National GPS Interference Detection and Mitigation (IDM)

49th CGSIC Savannah, GA

John Merrill
DHS PNT Program Manager
Office of Applied Technology Geospatial Management Office
Discussion

- DHS IDM Mandates
- Central Data Repository
- National Level Operations Plan
- National Sensor Capability
DHS IDM Mandates

1. Collect, analyze, store, & disseminate interference reports from all sources to enable appropriate investigation, notification & enforcement action.

2. Develop & maintain capabilities, procedures & techniques, & routinely exercise civil contingency responses to ensure continuity of operations in the event that access to GPS signal is disrupted or denied.

3. Coordinate domestic capabilities to identify, analyze, locate, attribute, & mitigate sources of interference to the GPS & its augmentations.
**Central Data Repository**

1. Collect, analyze, store, & disseminate interference reports from all sources to enable appropriate investigation, notification & enforcement action.

   - Standardized format of reports for analysts
   - Central Interference Report (IR) database focal point of all PNT interference
   - Encompass process and functions for detection validation, investigation, assessment, corroboration of IR
   - Automated dissemination of data and reduce IR information distribution delays for decision support
   - Mechanisms for cataloging PNT applications and associated vulnerabilities to interference
Central Data Repository

- User Authenticated Sign-on – 475
- 150 PNT incident reports (IR) per month (1800 annually)
- Database support 500,000 unique IR entries
- Responses to system queries less than 8 seconds
- New & updated IRs posted immediately visible, available and accessible
- Automatic update to subscribers – Initially working with the TRIAD:
  - USCG Navigation Center, FAA Operations Center, GPS Operations Center.
Central Data Repository

• PNTIP SETS data fields (1 – 10 mandatory):

  1. SETS ID # {Record URL}
  2. DATE START - DD/MM/YYYY
  3. DATE STOP - DD/MM/YYYY
  4. EVENT TIME START - #### UTC
  5. EVENT TIME STOP - #### UTC
  6. LATITUDE - +##.##### Degrees
  7. LONGITUDE - +###.####### Degrees
  8. USER EQUIPMENT TYPE
  9. FREQUENCY (L1, L2, L5… etc.) - ####.####
  10. REMARKS & OTHER RELEVANT INFORMATION
  11. EVENT STATUS
  12. SOURCE
  13. JOINT SPECTRUM INTERFERENCE RESOLUTION (JSIR) DTG
  14. ALTITUDE

Conversion factor to US National Grid is now part of this data field.
Central Data Repository

- Utilize existing, mature systems & applications
  - FAA Spectrum Engineering Tracking System (SETS)
  - DHS Integrated Common Analytical Viewer (iCAV)
    - Geospatial enabling/visualization tool
    - Geographic Information System interface that integrates multiple geospatial data sources from a centralized geospatial data warehouse
    - Ability to map, analyze, & view information from a mission specific application which assembles and compares data from various sources.
    - Ability to exchange data with GIANT, FALCON View
Warning:

This computer system, including all the related equipment, networks and network devices (specifically including Internet access) are provided only for authorized U.S. Government use. DHS computer systems may be monitored for all lawful purposes, to ensure that their use is authorized, for management of the system, to facilitate protection against unauthorized access, and to verify the security of this system.

During monitoring, information may be examined, recorded, copied, and used for authorized purposes. All DHS information, including personal information, placed on or sent over this system may be monitored. Use of this computer, authorized or unauthorized, constitutes consent to monitoring of this system.

Unauthorized use may subject you to criminal prosecution. Evidence of unauthorized use collected during monitoring may be used for administrative, criminal or adverse action. Use of this system constitutes consent to monitoring for these purposes.
<table>
<thead>
<tr>
<th>Ident</th>
<th>Equip</th>
<th>City, State</th>
<th>Start</th>
<th>Suspense</th>
<th>Frequency</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZDC</td>
<td>GPS</td>
<td>LEESBURG, VA</td>
<td>8/19/2003</td>
<td>8/20/2003</td>
<td>1575.42</td>
<td>Wide Area Augmentation System (WAAS) operations personnel report experiencing problems with all three reference station receivers. All receivers are loosing satellite track. Telco circuit checks OK. External interference is suspected. NOCC specialists have been notified.</td>
</tr>
<tr>
<td>JNU</td>
<td>GPS</td>
<td>JUNEAU, AK</td>
<td>2/25/2005</td>
<td>2/26/2005</td>
<td>1575.42</td>
<td>Wide Area Augmentation System (WAAS) personnel at the Operations Center reported loss of service due to high solar activity causing satellite signal degradation. WAAS Operators have been notified. NOCC Spectrum Management has been notified.</td>
</tr>
<tr>
<td>JNU</td>
<td>GPS</td>
<td>JUNEAU, AK</td>
<td>10/15/2005</td>
<td>10/16/2005</td>
<td>1575.42</td>
<td>Air Traffic personnel at the Juneau Automated Flight Service Station (AFSS) received a GPS Anomaly pilot report from a Cessna C310 (N5806X) about 15 nautical miles west of the airport. WAAS Operators checked their receivers and no problems noted. Notified the FAA National Operations Control Center (NOCC).</td>
</tr>
<tr>
<td>MU</td>
<td>GPS</td>
<td>UTAH TEST RGE, UT</td>
<td>12/7/2005</td>
<td>12/9/2005</td>
<td>1575.42</td>
<td>Global Positioning System (GPS) will be unreliable and may be unavailable within a 290 NM radius of the Michael (MU) Tactical Air Navigation (TACAN) at FL400; decreasing in area with altitude to a circle of 260 NM radius at FL250, and 170 NM radius at FL100 and 4,000ft AGL.</td>
</tr>
<tr>
<td>NID</td>
<td>GPS</td>
<td>CHINA LAKE, CA</td>
<td>9/13/2005</td>
<td>2/28/2006</td>
<td>1575.42</td>
<td>Global Positioning System (GPS) will be unreliable and may be unavailable within a 310 NM radius of the NAWS China Lake/Armitage airport (NID) at FL400 ending at 113W longitude and not extending into Oakland oceanic airspace; decreasing in area with altitude to a circle of 260 NM radius at FL250, and 190 NM radius at FL100 and 170 NM radius</td>
</tr>
</tbody>
</table>

http://pntip.faa.gov/login/EVENT_listGPS.asp
Equip – FAA Equipment types which may be experiencing the interference. Eventually populate with PNT equipment.

This is the Intranet available to authenticated users.

http://pntip.faa.gov/login/EVENT_searchGPS.asp
This is currently the FAA Maintenance Management System Mainframe event code category. In the GPS SETS module is replaced by Joint Spectrum Interference Resolution (JSIR) date time group.

http://pntip.faa.gov/login/EVENT_searchGPS.asp
PNTIP data theme layer imbedded within DHS Themes
National Level Operations Plan

2. Develop & maintain capabilities, procedures & techniques, & routinely exercise civil contingency responses to ensure continuity of operations in the event that access to GPS signal is disrupted or denied.

- National Security Council – Chartered Purposeful Interference Response Team & DOT-DOD Information Dissemination & Coordination Team sponsored events
- CPX exercises to test/evaluate supporting authorities, multi-agency collaborative environment for shared situational awareness, roles/responsibilities… etc…
- Evaluate effects on the Critical Infrastructure and Key Resource (CIKR) sectors
3. Coordinate domestic capabilities to identify, analyze, locate, attribute, & mitigate sources of interference to the GPS & its augmentations.

- System-of-Systems approach to provide real-time monitoring (preparedness), location & notification (response) of GPS interference for protecting the Nation’s CIKR sectors.
  - Designed with government & commercial hardware
  - Persistent monitoring yields situational awareness
  - Timely response to anomalies
  - Sensor placement based on PNT CIKR Criticality
  - Remains operational when GPS systems is “stressed”

- Collective Effort by various USG entities

- Significant Cost & Risk reduction by taking full advantage of mature, existing systems
Path to a National Sensor Capability

Central data repository (CDR) Requirements Completed

CDR Implementation

GPS Vulnerability Risk Assessment

National Level Operations Plan

PNT Strategic Plan Requirements Development

Sensor Feasibility Test #1

Sensor Feasibility Test #2

Complete Feasibility Tests Technology Assessment

Working Group consisting of USG stakeholders; DHS is lead

These projects have been funded; contract awards are pending

All actions needed to complete each milestone have been funded
QUESTIONS?

John.Merrill@dhs.gov

John.Merrill@dhs.sgov.gov

202-447-3731