Signal Sentry GPS Interference Detection & Geolocation Technology
September 2015
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Business Development

This document is not subject to the controls of the International Traffic in Arms Regulations (ITAR) or the Export Administration Regulations (EAR).
Harris is the GPS Signal Expert
- Developed Over 50 GPS satellite payloads
- Payloads & Transmitters have been on every GPS satellite ever launched
- Our payloads transmit the GPS signal from space
- We have accumulated over 500 years of on-orbit life
- No mission-related failure due to our equipment
- Currently developing the next generation navigation payloads
Jamming

GPS jamming does not allow receivers to lock onto the GPS signal. GPS is susceptible to outages due to intentional & unintentional jamming. A small jammer can disrupt the GPS signal for a mile or more. People jam because they are smuggling, stealing or trying to escape tracking. Availability of low-cost GPS jamming devices has increased the risk.
Real Risk of GPS Disruption

November 2009
Ground-based Augmentation Systems (GBAS) Jammed
Took 8 months to find the source

PNT Advisory BD “We must quickly develop and field systems that will rapidly locate, mitigate and shutdown the interference”
PNT Advisory Board

U.S. Organizational Structure for GPS Governance

- WHITE HOUSE
- NATIONAL EXECUTIVE COMMITTEE FOR SPACE-BASED PNT
  - Executive Steering Group
    - Co-Chairs: Defense, Transportation
- NATIONAL COORDINATION OFFICE
  - Host: Commerce
  - ADVISORY BOARD
    - Sponsor: NASA

- Defense
- Transportation
- State
- Interior
- Agriculture
- Commerce
- Homeland Security
- Joint Chiefs of Staff
- NASA

- GPS International Working Group
  - Chair: State
- Engineering Forum
  - Co-Chairs: Defense, Transportation
- Ad Hoc Working Groups
Summary: The United States is now critically dependent on GPS. For example, cell phone towers, power grid synchronization, new aircraft landing systems, and the future FAA Air Traffic Control System (NEXGEN) cannot function without it. Yet we find increasing incidents of deliberate or inadvertent interference that render GPS inoperable for critical infrastructure operations.

Most alarming, the very recent web availability of small GPS-Jammers suggests the problem will get worse. These so-called personal protection devices (PPDs) as well as other, readily available, more powerful devices can deliberately jam the Global Positioning System (GPS) signal over tens of square miles. They also can be devastating to the other, new foreign satellite navigation systems being deployed worldwide.

PPDs are illegal to operate, but many versions are available (for as little as $30) from foreign manufacturers over the Internet. The simplest models plug in to a cigarette lighter and prevent all GPS reception within a line of sight range of 5 to 10 miles. Current penalty for operation is simply that the device is confiscated.

We currently lack sufficient capabilities to locate and mitigate GPS jamming. It literally took months to locate such a device that was interfering with a new GPS based landing system being installed at Newark Airport, NJ.

We must quickly develop and field systems that will rapidly locate, mitigate and shutdown the interference.
Real Risk of GPS Disruption

Coast Guard Vice-Admiral Chuck Michel saw it happen in one Eastern Seaboard port.

“It was believed to be sort of a vandal or a person messing around, actually blocked that GPS signal from that computer’s ability to do that, and the port came to a halt,” he said.

*Maritime Cyber Security Symposium March 2-3 2015

The FCC said an aircraft tracking system at Newark Liberty International Airport experienced interference from a GPS jamming device used by a Readington man who claimed he was simply trying to hide his whereabouts from his employer. The FCC fined the driver $31,875 Aug 2012

46 Stolen Cars and exported from LA Port Using GPS PPD

Pharmaceutical Cargo Security Coalition Symposium
* Novartis Pharmaceutical East Hanover February 10-11 2015

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Signal Sentry® 1000
Answering the risk by locating the jamming source
Signal Sentry® 1000 Overview

Designed to protect critical infrastructure from GPS Disruption
Detects and locates sources of GPS signal interference
Provides location of interference
Presented in the form of geographical pin mapping
Provides actionable intelligence to the user
Leverages Exelis signal domain knowledge of GNSS
Patented Exelis Technology
Signal Sentry 1000 data aids Intelligence Led Policing

Assures safety, efficiency, and revenue
Signal Sentry

• Designed to protect critical infrastructure from GPS disruption jamming & spoofing
• Situational Awareness of GPS Interference
• Real time geolocation of GPS interference
• Actionable Intelligence for quick mitigation of GPS disruption

Deployed Systems

• 2014 Super Bowl at Met Life Stadium
• Southampton Port United Kingdom
• Newark N.J DHS & Essex County Sherriff

Field Tested

• Sennybridge Test Range UK
• Vidsel test range in Sweden
Signal Sentry 1000 Components

Includes antennas, sensors and a server
- Antennas connected to the sensor
- Sensors connected to the server

System detects, locates and maps the jamming source

Data is available through an easy-to-use web enabled GUI

Information used for action – change navigation methods, alert authorities…
Interferer Frequency Chart Example – When?

Interferer Frequency
Geolocated Instances of Interference Lasting at Least 1 Minute by Day of Week From Friday, January 03, 2014 2:30:28 PM To Monday, February 03, 2014 2:30:28 PM

If the option Count only Geolocated Interferers is enabled, clicking chart items causes a map to be displayed in this area that shows the geo-located interferers pertaining to the selected chart items. Selected chart items are shown in red, and non-selected chart items are shown in blue.

Resolution: Day of Week

Min. Interference Duration (hh:mm:ss) 0 1 0

□ Count only Geolocated Interferers
□ Count only Non-geolocated Interferers
□ Count all Interferers

From Date (MM/dd/yyyy hh:mm:ss) 1/3/2014 2:30:28 PM To Date 2/3/2014 2:30:28 PM

□ From Time of Day (hh:mm:ss) 00:00 AM
□ To Time of Day (hh:mm:ss) 00:00 PM

Update

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Interference Frequency – When & Where?

- Selecting histogram bar displays location of events on map below
- Can select more than one bar at a time
Signal Sentry 1000 Test Results

Tested during GPS jamming trials in Sennybridge, UK in September 2014
Trials administered by the Defence Science and Technology Laboratory
Off-the-shelf jamming devices were used during the tests
Located stationary & moving jammers in open & obstructed environments
Identified jammers in moving vehicles within a 10-meter accuracy

Jammer in car at 40 mph
Jammer Description

Two Jammers utilized during the trials:
150mW and .5W
Used to disrupt the GPS L1CA code that operates at 1575.42 MHz

150mW jammer waveform

.5w jammer waveform
Open Field Tests

Test was constructed to geolocate jamming in an area with no obstructions
Test included static jammers and dynamic jammers
Six waypoints were surveyed for the purpose of evaluating location accuracy

Open Field Static Jammer Locations
Obstructed Area Tests

An obstructed area test was constructed
Test Signal Sentry 1000 in an area with obstructions
Simulate an urban environment
Took place in Sennybridge area called a FIBUA (Fighting in Built-up Areas)
Tested both stationary and dynamic jammers
For more information visit:

www.exelisinc.com/signalsentry