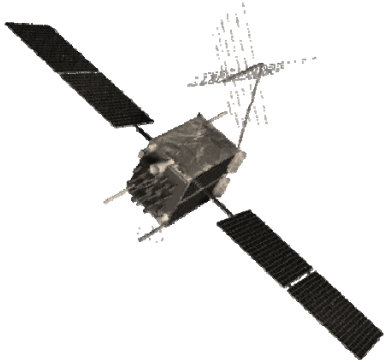
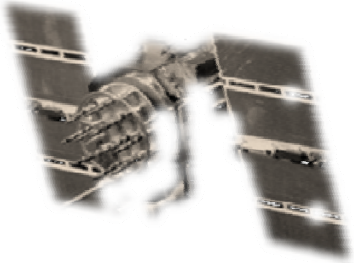
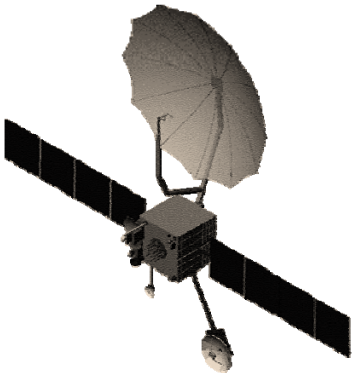


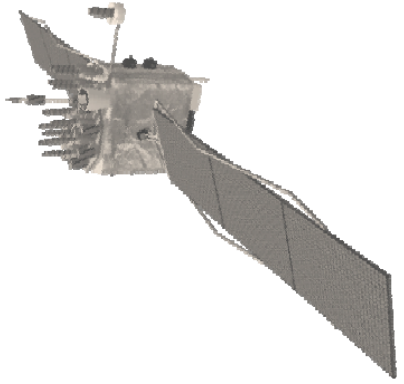


U.S. Space-Based Positioning, Navigation and Timing Policy and Program Update

5th International Committee on GNSS

18 October 2010





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

Overview

U.S. Space-Based PNT Policy

Global Positioning System Description

GPS Augmentations

Summary

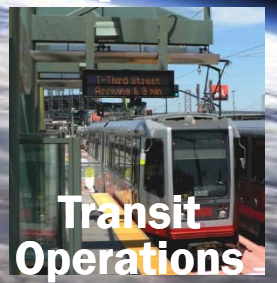
GNSS is Essential to Our Economies and National Critical Infrastructures

Satellite Operation

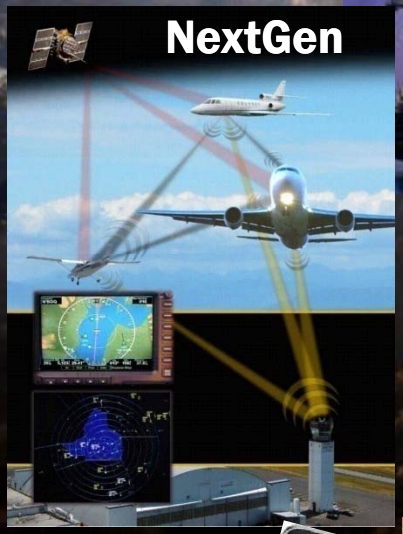
Surveying & Mapping

Power Grids

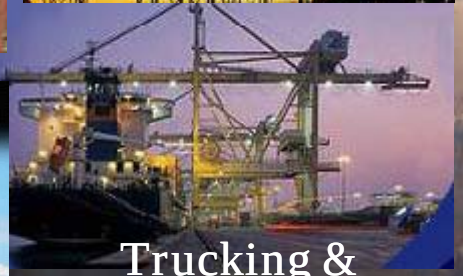
Precision Agriculture



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

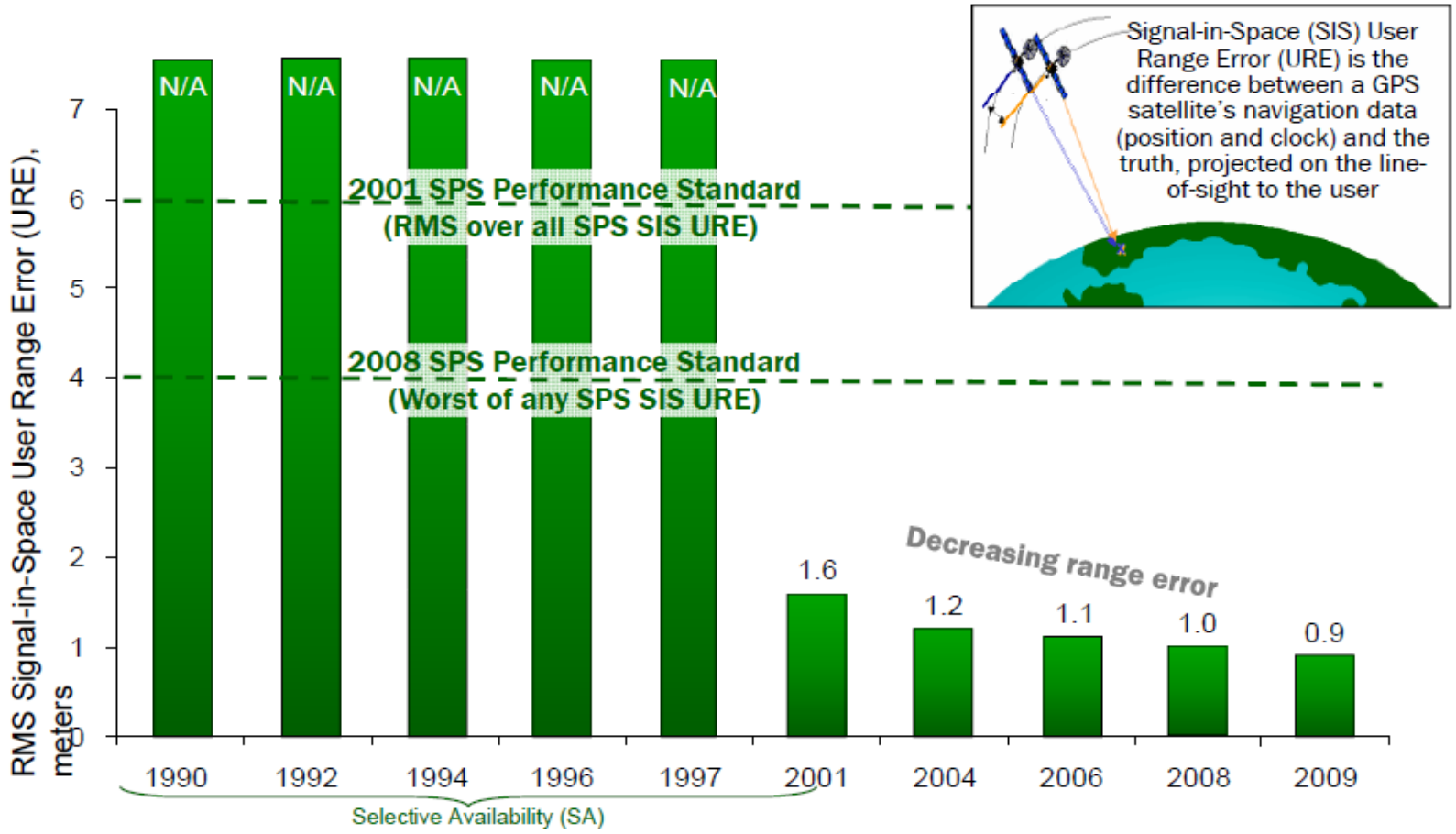
Pursue through Bilateral and Multilateral Cooperation

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

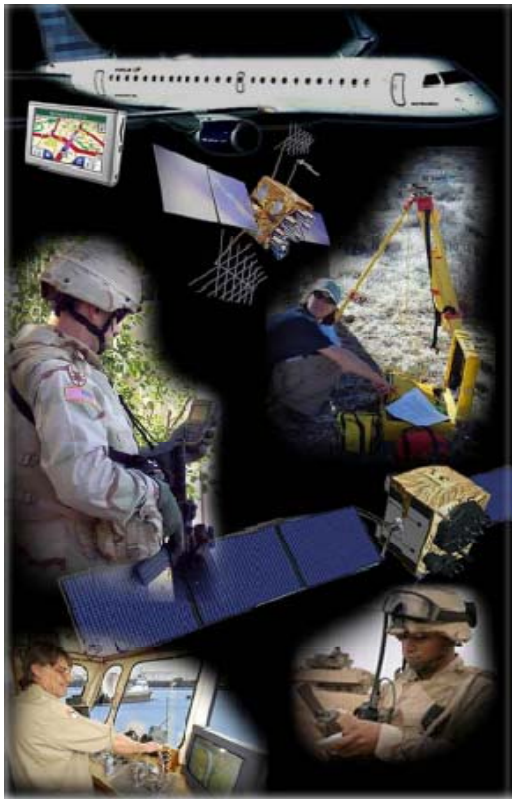
SPS Signal in Space Performance



System accuracy exceeds published standard

Civil Capability Improvements

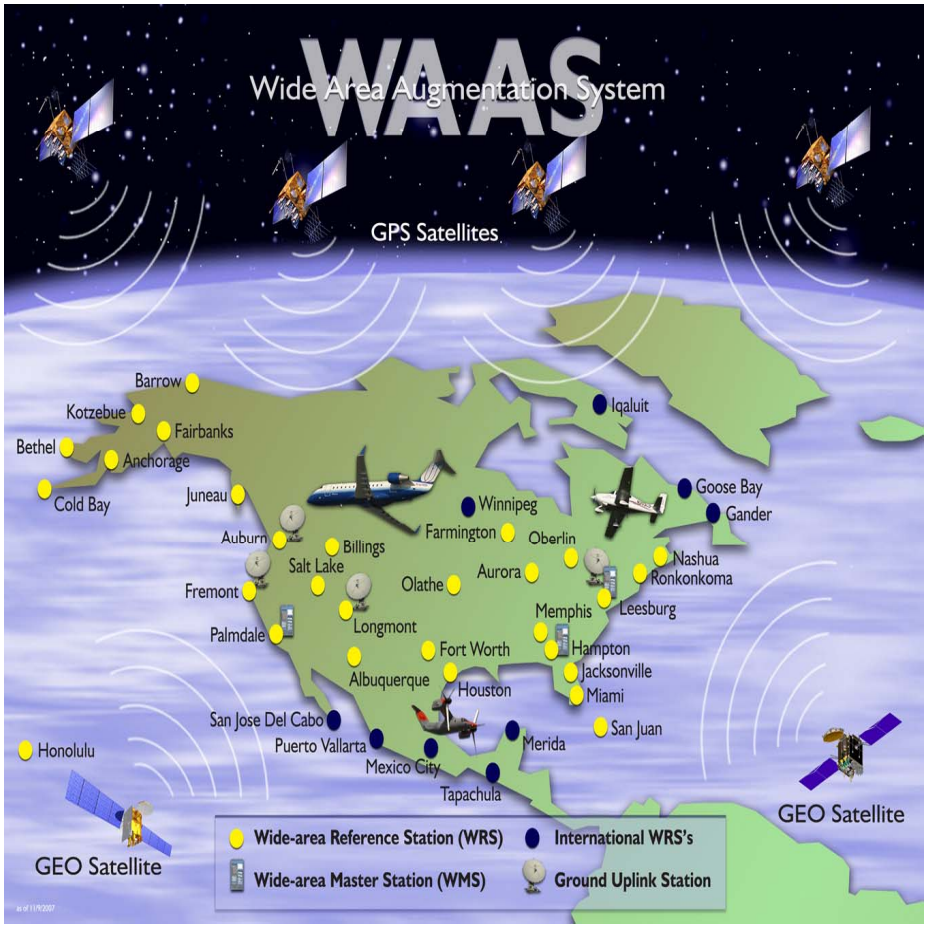
- L2C
  - 24 operational satellites in FY16
  - Defined in IS-GPS-200
- L5
  - Demonstration payload on IIR-20(M) to ensure frequency spectrum protection
  - 24 operational satellites in FY18
  - Defined in IS-GPS-705
- L1C
  - 24 operational satellites in FY21
  - Defined in IS-GPS-800
- Integrity Monitoring
  - 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 Spefications:
  - 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:
  - **www.gps.gov/technical** or
  - **http://www.losangeles.af.mil/library/factsheets/factsheet.asp?id=9364**

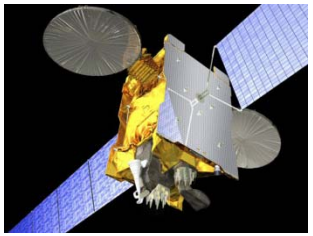
WAAS Architecture



38 Reference Stations

3 Master Stations

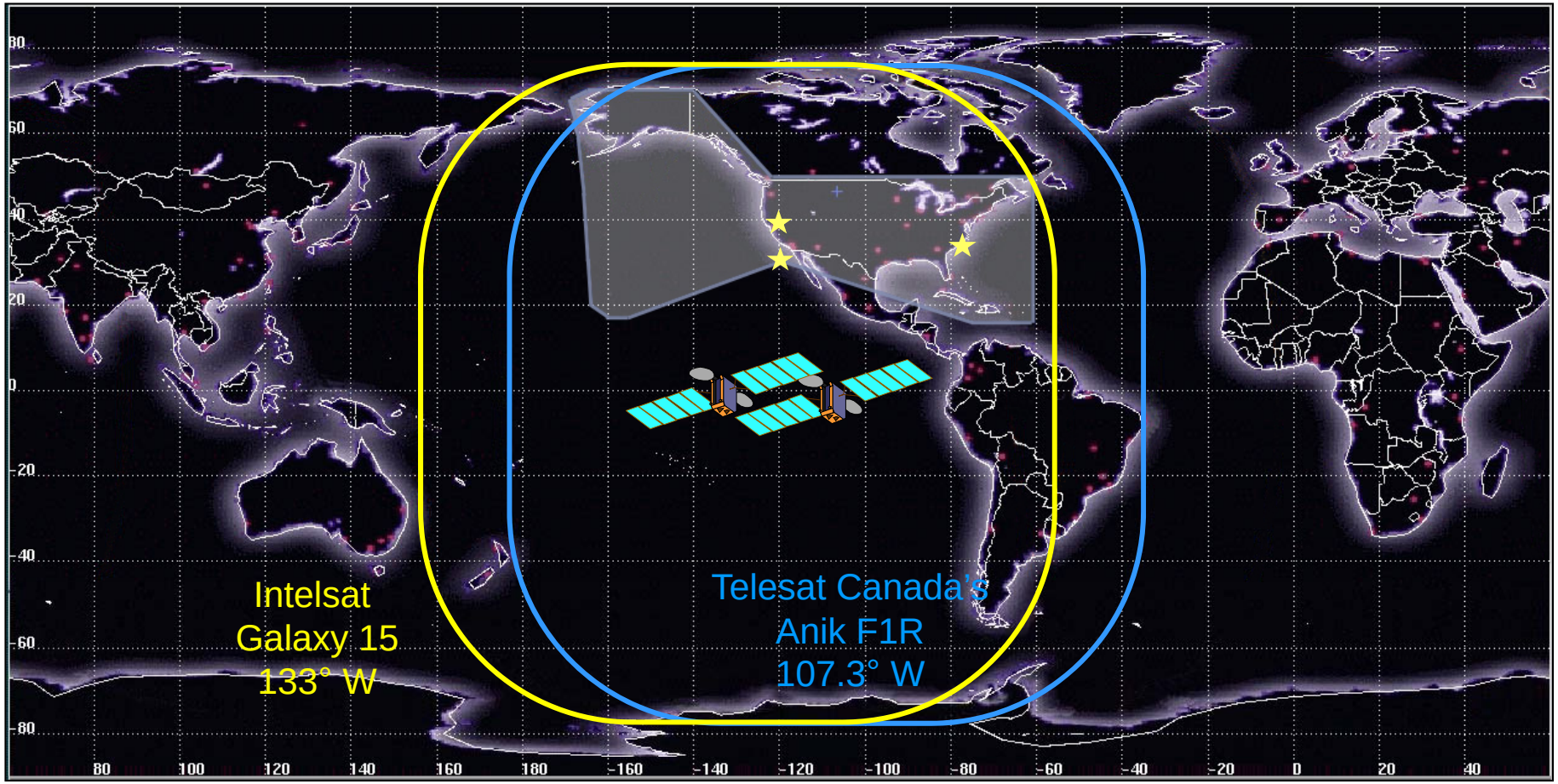
4 Ground Earth Stations



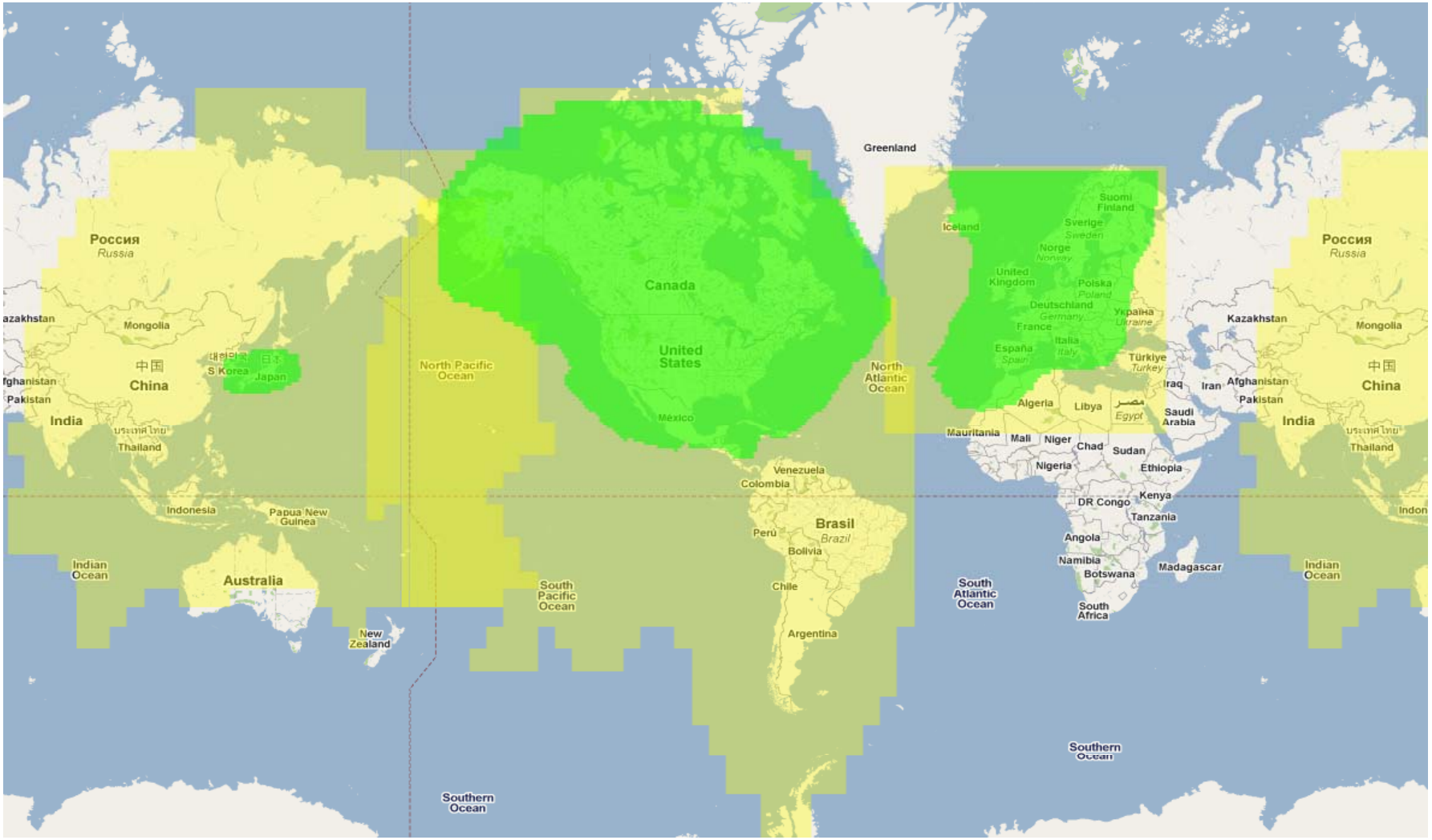
2 Geostationary Satellite Links

2 Operational Control Centers

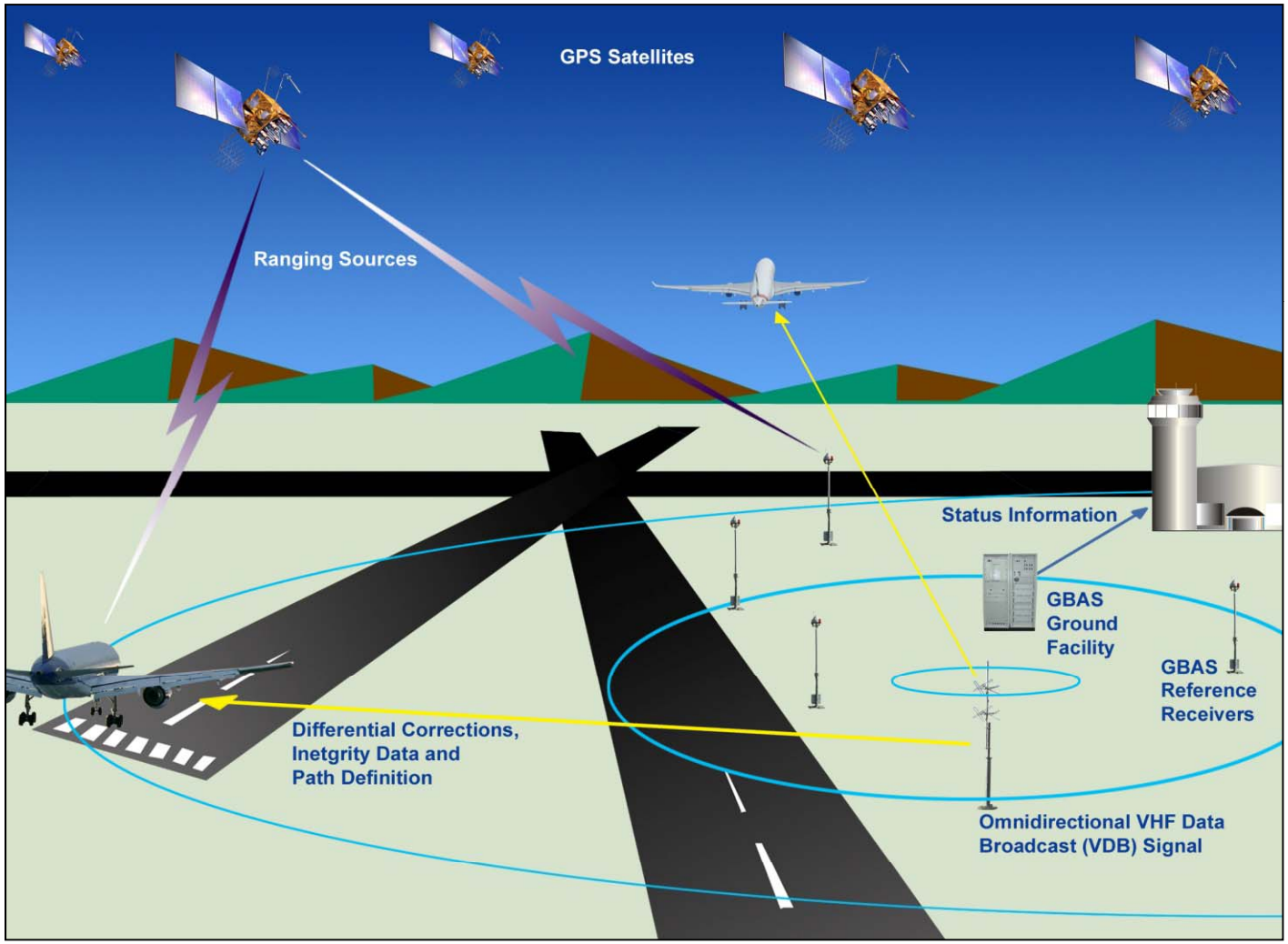
GEO Satellite Coverage Plot



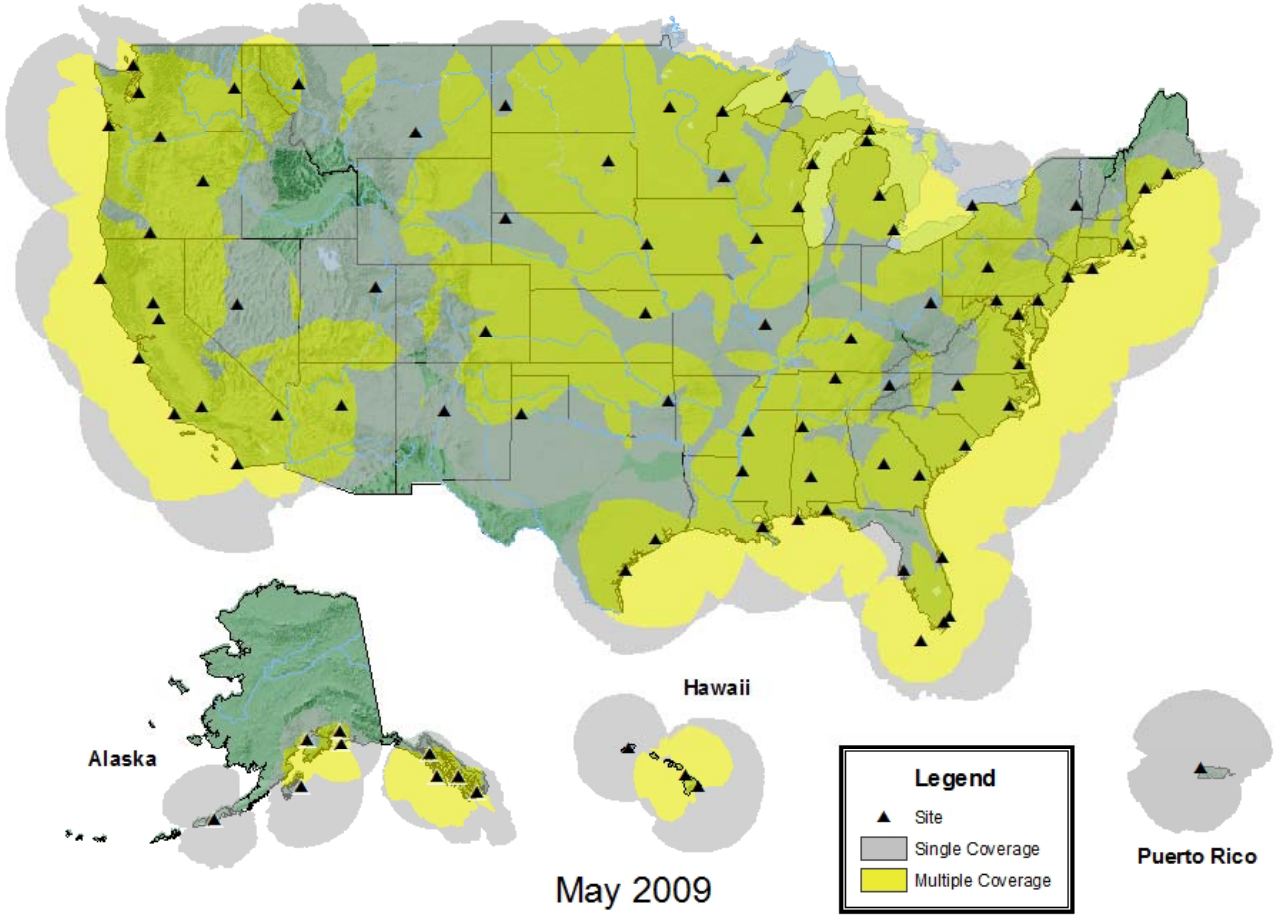
Global SBAS Coverage



Local Area Augmentation System (LAAS)



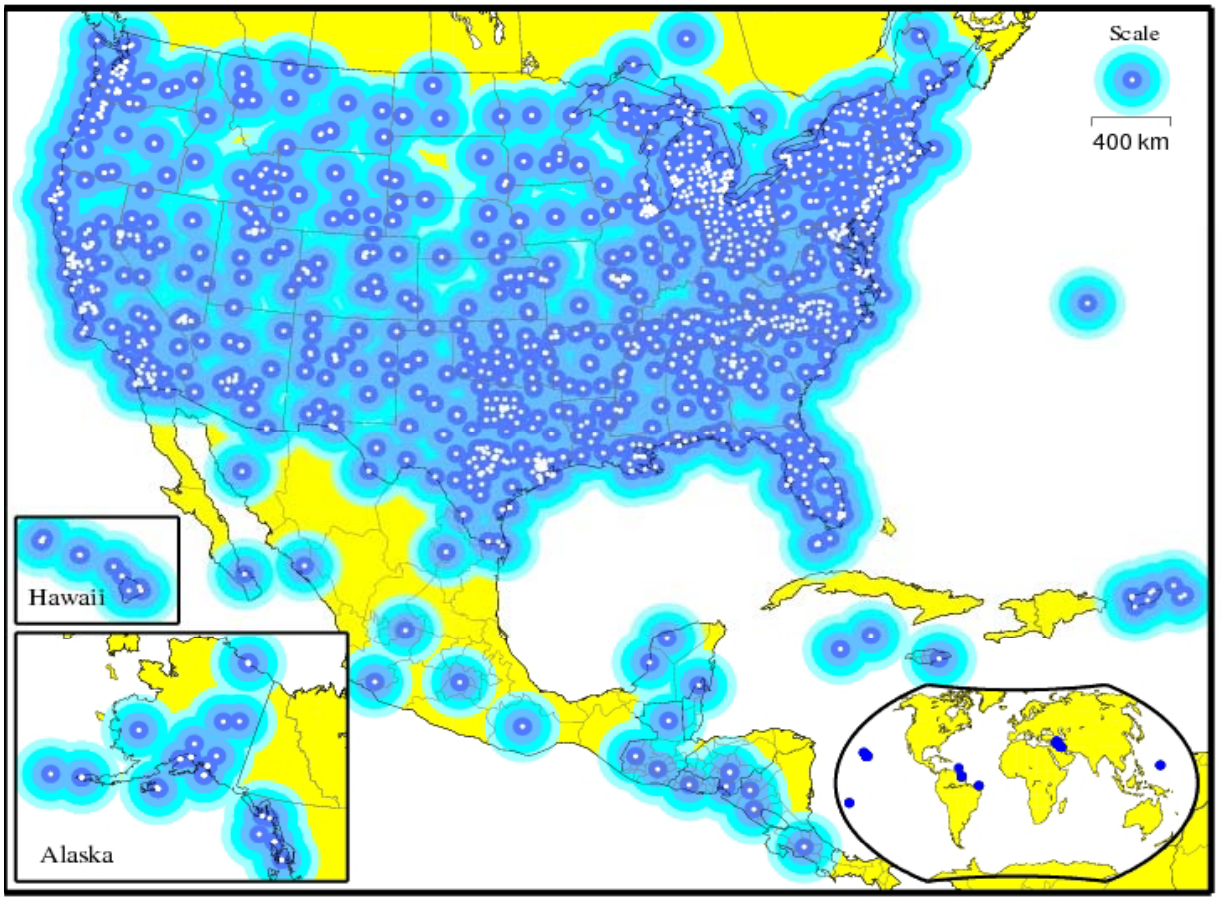
National Differential GPS (NDGPS)



National Continuously Operating Reference Stations (CORS)

Sponsor: NOAA

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



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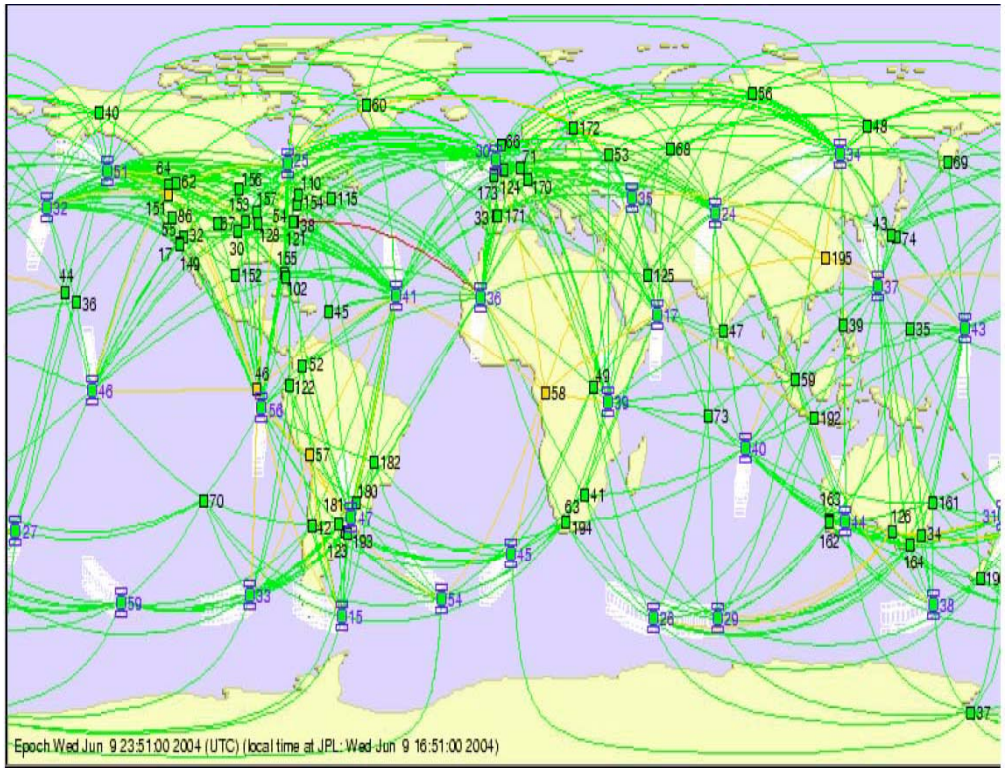
Global Differential GPS (GDGPS) and TDRSS Augmentation Service for Satellites (TASS)

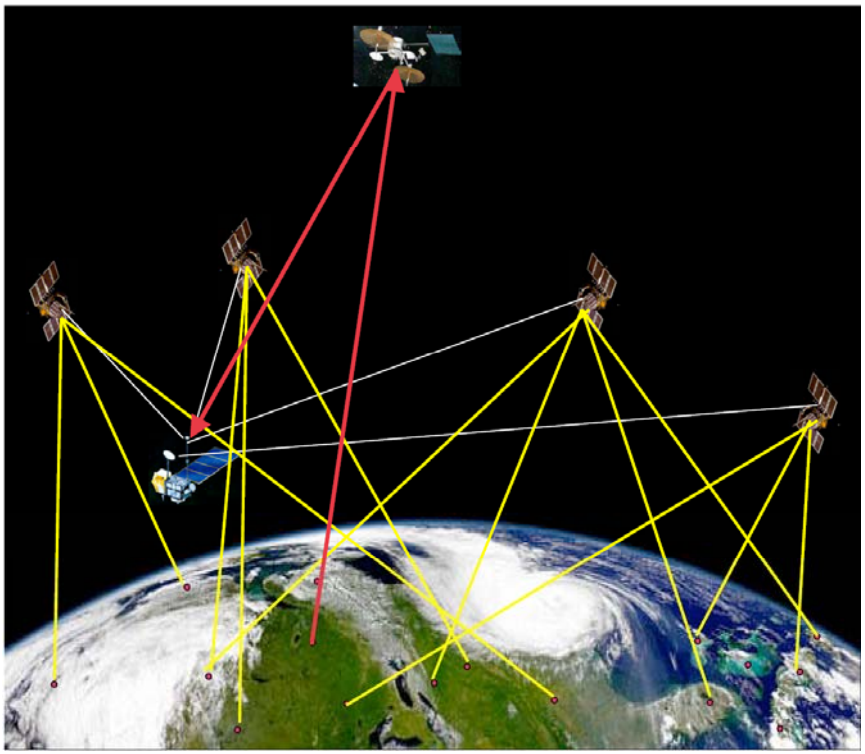
Sponsor: NASA

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