



# Homeland Security

**CRITICAL INFRASTRUCTURE PROTECTION &  
RESILIENCE NORTH AMERICA – EXPO  
KENNEDY SPACE CENTER, FLORIDA**

***GPS Time – How would a disruption affect your operation?***

December 6, 2017



**SPACE-BASED POSITIONING  
NAVIGATION & TIMING**  
NATIONAL COORDINATION OFFICE

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# Timing is Everything!



## Applications:

- Aviation
- Agriculture
- Search & Rescue
- Surveying & Mapping
- Trucking & Shipping
- Fishing & Boating
- Scientific
- Timing Stamps
- Tracking
- Exploration
- Offshore drilling
- Military



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# GPS Overview



## Civil Cooperation

- 3+ Billion civil & commercial users worldwide
- Search and Rescue
- Civil Signals
  - L1 C/A (Original Signal)
  - L2C (2<sup>nd</sup> Civil Signal)
  - L5 (Aviation Safety of Life)
  - L1C (International)



**35 Satellites / 31 Set Healthy**

**Baseline Constellation: 24 Satellites**

Satellite Block	Quantity	Average Age	Oldest
GPS IIR	12	15.9	20.3
GPS IIR-M	7	10.3	12.2
GPS IIF	12	3.8	7.5
Constellation	31	10.0	20.3

AS OF 22 NOV 17

## Spectrum

- World Radio Conference
- International Telecommunication Union
- Bilateral Agreements
- Adjacent Band Interference

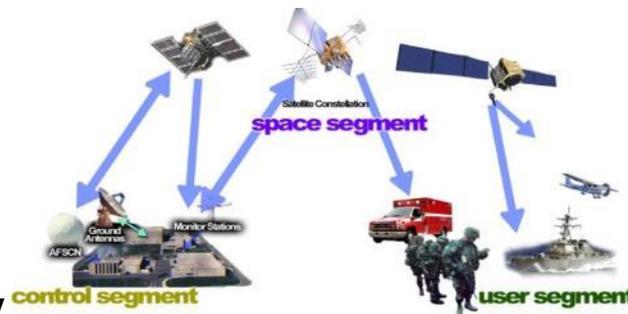


## Department of Transportation

- Federal Aviation Administration

## Department of Homeland Security

- U.S. Coast Guard



## Department of Defense

- Services (Army, Navy, AF, USMC)
- Agencies (NGA & DISA)
- US Naval Observatory
- PNT EXCOMS
- GPS Partnership Council

## Maintenance/Security

- All Level I and Level II
  - Worldwide Infrastructure
  - NATO Repair Facility
- Develop & Publish ICDs Annually
  - Public ICWG: Worldwide Involvement
  - Materials Available at: [gps.gov/technical/icwg](http://gps.gov/technical/icwg)
- Update GPS.gov Webpage
- Load Operational Software on over 970,000 SAASM Receivers
- Distribute PRNs for the World
  - 120 for US and 90 for GNSS

## International Cooperation

- 57 Authorized Allied Users
  - 25+ Years of Cooperation
- GNSS
  - Europe - Galileo
  - China - Beidou
  - Russia - GLONASS
  - Japan - QZSS
  - India - NAVIC



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# The World Depends on Critical Infrastructure, GPS, and Timing



Petroleum Industry



Power Grids



Space Applications

Precision Agriculture



Air Traffic Control



Surveying & Mapping



Personal Navigation



Industrial Control



Telecom



Supply Chains

Emergency Services



Transit Operations



Shipping & Maritime Applications



Financial Markets



# Operationalizing Resilience

- Foundations of Resilience
- Emerging Technologies and Resiliency
- Policy Matters
- Critical Infrastructure Resiliency & Sector Interdependencies
- Assess / Understand Your GPS/GNSS Dependencies
- Contingency Plans



# What Should Resiliency Mean to the PNT Community?

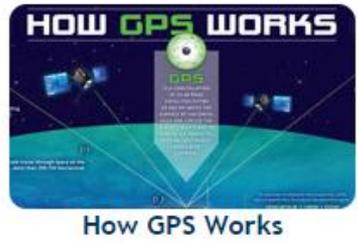
- Identify, rapidly Recover from any disruptions, and Restore the essential functions of the economy, society, and government, as quickly as possible.
- Therefore outages/disruptions are significantly Mitigated by introduction and adoption of best practices and independent P/N/T sources such that a disruption is by and large a non-event.
- Back-up
- Best Practices —
  - ❑ Development of Global Positioning System (GPS) Equipment Used by Critical Infrastructure (2017)
  - ❑ Best Practices for Improved Robustness of Time and Frequency Sources in Fixed Locations (2015)
  - ❑ Look for an upcoming Bulletin on the GPS Clock Rollover on April 6, 2019



- How accurate is GPS?
- How vulnerable is GPS to malicious jamming?

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### Featured Content



### Radionavigation-Satellite Service

- Jan 6: Best Practices for Improving the Operation and Development of GPS Equipment Used by Critical Infrastructure

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### Guidance for Critical Infrastructures

- Best Practices for Improving the Operation and Development of GPS Equipment Used by Critical Infrastructure (PDF)
- Best Practices for Improved Robustness of Time and Frequency Sources in Fixed Locations (PDF)
- Best Practices for Leap Second Event Occurring on 31 December 2016 (us-cert.gov)

### Useful content

- Service Outages & Status Reports
- Civil GPS Performance Data
- **UPDATED** Interface Specifications
- Other Technical Documentation
- Public Presentations
- Congressional Legislation & Funding

# Summary

- Time and Frequency
- Modernize, with new security features, the U.S. GPS
- International Cooperation on Interoperability and Compatibility
- Continuously Enhance the Resiliency of Critical Infrastructure, and Timing-Dependent Systems and Networks by examining:
  - Local Timing Sources
  - Alternative Sources of PNT
- Ensure PNT Definitions and Policies Remain Current and Useful
- Conclusion – What will your operation do?





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For more information, visit:

- [www.gps.gov](http://www.gps.gov)
- [www.dhs.gov/critical-infrastructure](http://www.dhs.gov/critical-infrastructure)

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