



EUSBSR EU STRATEGY FOR THE BALTIC SEA REGION

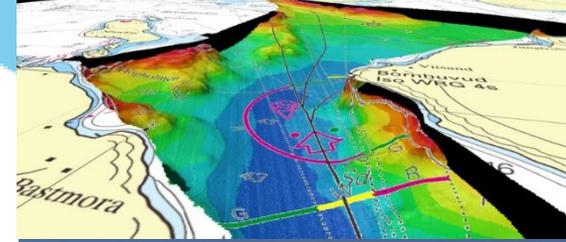
EUSBSR PA SAFE Operational Advisory Board

October 16, 12.30-15.30 CEST
Online - Zoom

Interreg
Baltic Sea Region



Co-funded by
the European Union



Agenda - Theme Security

12.30 Tour de table - Short intro of everybody online

12.45 Regional exercises - BALEX, Maciej Grzonka, Polish Maritime Search and Rescue Service

13.00 Current challenges in civil maritime security in the region, Commander Pekka Niittylä, Finnish Border Guard

13.15 GNSS interference - effects and countermeasures, Niklas Hehenkamp, German Aerospace Center

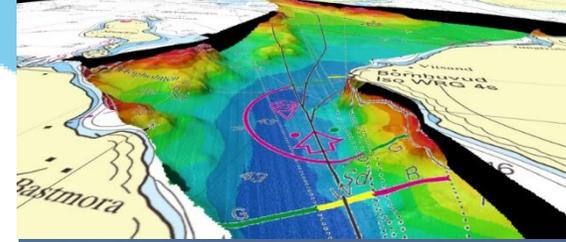
13:30 Discussion - What are your two main security challenges (all)

14:15 BREAK

14:30 Continued discussion

15:30 End





PA MARITIME SAFETY - maritime safety and security

Action 1: Enable reliable and secure navigational conditions to the Baltic Sea.



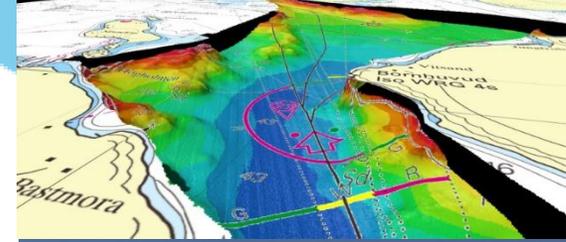
Action 2: Develop navigation in ice to meet future challenges

Action 3: Enable efficient traffic management and implement maritime services.



Action 4: Ensure accurate preparedness and response for maritime accidents and security incidents.





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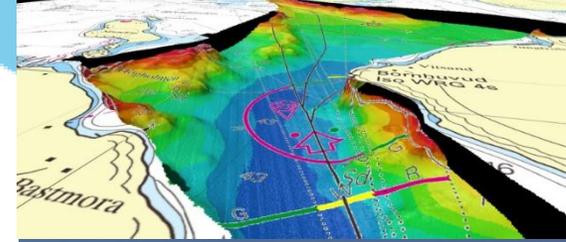
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Tour de table - Short intro of everybody online

- Name
- Role
- Organisation





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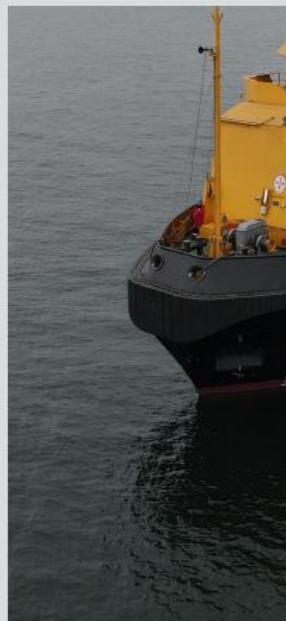
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BALEX DELTA

25-28 August 2025
Świnoujście | Poland



INTERNATIONAL OIL SPILL RESPONSE EXERCISE



About BALEX DELTA

The annual international marine pollution response exercise in the Baltic Sea, BALEX, is held in accordance with the 1992 [Convention on the Protection of the Marine Environment of the Baltic Sea Area](#) (the Helsinki Convention). The Convention mandates cooperative responses and preparedness among the Baltic Sea States for large-scale accidents.

The general objective of the BALEX exercises is to ensure that every Contracting Party is able to lead a major response operation.

BALEX exercises are hosted by the Contracting Parties according to a schedule agreed on by the HELCOM Response Working Group. BALEX has been held every year since 1989.

Port of Swinoujscie



Balex 2025 Exercise scenario

Bulk carrier 'X' hits the side of tanker 'Y' on the fairway to Swinoujście Harbour, causing serious damage to the tanker's hull and oil in one of the tanks starts to leak. A large amount of petroleum products enter the Pomeranian Bay, which means a catastrophic oil spill whose effects cannot be remedied using only national means, which is why we ask for help from other HELCOM countries. Despite the efforts made, it is not possible to completely limit the spill on the high sea and some of the pollutants have reached the beaches between Świnoujście and Międzyzdroje. As a result, it is necessary to organize a clean-up operation on the shoreline as well.



Balex Delta 2025 Offshore Scenario

**Open Sea Scenario took place on the 27th of August
(Wednesday)**

Main organiser: Maritime Search and Rescue Service

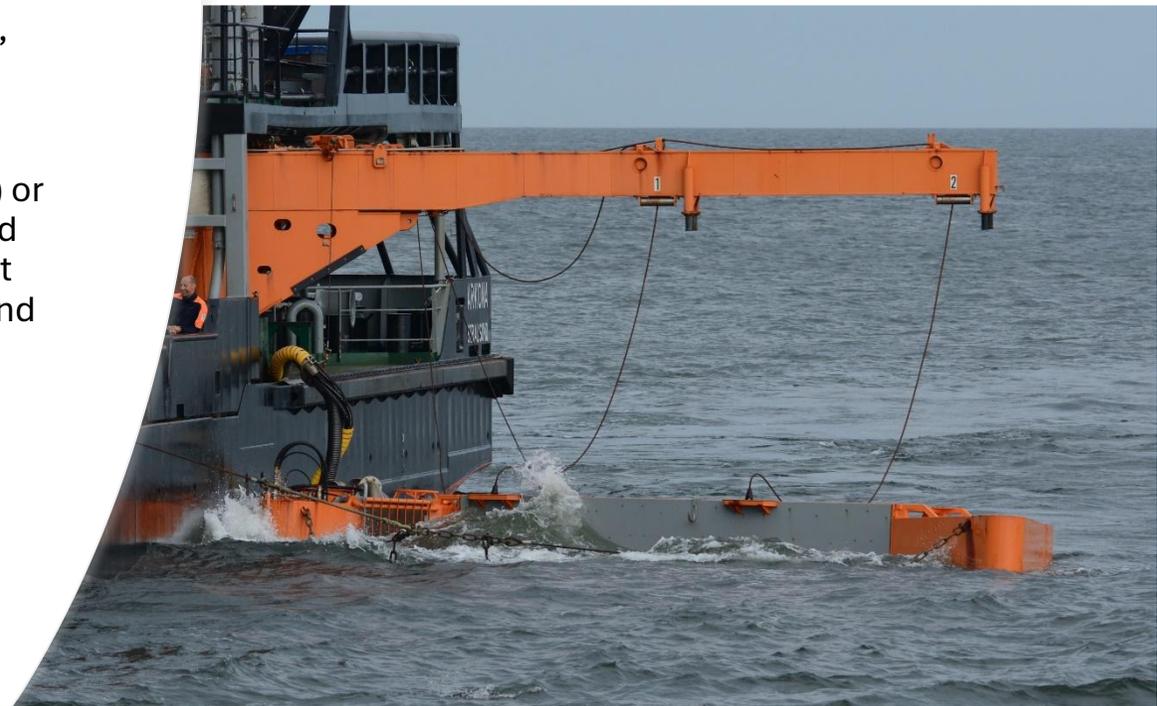
List of Participating vessels:



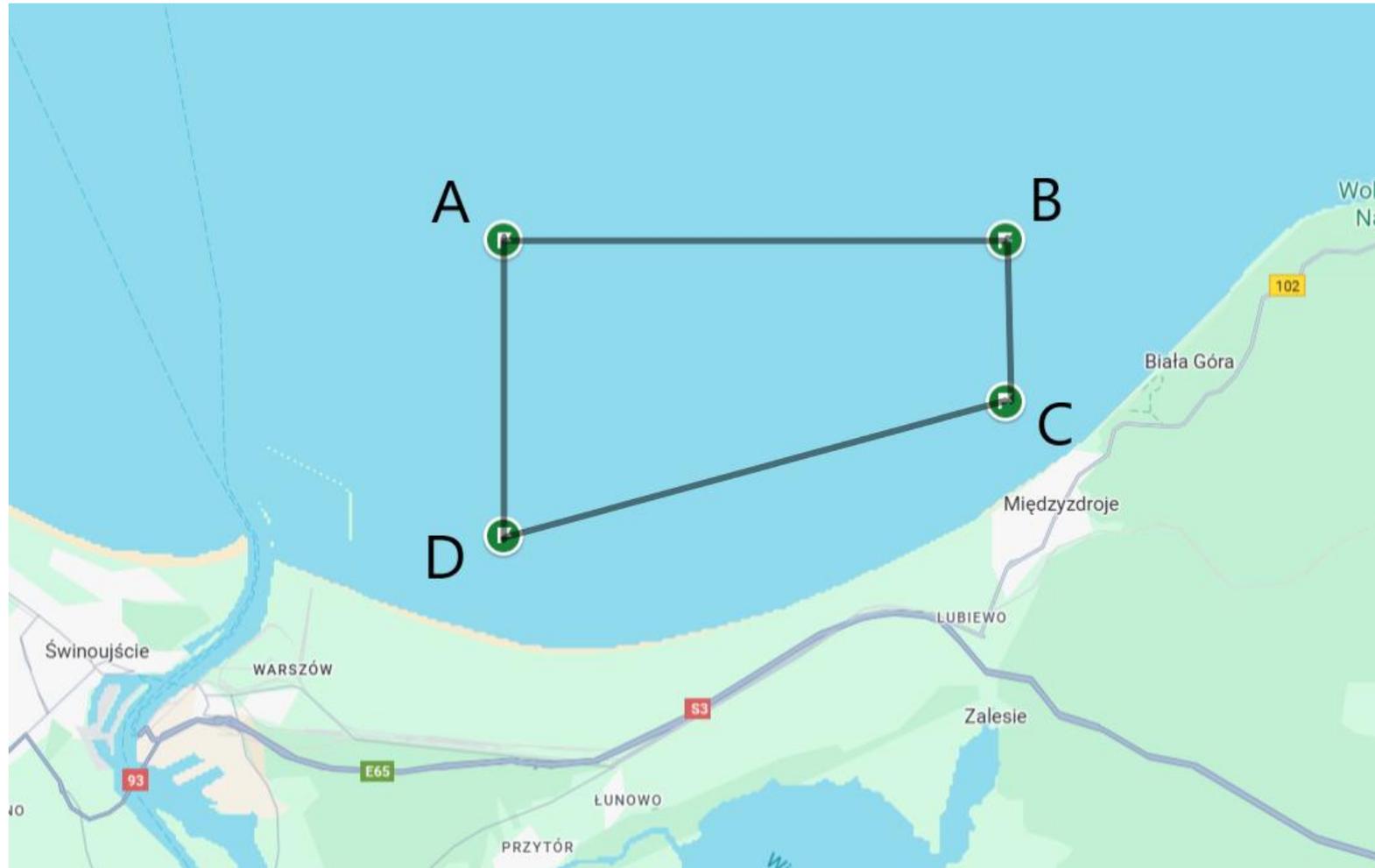
	Country	Name of ship	Organization	Crew
1	Denmark	MHV 851 SABOTOEREN	Danish Navy Homeguard	12
2	Denmark	MHV 911 Bopa	Danish Navy Homeguard	12
3	EU	Norden	European Maritime Safety Agency	9
4	Estonia	Kindral Kurvits	Estonian Navy	18
5	Finland	FNS Louhi	Finnish Navy	32
6	Germany	Arkona	Havariekommando	16
7	Germany	Vilm	Havariekommando	6
8	Lithuania	ŠAKIAI	Lithuanian Navy	22
9	Sweden	KBV034	Swedish Coast Guard	7
10	Poland	Kapitan Poinc	Maritime Search and Rescue Service	12
11	Poland	Czesław II	Maritime Search and Rescue Service	5
12	Poland	Planeta I	Maritime Office Szczecin	7
13	Poland	Pasat (observer vessel)	Maritime Search and Rescue Service	7
14	Poland	Cyklon (popcorn vessel)	Maritime Search and Rescue Service	4
			total:	169

„classic” oil spill scenario

The exercise scenario focused exclusively on responding to an offshore oil spill incident. The objective was to activate and coordinate relevant response teams and resources, including initial notification procedures, mobilization of offshore response vessels, deployment of containment and recovery equipment, and implementation of aerial surveillance for spill monitoring. No hazardous and noxious substances (HNS) or emergency towing elements were included in this exercise. The scenario aimed to test operational readiness, communication, and coordination between offshore operators, response contractors, and relevant authorities.



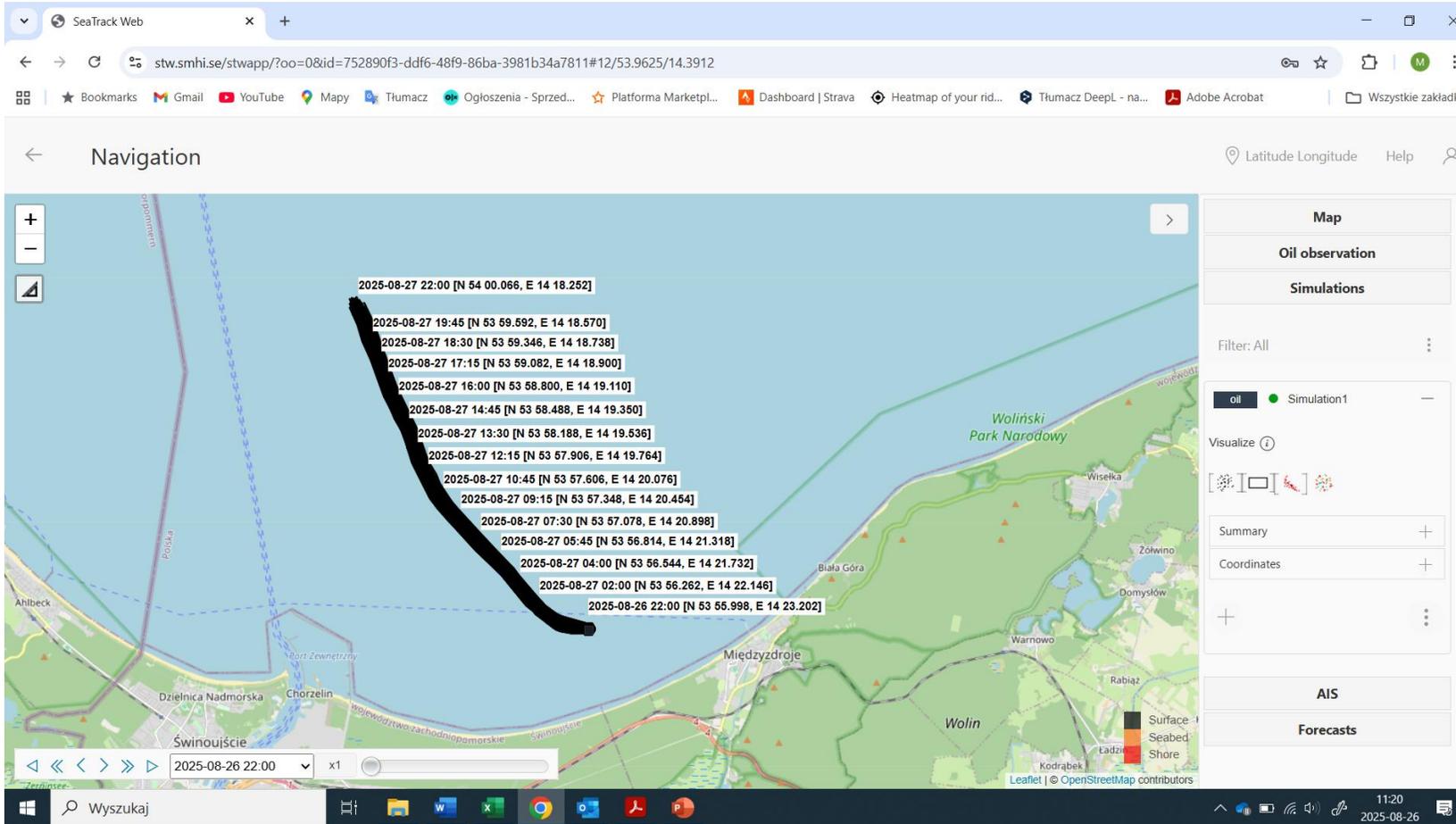
Offshore Exercise Area



A $\phi = 53^{\circ} 57.7' N$	$\lambda = 014^{\circ} 20,0' E$
B $\phi = 53^{\circ} 57.7' N$	$\lambda = 014^{\circ} 26,2' E$
C $\phi = 53^{\circ} 56.3' N$	$\lambda = 014^{\circ} 26,2' E$
D $\phi = 53^{\circ} 55.3' N$	$\lambda = 014^{\circ} 20,0' E$

Oil spill simulation

Oil spill was simulated by 10m³ of popcorn



STW simulation 26.08.2025

Balex Delta 2025 Shoreline Part

**Shoreline Part will take place on
the 27th of August 2025
(Wednesday)**

During the shoreline part of the
exercise, three episodes will be
carried out:

1. Oil Pollution Response.
2. Oiled Wildlife Response.
3. Chemical munitions washed up
on the beach.



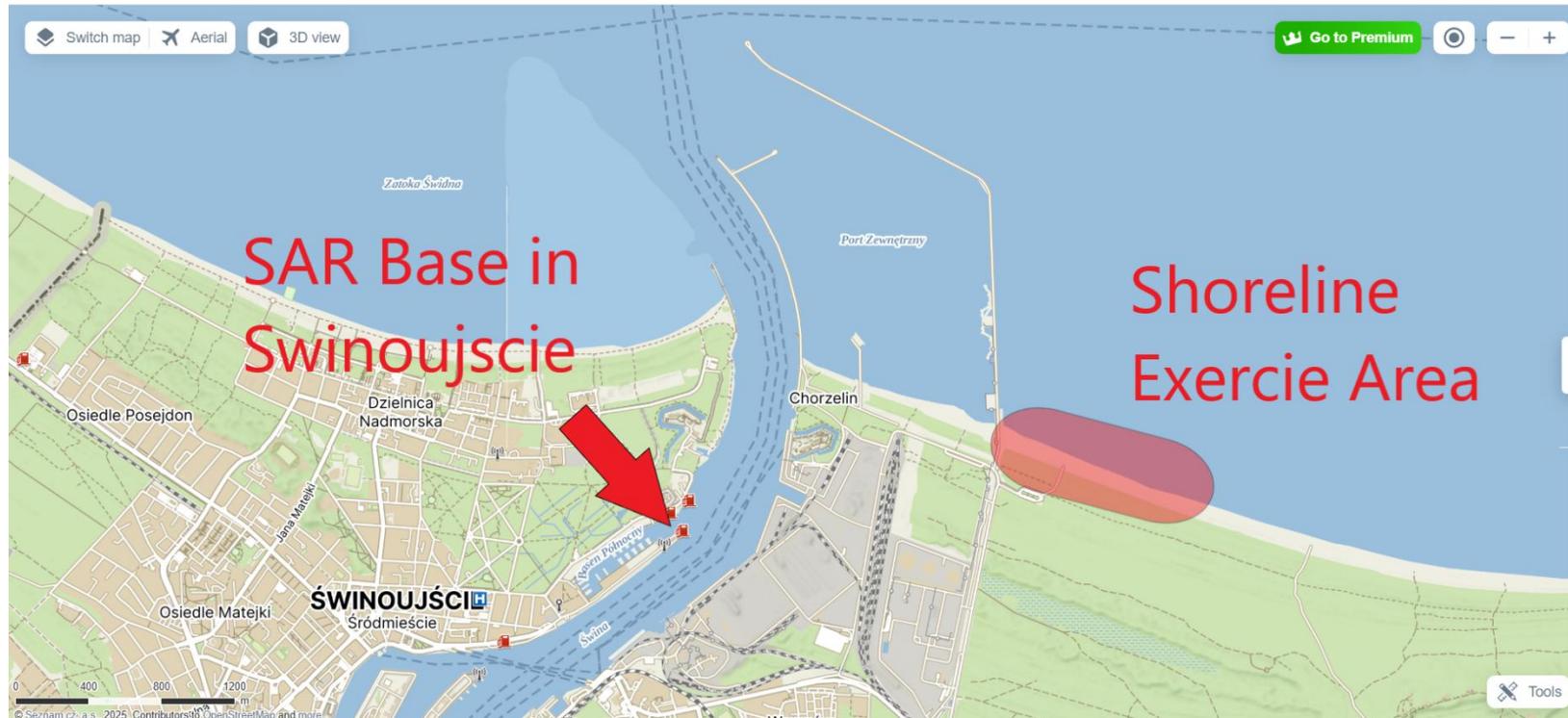
Balex Delta 2025 Shoreline Part

Main organiser: West Pomeranian Voivodeship Office in Szczecin

Participants:

- West Pomeranian State Fire Service,
- Maritime Office in Szczecin,
- Polish SAR Service,
- 18th West Pomeranian Territorial Defence Brigade,
- 8th Coastal Defence Flotilla (Polish Navy)
- West Pomeranian Veterinary Inspection,
- West Pomeranian Inspectorate for Environmental Protection,
- WWF Poland Foundation,
- Wolin National Park,
- Polish Border Guard
- West Pomeranian Police
- Bundesanstalt Technisches Hilfswerk (THW) - Germany

Exercise Area – shoreline



Episode 1

Oil Pollution Response



Episode 2

Oiled Wildlife Response

- 10 volunteers from the WWF „Blue Patrol”
- field collection point on the beach (tents) 3 people,
- bird catching teams - 6 people,
- transport from the beach to the centre - 1 person
- Other people involved in the preparation and conduct of the exercise, and introduction to observers: two veterinarians, coordinators (a total of about 8 people)



Episode 3

Chemical munitions

Identification and disposal of drums of Chemical Warfare agents.

During shoreline clean-up work, it was noticed that barrel-like objects were sticking out from under the oil layer. During their excavation, it was suspected that they might be remnants of chemical weapons sunk in the Baltic Sea after World War II. Due to the impossibility of visually identifying the contents, it is not possible to determine the actual contents.

Verification of national procedures for responding to a crisis incident, including the use of specialised military units designated to operate with chemical warfare agents.





Organizational Conclusions from BALEX 2025 Exercise

- Importantly, the exercise was a **rare opportunity to have all relevant institutions engaged simultaneously**, allowing them to focus collectively on a potential large-scale oil spill scenario.
- However engaging **institutions not normally involved in oil spill response** proved challenging, because of limited familiarity with oil spill response frameworks among some participating bodies.
- The overall planning and coordination of the exercise required a **heavy organizational workload**, highlighting the need for clearer task distribution and early planning.

Thank You for Attention

Maciej Grzonka – maciej.grzonka@sar.gov.pl

Maritime Search and Rescue Service



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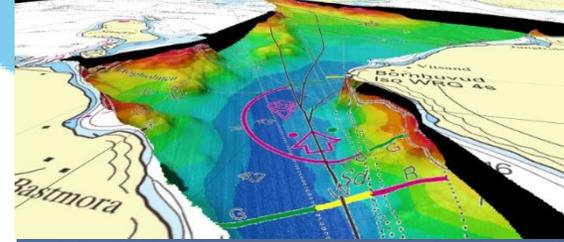
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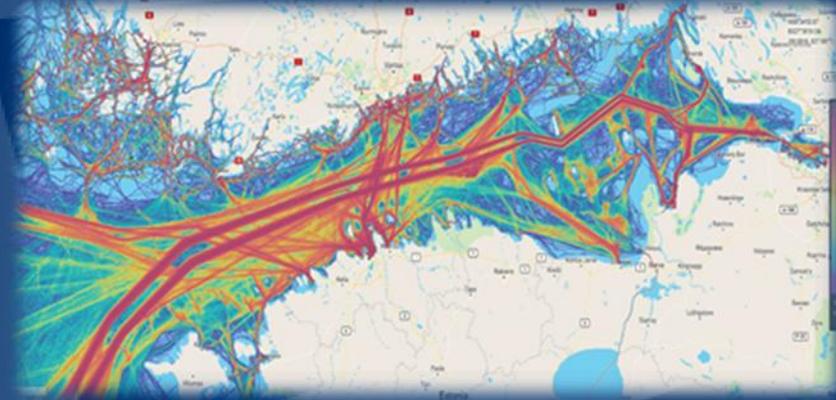
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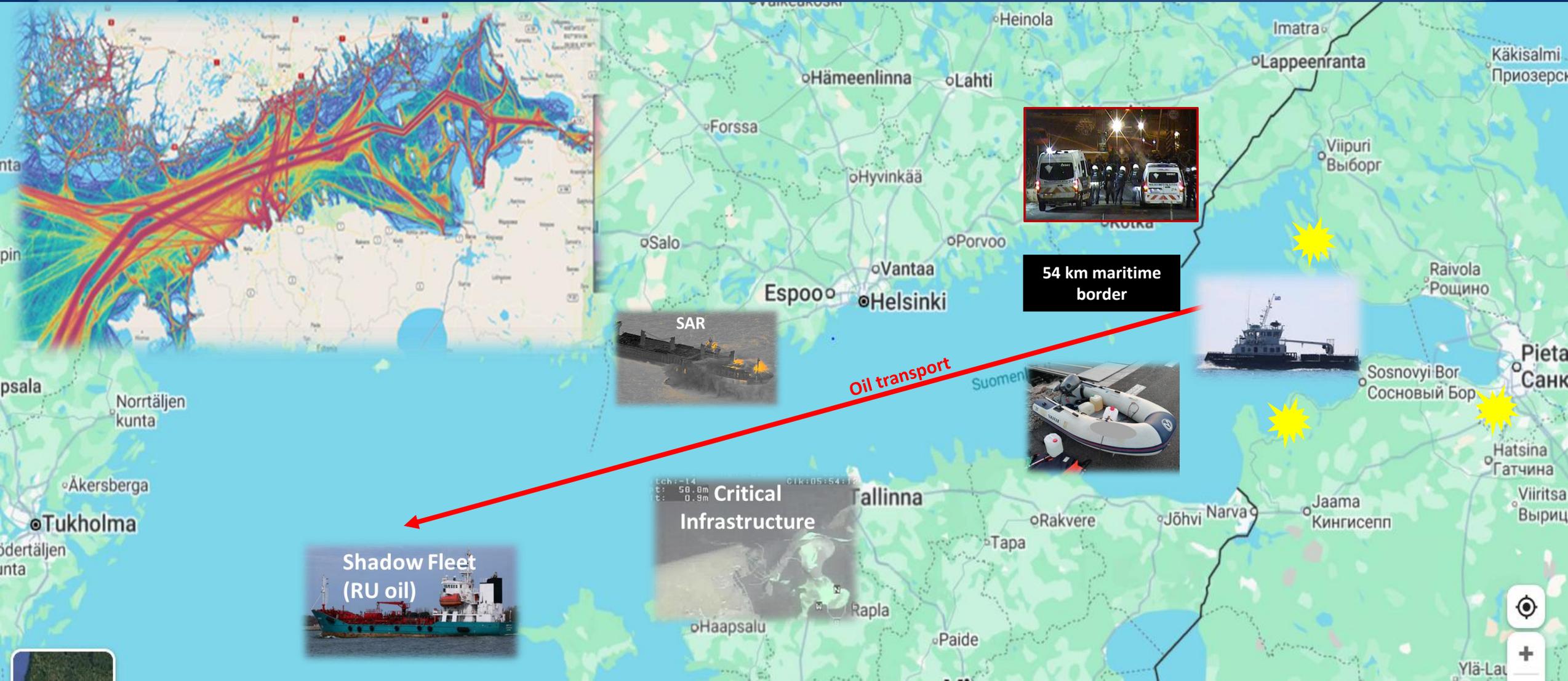
Current challenges in civil maritime security in the region



Classification of the presentation: Public

Commander Pekka Niittylä
Finnish Border Guard HQ, Maritime Safety and Security Unit
Pekka.niittyla@raja.fi

Current challenges in civil maritime security in the region



Challenges related to the Shadow Fleet

Shadow fleet poses a **very significant risk to marine environment and safety** in Northern Baltic

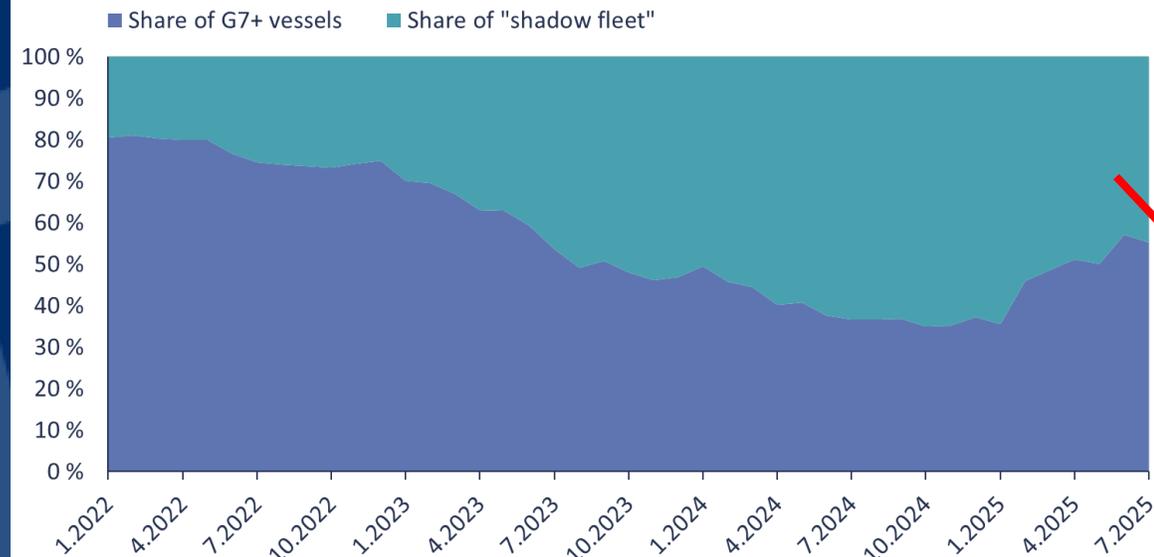
- **Amount of oil transported is in same level** than before the war and sanctions (~ 80 oil tankers / week)
- Vessels are old → increasing number (25 %) **older than 20 years**
- Half of the vessels **does not carry reliable insurance certificate** from western P&I → cleaning costs for EU and coastal state
- Technical condition
- Crew competence in ice navigation?

RISKS

- Lives lost at sea
- Environmental damage
- Maritime supply chains
- Maritime safety
- And many other implications should a major accident occur



Share of Russian maritime oil exports handled by vessels owned or insured in price cap coalition countries



Source: CREA Russia Sanctions Tracker. The figure is based on the volumes of crude oil and oil products exported from Russian ports. In crude oil shipments only, the share of the shadow fleet is significantly higher. "Shadow fleet" refers to all vessels without G7/EU/Norway issued insurance.

© Bank of Finland, 8 Sept 2025

Challenges related to oil recovery

- New fuel types, applicability of the existing equipment in recovering spills of these fuels.
- Changes in oil transportation pattern.
- Response in ice conditions.
- Response in darkness.
- HNS response.



Security in GoF, GNSS disturbance and AIS-spoofing

- Russia has interfered with satellite positioning signals in the Gulf of Finland since spring 2024.
- Since autumn 2024, a phenomenon has been observed in the signals of the AIS system used to prevent collisions between vessels travelling to Russia.
- The interference with satellite positioning is likely to be related to the protection of the oil terminals in the eastern most part of the Gulf of Finland, while the reoccurring fabrication of the AIS signal (spoofing) is related to the concealing of tracks related to buying Russian oil.
- **Both phenomena endanger maritime safety, especially in the Gulf of Finland, and they have increased in frequency during summer 2025. There are several close calls for severe maritime accident because of the phenomenon.**

What should be considered from the Civil Maritime perspective?

- GNSS systems (incl. related systems) are not reliable. Even if Your systems work, it doesn't mean that other ships have functioning devices. Can You navigate without GPS?
- Risks related to a major SAR and/or oil recovery related incident are very high. Should an incident occur, it would effect many aspects of Civil maritime traffic.
- Tensions in the Baltic Sea are high due to the war in Ukraine – presence of Navy and LE vessels is hightened, security related checks (in ports and at sea) are more frequent and thorough.



RAJAVARTIOLAITOS
GRÄNSBEVAKNINGSVÄSENDET
FINNISH BORDER GUARD



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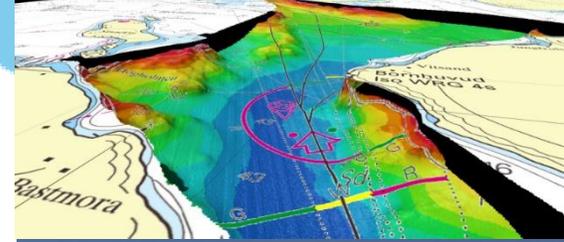
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GNSS Interference – effects and countermeasures

Niklas Hehenkamp



Overview



- 1. What is GNSS jamming and spoofing?**
- 2. Effects of GNSS interference**
- 3. Countermeasures within the GNSS ecosystem**
- 4. Resilience through backup systems**

WHAT IS GNSS JAMMING AND SPOOFING?

Global Navigation Satellite Systems

- GNSS: GPS, GALILEO, BEIDOU, GLONASS
- Orbit: ~20000 km
- Weak (below noise level) signal is acquired and tracked through advanced correlation techniques
- Time-of-arrival measurements enable positioning
- It's everywhere!



Jamming & Spoofing

Jamming

- Strong radio signal superimposes GNSS signal
- Acquisition and tracking denied

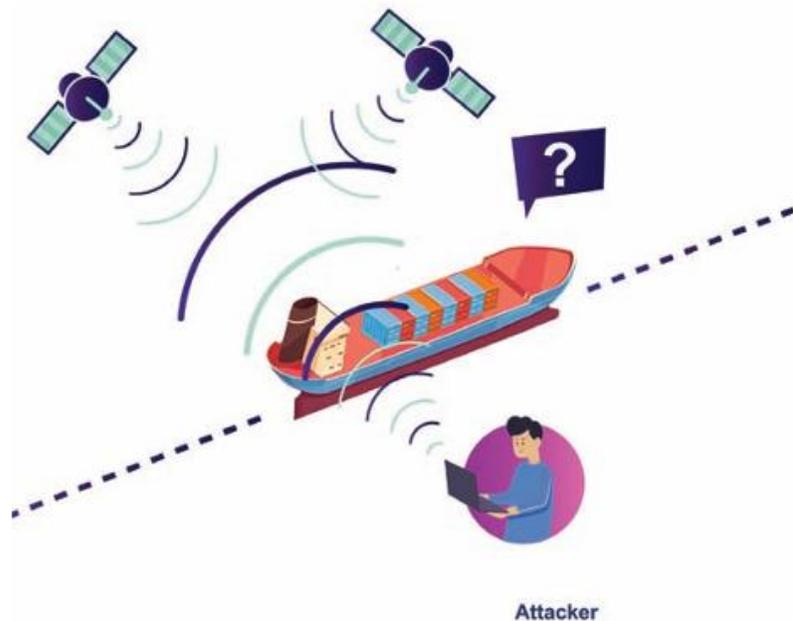


Figure 1 Jamming

Spoofing

- Attacker sends manipulated GNSS signals
- Target acquires and tracks „fake“ signal
→ False position assumed

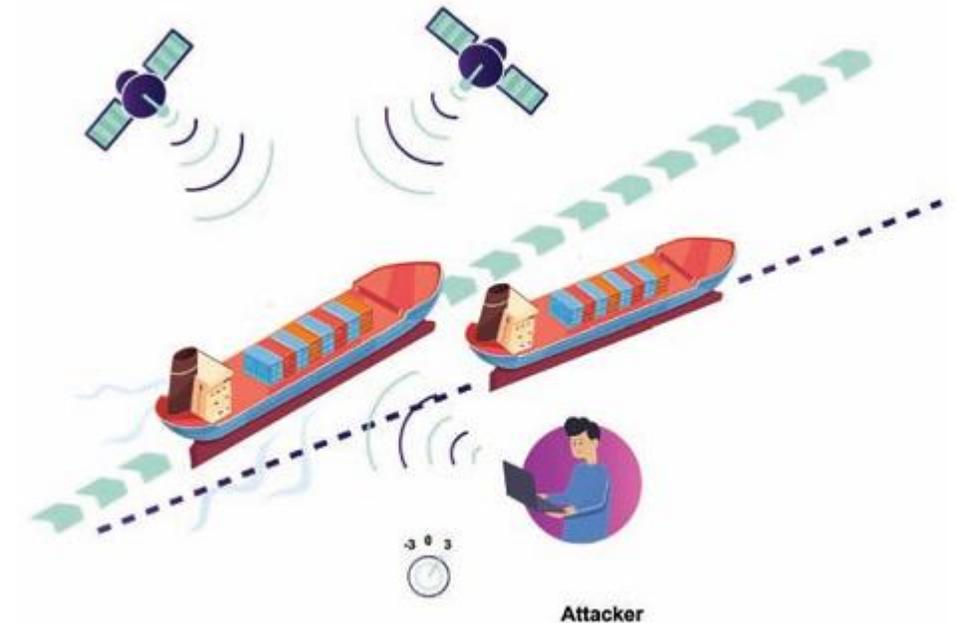


Figure 2 Spoofing

EFFECTS OF GNSS INTERFERENCE

The Baltic Jammer

- Increase in interference to GNSS signals in the Baltic Sea region since December 2023
- Affect civil users and pose hazards
- Jamming on maritime domain → security applications; military operations, cargo tracking and fishing fleet monitoring

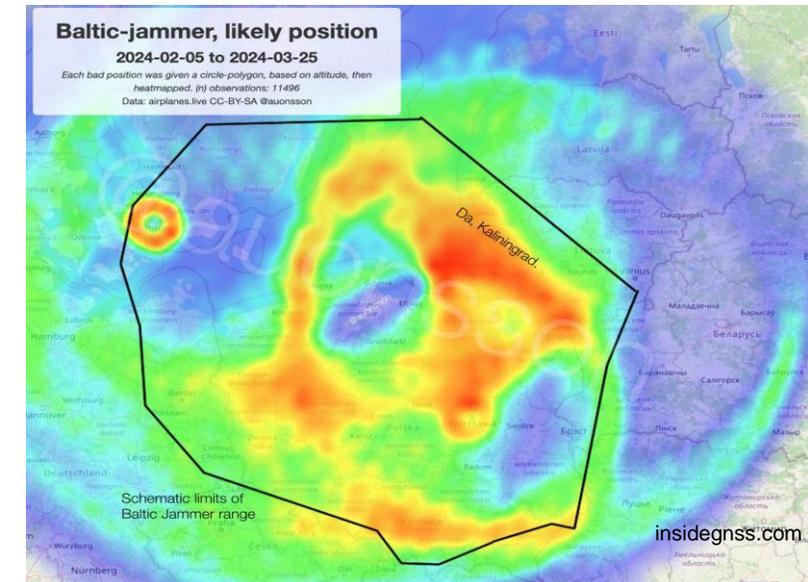
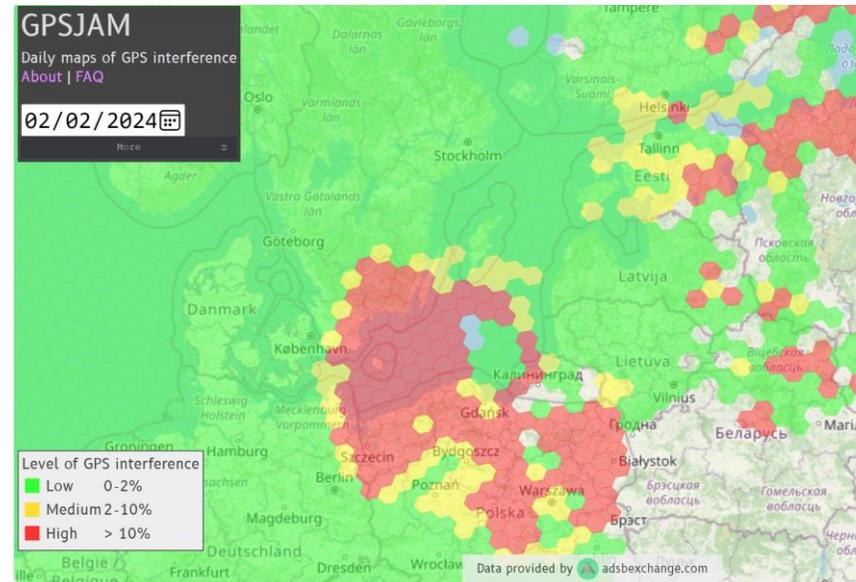


Figure 1: GNSS RFI affecting ADS-B data on 2nd February 2024(left), Baltic Jammer likely position analysis(right)

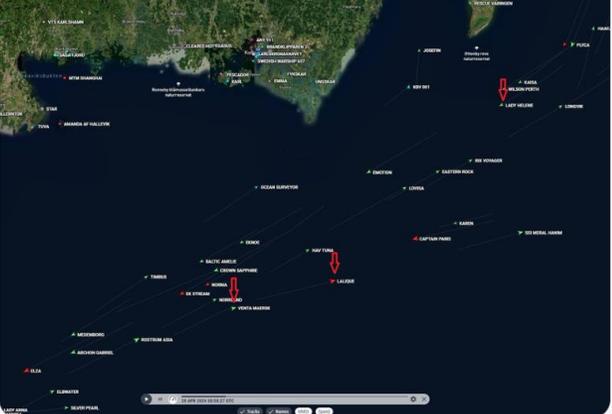
Impact of Baltic Sea GNSS Interference

Several ships calling out "having no GPS for hours" last night.

Not sure what to make of this, if its "man-made" or a technical issue. At a first glance it does not seem to affect positions reported by AIS.

Replied to @HrKrog and @aonsson
Checked my VHF16 logs...

VENTA MAERSK called out on VHF16 at 00:58 UTC asking if anyone else had GPS-issues. LALIQUE confirmed, so did LADY HELENE and stated...
[Show more](#)



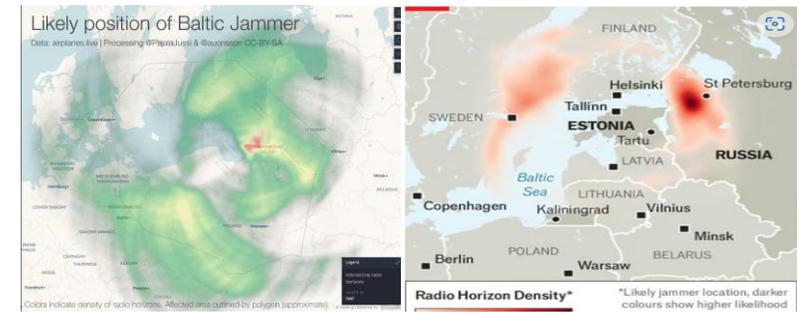
- **Vessels heavily depend on GNSS**, not only for navigation → also for timing signals that synchronize critical communication and control systems
- **Disruptions to GNSS signals** can affect Electronic Chart Display and Information Systems (ECDIS), AIS transponders, and even **onboard communication submodules**
- **ADS-B** research **contribution** to aviation safety and threat detection → similar methodologies can be applied to **GNSS in the maritime domain** (Medina, Daniel, et al. IEEE, 2019.)



The Economist explains

Who is jamming airliners' GPS in the Baltic?

Russia seems to be the culprit, but it may be inadvertent



GNSS Jamming in Estonia Leads to Finnair Flight Cancellations



COUNTERMEASURES WITHIN GNSS

Countermeasures

Signal level mitigation

- Power monitoring
- C/N0 monitoring
- Coordinates monitoring
- Time monitoring

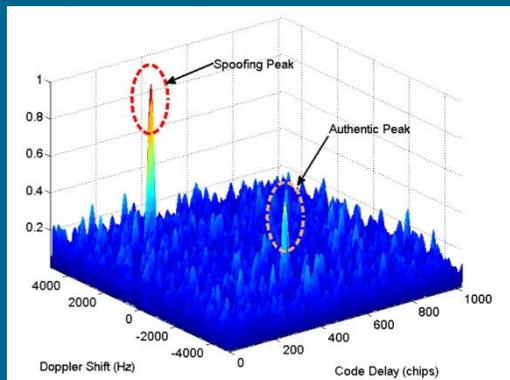


Image: University of Calgary

Antenna design

- Multiple antennas: dynamically adjust antenna pattern to suppress jammer
- Multiple receivers



Image: DLR

Redundancy

- Comparison of multiple sensors (IMU, Cameras, Radar, ...)



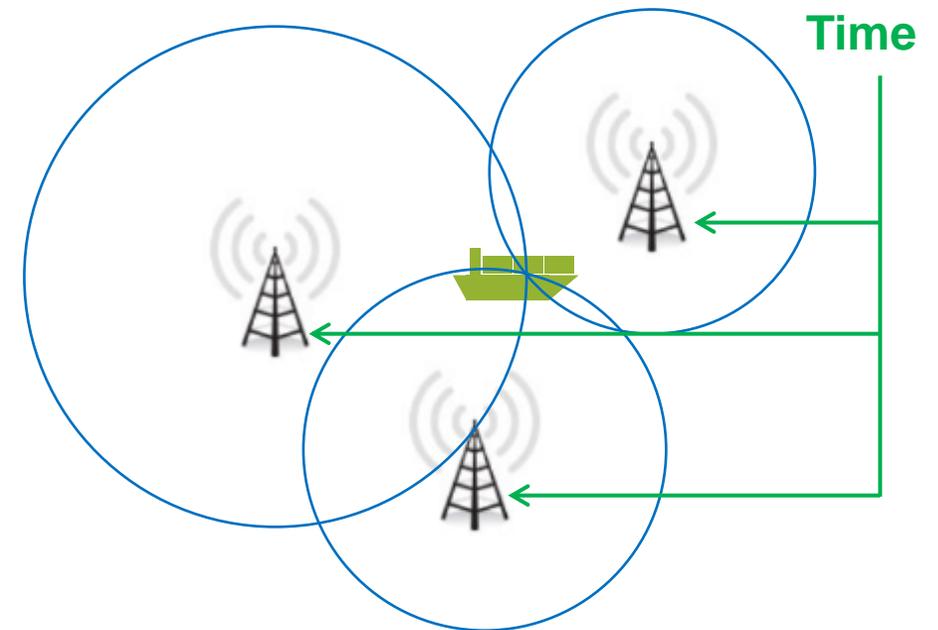
Image: DLR

BACKUP SYSTEMS: R(ANGING)-MODE

Maritime Alternative: R-Mode

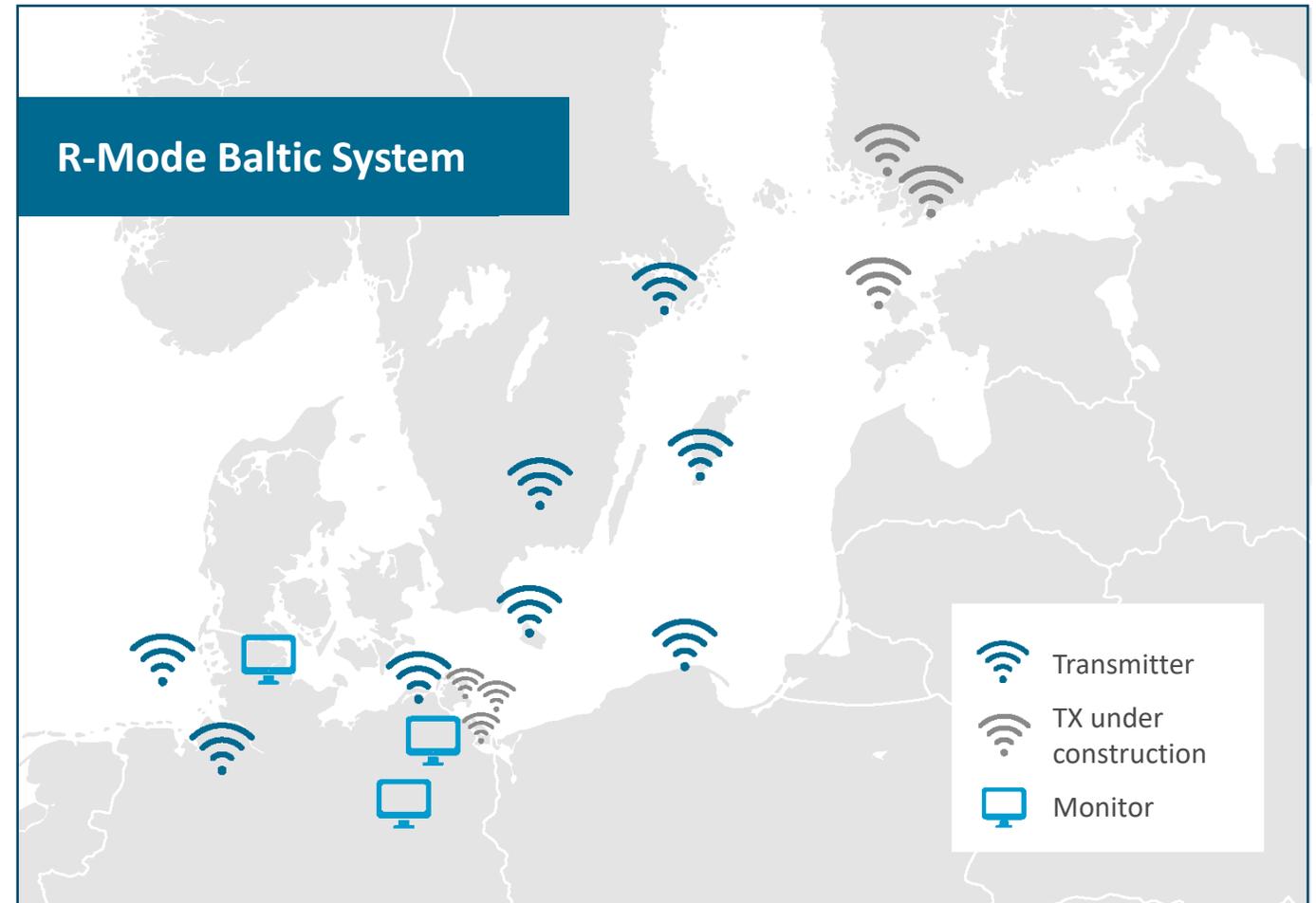
R(anging)-Mode is a terrestrial radionavigation system, that

- sends time-synchronized radio signals
- Supports existing maritime radio infrastructure
- consists of MF and VHF transmitters
- **Trustworthy**: operated by national maritime administrations
- **Increases Resilience**: Uses different frequency bands compared to GNSS and leads to higher reception performance
- **DLR** has been leading the development of an R-Mode test system and developing core technology since 2017



R-Mode Baltic system

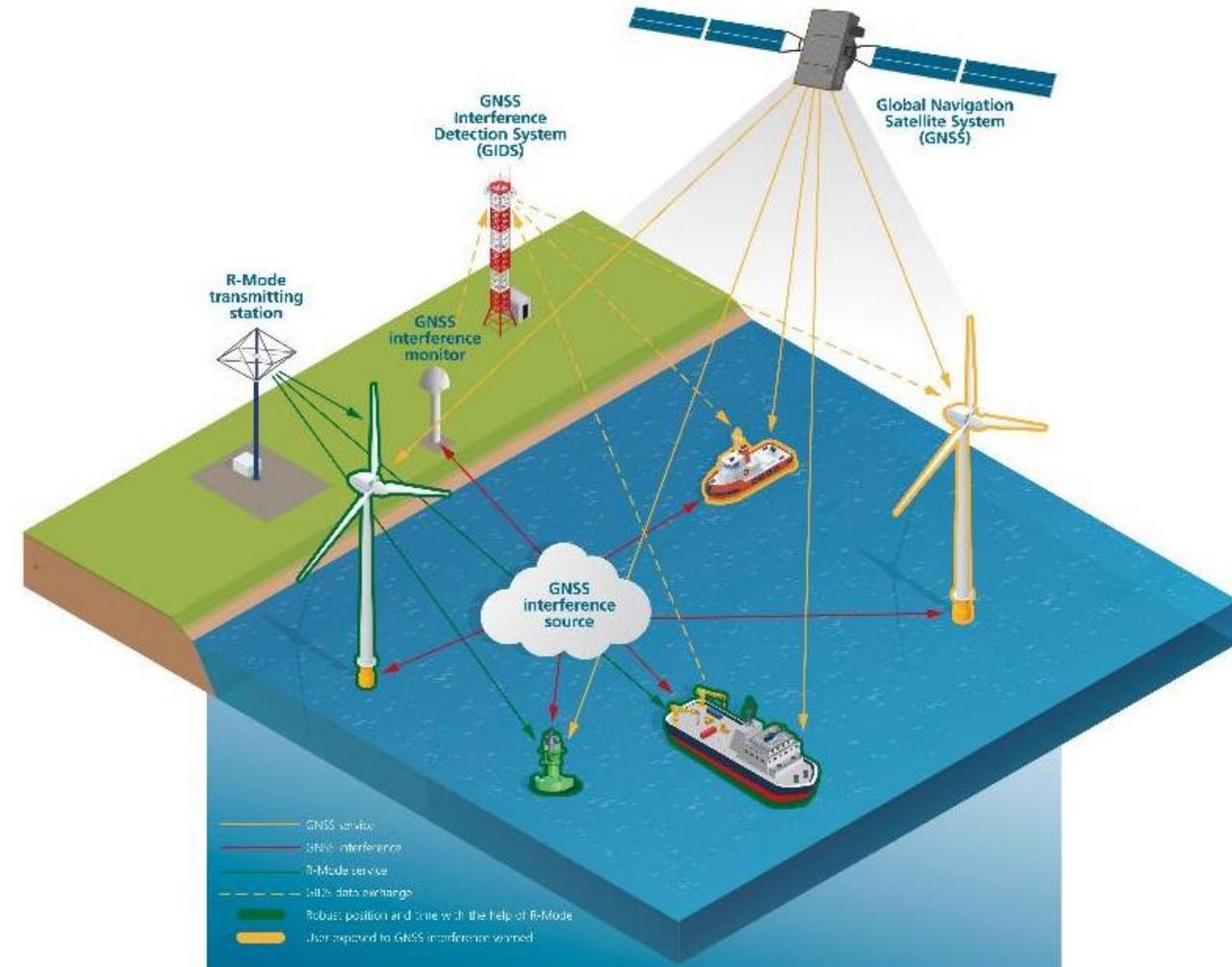
- MF+VHF R-Mode test bed in the Baltic Sea, implementation since 2017
- Partners: Germany, Poland, Sweden, Denmark, Norway, Estonia and Finland
- Pre-operational R-Mode System 2026
- Preparation of international standards and agreements for the start of operational operations



ORMOBASS (11/2023 – 3a)

Operational R-Mode Baltic Sea System to support resilient navigation

- Extension of the R-Mode Baltic test bed to the area from Heligoland to Helsinki
- Implementation and validation of core components of the operational R-Mode (design and monitoring)
- Development of a combined GNSS + R-Mode receiver for positioning and identification of GNSS interferences
- R-Mode standardisation at IALA, IMO, IEC



Imprint



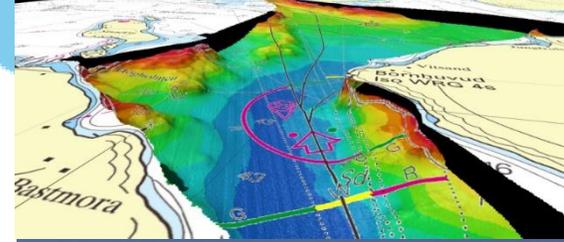
Topic: GNSS Interference – effects and countermeasures

Date: 16.10.2025

Author: Niklas Hehenkamp

Institute: Institute of Communications and Navigation

Image credits: DLR (CC BY-NC-ND 3.0) unless stated differently



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What are your two main security challenges?



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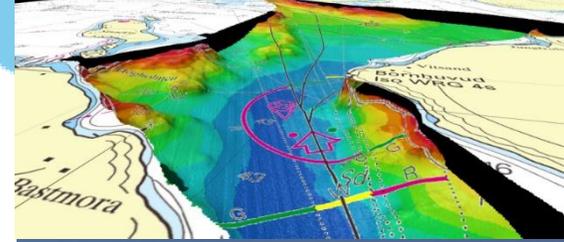
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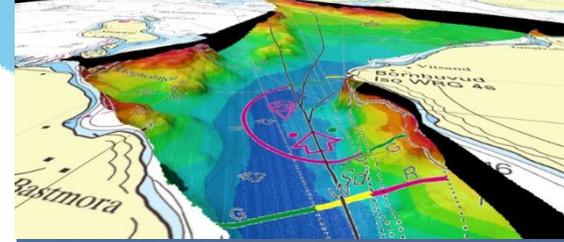
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