



AIR NAVIGATION SERVICES DEPARTMENT (ANS)

The use of space-based systems
and equipment
in Air Navigation Services of
Mongolia

Boldbayar BATBOLD

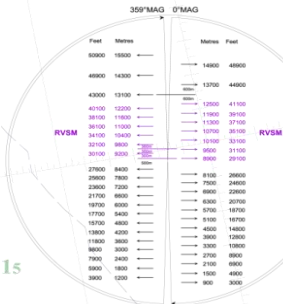
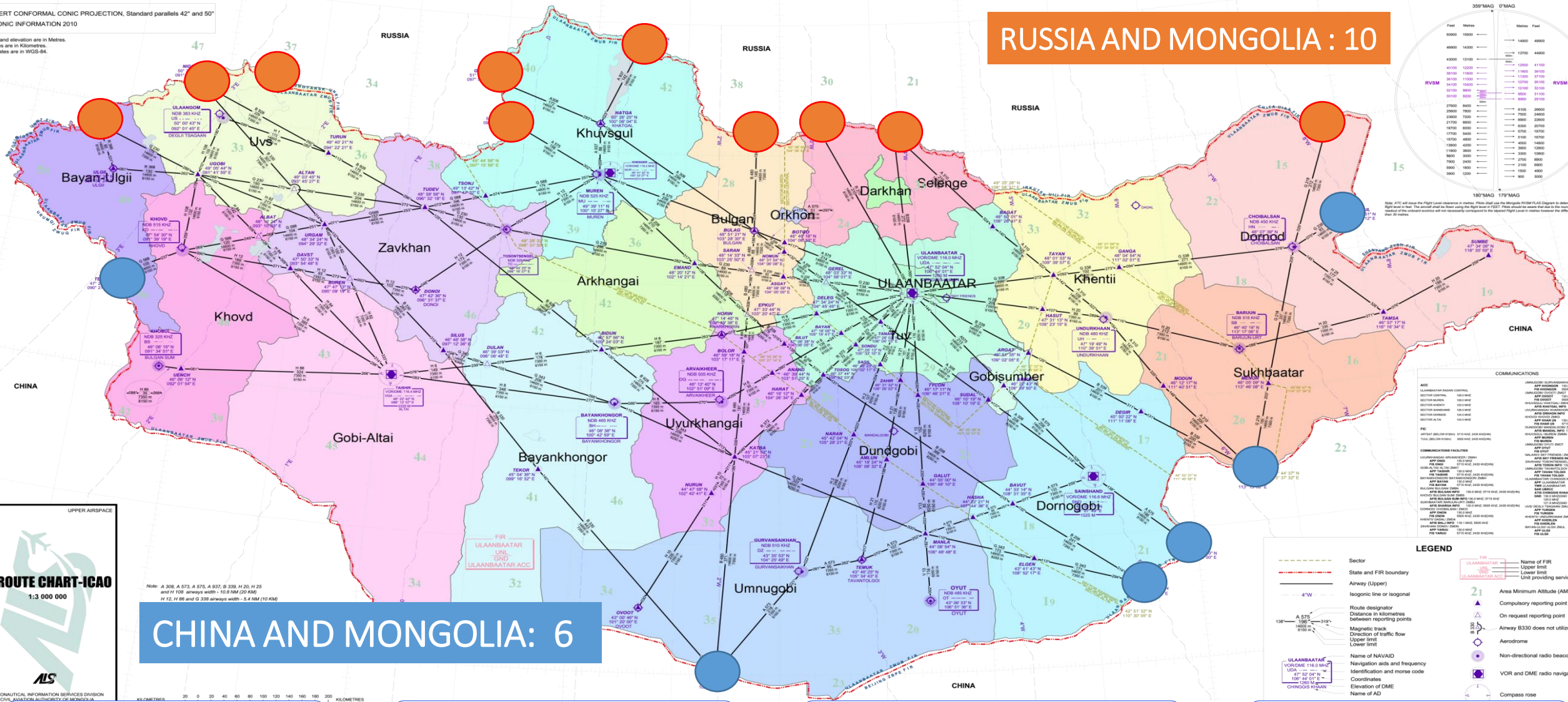
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MONGOLIAN AIRSPACE STRUCTURE

LAMBERT CONFORMAL CONIC PROJECTION, Standard parallels 42° and 50°
ISOGONIC INFORMATION 2010
Altitude and elevation are in Metres.
Distances are in Kilometres.
Coordinates are in WGS-84.

RUSSIA AND MONGOLIA : 10



ENROUTE CHART-ICAO
1:3 000 000

ALIS

AERONAUTICAL INFORMATION SERVICES DIVISION
CIVIL AVIATION AUTHORITY OF MONGOLIA

CHINA AND MONGOLIA: 6

16 EXIT/ENTRY POINT

95 AIRWAYS

25 AIRPORTS

6 SECTOR

LEGEND

--- FIR	Ulaanbaatar	Name of FIR
--- ULAAANBAATAR	ULAAANBAATAR	Upper limit
--- ULAAANBAATAR ACC	ULAAANBAATAR ACC	Lower limit
21	Area Minimum Altitude (AMA)	
▲	Compulsory reporting point	
△	On request reporting point	
⊙	Airway B330 does not utilize this	
⊙	Aerodrome	
⊙	Non-directional radio beacon (NDB)	
⊙	VOR and DME radio navigation	
⊙	Compass rose	

AIR NAVIGATION POLICY AND PLANNING



**AIR
NAVIGATION
PLAN-2024**



**ICAO
Global Air Navigation Plan
ASBU**



**GOVERNMENT POLICY
FOR
AVIATION**

CURRENT USE OF GNSS

What is PBN?

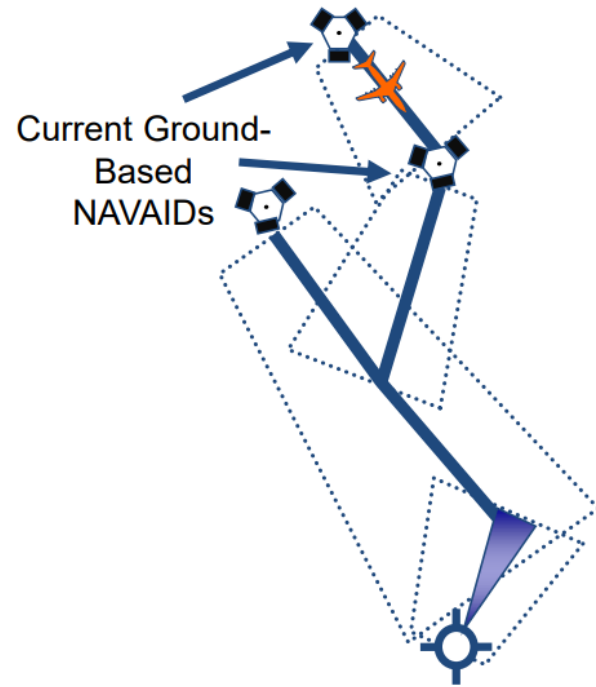
- PBN defines performance requirements for aircraft navigating on an ATS route, on a terminal or on an approach procedure. Those routes and procedures are composed of way-points which are expressed by WGS 84 coordinates rather than fixes expressed by radial/bearing and distance from ground navigation aids and permit the flexibility of point-to-point operations.

Benefits of PBN

- Through the application of Area Navigation (RNAV) and Required Navigation Performance (RNP) specifications, altogether components of PBN, PBN can provide the means for flexible routes and terminal procedures, reduce aviation congestion, conserve fuel, protect the environment, reduce the impact of aircraft noise, improve safety and accessibility to challenging airports, and increase airspace capacity.

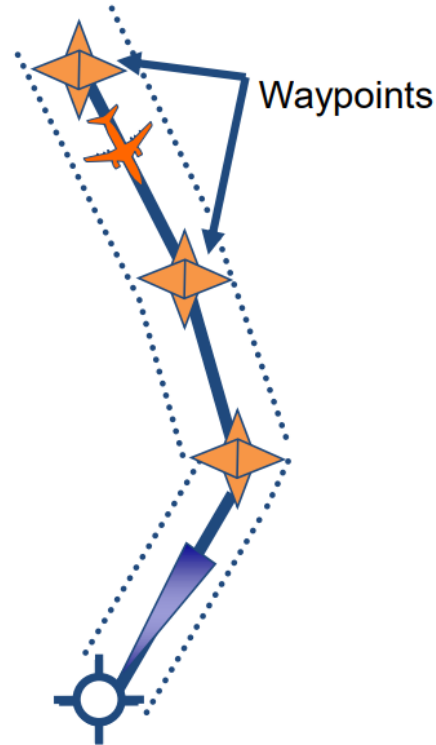
CURRENT USE OF GNSS

Conventional



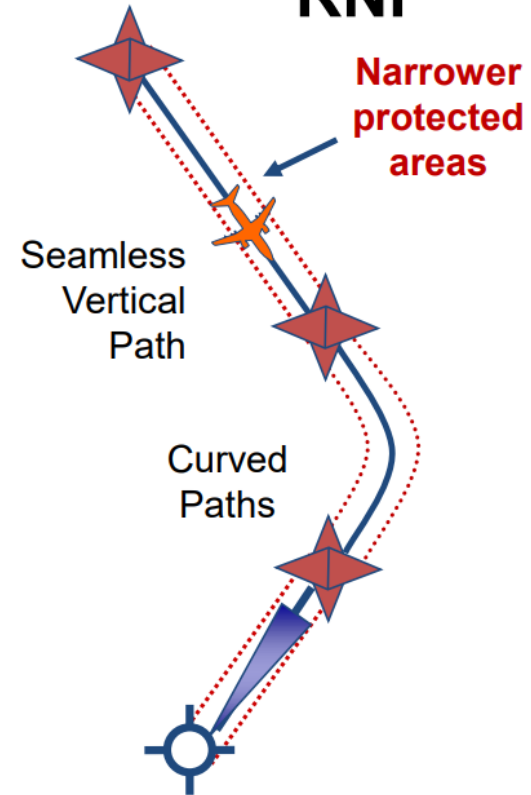
Limited Design Flexibility

RNAV



Increased Airspace Efficiency

RNP



Optimized Use of Airspace

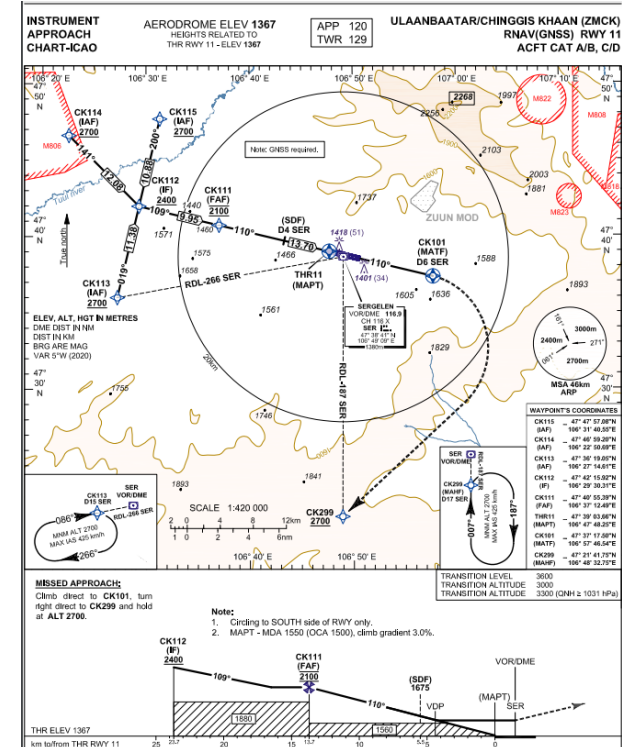
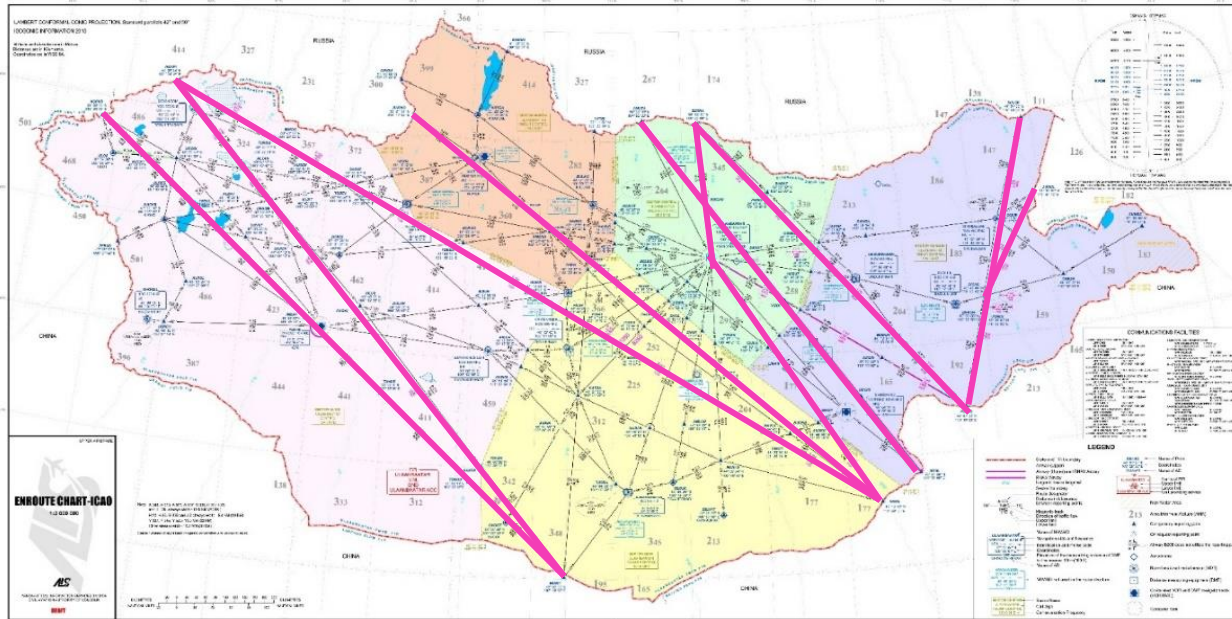
CURRENT USE OF GNSS

- The International Civil Aviation Organization (ICAO) has been promoting the Performance Based Navigation (PBN) program since 2007.
- In 2009, Mongolia submitted a plan to implement PBN program to ICAO.
- To date, Mongolia has successfully implemented Phases I and II of PBN plan and Phase III to be implemented by 2025.

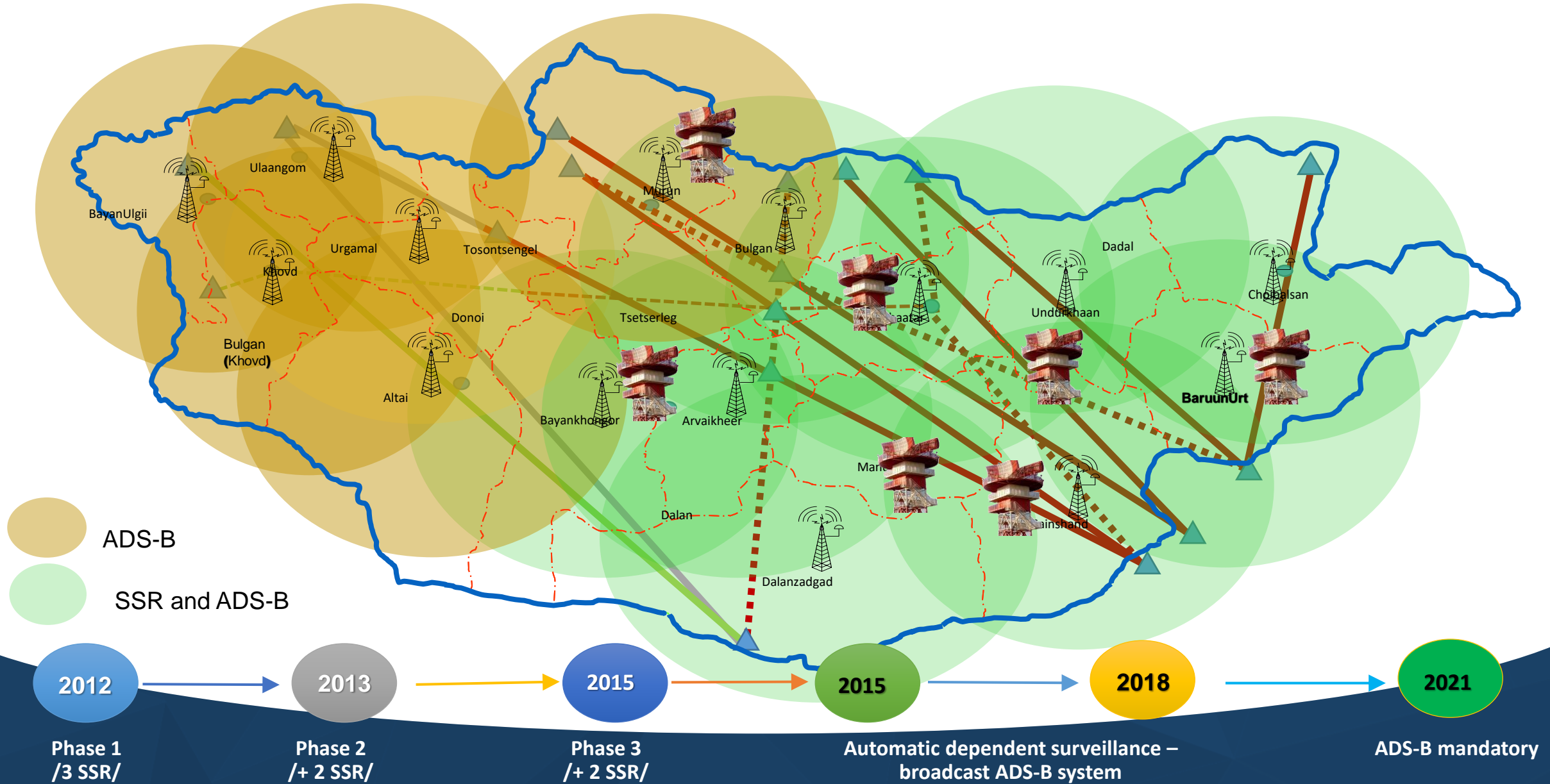
CURRENT USE OF GNSS

- Within the framework of Phase I and II (2017)
 - 10 RNAV ATS routes established
 - 23 PBN flight procedures at 9 locations

Performance Based Navigation



SURVEILLANCE SYSTEM COVERAGE

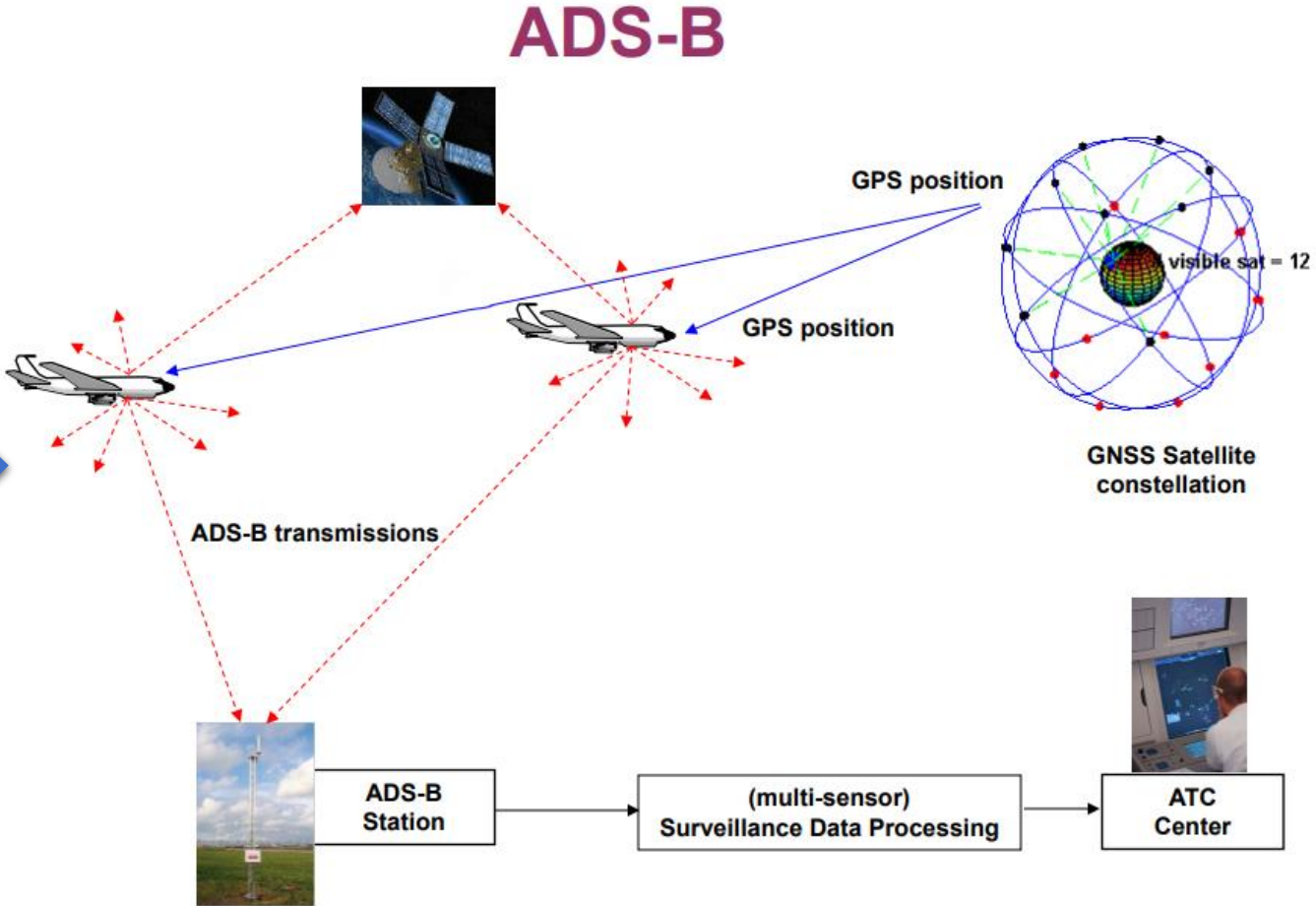


CURRENT USE OF GNSS

Automatic Dependent Surveillance Broadcast (ADS-B)

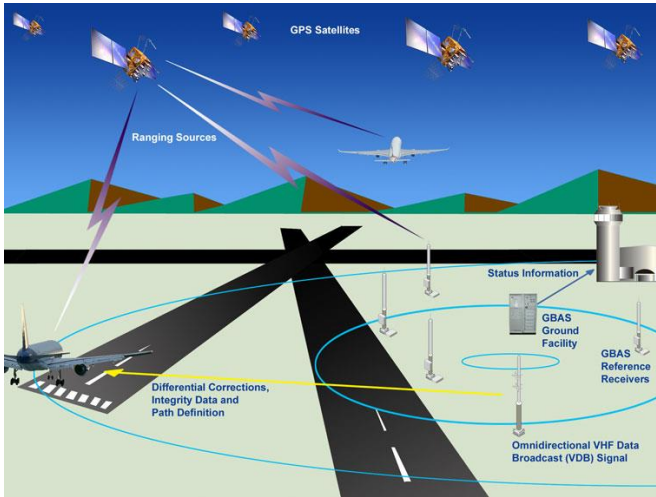


Surveillance radar



PLANNING FOR FUTURE USE

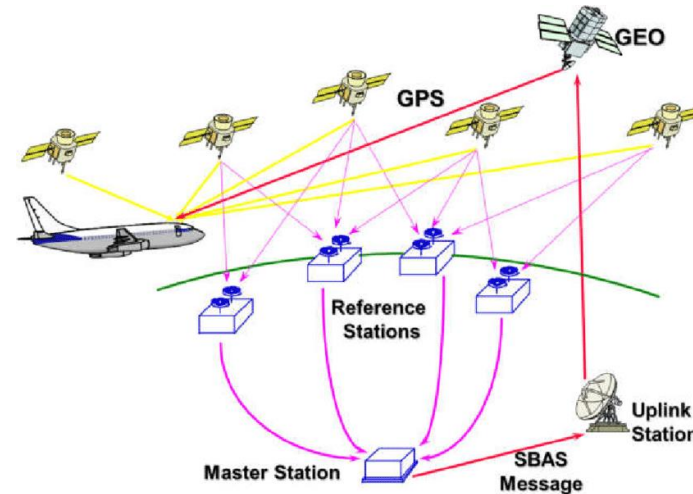
GBAS, SBAS



A Ground Based Augmentation System (GBAS) augments the existing Global Positioning System (GPS) used in airspace by providing corrections to aircraft in the vicinity of an airport in order to improve the accuracy of, and provide integrity for, these aircrafts' GPS navigational position. The goal of GBAS implementation is to provide an alternative to the Instrument Landing System (ILS) supporting the full range of approach and landing operations.

The performance of Global Navigation Satellite Systems (GNSSs) can be improved by regional Satellite-based Augmentation Systems (SBAS), such as the European Geostationary Navigation Overlay Service (EGNOS). SBAS improves the accuracy and reliability of GNSS information by correcting signal measurement errors and by providing information about the accuracy, integrity, continuity and availability of its signals.

SBAS uses GNSS measurements taken by accurately located reference stations deployed across an entire continent. All measured GNSS errors are transferred to a central computing centre, where differential corrections and integrity messages are calculated. These calculations are then broadcast over the covered area using geostationary satellites that serve as an augmentation, or overlay, to the original GNSS message.



Existing SBAS

Several countries have implemented their own Satellite-based Augmentation System. For example, in Europe EGNOS covers the majority of the European Union (EU), along with some neighboring countries and regions. Other national SBASs include:

- **USA:** Wide Area Augmentation System (WAAS)
- **Japan:** Michibiki Satellite Augmentation System (MSAS)
- **India:** GPS-aided GEO-Augmented Navigation (GAGAN)
- **China:** BeiDou SBAS (BDSBAS) (in development)
- **South Korea:** Korea Augmentation Satellite System (KASS) (in development)
- **Russia:** System for Differential Corrections and Monitoring (SDCM) (in development)
- **ASECNA:** SBAS for Africa and Indian Ocean (A-SBAS) (in development)
- **Australia and New Zealand:** Southern Positioning Augmentation Network (SPAN) (in development)

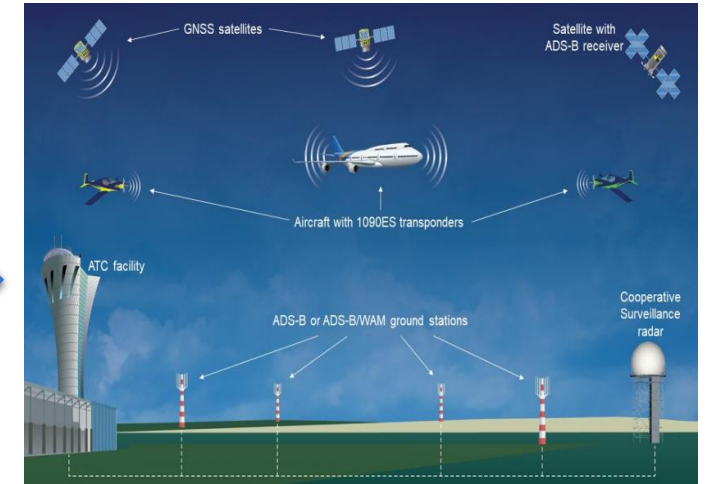
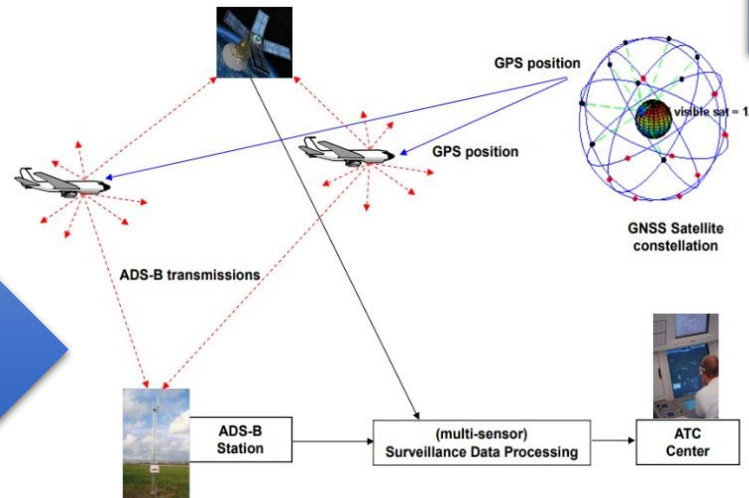
PLANNING FOR FUTURE USE

Satellite based ADS-B



Surveillance radar

Automated dependent surveillance broadcasting system ADS-B



Satellite based ADS-B

FOCUS RELATED TO THE USE OF GNSS

- Reliable operation of GNSS system.
- Training and developing employees
 - Complex, and high-tech equipment is required.

THANK YOU
FOR
YOUR ATTENTION!