Space Threat Assessment

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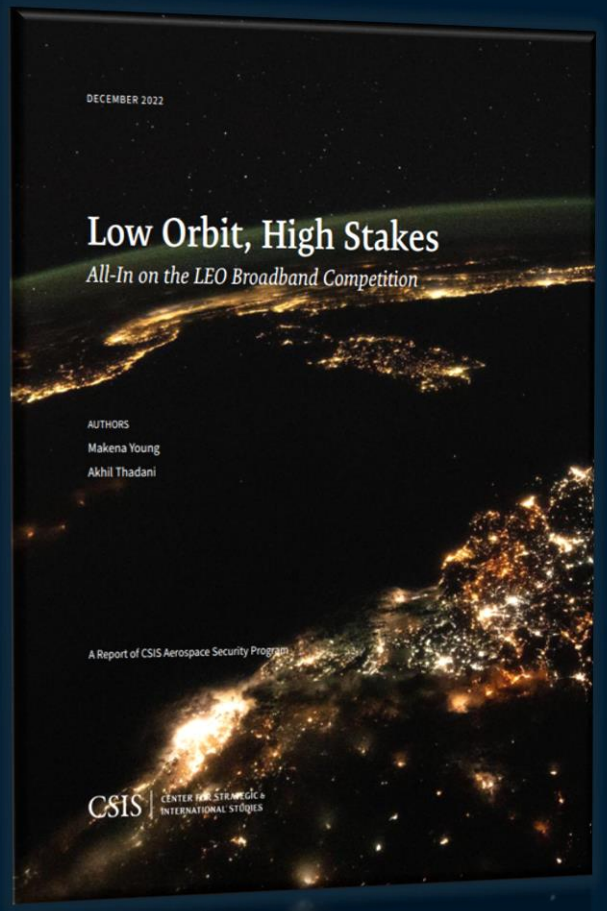
Agenda

About Us

Current Threat Landscape

Counterspace Assessments by Country

Our Mission: Educate and Inform the Public Debate

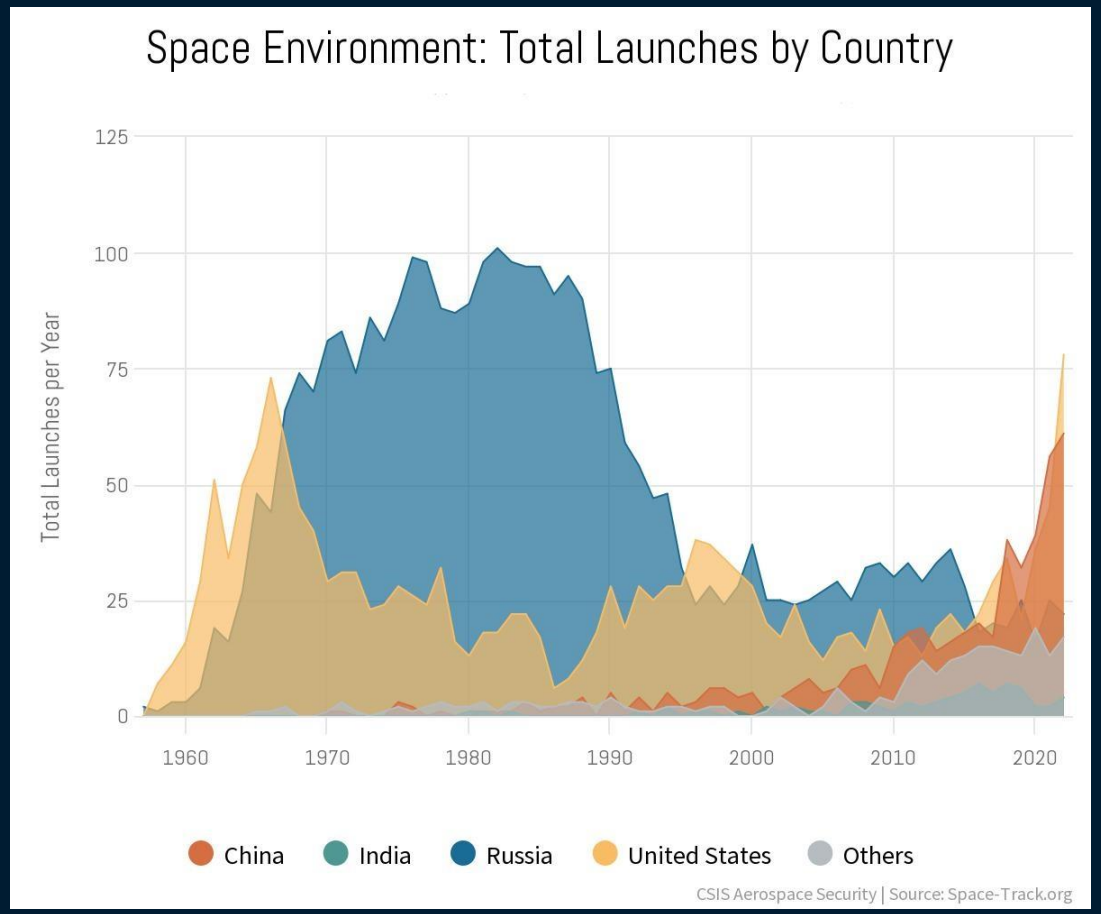


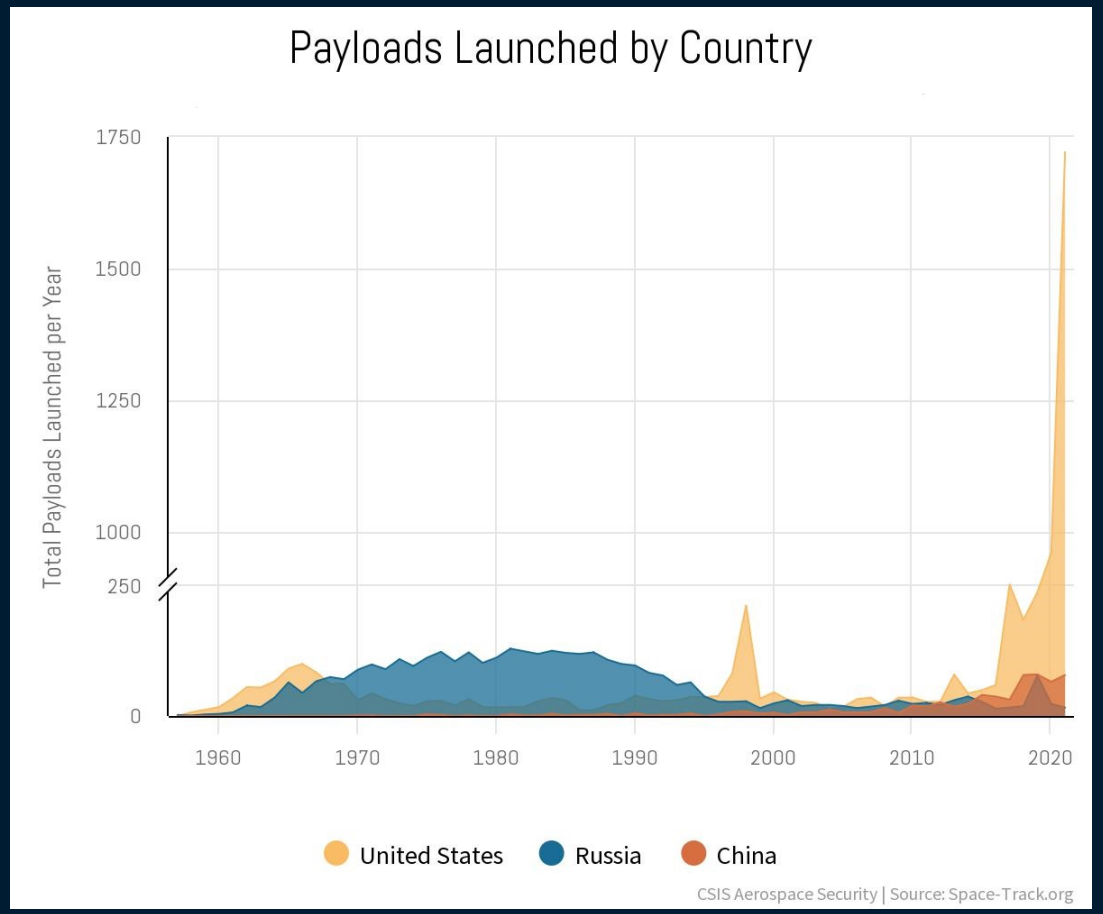
Current Threat Landscape

What is changing in space?

- **Diverse:** More international, more commercial
- **Disruptive:** New entrants, new commercial missions
- **Disordered:** Lack of widely accepted norms, gaps in current laws and treaties
- **Dangerous:** “Juicy” targets in space, proliferation of counterspace capabilities

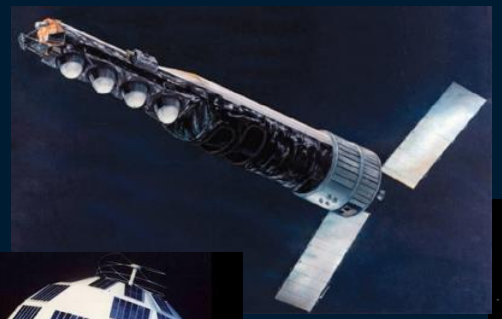
More Diverse: No Longer Dominated by U.S. & Russia





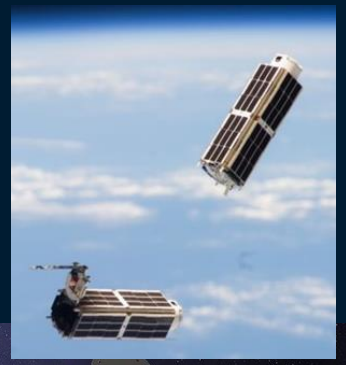
More Disruptive: New & Expanding Commercial Missions

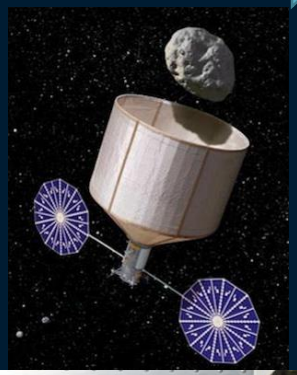
Government-Dominated → Private Sector-Dominated

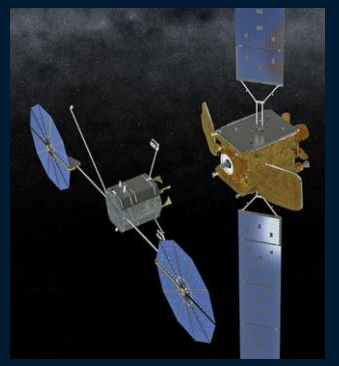








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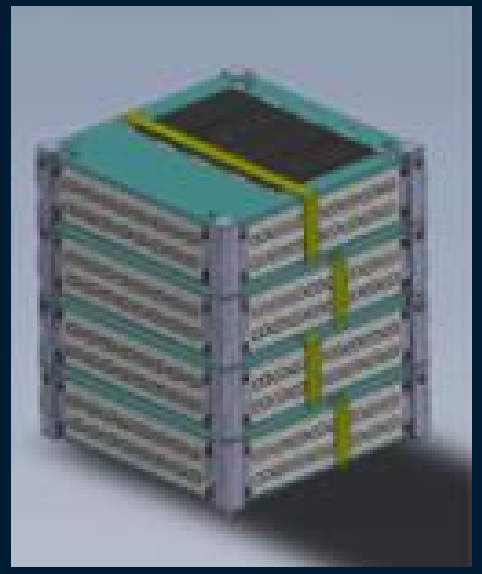
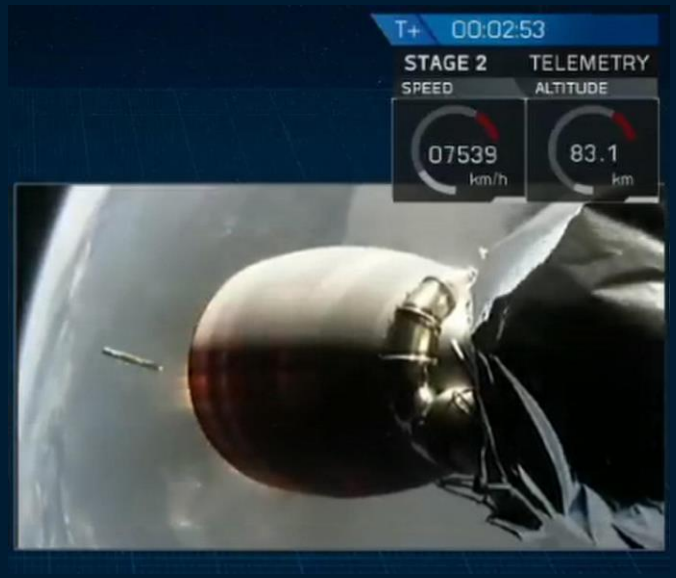
More Disordered: Laws & Regulations Not Keeping Pace



SpaceBee 1-4

Indian PSLV



Falcon 9 Second Stage Video Feed

Falcon Heavy / Spaceman

More Dangerous: Greater Dependence on Space

Civilian Communication and Navigation

Banking Sector

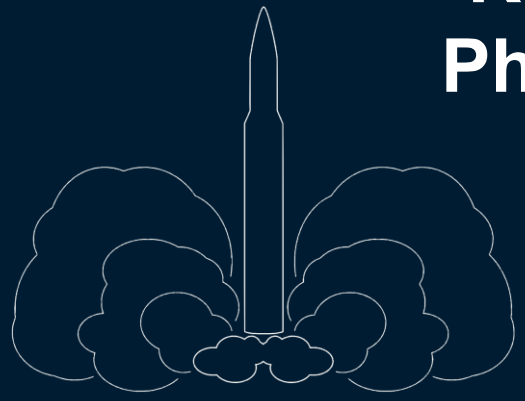
Counter-Terrorism Operations

High-End Combat

Nuclear Command & Control

More Dangerous: Proliferation of Threats

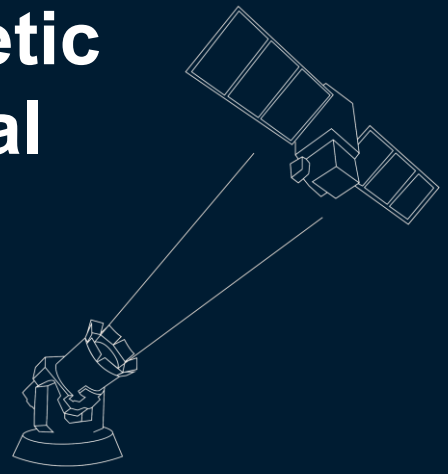
Kinetic Physical



- Direct ascent ASAT
- Co-orbital ASAT
- Ground station attacks

Non-Kinetic Physical

- Lasers
- High-powered microwave
- Electromagnetic pulse (EMP)

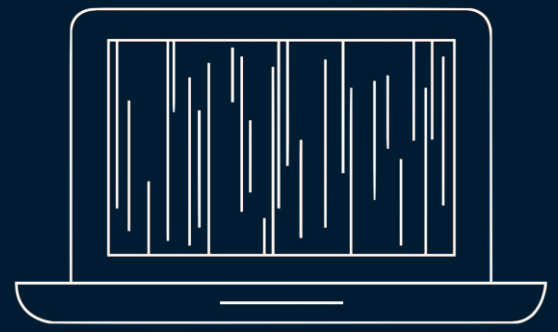


Electronic

- Uplink jamming
- Downlink jamming
- Spoofing

Cyber

- Monitoring traffic patterns
- Intercept / exploit data
- Corrupt data
- Command and control intrusion



Threat Characteristics Vary by Type of Attack

	Kinetic Physical			Non-Kinetic Physical				Electronic			Cyber		
Types of Attack	Ground Station Attack	Direct-Ascent ASAT	Co-Orbital ASAT	High Alt. Nuclear Det.	High-Powered Laser	Laser Dazzling / Blinding	**Laser Dazzling / Blinding**	Uplink Jamming	**Downlink Jamming**	Spoofing	Data Intercept / Monitoring	Data Corruption	Seizure of Control
Threat Characteristics: Attribution	Variable attribution depending on mode of attack	Launch site can be attributed	Can be attributed by tracking previously known orbit	Launch site can be attributed	Limited attribution	Clear attribution of the laser's location at time of attack	Clear attribution of the laser's location at time of attack	Modest attribution depending on mode of attack	Modest attribution depending on mode of attack	Modest attribution depending on mode of attack	Limited or uncertain attribution	Limited or uncertain attribution	Limited or uncertain attribution
Reversibility	Irreversible	Irreversible	Irreversible or reversible depending on mode of attack	Irreversible	Irreversible	Irreversible or reversible; attacker may not be able to control	Irreversible or reversible; attacker may not be able to control	Reversible	Reversible	Reversible	Reversible	Reversible	Irreversible or reversible depending on mode of attack
Awareness	May or may not be publicly known	Publicly known depending on trajectory	May or may not be publicly known	Publicly known	Only satellite operator will be aware	Only satellite operator will be aware	Only satellite operator will be aware	Satellite operator will be aware; public may or may not be	Satellite operator will be aware; public may or may not be	May or may not be known to the public	May or may not be known to the public	Satellite operator will be aware; public may or may not be	Satellite operator will be aware; public may or may not be
Attacker Damage Assessment	Near real-time confirmation of success	Near real-time confirmation of success	Near real-time confirmation of success	Near real-time confirmation of success	Limited confirmation of success if satellite begins to drift uncontrolled	No confirmation of success	No confirmation of success	Limited confirmation of success	Limited confirmation of success if local RF signals can be monitored	Limited confirmation of success if effects are visible	Near real-time confirmation of success	Near real-time confirmation of success	Near real-time confirmation of success
Collateral Damage	Station may control multiple satellites; potential loss of life	Orbital debris could affect other satellites in similar orbits	May or may not produce orbital debris	Higher radiation levels in orbit would persist for months or years	Could leave target satellite disabled and uncontrolled	None	None	Only disrupts the signals targeted and possibly adjacent frequencies	Only disrupts the signals targeted and possibly adjacent frequencies	Only affects the specific RF signals targeted	None	None	Could leave target satellite disabled and uncontrolled

Example Dual-Use Capabilities

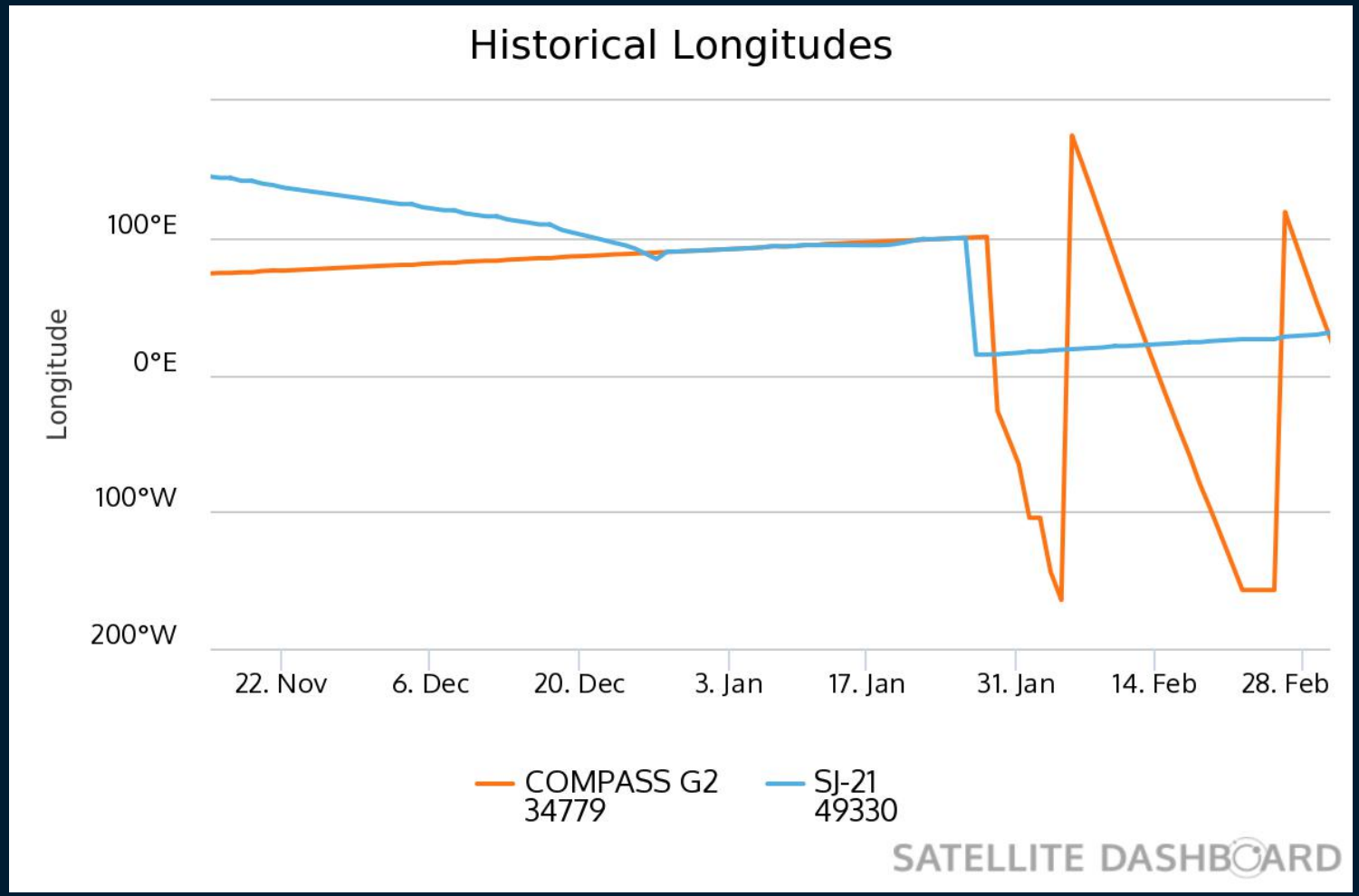
Source: Space.com, https://www.space.com/space-junk-harpoon-removedebris-satellite-video.html

Counterspace Assessments by Country

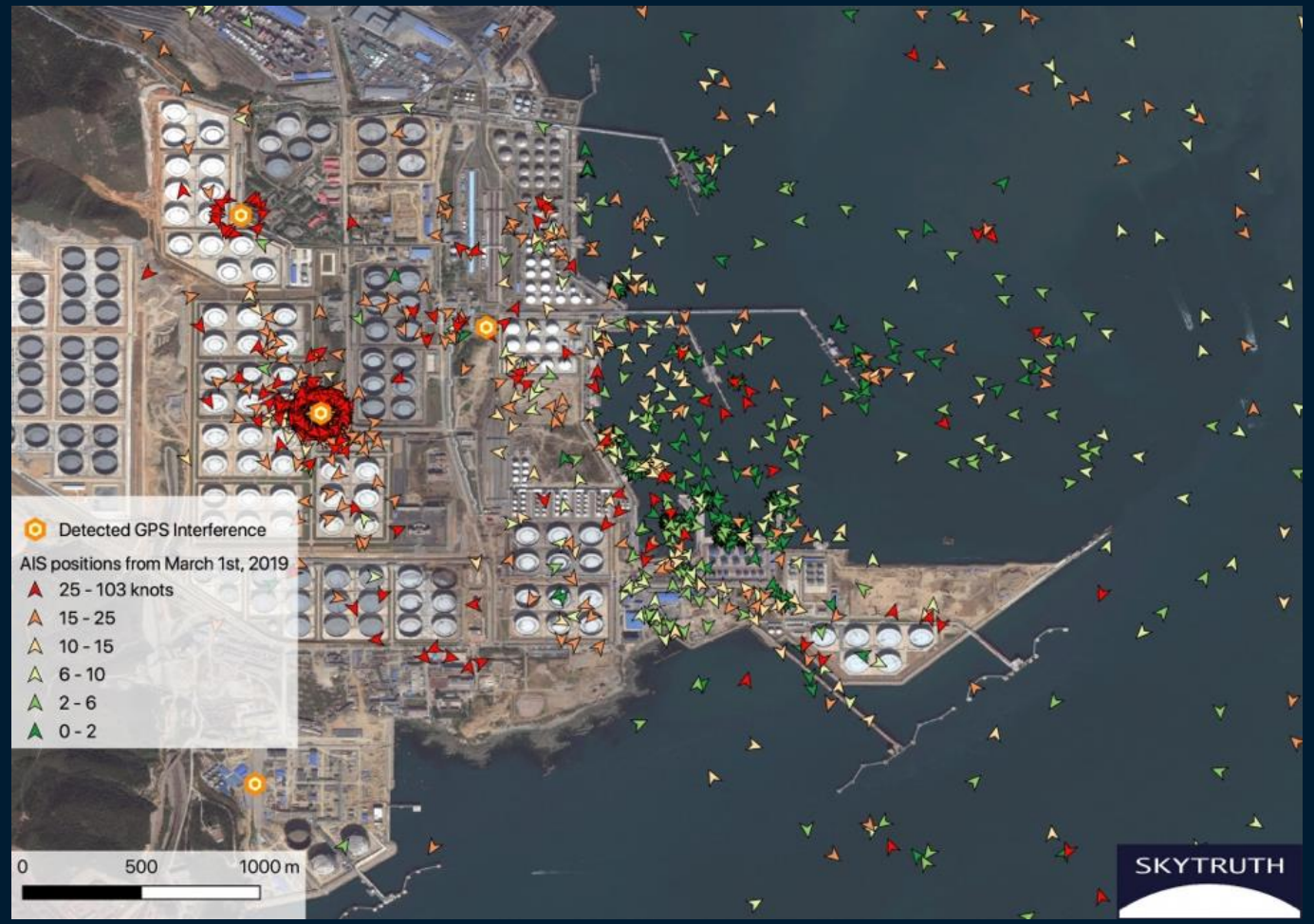
Chinese Orbital Spaceplane

Image courtesy of Slingshot Aerospace

Chinese RPO: SJ-21 & Compass G2



GPS Spoofing in the Port of Shanghai

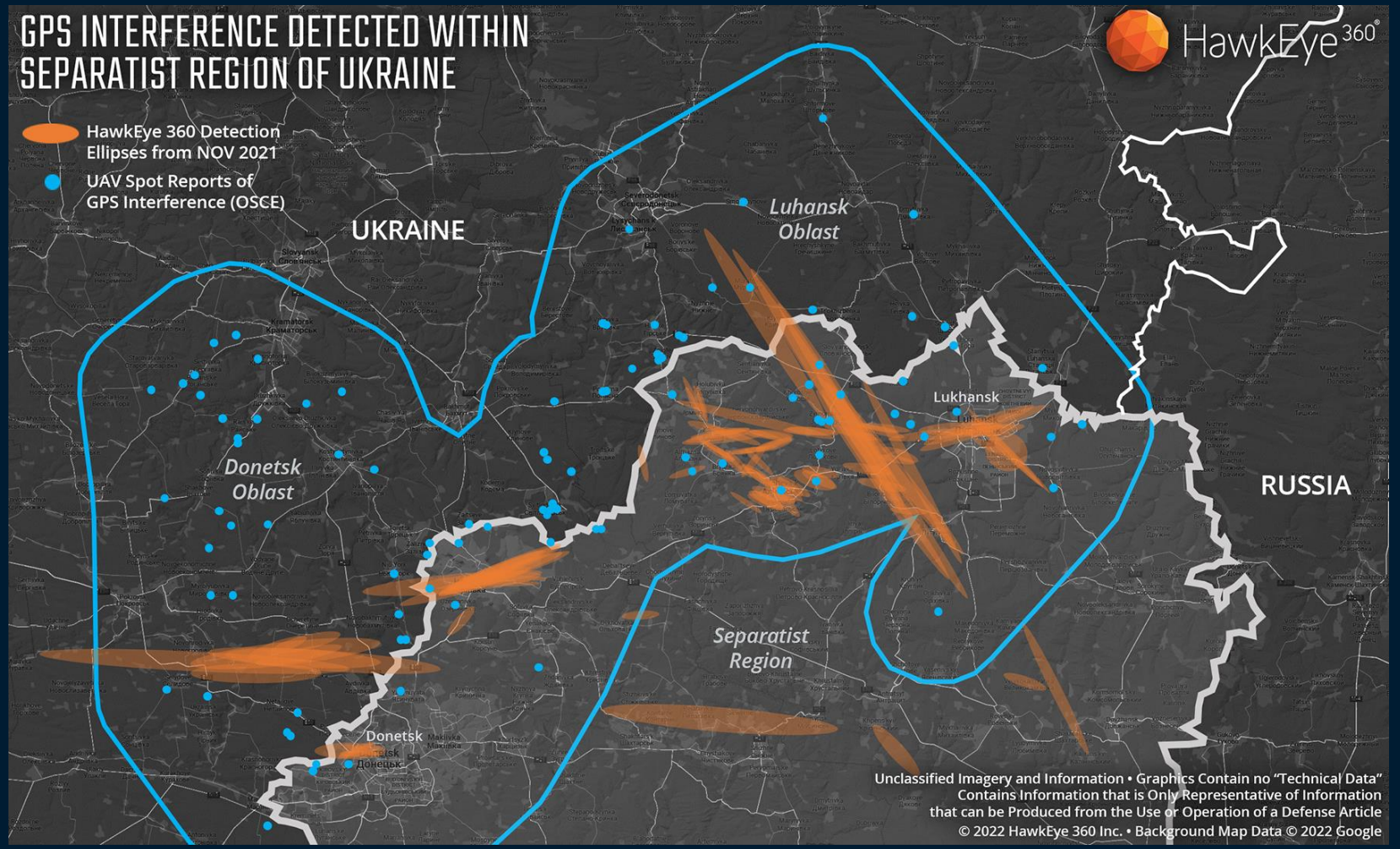


Sources: Skytruth / AIS data courtesy of Global Fishing Watch / Orbcomm / Spire.

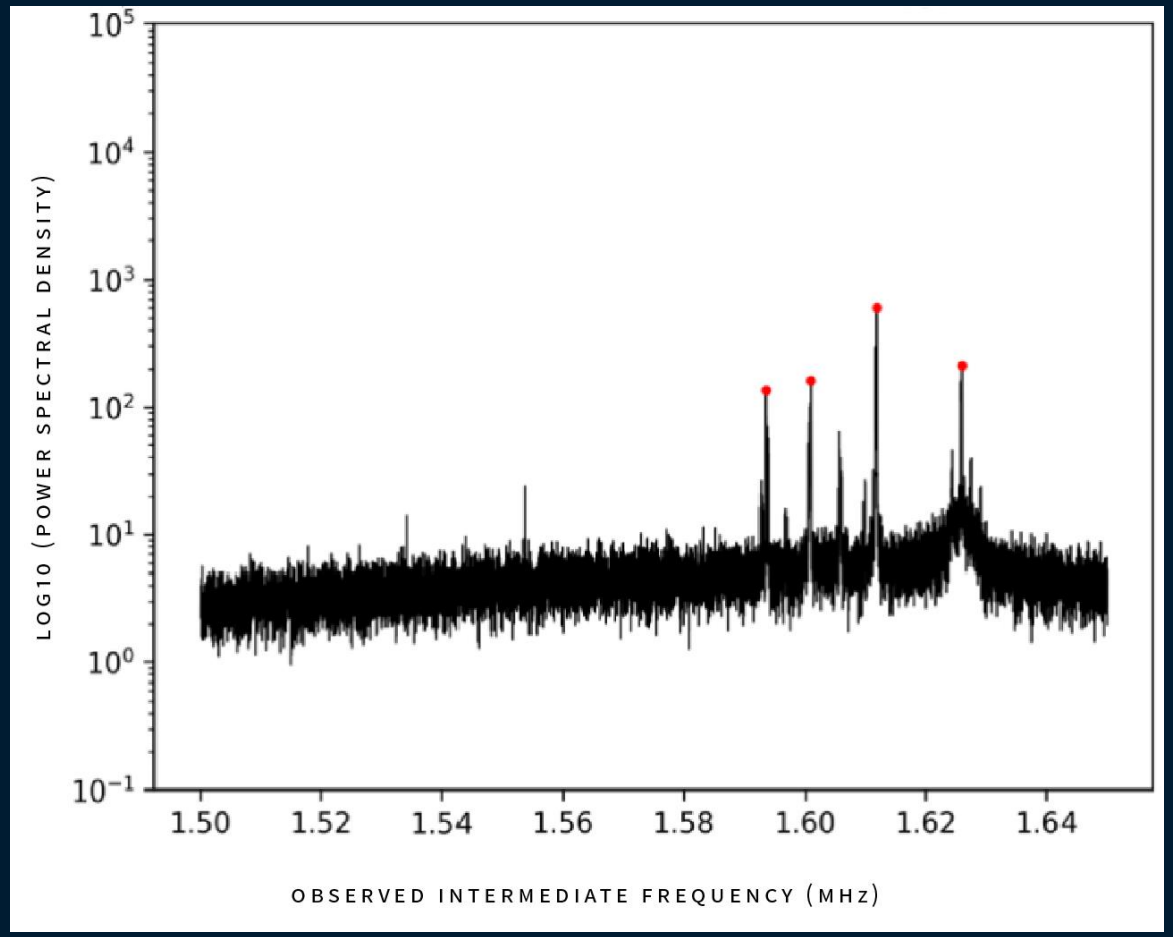
Russian Counterspace Activities Before and During Ukraine Invasion

Russian ASAT: November 2021

Russian GPS Interference

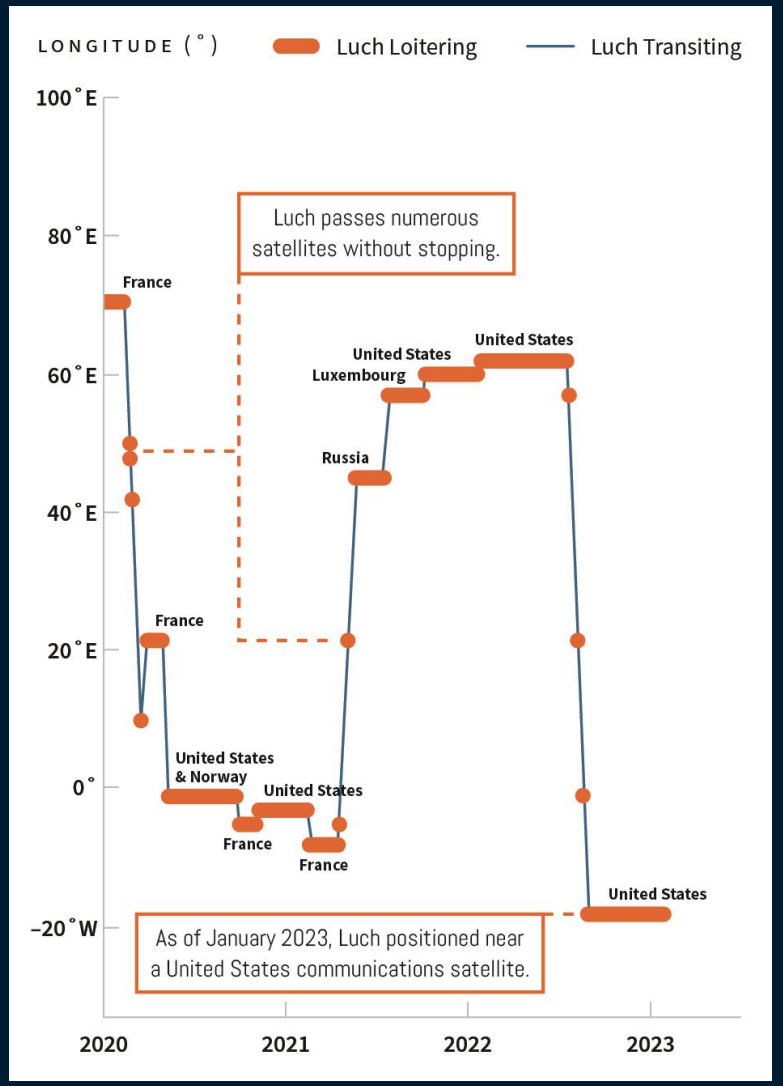


GNSS Interference in Eastern Mediterranean

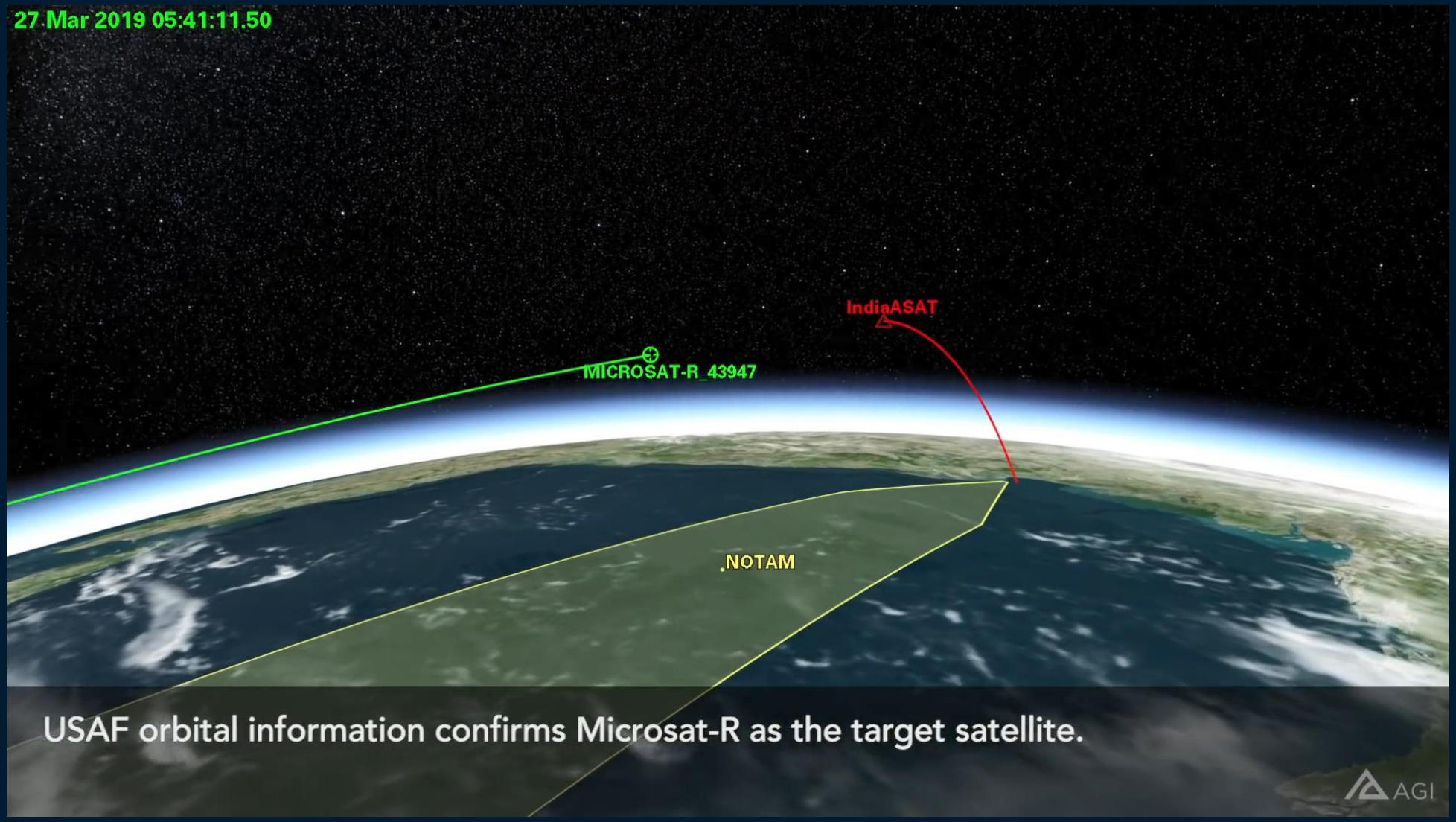


Data courtesy of Spire Global

Inspector Satellite Luch



India

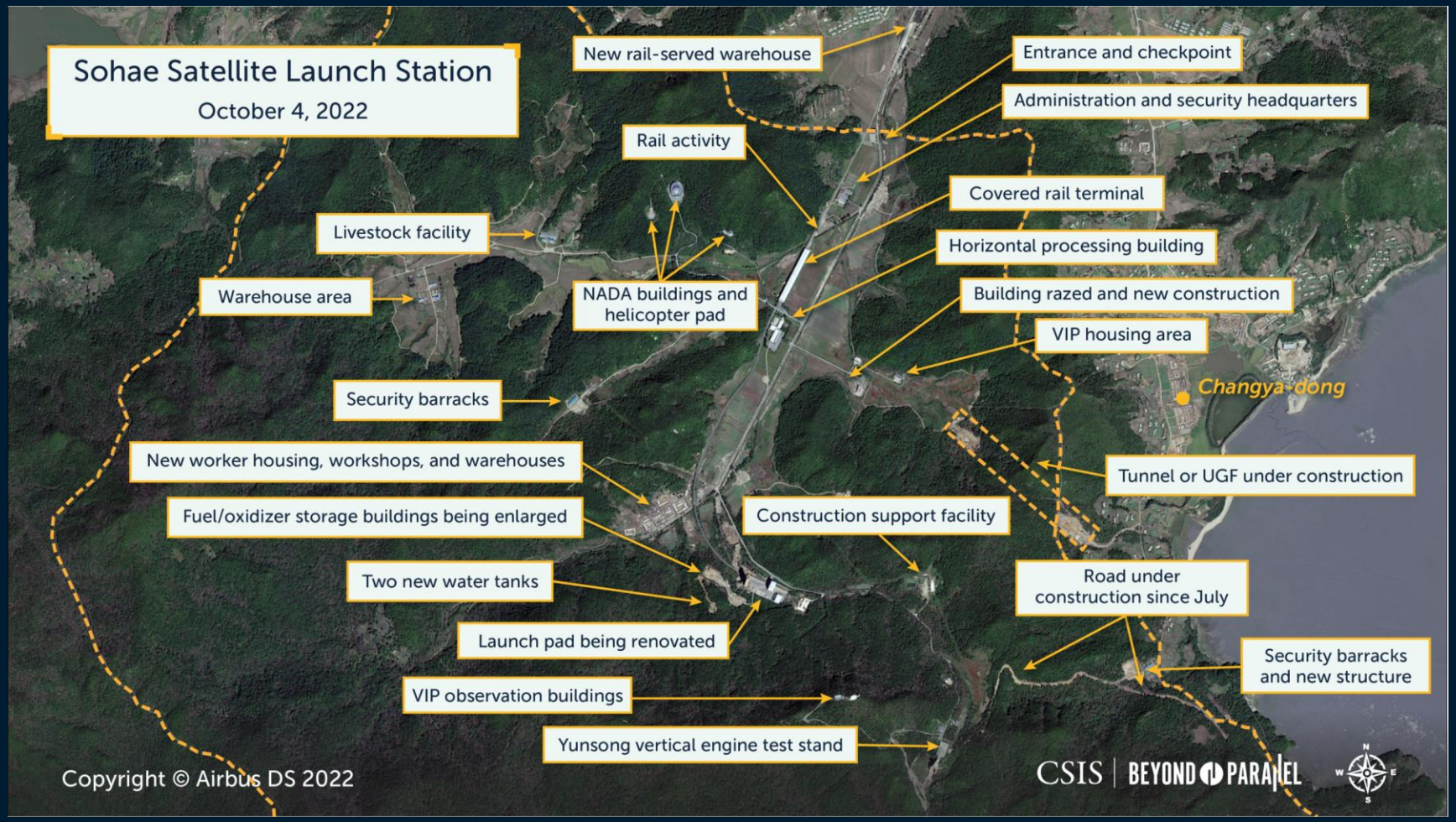


Source: Analytic Graphics Inc., https://youtu.be/Pzhtc-rFbvM

Iran


Scorching and damage present only on northern side of launch pad
Damaged gantry service tower
Damaged support vehicle
Damaged support vehicle
Damaged propellant burner trailer
Damaged Safir mobile-erector-launcher

North Korea


Sohae Satellite Launch Station
October 4, 2022
New rail-served warehouse
Entrance and checkpoint
Administration and security headquarters
Rail activity
Covered rail terminal
Livestock facility
Horizontal processing building
Warehouse area
NADA buildings and helicopter pad
Building razed and new construction
VIP housing area
Changya-dong
Security barracks
New worker housing, workshops, and warehouses
Tunnel or UGF under construction
Fuel/oxidizer storage buildings being enlarged
Construction support facility
Two new water tanks
Road under construction since July
Launch pad being renovated
Security barracks and new structure
VIP observation buildings
Yunsong vertical engine test stand
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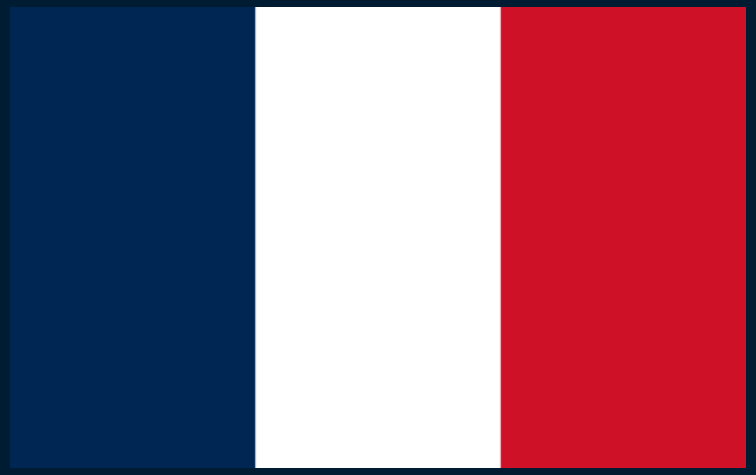
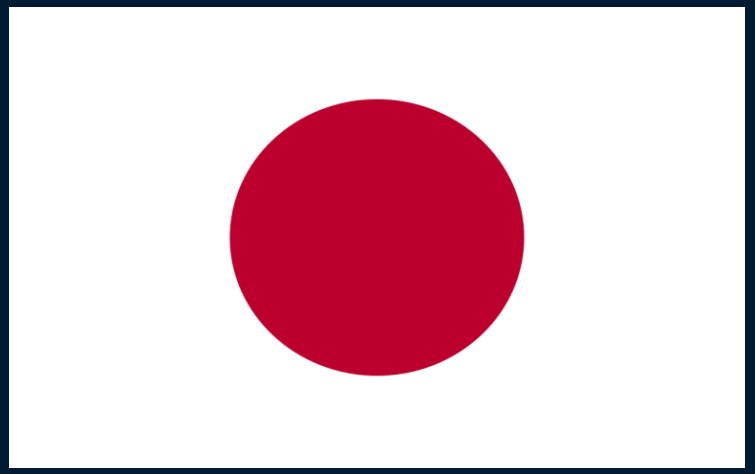
Others





What to Watch

- Lessons Learned from Russia's Invasion of Ukraine
  - Commercial data and communication services have been integral to Ukraine's resistance
  - Increase in electronic and cyber capabilities, large emphasis on jamming likely will continue in this conflict and in the future
  - Example of space assets bolstering the success of national security objectives, particularly for small nations against larger nations
- Direct-Ascent ASAT Ban: Resolution passed in the U.N. in November 2022
  - 155 countries voted in support, 9 voted against, 9 abstained
    - China, Russia, India, Iran, and North Korea did not vote in favor of the resolution
- Space Situational Awareness
  - Can enable counterspace weapons targeting
  - Can track on-orbit activities

Counterspace Timeline

Thank you!

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