

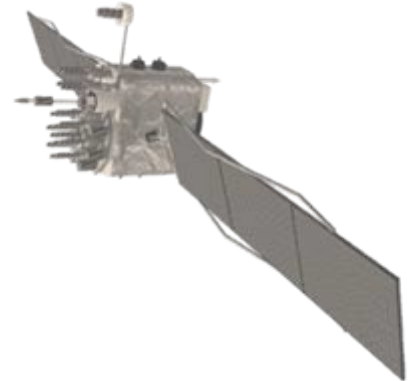


U.S. Space-Based Positioning, Navigation and Timing Policy and Program Update

5th International Committee on GNSS

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United States of America*





Overview



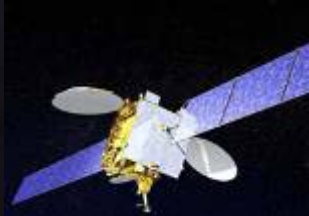
U.S. Space-Based PNT Policy

**Global Positioning System
Description**

GPS Augmentations

Summary

GNSS is Essential to Our Economies and National Critical Infrastructures



Satellite Operation



Surveying & Mapping



Power Grids



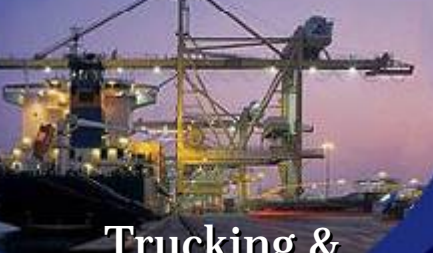
Precision Agriculture



Transit Operations



NextGen



Trucking & Shipping



IntelliDrive



Telecom



Personal Navigation



Disease Control



Oil Exploration



Fishing & Boating



U.S. Policy: Maintain leadership in the service, provision and use of GNSS



- Provide continuous worldwide access for peaceful uses, free of direct user charges
- Encourage compatibility and interoperability with foreign GNSS services and promote transparency in civil service provisioning
- Operate and maintain constellation to satisfy civil and national security needs
 - *Foreign PNT services may be used to complement services from GPS*
- Invest in domestic capabilities and support international activities to detect, mitigate and increase resiliency to harmful interference



Keys to Successful U.S. Program



- Policy Stability
- Transparency
- Program Stability
- Sustained Performance and Credibility
- Continuous Improvement

Policy stability and transparency improve industry confidence and investment



U.S. Objectives in Working with Other GNSS Service Providers



- Ensure **compatibility** – ability of U.S. and non-U.S. space-based PNT services to be used separately or together without interfering with each individual service or signal
 - Radio frequency compatibility
 - Spectral separation between M-code and other signals
- Achieve **interoperability** – ability of civil U.S. and non-U.S. space-based PNT services to be used together to provide the user better capabilities than would be achieved by relying solely on one service or signal
 - Primary focus on the common L1C and L5 signals
- Ensure a level playing field in the global marketplace

Pursue through Bilateral and Multilateral Cooperation



GPS Constellation Status



31 Healthy Satellites

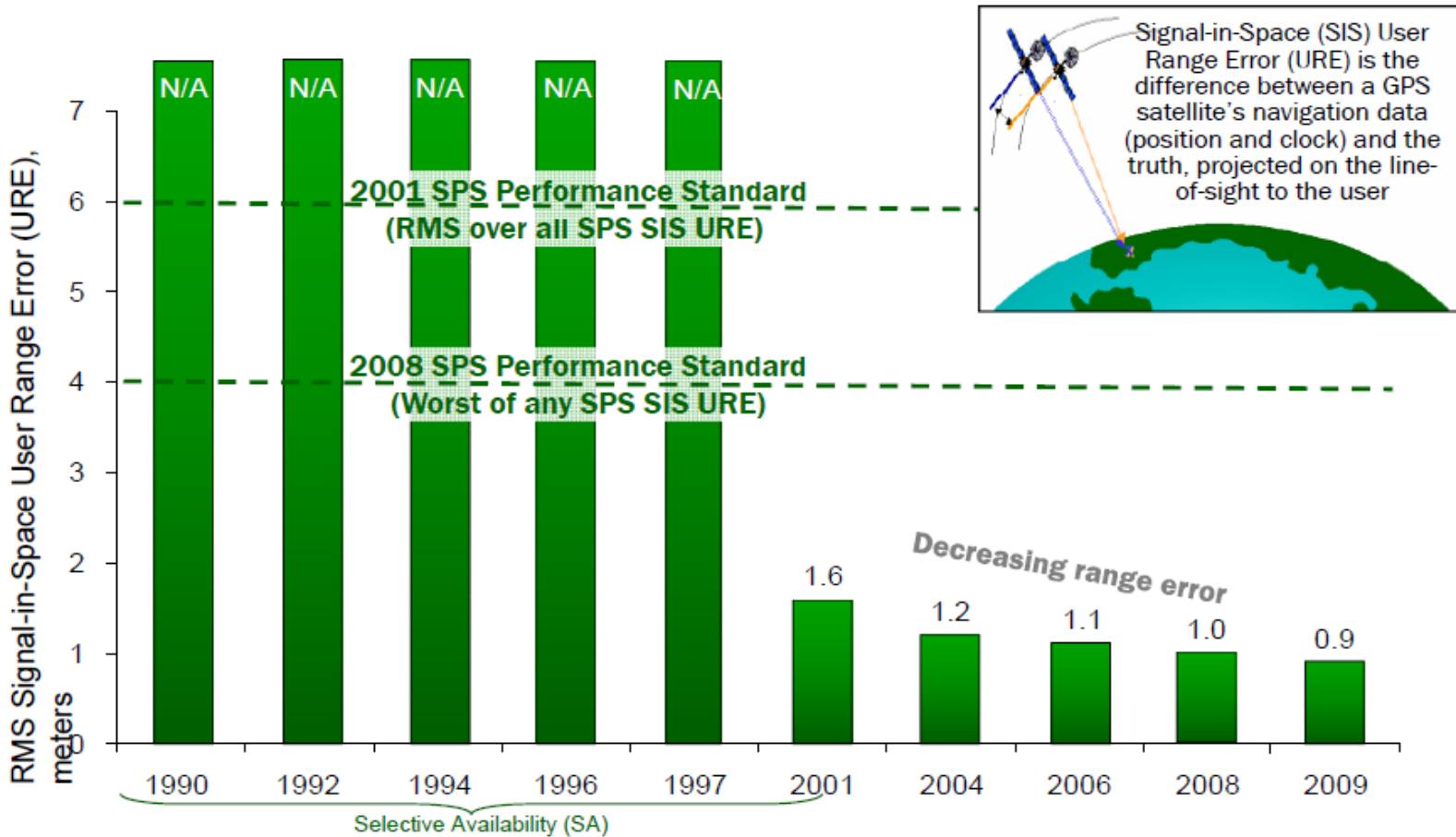
Baseline Constellation: 24

- 11 Block IIA satellites
- 12 Block IIR satellites
- 7 Block IIR-M satellites (8 operational)
 - 1 IIR-M in “test” mode – SVN-49
- 1 Block IIF satellite (SVN 62, PRN 25)
 - Launched June 2010
 - Set Healthy 27 August 2010
 - First Operational L5
 - Best GPS clock performance
- Next IIF Launch Mid 2011





SPS Signal in Space Performance



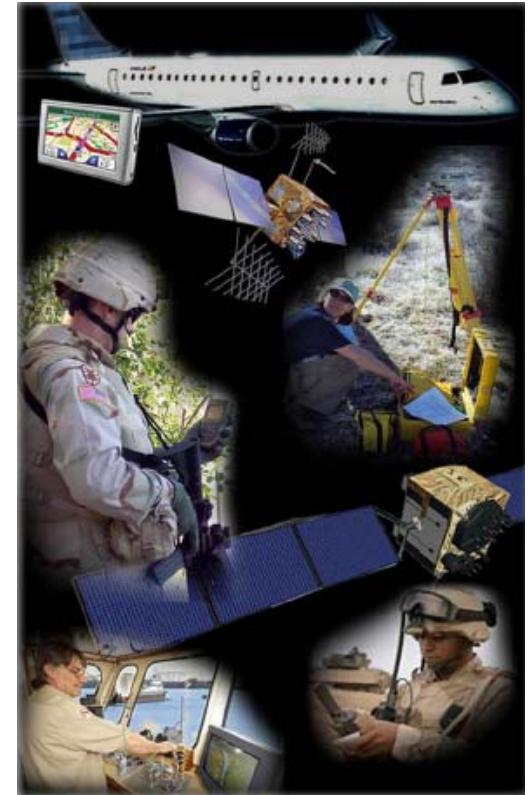
System accuracy exceeds published standard



Civil Capability Improvements



- **L2C**
 - 24 operational satellites in FY16
 - Defined in IS-GPS-200
- **L5**
 - Demonstration payload on IIR-20(M) to ensure frequency spectrum protection
 - 24 operational satellites in FY18
 - Defined in IS-GPS-705
- **L1C**
 - 24 operational satellites in FY21
 - Defined in IS-GPS-800
- **Integrity Monitoring**
 - GPS III integrity enhanced by SV reliability and on-board clock monitoring





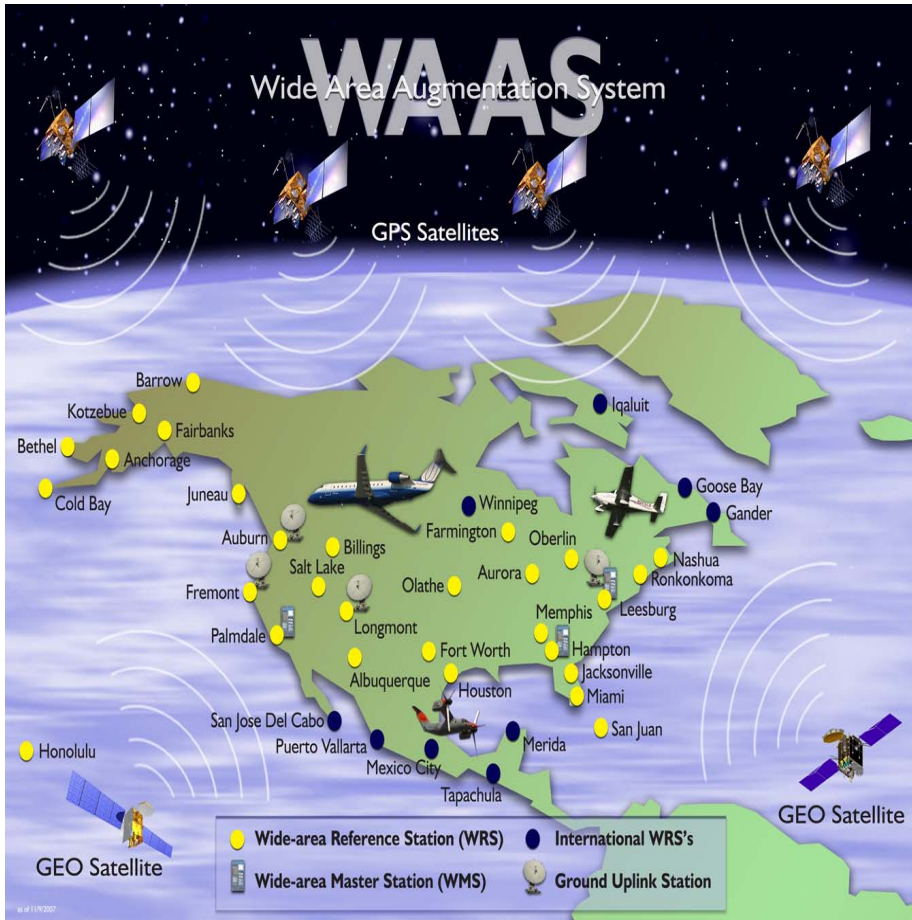
Public Interface Specifications



- **Current versions of the public GPS Signal-in-Space (SIS) Interface Specifications:**
 - **IS-GPS-200 – L1 P(Y) + C/A, L2 P(Y) + L2C**
 - **IS-GPS-705 – L5 I5 + Q5**
 - **IS-GPS-800 – L1 L1CP + L1CD**
- **These, and other key IS/ICD documents available at:**
<http://www.losangeles.af.mil/library/factsheets/factsheet.asp?id=9364>



WAAS Architecture



38 Reference Stations



3 Master Stations



4 Ground Earth Stations



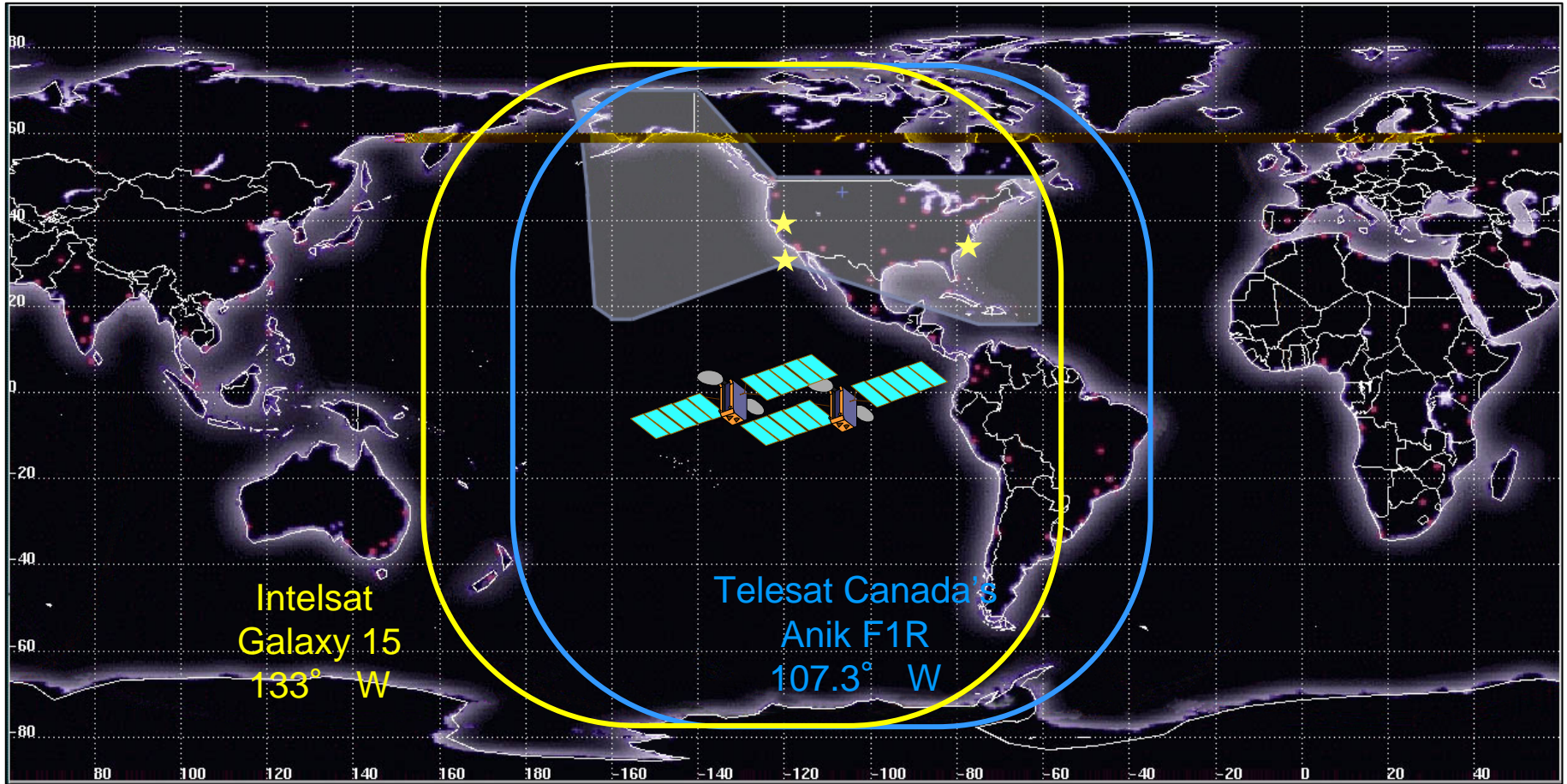
2 Geostationary Satellite Links



2 Operational Control Centers

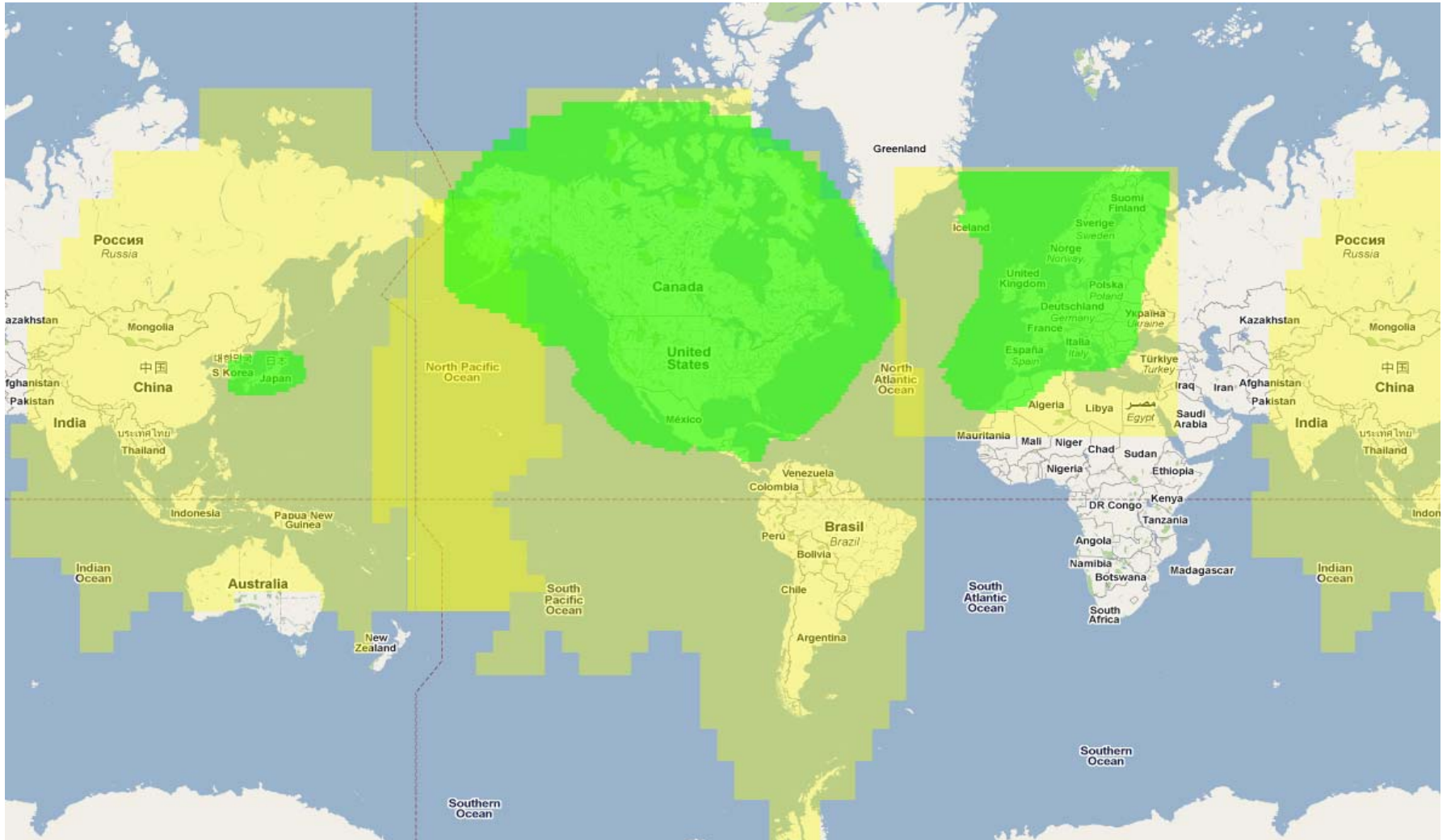


GEO Satellite Coverage Plot



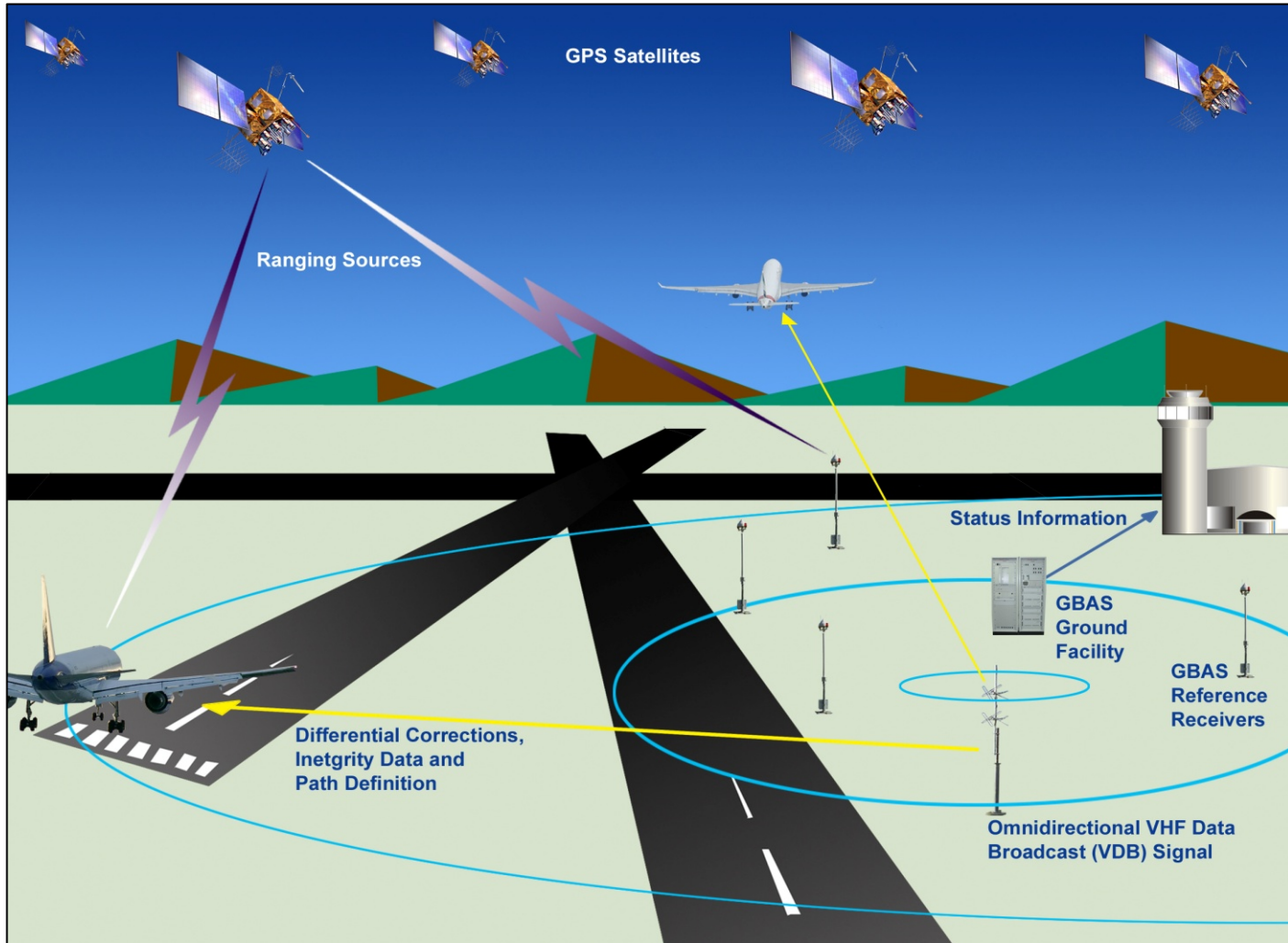


Global SBAS Coverage



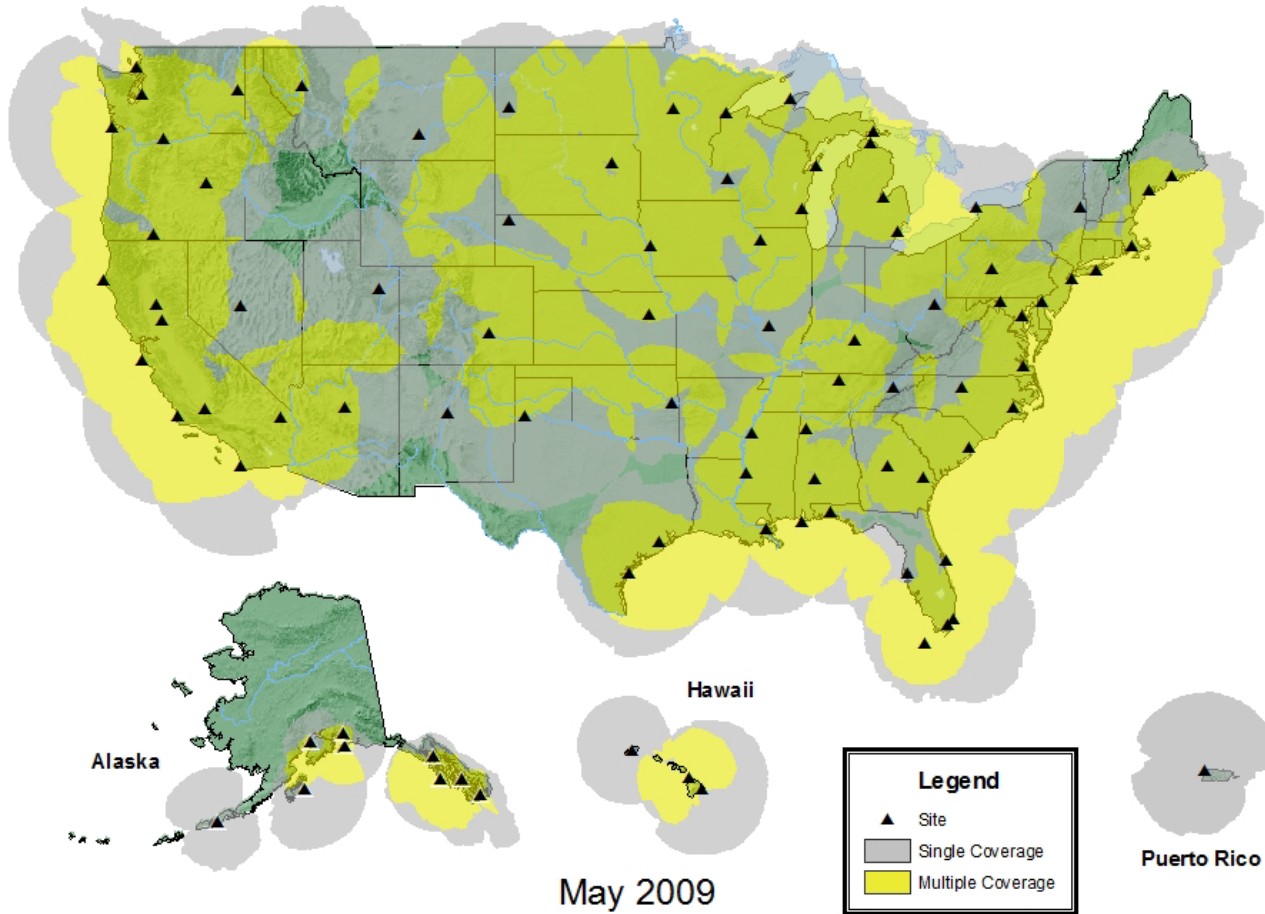


Local Area Augmentation System (LAAS)





National Differential GPS (NDGPS)

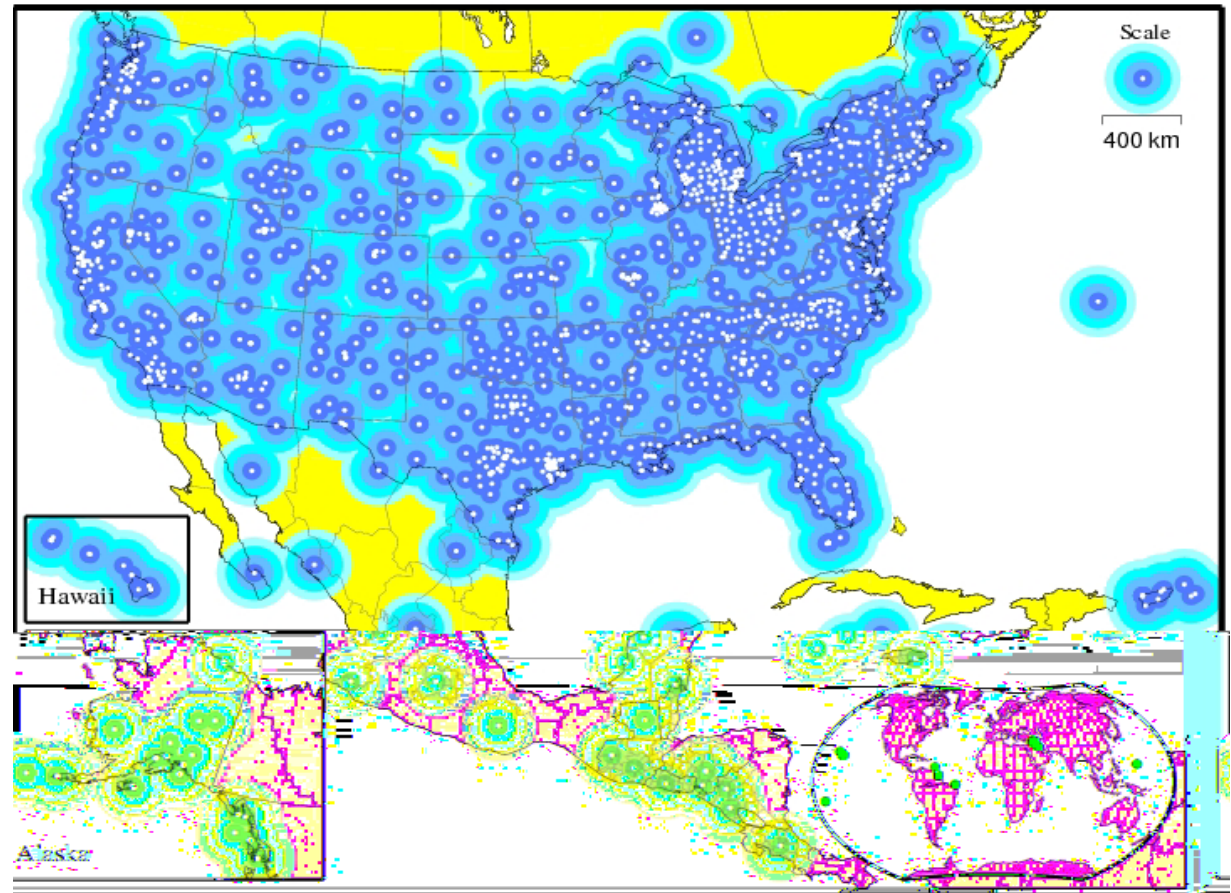




National Continuously Operating Reference Stations (CORS)

Sponsor: NOAA

- 1,300+ sites
- Operated by 200+ academic organizations
- Enables highly accurate, 3-D positioning





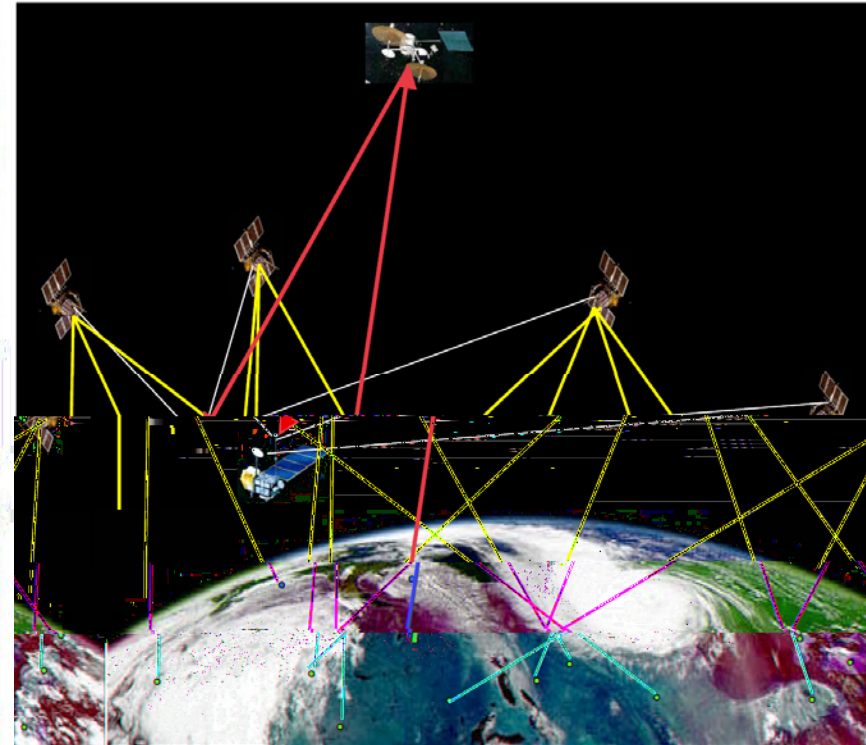
Global Differential GPS (GDGPS) and TDRSS Augmentation Service for Satellites (TASS)

Sponsor: NASA

GDGPS: More than 100 real-time tracking sites

- Real-Time Positioning, Timing, and Orbit-Determination

**TASS: Future plans to disseminate GDGPS corrections to satellites
for autonomous orbit determination and science missions**





Summary

- The U.S. supports free access to civilian GNSS signals with public domain documentation necessary to develop user equipment and achieve service certification by international regulatory bodies
- GPS is a critical component of the global information infrastructure
 - Compatible with other satellite navigation systems and interoperable at the user level
 - Guided at a national level as multi-use asset
 - Acquired and operated by Air Force on behalf of the USG
- The U.S. policy promotes open competition and market growth for commercial GNSS

GPS continues to provide consistent, predictable, dependable performance