

NATO AND SPACE SERVICES

SPACE-ENABLED CAPABILITIES. ALLIED STRENGTH.
MISSION SUCCESS.

Space services are essential to NATO's ability to understand, decide, communicate, and act. From daily operations to crisis response, space capabilities enhance situational awareness, connect forces, and create a decisive advantage.



SPACE MULTIPLIES ALLIED POWER

Space-based services support every domain—land, sea, air, cyber, and space—enabling interoperability, resilience, and freedom of action for NATO and its Allies.

TEN KEY TOPICS. ONE CRITICAL ADVANTAGE.



1 HOW NATO USES SPACE SERVICES



2 SATELLITE COMMUNICATIONS



3 POSITIONING, NAVIGATION & TIMING



4 SPACE-BASED INTELLIGENCE, SURVEILLANCE & RECONNAISSANCE



5 MISSILE WARNING FROM SPACE



6 COMMERCIAL SPACE SERVICES



7 SPACE DOMAIN AWARENESS



8 PROTECTING SPACE-ENABLED SERVICES



9 MULTINATIONAL SPACE ARCHITECTURE



10 NATO SPACE SERVICES IN A FUTURE CONFLICT



SPACE IS A SHARED DOMAIN. ALLIED COOPERATION MAKES IT A FORCE MULTIPLIER.

HOW NATO USES SPACE SERVICES

SPACE ENABLES ALLIED OPERATIONS, STRENGTHENS DETERRENCE, AND SUPPORTS DEFENCE.

WHY SPACE MATTERS



ENHANCES DETERRENCE AND DEFENCE

Space services provide critical information and effects that strengthen Allied deterrence and protect our forces and populations.



ENABLING ALL OPERATIONS

Space capabilities support NATO's missions and operations across air, land, maritime, cyber, and the information environment.



MULTIPLIER OF NAVAL, AIR AND LAND POWER

Space services extend reach, improve precision, and enable better decisions from strategic to tactical levels.



RESILIENCE AND CONTINUITY

Diverse sources and robust architectures help ensure assured access to vital services in peacetime, crisis and conflict.

CORE SPACE SERVICES NATO RELIES ON



HOW NATO ACCESSES THEM



ALLIED-LED AND COORDINATED

NATO coordinates space support among Allies, leveraging national capabilities to deliver services to the Alliance.



TRUSTED COMMERCIAL PARTNERS

NATO also makes use of trusted commercial providers to enhance capacity, resilience and innovation.



GOVERNANCE AND SECURITY

Access is based on agreed policies, standards, and security requirements that safeguard information and ensure responsible use.



INTEGRATED INTO OPERATIONS

Space services are integrated into NATO's command and control and planning processes at strategic, operational and tactical levels.

KEY MILESTONES

BUILDING NATO'S SPACE FOUNDATION AND CAPABILITIES

JUNE 2019



NATO ADOPTED AN OVERARCHING SPACE POLICY

Establishing principles to guide responsible use of space and strengthen Allied cooperation.

DECEMBER 2019



ALLIES DECLARED SPACE AN OPERATIONAL DOMAIN

Recognizing space as critical to operations and confirming its role in Allied defence.

OCTOBER 2020



DECISION TO ESTABLISH A NATO SPACE CENTRE

Defence Ministers decided to establish a NATO Space Centre at Allied Air Command in Ramstein.

2021-2025 AND BEYOND



CONTINUED DEVELOPMENT AND INTEGRATION

Enhancing capabilities, deepening cooperation with Allies and trusted partners, and integrating space services into all operations.



THE KEY TAKEAWAY

SPACE IS AN ENABLING DOMAIN, NOT A STAND-ALONE MISSION AREA.

NATO DOES NOT OWN SPACE ASSETS. IT COORDINATES ACCESS TO SPACE SERVICES PROVIDED BY ALLIES AND TRUSTED COMMERCIAL PARTNERS TO SUPPORT THE ALLIANCE'S MISSIONS AND OPERATIONS.



SATELLITE COMMUNICATIONS: CONNECTING NATO FORCES

SECURE, RESILIENT, AND INTEROPERABLE COMMUNICATIONS ANYTIME, ANYWHERE

Satellite communications are essential in all NATO missions. They provide global reach, rapid deployment support, and the assured connectivity needed to consult, command, control, and share information across domains.



WHAT SATCOM ENABLES



CONSULTATION

Connects decision-makers to consult quickly and coordinate across nations and commands.



COMMAND AND CONTROL

Enables secure voice, data, and video for effective command and control in all domains.



INTELLIGENCE SHARING

Supports timely exchange of intelligence, surveillance, and situational awareness.



REACH-BACK

Provides access to national expertise, services, and resources from deployed locations.



CONNECTIVITY FOR DEPLOYED FORCES

Delivers reliable communications to forces at sea, in the air, and on land.

FROM COMMAND CENTRE TO DEPLOYED FORCES

COMMAND CENTRE



Strategic and operational command centres plan, decide, and task.

GROUND STATIONS



NATO and national ground stations connect to satellites.

SATELLITE LINK



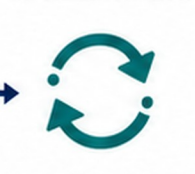
Military, governmental, and trusted commercial satellite networks.

DEPLOYED FORCES



Secure, resilient communications across sea, air, and land.

FEEDBACK & INFORMATION FLOW



Information flows back to decisions, actions, and shared awareness.



SECURE BY DESIGN • INTEROPERABLE • AVAILABLE GLOBALLY • ON DEMAND

NSS6G AT A GLANCE



NATO SATCOM Services 6th Generation (NSS6G) succeeded the earlier NSP2K programme in **JANUARY 2020**.



Operated by a **MULTINATIONAL CONSORTIUM** of Allied nations on behalf of NATO.



Accesses services from **ALLIED GOVERNMENTAL SYSTEMS** and **TRUSTED COMMERCIAL PROVIDERS**.



Provides assured, resilient, and cost-effective satellite communications for today and the future.

SATCOM USE CASES ACROSS NATO OPERATIONS

LAND FORCES	AIR OPERATIONS	MARITIME OPERATIONS	HEADQUARTERS
✓ Command and control of dispersed units	✓ Command and control of air assets	✓ Command and control of task forces	✓ Strategic consultation and coordination
✓ Secure voice and data in remote areas	✓ Real-time mission updates and targeting	✓ Maritime domain awareness feeds	✓ Planning and operations collaboration
✓ Intelligence and surveillance data exchange	✓ Sensor data and video downlink	✓ Ship-to-shore and ship-to-ship connectivity	✓ Intelligence sharing and fusion
✓ Logistics and sustainment coordination	✓ Air-to-ground and beyond-line-of-sight C2	✓ Logistics and port coordination	✓ Crisis management and reporting
✓ Access to reach-back expertise	✓ Safety-of-flight and tracking	✓ Search and rescue coordination	✓ Coalition and partner connectivity

WHY RESILIENCE MATTERS



Assures mission success in contested, degraded, and high-demand environments.



Global coverage and rapid deployment support operations anywhere, anytime.



Multiple providers and systems increase continuity and reduce risk.



Strengthens deterrence and protects our forces and our nations.

RISKS & CHALLENGES



CONGESTION

High demand can reduce available bandwidth.



JAMMING

Adversaries may try to disrupt satellite signals.



CYBER THREATS

Networks and data face persistent cyber risks.



NEED FOR REDUNDANCY

Diverse satellites, paths, and providers ensure resilience.

POSITIONING, NAVIGATION AND TIMING: THE INVISIBLE BACKBONE OF NATO OPERATIONS

PNT ENABLES PRECISE POSITIONING AND SYNCHRONIZATION ACROSS ALL NATO MISSIONS

Positioning, Navigation and Timing (PNT) provides the warfighter with “know where, know when.” It is a core enabler of situational awareness, decision-making and the safe, effective use of forces. Though often invisible, PNT underpins every phase of military operations—on land, at sea, in the air, in space and in cyberspace.

WHAT PNT DOES



POSITIONING

Determines precise location, velocity and orientation anywhere on Earth, on land, at sea, in the air, and in space.



NAVIGATION

Guides forces and platforms safely and efficiently along the desired route to their objective.



TIMING

Provides precise and resilient time reference to synchronize operations, networks and data.

OPERATIONAL USES



FORCE MOVEMENT

Enables precise maneuver, convoy coordination and deconfliction of operations.



AIR AND MARITIME NAVIGATION

Supports safe, precise navigation in all domains and all weather conditions.



NETWORK TIMING AND SYNCHRONIZATION

Synchronizes communications, data links, sensors and command systems.



TARGETING SUPPORT

Provides time and position references for weapons, sensors and effects.



SEARCH AND RESCUE COORDINATION

Helps locate, coordinate and time rescue operations and distress beacons.



LOGISTICS AND SUSTAINMENT

Tracks assets, manages supply chains and improves efficiency and safety.



TIME-STAMPING OF DATA

Ensures integrity, order and accountability of operational data and information.

FROM SIGNALS TO OPERATIONAL EFFECTS

PNT SIGNALS (SOURCE)



Satellite and terrestrial PNT signals provide position and time information.

PNT FUNCTIONS (FOUNDATION)



Signals are used to calculate position, navigate routes and synchronize time.

ENABLERS (ACROSS SYSTEMS)



PNT enables platforms, sensors, weapons, communications and information systems.

OPERATIONAL EFFECTS (MISSION SUCCESS)



Better situational awareness, synchronized actions, precision effects and mission assurance.

PNT DEGRADATION: CONSEQUENCES FOR OPERATIONS

AREA	IF PNT IS DEGRADED	OPERATIONAL IMPACT
Force Movement	Navigation errors, position uncertainty	Delays, fratricide risk, mission failure
Air and Maritime Navigation	Route deviation, unsafe separation	Increased risk, airspace/maritime safety degraded
Network Timing	Out-of-sync networks and sensors	Communications failures, reduced situational awareness
Targeting Support	Timing or position error	Reduced accuracy, collateral damage risk, effects degraded
Search and Rescue	Location and timing errors	Slower response, lives at risk
Logistics	Tracking and delivery errors	Inefficiency, shortages, mission delay
Data and Information	Unreliable time stamps	Data integrity questioned, trust and accountability reduced



WHY TIMING MATTERS

- ✓ Synchronizes networks, sensors and weapons
- ✓ Enables coordinated action across forces
- ✓ Ensures integrity of data and communications
- ✓ Supports safe navigation and deconfliction
- ✓ Provides a common time reference for all systems
- ✓ Small timing errors create large operational effects

RISKS AND BACKUPS

DEPENDENCE CREATES VULNERABILITIES



Adversaries can attempt to disrupt PNT using jamming, spoofing or space-based threats, degrading accuracy, availability or trust in PNT information.

NATO'S APPROACH



Resilience by design: hardened systems, disciplined emission control and rapid detection



Diverse PNT sources: multiple satellite constellations, terrestrial systems and partner-provided services



Alternative PNT: inertial navigation, terrain and map-matching, celestial navigation and other non-satellite methods



NATO-led enterprise: political guidance, standards, information sharing and capability development across the Alliance



SPACE-BASED INTELLIGENCE, SURVEILLANCE AND RECONNAISSANCE FOR NATO

FROM SPACE TO SITUATIONAL AWARENESS AND DECISION ADVANTAGE

SENSORS AND SOURCES

SPACE SYSTEMS PROVIDE PERSISTENT, WIDE-AREA COLLECTION ACROSS MULTIPLE DOMAINS.



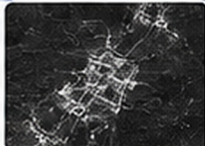
ELECTRO-OPTICAL

High-resolution imagery in visible and infrared to detect, identify and monitor activities.



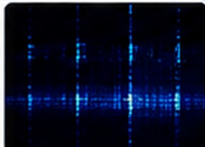
SYNTHETIC APERTURE RADAR

All-weather, day-and-night imaging that can see through clouds and operate in challenging conditions.



RADIO-FREQUENCY / SIGNALS INTELLIGENCE

Detects and geolocates emissions to understand communications and electronic activity.



ADDITIONAL SOURCES

Includes satellite communications, navigation data and commercial data that complement ISR.



FROM COLLECTION TO DECISION

SPACE DATA IS TRANSFORMED INTO TIMELY, RELEVANT INTELLIGENCE THAT DRIVES ALLIED OPERATIONS.



JOINT ISR IS VITAL FOR NATO MILITARY OPERATIONS.

It strengthens deterrence, supports crisis management and enables Allies to act with speed, precision and unity.

APSS AND AQUILA



Allies announced the Alliance Persistent Surveillance from Space (APSS) initiative in 2023.



APSS is intended to build a virtual constellation, known as Aquila, combining national and commercial assets to enhance surveillance and intelligence for the Alliance.



By mid-2026, APSS had expanded to 19 participating countries.



APSS and Aquila exemplify Allied cooperation, burden sharing and innovation to maintain a persistent edge from space.

WHY SPACE-BASED ISR MATTERS



PERSISTENT SITUATIONAL AWARENESS

Provides continuous visibility beyond national borders and across domains.



EARLY WARNING AND DETECTION

Helps identify emerging threats and changes in activity to enable timely response.



PLANNING AND TARGETING SUPPORT

Delivers accurate, timely information to support mission planning and precision effects.



ALLIED INTEROPERABILITY AND UNITY

Enables secure information sharing and common understanding among Allies and partners.



RESILIENCE AND REDUNDANCY

A mix of national and commercial assets increases resilience and reduces risk.



INFORMED DECISION-MAKING

Transforms data into actionable intelligence for confident and timely decisions.



SPACE-BASED ISR GIVES NATO THE PERSISTENT, WIDE-AREA AWARENESS NEEDED TO DETER ADVERSARIES, PROTECT ALLIES AND DEFEND OUR VALUES, WHEREVER AND WHENEVER IT MATTERS.

MISSILE WARNING FROM SPACE: DETECTING THREATS EARLIER

EARLIER DETECTION. SHARED WARNING. STRONGER DEFENCE.

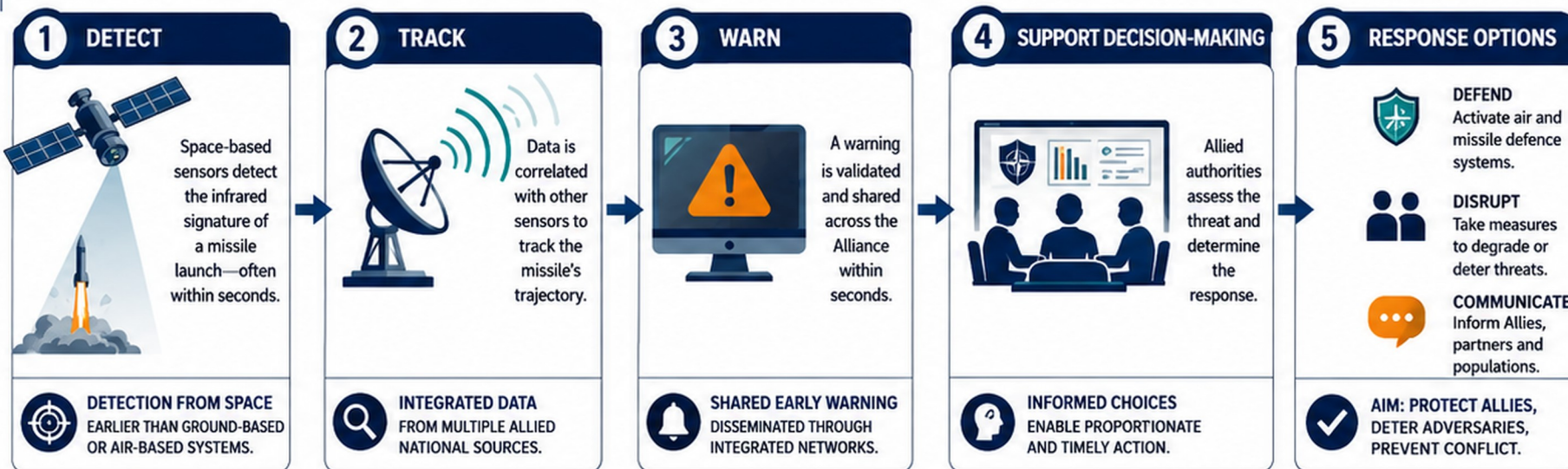
NATO uses a network of Allied national capabilities and integrated warning networks—including space-based sensors—to detect, track and warn of missile events, providing time for decisions that save lives and strengthen deterrence.



NATO POLICY: SHARED EARLY WARNING

- Shared early warning is a capability that **CONTRIBUTES TO DETERRENCE AND DEFENCE** by providing **PERSISTENT MONITORING AND WARNING** OF MISSILE EVENTS.
- NATO INTEGRATED AIR AND MISSILE DEFENCE provides **ALERTS AND EARLY WARNING INFORMATION** on air and missile attack, including **DISSEMINATION OF SHARED EARLY WARNING INFORMATION ON MISSILE LAUNCHES**.
- NATO maintains a **PERSISTENT 360-DEGREE SURVEILLANCE CAPABILITY** and the ability to **MONITOR AND WARN** on air and missile threats on a **24/7 BASIS**.

FROM DETECTION TO DECISION: BUYING TIME THAT MATTERS



HOW THIS SUPPORTS DETERRENCE AND DEFENCE

- ✓ **EARLY WARNING BUYS TIME:** More time to assess, decide and act—saving lives and reducing damage.
- ✓ **STRENGTHENS DETERRENCE:** Adversaries face a resilient Alliance that sees and understands threats and is prepared to respond.
- ✓ **SHARED AWARENESS:** Common operating picture enables unity of effort and coordinated responses across the Alliance.

NATO'S APPROACH: NETWORKS, NOT A SINGLE CONSTELLATION

- NATO DOES NOT OWN OR OPERATE A DEDICATED SPACE-BASED WARNING CONSTELLATION.
- NATO LARGELY RELIES ON ALLIED NATIONAL CAPABILITIES AND INTEGRATED WARNING NETWORKS.
- National assets and NATO command, control and communication systems combine to deliver shared situational awareness.

LIMITATIONS AND DEPENDENCIES

- Depends on the availability and performance of Allied national capabilities.
- Adversaries may use countermeasures.
- Space weather and technical anomalies can affect sensors and links.
- Information must be fused, validated and acted on quickly to be effective.

KEY TAKEAWAY: EARLY WARNING BUYS TIME

Time gained enables better decisions—turning information into protection.

LAUNCH
Adversary fires a missile.

SECONDS
Space sensors detect the launch.

TENS OF SECONDS
Warning is validated and shared.

MINUTES
Leaders assess, decide and act.

OUTCOME
Better prepared.
Lives saved.
Deterrence upheld.

PERSISTENT SURVEILLANCE. SHARED WARNING. UNITED RESPONSE.



COMMERCIAL SPACE SERVICES AND NATO OPERATIONS

STRENGTHENING ALLIANCE RESILIENCE, AGILITY, AND EFFECTIVENESS IN PEACE, CRISIS, AND CONFLICT

WHY COMMERCIAL MATTERS



COMPLEMENT, NOT REPLACE

Commercial space services complement national military capabilities, helping NATO fill gaps, scale capacity, and stay ahead of emerging needs.



RESILIENCE THROUGH DIVERSITY

Access to multiple commercial providers and systems increases resilience and reduces reliance on any single asset or nation.



AGILITY AND SPEED

Commercial innovation and rapid refresh cycles deliver new capabilities and capacity faster than traditional approaches.



FOCUS ON CORE MISSIONS

Outsourcing non-core space services allows Allies to focus investments and personnel on critical national military capabilities.

HOW COMMERCIAL SPACE SERVICES SUPPORT NATO OPERATIONS

A TYPICAL VALUE CHAIN



1. ACQUIRE

Commercial satellites and ground systems provide data and communications.



2. PROCESS

Cloud-enabled platforms store, process, and integrate data at scale with speed and elasticity.



3. ANALYZE

Analytics and AI transform data into intelligence and operational insights.



4. DELIVER

Timely, actionable information and services delivered to users across NATO.



5. DECIDE & ACT

Commanders use trusted space-enabled information to inform decisions and actions.



GOVERNANCE, SECURITY, AND ASSURANCE

Policies, oversight, cyber protection, and risk management applied across the entire chain.

POLICY DIRECTION SINCE 2025



IN FEBRUARY 2025, NATO ENDORSED ITS FIRST COMMERCIAL SPACE STRATEGY.



The strategy aims to strengthen the Alliance's relationship with commercial space partners and improve NATO's ability to leverage commercial space services in peace, crisis, and conflict.



The strategy emphasizes resilience, availability, and better integration of commercial expertise into training, exercises, and operations.



It guides Allies and NATO to engage effectively with industry while managing risks and protecting national security and operational advantage.

TYPICAL SERVICES



SATCOM

Secure voice, data, and broadband connectivity for command, control, and force operations.



EARTH OBSERVATION

High-resolution imagery and sensing for situational awareness, monitoring, and targeting support.



ANALYTICS & INSIGHTS

AI/ML-enabled analytics, fusion, and dashboards that turn data into actionable intelligence.



SPACE DOMAIN AWARENESS DATA

Data and services to detect, track, and understand objects and events in space.



CLOUD-ENABLED PROCESSING

Elastic compute and storage to process data near real time and share securely at scale.



RESILIENT BACKUP CAPACITY

Commercial surge and backup services that enhance continuity when systems are degraded or contested.

BENEFITS TO NATO



ENHANCED RESILIENCE

Multiple commercial sources and orbits reduce single points of failure and help assure mission continuity.



GREATER AGILITY

Rapid access to new capabilities and capacity supports fast adaptation to changing threats.



STRONGER INTEROPERABILITY

Commercial standards and services integrate with NATO networks and alliances more easily.



COST EFFICIENCY

Pay-for-use models and competition help optimize resources and avoid unnecessary overbuild.



ACCESS TO INNOVATION

Leverage cutting-edge technology from a dynamic commercial ecosystem.



SCALABLE OPERATIONS

On-demand services scale to meet peacetime, surge, and wartime operational requirements.

TRADE-OFFS: BALANCING OPPORTUNITIES AND RISKS

OPPORTUNITIES



SPEED

Faster delivery and fielding of capabilities.



SCALE

Access to vast capacity and global coverage.



INNOVATION

Continuous technology advances and new services.



FLEXIBILITY

Right-size services and pay for what you use.

RISKS TO MANAGE



SECURITY

Protecting sensitive data and operational details.



CONTRACTUAL COMPLEXITY

Managing contracts, SLAs, and intellectual property.



CONTINUITY RISK

Provider viability, market consolidation, and dependencies.



SOVEREIGNTY & CONTROL

Assuring decision rights and assured access when needed.



NATO LEVERAGES COMMERCIAL SPACE SERVICES TO STAY RESILIENT, INNOVATIVE, AND READY—TOGETHER.

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SPACE DOMAIN AWARENESS: UNDERSTANDING WHAT IS HAPPENING IN ORBIT.

Space domain awareness (SDA) means understanding objects, activity, risks, and threats in space so NATO can protect the services on which it depends.



SPACE ENABLES
OUR OPERATIONS.
AWARENESS PROTECTS
OUR ADVANTAGE.

NATO IS DEVELOPING SPACE DOMAIN AWARENESS BY:



RAISING AWARENESS OF RELIANCE ON SPACE

Ensuring Allies understand how space services support operations and daily life—and the risks of disruption.



IMPROVING SHARED UNDERSTANDING OF THREATS AND VULNERABILITIES

Building a common picture of risks to space systems and the services they provide.



INCREASING INFORMATION AND INTELLIGENCE SHARING AND FUSION

Improving the exchange, integration, and analysis of data and intelligence among Allies.



NATO'S OPERATIONAL
HUB FOR SPACE
SUPPORT IS IN
RAMSTEIN, GERMANY.



NATO COORDINATES WITH ALLIED NATIONAL CIVIL AND MILITARY SPACE ACTORS.

This includes national space agencies, commercial providers, and international partners.

WHAT SPACE DOMAIN AWARENESS INCLUDES



ACTIVE SATELLITES

Tracking and characterizing operational satellites and their status and capabilities.



DEBRIS

Monitoring space debris to assess collision risk and protect spacecraft and services.



INTERFERENCE

Detecting and analyzing attempts to jam, spoof, or otherwise disrupt space services.



CLOSE APPROACHES

Identifying and assessing close approaches between objects in space.



ABNORMAL SPACECRAFT BEHAVIOR

Noticing unusual or unexpected behavior that may indicate a problem or hostile intent.



THREATS TO GROUND INFRASTRUCTURE

Assessing risks to ground stations, networks, and other infrastructure that support space services.

HOW INFORMATION IS SHARED



1. MONITOR

Collect data from sensors, satellites, networks, and open sources.



2. ASSESS

Analyze, correlate, and fuse information to build a common operational picture.



3. SHARE

Share timely, relevant information and intelligence across Allies and partners.



4. ACT

Enable decisions and actions to protect space services and support operations.

WHAT NATO NEEDS TO WATCH

CATEGORY	KEY QUESTIONS
ACTIVE SATELLITES	Which satellites are operating, and how are they functioning?
DEBRIS	Where is debris, and what is the collision risk?
INTERFERENCE	Is anyone interfering with or attempting to disrupt our signals?
CLOSE APPROACHES	Which objects are making close approaches, and what is the risk?
ABNORMAL BEHAVIOR	Is any spacecraft behaving abnormally or unexpectedly?
GROUND INFRASTRUCTURE	Are ground systems and networks under threat or attack?

WHY IT SUPPORTS OPERATIONS



PROTECTS SATELLITES AND SPACE SERVICES ON WHICH NATO RELIES.



REDUCES RISK TO ALLIED FORCES AND CIVIL POPULATIONS.



IMPROVES EARLY WARNING OF POTENTIAL THREATS AND DISRUPTIONS.



SUPPORTS RESILIENCE, CONTINUITY, AND RAPID RESPONSE.



STRENGTHENS ALLIED UNITY AND SHARED SITUATIONAL AWARENESS.



PROTECTING NATO'S SPACE-ENABLED SERVICES FROM DISRUPTION

NATO DEPENDS ON SPACE-ENABLED SERVICES. OUR OBJECTIVE IS CONTINUOUS, SECURE ACCESS—NOT PROTECTING SATELLITES ALONE.



Space-enabled services are vital to NATO operations and decision-making. They support secure communications, positioning, navigation and timing (PNT), intelligence, surveillance and reconnaissance (ISR), missile warning, and weather forecasting.



NATO POLICY AND PLANNING FOCUS ON RESILIENCE: ENSURING CONTINUOUS, SECURE ACCESS TO SERVICES.

SPACE-ENABLED SERVICES NATO RELIES ON



SECURE COMMUNICATIONS



PNT FOR FORCES AND SYSTEMS



ISR AND RECONNAISSANCE



MISSILE WARNING



WEATHER AND ENVIRONMENT



DATA TRANSPORT AND SERVICES



WHAT RESILIENCE LOOKS LIKE

- ✓ Services remain available and trustworthy despite disruption or attack
- ✓ Operations continue through alternative paths and providers
- ✓ Degraded operations continue while recovery is underway
- ✓ Rapid detection, attribution support, and response
- ✓ Learning and adaptation improve future resilience



LAYERED PROTECTION



SPACE SEGMENT



GROUND SEGMENT



NETWORKS AND DATA LINKS



APPLICATIONS AND USERS

PROTECT EVERY LAYER. ASSURE THE SERVICE.



WHY CONTINUITY MATTERS



ENABLES COMMAND AND CONTROL



PROTECTS ALLIANCE FORCES AND PARTNERS



DELIVERS TIMELY INFORMATION AND DECISIONS



DETERS ADVERSARIES THROUGH RESILIENCE AND CREDIBILITY

MAIN THREATS	RESPONSE APPROACHES						
	REDUNDANCY AND DIVERSIFICATION	HARDENED GROUND INFRASTRUCTURE	MONITORING AND WARNING	TRAINING AND EXERCISES	INFORMATION SHARING	CYBER DEFENCE	TRUSTED COMMERCIAL SUPPORT
JAMMING	●	●	●	●	●	●	●
SPOOFING	●	●	●	●	●	●	●
CYBERATTACK	●	●	●	●	●	●	●
DAZZLING (BLINDING)	●	●	●	●	●	●	●
KINETIC ANTI-SATELLITE ATTACK	●	●	●	●	●	●	●
DEBRIS	●	●	●	●	●	●	●
GROUND-SEGMENT SABOTAGE	●	●	●	●	●	●	●
SUPPLY-CHAIN RISKS	●	●	●	●	●	●	●
DATA-LINK DISRUPTION	●	●	●	●	●	●	●



RESILIENCE IS A COLLECTIVE AND CONTINUOUS EFFORT. | NATO, ALLIES, PARTNERS AND TRUSTED INDUSTRY WORK TOGETHER TO ASSURE THE SPACE-ENABLED SERVICES THAT KEEP OUR ALLIANCE SAFE AND EFFECTIVE.



NATO'S MULTINATIONAL SPACE ARCHITECTURE: HOW ALLIES SHARE CAPABILITIES

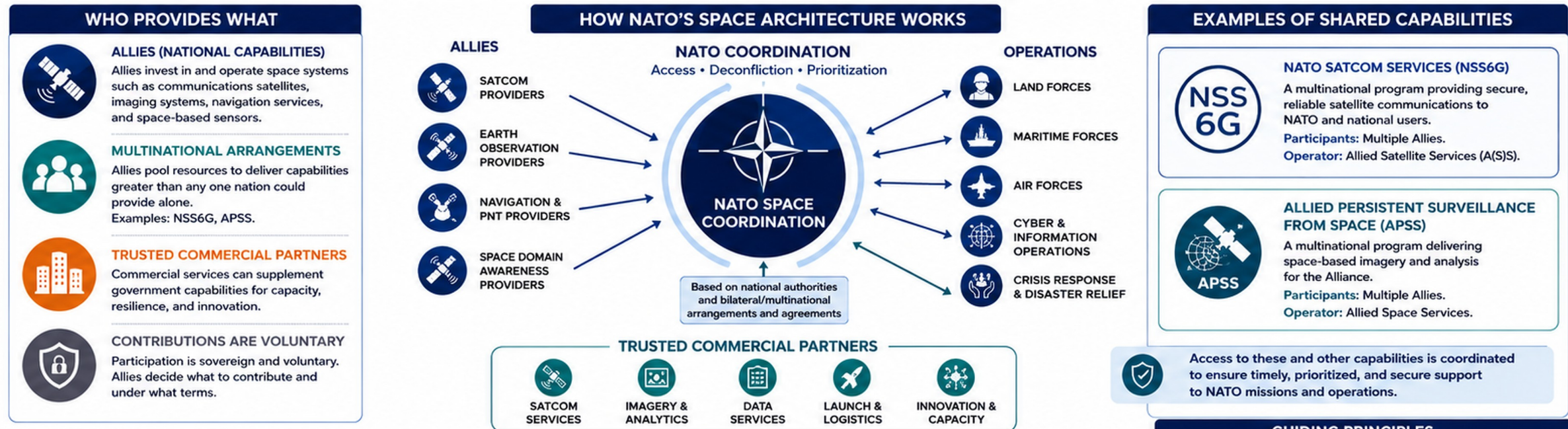
FEDERATED, VOLUNTARY, AND SECURE SPACE SUPPORT FOR ALLIANCE OPERATIONS



NATO'S OVERARCHING SPACE POLICY emphasizes voluntary participation, leveraging Allied capabilities, and trusted commercial service providers. The Alliance relies on national and multinational arrangements—not a single centralized NATO-owned space system.



PURPOSE:
Enable space support to Alliance operations—secure communications, situational awareness, navigation, and timing—by coordinating access to capabilities provided by Allies and trusted partners.



BENEFITS AND CHALLENGES OF A FEDERATED MODEL

	 BURDEN-SHARING	 INTEROPERABILITY	 RESILIENCE & ASSURANCE	 SECURITY	 COMPLEXITY
BENEFITS 	Allies invest according to capability and priorities; costs are shared across nations and programs.	Common standards, procedures, and interfaces enable combined operations and data sharing.	Diverse providers, orbits, and services reduce single points of failure and increase robustness.	National ownership and classified systems remain under national control; information is protected.	A federated approach allows flexibility and choice while avoiding the cost and risk of a single system.
CHALLENGES 	Uneven contributions and priorities can create gaps or dependencies.	Variations in systems and processes require sustained coordination and standardization.	Access depends on availability, capacity, and national decisions in times of crisis.	Protecting sensitive information across multiple providers requires strong security practices.	Coordinating many actors and agreements can be resource-intensive and time consuming.

GUIDING PRINCIPLES

-  **VOLUNTARY PARTICIPATION AND SOVEREIGN DECISIONS**
Allies choose what to provide and how to participate.
-  **LEVERAGE AND COMPLEMENT**
Use national, multinational, and commercial capabilities to meet operational needs.
-  **COORDINATE, DON'T DUPLICATE**
NATO coordinates access and use—Allies provide.
-  **SECURE AND TRUSTED**
Rely on trusted partners and robust security to protect information and missions.



NATO SPACE SERVICES IN A FUTURE CONFLICT

ENABLING DECISION ADVANTAGE, UNITY OF EFFORT, AND RESILIENCE ACROSS ALL DOMAINS

ILLUSTRATIVE SCENARIO

Hypothetical multi-domain operation.
Not a prediction or current assessment.

OPERATIONAL PHASES

How space services support the mission across time

1

PRE-CRISIS



- Build situational awareness
- Monitor risks and trends
- Assure readiness
- Strengthen partnerships
- Exercise and integrate

2

DEPLOYMENT



- Deploy forces and enablers
- Establish C2 and logistics
- Validate space support
- Synchronize services
- Scale capacity

3

CONTESTED OPERATIONS



- Enable maneuver and fires
- Provide shared awareness
- Coordinate multi-domain effects
- Sustain mission tempo
- Inform decision advantage

4

DEGRADED ENVIRONMENT



- Counter jamming and attack
- Degrade adversary capabilities
- Maintain essential services
- Adapt operations
- Preserve force cohesion

5

RECOVERY AND ADAPTATION



- Restore and reconstitute
- Reassess the environment
- Learn and improve
- Remodernize capabilities
- Strengthen resilience

SPACE SERVICES THAT ENABLE OPERATIONS



SATELLITE COMMUNICATIONS (SATCOM)

Resilient voice, data, and video links for command and control, and force connectivity.



POSITIONING, NAVIGATION & TIMING (PNT)

Precise position, navigation, and timing for maneuver, targeting, and synchronization.



SPACE-BASED ISR

Persistent observation for detection, tracking, and change assessment.



SHARED EARLY WARNING

Timely detection and alerting of threats to populations and forces.



ENVIRONMENTAL MONITORING

Weather, ocean, and space weather data to inform planning and safety.



COMMERCIAL & ALLIED AUGMENTATION

Additional capacity, coverage, and innovation through trusted partners and industry.



SPACE DOMAIN AWARENESS (SDA)

Detect, track, and characterize space objects and events to protect missions.

SPACE-ENABLED DECISION CYCLE AND OPERATIONAL TEMPO



COLLECT

Space sensors and links gather data and signals.



PROCESS & FUSE

Data is processed, fused, and correlated with other domains.



ANALYZE & ASSESS

AI/analytics and human expertise extract insight and assess impact.



DECIDE

Commanders make informed decisions with confidence.



ACT & COMMAND

Orders and effects are delivered across all domains.



ASSESS & ADAPT

Outcomes are measured; plans and capabilities are adjusted.

RAPID DATA SHARING, INTEROPERABILITY, AND TRUST ENABLE SPEED, AGILITY, AND UNITY OF EFFORT

HOW SPACE SERVICES SUPPORT MULTI-DOMAIN OPERATIONS



LAND

Precision navigation, secure C2, and ISR for maneuver.



AIR

Global communications, situational awareness, and targeting data.



MARITIME

Maritime domain awareness, navigation, and mission command and control.



CYBER

Resilient space links and PNT support cyber operations.



SPACE

SDA, protected assets, and freedom of action in space.



INFORMATION

Timely, accurate data to counter disinformation and inform allies.

LIKELY STRESSORS TO SPACE SERVICES



JAMMING & SPOOFING

Interference to disrupt communications, PNT signals, and sensors.



CYBERATTACKS

Intrusions targeting ground systems, networks, and data.



COUNTERSPACE WEAPONS

Kinetic or non-kinetic actions to degrade or destroy space assets.



SERVICE DENIAL

Commercial outage, weather events, or supply chain disruption.



DECEPTION & DISINFORMATION

False signals and narratives to confuse and delay decision-making.



RESILIENCE AND MITIGATION RESPONSES



PROTECT

Harden systems, secure networks, and manage emissions.



DIVERSIFY

Use multiple orbits, providers, bands, and architectures.



MOBILIZE & ADAPT

Rapid reconfiguration, movable terminals, and on-orbit re-tasking.



INTEGRATE & SHARE

Trusted data sharing and allied interoperability.



PREPARE & TRAIN

Exercises, doctrine, and talent to operate in adversity.



FUTURE CONFLICT WILL INTENSIFY DEPENDENCE ON SPACE-ENABLED SERVICES—MAKING RESILIENCE, INTEGRATION, AND RAPID DATA SHARING MORE IMPORTANT THAN EVER.

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