Space Warfare and the Implications for Extended Deterrence, Capabilities and the Character of War in the 21 Century.

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Why is this important?

Congested, Contested and Competitive

1,100 active systems

21,000 trackable debris

Antisatellite capabilities
(hard-kill 7 soft-kill, jamming, dazzling)

A total of 11 countries operate 22 launch sites.

More than 60 nations and government consortia operate satellites.

50% + NATO Allies have space capabilities

Who is doing this?

Bleddyn E. Bowen has presents a rump materialist evaluation of the current distribution of spacepower in the international system (Bowen, 2018)

‘Spacepower is ‘the use of outer space’s military and economic advantages for strategic ends’, and a ‘space power’ is an entity that uses outer space for its political objectives

Who is doing this?

We can use a three-tiered analysis of spacepower

Bowen argues: ‘a tripolar top-level of spacepower is in effect’

Tier 1 Space Powers: USA, Russia and China

(Bowen, 2018)

- possess extant or almost-operational launch capability for both low-Earth orbital and geostationary launches
- possess space agencies space programmes that have evolved from ballistic missile and nuclear programmes
- possess a high degree of space technology production capability for war, development and prestige objectives.
- possess soft-kill and hard-kill anti-satellite (or counterspace) weapons that may be based on Earth or in space.
- possess a network of space observation systems.

Tier 2 Space Powers: Japan, India and the (EU-ish)

(Bowen, 2018)

- produce some of their own space technology with a specialisation in two but rarely three of the purposes of spacepower
- have a basic launch capacity
- have national space agencies
- frequently out of necessity collaborate with other states in the production of crucial space technologies
- may possess relatively small numbers of space observation sites that are linked into a Tier 1 or other Tier 2 SSA systems

Tier 3 Space Powers: all the rest

(Bowen, 2018)

- offer occasional contributions in space technology
- almost always purchase space technology or services from third parties
- almost always collaborate with other more capable space actors
- *Vast majority of EU and NATO member states

EU & NATO

- EU MS of NATO and EU MS deployed more satellites than India &Japan
- Collectively - start to resemble a Tier 1 space power
- Especially given the independent launch capability provided by the ESA
- Considerable advantages in the area of space situational awareness (SSA)
- SSA is essential capability for intelligence and military purposes
- EU is ‘arguably’ cementing itself as a major space power through:
  - independent launch services
  - Global Navigation Satellite System: Galileo & Copernicus

Three Segments of Satellite Operations

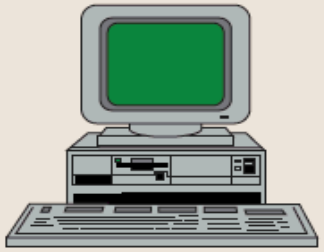
Control Center

Satellites

SPACE

Tracking Station

CONTROL



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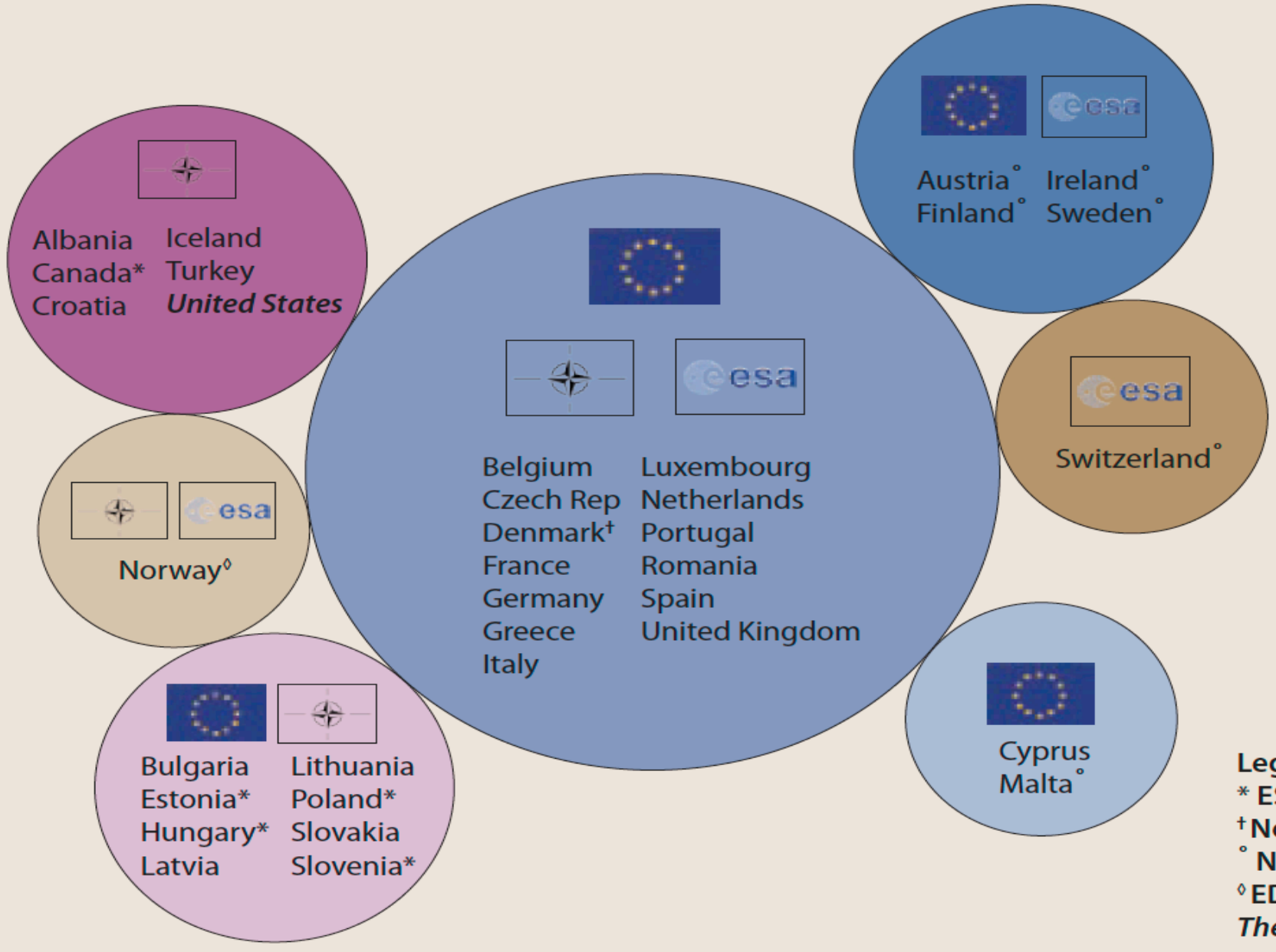
Albania
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Germany
Greece
Italy
Luxembourg
Netherlands
Portugal
Romania
Spain
United Kingdom
Switzerland°
Norway◊
Bulgaria
Estonia*
Hungary*
Latvia
Lithuania
Poland*
Slovakia
Slovenia*
Cyprus
Malta°
Legend:
* ESA Cooperation Agreement
† Not a member of EDA
° NATO Partnership For Peace Member
◊ EDA Cooperation Agreement
The United States has a Space Policy

Space Capability	NATO Uses (not all inclusive)	Example Systems
Position, Velocity, Time and Navigation	• Precision strike • Force navigation • Support to PR/CSAR • Network timing	• Global Positioning System (US) • Galileo (EU)
Integrated Tactical Warning and Threat Assessment	• Force protection • Attribution • Missile defence	• Space Based Infrared System (US) • Spirale (FRA*)
Environmental Monitoring	• Mission planning • Munitions selection • Weather forecasting	• Defense Meteorological Satellite Program (US) • EUMETSAT (EU)
Communications	• Command and Control • Unmanned Aerial Vehicle ops • Deployed communications	• Syracuse (FRA) • SICRAL (ITA) • SKYNET (UK)
Intelligence, Surveillance and Reconnaissance	• Order of battle • Battle damage assessment • Targeting	• SAR Lupe (DEU) • COSMO SKYMED (ITA) • HELIOS (FRA)

US, EU and NATO Rhetoric on Space Deterrence

***Space is one of our vital national interests… and it is becoming a contested war-fighting domain and we have to adapt to that reality. It is a domain that we must be equally prepared as all of the other domains [air, sea land cyber]. It is no longer a new domain, it is a domain*. (James N. Mattis US Secretary of Defense at Sheetz, 2018)**

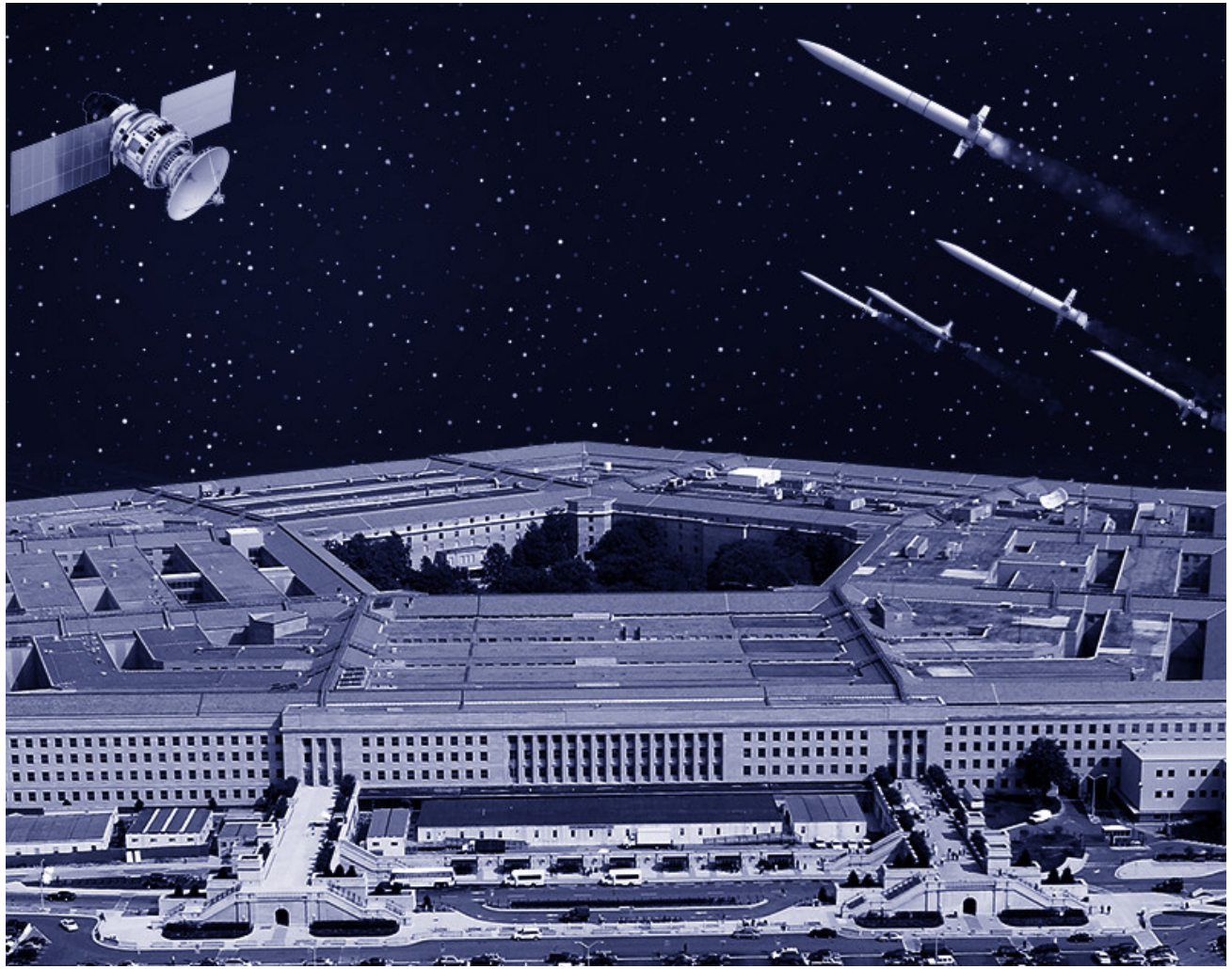
The United States Government shall:
Demonstrate U.S. leadership in space-related fora and activities to: reassure allies of U.S. commitments to collective self-defense; identify areas of mutual interest and benefit; and promote U.S. commercial space regulations and encourage interoperability with these regulations

US NATIONAL SECURITY SPACE STRATEGY

Prevent and deter aggression against space infrastructure that supports U.S. national security

The United States will employ a variety of measures to help assure the use of space for all responsible parties, and, consistent with the inherent right of self-defense, deter others from interference and attack, defend our space systems and ***contribute to the defense of allied space systems, and, if deterrence fails, defeat efforts to attack them***

Develop capabilities, plans, and options to deter, defend against, and, if necessary, defeat efforts to interfere with or attack U.S. ***or allied space systems***



As Interpreted by NATO

‘The extension of deterrence to include the domains of cyber and space presents a considerable additional challenge to the management of any such a crisis, whether intended or otherwise.’

Strategic Concept Declaration	Specified and Implied Space-Related Tasks
Safeguard the freedom and security of all members by political and military means	Provide strategic intelligence, missile warning, satellite navigation, satellite communication
Deter and defend against threats, including emerging security challenges, where they threaten fundamental security of individual Allies or the Alliance as a whole	Develop credible deterrence mechanisms for space systems and defensive measures to preserve space capabilities in support of operations should deterrence fail
Enhance international security through partnerships, contributing to arms control, non-proliferation and disarmament	Conduct non-invasive treaty monitoring to aid international efforts to control arms and non-proliferation
Countries are increasingly reliant on communication, transport and transit routes for international trade, energy and prosperity	Provide for secure, defendable, and redundant satellite communications as a mechanism through which international trade is regularly conducted
Environmental and resource constraints including water scarcity and increasing energy needs have potential to significantly affect NATO planning and operations	Provide persistent, non-invasive, global monitoring to warn of emerging crises
Maintain the ability to sustain concurrent major joint operations and several smaller operations for collective defence and crisis response, including at strategic distance	Provide the virtual infrastructure required for modern military operations including satellite communications, remotely piloted vehicles and all-weather precision strike
Develop a ballistic missile defence capability for populations and territory	Conduct space operations to enable all phases of Integrated Air and Missile Defence defined as: • Surveillance • Battle Management, Command, Control, Communications, and Intelligence • Active Air Operations • Passive Air Operations
Be prepared to contribute to stabilisation and reconstruction	Aid host-nations by providing satellite communications, navigation and imagery to plan and monitor reconstruction efforts

NATO

Lessons learned in recent NATO-led operations have lead to lessons-learned:

the Alliance is dependent on Space capabilities and the support provided by the professionals, agencies, and nations that manage and operate the related-systems.

It is obvious that NATO commanders, staffs and forces must continue to gain knowledge and experience to better orchestrate Space support to operations.

NATO

A number of significant technology-related trends including the development of laser weapons, electronic warfare and technologies that impede access to space – appear poised to have major global effects that will impact on NATO military planning and operations.

(NATO Strategic Concept, 2010)

NATO

NATO is an alliance enabled by space. NATO operations increasingly take advantage of space, but potential adversaries are seeking to negate that advantage

- e.g. Libya, Afghanistan, NATO Maritime Forces

NATO is critically dependent on space but its doctrine and planning have not kept up.

NATO doctrine and planning need to evolve in order to preserve the operational benefits afforded by space-based capabilities and to minimize vulnerabilities

The EU

Space technologies, data and services can support numerous EU policies and key political priorities, including the competitiveness of our economy, migration, climate change, the Digital Single Market and sustainable management of natural resources.

Space is also of strategic importance for Europe. ***It reinforces Europe's role as a stronger global player and is an asset for its security and defence.***

Europe has a world-class space sector, with a strong satellite manufacturing industry, which captures around 33 % of the open world markets, and a dynamic downstream services sector with a large number of SMEs.

The European space economy, including manufacturing and services, employs over 230 000 professionals and its value was estimated at EUR 46-54 billion in 2014, representing around 21% of the value of the global space sector

(Space Strategy for Europe, 2016)

Key Research Questions

- Is ‘space deterrence’ credible?
- If so, is capable, credible and properly communicated?
- How can the US and NATO provide for extended deterrence?
- What lessons can be applied from traditional deterrence (nuclear deterrence)?
- And what are the limitations of this?
- Implications for the character of war and the Laws of Armed Conflict?

Deterrence : key definitions

Glenn Snyder defines deterrence as:

“discouraging the enemy from taking military action by posing for him a prospect of cost and risk outweighing his prospective gain”

As a result, deterrence of aggression against space systems is simply an extension of deterrence in other domains.

Deterrence succeeds by altering the cost-benefit calculus of a potential aggressor.

Deterrence : key definitions

Changing an aggressor’s expected costs requires that the deterrer focus on three elements:

capability, credibility, and communication.

Deterrence : key definitions

Capability: is necessary to persuade an aggressor that the deterrer would respond to an attack

Credibility: is necessary to persuade an aggressor that the deterrer would respond to an attack

Communication: Communication is necessary to demonstrate that a deterrer is both capable and credible

Extended Deterrence

- Came out of the Cold War
- Built on a foundation of symmetrical alliance systems (is this true today?)
- Perceived as a continuum of security from conventional to nuclear
- Linking use of force in former to the potential for the latter
- Was (is) the most difficult form of deterrence to make credible and to communicate
- The so- called Tripewire was the answer

Space Deterrence

deterring harmful actions by whatever means against national assets in space and assets that support space operations (Krepon, 2016).

Concepts of nuclear deterrence have been well developed.

In contrast, attention to space deterrence has been sporadic during and after the Cold War

sparked mostly when anti-satellite (ASAT) capabilities have been tested.

These concerns faded after the demise of the Soviet Union, but have now revived with the advent of China's (and others) ambitious space program and ASAT capabilities

Nuclear vs Space Deterrence

During Cold War, space deterrence was linked to nuclear deterrence

Seen as precursor to nuclear attack

Space is now seen as a separate domain

(land- air- sea –cyber- space)

But with different characteristics and escalation dynamics

In many ways, space is an Achilles' heel

Deterrence Thinking Outdated?

Advertent and Inadvertent escalation

Advertent Escalation:

Deliberate and sustained conventional attack to alter balance of force in space

Inadvertent Escalation:

Occasional accidental attacks attacks to achieve a conventional mission

- Both more likely now because space is relied on for conventional missions and this gives states incentive
- The greatest danger is operational and not strategic

Key Findings: the bad news

The paradox for deterrence today is that while the United States has the most advanced cyber and space forces in the world, they neither deter our opponents generally nor deter hostile acts specifically directed against US (or allied) space assets.

Threats by the United States to use cyber or anti-satellite (ASAT) attacks will not deter because these attacks cause only limited damage and do not put opponents sufficiently at risk.

Threats by the United States to use military force to defend cyber or space assets will also fail to deter because in peacetime, these threats are not credible and in wartime, opponents are likely to judge that the benefits of an attack on cyber or space assets will outweigh the costs.
(Krepon and Thompson, 2013)

Key Findings: the bad news

Today in peacetime, adversaries will test the thresholds of provocation of US, NATO and EU capabilities

Given the high dependence of these assets, in times of crisis opponents will assume it is worth attacking these assets

A breakdown in space deterrence would most likely be the result of adversary seeking tactical advantage in conjunction with limited military operations

What is the appropriate response and against what?

Key Findings: the bad news

Lack of symmetrical alliance structure makes response very risky

Various conditions make extended deterrence in space almost impossible

What is it that you are trying to deter?

How can one engage in ED on behalf of an ally's space assets in the face of jamming, dazzling etc.

Problems of Attribution
- Was a laser to interfere or measure?

Retaliatory space attacks in pursuit of deterrence (punishment) opens up US and European infrastructure to retaliation

Key Findings: the good news

The ubiquity of space structure and the fragility of space systems creates a degree of existential deterrence

As we are all so dependent on space infrastructure – disruption is very escalatory

So space deterrence should be thought of as deterring war as a whole
And not different from general principles of general deterrence

Allies need to focus on capabilities to win battles and to fight through unavoidable attacks

The focus for US, EU and NATO

Attribution: Where did the attack come from

Reversibility: are these less escalatory

Resilience: to sustain attacks and respond

Thresholds: understanding the likely breaking points of any attack

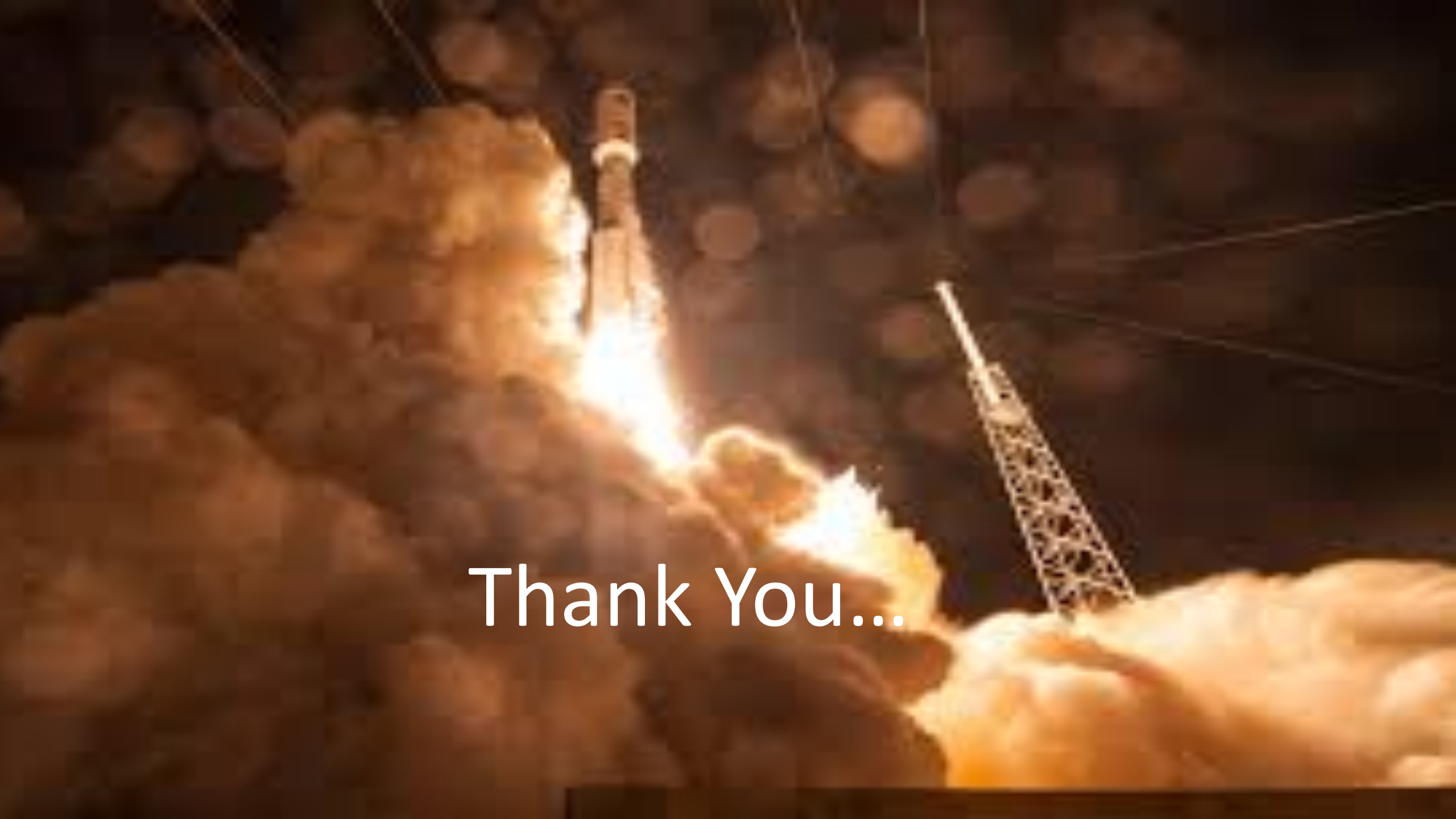
Space, European Strategic Autonomy and EU-NATO

- Galileo
- Enablers
- US investment in NATO
- The European ‘nuclear issue’ but would need true Space Situational Awareness and Network-Centric capabilities for true EU Strategic Autonomy

Type of Attack	Direct Ascent ASAT	Co-orbital ASAT	Ground Station Attack	High Altitude Nuclear Detonation	High-Powered Laser	Laser Dazzling / Blinding	High-Powered Microwave	Uplink Jamming	Downlink Jamming	Spoofing	Cyber—Data Intercept / Monitoring	Cyber—Data Corruption	Cyber—Seizure of Control
Attribution	Launch site can be attributed	Can be attributed by tracking previously known orbit; Irreversible	Variable attribution, depending on mode of attack	Launch site can be attributed	Limited attribution	Clear attribution of the laser's location at the time of attack	Limited attribution	Modest attribution, depending on mode of attack	Modest attribution, depending on mode of attack	Modest attribution, depending on mode of attack	Limited / uncertain attribution	Limited / uncertain attribution	Limited / uncertain attribution
Reversibility	Irreversible	Irreversible or reversible, depending on capabilities	Irreversible	Irreversible	Irreversible	Reversible or irreversible, although attacker may not be able to control	Reversible or irreversible, although attacker may not be able to control	Fully reversible	Fully reversible	Fully reversible	Fully reversible	Fully reversible	Irreversible or reversible, depending on mode of attack
Awareness	Publicly known, depending on trajectory	May or may not be publicly known	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	Only satellite operator will be aware	Satellite operator will be aware, may or may not be known to the public	Satellite operator and public may not be aware	Satellite operator and public may not be aware	Satellite operator and public may not be aware	Satellite operator and public may not be aware
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	Limited confir-mation of suc-cess if satellite begins to drift uncontrolled	No confirmation of success	Limited confirmation of success if monitoring of the local RF environment is possible	Limited confir-mation 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	Orbital debris could affect other satellites in similar orbits	May or may not produce orbital debris affecting other satellites in similar orbits	Ground station may control multiple satellites, potential for loss of life at the ground station	Indiscriminate effects from higher radiation levels in orbit that would persist for months or years	Could leave target satellite disabled and uncontrollable	None, only damages the target satellite's sensors	Could leave target satellite disabled and uncontrollable	Only disrupts the signals targeted and possibly adjacent frequencies	Only disrupts the signals targeted and possibly adjacent frequencies	Only corrupts the specific RF signals targeted	None	None	Could leave target satellite disabled and uncontrollable

Space deterrence is a misnomer, there is only deterrence. Space should be part of a wider picture in terms of who are we deterring, why are we deterring them, and what means are available to us to deter them with.

Space may be one of those means but the idea that somehow we would expend scarce political and diplomatic capital on signaling to adversaries that they should not take pot-shots at our satellites strikes me as a bit silly and misses the whole point of deterrence which is, of course, to deter war


Thank You…