



How the West is Losing the Navigation & Timing War

NOV 2019

International Navigation Conference, Edinburgh

FOOTAGE FARM 250026

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



Francis Fukuyama

THE END
OF HISTORY
AND
THE
LAST
MAN







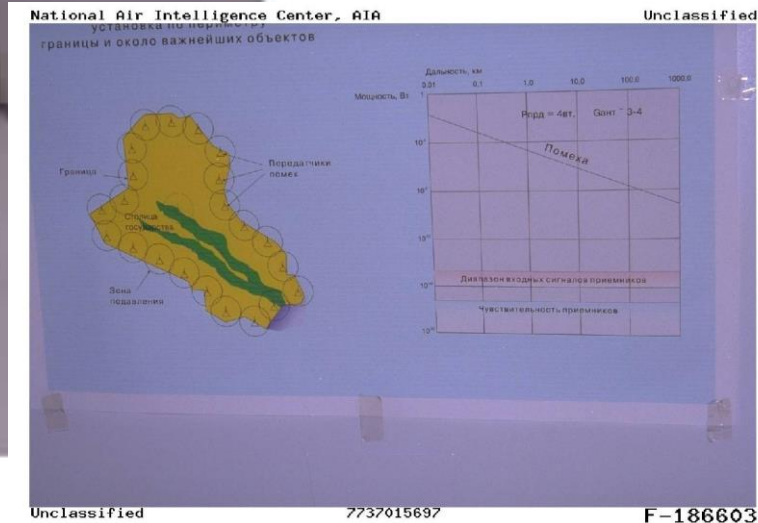
Subscribe







August 1997

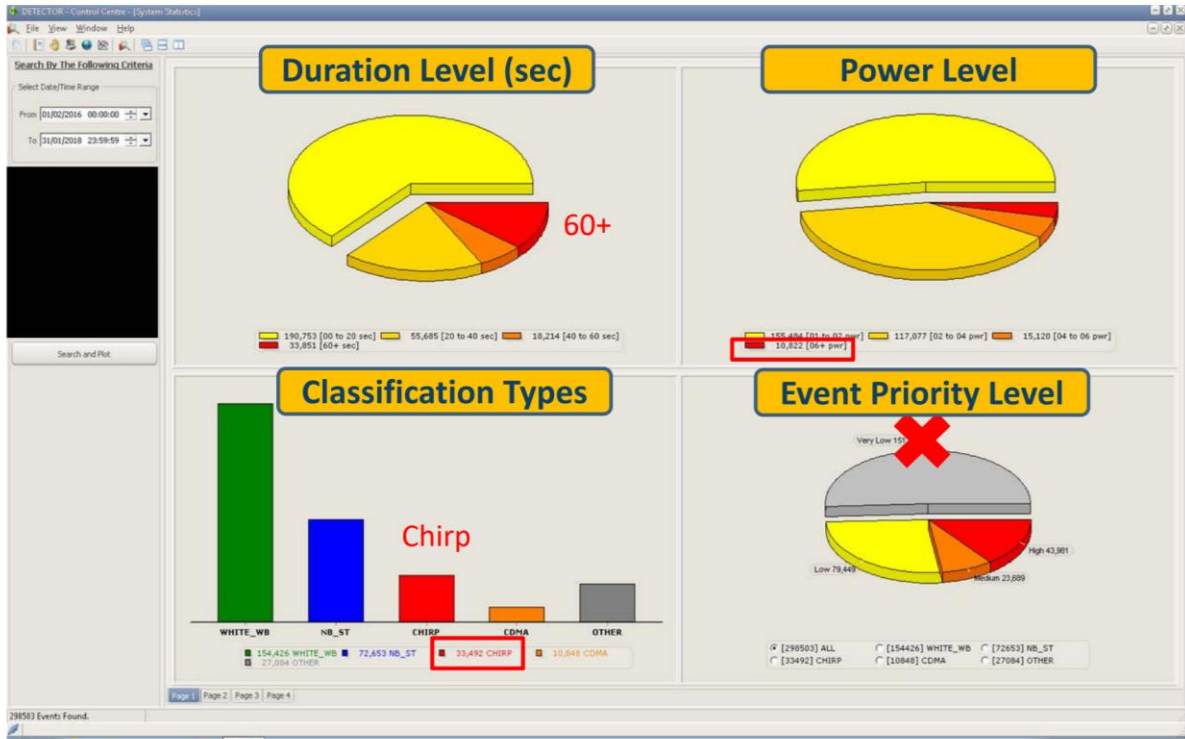


271454Z AUG 97SUBJ: RUSSIAN AVIACONVERZIA PORTABLE GPS AND GLONASS JAMMER SYSTEM (U)

SUMMARY: (U) CONFEX - THE RUSSIAN FIRM AVIACONVERZIA MARKETED 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.

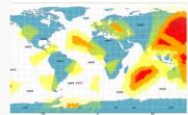


Overall 2-Year Activity





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. Schwittek

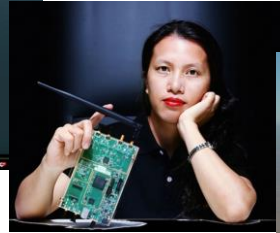
Spooing – Cost ↓ Capability ↑ Ease of use ↑



Iran, Dec 2011



UT Austin, 2012-13



Las Vegas, Dec 2015



US Southern Border
Dec 2015



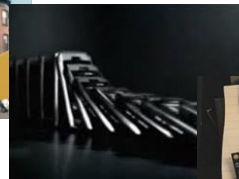
Persian Gulf, Jan 2016



Russian VIP
protection
2016 - Present



Pokemon
July 2016



Portland
Oct 2017



All GNSS at Once
June 2018

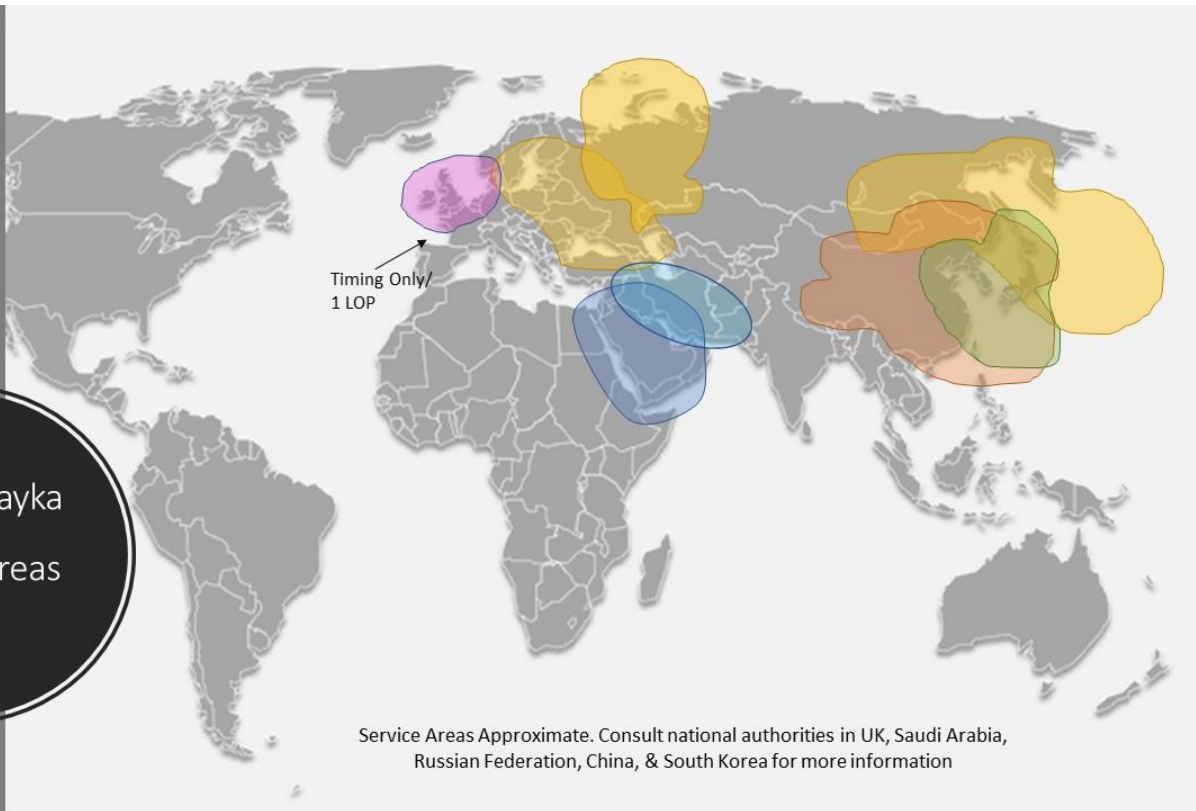


Signals & Maps
Jul 2018



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

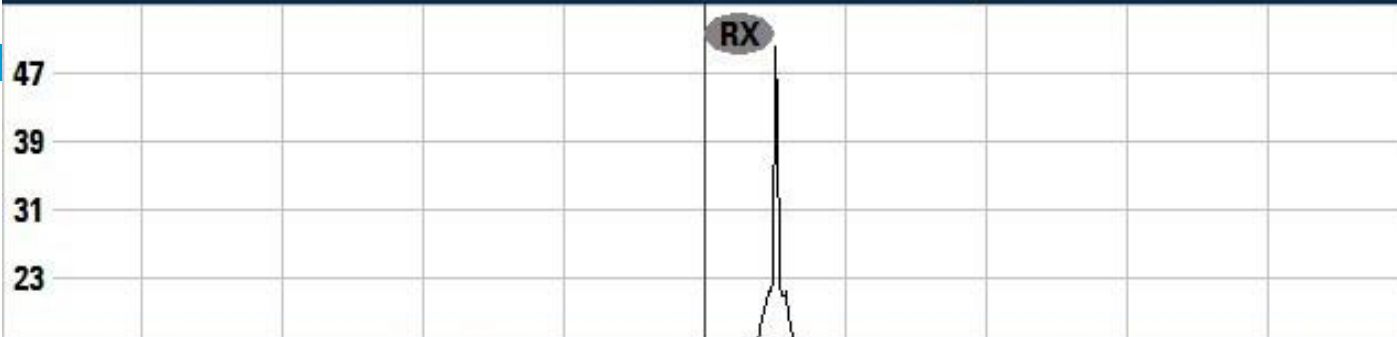
LEVEL: Max Peak

AFB: Off

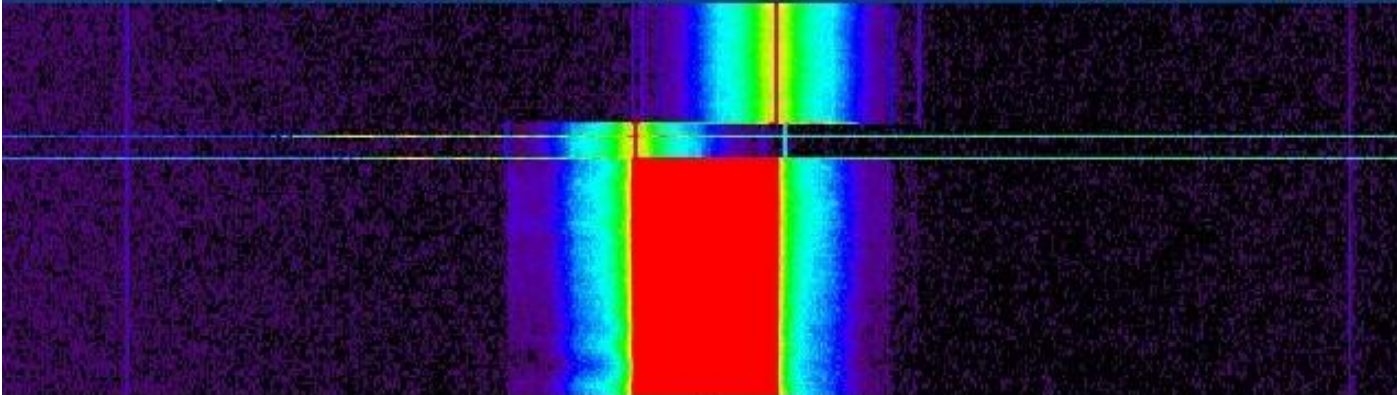
ATT: Off

MGC: Off

A **1 575.417 000** MHz **+0.2 dB μ V**



IF-PAN Freq $\left\langle \right\rangle$ 1 575.417 000 MHz $\left\langle \right\rangle$ 10 MHz 6.25 kHz 72.0 ms



Save Screen

Save Trace

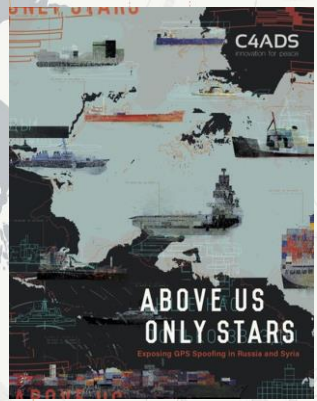
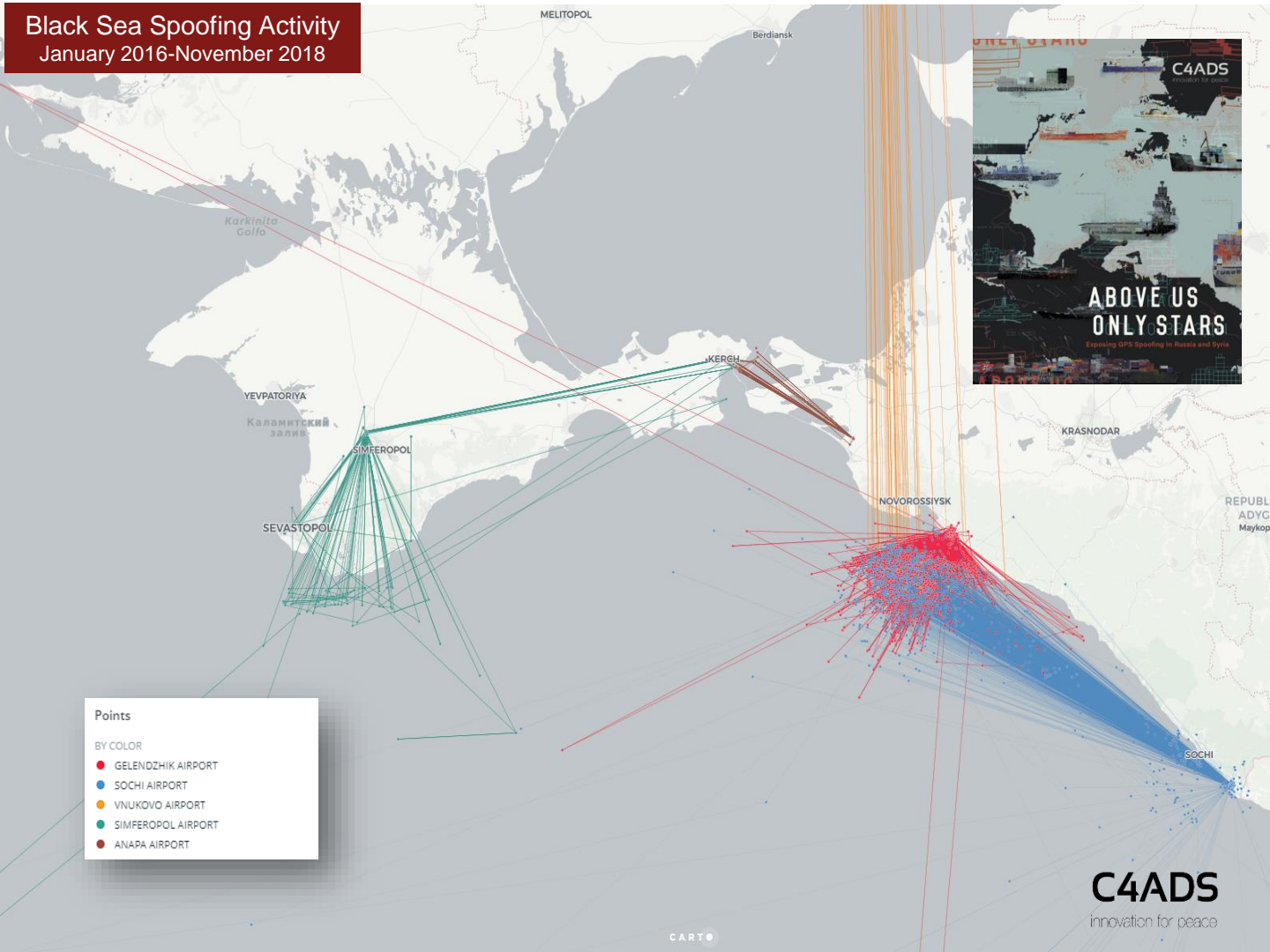
User Presets

GPS Positions

Date: 2017-09-15

Time: 12:48

Black Sea Spoofing Activity January 2016-November 2018



Points

BY COLOR

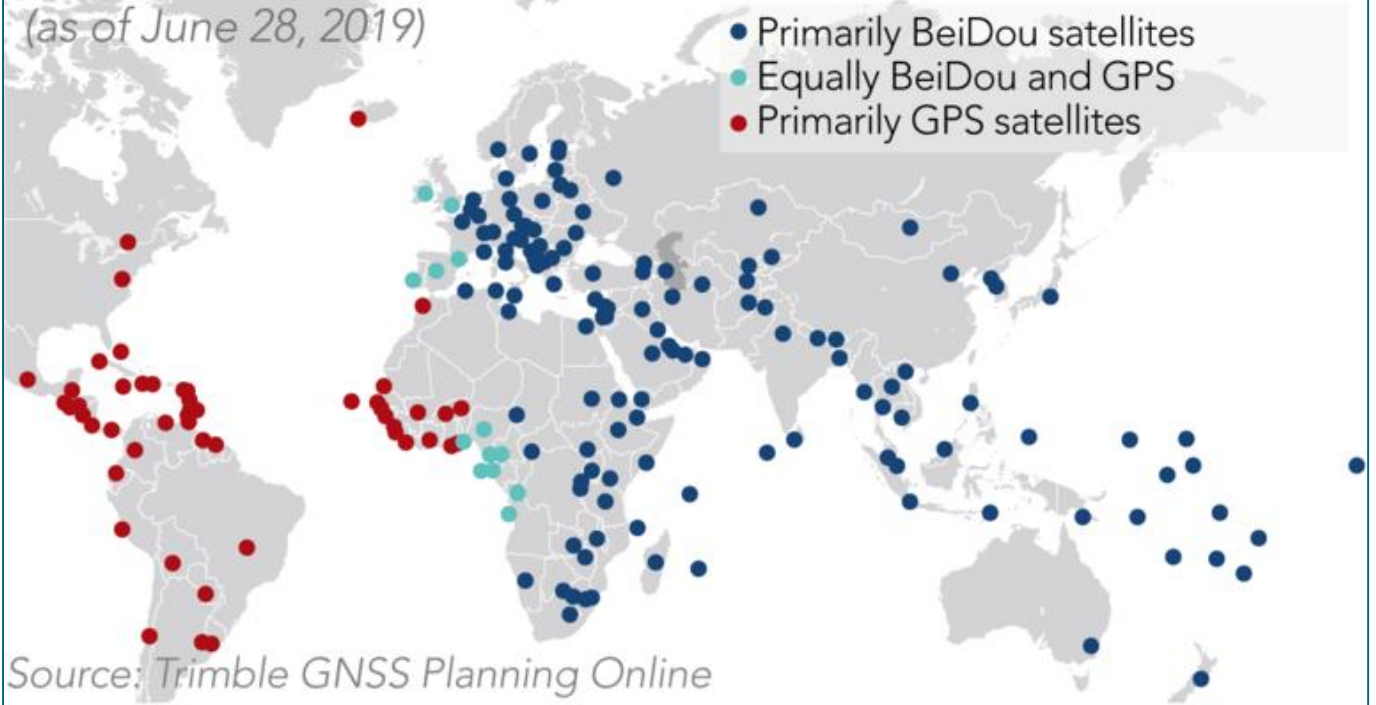
- GELENDZHIK AIRPORT
- SOCHI AIRPORT
- VNUKOVO AIRPORT
- SIMFEROPOL AIRPORT
- ANAPA AIRPORT

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'

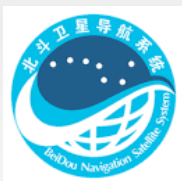
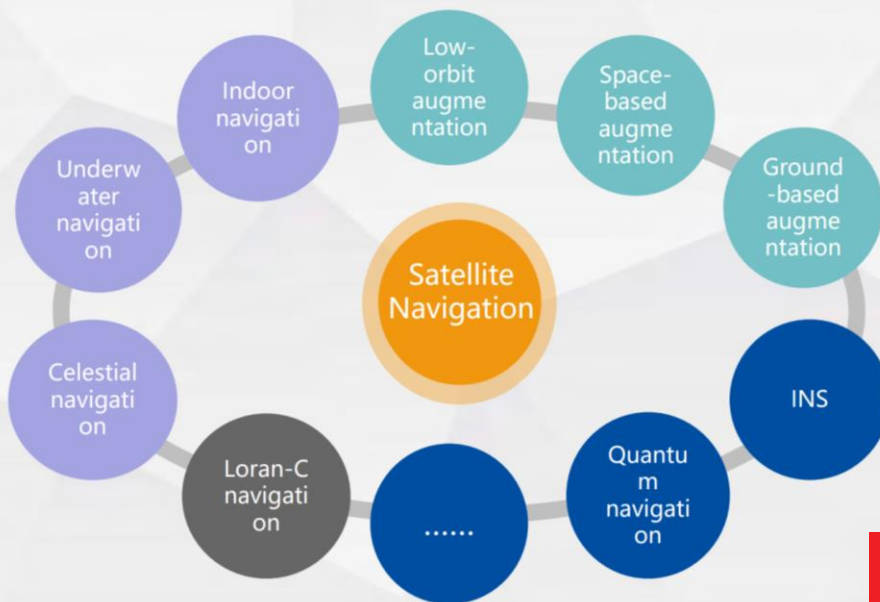
Global Times (China)



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,



Spoofing?

December 2011



January 12, 2016



January 12, 2016



Spoofering?

- 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

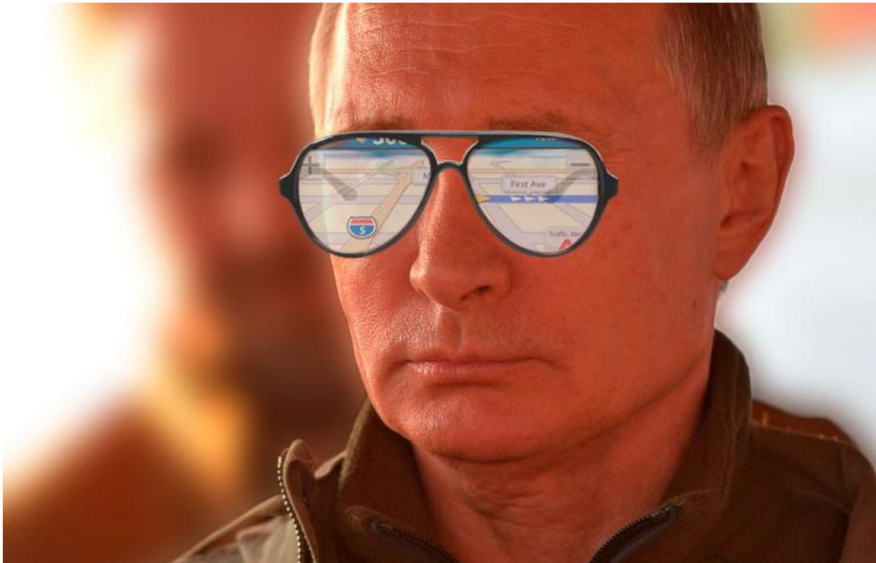


The Moscow Times

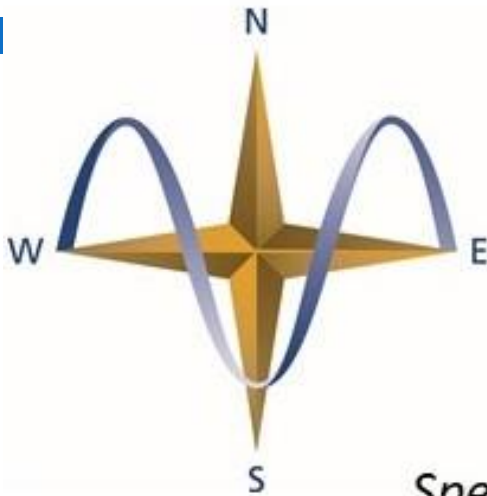
Oct. 21 2016 - 03:10

The Kremlin Eats GPS for Breakfast

Why geolocation in central Moscow has become a real headache







RESILIENT NAVIGATION *and* TIMING FOUNDATION

Speaking Up for GPS/GNSS Users

The Resilient Navigation and Timing Foundation is a 501(c)3
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www.RNTFnd.org