



***Responsible use of PNT/GPS in the Emergency Services Sector
(& the Evolving Security Mindset of Emergency Practitioners)***

REGION VI HIGHER EDUCATION COLLABORATIVE SUMMIT

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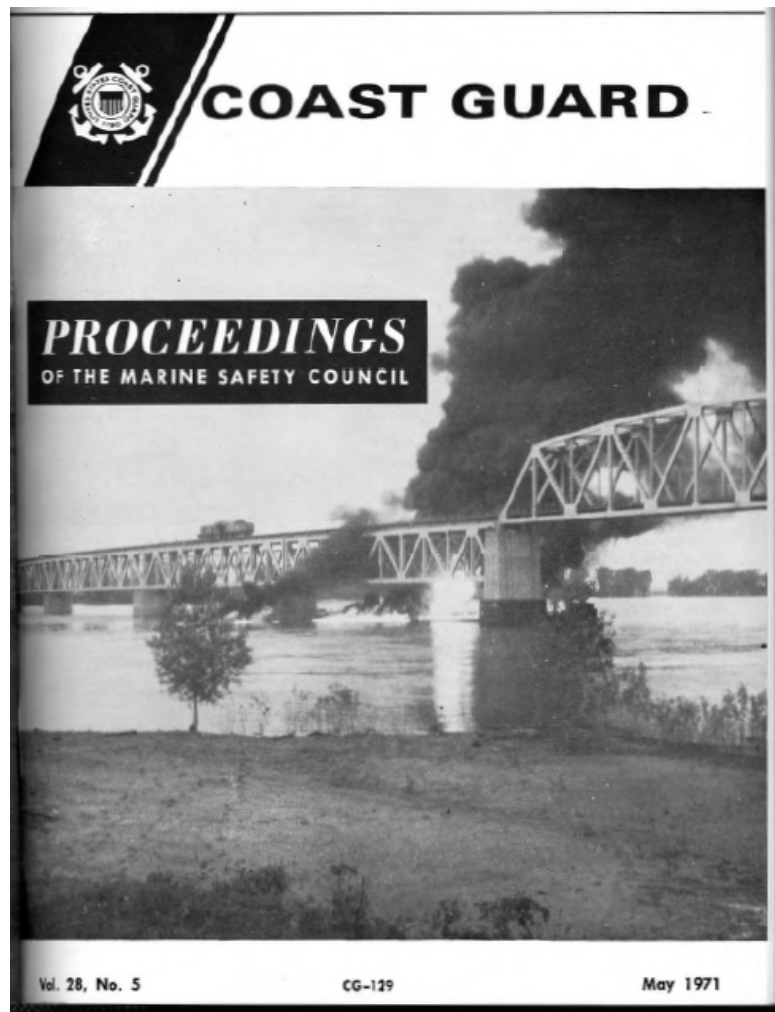
CISA/Region 6/SE TX

Robert Crane

Program Executive, Public Sector & Energy

SHSU/IHS

Out of tragedy comes purpose – May 12, 1969



The following persons died as a result of the casualty:

William R. OPITZ –

Master of the MV *Martin*.

Memphis, Tenn.

Captain Opitz died at St. Mary's Hospital in Quincy, Ill., on 16 May 1969, as a result of burn injuries.

Walter C. MITCHELL –

Triangle Oil Refinery Manager,

La Grange, Mo.

Albert FRIEDEN –

Triangle Oil Refinery Co. Terminal Assistant

La Grange, Mo.

Lewis HAGANHOFF –

Truckdriver, La Grange, Mo.

Aaron GEAN –

Deckhand, MV *Martin*, Address: Alton, Ill.

Glenn H. MAPLES –

Triangle Oil Refinery Manager,

La Grange, Mo.

The following persons were injured as a result of the casualty:

W. A. MORRISON –

Unlicensed Assistant Engineer of the M/V *Martin*. Address: Marble Hill, Mo.

Oren McPHERSON –

Cook of the M/V *Martin*. Address: Memphis, Tenn.

Fire and Explosion on Tank Barge *MOS 106* at
La Grange, Mo., on Mississippi River, on May 12, 1969

Agenda

Evolving Security Mindset for Planners & Practitioners

Homeland Security & Emergency Management is National Security

Trends in National Security

Global Positioning System (GPS) Overview

Responsible Use of GPS/PNT & Mitigation Options.

Open Discussion: Evolving Mindset & Path forward

Evolving Security Mindset

- In his book “The Fifth Discipline: The Art & Practice of Learning Organizations,” Dr. Peter Senge from MIT describes “Mental Models” as our representation of REALITY.

“Mental Models are deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action.” (RC: Inaction)

- Starts with not consciously aware of our mental models or the effects on our behavior...
- Turning the mirror inward:
 - Learning to unearth our internal pictures of the world...
 - Bring them to the surface...
 - Hold them rigorously to scrutiny...
- Includes the ability to carry on ‘learningful’ conversations that balance inquiry and advocacy...
- Team learning starts with ‘dialogue,’ ... suspend assumptions and enter into a genuine ‘thinking together.’

- Source: Senge 8-10

Former CG Commandant Admiral Allen –



- ✓ Katrina produced the same effects produced as if a weapon of mass effect had been used on the city.
- ✓ Loss the continuity of government (infrastructure and essential services and functions of society.
- ✓ There was an inability to take resources that were flowing in and apply them to mission effect.
- ✓ Still treating the entire issue as if it was a hurricane.



Trends in National Security

Geopolitical pressures: Pandemic, Inflation, Supply Chains, Economic Rebound, Russia's war in Ukraine, Middle-East, China, Iran, North Korea

Self-Protection Measures by companies, local & regional governments resulting from disasters, overreliance on single point vendors, suppliers, supply chains, services

Uninterrupted Availability - 24/7/365 uptime.

Data Science – transparency, traceability, balancing supply/demand, outage predictability, improving customer service

Climate Change – disasters and crisis variations

Energy Transition (Net-Zero by 2050) -> Renewable Energy - Micro-Grids, Wind, Solar, Geothermal, energy storage, bitcoin mining, electric vehicles, decarbonization, hydrogen, small scale nuclear, waste-to-energy

Innovation / Solutions, Jobs, Upskilling, Retooling

Emerging Technologies – PNT, Artificial Intelligence, Web3, Smart Grid, Blockchain (smart contracts), Quantum, Energy Resource Management

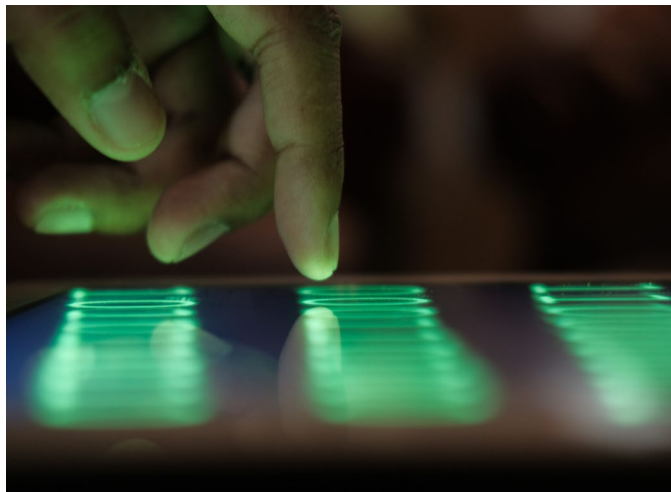
Education, Training & Credentials of Value – Current, Relevant, Helpful, Useful, Purposeful



HACKED



Intent and Capabilities exist to disrupt networks



ECONOMIC ESPIONAGE DEFINITION

• Foreign power-sponsored or coordinated intelligence activity directed at the U.S. Government or U.S. corporations, establishments, or persons, designed to unlawfully or clandestinely obtain sensitive financial, trade, or economic policy information, proprietary economic information, or critical technologies, or to unlawfully or clandestinely influence sensitive economic policy decisions.

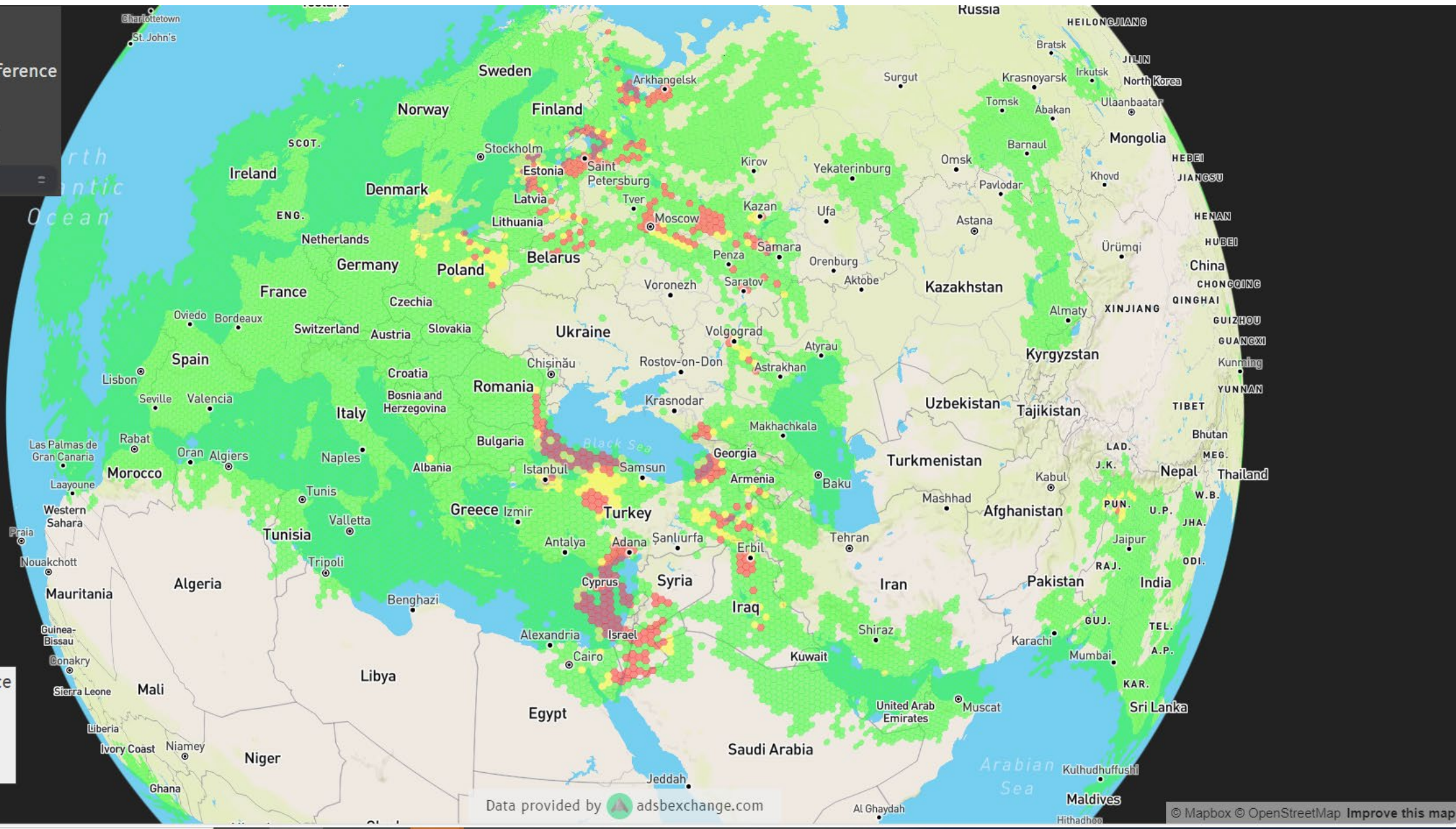


GPSJAM

Daily maps of GPS interference
[About](#) | [FAQ](#)

02/18/2024

More



Level of GPS interference

- Low 0-2%
- Medium 2-10%
- High > 10%

mapbox

Data provided by [adsbexchange.com](#)

© Mapbox © OpenStreetMap Improve this map



GPS Overview

Global Positioning Satellites: Encompassing the DoD and Civil Industry Partners

- GPS is utilized across the world 6B+ users.
- GPS impacts almost every industry, some of these industries include:
 - Agriculture
 - Maritime
 - Public Safety
 - Recreation
 - Space
 - Aviation
 - Finance
 - Telecommunications
 - Telematics
 - Oil/Gas
- GPS economic benefit ~\$1.4 Trillion*



**GPS meets all technical performance commitments:
Accuracy, Integrity, Availability and Continuity**



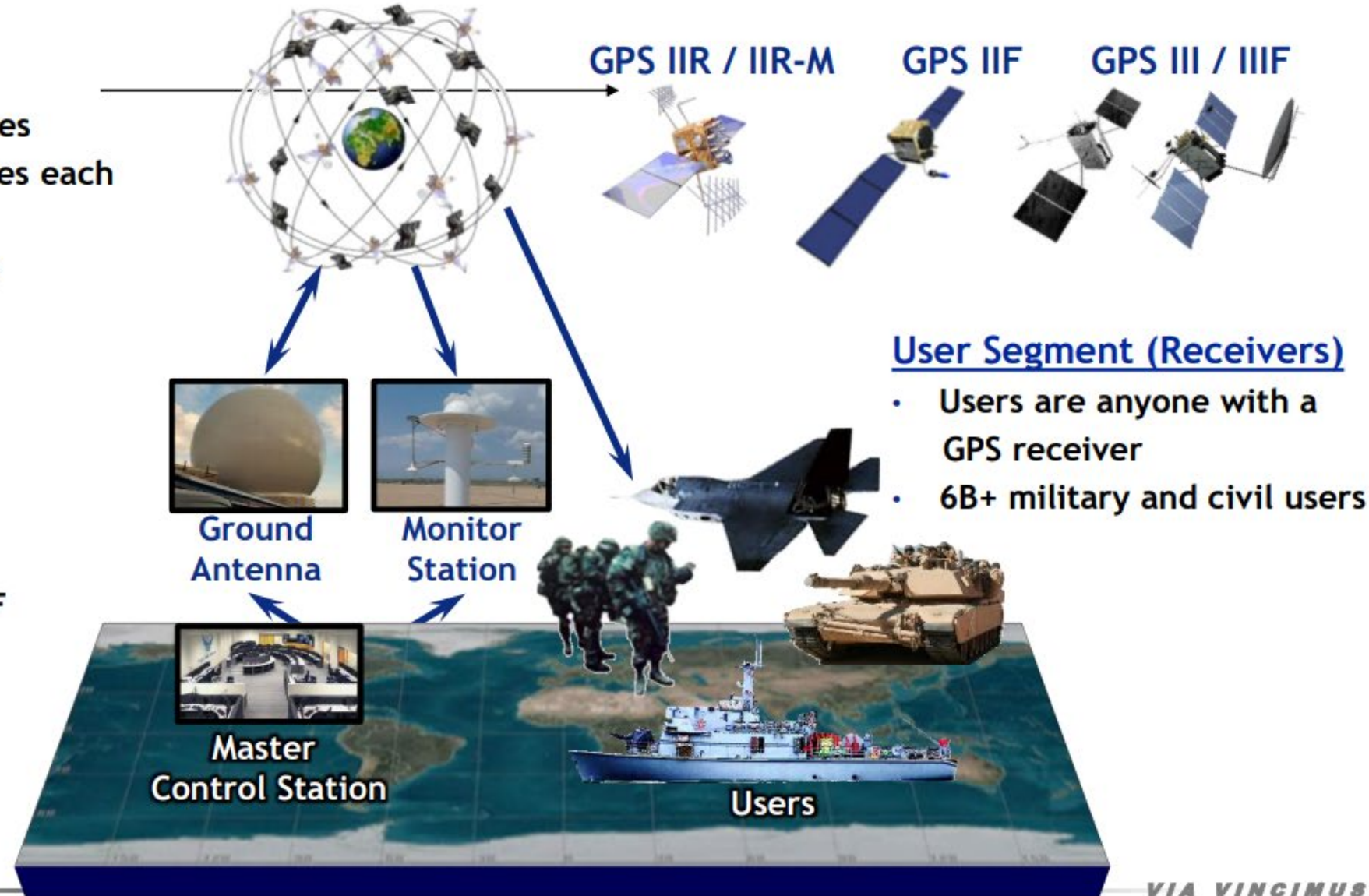
GPS Enterprise Architecture

Space Segment (Satellites)

- Required: 27 ops-ready satellites
 - 6 orbital planes, 4/5 satellites each
 - Semi-synchronous orbit
- Current: 31 broadcasting, plus residuals (6)

Control Segment (Ground)

- Master Control Station (MCS)
 - Schriever SFB, CO
- Ground Antennas (4) and USSF Monitor Stations (17)
- Backup facility
 - Vandenberg SFB, CA



User Segment (Receivers)

- Users are anyone with a GPS receiver
- 6B+ military and civil users

What Should Resiliency Mean?

IDENTIFY, rapidly RECOVER from any disruptions, and RESTORE the essential functions of the operations, as quickly as possible.

Therefore outages/disruptions are significantly MITIGATED by introduction and adoption of best practices and independent sources and methods such that a disruption is by and large a non-event.

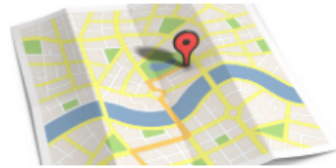
Best Practices

GPS: The Global Positioning System

A global public service brought to you by the U.S. government

INFORMATION FOR THE GENERAL PUBLIC

How to Correct Your Address in GPS Devices, Apps, & Online Maps



Do GPS devices show your home or business in the wrong place? The problem is not GPS! It's the mapping software.

[Report your issue to the software providers](#)

Common Questions →

- How do I add or correct my address in GPS devices, apps, and maps?
- What can I do about trucks driving through my neighborhood?
- How do I report GPS service outages?
- Can GPS help me find my lost phone?
- How does GPS work?
- How accurate is GPS?
- How vulnerable is GPS to malicious jamming?

Featured Content



What is GPS?



How GPS Works



Truckers: Don't Use Consumer GPS Devices!



GPS Jamming is Illegal

FOR GPS PROFESSIONALS

What's **HOT** for Pros

- PNT advisory board, Dec 2023
- CGSIC Denver 2023
- Technical documentation
 - Public ICWG, Sep 2023
 - PRN assignments, Apr 2023
 - GPS III antenna patterns (USCG.gov)
 - ICD uprevisions, Aug 2022

News Items →

- Nov 20: PNT Advisory Board to convene December 6-7 in Houston, TX
- Sep 19: DHS Invites Critical Infrastructure Owners and Operators to GPS Spoofing Test Event
- Apr 12: PNT Advisory Board to convene May 3-4 in Annapolis, MD
- Mar 20: Joint announcement on GPS-KPS technical working group meeting

New Additions to GPS.gov →

- Jan 5: ESG response to advisory board (PDF)
- Dec 6: Advisory board bios: Bryan Chan; Logan Scott; William Shelton
- Dec 4: Dec 2023 advisory board meeting
- Sep 18: May 2023 advisory board minutes (PDF)

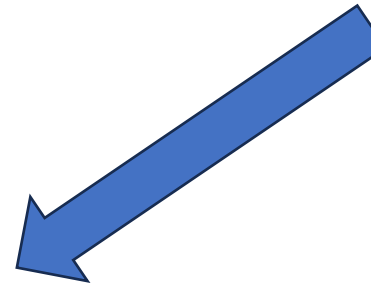
Resilience Through Responsible Use of PNT →

Information and resources for improving positioning, navigation, and timing resilience, especially in critical infrastructure

Report/Lookup GPS Service Disruptions →



Backup Slides





GPS Constellation Status

37 Satellites • 31 Set Healthy
Baseline Constellation: 24 Satellites

Satellite Block	Quantity	Average Age (yrs.)	Oldest
GPS IIR	7	21.7	26.1
GPS IIR-M	7	16.1	17.9
GPS IIF	11	9.6	13.3
GPS III	6	2.9	4.7

As of 12 Oct 2023

GPS Signal in Space (SIS) Performance

1 Jan - 23 Oct 2023

Average URE*	Best Day URE	Worst Day URE
48.4 cm	34.1 cm 23 Jun 23	163.7 cm 25 Jan 23

*All User Range Errors (UREs) are Root Mean Square values

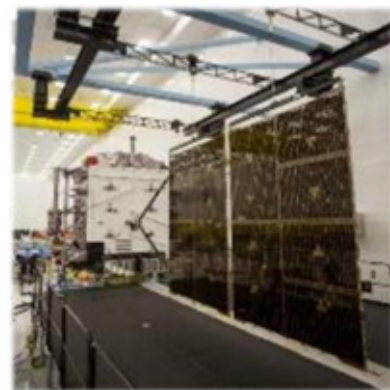




GPS III Program

- GPS IIIs on orbit:
 - SV01 Set healthy and available for use on 13 Jan 20
 - SV02 Set healthy and available for use on 1 Apr 20
 - SV03 Set healthy and available for use on 1 Oct 20
 - SV04 Set healthy and available for use on 2 Dec 20
 - SV05 Set healthy and available for use on 25 May 22
 - SV06 Set healthy and available for use on 16 Feb 23
- All remaining GPS IIIs in storage & Available For Launch
 - SV07 - AFL 20 May 21; TLD Summer 2024
 - SV08 - AFL 10 Jun 21; TLD FY25
 - SV09 - AFL 23 Aug 22; TLD FY26
 - SV10 - AFL 8 Dec 22; TLD FY26

- AFL - Available For Launch; TLD - Target Launch Date



Six GPS III satellites declared operational



Improved Civil Signals

Three New Navigation Signals designed for civilian use

L1 (Legacy)

L2C - Commercial Needs - enables ionospheric correction, improving accuracy

L5 - Safety-of-life transportation - compatible with the Federal Aviation Administration (FAA) Wide Area Augmentation System (WAAS) supporting Civil Aviation in the National Airspace

L1C - Interoperability between GPS and international satellite navigation systems

