



How America is Losing the GPS War – and risking everything

MARCH 2020

Assn of Old Crows Webinar

FOOTAGE FARM 250026

TCR 02:21:35:24
UBR FA:10:10:04



0:51 / 9:25

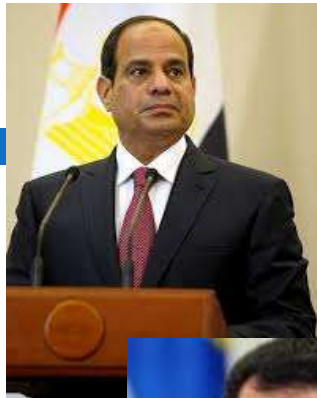
Scroll for details





Francis Fukuyama

THE END
OF HISTORY
AND
THE
LAST
MAN











August 1997



Unclassified

7737015637



Unclassified

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F-186603

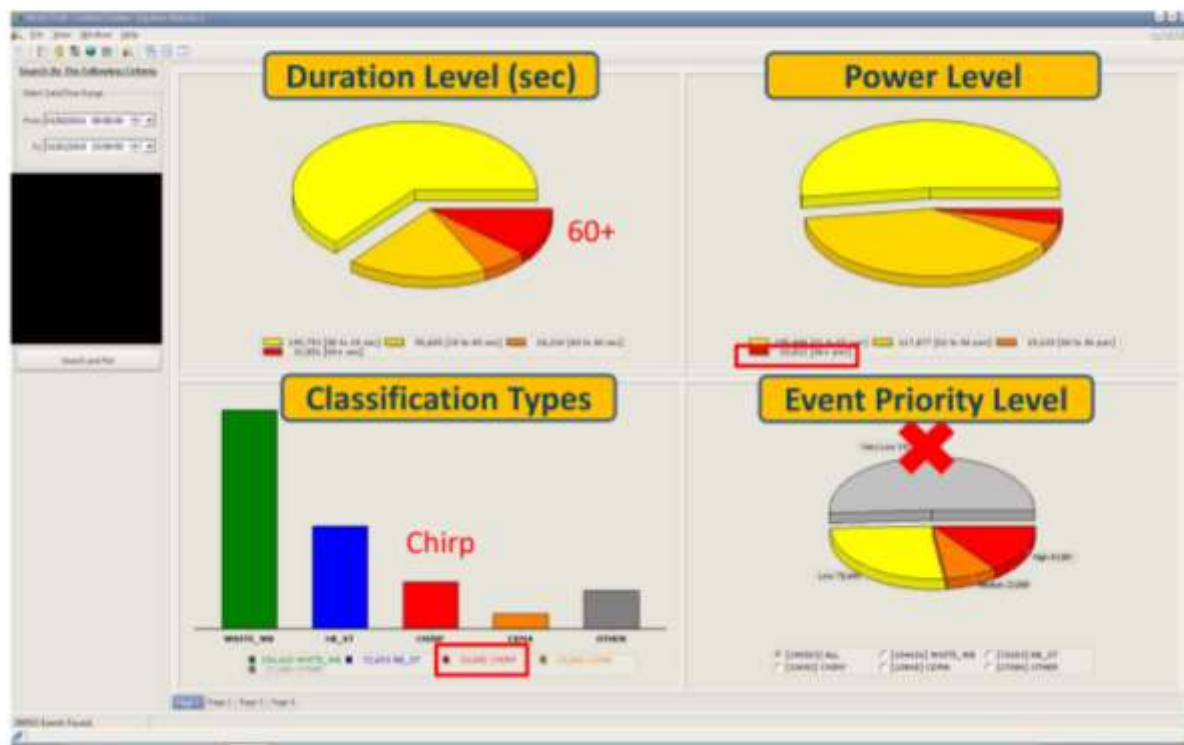
271454Z AUG 97SUBJ: RUSSIAN AVIACONVERSIA PORTABLE GPS AND GLONASS JAMMER SYSTEM (U)

SUMMARY: (U) CONFEX - THE RUSSIAN FIRM AVIACONVERSIA MARKETING AND DISPLAYED ITS PORTABLE GPS AND GLONASS JAMMER AT THE MOSCOW AIR SHOW '97, 19-24 AUG 97, IN MOSCOW, RUSSIA. THE 4-WATT JAMMER JAMS CIVILIAN AND MILITARY FREQUENCIES OF GPS AND GLONASS UP TO A RANGE OF 200 KM. PROTOTYPE AT THE SHOW - LOOKING FOR BUYERS.



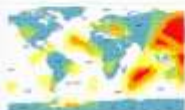
Overall 2-Year Activity

STRIKE3





From Our Blog



One man's mistake, missing backups and complete reboot: The tale of Europe's Galileo satellites going dark – The Register

Nov 11, 2019

Graphic showing Galileo's failure. Pic: Bert Hubert. Blog Editor's Note: An interesting summary/compilation about this summer's Galileo failure. Interesting how the human factor is still so dominant in many of these kinds of mishaps. In aviation we call pilots the...

[read more](#)

11 Firms Chosen to Demonstrate GPS Backup Technologies – Inside GNSS

Nov 9, 2019



Could the world cope if GPS stopped working? – BBC News

Nov 7, 2019



"Unacceptable! Never again!": EC Deputy on Galileo outage – GPS World

Nov 6, 2019



What is spoofing and how can you ensure GPS security? – Aerospace Testing International

Nov 5, 2019

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August 2000

THE TIMES

THE SUNDAY TIMES





REUTERS/Sara K. Schwittrek

Spoofing – Cost ↓ Capability ↑ Ease of use ↑



Iran, Dec 2011



UT Austin, 2012-13



Las Vegas, Dec 2015



US Southern Border
Dec 2015



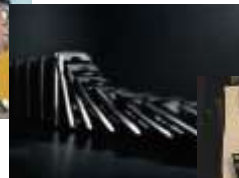
Persian Gulf, Jan 2016



Russian VIP
protection
2016 - Present



Pokemon
July 2016



Portland
Oct 2017



All GNSS at Once
June 2018

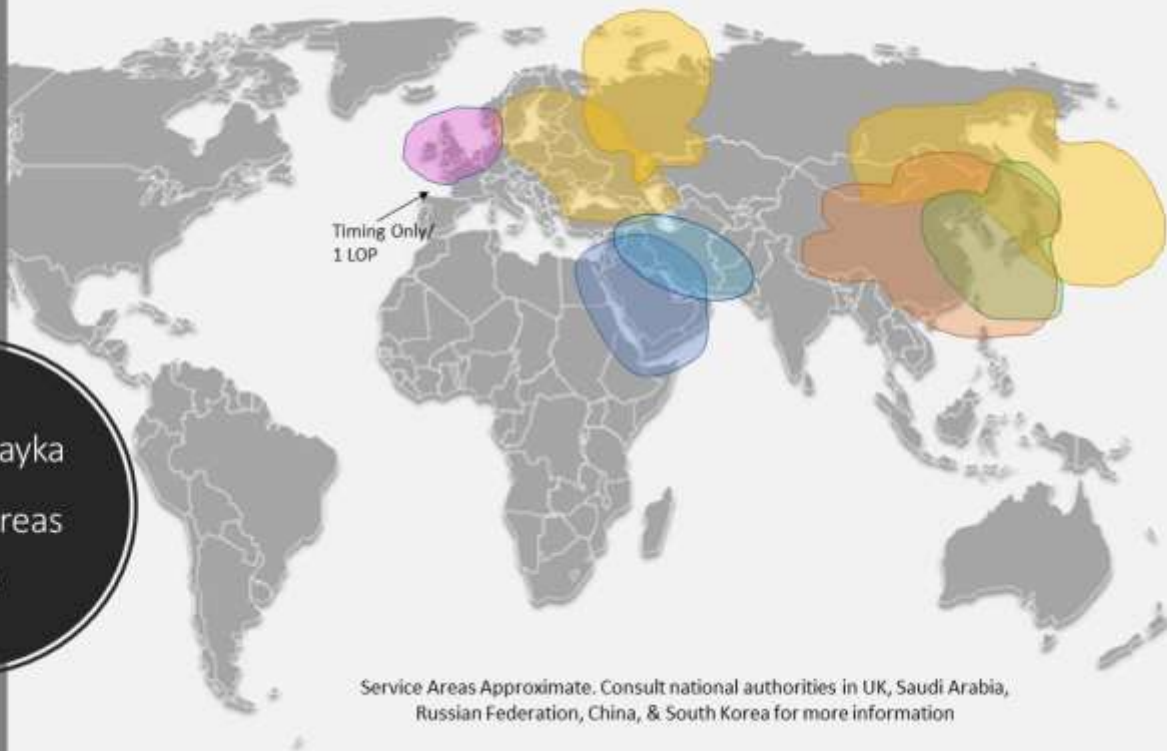


Signals & Maps
Jul 2018



RESILIENT
NAVIGATION
and TIMING
FOUNDATION

Loran/Chayka Service Areas 2019



Required number of cruise missiles depending on Circular Error Probability (CEP)							
3 meters		5 meters		8 meters		10 meters	
Per silo	For all silos	Per silo	For all silos	Per silo	For all silos	Per silo	For all silos
5	900	14	2520	35	6300	54	9720

Source: <http://vpk-news.ru/articles/27617>



BW: 9 kHz

MOD: FM

LEVEL: Max Peak

AFG: Off

ATT: Off

MGC: Off

A

1 575.417 000 MHz

+0.2 dB μ V



47

39

31

23

RX

IF-PAN Freq 1 575.417 000 MHz 10 MHz 6.25 kHz 72.0 ms

Save
Screen

Save
Trace

User
Presets

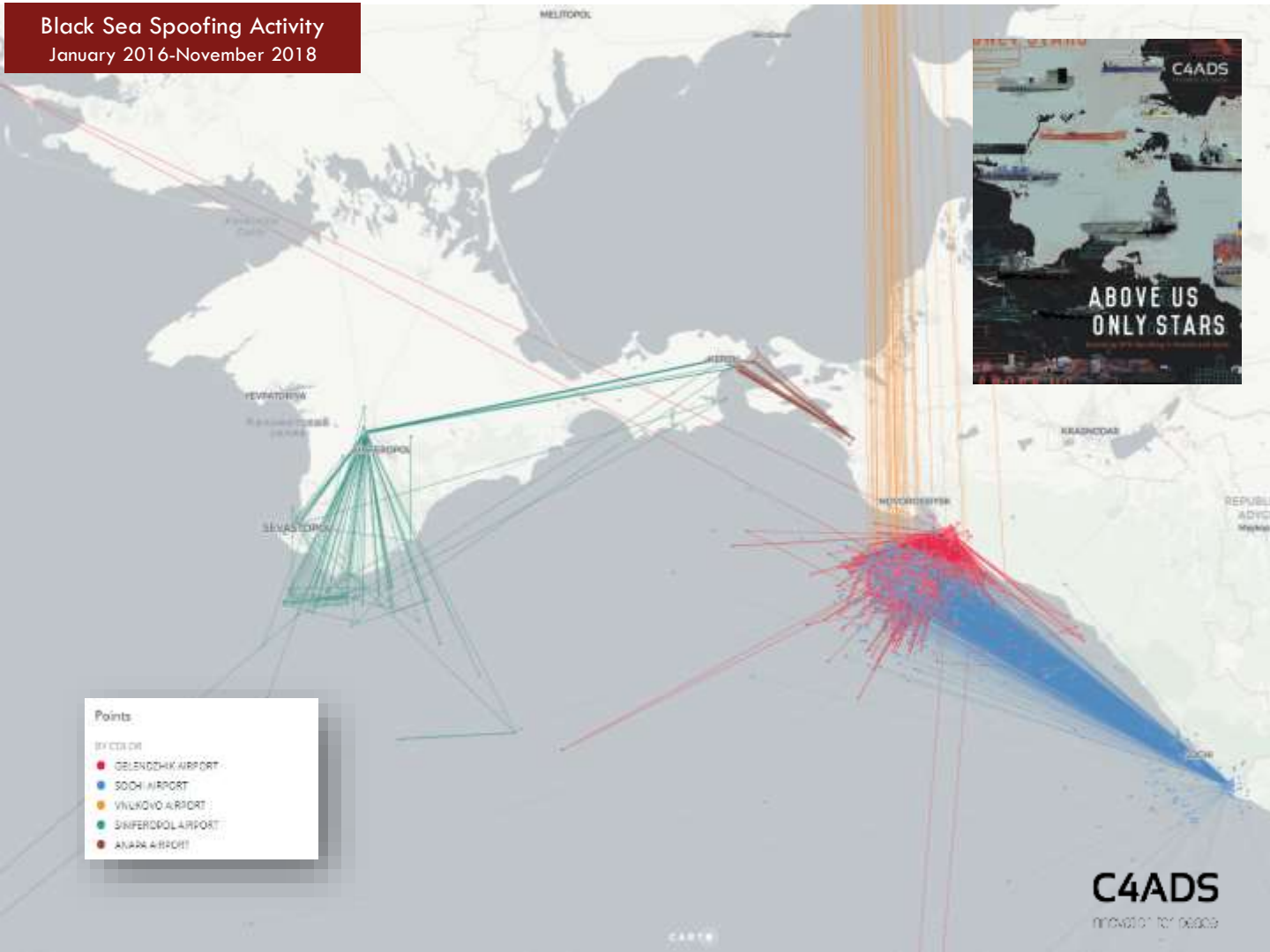
GPS
Positions

Date:
2017-09-15

Time:
12:48

Black Sea Spoofing Activity

January 2016-November 2018





Port of Shanghai, People's Republic of China

More BeiDou than GPS in 130 of 195 Countries

Chinese version of U.S. GPS, Beidou expands influence in Asia and Africa

National capitals where positioning satellites can be observed
(as of June 28, 2019)



Source: Trimble GNSS Planning Online

‘BeiDou + GLONASS Better than GPS’

Global Times (China)



2. System Construction of PNT System

(2) Prospect of the Development

It's expected to be built into a national comprehensive PNT system by 2035
more ubiquitous, more integrated, more intelligent,



UNCLASSIFIED



STRATEGY
for the
DEPARTMENT OF DEFENSE
POSITIONING, NAVIGATION AND TIMING (PNT)
ENTERPRISE
[UNCLASSIFIED VERSION]

CLEARED
For Open Publication
Aug 15, 2019

Department of Defense
OFFICE OF POSITIONING, NAVIGATION AND TIMING POLICY

Ensuring a U.S. Military PNT Advantage

NOVEMBER 2018

DoD Chief Information Officer
Principal Staff Assistant for PNT Policy



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Spoofing?

December 2011



January 12, 2016



January 12, 2016



Spoofing?



- Right after US/Iran nuclear agreement
- Same day as President's last major speech to the nation

Drone Shoot Down –

June 2019

Did Iran Spoof It Then Shoot It?



Russia Jamming GPS Signals in Syria to Counter US Drones – NBC News



GPS Jammed: Russia Is
Messing with America's F-35s
– National Interest



‘China to Target GPS First in Cyber War’ – Senator Sasse, Intelligence Committee



The Moscow Times

Oct. 21 2016 - 03:10

The Kremlin Eats GPS for Breakfast

Why geolocation in central Moscow has become a real headache



What to Do?

- Protect — GPS Signals
- Toughen — Users & Equipment
- Augment — w/other signals & sources



Positioning, Navigation, & Timing (PNT) Multi-Level Resiliency Model



Example Systems

Global Layer	From Space: GNSS (GPS, Galileo, GLONASS, BeiDou) + augmentation
Continental Layer	Terrestrial: eLoran, HDOP, EGNOS, MSK
Local Layer	Terrestrial: Pseudolites, Phas Locates, DME/DME-T/CA
Autonomous	Terrestrial: OAC, Loran Harke, Sonar, Cold Atom



New Report Highlights Soaring GPS III Costs



SPRING ARTICLE

April 4, 2018 | By Amy McCullough



Lockheed Martin employees work on a GPS III satellite. Lockheed Martin photo.

The cost of military GPS III terminals and ground systems and of Joint Direct Attack Munitions increased significantly from 2016 to 2017, while program costs for the C-130J and Evolved Expendable Launch Vehicle program saw cost decreases of at least \$1 billion.

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Air Force Depots Not Slowing Down



Snapshot: DOD and COVID-19



B-2s Fly With Dutch F-35s for First Time



CENTCOM Stops Flow of Troops to Counter COVID-19



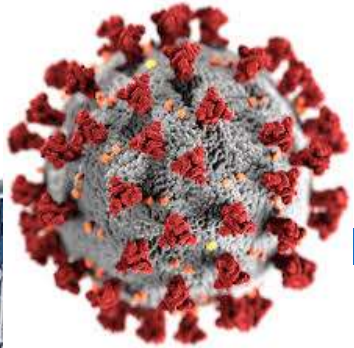
EUCOM Trying to Maintain Readiness Despite Exercise Cancellations

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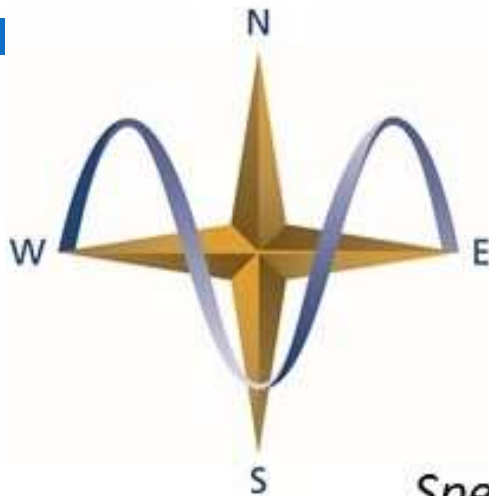












RESILIENT NAVIGATION *and* TIMING FOUNDATION

Speaking Up for GPS/GNSS Users

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