

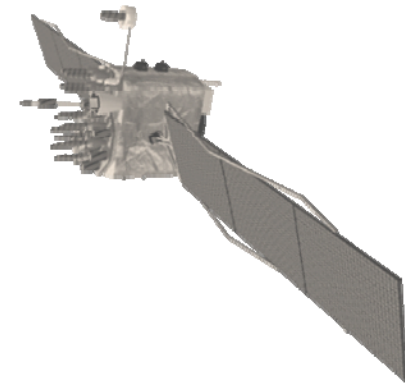
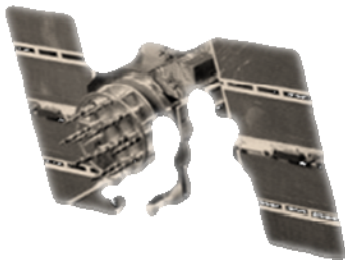
U.S. Space-Based Positioning, Navigation and Timing Policy and Program Update

7th International Committee on GNSS

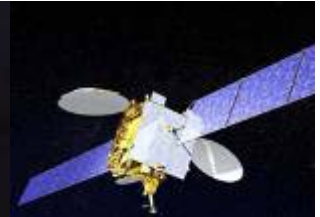
4 November 2012

*Anthony J. Russo
Director, National Coordination Office
United States of America*

*Bernard J. Gruber
Director, Global Positioning Systems Directorate
United States of America*



GNSS enables a diverse array of applications



Satellite
Operation



Surveying &
Mapping



Power
Grids



Precision Agriculture



Transit
Operations



NextGen



Disease Control



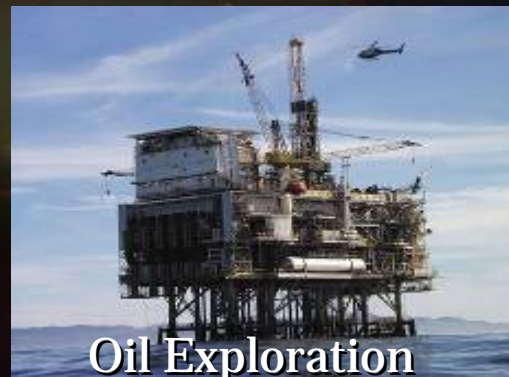
Intelligent Vehicles



TeleComm



Trucking &
Shipping



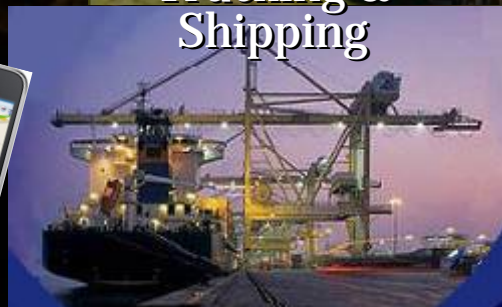
Oil Exploration



Fishing & Boating

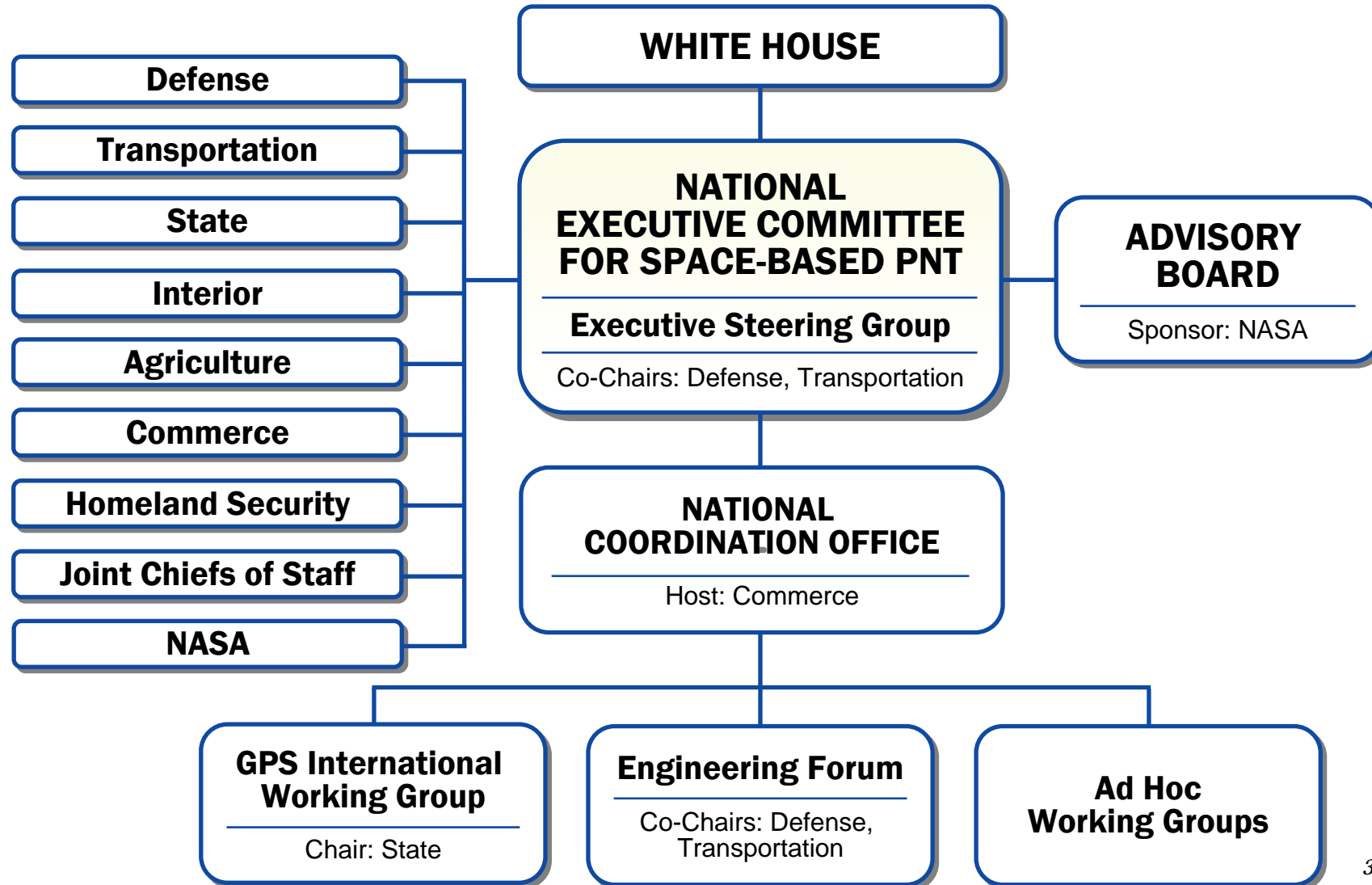


Personal
Navigation





National Space-Based PNT Organization





U.S. Policy



- 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



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*



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



GPS IIF-3 Launch



SVN-65 , October 4, 2012



GPS Constellation Status

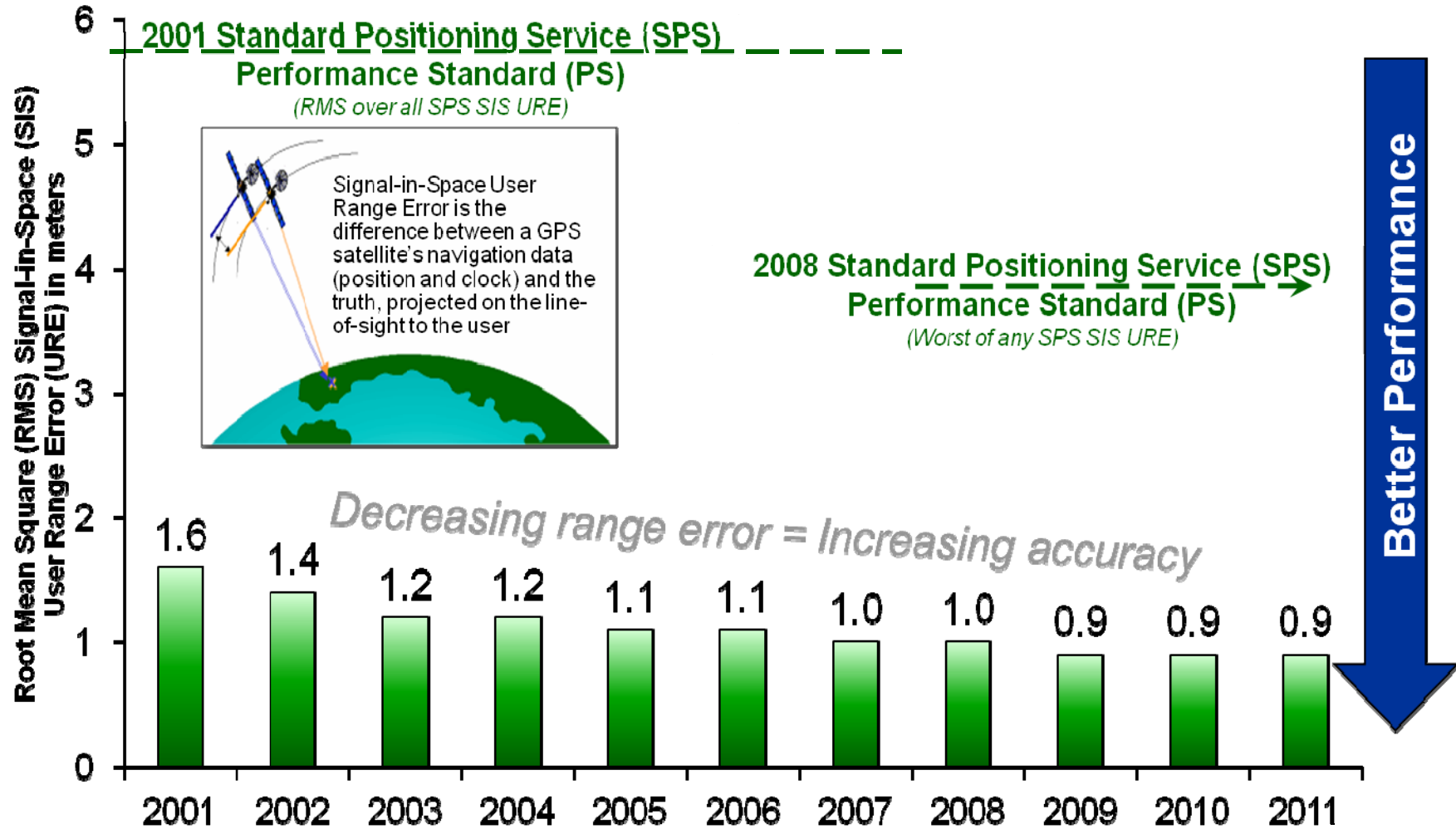
**35 Satellites (30 Operational)
(Baseline Constellation: 24+3)**

- 12 Block IIA
 - 3 on-orbit in residual status
- 12 Block IIR
- 8 Block IIR-M
 - Transmitting new second civil signal
 - 1 GPS IIR-M in on-orbit testing
- 3 Block IIF
 - SVN-65 operational late 2012
- Global GPS civil service performance commitment met continuously since December 1993





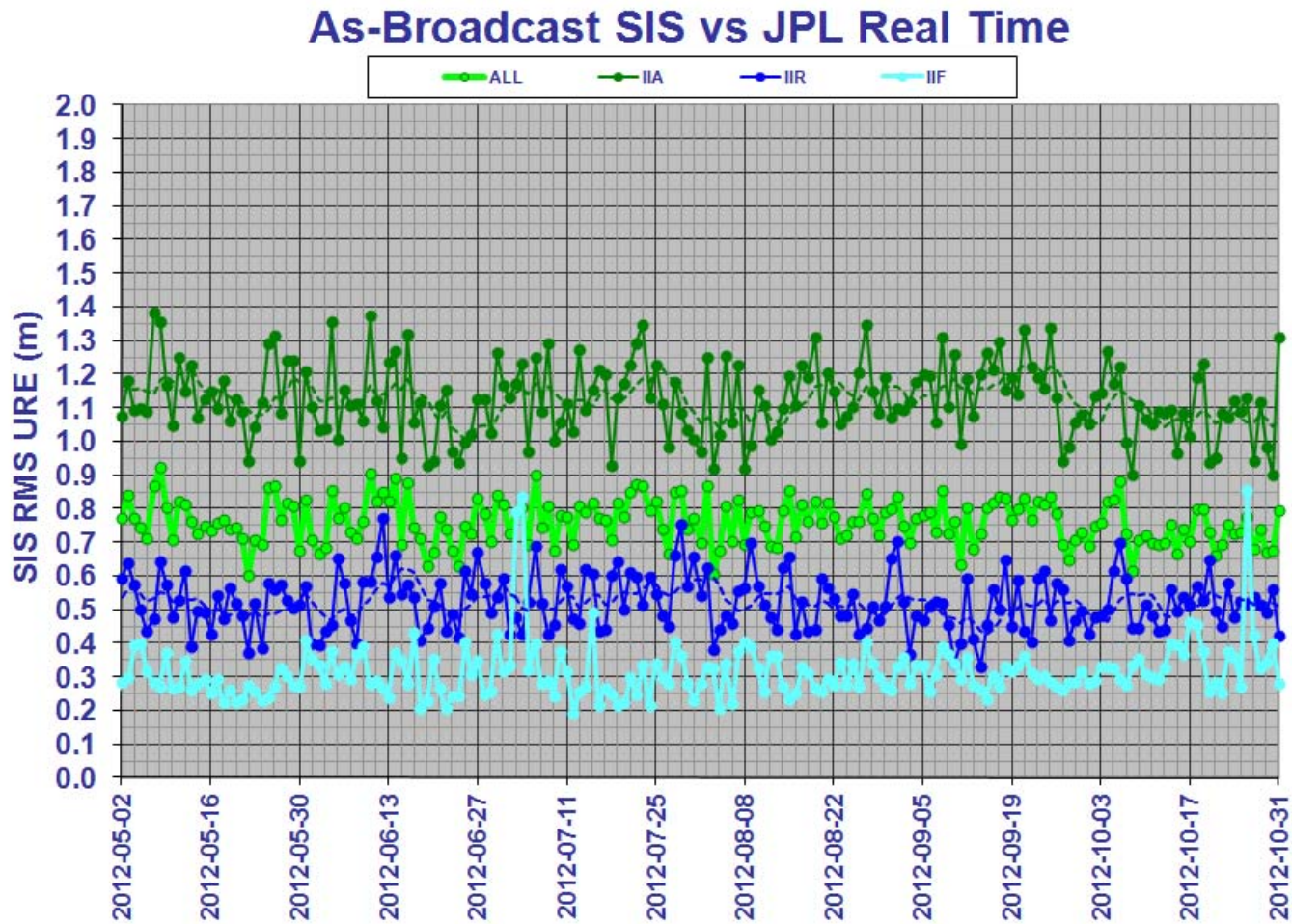
Standard Positioning Service (SPS) Signal-in-Space Performance



System accuracy exceeds published standard

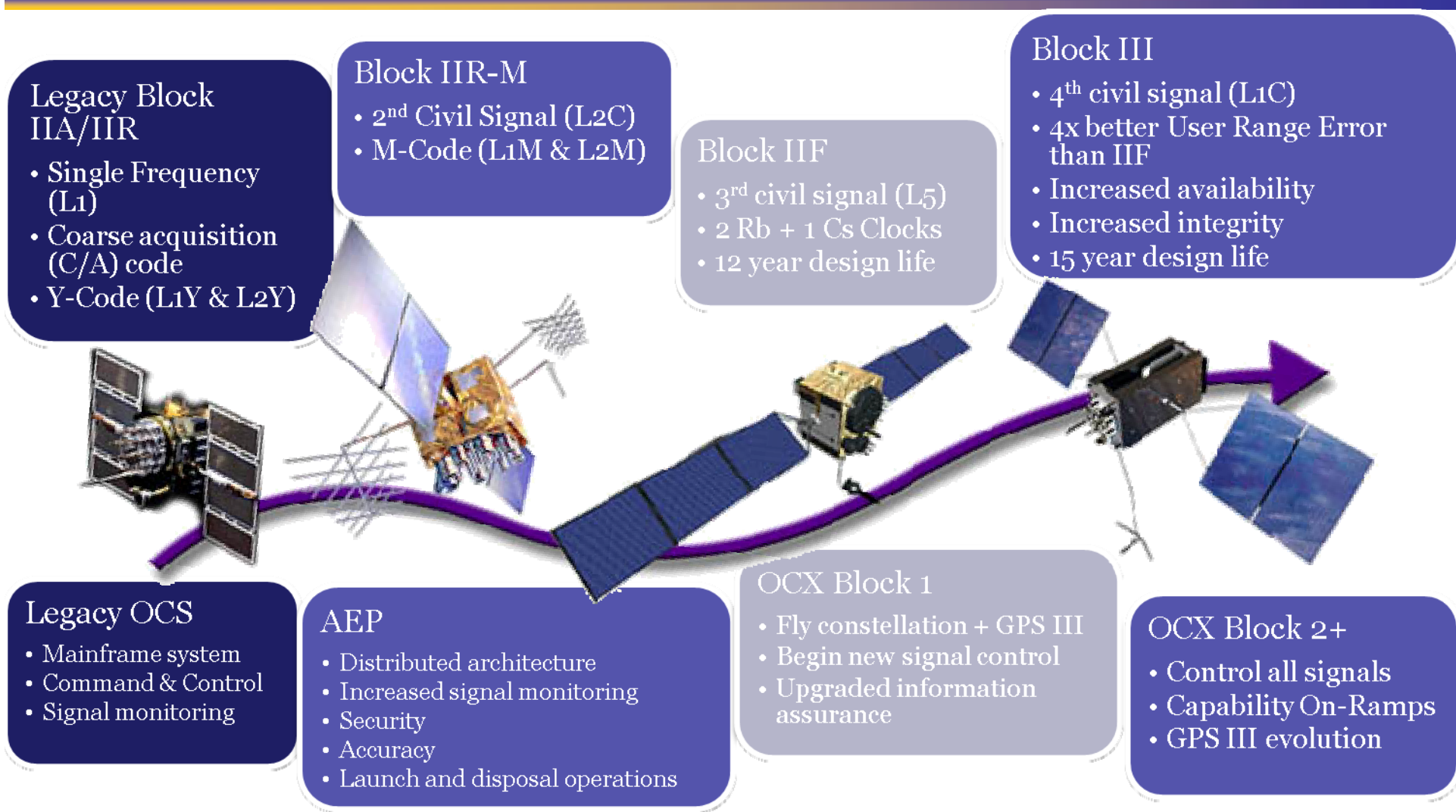


GPS SIS Performance – Past 6 Months





GPS Modernization Program



Increasing System Capabilities ♦ Increasing User Benefit



Modernized Civil GPS Capabilities

2nd Civil Signal (L2C)

Provide dual-frequency civil navigation and extend GPS availability in challenged environments



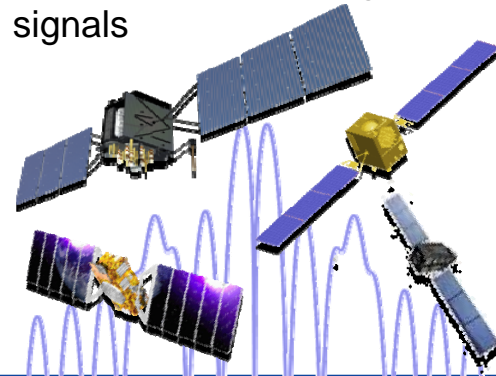
3rd Civil Signal (L5)

Provide dual-frequency and/or triple-frequency civil navigation and safety-of-life signals



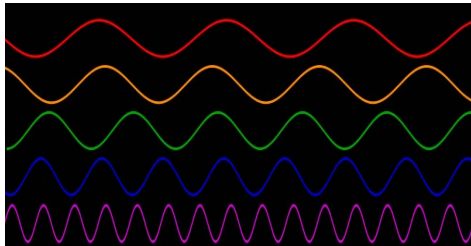
4th Civil Signal (L1C)

Provide internationally harmonized civil navigation signals



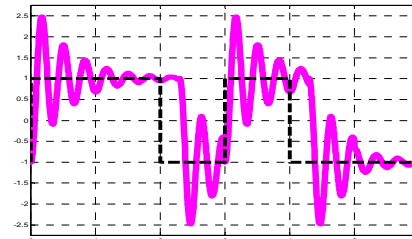
Precision Carrier-Phase Tracking

Dataless pilot channels for precision carrier phase lock loop tracking



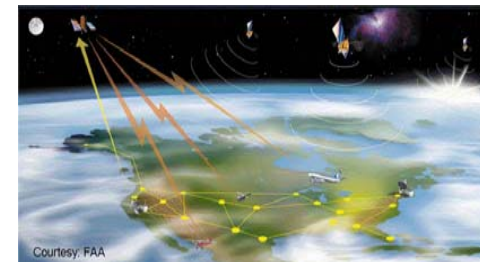
Monitored Integrity

On-board monitoring for clock anomalies, ground monitoring for signal malformation anomalies



External Augmentations

Extend GPS accuracy and integrity for safety-of-life applications



Courtesy: FAA



Summary



- The U.S. supports free access to civilian GNSS signals and all necessary public domain documentation
 - GPS.gov -- official public resource for official U.S. Government information about GPS and related topics
- 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*



BACKUP SLIDES





GPS.gov

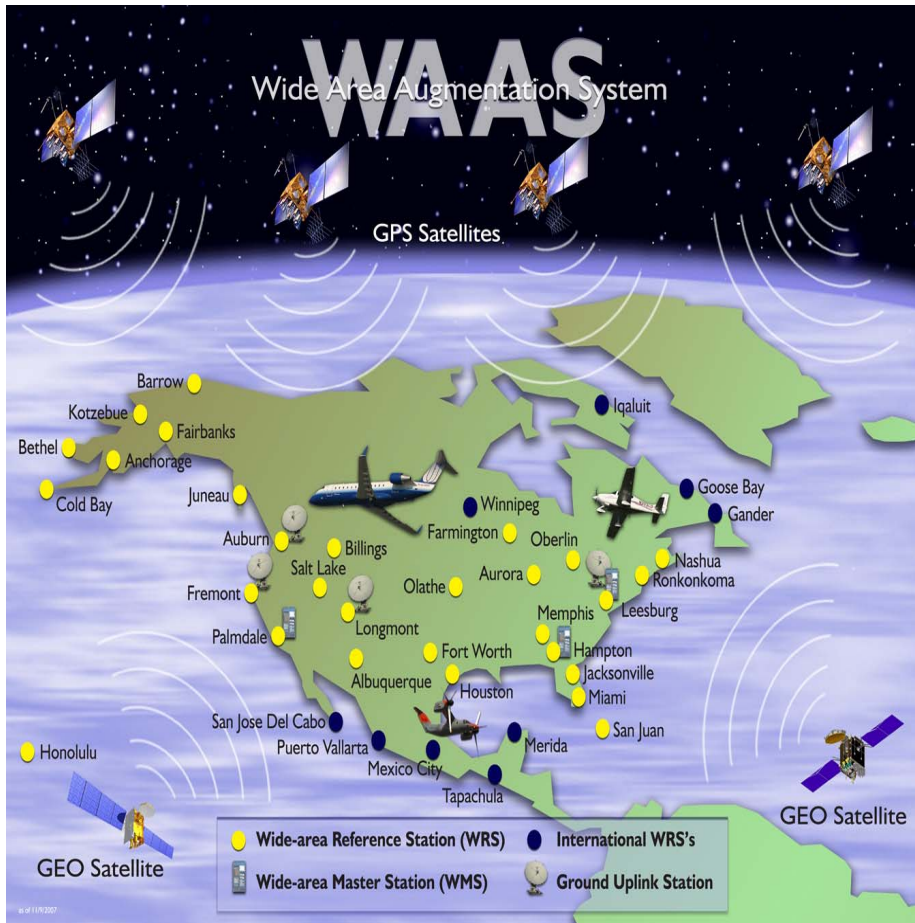


- Migrated PNT.gov website to the new GPS.gov website
- GPS.gov is now a central public resource on Official U.S. Government information about GPS and related topics

The screenshot shows the homepage of GPS.gov. At the top, there is a navigation bar with links for HOME, WHAT'S NEW, SYSTEMS, APPLICATIONS, GOVERNANCE, MULTIMEDIA, and SUPPORT. Below this is a large banner for "Lost Satellite Reception" with the headline "FCC Steps Up Enforcement Against GPS Jammer Sales". To the right of the banner is a text block about FCC actions against illegal GPS jammers. Below the banner are three main content areas: "Get Help with Incorrect Addresses, Maps, and Directions" with a map snippet; "Successful Launch of Third GPS IIF Satellite on Oct 4" with a video player showing a rocket launch; and "GPS User Support" with a "Common Questions" section listing topics like reporting service problems and how GPS works. A "More Feature Stories" section is also visible at the bottom left.



WAAS Architecture



38 Reference Stations



3 Master Stations



6 Ground Earth Stations



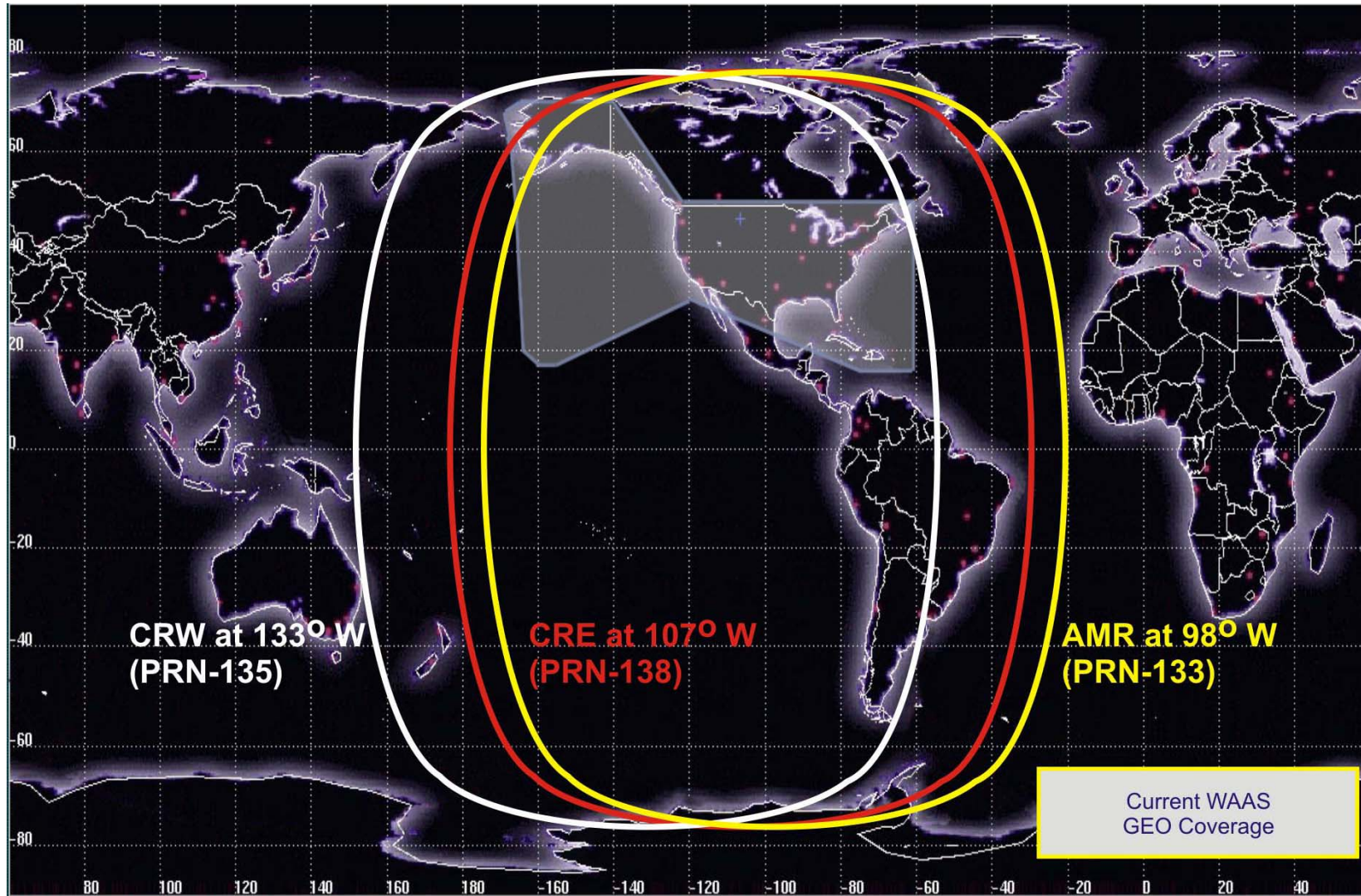
3 Geostationary Satellite Links



2 Operational Control Centers

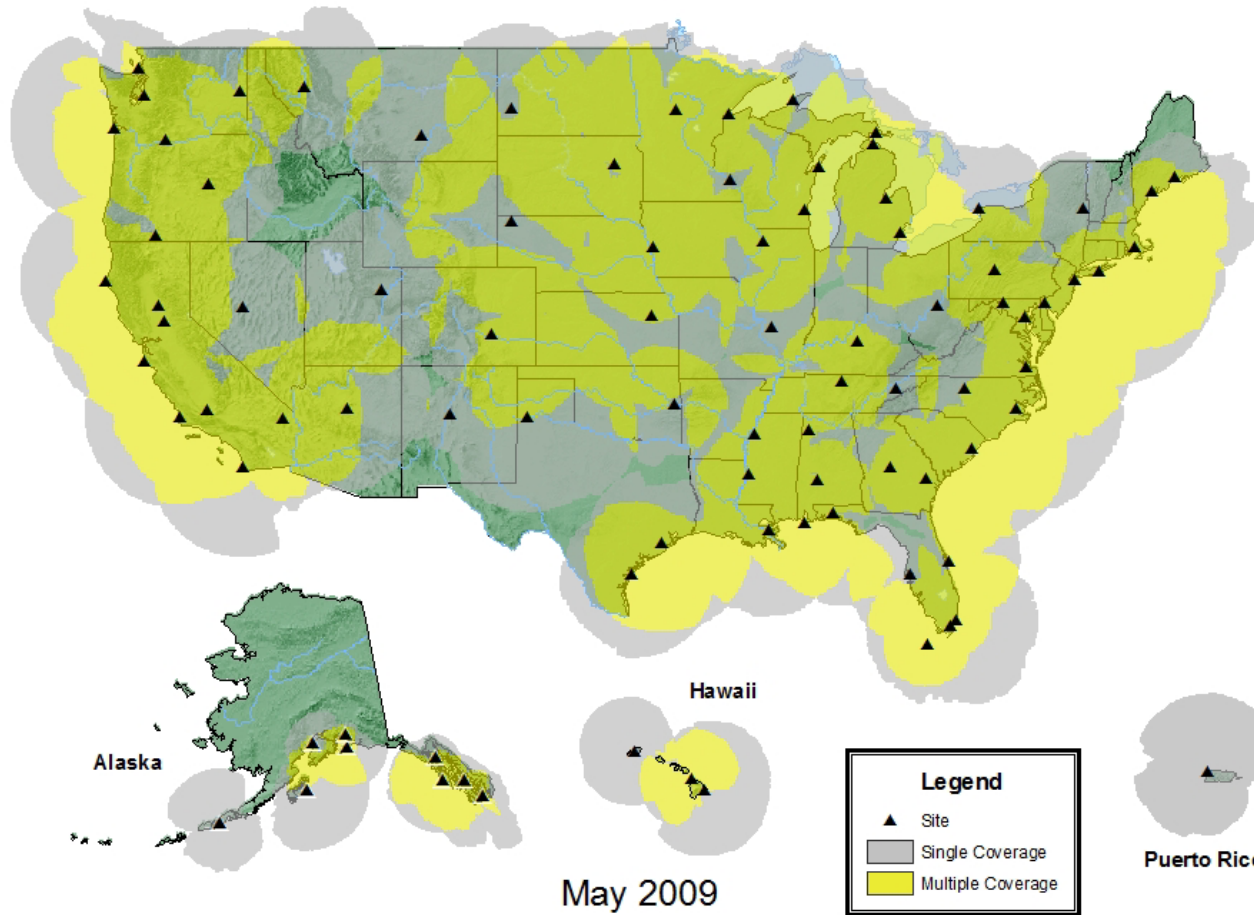


GEO Satellite Coverage Plot





National Differential GPS (NDGPS)



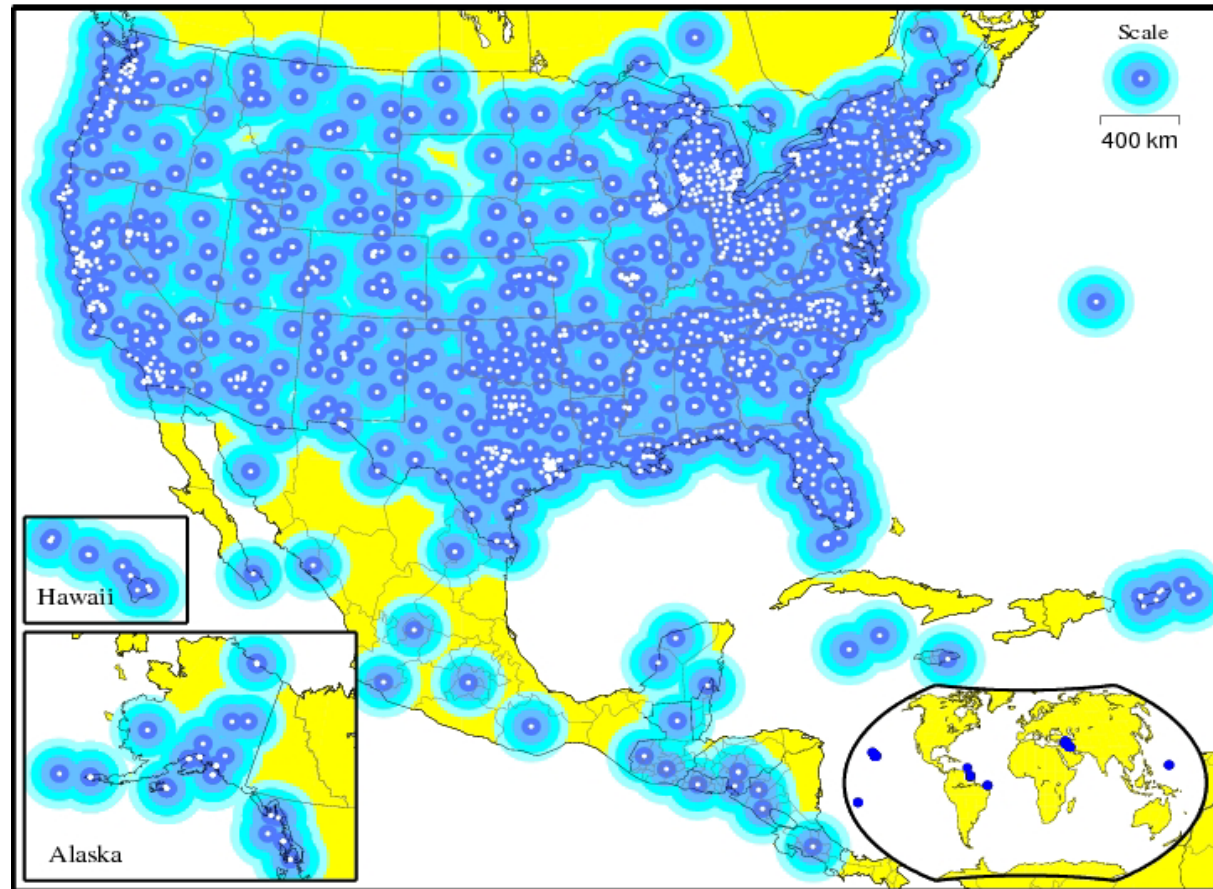


National Continuously Operating Reference Stations (CORS)



Sponsor: NOAA

- 1,900+ 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

