



United Nations  
Global Geodetic Centre of Excellence

## **Hidden risk to critical infrastructure and the economy**

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# *One Satellite Signal Rules Modern Life. What if Someone Knocks It Out?*

Threats are mounting in space. GPS signals are vulnerable to attack. Their time-keeping is essential for stock trading, power transmission and more.



# Reliance on satellites

- We have an ever-increasing reliance on satellites
- ‘A single point of failure’ for some national economies and operation of critical infrastructure
- **Critical Infrastructure operation:**
  - A 2012 report from the U.S. Department of Homeland Security found that 15 of 18 critical infrastructure and key resources sectors relied on the global positioning system (GPS).
- **Economic benefits:**
  - Over the next decade, revenue from GNSS, Earth Observation and satellite telecommunications (80% of the space industry market revenue) has growth rate of ~9%
  - Reaching a total of almost €800 billion.
- This is why countries are investing in GNSS, Earth Observation and satellite telecommunications and want sovereign capability



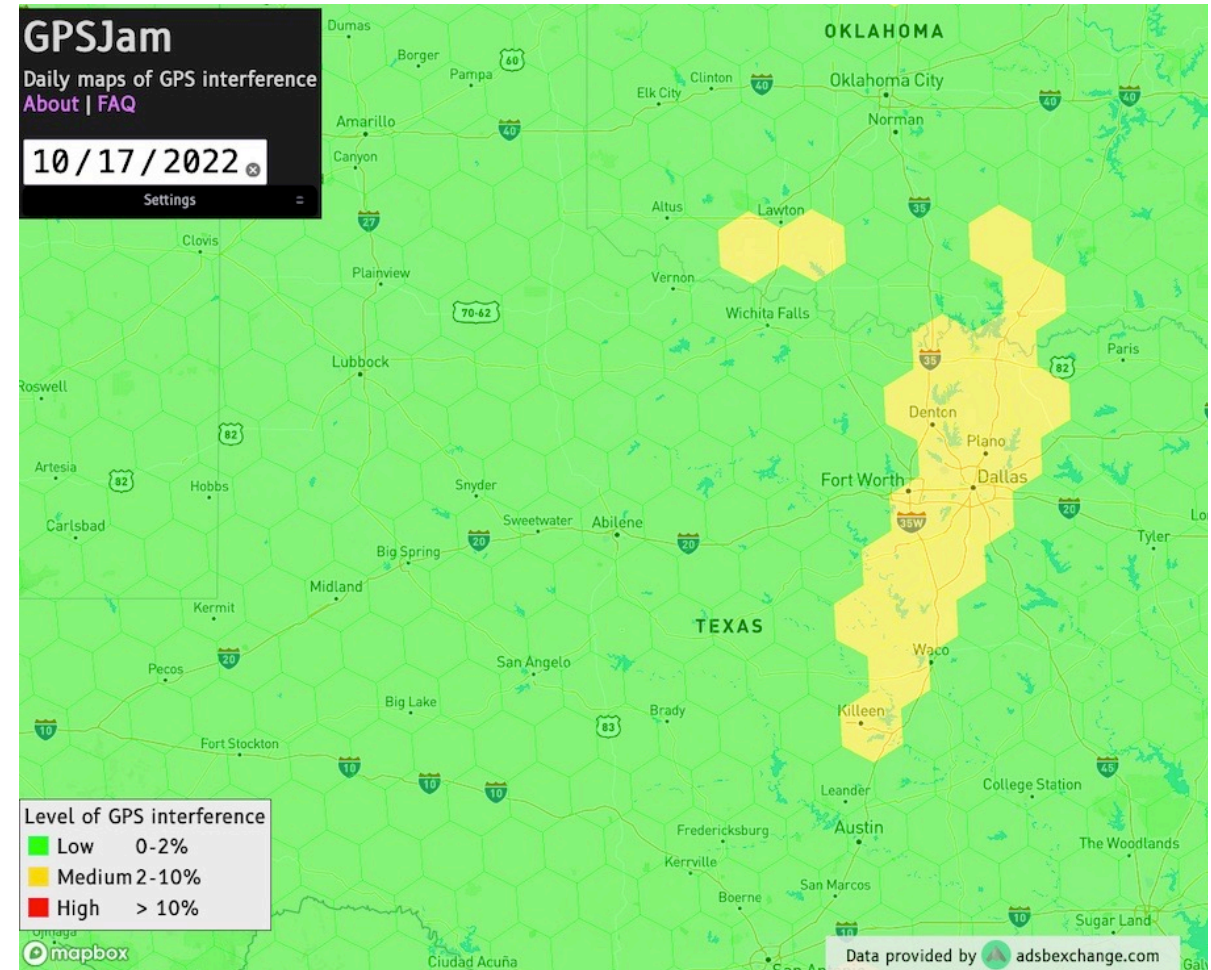
# Back to our scenario – could it happen?

- Yes – but it's unlikely
  - solar storm
  - a coordinated cyber-attack
  - space debris collision event
  - deliberate attack
- Space agencies and satellite operators implement rigorous safety measures and redundancy systems to minimize the impact of potential failures.
- **Member States, space agencies and satellite operators are aware of these risks and are actively work to mitigate these risks.**



# More likely scenario

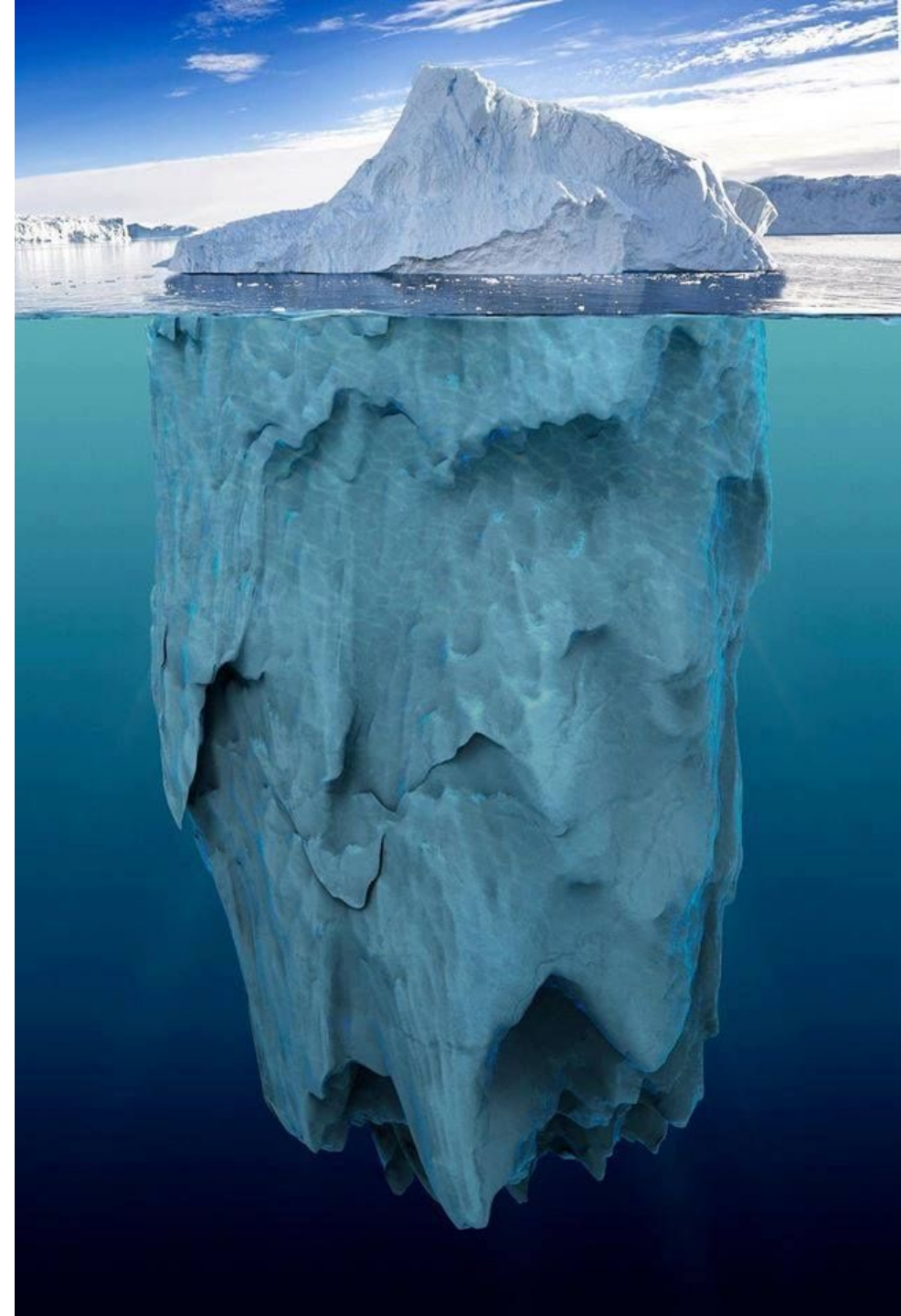
- Subset of localized impacts
  - Outages, degradation of satellite services for a period of time, or in a specific region.
  - Jamming, Spoofing, space weather events (e.g. intense solar activity) or satellite malfunction.
- **Again - Member States, space agencies and satellite operators are aware of these risks and are actively work to mitigate these risks.**



<https://arstechnica.com/information-technology/2022/10/cause-is-unknown-for-mysterious-gps-outage-that-rerouted-texas-air-traffic/>

# Hidden Risk

- The risks that Member States, space agencies and satellite operators ~~are aware of~~ aren't aware of ~~and are actively work to mitigate these risks~~ but threaten our use of satellites and all the applications derived from them.

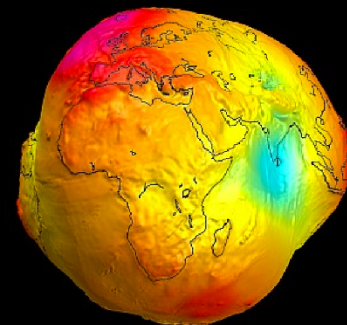
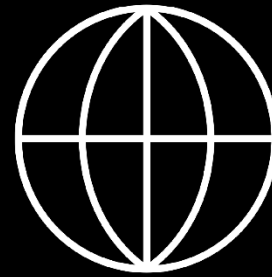
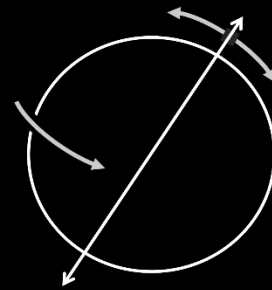
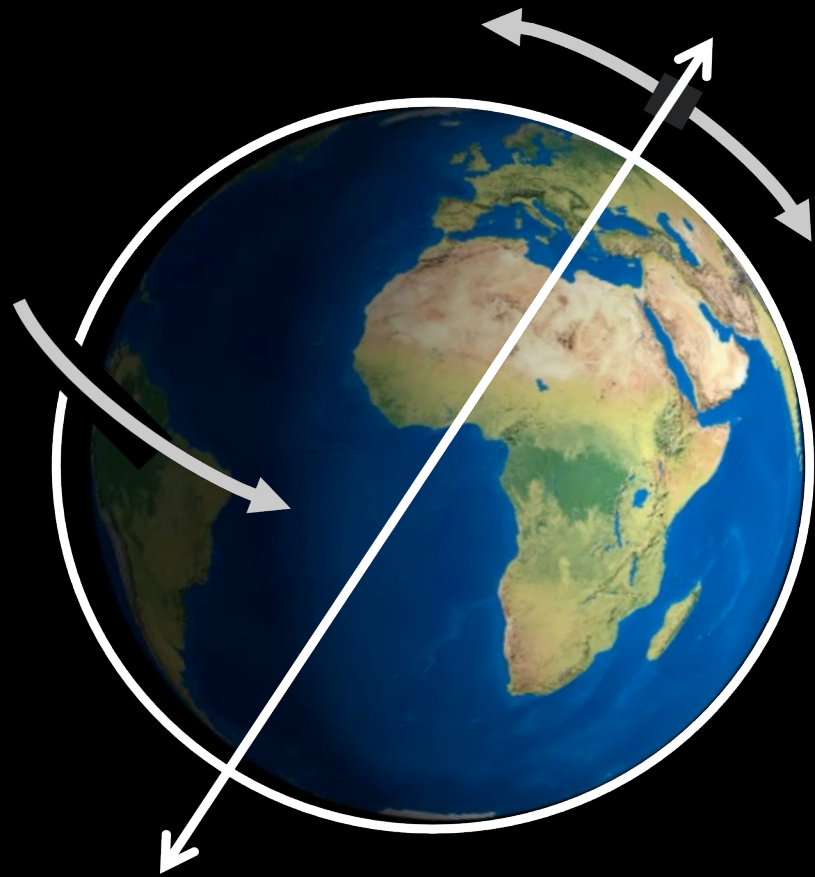


# Geodesy Ground Stations Observations

# Data Collection and Analysis

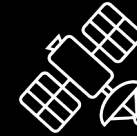
# Geodetic Products

# Space Based Delivery



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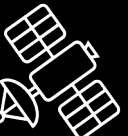
GNSS



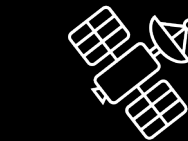
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Safety of life



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Communications



EO

## GLOBAL GEODESY SUPPLY CHAIN

Video source: Vecteezy.com

Deutsches Zentrum für Luft- und Raumfahrt (DLR)

# Weaknesses in the Global Geodesy Supply Chain

## 1. Evidence

- Little to no evidence which is written in a form decision makers can understand
- Why it deserves investment of time, people, or money
- Reports which describe the economic, environmental, and societal benefits don't mention geodesy

## 2. Resources

- Dedicated people and funding
- Reliance on old and aging infrastructure (and people)
- Lack of ground observatories in some parts of world
- Lack of analysis centres for some techniques





# Weaknesses in the Global Geodesy Supply Chain

## 3. Governance

- Lack of formal commitments
- Reliance on in-kind contribution
- Lack of global cooperation and coordination

## 4. Capacity

- Decrease in formal training options
- Decreasing number of geodesists ('Geodesy Crisis')

## 5. Awareness

- No-one knows what geodesy is

