

**United Nations/Moldova/United States of America
Workshop on the Applications of
Global Navigation Satellite Systems
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GLOBAL NAVIGATION SATELLITE SYSTEM AS A COMPONENT OF NATIONAL INFRASTRUCTURE

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- Content of presentation:
 - Introduction
 - GNSS vulnerabilities and national infrastructure
 - Managing GNSS vulnerabilities
 - Benefits of GNSS vulnerabilities management
 - Conclusion

Departures Terminal 1

ENREGISTREMENT CHECK IN

Time	Carrier	Flight	Destination	Check-in	Status
18:10	Wizzair	WW 1530	Birmingham	F	Cancelled
18:15	British Airways	BA 355	London Heathrow	D	Cancelled
18:35	Iberia	IB 8755	Madrid	E	Cancelled
18:45	Lufthansa	LX 561	Zürich	C	Cancelled
19:00	Lufthansa	LH 4139	Frankfurt	E	Cancelled
19:25	British Airways	BA 8476	London City	D	Cancelled
19:25	TAP Air Portugal	TP 485	Lisbonne	E	Cancelled
19:35	SAS	SK 8690	Göteborg	F	Cancelled
20:05	Olympic Air	OS 422	Vienne	E	Cancelled
20:15	Afrikair	AF 8158	Genève	C	Cancelled
20:30	Blue Air	B6 150	Bucarest	B	Cancelled
20:30	Ryanair	BE 1616	Southampton	F	Cancelled
20:40	Iberia	IB 8781	Barcelone	E	Cancelled
20:50	Eurowings	4U 425	Cologne	F	Cancelled
21:00	British Airways	BA 357	London Heathrow	D	Cancelled
21:00	Transavia	HG 8015	Vienne	C	Cancelled
21:00	Lufthansa	LH 8258	Luxembourg	C	Cancelled
21:15	Lufthansa	LH 4157	Munich	E	Cancelled
21:45	KLM	HV 5586	Amsterdam	E	Cancelled
21:45	Lufthansa	LH 5397	Bruxelles	F	Cancelled
22:15	Brussels Airlines	BV 1771	Rome Fiumicino	C	
22:30	Transavia	PH 2758	Copenhague	E	Cancelled
22:50	Wizzair	WW 5372	Nottingham	E	Cancelled
23:40	Transavia	BT 3917	Djerba	C	Expected 01:15
23:45	Vueling	VY 8611	Barcelone	C	Cancelled
06:40	Lufthansa	LH 4159	Munich	E	Cancelled
07:00	Lufthansa	LX 565	Zürich	C	Cancelled
07:25	Lufthansa	LH 4143	Frankfurt	E	Cancelled

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- Introduction
 - Increasing number of GNSS applications: everyday life, navigation, traffic and asset management, public security, agriculture, forestry, science etc.
 - GNSS vulnerabilities
 - Need to assure seamless and robust GNSS operation



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- GNSS vulnerabilities and national infrastructure
 - Sources of GNSS vulnerabilities
 - Global vulnerabilities
 - Locally-caused vulnerabilities

SOURCES OF GNSS VULNERABILITIES

POSITIONING ERRORS

DILUTION OF PRECISION

USER EQUIVALENT RANGING ERROR

- satellite ephemeris
- satellite clock
- multipath
- receiver noise
- ionospheric delay
- tropospheric delay

REDUCED SERVICE AVAILABILITY

NATURAL CAUSES

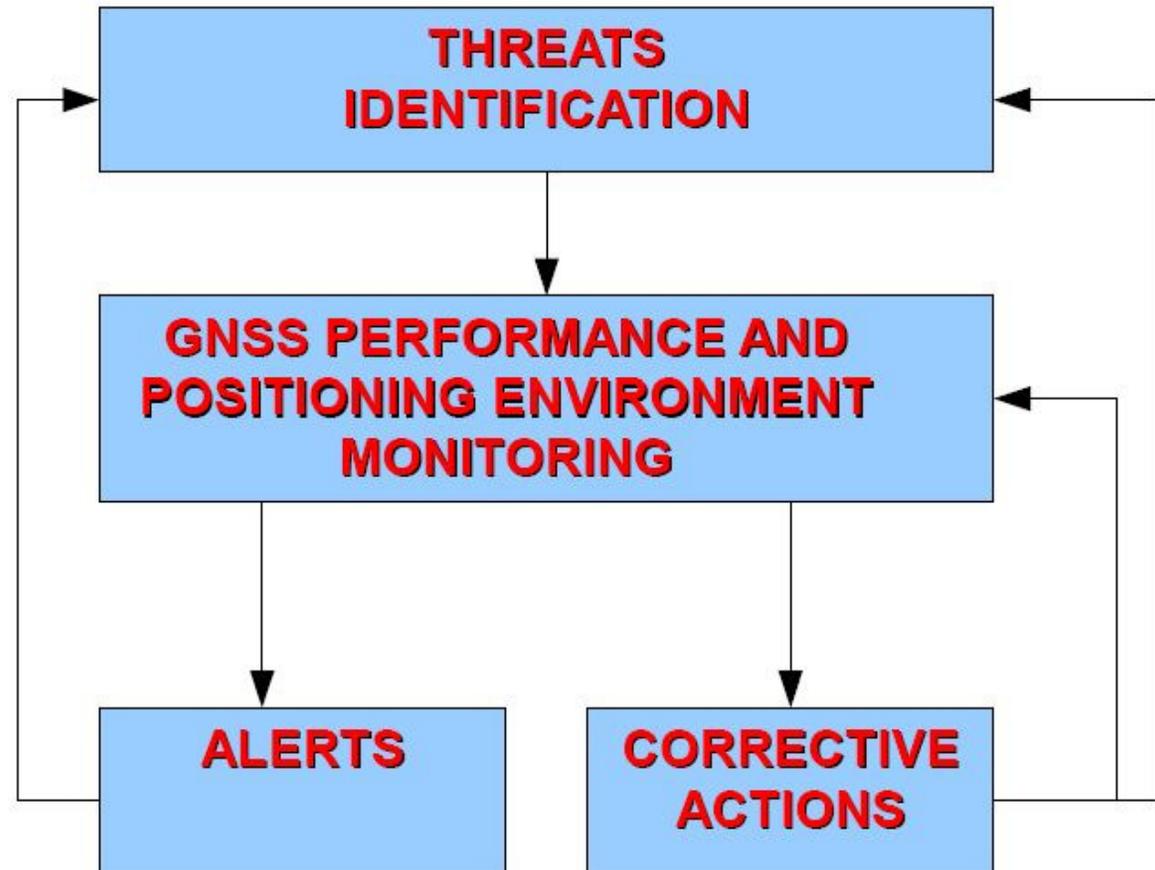
ARTIFICIAL CAUSES

- geomagnetic storms
- ionospheric storms
- volcanic eruptions
- earthquakes

- intentional (jamming)
- non-intentional (non-EMC)

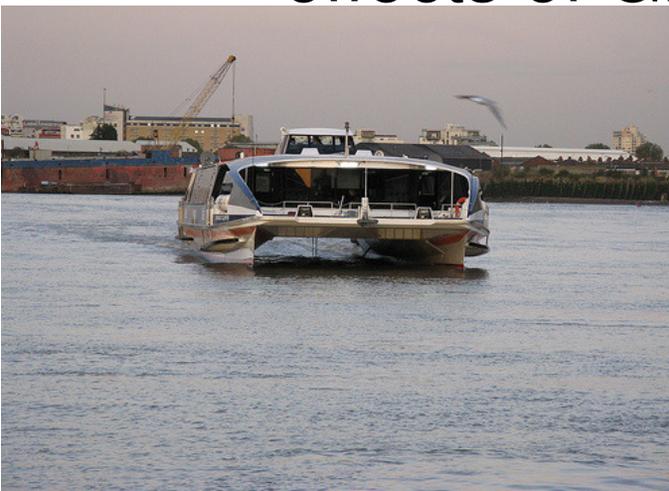
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- GNSS vulnerabilities management procedure
 - General approach
 - Vulnerabilities identification
 - Alert broadcasts
 - Corrective actions
 - International co-operation



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- Benefits of GNSS vulnerabilities management
 - GNSS implementation:
 - voluntary
 - regulatory
 - Demand for advanced systems and services means that GNSS has reached the maturity level
 - GNSS vulnerabilities management helps to tackle effects of GNSS vulnerabilities



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- Conclusion

- GNSS vulnerabilities are caused by global and local sources
- In order to combat local sources, national GNSS vulnerabilities management procedure should be established
- International co-operation is essential in minimising the effects of GNSS vulnerabilities



THANK YOU FOR YOUR ATTENTION !

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