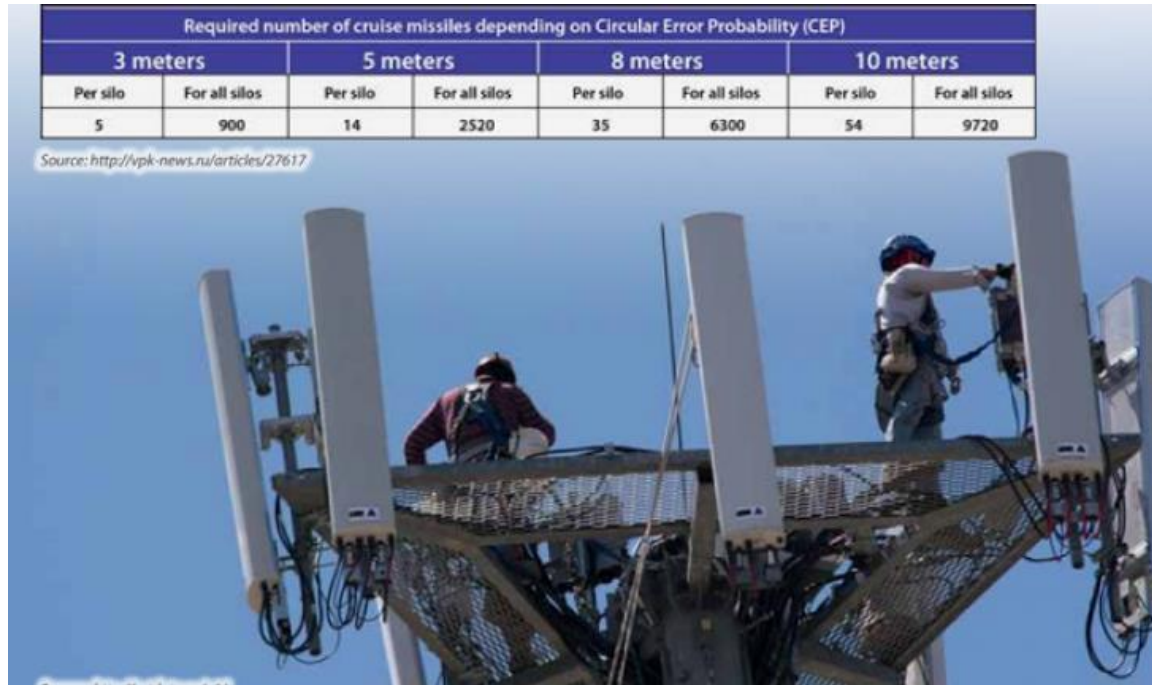


Russia Undermining Confidence in GPS

US National PNT Advisory Board

17 May 18

From Self Defense Precaution to...



“25,000 Russian Cell Towers to Include GPS Jammers to Thwart US Cruise Missiles”

Multiple Russian Press Outlets - 2015

Active Disruption

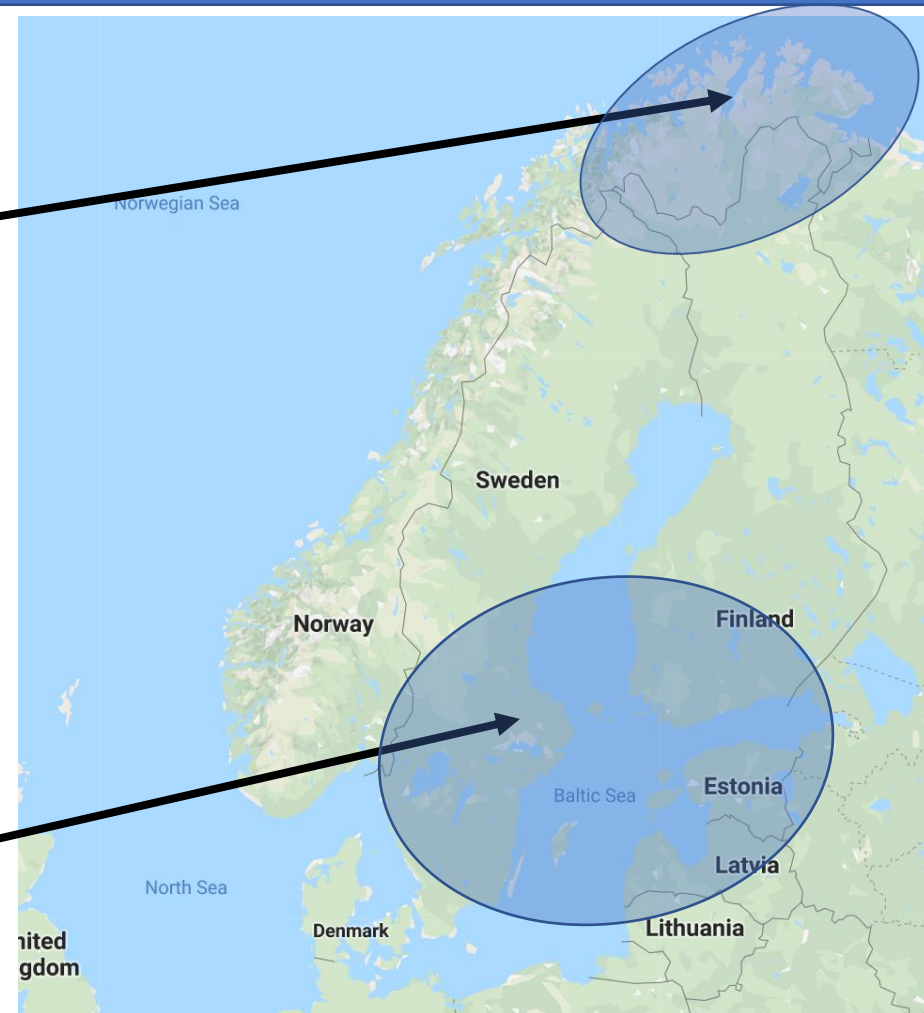
Finnmark, Norway

- Sept 2017
 - March 2018
- Aviation &
Telecommunications

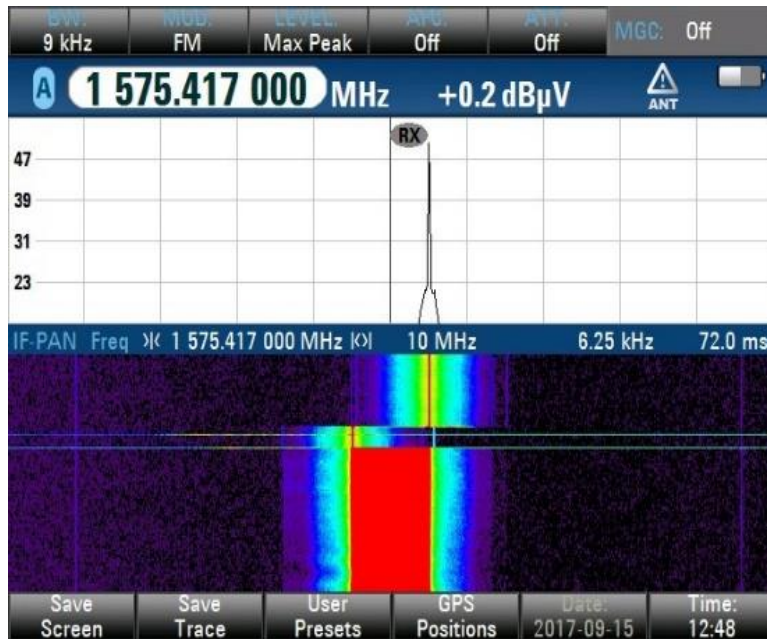
Baltic Sea

(Norway, Sweden, Finland, Latvia)

- Sept 2017
- Cell Phones, other?

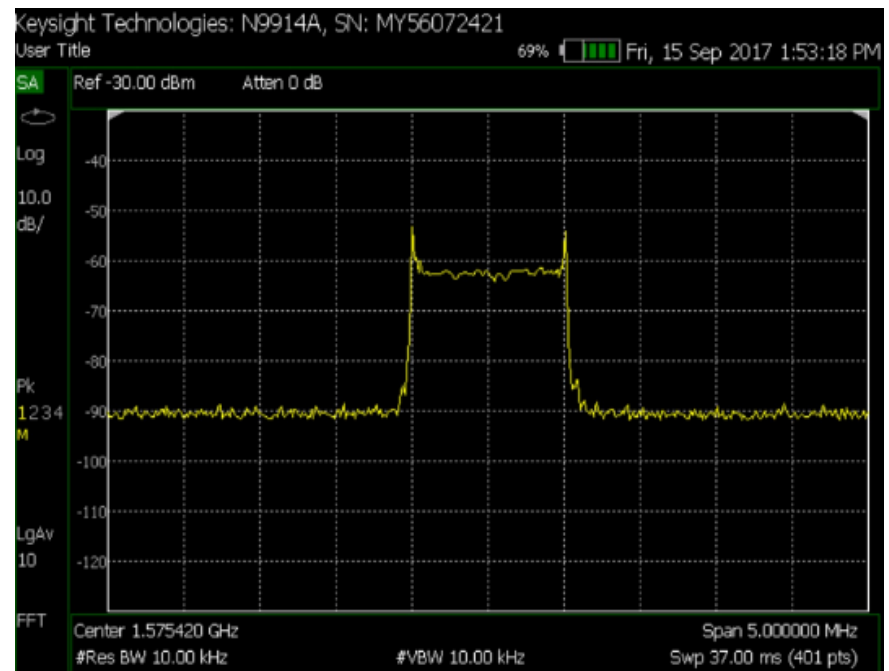


Active Disruption



GPS but not GLONASS
or other GNSS

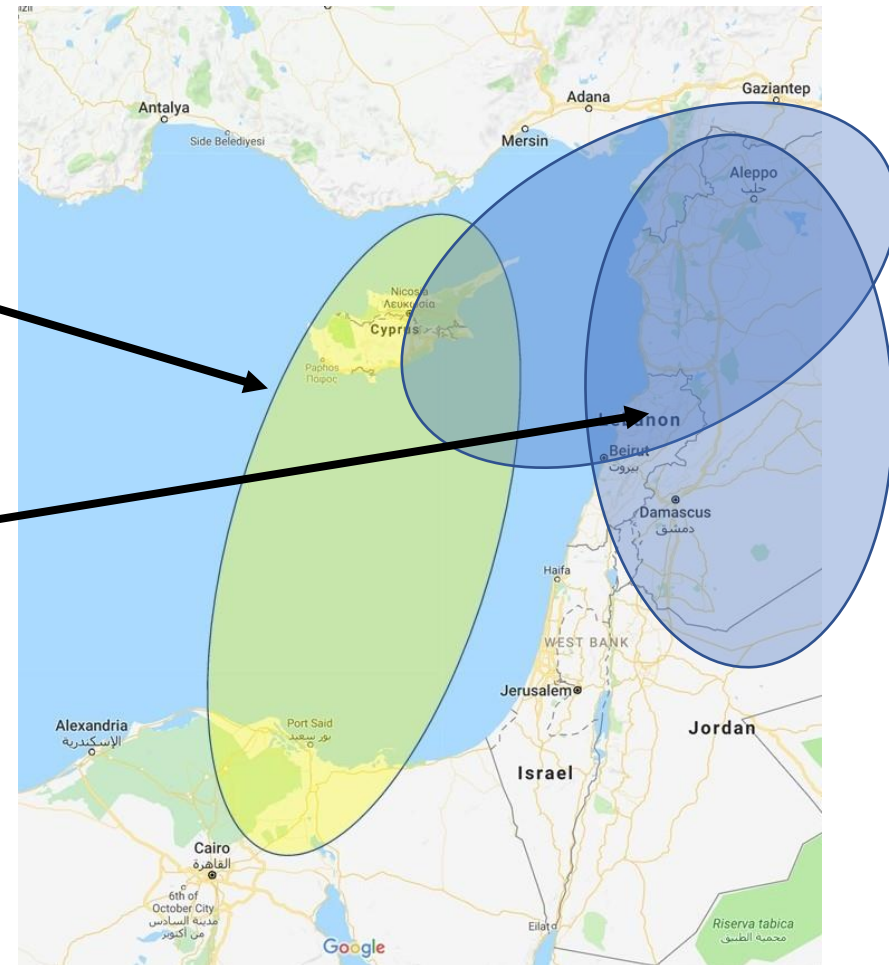
Images: Norwegian Communications
Authority



Active Disruption

Eastern Mediterranean –
Four US Maritime Administration
Advisories Since March 2018

‘Most aggressive jamming
environment the world has seen.’
US General Raymond Thomas



Active Disruption

Flight Standards Bureau

Long Term GPS Warnings

- Ukraine, espec. Crimea
- Turkey



Active Disruption

Spoofing

Baltic –

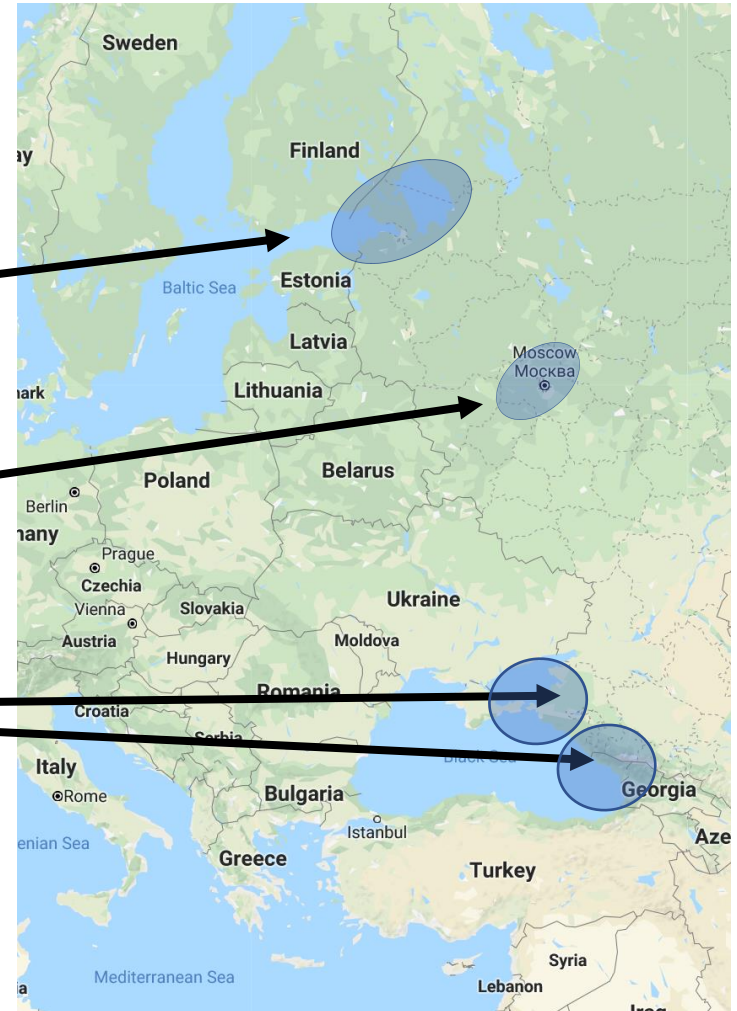
- Since at least 2015

Moscow –

- Since at least 2016

Black Sea

- Since at least 2015



Russian Deputy Prime Minister

Dmitry Rogozin to President Putin:

“This year we will fully equip all seaports in Crimea with these systems (differential GLONASS)...

Do you remember how you criticized us for lagging behind in GPS? We have caught up with this backlog and will not have it anymore.

...8,791 vessels in our basin are now GLONASS equipped.”

Possible Russian Goals

- Frustrate western military and peacekeeping operations
- Protect high value assets from drones
- Encourage adoption and use of GLONASS in lieu of GPS
- Intimidate its neighbors, cause them to question relationship with/reliance upon US and US technology

It is the policy of the United States to:

“... continue to provide civil services that exceed or are competitive with foreign civil space-based positioning, navigation, and timing services and augmentation systems...”

and

“Encourage foreign development of positioning, navigation, and timing services and systems based on the Global Positioning System.”

NSPD-39, 2004

Possible Remedy

National Space Council Panel – February 2018

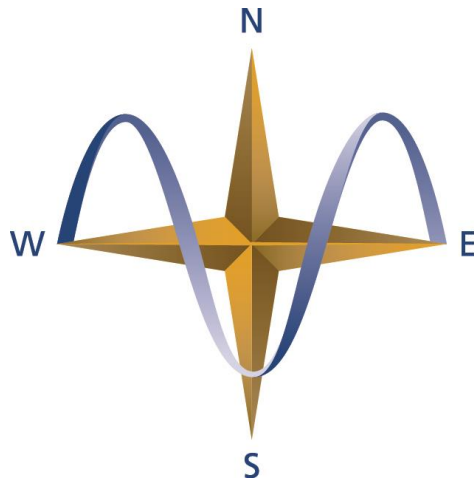
- ‘Need holistic approach to space security w/ ground systems like eLoran’

PNT Advisory Board Presentations – June 2017

- iPosi – ‘GPS + encrypted high power eLoran time signal is bullet proof.’
- Dr. Gene McCall – ‘GPS + eLoran ideal combo’

Multiple US Govt Studies 2007 – 2018

- ‘eLoran is only practical augment’



RESILIENT
NAVIGATION
and TIMING
FOUNDATION

Protect – Toughen - Augment

The Resilient Navigation and Timing Foundation is a 501(c)3 scientific and educational charity registered in Virginia