

RESILIENT
NAVIGATION
and TIMING
FOUNDATION

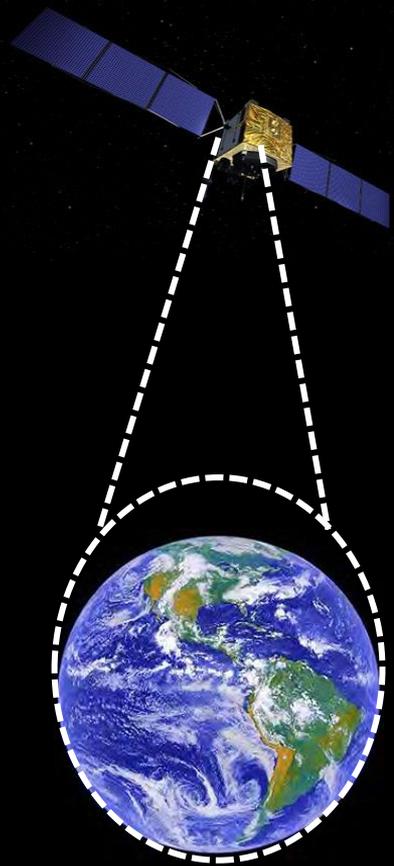


Progress Toward Resilient PNT

Good News and Bad News

JUNE 2014

National PNT Advisory Board



“...a single point of failure...”

Unlikely, yet...



11 Hours...

**“GPS World
GLONASS Gone...
Then Back”**

InsideGNSS
Engineering Solutions from the Global Navigation Satellite System Community

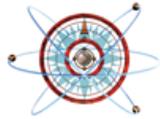
**“GLONASS Suffers
Temporary System-
wide Outage”**



10,000s of Disruptions Every Day...



Global Awareness



ENC-GNSS 2014

Technology – Innovation – Business



Resilient PNT Forum



“GNSS Disruption Threat”

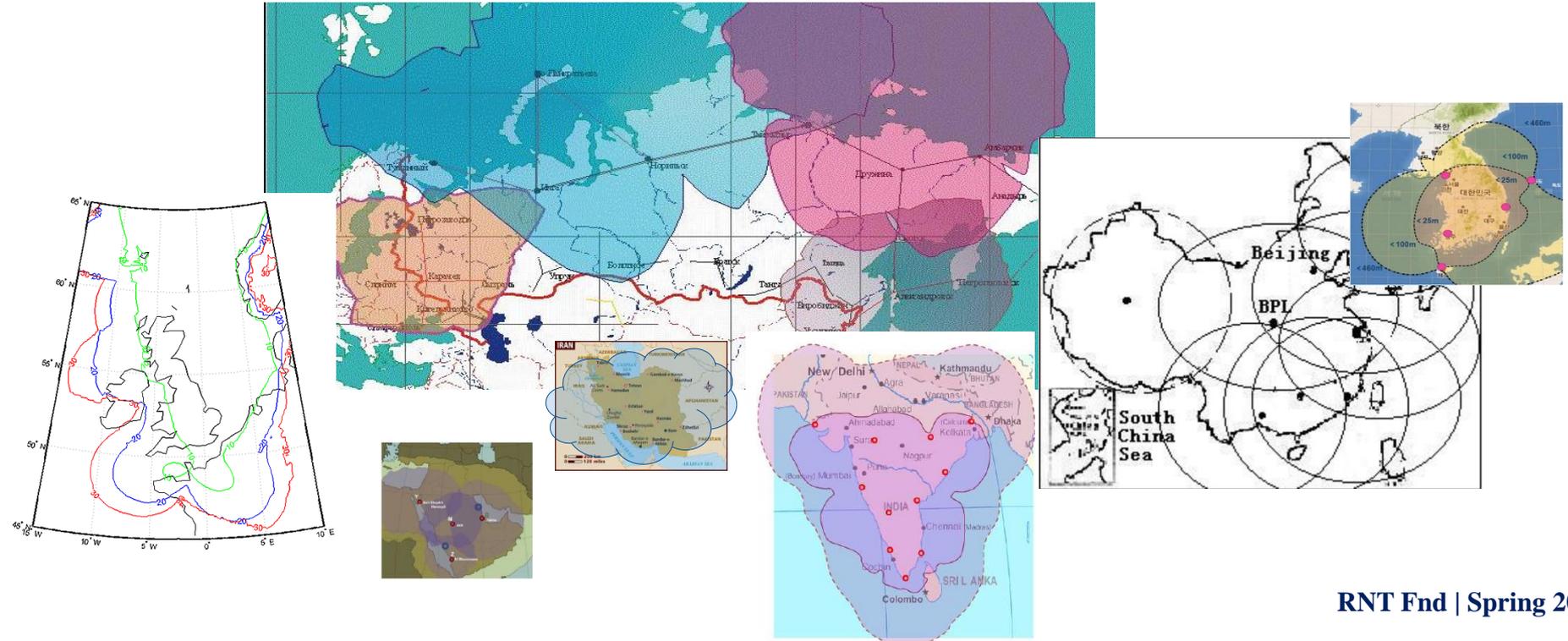
“Protect, Toughen, Augment”

(Dr. Brad Parkinson)

“So You Think You Are Safe”

“PNT – Growing up & Getting Serious”

Global Action



US Action & Inaction

Feb 2008

“We will Build”



Homeland
Security

Press Office
U.S. Department of Homeland Security
February 7, 2008
Contact: (202) 282-8010

STATEMENT FROM DHS PRESS SECRETARY LAURA KEEHHNER ON THE
ADOPTION OF NATIONAL BACKUP SYSTEM TO GPS

Oct 2009

“Program de-funded”



Homeland
Security

FY-2010 PRESIDENT'S BUDGET REQUEST AND
DEPARTMENT OF HOMELAND SECURITY APPROPRIATIONS ACT

In US – Congress Concerned



2014 Defense Auth Act

Administration must report on, when space systems “*...plan to provide necessary national security capabilities through alternative space, airborne, or ground systems...*”

In US – Congress Concerned



In US – Congress Concerned



DHS Secretary:

- Shall preserve Loran-C infrastructure for possible re-use
- Has legal authority to enter into a Cooperative Agreement w/ public or private entity to build eLoran

2014 Coast Guard Auth Act, passed by House, now with Senate

RNT Fnd | Spring 2014

DHS Views Letter

17 April 2014



“In...2009 the Secretary ... certified that the system infrastructure is **not needed as a backup to the Global Positioning System...**

Administration **cannot support this retrograde effect** ... urges the Senate to delete this provision in its entirety.”

Some in Administration Concerned

“We have known about the problem since 2001.”



“Interested in eLoran as part of APNT.”

Other Depts. & Staffs concerned & interested

RNT Foundation



Education



Better Laws & Enforcement



Strong, Difficult-to-Disrupt Terrestrial Signals



RNT Foundation



International Membership

Poland

Netherlands

Norway

Egypt

United Kingdom

Australia

Canada

RNT Foundation - Media



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PRESS RELEASE

Congress Supports GPS-Backup System, Russian Satellites Fail

Fairfax, VA (April 4, 2014) – Resilient Navigation and Timing Foundation announced that just hours after the U.S. House of Representatives passed legislation Tuesday to preserve infrastructure that could support a back-up system for GPS, the Russian GLONASS satellite navigation system unexpectedly went out of service for 11 hours. On Tuesday afternoon, the first of April, the House passed the 2014 Coast Guard Authorization Act requiring the Department of Homeland Security to halt dismantling and disposal of infrastructure that could be used for a terrestrial system during times and in places where GPS is not available. The Department had announced in 2008



InsideGNSS

Engineering Solutions from the Global Navigation Satellite System Community

GPS World

EXPERT ADVICE

The Low Cost of Protecting America

Dana A. Goward

Highly precise and free for use by anyone with an inexpensive receiver, GPS and other GNSS are great. Their navigation and timing signals have been incorporated into nearly every aspect of modern life, from synchronizing power grids to financial systems, the Internet, telecommunications, and transportation. The U.S. Department of Homeland Security estimates that these signals are used by all 16 of U.S. critical national infrastructure sectors, and are essential to the functioning of 11.

Jamming Threat Growing. When these faint signals can't be received, people immediately feel the impact and short- and long-term impacts on the user

If a navigation satellite outage became widespread and lasted more than a few hours because of a major solar flare, software problem, hacker or cyber-attack, most authorities agree that the impacts would be catastrophic.



Federal Communications Commission more than two years of concerted effort to identify the single perpetrator.

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has demonstrated how easy it is to take control of unmanned aircraft and ships on autopilot by sending a slightly stronger navigation signal, making the receiver think it is somewhere other than where it is. Iran claims to have done something similar, capturing a U.S. military drone in 2010. Humphreys has also shown (on paper) how time-stamps

RNT Foundation – Outreach



Resilient PNT Forum



Information Technology
Industry Council



CEA
Consumer Electronics Association

RNT Foundation - Congress



HR 4005 Passed the Full House on April 1, 2014

1

HOWARD COBLE COAST GUARD AND MARITIME
TRANSPORTATION ACT OF 2014
HR 4005

SEC. 221. E-LORAN.

(a) **IN GENERAL.**—The Secretary of the department in which the Coast Guard is operating may not carry out activities related to the dismantling or disposal of infrastructure that supported the former LORAN system until the later of

(1) the date that is 1 year after the date of enactment of this Act; or

(2) the date on which the Secretary provides to the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate notice of a determination by the Secretary that such infrastructure is not required to provide a positioning, navigation, and timing system to provide redundant capability in the event GPS signals are disrupted.

(b) **EXCEPTION.**—Subsection (a) does not apply to activities necessary for the safety of human life.

(c) **AGREEMENTS.**—The Secretary may enter into cooperative agreements, contracts, and other agreements with Federal entities and other public or private entities, including academic entities, to develop a positioning, timing, and navigation system, including an enhanced LORAN system, to provide redundant capability in the event GPS signals are disrupted.



RNT Foundation - Administration



RNT Foundation - Messaging

Terrestrial Pseudolites

- Xmit GPS time
- High power (resilient)
- Low frequency (no interference w/space signals)

GPS-Earth*

DRAFT



*Based upon proven eLoran technology

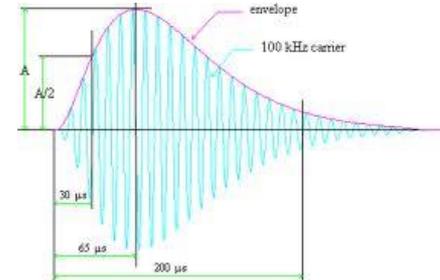
RNT Foundation - Messaging

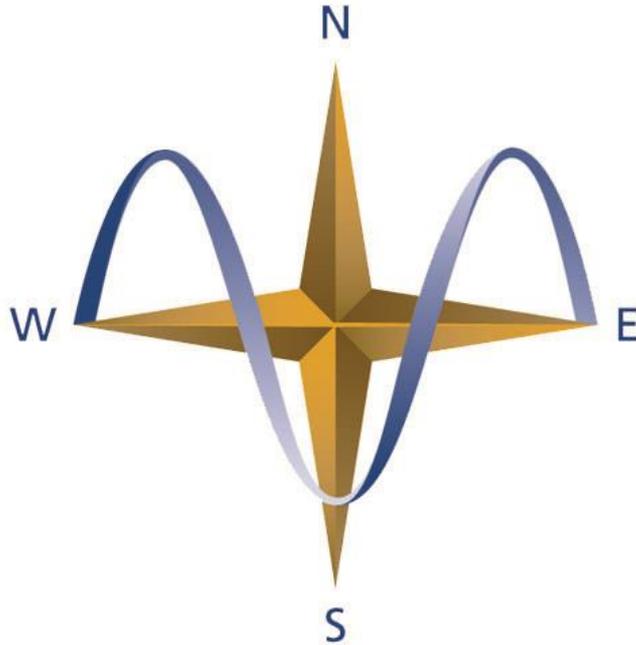
Low Frequency –

The new frontier of technology!

DRAFT

- Usable indoors, underground, underwater
- Guaranteed data delivery
- 30ns Timing accuracy
- Spectrum 1 Frequency





RESILIENT NAVIGATION *and* TIMING FOUNDATION

www.RNTFnd.org



Objective 1: The US government recognizing navigation and timing services as critical infrastructure. This will include designating and empowering a federal official with the responsibility and authority to ensure navigation and timing resilience.

Objective 2: Owners and operators of critical infrastructure being required to have multiple sources of precise navigation and timing information, with different failure modes, that ensure continuity of operations for proof of time and proof of location for at least 60 days.

Objective 3: A national statute making intentional possession of jamming and spoofing devices a misdemeanor, and intentional use of jamming and spoofing devices a felony. This law should also be enforceable at the state and local level so as to empower those authorities and leverage their much greater enforcement capabilities.



Objective 4: Establishment of a national system to detect and rapidly locate jamming and spoofing.

Objective 5: Sufficient enforcement personnel to respond to all detected jamming and spoofing incidents, and quickly apprehend and prosecute perpetrators.

Objective 6: Creation of a public-private-partnership or Cooperative Agreement between the federal government and a non-profit or for-profit entity to build and operate a resilient terrestrial navigation and timing system.

Objective 7: Establishment of the resilient terrestrial navigation and timing system, and broad use of its services across all commercial sectors of the United States.