



SPACE-BASED POSITIONING
NAVIGATION & TIMING
NATIONAL COORDINATION OFFICE



Space-Based PNT Executive Committee Recent and Emerging Issues

December 4, 2013

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Deputy Director**



Recent Space-Based PNT Executive Committee Agenda Items & Activities



- **Policy**
- **Threats to GPS**
- **PNT Critical Infrastructure Resiliency (CIR)**
- **Spectrum**
- **Nationwide Differential GPS (NDGPS)**
- **GPS Outreach: Raising Public Awareness**
- **Future EXCOM Topics**
- **GPS Constellation Status**



National Space Policy, 2010



The U.S. must maintain its leadership in the service, provision and use of Global Navigation Satellite Systems (GNSS)

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



Threats to GPS



- **Unintentional**
- **Intentional**
- **Proliferation of civil “privacy” jammers**
- **Laws, Enforcement & Location**



PNT CIR



- **Next steps discussed in late 2012**
- **Updated Guidance: February 2013**
 - **Presidential Policy Directive 21**
 - **Executive Order 13636**
- **Ongoing Interagency effort to address PNT CIR**



Spectrum



- **2010 & 2013 Presidential Memorandums**
 - 500 MHz broadband initiative, with sharing
- **LightSquared, Dish, Globalstar**
 - Multiple broadband companies with filings near GPS
- **National Advanced Spectrum & Communications Test Network (NASCTN)**
 - Facilitate and Coordinate: testing and evaluation of spectrum sharing capabilities
- **GPS Adjacent Band Compatibility Assessment (DOT)**
 - ID process for determining adjacent band power limits

***Spectrum Protection Issues Continue for GPS
and Have National-Level Attention***

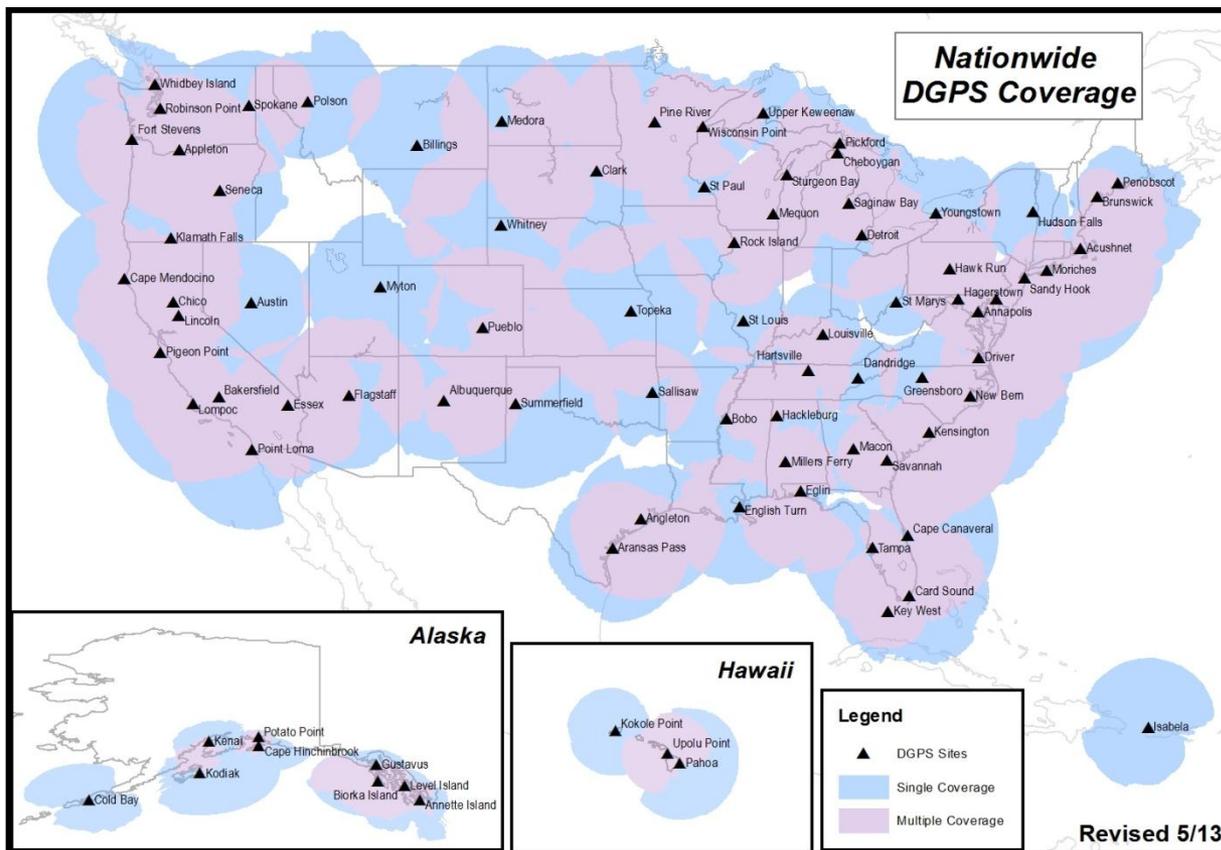


Nationwide Differential GPS (NDGPS)



Sponsors: U.S. Coast Guard & Department of Transportation

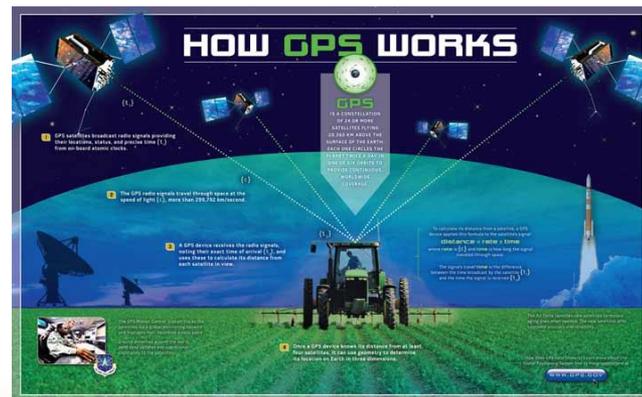
- 80+ sites
- Broadcasts GPS correction signals
- Improved accuracy & integrity
- Assessment of future of NDGPS





GPS Outreach: Raising Public Awareness

- **GPS.gov**
 - Mobile version of homepage and PNT Advisory Board section
 - Educational section
- **Educational efforts**
 - Developed & distributed new poster via National Science Teachers Association, Earth Science Week, etc. (22K+)
 - 4H Geospatial Summit
- **Exhibits**
 - Smithsonian, GPS Adventures
- **International events**
 - Moscow, ICG, APEC GIT, ION, CSNC, Munich Satellite Summit
- **Newsletter for Capitol Hill**





Future EXCOM Topics



- **Civil Jammer Proliferation: Domestic & International Actions**
- **National Advanced Spectrum & Communications Test Network (NASCTN)**
- **Current GPS Advisory Board Task:**
 - **Economic Impact Assessment**
- **Civil Navigation (CNAV) Broadcast**

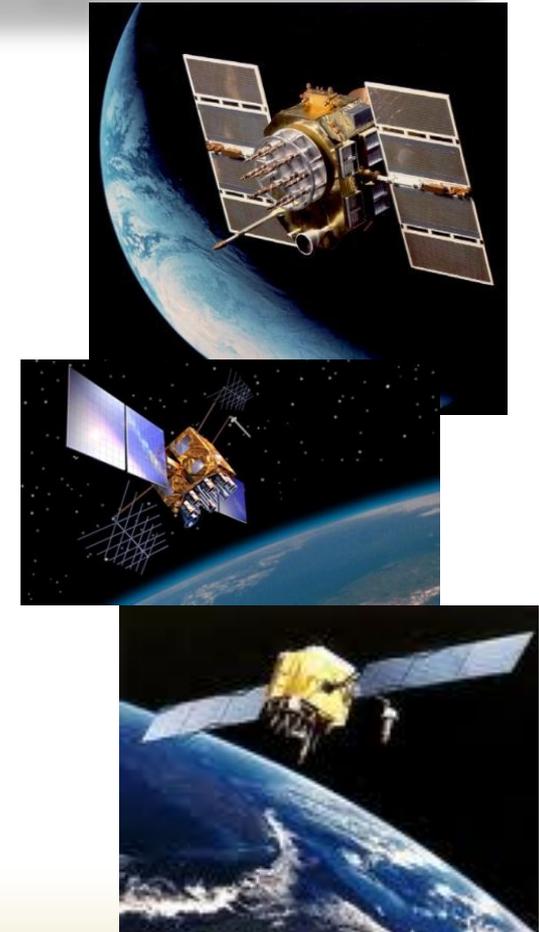


GPS Constellation Status



**36 Satellites (31 Operational)
(Baseline Constellation: 24+3)**

- 8 Block IIA
- 12 Block IIR
- 7 Block IIR-M
 - Transmitting second civil signal
- 4 Block IIF
 - Transmitting second & third civil signals
- 4 Additional satellites in residual status,
1 in test status
- Global GPS civil service performance
commitment met continuously since
December 1993





GPS Modernization Program



Legacy Block IIA/IIR

- Single Frequency (L1)
- Coarse acquisition (C/A) code
- Y-Code (L1Y & L2Y)

Block IIR-M

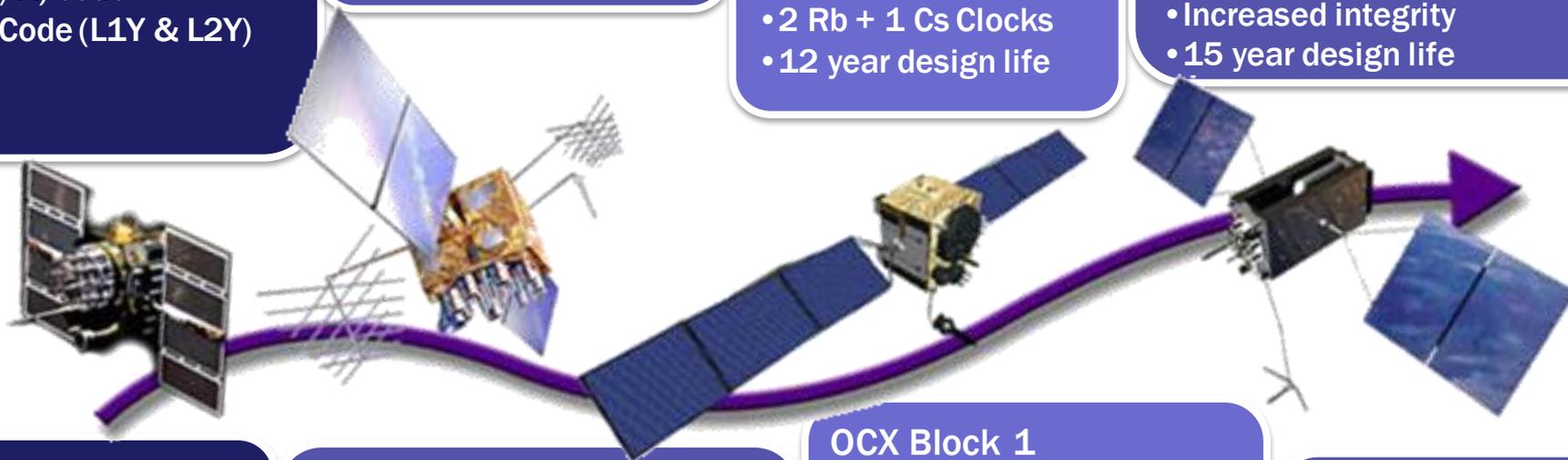
- 2nd Civil Signal (L2C)
- M-Code (L1M & L2M)

Block IIF

- 3rd civil signal (L5)
- 2 Rb + 1 Cs Clocks
- 12 year design life

Block III

- 4th civil signal (L1C)
- 4x better User Range Error than IIF
- Increased availability
- Increased integrity
- 15 year design life



Legacy OCS

- Mainframe system
- Command & Control
- Signal monitoring

AEP

- Distributed architecture
- Increased signal monitoring
- Security
- Accuracy
- Launch and disposal operations

OCX Block 1

- Fly constellation + GPS III
- Control L2C and L5 signals
- Upgraded information assurance

OCX Block 2

- Control L1C signal
- Capability On-Ramps
- GPS III evolution

Increasing System Capabilities - Increasing User Benefit



Modernized Civil GPS Capabilities



- **Second civil signal “L2C”**
 - Designed to meet commercial needs
 - Available since 2005 without data message
 - Currently **11** satellites broadcasting L2c



Third civil signal “L5”

- Designed to meet transportation safety of life requirements
- Uses Aeronautical Radio Navigation Service band
- Currently **4** satellites broadcasting L5

- **Fourth civil signal “L1C”**
 - Designed for GNSS interoperability
 - Specification developed in cooperation with industry
 - Launches with GPS III in 2015
 - Improved tracking performance



Urban Canyons

Improved
performance in
challenged
environments



Summary



- **GPS receives national-level attention and guidance**
- **U.S. policy upholds longstanding commitments to free, continuous, worldwide GPS access**
- **Spectrum issues continue for GPS**
- **Broad outreach efforts to promote understanding of GPS across America and beyond**



Thank You !



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