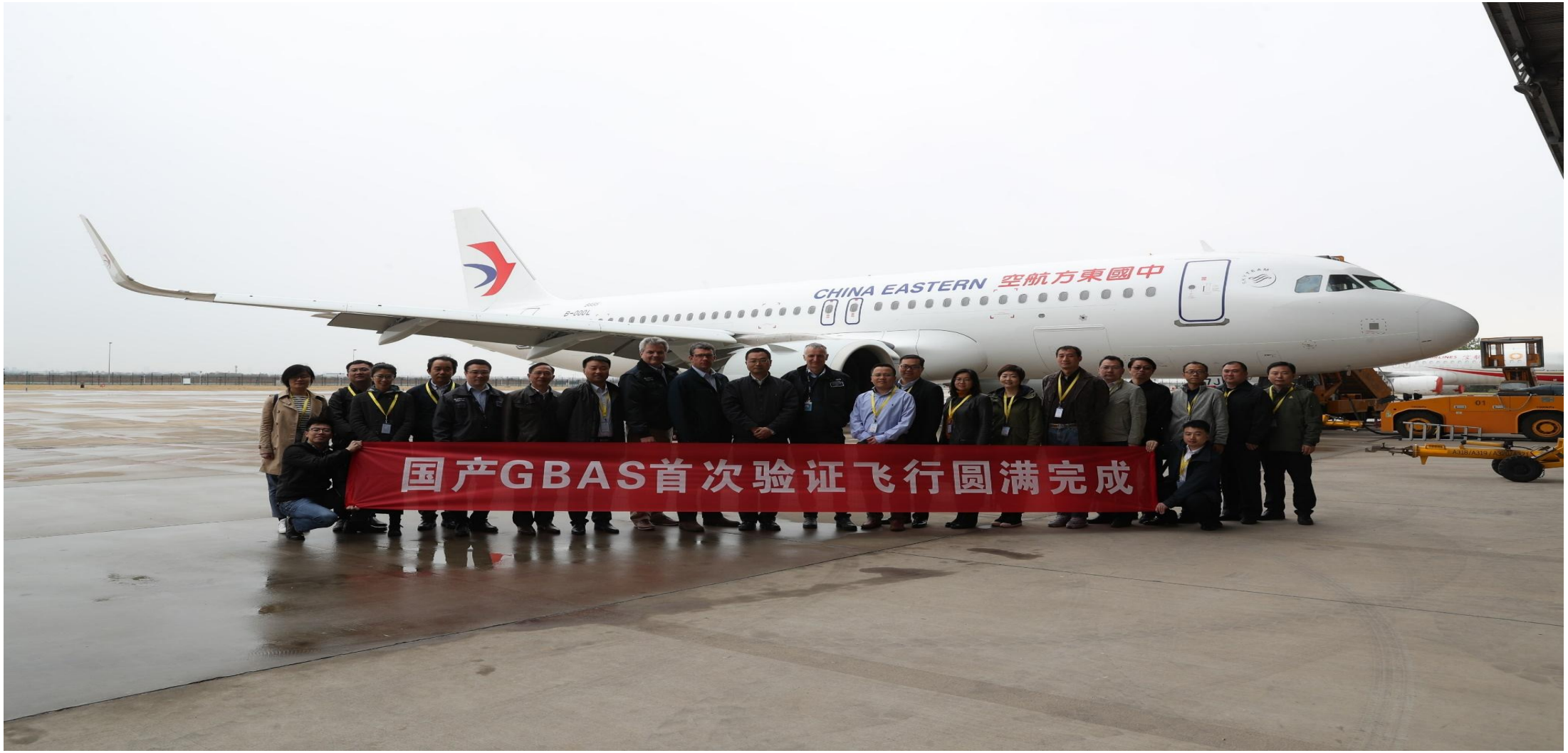
Xiamen Airline completed the flight validation in Zhoushan Airport.

Airbus and China Eastern Airline completed the flight validation in Tianjin International Airport before the A320 delivery.

Commercial Flights Validation in Zhoushan

Commercial Flights Validation in Tianjin by Airbus

Commercial Flights Validation by China Eastern Airline



Provisional Certificate of Approval

If the type certification is meeting the regulator and SARPs of ICAO, the type of provisional certificate of approval will be available, and can be put into operation on one site within 2 years for reliability confirmation.

Two OEM systems of GBAS were certificated to meet the performance requirements of GBAS Approach Service Type C (GAST-C),and the provisional certification of approval were issued by CAAC.

Reliability Confirmation

The equipment reliability confirmation period is 6 months.

Data records of operational maintenance during the reliability confirmation period, as required by the reliability confirmation plan.

Reports of downtime, fault reports, log analysis reports, inspection reports, update and upgrade reports (if any) during the reliability confirmation period.

Certificate of Approval

The provisional certification of approval is valid;

ISO 9001 is valid;

Radio transmission equipment type approval certificate is valid;

Reliability confirmation has been passed;

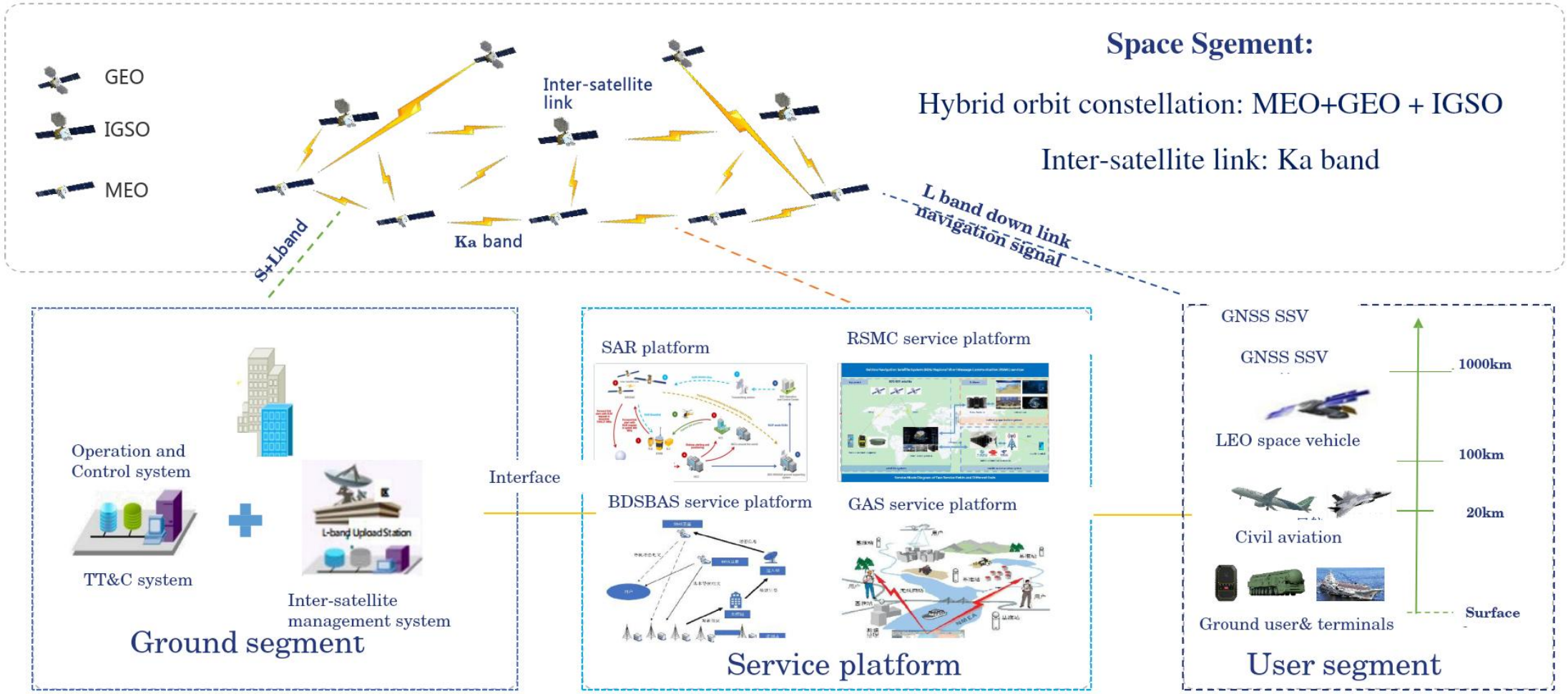
Technical support and after-sales service are satisfactory;

The OEM could apply for a certificate of approval.

03

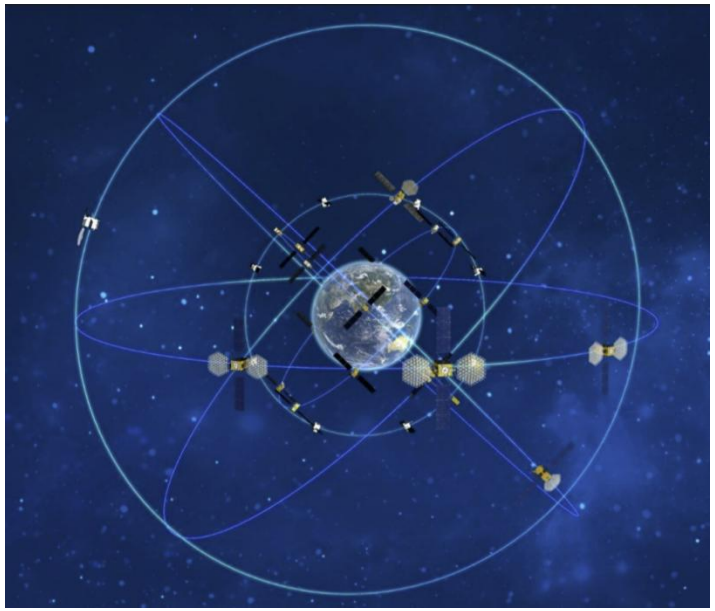
SBAS Status Update in China

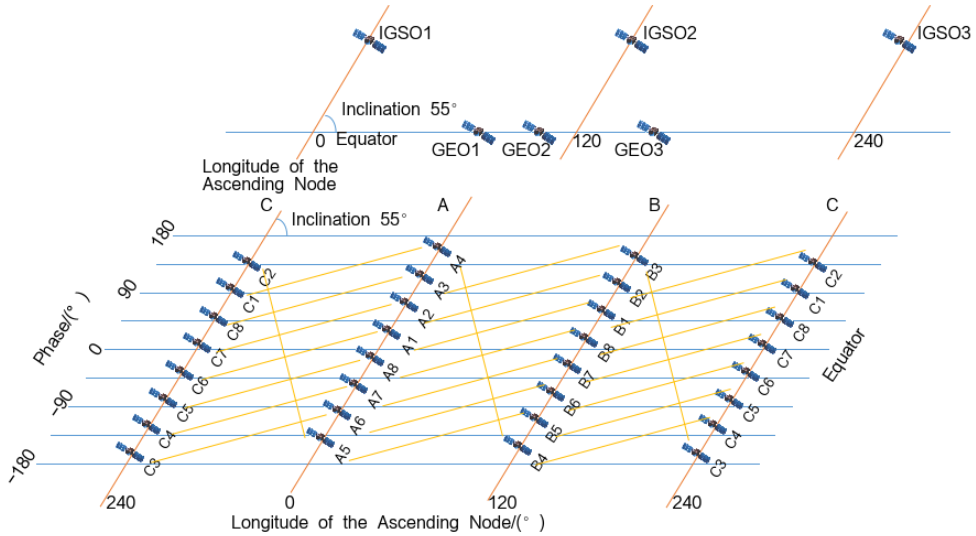
BDS-3 Configuration



BDS-3 Constellation

Satellite Types	Satellite Number	Number of Satellites on Each Orbital Plane	Orbital height	Orbital Plane Number	Orbital Plane Inclination	Revisit Time
MEO	24	3	21528 km	8	55°	7 days
IGSO	3	3	35786 km	1	55°	24 hours
GEO	3	1	35786 km	3	0	24 hours

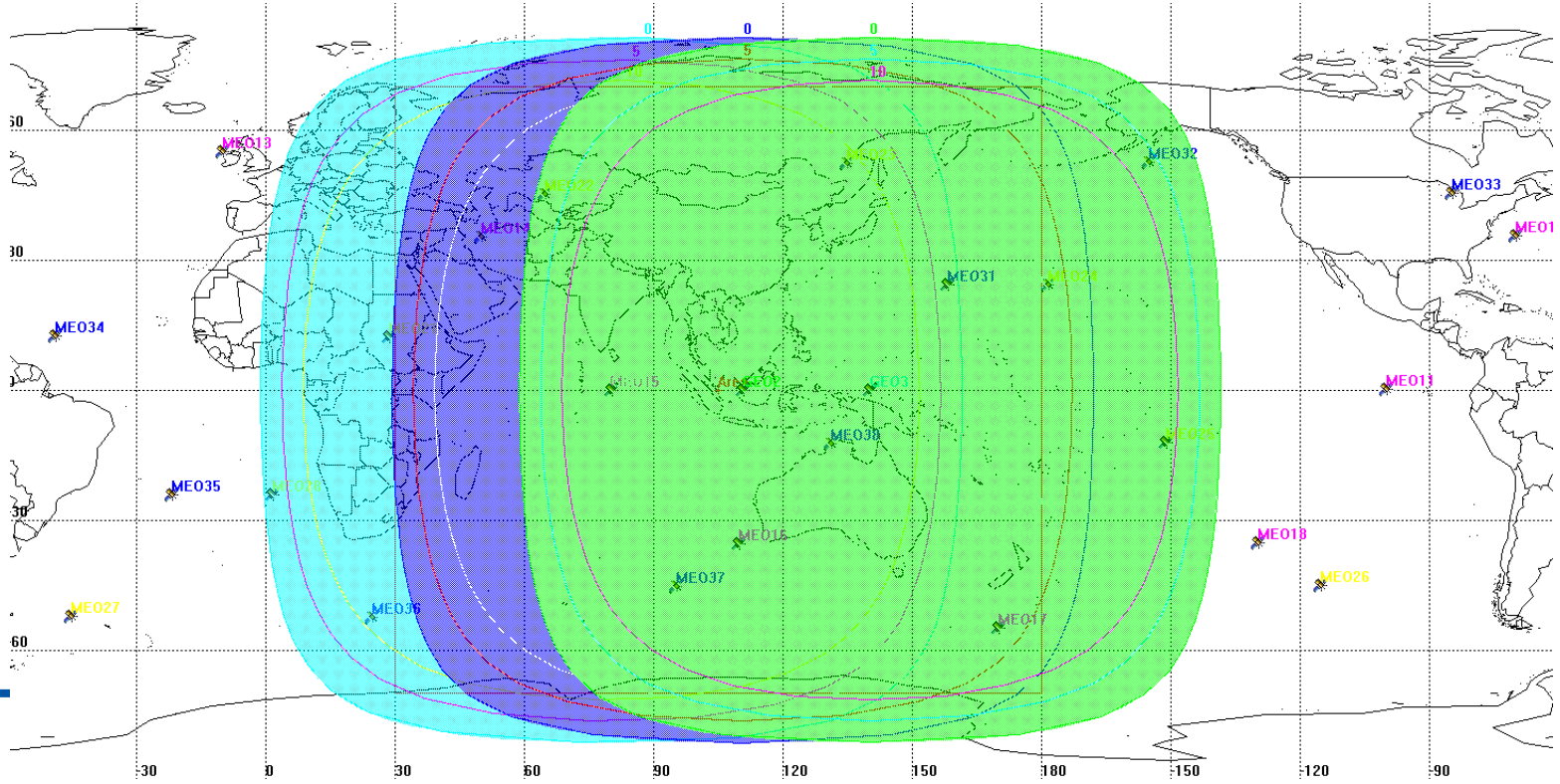




BDSBAS Introduction

The space segment of BDSBAS includes three Geostationary Earth Orbit (GEO) satellites, located at 80°E (PRN144), 110.5°E (PRN 143), and 140°E (PRN 130), respectively.

The BDSBAS ground segment consists of 27 Monitoring Stations (MSs), 2 Data Processing Centers (DPCs) located at Beijing and Xi'an, 1 Operation Control Center (OCC) located at Beijing and 3 Uplink Stations (USs) located at Beijing, Kashgar and Sanya.



BDSBAS Services

BDSBAS provides the SF SBAS service on BDSBAS-B1C signal, and the DFMC SBAS servie on BDSBAS-B2a signal.

BDSBAS Services Details

No.	BDSBAS Services	SF SBAS Service	DFMC SBAS Service
1	Signals	BDSBAS-B1C	BDSBAS-B2a
2	Signal Frequency	1575.42 MHz	1176.45 MHz
3	Core Constellations to be augmented	GPS	BDS and GPS
4	Time Reference	SNT_{SF}	BDT
5	Performance Requirement	APV-I	CAT-I
6	Operational Time	around 2029	TBD
7	GEO PRN Number	PRN#130，PRN#143，PRN#144	PRN#130，PRN#143，PRN#144

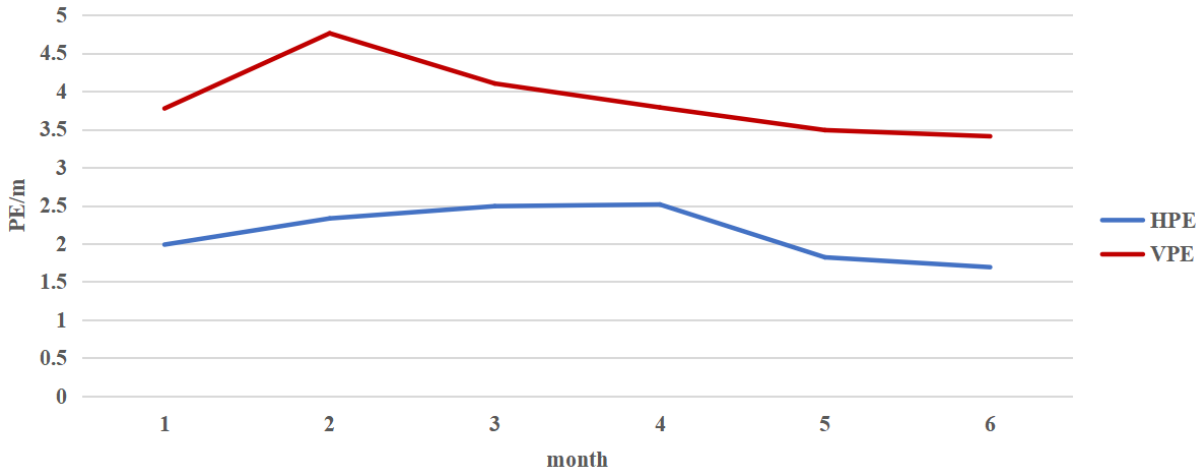
BDSBAS Service Performance Evaluation

The BDSBAS SF service performance evaluation results from January to June 2025.

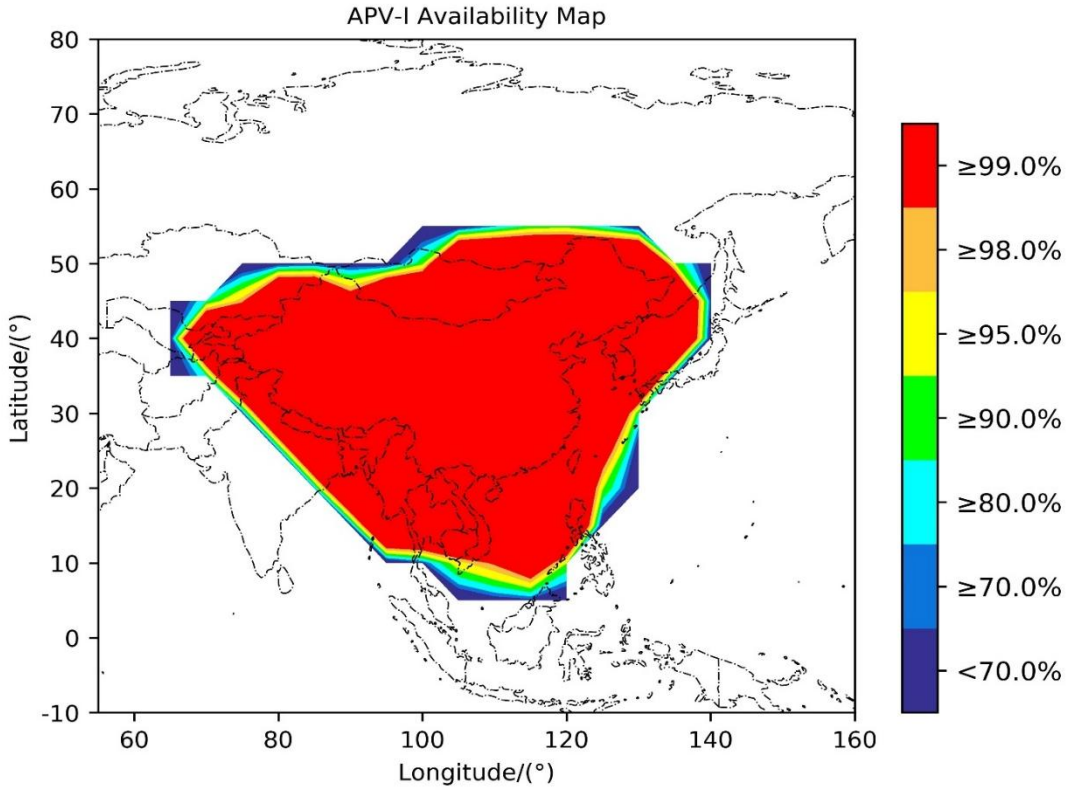
Positioning Accuracy

- HPE(95%)=2.13 m
- VPE(95%)=3.89 m

- During the evaluation period, no HMI events occurred.



BDSBAS SF service positioning accuracy



BDSBAS SF service - APV-I availability

BDSBAS Service Certification

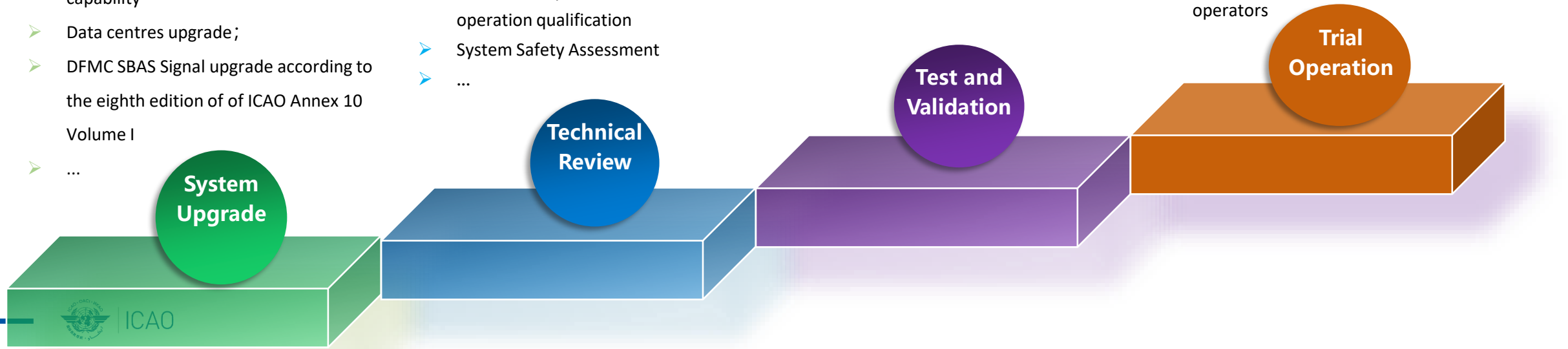
BDSBAS is scheduled to be upgraded, which covers both the monitoring stations and the data centers with the software and hardware upgrades. After the upgrade, the BDSBAS DFMC signal will comply with the eighth edition of ICAO Annex 10. The BDSBAS SF service will be enhanced in the ionospheric monitoring capabilities.

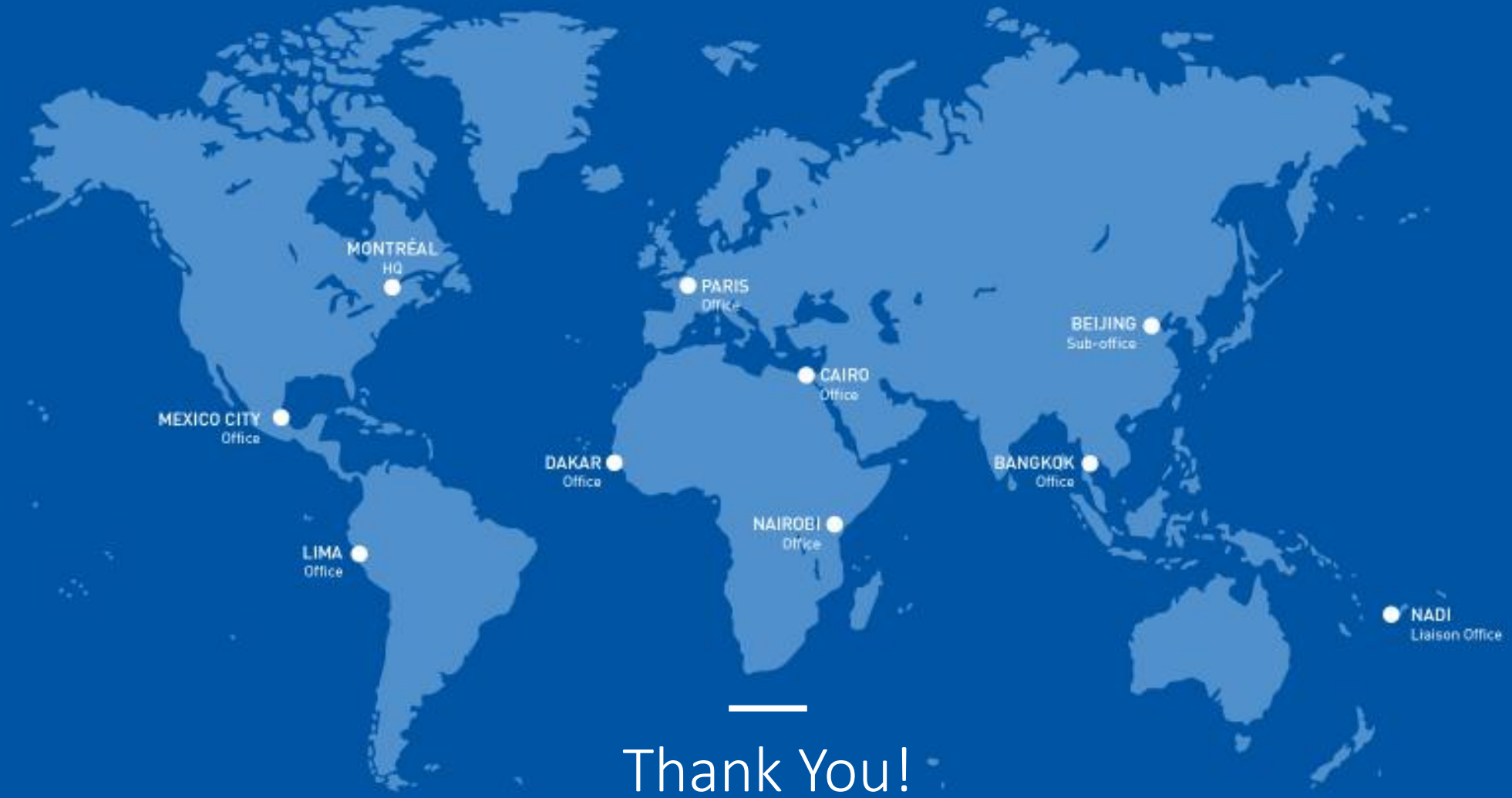
- Enhancement of SF ionospheric monitoring capability
- Data centres upgrade;
- DFMC SBAS Signal upgrade according to the eighth edition of of ICAO Annex 10 Volume I
- ...

- Review the system design and development document.
- Review the system construction and operation qualification
- System Safety Assessment
- ...

- Long term performance evaluation;
- Flight test;
- Flight verification.
- ...

- Regular operation performance evaluation;
- development of flight procedures and operational standards ;
- Training for crew and control personnel;
- Approval of the operating conditions of aircraft operators





Thank You!

ICAO