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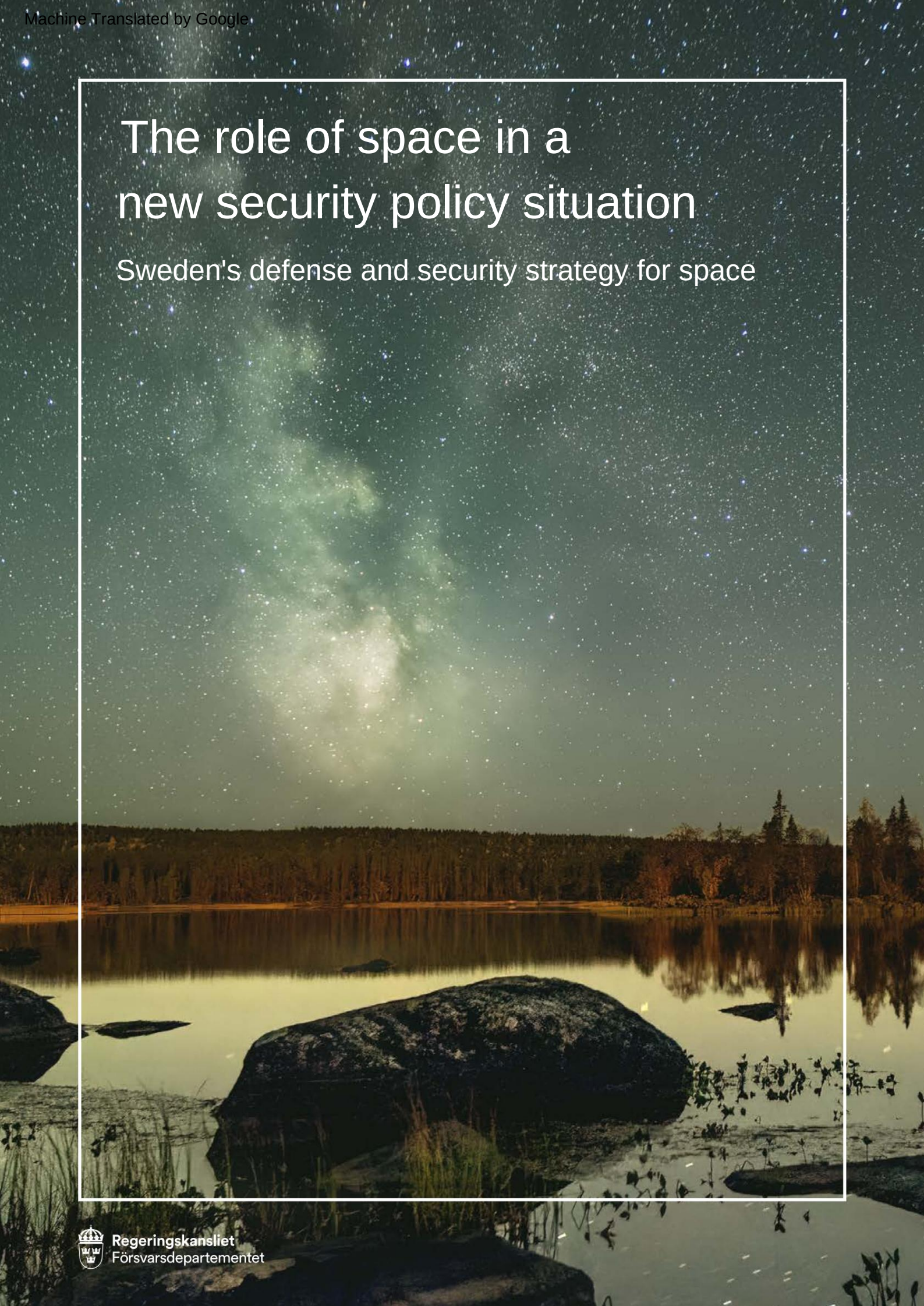
The role of space in a new security policy situation

Sweden's defense and security strategy for space



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Content

Glossary 3

Preface 5

Starting points 6

Space – the new open sea 6

A changed Europe 11

Paradigm shift in Swedish security policy 12

Freedom of action in and through space 16

Peace in space 16

Deterrence and defense 18

A collective threat picture 20

Strengthened security work 20

Increased resilience 21

Preparedness in the space domain 23

A space portfolio to support total defense and crisis preparedness 24

A balanced space portfolio 24

Space services 26

Support to space operations 28

Security of supply in the space area 29

Sweden in the international space arena 32

A reliable ally in NATO 32

A committed member of the EU 34

A strong voice in the UN 36

Nordic Community 37

Collaborations with strategic partners 37

Space policy in a new security policy situation 39

Joint management and coordination of space issues 39

Human capital in space, defense and security 41

Implementation and follow-up 43

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Glossary

CER - Critical Entities Resilience

DIANA - Defense Innovation Accelerator for the North Atlantic

EDA - European Defense Agency

EDF - European Defense Fund

EU - European Union

EUMETSAT - European Organization for the Exploitation of Meteorological Satellites

UN - United Nations

GNSS - Global Navigation Satellite System

HCOC - Hague Code of Conduct

ITU - International Telecommunication Union. UN's trade body for telecommunications and digitization.

MTCR - Missile Technology Control Regime

NATO - North Atlantic Treaty Organization

NIF - NATO Innovation Fund

NIS2 - Network and Information Security 2

Nordefco - Nordic Defense Cooperation

PESCO - Permanent Structured Cooperation

Space **capability** is the ability to use space infrastructure to support operations in other domains. It includes doctrine, organization, personnel and materiel.

Space data *(Space cata)* is produced and/or transmitted via space infrastructure and used to provide space services.

Space services *are* provided by space systems to users for various operations and activities, for example navigation.

Space debris **is** the result of human activities in space and is scrap from objects placed in space, such as satellites, rocket stages, etc.

The *Space domain* includes the physical environment in the form of the orbits around the Earth and the area between the Earth and the Moon.
It also covers the space infrastructure and the space sector. The space domain is based on the following segments: the launch segment, the space segment, the link segment, the ground segment and the user segment.

Space infrastructure includes space-based systems (satellites), data links, infrastructure for launching systems in space and ground-based systems (ground stations, operator centers, etc.).

Counterspace capabilities **are** capabilities that aim to mislead, degrade, deny, disrupt or destroy an adversary's access to space infrastructure and/or space services. The action effect can be reversible (for example jamming of signals) or non-reversible (for example attack with ballistic robots).

Space **intelligence** is processed information obtained via all intelligence channels and provides a basis for assessment of the space domain and its actors. May include technical intelligence on space operations and space systems, intelligence from open sources and strategic environmental analysis of the development of the space domain including actors and technology.

SST *(Space Surveillance and Tracking)*
Space monitoring and tracking of space objects takes place through a network of ground- and space-based sensors.

SSA *(Space Situational Awareness)* Space Situational Image is an operator-specific overview of the space environment and space travel as well as the most important space risks. These risks include collisions between space objects, fragmentation of space objects, re-entry into the atmosphere, space weather phenomena, and near-Earth objects. Space situation image is based on SST, space weather and near-Earth objects.

SDA *(Space Domain Awareness)* Military space situational picture is a timely and actionable awareness of all events, actions, intentions and actors in the space domain. SDA encompasses SST, space weather, the telewarfare environment and space intelligence in order to understand events in a multi-domain context.

SSC - Swedish Space Corporation

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Preface

Pål Jonson
Minister of Defence

Space is a strategic domain. The use of space is of great importance to our societies and not least to our defence. With space systems, today we can observe, communicate and orient ourselves at any time, almost anywhere on Earth. Space is also an operational domain. The use of space contributes to our total defense and Sweden's security by increasing the effect of our existing defense capabilities and ensuring important societal functions.

We must secure our defense and security interests in and through space by establishing ourselves as a significant and responsible space actor in defense and security.
Our geostrategic location and our combined national capacity in the space area are the starting points for achieving our strategic objectives.

Sweden must ensure its freedom of action in and through space.
Space is an arena for cooperation, but it is also characterized by competition and the risk of conflict, as well as the fact that the orbits around the Earth are a finite resource. We must have the ability to anticipate and manage the challenges connected to space. Concretely, this means that we take various technical, political, diplomatic and military measures, when required. It also means knowledge of oneself and the opponent, which is why a situational picture in the space domain is central.

Sweden must create a portfolio consisting of capabilities, services and capacity in the space area to support our total defense and our crisis preparedness. Through strategic path choices around own ownership, collaboration with others and commercial access, we increase our strategic independence and become a more relevant defense and security policy cooperation partner. We must develop our own space capabilities for reconnaissance and surveillance as well as launching satellites and take advantage of the potential of our national value chain in the space area.

Sweden must act together with others when possible and alone when necessary. We must contribute in the area of space by being a credible ally in NATO and a committed member of the EU. We prioritize defense and security policy space cooperation with our neighbors in the Nordics and our strategic partners.

Defense and security policy aspects are becoming increasingly important in Swedish space policy. We must therefore pursue a coherent and knowledge-based space policy that contributes to the development of crisis preparedness and total defence. We must ensure that we have human capital with interdisciplinary competence and knowledge to be able to understand and use space as a physical, strategic and operational domain.

With this strategy, we strengthen the defense and security dimension in space policy so that Sweden is better equipped to meet the challenges in space and more capable of using space for defense and security.

Sweden from space.

Photo: NASA

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Starting points

The use of space has made our societies stronger, safer and more prosperous and has become part of our everyday life. With space systems, one can observe, communicate and orient oneself almost everywhere on earth. Space is a strategic domain on which we have become increasingly dependent.

Space – the new open sea

In a more uncertain world where geopolitical tensions have increased, space continues to be an arena for cooperation, but with renewed great power competition the risk of conflict increases. The political and technological prestige of space programs means that they are used by states to advance strategic and political interests. Space systems have dual uses and commercial space systems are increasingly used for military purposes. In recent years, there has been an increase in the number of cyber-attacks, disruptions and conflict-inducing maneuvers in space that have also targeted civil and commercial space infrastructure, in several cases in the form of hybrid threats and attacks.

A large part of the development today takes place on the commercial side, with great opportunities linked to research, development and new services of benefit to society. The rapid technological development, innovation and application of new business models with commercial actors at the center have led to space services and space data being more accessible than ever to a growing number of actors. The growth in the space field contributes to an increased social dependence on the space infrastructure that is emerging and that more and more space services are integrated into various social functions.

Earthrise from the Moon. Image from Apollo 11 in 1969.

Photo: NASA

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Illustration of space junk.

Photo: ESA

There is global competition for access to spectrum for space infrastructure and services and a lack of launch capacity, driven in part by the establishment of new satellite constellations. Space technology, combined with other cutting-edge technologies such as AI and quantum technology, can transform warfare and is increasingly the result of technology-intensive innovation in the civilian sector.

The development of space travel was driven by military interests and military utility, such as strategic intelligence gathering and early warning. The ongoing operationalization of the space domain means that more and more states are defining space as an operational domain along with the sea, land, air and cyber domains, which is shown, among other things, through military doctrine and capability development. The interweaving of the space domain with other domains is becoming more apparent.

The challenges in space span a wide range that includes physical threats and hazards, political challenges, and the fact that Earth's orbits are a finite and economically exploitable resource. More actors in space means more objects in orbit around the Earth, which risks leading to an unsustainable use of the orbits. Even the exploration of space and other celestial bodies may in the future lead to conflicts of interest. The development and use of space denial capabilities aimed at denying an adversary access to space infrastructure or space services continues.

In 2021, Russia conducted an anti-satellite test against a satellite of its own using a robot launched from the ground, resulting in a prolonged field of space debris. Just before the full-scale invasion of Ukraine began, Russia carried out a cyberattack against a commercial satellite communications provider that disabled tens of thousands of European user modems. Russia also engages in telewarfare to, among other things, disrupt GNSS services for position, navigation and time, which affects civil maritime and aviation in Sweden's vicinity.

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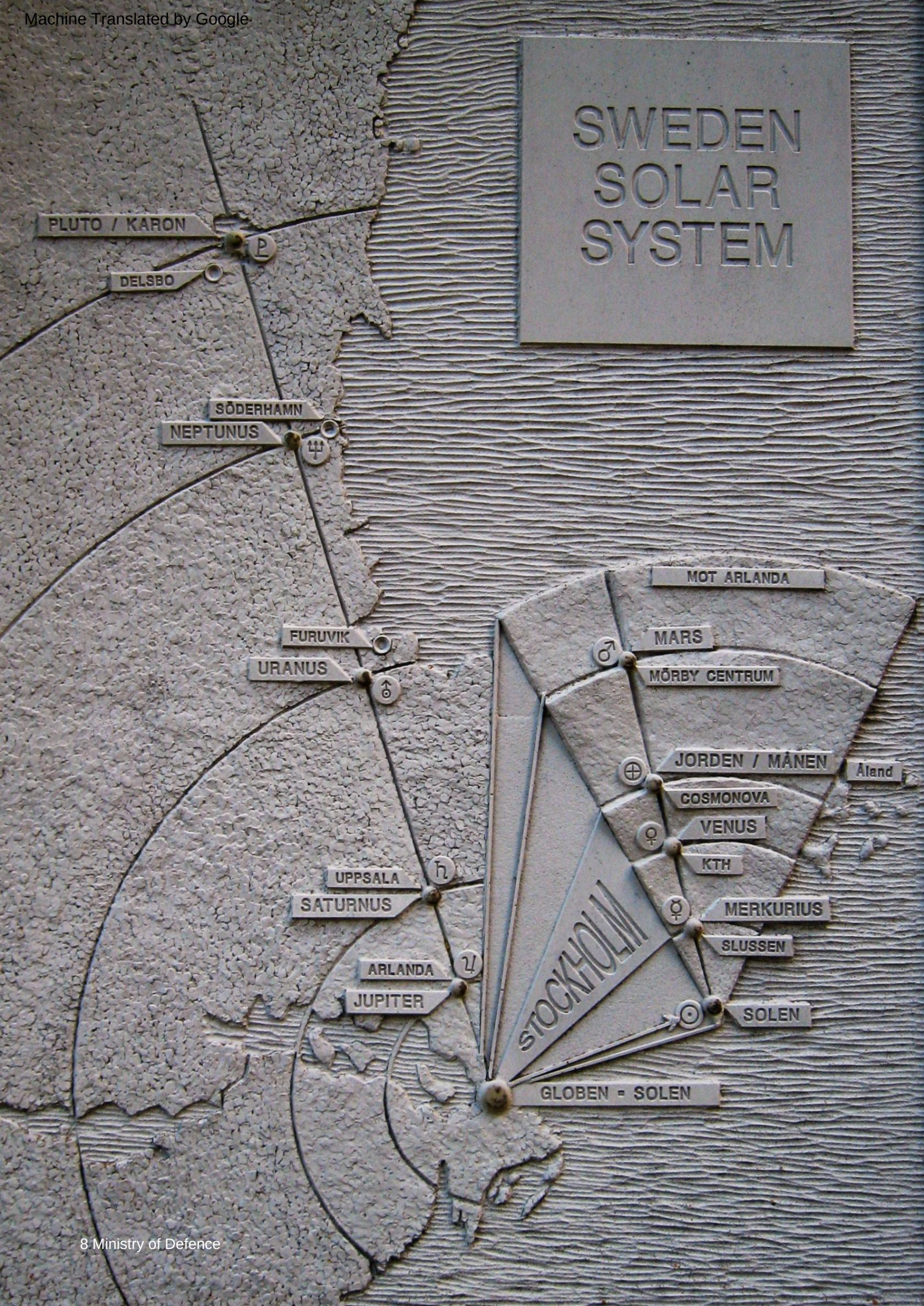

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The Outer Space Treaty of 1967 forms the basis of the international legal framework for outer space. Among other things, it stipulates that states must conduct their exploration and use of space in accordance with the rules of international law, including the UN Charter. The treaty also prohibits the deployment of weapons of mass destruction in orbit. States bear international responsibility for both governmental and non-governmental activities in space and for the activities to take place in accordance with the provisions of the Outer Space Treaty. The UN Charter contains, among other things, rules on states' right to self-defense in the event of an armed attack according to Article 51, but also rules for the peaceful resolution of conflicts. In addition to binding international law, there are also norms, rules and principles for responsible a

The increased activity in space entails a need to jointly develop international norms, rules and principles for what constitutes responsible action in space. This is done above all within the framework of the UN. Against the background of the consequences of destructive anti-satellite tests with robots from the ground in recent years, more and more states are making unilateral commitments not to carry out such, which may eventually become the norm. All EU countries have already made such commitments.

Sweden has the world's largest model of the solar system.

Photo: Wikimedia Commons

Signing of the Outer Space Treaty in 1967.

Photo: UN Photo

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A changed Europe

Europe is perhaps facing the most challenging security policy situation since the Second World War. The war in Ukraine has cemented the critical role that space services play in modern warfare. Satellite communication enables contact with the outside world and satellite images give the outside world a unique insight into the brutal reality of war. The war has also highlighted the vulnerability of space infrastructure and the dependence on access to space services and launch capabilities.

NATO

NATO attaches greater strategic importance to space. In 2019, the Allies adopted a comprehensive space policy, declaring space as an operational domain alongside the air, sea, land and cyber domains.

The policy is a step towards implementing space as an operational domain and strengthening the alliance's core tasks of deterrence and defence.

It is noted that strategic competitors and potential adversaries are developing and operationalizing technologies that could threaten allies' freedom of action in space.

The role of space in NATO's 360-degree perspective is emphasized in the alliance's strategic concept from 2022. The concept also states that one or more malicious cyber activities, or hostile operations against, from, or in space, can reach the level of armed attack and lead the North Atlantic Council to invoke Article 5.

NATO's first Space Symposium in 2024 provided a springboard to advance NATO's space agenda.

EU

Russia's full-scale invasion of Ukraine has brought about a transformation of the EU's security and defense policy, which has also included the space domain.

In recent years, the EU has developed the foreign and security policy dimensions of space policy, while links between space and defense industrial initiatives have been strengthened. The most important instrument for this is the EU's Space Strategy for Security and Defense from 2023, which was announced in the EU's Strategic Compass for Security and Defense 2022.

The strategy represents a paradigm shift in the EU's view of space and aims to partly strengthen the EU's strategic position and independence in the space domain, and partly to increase the EU's ability to face the increasing competition and conflict potential in space. The strategy shows an ambition to increase the use of the EU's civil space program for defense and security purposes, by integrating defense and security requirements into the development of the program. The strategy is a security policy instrument that strengthens the EU's credibility as a space actor on the global stage and that contributes to the common security and defense policy.

Arctic

In Sweden's immediate vicinity, the European part of the Arctic together with the Baltic Sea has a special geostrategic significance and the region has emerged as a strategically important arena for the majority of actors including NATO.

Many strategically important reconnaissance and surveillance satellites pass over the poles. Critical infrastructure in the region gets increased protection value. Access to space capabilities and space services for navigation, communication and surveillance will play a critical role in operating safely and effectively in the region.

The new security situation and the region's increased geostrategic importance demand an adaptation of the Nordics defense cooperation. With everyone Nordic countries in NATO, it also means a new era for Nordic defense cooperation.

Arctic.

Photo: ASP GeoImaging/Nasa

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Paradigm shift in Swedish security policy

Sweden is in a serious security policy situation and a strong total defense is crucial to deal with this. The solidarity security policy forms a foundation in Swedish defense and security policy. Sweden's security policy forms the basis for Swedish involvement in space matters as well.

Solidarity member of NATO and the EU

As in other domains, Sweden builds security in space together with others, as a solidary member of NATO and the EU, through cooperation in the Nordic countries and through cooperation with strategic allies. Sweden pursues a solidary alliance policy that aims to strengthen security and stability in the Swedish neighborhood, as well as in the entire Euro-Atlantic area. The transatlantic link between Europe and the US is crucial to our security. With membership in NATO, the defense of Sweden is moved to NATO's outer border. This means that Sweden must have the ability to act for the common security within the alliance, where the national defenses contribute to the alliance's combined strength.

A space nation with a geostrategic location in the north

As a space nation with an industrial capability in almost the entire value chain, Sweden has good conditions to contribute to common security. Infrastructure, industrial capability, innovative power and expertise in space are assets that can be used strategically to support Sweden's security policy line and strategic objectives.

Sweden's polar location provides ideal conditions for controlling, monitoring and launching satellites that pass over the poles. Sweden is developing the ability to launch satellites into space from the spaceport at Esrange, and thus becomes one of the few countries with launch capacity. The geostrategic situation in both the Arctic and Baltic Sea regions means that Sweden can play an important role in developing and providing space capabilities and space services within NATO and the EU. Sweden will likely also be affected in the event of an armed conflict in the Arctic.

Swedish soldiers in connection with Sweden became a member of NATO.

Photo: David Kristiansen/The Swedish Armed Forces

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Activities threatening security

Sweden's geostrategic location and space capabilities mean that several antagonistic actors conduct security-threatening activities against Sweden. Acquisition of and access to Swedish infrastructure, technology and knowledge in the Swedish space sector by a foreign power can threaten Swedish security and competitiveness. The intelligence threat to space operations in Sweden is directed at authorities, partners, industry and the research world.

Russia, China and Iran are pursuing acquisitions against Swedish actors. Russia is the biggest military threat in the immediate area. China uses space activities to strengthen its role in the global arena and applies the principle of civil-military integration. To achieve influence in the Arctic, China establishes ground stations for data collection from Chinese satellites in the Nordic countries and uses research collaborations.

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Swedish space policy

Within the state administration, there are several activities that deal with space issues and that use space infrastructure. The development and increasing importance of the space domain means that more and more businesses are affected. Several agencies are implementing organizational changes to deal with space issues. Space services are already today integrated in some of the Swedish Armed Forces' functional chains and will in the future become increasingly integrated and support multi-domain operations. Space services are also increasingly contributing to civil preparedness and there is great potential for the use of space data in law enforcement.

At the same time, a national increase in society's dependence on space means that Sweden becomes more vulnerable.

Defence, security and foreign policy aspects are becoming increasingly important in Swedish space policy. From Sweden's national space strategy from 2018, it appears that space operations should be conducted from a holistic perspective where the benefit to society is at the center while ensuring Sweden's security, and that operations should be based on a strong Swedish space industry and high-quality space research.

The defense and security strategy for space is a complement to the national space strategy with an emphasis on total defense and security as the ultimate guarantor of a free and democratic society. By strengthening the defense and security dimension in space policy, Sweden will be better equipped to meet the challenges in space and more capable of using space for defense and security.

The overall goal of the strategy is to secure Sweden's defense and security interests in and through space. In order to achieve this, Sweden must establish itself as an important and responsible space actor in the field of defense and security through national and international activities. The strategy is based on four pillars that include eight strategic goals with associated efforts.

Cyber soldiers.

Photo: Mattias Andersson/The Swedish Armed Forces

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Freedom of action in and through space

Against the background of Sweden's growing role as a space actor in defense and security, it is of the utmost importance that ensure Sweden's access to and use of space as well as access to robust space services and space data in all situations. Sweden must gather strength to understand, counter and respond to aggressive actions and threats connected to space. Challenges and threats must, as far as possible, be met in cooperation with other countries and organizations. It includes a toolbox of political, technological, diplomatic and military measures.

Strategic goal 1: Sweden must ensure its political and military freedom of action in and through space.

Strategic goal 2: Sweden must have the ability to prevent, detect and manage security-threatening activities against Sweden or Sweden's allies in the space area, both on Swedish territory and with regard to Swedish space infrastructure.

Peace in space

Sweden must contribute to a peaceful, safe and sustainable use of space through:

- to develop and conduct an active space diplomacy;
- continued compliance with our international commitments and to work for more states to accede to the Outer Space Treaty;
- to work for the maintenance of the rules-based order and international coordination within the UN system in space;
- transparent communication about how we act in space.

Peace in space must continue to be secured. Threats and attacks are prevented by promoting stability and security in space, thereby preventing space from becoming an arena for warfare. As a global commons, space is non-territorial and cannot be acquired by any state by asserting sovereignty in accordance with the Outer Space Treaty from 1967. Sweden is a party to four of the five international treaties on space. As a space nation, Sweden acts in accordance with the principle of showing due regard for the corresponding interests of other actors when conducting space activities in accordance with Article 9 of the Outer Space Treaty. Sweden, together with the other EU member states, stands behind the commitment not to carry out destructive tests with anti-satellite robots from the ground.

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Sweden actively participates in collaborations around international export control which affect the space area. In accordance with the Hague Code (HCOC), Sweden, as a nation with launch capacity, must provide notifications before satellite launches and in addition ensure that safety is guaranteed in connection with launches vis-à-vis the countries that may be affected. Sweden is a member of the Missile Technology Control Regime (MTCR), whose activities mainly concern the export control of complete robotic systems (ballistic robots, sounding rockets and launchers for spacecraft) and other unmanned aerial vehicles.

Sweden is a member of the International Telecommunication Union (ITU) which, among other things, maintains the radio regulations, which regulate the global use of radio spectrum, and coordinates satellite orbits for all types of wireless communication. Frequencies are a necessary resource for all space infrastructure, and Sweden must protect both the rules-based order and the processes coordinated through the UN in this regard. A well-functioning and rules-based international cooperation is crucial for Swedish security interests in this area.

Transparent communication regarding actions in space helps to reduce risks of misunderstandings and increases trust between space actors and strengthens the possibilities for diplomatic efforts. Development of a code of conduct for military action in space together with others constitutes an important part.
The communication of this defense and security strategy for space matters is in itself a confidence-building measure.

Europe.

Photo: ESA

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Deterrence and defense

Sweden must individually and together with others:

• act as a de-conflict and war deterrent to maintain peace in space;

• take political and military action when necessary.

Credible deterrence is achieved together with allies.
Total defence, as part of NATO's collective defence, contributes to NATO's collective deterrence capability and thus to peacekeeping and war deterrence. It can also help deter peacetime hybrid threats. By enabling early action already in peacetime, Sweden can contribute to strengthening collective defense and thus NATO's collective deterrence.

Political measures are taken individually and together with allies in NATO and within the framework of the EU and the UN with the aim of achieving freedom of action in space without military measures.

If necessary, Sweden must act militarily by taking appropriate defensive and offensive measures, individually or together with allies in NATO, in accordance with international law and national law. The collective defense commitments in Article 5 of the North Atlantic Treaty also cover space where an armed attack in, from or to space could lead to the invocation of Article 5. As a member of the EU, Sweden can invoke the mutual assistance clause under Article 42.7 of the Treaty on European Union in the case an attack connected to space would constitute an armed attack on Swedish territory.

A correct situational picture of the space domain is central to identifying actions that pose a threat to Swedish interests and to prevent the escalation of conflicts in space. It also contributes to accountability and verification of compliance with national and international regulations.

The Air Force conducts an overflight.

Photo: Antonia Sehlstedt/The Swedish Armed Forces

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A collective threat picture

Sweden must work to ensure that the actors concerned have access to a broad and unified picture of the threats to the space domain through increased cooperation.

The threat picture against the space domain is complex, where the boundaries between external and internal security are blurred. Threats to the space infrastructure also pose a threat to military capabilities as space capabilities and space services support capabilities in other domains. Access to dimensioning threat images makes it easier for actors in civil defense to make vulnerability analyzes linked to space.

Civil and commercial space infrastructure that can be used for military purposes risks being seen as military targets and thus receives a transferred threat image. It is therefore important to have dialogue between the public and private sectors so that an adapted threat analysis is made available to military, civilian and private actors. By enabling situational and need-based information sharing between authorities and business in an organized and structured way, a collective capability for space intelligence is created.

Strengthened security work

Sweden must work for:

- to develop collaboration between relevant authorities with the aim of strengthening security work in the space sector;

- to develop cooperation with the commercial space sector that develops technology and services for dual use, with the aim of strengthening awareness of protection values and strengthening Swedish crisis preparedness;

- to evaluate and, if necessary, adapt Swedish space legislation that ensures Sweden's safety and other defense, security and foreign policy interests in line with the requirements of international law.

The pace of development in the space sector is high and means that new protective values are also being created at a high rate. This means that you need to take protective measures at a corresponding pace. A high awareness of security values within the Swedish space sector is necessary for Swedish space activities to be used in support of total defense and crisis preparedness. A strategic and security-conscious approach to space operations contributes to an international reputation as a space actor, defense and security policy partner and ally.

Legal instruments, such as the Foreign Direct Investment Review Act, create the conditions for dealing with threats to security-sensitive operations from foreign powers. Given the development in the space domain, it is important to have an adapted national regulation of space activities that, in line with international law, takes care of national security needs.

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Agricultural fields around Malmö and Lund taken by Copernicus Sentinel-2.

Photo: Copernicus Sentinel data (2021)/ESA

Increased resilience

Sweden must work for:

- that the actors within the preparedness sectors build up knowledge about dependence on space services and conduct summary risk and vulnerability analyzes within each sector;
- that the Swedish space infrastructure in space and on the ground and the radio links in between are based on a strong security architecture;
- redundancy in access to space services and robustness of space services;
- to strengthen cooperation with the commercial space sector that develops technologies and services for dual use.

The ability to withstand and recover from threats and attacks can be achieved through resilience, robustness and redundancy. Increased resilience requires a holistic approach from a technical and operational perspective as well as from a policy perspective that includes civil, commercial and military infrastructure as well as cooperation with other countries. Space is one of the sectors covered by the EU directive on measures for a high common level of cyber security throughout the Union (NIS2 Directive) and on the resilience of critical entities (CER Directive). In the space sector, operators are affected in the form of operators of ground-based infrastructure that support the provision of space-based services, such as the Swedish Rymdaktiebolaget (SSC) with its operations at Esrange.

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Addictions

A goal of the civil defense is to have the ability to ensure that basic societal functions are maintained in wartime. It is therefore important that there is a broad understanding of society's dependence on space services and space data. Such dependencies are found within all ten preparedness sectors.

Resilient space infrastructure

Resilience is the ability to recover from a disturbance. A resilient space infrastructure is important for total defense capability by contributing to the right data being available to Swedish users at the right time, even in the event of major stresses such as physical attacks and cyber attacks as well as electromagnetic disturbances. One way to ensure access to space services may be the ability to rapidly replace its physical systems using responsive space capabilities.

Redundancy with options

Redundancy in space services can be achieved by using several alternative systems for similar services in one or more domains and through strategic collaborations, including with commercial actors. With systems both in space and within the atmosphere, such as ground-based navigation services, vulnerability to interference can be reduced.

Robustness for reliable data

Robust space services are essential to obtain reliable data and unadulterated signals. This can be achieved through a robust infrastructure, including by having ground stations in Sweden so that critical information can reach Swedish actors without going through other countries with the risk of information manipulation. Interference with GNSS services affects civil aviation and shipping. A national infrastructure with an alarm function for monitoring the GNSS services helps to understand and deal with disturbances.

Preparedness in the space domain

Sweden must further develop preparedness for handling incidents in the space domain on a national level with relevant actors, including through exercise activities.

A good preparedness for crises and wars involving space is a prerequisite for preventing, resisting and managing incidents involving the space infrastructure and for ensuring the availability of space services within total defense and crisis preparedness. Sweden participates in exercises within the EU and together with allies and partners.
Through exercises at the national level, an understanding of and knowledge of the management of threats and incidents in the space domain is created.

European Space Operations Center
in Darmstadt, Germany.

Photo: ESA

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A space portfolio to support total defense and crisis preparedness

Space systems enable navigation, global surveillance and communication over long distances. Space services and space data contribute to crisis preparedness, civil and military defence, which form parts of the machinery for maintaining society's security. A space portfolio consisting of a set of capabilities, services and capacities leads to increased strategic independence and that Sweden becomes a more defense and security policy relevant ally and partner.

Strategic goal 3: Sweden must be a defense and security policy-relevant and sought-after partner in the space area.

Strategic goal 4: Sweden must ensure the necessary readiness with a broad access to space services and space data in support of total defense and crisis preparedness.

Strategic goal 5: Swedish space industry must through development of space services and dual-use space data contribute to Sweden's security policy strength.

A balanced space portfolio

Sweden must work for:

- to maintain a space portfolio of capabilities, services and capabilities to ensure access to space services and space data within total defense and crisis preparedness;

- to take advantage of the potential of the space services and space data that contribute to national decision-making and the maintenance of national security.

The Swedish value chain in the space area includes the development, launch and control of space systems as well as the processing and processing of space data. Sweden is too small a country to have access to the entire value chain and full-scale space capability. Affordability is achieved both individually and together with strategic partners and allies as well as through the use of commercial services. The value chain itself enables collaborations with others so that strategic objectives can be met, which makes it a strategic resource.

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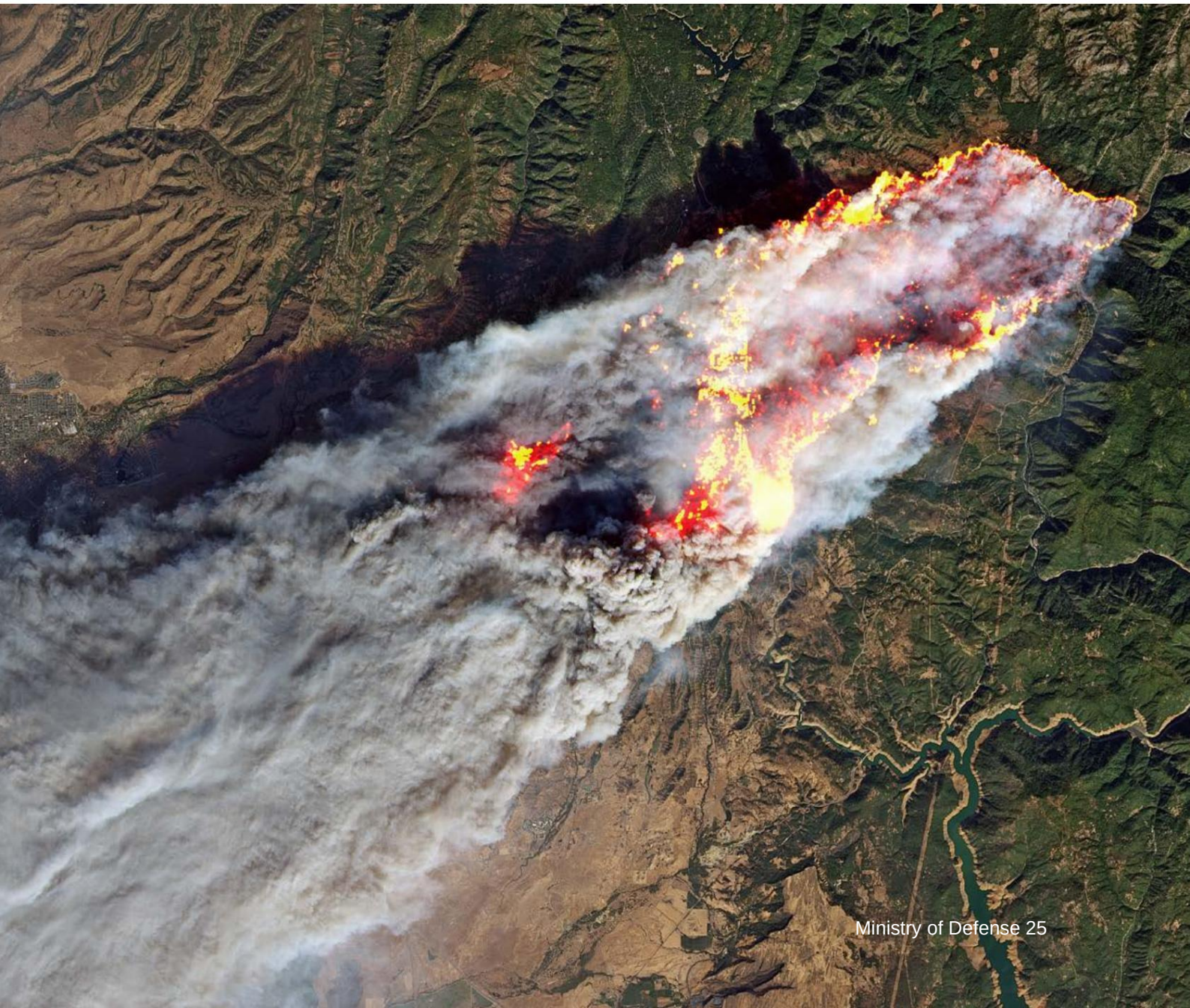
Total defense is dimensioned to defend Sweden and allies against armed attack based on the collective defense within NATO. The national defense capability, including the space portfolio, forms part of NATO's collective defence. The portfolio is dimensioned by both national capability needs and NATO's capability needs.

The space portfolio is balanced through strategic path choices around national ownership, cooperation and commercial access. National space capabilities mean Swedish disposal of and guaranteed access to space services and space data. International collaborations provide interoperability and cost sharing with access to space services and space data. Procurement of space services and space data from commercial suppliers means lower investment costs and increased flexibility.

The portfolio must include space solutions that are designed to contribute to the needs of socially important actors regardless of the security situation and with dual use and cost sharing as far as possible.

Satellite image of forest fire in California, USA.

Photo: NASA



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Arctic weather satellite illustration.

Photo: OHB/ESA

Space services

Sweden must work for:

- that the potential of geodata from the EU's satellite center is utilized and developed in order to create great added value for total defense and crisis preparedness as well as the fight against crime;

- to achieve self-sufficiency by developing national space capabilities for reconnaissance and surveillance for current situational awareness for Sweden and allies;

- to achieve readiness with allies regarding secure satellite communications providing coverage over the Arctic in support of command;

- to be able to use space services for connectivity as a redundant solution for Sweden's most necessary connection to the outside world;

- to effectively use the space services and space data that are developed within the EU's space program for total defense and crisis preparedness.

In military defense, space services contribute to enhancing the effectiveness of existing defense capabilities and are essential to the cohesive intelligence and countermeasures chains that enable multi-domain operations. In civil defense and crisis preparedness, space services contribute to ensuring important societal functions such as transport, rescue services, energy supply and order and security.

Scouting and surveillance

Reconnaissance, surveillance and earth observation from space contribute to intelligence production, situational awareness, planning and management, including through image and signal reconnaissance and measurement from space. Today, space services are used from commercial providers and through international collaborations with strategic partners and organizations such as the EU and the European Weather Satellite Cooperation (EUMETSAT). The ability to use AI for the analysis of these complex and large data sets is central.

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Early warning contributes to deterrence, defense and increased protection by providing monitoring and warning of robotic launches and other threats over time. Today, this capability is being developed together with close partners and allies.

Satellite communication

Robust satellite communications support operations of vital importance to society. Satellite communications contribute to multi-domain operations, control of unmanned systems over large distances. It also constitutes an alternative communication path in the event that ground-based electronic communications are severely limited and is used by emergency authorities both within national operations and in international operations as a supplement to ground networks and fiber. Today, the services of commercial suppliers are used for satellite communication, and collaborations within the framework of the European Defense Agency (EDA). Today, there is an opportunity to make greater use of international initiatives in this regard.

Positioning, navigation and time synchronization

Robust and accurate time and position are a prerequisite for our modern society and part of total defense. Positioning, navigation and time synchronization with space-based systems are used for positioning own units, navigation and control of platforms, time reference in management systems and situational picture. Today, services from several satellite navigation systems (GNSS) are used.

Ground-based infrastructure is crucial for access to space services, which is why there is a need to maintain, modernize and expand ground-based infrastructure.

Rocket launch with the James Webb telescope from the European Space Base in French Guiana.

Photo: ESA/CNES/Arianespace

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Support to space operations

Sweden must work for:

- to develop own capability for rapid launch of satellites, so-called responsive launch;

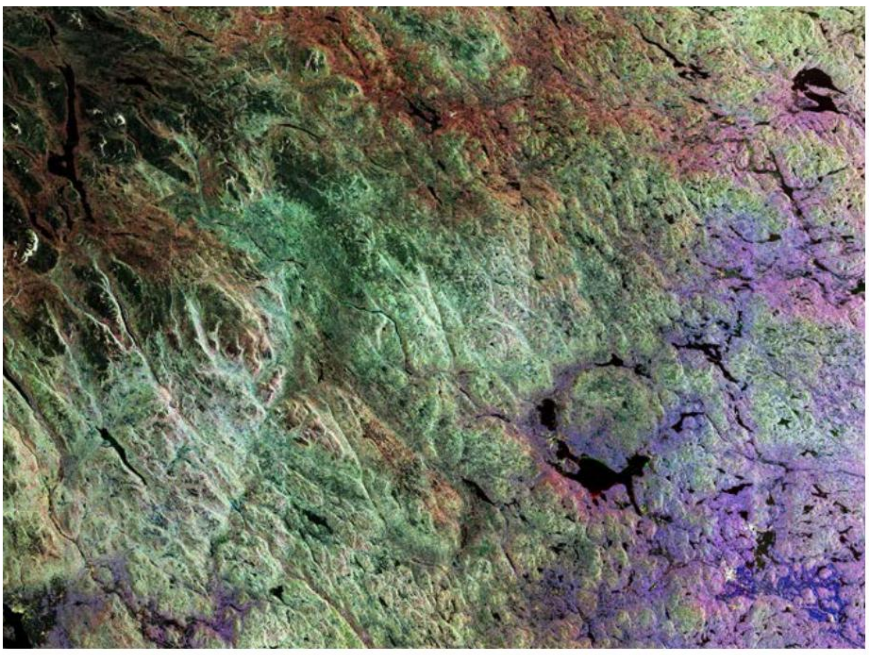
- to continue developing capabilities for military space situational imaging together with strategic partners and through the EU's partnership for space surveillance. Synergies with and sharing of civil and commercial capacity must be sought where possible.

Launch and control of satellites

Launch and control of satellites enable and support space operations. Esrange is a strategic resource and is owned and operated by the state-owned company SSC. SSC and Esrange enable access to a global network of antennas for steering satellites and to national capabilities for launching satellites into space.
Responsive space capabilities enable rapid adaptation to time-critical and dynamic needs in the space domain, such as the ability to quickly replace or supplement satellites in orbit. It is crucial to enable access to launch capabilities for the total defense and allies in all conflict situations.

Space mode image

The space situation picture is an overview of the space environment and space travel as well as the most important space risks. It provides information to actors in the total defense and the preparedness system with the aim of issuing warnings about, for example, space weather and collisions between objects in space. The military space situational picture also includes space intelligence in order to assess, understand and act on threats and events in the space domain and constitutes a prerequisite for the management of space operations. It increases the possibilities of taking protective measures against other actors' space-based information acquisition and provides conditions for protecting one's own combat forces and the space infrastructure.



Composite of radar scans of Siljan in Dalarna taken by Sentinel-1A.

Photo: Copernicus Sentinel data (2015)/ESA

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Security of supply in the space area

Sweden must work for:

- to broaden and strengthen the contact surfaces between owners of needs i total defense and crisis preparedness and performers in the space sector;

- to enable innovation and development of space solutions that can be quickly adapted to new threats and tasks in the space domain.

A competitive defense and space industry

A stable industrial base, industrial capability, as well as research and innovation in the space area are crucial to ensure long-term security of supply in the space area. In addition to ensuring excellence, the industry plays an important role in identifying and managing vulnerabilities, not least regarding security of supply in the value chain. A good supply readiness, for example through contingency agreements with suppliers, enables space capabilities at a high level of readiness. To ensure access to future-proof space services and space data, a competitive defense and space industry is required where the research, development and production capacity can meet the needs. Trustful collaboration between the state and business is a prerequisite for providing total defense and crisis preparedness in the short and long term, as well as for a faster ability to adjust in crisis and war.

Dialogue meeting on defense innovation at the Ministry of Defence.

Photo: Niklas Forsström/Governingskansliet

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Research, development and innovation

Privacy-critical knowledge can only be achieved through self-care, which is why Sweden needs to take a special responsibility for maintaining competence in privacy-critical areas. Ensuring such knowledge and access to cutting-edge technologies contributes to maintaining strategic and security policy independence.
Space technology is an area that handles privacy-critical knowledge. Technology priorities for total defense and crisis preparedness must be based on a balance between capability needs, Swedish areas of strength and a collective monitoring of, understanding of and possible application of ground-breaking technologies.

Technology in the following areas is of particular interest to space operations in the Swedish total defense sphere: cyber security, encryption, AI and data processing, signature adaptation and protection of satellites, sensors for reconnaissance and surveillance from and in space, maritime communications and responsive launch of satellites. Development of research satellites for demonstration and testing of defense and security applications supports the long-term development of operational capability in total defence.

The high rate of development in the space sector requires innovation and the application of new space technology in the procurement of defense equipment and other space-related services and capabilities. Development of new technical solutions often takes place in small and medium-sized companies. An important tool in the strategic direction for defense innovation is the innovation program for civil-military synergies, which will strengthen the opportunities to make use of cutting-edge technology, including space technology, for military applications, as well as strengthen the conditions for commercial procurement.

Entering into various research collaborations, especially with strategically important partners, is an important tool for securing access to knowledge and cutting-edge technologies and ensuring a good rate of development within the space industry.

Quantum computer at Chalmers Technology university in Gothenburg,.

Photo: Sofia Sabel/Imagebank.sweden.se

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Sweden in the international space arena

Sweden participates in many international organizations, multilateral contexts and bilateral space cooperation of strategic importance for Sweden's defense and security interests in the space area.
It is therefore important to avoid duplication as much as possible and to achieve interoperability and cost sharing when developing capabilities. As a member of NATO and the EU, Sweden must work for close cooperation between the organizations in space matters where appropriate.

Strategic goal 6: Sweden must be an active and responsible partner and NATO ally in defense and security policy space contexts where Sweden, together with others, influences international space policy based on national interests.

Strategic goal 7: Based on Swedish interests, Sweden shall prioritize and take an active role in strategically significant defense and security policy space cooperation.

A reliable ally in NATO

Sweden must work for:

- to contribute to developing NATO's space policy, strengthening the alliance collective space capabilities and benefit from the allies' collective space infrastructure for Sweden's defense and security;
- to contribute to NATO in space-based reconnaissance and surveillance, secure satellite communications in the Arctic, responsive launch of satellites and maritime situational awareness;
- that Swedish innovation and accelerator environments and test centers are linked to NATO's innovation accelerator;
- that Swedish companies and entrepreneurs get the opportunity to contribute to space capability development within NATO.

Through Sweden's membership, the transatlantic link is strengthened and NATO becomes Sweden's most important defense policy arena. As an ally, Sweden contributes to NATO's work in managing the broad threat picture in all domains in accordance with the 360-degree perspective and NATO's capability planning. Sweden is one of the few allied countries that can contribute to the alliance's capabilities in all five domains (air, land, sea, cyber and space). Total defense forms part of NATO's collective

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The Swedish flag is raised at NATO headquarters in Brussels to draw attention to Sweden's NATO membership.

Photo: NATO

defense. As a credible, reliable and solidary actor, Sweden participates in and contributes to NATO's space cooperation and to the alliance's common understanding of the role of space in crisis preparedness and crisis management.

Sweden's geostrategic position and security policy interests are the starting points for Sweden's contribution to the alliance. With Swedish defense and space industry and innovation power, Sweden can develop space capabilities that can contribute to NATO's collective defense capability.
The satellite launch capability at Esrange can contribute to allied access to space.

Sweden is part of the venture capital fund (NIF) which invests in start-up companies with defense potential and which is also linked to NATO's innovation accelerator (DIANA). This creates conditions for small and medium-sized companies in Sweden to participate in international collaborations. Through NATO's commercial platform for space, SPACENET, the contact surfaces between business and the allies' defense authorities are strengthened.

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A committed member of the EU

Sweden must work for:

- to contribute to strengthening the Union's role as a leading space actor and benefit from the Union's joint space infrastructure for Sweden's defense and security;

- that the launch capacity at Esrange can contribute to EU accession to space;

- to play an active role in the EDA in order to influence the design of the EU's space program and to ensure the Member States' exclusive competence for defense and national security;

- to monitor that the EU's space policy promotes Swedish defense and security interests in space and strengthens Swedish competitiveness globally.

The EU is Sweden's main foreign policy arena and has financial, legislative and political instruments also within security and defense policy. European security and Europe's position as a global space power are strengthened by the EU cooperating with NATO and countries such as the USA, Canada, Norway, Iceland, Switzerland and the UK.

In accordance with the EU's space strategy for security and defence, the EU's civilian space program must be used to a greater extent for security and defence, while maintaining its civilian character. The EU's space industrial base must be strengthened. Swedish actors participate in international defense cooperation for technology, materiel and capability development in the space area within the framework of EDA, the Permanent Structured Cooperation (PESCO) and with the support of the European Defense Fund (EDF).

As a member of the EU, Sweden co-finances and exercises ownership and control over the EU's space programme. Sweden thus gets access to data and services that support total defense and crisis preparedness. The EDA plays an important intergovernmental role by supporting Member States in shaping the military requirements for the EU's space programme.

Model of a rocket located at the space campus in Kiruna.

Photo: Jonathan Nackstrand/EU

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Antenna at Esrange Space Center.

Photo: Angela Teale/SSC

A strong voice in the UN

Sweden shall:

- in negotiations at the UN, continue to actively contribute to the development of global norms and rules for responsible action in space, which can reduce space threats and the risk of conflict;

- participate actively in the ITU's international coordination of radio spectrum for satellites and satellite orbits;

- protect existing international law.

Both the Outer Space Treaty and general rules and principles of international law applicable in space must be complied with. Sweden's line is based on overall national defense, security and foreign policy interests and we act in close cooperation with the rest of the EU, NATO and with the Nordic countries.

Sweden actively participates in the UN's open working groups on responsible behavior in space. Sweden contributes to stability in space and its international reputation as a responsible sending state, by acting in accordance with international law and by introducing national legislation that ensures that Sweden fulfills its international obligations. During the ITU's World Radio Conference, the Radio Regulations are reviewed and revised if necessary. The regulations regulate obligations and rights for the use of radio spectrum and satellite orbits on an international level. By enforcing the radio regulations, the ITU acts so that harmful radio interference can be avoided.

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Nordic Community

Sweden must work for:

- to continue developing space cooperation within Nordefco and bilaterally with the countries within the Nordic community;

- that the North Calotte becomes an important region for European space operations.

Finland's and Sweden's membership in NATO creates new conditions for the Nordic defense cooperation Nordefco. For example, the Nordic countries' defense and security policy and military planning can be coordinated and even integrated to a greater degree. The Nordic countries share geographical conditions, which provides unique opportunities for cooperation in the space field in general. The North Calotte can become an important region for European space activities. Space cooperation can be a possible complement to the declaration of intent between the Nordic air forces.

Collaborations with strategic partners

Sweden must work for:

- to deepen and broaden collaborations with like-minded people within the EU and NATO as well as with partner countries in the Indo-Pacific region;

- to apply a holistic perspective before participating in new international collaborations to ensure that each collaboration contributes to the whole and provides added value.

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International collaborations provide access to knowledge that is not available nationally and open up export opportunities for Swedish space technology. The space industry in Sweden is dependent on cooperation with strategic partners outside the EU, especially the United States, whose space sector is extensive and capital strong. Cooperation with the USA, both civil and military and in research, should be further strengthened in the space area. Sweden has bilateral existing defense and security policy collaborations with the USA as well as with other strategic partners such as Canada, France, Germany and Great Britain. These collaborations should be further developed in the area of space. Sweden also participates in multilateral research collaborations in navigational warfare and responsive space capabilities.

Collaborations with strategic partners in the southern hemisphere are also interesting from a space capability perspective. As the Euro-Atlantic and Indo-Pacific regions become more intertwined, there is potential to broaden cooperation with partner countries such as Australia, South Korea, New Zealand and Japan.

The space area is strongly internationalized and the international space collaborations Sweden is part of must be relevant and/or appropriate in terms of defence, security and foreign policy. This requires effective export control measures as the space area is characterized by a large amount of technology and products with dual uses. Space cooperation within defense and security must be assessed from the following perspective: opportunities for and impact on national security, capability enhancement within total defence, Swedish areas of strength and opportunities for industry as well as other defence, security or foreign policy bases.

Norwegian Prime Minister Jonas Gahr Støre and Swedish Prime Minister Ulf Kristersson agree to develop the bilateral cooperation in the space sector.

Photo: Tom Samuelsson/Governingskansliet

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Space policy in a new security policy situation

With the deteriorating security policy situation, the strategic and operational importance of space has increased, and space issues increasingly concern total defense and crisis preparedness. This calls for a coherent space policy in which all perspectives are included. In order for Sweden to be able to take informed decisions and be a relevant space actor, an increase in awareness and knowledge about space, defense and security is needed.

Strategic goal 8: Sweden must pursue a coherent and knowledge-based space policy that meets the new security situation and contributes to the development of crisis preparedness and total defence.

Joint management and coordination of space issues

Sweden must work to achieve:

- a central and cohesive governance and management of space issues;
- concerted action in international contexts and communication based on a unified line;
- an appropriate division of responsibility for coordination of space issues within total defense and crisis preparedness.

Cross-sectoral nature

Space activities span several policy areas. Swedish space activities are conducted in the public and private sectors, where the public sector can be divided into a civil part, a military part and an intelligence part. No actor has the conditions to manage the entire space area from the perspective of all sectors. Space is thus an issue of a cross-sectoral nature that requires coherent governance.

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Collective action

Space issues in international bodies such as the UN and the EU are handled by a variety of actors in Sweden at different levels. The committees in the EU's civil space program are staffed by actors primarily in the civil sector, while the defense dimension of the program is increasing. In the UN, space issues of a military nature are dealt with within the framework of the UN Disarmament Forum and of a civilian nature in the UN Committee for the Peaceful Uses of Outer Space, while due to dual uses it is sometimes difficult to separate civilian from military activities.

It places demands on clear coordination and communication of lines of action in the authorities and organizations concerned, but also demands on a sufficient level of resources. Developed coordination at the national level is also necessary to proactively pursue advocacy work at an early stage for new proposals for initiatives and programs in international forums.

Clear responsibility

There is a need for division of responsibilities in order to improve the systematics in identifying measures and allocating funds in the space area. Given the development of the surrounding world and the emerging total defence, more and more authorities need to relate to and manage space-related issues.

The growing space travel, such as the launch of satellites, means more contact surfaces between airspace and space. Within civil aviation there is an increased use of space infrastructure. A developed cooperation between the space and aviation sectors contributes to effective coordination and safety.

The development of total defense requires a developed and coherent focus, planning and follow-up that includes the space domain. A structure for space, defense and security with a clear division of responsibilities is an important piece of the puzzle in this.

United Nations Office in Geneva, Switzerland.

Photo: Violaine Martin/UN Photo

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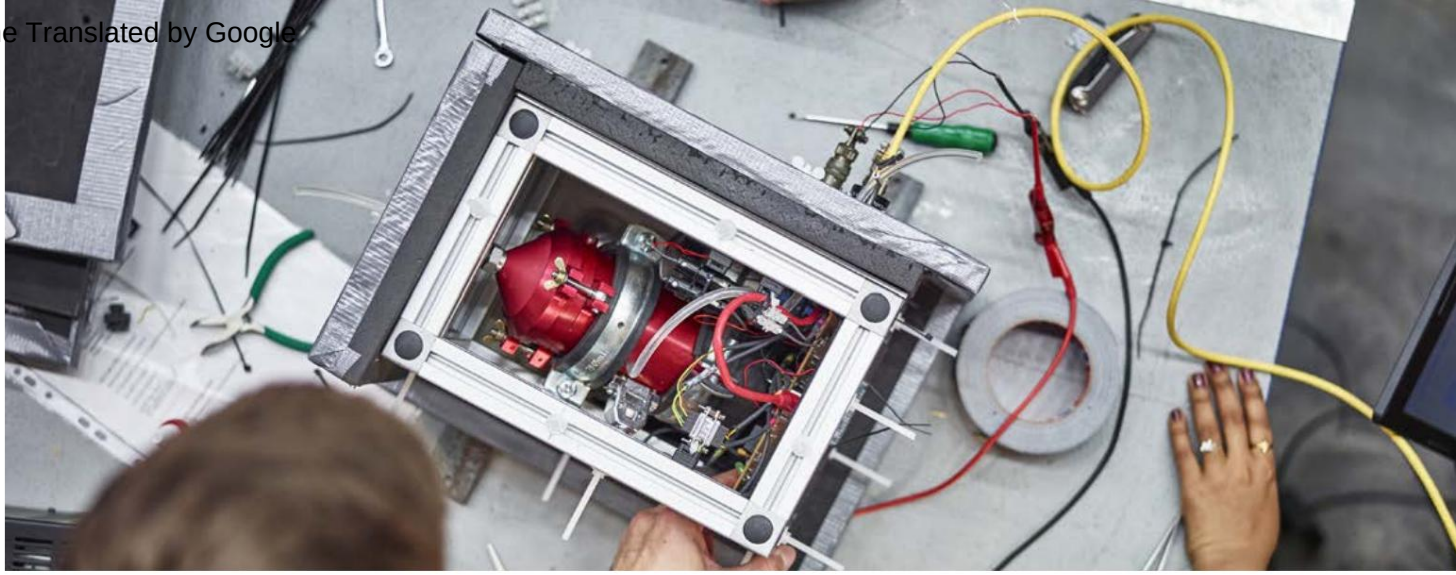

Space research at the Esrange Space Center in Kiruna.

Photo: Hans-Olof Utsi/Imagebank.sweden.se

Human capital in space, defense and security

Sweden must work for:

- to ensure an indigenous human capital to be able to understand and use space as a physical, strategic and operational domain;
- to continue to promote and to a greater extent use national knowledge centers with interdisciplinary domain knowledge in space, defense and security for knowledge provision;
- to promote civil-military cooperation in technology development in order to be able to maintain a sufficient level of capabilities, competence, personnel and infrastructure.

A competence perspective in space policy ensures access to knowledge, skills and competences in the space area. Such domestic human capital in both the public and private sectors is a prerequisite for the development and use of space capabilities within total defense and crisis preparedness. Sweden must also be able to contribute with space-competent labor internationally, for example within NATO and the EU.

Active participation in international contexts places demands and expectations on Sweden to possess an adequate level of knowledge. This applies, for example, to negotiations on international space policy and international space law. Knowledge of the importance and use of space for defence, crisis management and security is central, as are the defense and security political consequences of space activities.

In order to understand and use space as a physical, strategic and operational domain, knowledge and competence are needed in the technical, natural science and social science disciplines, including war science. At the same time, an increase in knowledge about total defense is needed. The development of educations that consider space, defense and security as a whole is an important part of the competence supply. Domestic knowledge and competence constitute a strategic asset for Sweden. A long-term knowledge build-up through education, research and development linked to space in total defense ensures access to knowledge over time.

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Antenna at Esrange Space Center.

Photo: SSC

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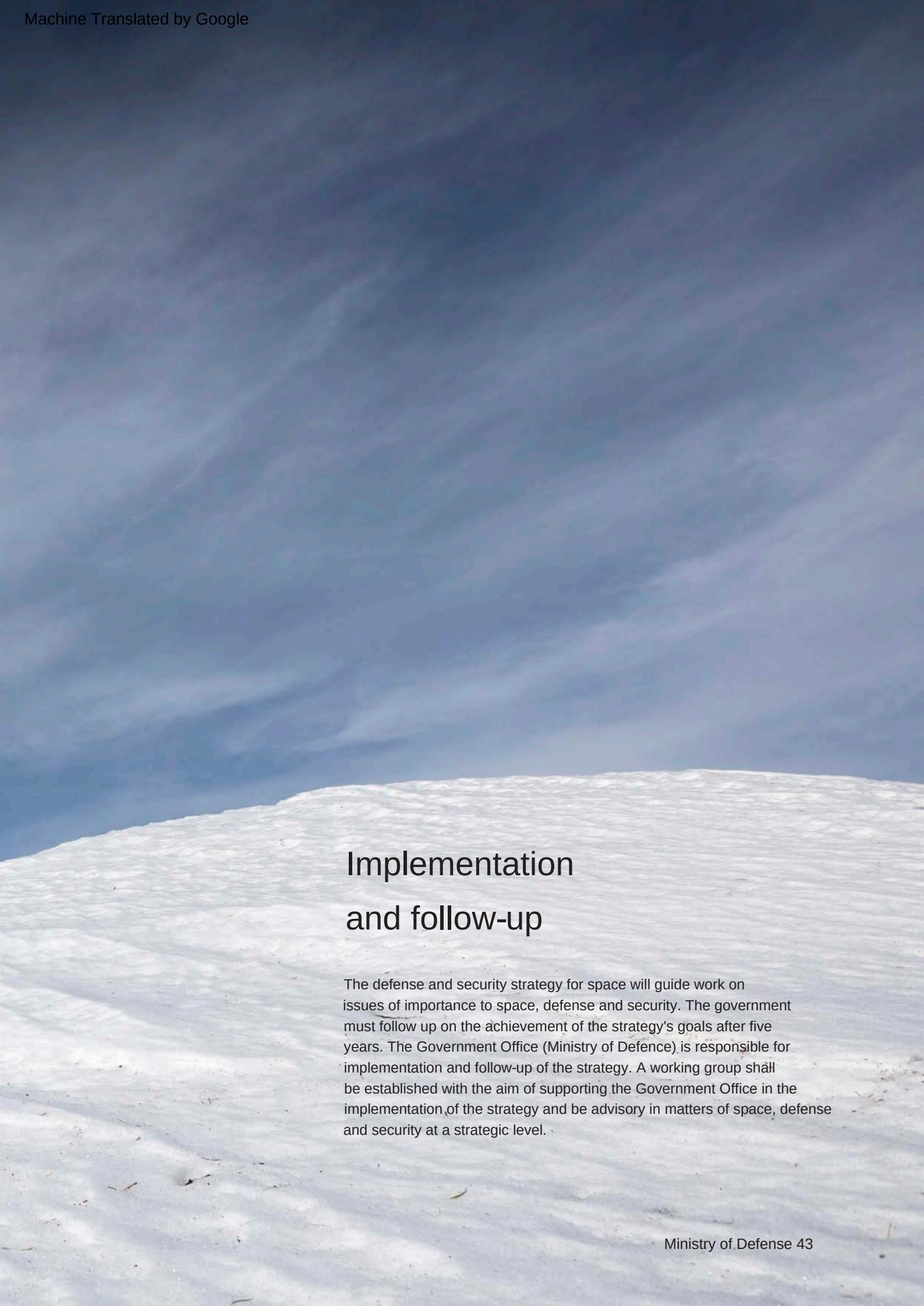

Implementation and follow-up

The defense and security strategy for space will guide work on issues of importance to space, defense and security. The government must follow up on the achievement of the strategy's goals after five years. The Government Office (Ministry of Defence) is responsible for implementation and follow-up of the strategy. A working group shall be established with the aim of supporting the Government Office in the implementation of the strategy and be advisory in matters of space, defense and security at a strategic level.

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Government Office
Exchange: 08-405 10 00
www.regeringen.se

Read more about the government's work with the space domain at regeringen.se/regeringens-politik/rymmdomanen