Institutional Organization of the European Space Program: Ensuring the Security of the Union

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Abstract

This dissertation is looking into the question of what would be the optimal institutional organizational structure of the European space programme with regard to the EU member states' security. To do so this dissertation is defining the realities of today's space domain as contested and congested, thus there is a need to be prepared for new security challenges. This is to be done under the theoretical framework of strategic autonomy. This dissertation operates with official documents of the EU and ESA that are defining the current organizational structure, their relationships, as well as organizational structure of the two European space flagship, projects Galileo and Secure Connectivity. Together with data collected through anonymous interviews with European space security experts this dissertation through thematic analysis defines four key areas that need to be improved in order to increase the member states' security and provides relevant recommendations. The areas to be improved are those of internal convergence on the basic topics, defining new industrial space policy, building domestic capacities, and improving the external messaging.

Keywords: Space programme, European Union, European Space Agency, Strategic Autonomy

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Contents

List of Abbreviation

ASAT	Anti-satellite weapons
CSDP	Common Security and Defence Policy
EC	European Commission
EDA	European Defence Agency
EEAS	European Union External Action Service
EEE	Electrical, Electronic and Electro-mechanical
ELDO	European Launcher Development Organization
ESA	European Space Agency
ESRO	European Space Research Organization
EU	European Union
EUSISS	European Institute for Security Studies
EUSPA	European Space Program Agency
FFPA	Financial Framework Partnership Agreement
GNSS	Global Navigation Satellite Systems
GPS	Global Positioning System
GSA	The European Global Navigation Satellite Systems Supervisory Authority
ITAR	International Traffic in Arms Regulations
JAXA	Japan Aerospace Exploration Agency
LEO	Low Earth Orbit
LSI	Large-scale Integration
MFF	Multinational Financial Framework
NASA	National Aeronautics and Space Administration
NATO	The North Atlantic Treaty Organization
PESCO	Permanent Structured Cooperation
PLA	People's Liberation Army
PPP	Public-Private Partnership
PRC	People's Republic of China
R&D	Research and Development
RTO	Research & Technology Organization
SME	Small and Medium Enterprises

SSA	Space Situation Awareness
SST	Space Surveillance and Tracking
WTO	World Trade Organization

1. Introduction

In the 21st century, the security environment is rapidly changing throughout many spheres. One particular sphere is the space domain. Since the end of the Cold War, we are observing changes in terms of the number of stakeholders as well as a proliferation of space technology. We see the transition from the Old Space environment, in other words, the elite club of the United States and the Soviet Union during the Cold War era, to a New Space environment with new state actors joining such as the People's Republic of China, India, and South Korea together with countless private companies focusing on launch, satellite manufacturing, or space-based services such as SpaceX, OneWeb, etc.

Moreover, with the broadening of the actors venturing to space the proliferation of space technology is bigger than ever before. With the miniaturization of technology developing a CubeSat is now viable for actors such as schools, planetariums, and transportation companies, in other words, actors that in the past have been dependent on the state and its infrastructure, if any was even available. More importantly, the launch cost of such a satellite has dropped significantly that even an individual can afford to launch one.

Given the inherently dual-use nature of space technology such as every satellite being a possible kinetic anti-satellite weapon as well, in combination with the previous this creates the space environment much more congested and contested, introducing new security risks and challenges. Furthermore, today's dependency on space technology both civilian and the military is unprecedented, therefore, more actors are developing new technologies not only how to protect their own space-based assets but also how to deny access to space to others.

Because of these changes Europe has to be prepared to respond to the new challenges. Traditionally the European space programme was a combination of the ESA, and its member states and was later joined by the EU. This multitude of actors is crucial for the European space efforts as it allows the pooling of the resources for projects such as Galileo or Copernicus which could not be afforded by any single European state alone.

But this organizational structure also presents challenges to effectivity and ability to respond to new security realities of the current space environment. Therefore, there is a need to explore new potential organizational structures and solutions which will put the security of the EU member states at the forefront.

2. Research Design and Methodology

This thesis aims to offer recommendations regarding the institutional organization of the European space programme in order to increase the security of the EU member states. To achieve this the EU must develop greater strategic autonomy, both political and industrial.

Firstly, this dissertation will develop its theoretical framework. It will have two parts. Part one is to establish space as a contested domain that is being more securitized and its strategic importance will only rise in the future. The second part will be looking at the theoretical concept of strategic autonomy. What it is in general, what it means within the European context, and lastly what it is in the European-space context.

The dissertation will then be looking into the official EU and ESA space-related documents that are dealing with their respective organizational structure as well as define the relationships between the two of them. Furthermore, European space flagship projects Galileo and EU Space-based Secure Connectivity systems will be looked at through official documents to better understand the organizational structure of these projects, how they came to being, and what are the responsible institutions. The researcher will also conduct interviews with relevant European space security experts to provide their perspectives on the given issue of institutional organizational structure.

Data gathered from the official documents and the interview will be then analyzed in the last section of the dissertation and recommendations will be provided regarding the improvements to the institutional organizational structure in order to increase the security of the EU member states. To keep focused on the aims and the objectives this thesis will work with one research question.

- What would be the optimal institutional organization of the EU space program for ensuring the security of the EU member states?

To answer this research question this thesis will employ a qualitative research method, specifically the case study research approach. This methodology is suitable for this thesis because a case study can be used to explain, describe, or explore a phenomenon in its natural context (Yin, 2009). The case study approach, thus, focuses on *how, what,* and *why* questions. In this case, "What would be the optimal institutional organization of the EU space program for ensuring the security of the EU member states (King et al., 1994)?"

The case study method primarily relies on the collection of in-depth and detailed data about the subject which is usually an institution. This thesis intends to gather data from primary and secondary sources.

More specifically academic papers diving into the topics of space security with the stress on the congestion and contestation of the space domain, together with the works focusing on strategic autonomy. Writings looking into the contestation of space domain were chosen to demonstrate the difference between the Cold War era Space Race and the 21st-century Space Race. This distinction is then demonstrated in the "Old Space" and "New Space" environments and their differences in Paikowski's work *What is new space? The changing ecosystem of global space activity.*

Academic papers dealing with the topic of strategic autonomy in the context of the European Union and furthermore, space domain are scarce. Therefore, this dissertation first introduces the concept of strategic autonomy in general, which would apply to any country in the world. Afterwards, it establishes the strategic autonomy and its evolution in the context of the European Union using concrete examples of the War in Kosovo, and the intervention in Libya. Furthermore, it assesses the European strategic autonomy in the context of the space domain through the current European position, capabilities and shortcomings. As highlighted previously work diving into this topic scares. Therefore the vital work for this section is Fiott's *Strategic autonomy: towards 'European sovereignty' in defence?* and *The European space sector as an enabler of EU strategic autonomy* together with Marco Aliberti, Matteo Cappella, and Tomas Hrozensky and their book *Measuring Space Power: A Theoretical and Empirical Investigation of Europe.*

The data corpus of this dissertation has two parts. The first part is the official documents issued by the European Union, such as the legislation passed regarding its space programme in the early 2000s together with the documents relating to the Galileo project and EU Space-based Secure Connectivity systems formerly known as GOVSATCOM. Other documents examined are the ones issued by the European Space Agency (ESA) such as the 2005 *Convention of the European Space Agency* dealing with the inner workings of the agency. This dissertation will also look at the documents that are establishing the relationship between the EU and ESA itself, for example, the 2004 *Framework Agreement.* Lastly, the documents dealing with the industrial policy of both EU and ESA will be used as this is a key area for the European space programme.

The dissertation's scope is between 20 000 and 24 200 words with the deadline of July 26, 2022, therefore, the timeframe from the end of November 2021 until the deadline offers enough time to

conduct the research of the above-specified scope. Given the topic, reliance on the official documents, as well as the time and word count constraints the issue with the literature corpus is that the researcher can get easily overwhelmed by the number of documents. To prevent this only the most essential documents have been chosen. The choosing process of the relevant documents was quite straightforward as the first EU regulation regarding space has been chosen to be the 1999 *COUNCIL RESOLUTION of 19 July 1999 on the involvement of Europe in a new generation of satellite navigation services Galileo Definition phase.* This document was the one defining the Galileo project and further space-related documents were stemming from this one. Access to the documents was not an issue as all EU laws and regulations are accessible online.[1] Furthermore, the page allows for easy search as well as showing which documents replaced which one. Therefore, having the previously mentioned document as a starting point then allowed for a quick search of all following documents. Documents regarding ESA were more problematic to be found but there is only a limited number of them issued thus the problem of being overwhelmed is limited.

The second part of the data corpus is gathered from the semi-structured interviews. Obtaining data from different sources that will lead to the same result has been promoted as a way to increase the validity of the research (Stake, 1995) and looking at the issue from different angles can help to offer a holistic picture of the phenomenon (Pinnock et al., 2008). Given the scope and aims of the thesis, it is the best method of obtaining the data. Therefore, three space security experts have been chosen to provide their expertise on the topic of this dissertation.

Because of the decision to conduct the interviews, relevant ethical issues have to be taken into consideration. The author did obtain ethical approval from the University of Glasgow College of Social Sciences Ethics officer.[2]

Furthermore, all interviewees were educated about the purpose of the research, their role in it, and how the researcher will handle their private information through the Plain Language Statement document. All interviewees did give the interview willingly and confirmed it by signing the Consent Form. Moreover, all participants were provided with the questions beforehand when they were asked for the interview via email.

[1] EU documenets are available at: https://eur-lex.europa.eu/homepage.html.
[2] For further details, you can contact the office at the following email: socsci-ethics@glasgow.ac.uk.

Due to the different geographical locations of the research and interviewees, the interviews were conducted online via the Zoom platform. Audio and video recordings of each interview were made followed by the written transcript that is in the dissertation's appendix. After the interview, the written transcript was sent to the interviewees for their approval to be used in the dissertation. Furthermore, all interviewees will receive an online copy of the dissertation to be able to see how the information gained from their interviews was used. Lastly, the audio and video recordings of each interview will be destroyed permanently on the day of submitting this dissertation, specifically on 26.08.2022.

At first, interviews were envisioned to be public, but after the first two interviews were conducted the interviewees expressed their wish for either some parts of the interview to be redacted or a suitable alternative was to make the interviews anonymous. The reason behind this was the openness of the interviewees which could have a negative impact on their professional life. After some consideration and discussion with the research supervisor, it was concluded to make the interviews were anonymous as the data collected were crucial for the research. Therefore, a change form regarding the ethical approval was gained and all interviews were anonymized so that the identity of the interviewees stays protected and all necessary university regulatory needs were met. During each interview, the following seven questions were asked together with some additional depending on the interviewee's replies.

- How would you describe the security dynamics of today's space competition?
- In the context of Chinese, Indian, and American plans for the future of space development, where does the European space program stand?
- Given the EU member states' capacities, and capabilities and keeping security elements in mind, what would be an ideal future direction for the EU space program?
- How would you describe the strategic autonomy of the EU's space program?
- In your opinion, would the EU space program benefit from bigger strategic autonomy?
- What would you say are some necessary reforms that the EU may undertake to be better prepared for the more contested space competition?
- What role do you envision the European Union space program will play?

These questions were chosen to provide a holistic picture of the current and future state of the European space programme and to illuminate the issues that it is experiencing together with possible ways how to solve them.

The biggest issue was finding the time for the interview as all three interviewees are top experts with busy schedules. The researcher secured both internet connection and recording redundancy alternatives, therefore no issues during the interviews were encountered.

Data gathered will be then analyzed using thematic analysis. This approach is used to examine usually textual data, in this case, official documents and data gathered from the interviews to systematically identify, organize, and offer insight into patterns of meaning so-called themes across the dataset (Braun, 2012). To gain these themes data have to be coded. Coding is a term for sorting and labelling which is part of the analysis. These labels can be names, categories, concepts, or theoretical ideas (O'Reilly, 2012). To do that, this thesis will use the NVivo software package which will help to identify the themes related to the research question of what would be the optimal institutional organization of the EU space program in the context of EU member states' security.

The analysis part will be followed by the Recommendation section which will offer three to five recommendations depending on the themes identified in the analysis section. These recommendations will serve as the answer to the dissertation's research question as they will be focusing on how to optimize the European space programme organization in order to increase the member states' security.

3. Literature Review

The history of the relationship between the European Union (EU) and the European Space Agency (ESA) started even before the ESA was established. Its predecessors European Launcher Development Organization (ELDO) and European Space Research Organisation (ERSO) were two intergovernmental organizations established to provide Europe with space capabilities. The ELDO focused on the manufacturing of launch vehicles and ERSO on satellite manufacturing. Having two agencies was not as efficient as it could have been and it was decided in 1975 that ELDO and ERSO will merge into ESA (ESA, 2005). ESA was initially conceived as serving western European nations. After the end of the Cold War and the enlargement of the EU, membership of the ESA grew as well.

The talks about the possible reorganization of the EU/ESA relationship started at the beginning of the new millennia. In the *Council Resolution of 16 November 2000 on a European Space Strategy,* it was concluded that given the EU's size, economy, and technological advancements the EU should do better and its space program should have a more prominent role (European Council, 2000).

Two main ideas on how to reform the relationship emerged. First, ESA will become to the EU what NASA is to the United States. Second, the EU will become an ESA member. As von der Dunk argues ESA becoming the EU's agency is not feasible. Firstly, ESA's research and development (R&D) priorities are traditionally ESA's Director General and the Council's prerogative. Therefore, if ESA would be the EU's space agency it would lead to a clash with the European Commission (EC) in decision-making. The resulting interference into ESA structure and working culture would draw into question the reason for its existence. Therefore, von der Dunk argues that the EU should become an ESA member. Precedence would be EU involvement in the World Trade Organization (WTO). Being a member EU could steer the direction of the ESA programs or even bypass the ESA by investing in optional programmes which would benefit European companies, and promote competition to the ESA model of governance and any entity from the EU would be eligible (von der Dunk, 2003).

The opposite view to von der Dunk's was presented by Hobe who assessed the relationship from the power-dynamic perspective. He dismisses the notion that the EU would join ESA because the

EU would lose political power as it would be the ESA Council responsible for the aim of the program. On the other hand, if the ESA would become an EU space agency the EU would be in charge of drafting the space policy and the ESA would simply implement them (Hobe, 2004).

A similar debate started in 2009 with the ratification of the Lisbon Treaty Article 189 which mandates the EU to draw up a European space policy and establish appropriate relations with ESA (Treaty of Lisabon, 2009). Again there were two main streams either for ESA's integration into the EU or against it.

Gaubert argues that ESA is primarily a research institution. Therefore, it belongs to the same group as CERN, the European southern observatory, and the European molecular biology organization that are all established outside of the EU and it should stay like it (Gaubert, 2009). Moreover, there is a difference in identity. ESA's identity is technical, and the EU's is political. Thus, if the ESA becomes an EU agency operational know-how would be lost because the EU would run it politically as it does with any other EU institution (Gaubert, 2009). On the other hand, Peter and Stoffl argue that the United European space program under unified European Union leadership will likely foster stronger and more prominent missions. Successful and ambitious space exploration can help to reinforce the building of a European identity. Such missions will provide the public with pride and increase confidence in future capabilities (Peter and Stoffl, 2009). This confidence then can change easily into unity which is necessary for resilience and facing threats.

The latest debate on this topic is connected with the reigning interest and growing importance of the space domain. Mai'a argues that ESA will refuse any merger under the EU umbrella because ESA views space through the original "*space flight idea"* – a peaceful, romantic "for all mankind" approach to the utilization of space. EU ideas for space stem from practical purposes, security and defence. Even though there are other political and institutional issues preventing the merger Mai'a views the different approaches to space as the most important (Mai'a 2021). Farkac examined the issue from an economical perspective. He concluded that the ESA member states prefer the ESA to remain an intergovernmental organization because of the geographical return of the investments to the ESA budget. Moreover, lower contribution and smaller population of the state, the state is more in favour of keeping the geographical return of investments and opposition to the ESA's transformation into the EU agency (Farkac, 2018).

Christensen argues that if the ESA would become the full-fledged EU space agency, EU institution, in other words, other EU states that are not currently in ESA, Bulgaria, Croatia, Cyprus,

Latvia, Lithuania, Malta, Slovakia, and Slovenia would get equal access to the space program and its resources, education, and business opportunities, as well as, astronaut training program just through their EU membership (Christensen, 2021).

So far the possible institutional organization of the European space program have been examined from various perspectives but the security aspect has been omitted. That poses an important gap as the space domain undergo a rapid and significant transformation in the last decades. Firstly, with the proliferation of space technology, new players are able to venture into space. Smaller countries are in possession of their own satellites and/or possess or developed indigenous launching capabilities. Furthermore, the entrance of private companies adds to the congestion of the space domain. Secondly, rising tension between the USA and the People's Republic of China (PRC) has come to the forefront of confrontation once more. Moreover, the Russian war in Ukraine highlighted the importance of space assets for modern warfare, making everyone "to take notes" so to speak. NATO was a few years ahead of this trend reflected by the decision to declare space as the newest operational domain.

For these reasons, it is important to revisit the old question of how to organize the European space programme from a security perspective. Should the EU take over the ESA or the EU become an EU institution, or rather a different approach is needed even before institutional merging could be possible?

4. Theoretical Framework

4.1. Space, as a Contested Domain

To assess the strategic autonomy in the space sector, the space domain in the 21st century has to be defined first. To do so Paikowski uses the terms "Old Space" and "New Space" that are referring to ecosystems rather than a specific time period. As she points out Old Space is often wrongly associated with the Cold War period even though after the year 1990 Old Space and New Space ecosystems do coexist (Paikowski, 2017).

The Old Space ecosystem is characterized by the dominance of the state actors (the United States and the Soviet Union, with their respective allies, and the US, Russia and PRC after the end of the Cold War). During the Cold War, the rationale for space activities were stemming from a national security perspective. Firstly, the superpowers wanted to gain space-based intelligence, and secondly, they channelled their hostilities into non-violent public competitions through the Space Race. The progressive development throughout the Cold War era has shown that space technologies are inherent dual-use in nature. For that matter, space development become a strategic and prestigious endeavour for powerful countries. Therefore, state actors were dominant and commercial activities were at a minimum (Paikowski, 2017).

This started to change after the end of the Cold War as the security environment changed as well. Space technology proliferation restrictions were dropped and an opportunity arose for using the same technologies for both military and civilian projects, giving space for public-private partnerships (PPPs). This new dynamic fostered bigger international cooperation, commercialization, and expansion of the global space market. The outcome of this process was the emergence of new actors, small and developing states, and the private sector (Paikowski, 2017).

The rationale for going to space for these new actors in the New Space ecosystem is the cost-benefit consideration. Because of that, the approach to finance, Research and Development (R&D), duration of missions, targets of the missions, and management differ from the Old Space ecosystem. Under a New Space, there is a shift from big, time-consuming, and very expensive projects such as the James Web telescope, to less time R&D consuming projects, shorter duration of missions, with a fixed price that allows for more risk-taking (Paikowski, 2017). This was achieved through the miniaturization of satellites – CubeSat, which offers a cheap solution for a new technology to be tried out, not only by the private sector, but the scientific community, and

governments as well. Furthermore, the New Space ecosystem offers new solutions such as reusable launchers, and mega-constellations (Quintana, 2017). Therefore, with the lower price and off-the-shelf solutions, bigger risk-taking in the New Space ecosystem allows for quicker technological demonstration in orbit rather than in the lab, making it much more innovative than the Old Space ecosystem.

The innovations are led more and more by the civil space sector as it is one of the fastest-growing industries in the world with $350 billion in 2015 to an estimated $640 billion in 2030. Today, over 76% of global revenue in the space sector is generated by commercial activities (Space Foundation, 2016). New private projects are proposed, financed, developed, or even deployed such as mega-constellations, new launch platforms, on-orbit servicing, space debris removal, space mining, in-space manufacturing, space tourism, and lunar missions, etc., (Quitana, 2017) all of which have security implications.

Mega-constellations are one example. Today SpaceX's Starlink became almost a synonym of mega-constellations but companies such as OneWeb, Boing, and Samsung are working on their networks as well. As of April 2, 2022, there are 25 724 objects in the Earth's orbit that sensors can track (N2YO.com - real-time satellite tracking, 2022). Out of which at the end of 2021 were 5000 active satellites (McDowell, 2021). Of those, there are 1469 StarLink satellites in orbit out of approved a total of 30 000 to be launched (Barret, 2022). Other private and state actors are not staying behind as well. British company OneWeb asked for the US Federal Communications Commission's (FCC) approval of 6 372 satellites in 2021 (Fletcher, 2021). The PRC is also planning its mega-constellation with 13 000 satellites (Jones, 2021). This huge increase in the number of satellites at the Low Earth Orbit (LEO) is potentially dangerous for the utilization of the orbit itself as space debris proved to be a big threat to ISS and after the Russian Anti Satellite Weapon test (ASAT) the danger to ISS and other functioning infrastructure increased tremendously (Smith, 2022). Moreover, the current Russian invasion of Ukraine demonstrated the importance of the LEO internet mega-constellations as SpaceX's Starlink is in many places in Ukraine the only way of internet connection not only for civilians but also the only solution to conduct military operations. Ukraine's armed forces are using drones connected to artillery through Starlink for target acquisition (Freund, 2022).

With this amount of planned satellites to be put into orbit the demand for space launches grows proportionately. This demand drives the cost of launches per kilogram down significantly. One

solution to the price problem was ridesharing when one launching vehicle is used to deploy multiple satellites even from a different entity (Foust, 2022). More importantly, reusable launch stages are a game-changing technology. Not only it can reduce the amount of space debris but also makes space available to a broader range of customers due to lower prices per kilogram (Quitana, 2017).

Shifting the balance in favour of the private sector, commercialization of space activities, decreasing the cost of R&D and cheaper access to orbit leads to proliferation of the space technology in the hands of many new state and non-state actors. Compared to the Old Space ecosystem where space technology was the privilege of Super Powers (Paikowski, 2017). Because of the inherently dual-use nature of space technologies, this proliferation has potentially severe security implications. Developing and launching a small satellite to a strategically important orbit and then making it "kamikaze" against an adversary satellite is a relatively cheap option compared to developing of ground-based ASAT system (Pražák, 2021).

For the reason of easier proliferation, there is a strong need for a robust system of norms when it comes to the usage of the space domain. Currently, there is not any set of norms that would ensure responsible behaviour and decrease the risk of accidents or weaponisation. There, are initiatives, such as the European Union Code of Conduct for Outer Space Activities 17175/08 (European Union, 2008) but these can only be reforged into binding norms if the entity proposing them is a leading actor. In other words, to be a rule-maker takes having the capabilities, otherwise one will remain a rule-taker.

Even with the entry of countless new actors, as Paikowski argued, the Old Space ecosystem still exists alongside the New Space. Therefore, traditional state actors are still interested in the space domain. The US and its partners are coming back to the Moon with the Artemis program (Artemis Plan, 2020). The PRC and Russia agreed to a joint exploratory mission to the Moon and to develop a Moon base as well (Lee Mayers, 2021). India's space program is steadily developing its domestic capabilities intending to launch the first Indian astronaut in 2023 under the Gaganyaan programme (Tripathi, 2021).

Moreover, the military aspect of the national space programs is on the rise as well. Since the Gulf War, which was the first space war, where the US effectively used space systems to dominate the battlefield other nations realized the importance of space systems for their offensive and defensive

capabilities. They are so crucial that any side cannot win without them (in non-nuclear conflict) (Bowen 2022).

The US as the first country in the world established its Space Force in 2019 as an independent branch space branch of the Armed Forces (Pawlyk, 2019). The PRC's People's Liberation Army (PLA) identified space as a new domain, as a result of military reformers announced at November 2013 Third Plenum, which led to establishing a designated organizational structure to coordinate these forces (Pollpeter, 2016). Russia reminded everyone about its military space capabilities with a 2021 ASAT test (Gohn, 2021). Japan's policy towards space technology evolved in time from "peaceful" meaning "non-military " use to "peaceful" defined as "non-aggressive" thus allowing for military use with the focus on defence (Johnson-Freese, 2017).

Overall the space domain today is a very congested, contested, and competitive domain and staying behind will have severe security implications for anyone as acknowledged by EU member states officials, EU institutions, the European Space Agency, NATO, and representatives from think tanks and aerospace and defence industry members during the 2019 roundtable co-organized by the Finish Presidency of the Council of the EU in Brussels (The EU, Space and Defence, 2019).

4.2. Strategic Autonomy

After establishing the realities of the space domain in the 21st century this section will explore the concept of strategic autonomy. What it is, what it is in the European context, and what it is in the context of the European space sector.

In the international system composed of individual states exists countless interdependencies between those states. These can have various forms such as international law, trade, norms and values, agreements, and diplomacy. All these to a different degree impact the state's ability to pursue its national interests as they are generating pressures on the state and thus, compel it to change or modify its policies and behaviour. In other words, infringing on its strategic autonomy. Because of that, only a lone superpower in a unipolar international order would possess absolute strategic autonomy. In bipolar or multipolar international systems pressures to modify its behaviour are exerted by its peers. For that reason, strategic autonomy has to be understood in relative terms and not in absolutes (Kalyanaraman, 2015).

For that reason, autonomy is not something a state either has or does not have. Firstly, it is a spectrum and secondly, it is not universal across all spheres and domains. Traditionally strategic

autonomy is connected with defence and security. The European context is not any different. With slight exceptions during the Cold War when the concept was understood in the context of European defence industries. But since the 1990s understanding shifted to defence and security (EEAS, 2020).

The 1990s seemed like a good time to put forward a common European defence policy as other projects of European integration such as the Euro that was being discussed. But this idea was tested by the reality of the Balkan crisis. The Europeans were unable to deal effectively with the War in Kosovo, essentially in the EU's backyard, and the US through NATO had to be involved (Khol, 2000). The answer to this fiasco was the creation of the European Security and Defence Policy in 1999 through the Saint-Malo Declaration signed a year prior (Joint Declaration on European Defence, 1998). In 2009 the Lisbon Treaty transformed the policy into today's form as Common Security and Defence Policy (CSDP). This change also allowed member states to pursue further defence integration through Permanent Structured Cooperation (PESCO) (Treaty of Lisbon, 2009).

Event with a new breath of strategic autonomy the second reality check came with the 2011 Libya intervention of the UK and France. Once again it demonstrated the strategic autonomy to be just on paper and political talk, proving that Europeans do not have the capabilities and capacities to lead small-scale military operations without the US (Billon-Galland, Thomson, 2018).

The result of this was re-thinking and re-conceptualizing the European strategic autonomy. Officially the term was used by the European Council of ministers in 2013 (European Council, 2013) and subsequentially was fully developed in the 2016 EU Global Strategy (Council of the European Union, 2016).

The *Shared Vision, Common Action: A Stronger Europe, A Global Strategy for the European Union's Foreign and Security Policy* document presents strategic autonomy as a means to security. More specifically, the document points out that to maintain security within the Union it is important to be able to contribute to the security outside of its borders. Furthermore, the strategy confirms the primacy of NATO as a security provider but presents the ambition to act both autonomously and in cooperation with NATO at the same time (EU Global Strategy, 2016).

European Institute for Security Studies (EUISS) presents three drivers behind the European strategic autonomy.

1. Responsibility

2. Hedging
3. Emancipation

Strategic autonomy as a responsibility comes from the notion that the EU member states should contribute more to the security and defence within NATO, preferably through the EU frameworks. In practice, that means the EU will have the autonomy to conduct missions and not be dependent on the political and military support of the US as in the Western Balkans and Libya (Fiott, 2018). Strategic autonomy as hedging does not decrease overall dependency or increase autonomy. Instead, it offers to maintain good relations with the US in areas such as economy and diplomacy while at the same time it gives space to focus on strategic areas such as defence industries to improve the EU's autonomy (Fiott, 2018).

Strategic autonomy as emancipation is the most radical out of the three. It can be seen as a continuation of the responsibility approach as it allows for the EU's defence-industrial autonomy. Moreover, it comes from the premise that hedging can increase the dependency on the US, and hedging is the representation of the acceptance of the EU's dependency on the US. For that reason, emancipation is the only way how to unlock the EU's full potential to become a global power. Furthermore, the logic behind this approach is not only detaching from the US but also preventing the creation of new dependencies on other powers such as the People's Republic of China. Thus, this approach is binary. Either the EU can take care of itself or it cannot (Fiott, 2018).

According to EUSISS, the EU is currently somewhere between Responsibility and Hedging, mainly because in many areas the EU cannot afford the Emancipatory approach as it does not yet possess the capabilities. Furthermore, the brief stresses that some dependencies on other actors can be beneficial to the EU (Fiott, 2018).

Lippert, Ondarza, with Perthes in their report argue that in the sphere of technology the EU is the third producer of innovations after the United States and PRC. They argue that in the realm of the digital economy, or 5G networks the EU cannot catch up with them instead, the EU can only influence standardization processes and technology utilization if the EU does have the technological know-how, relevant research, and some manufacturing capabilities. When it comes to space domain and space technologies they do not argue for strategic autonomy instead they are in favour of participation and multilateral governance to make the most of space domain utilization potentials. They demonstrate this mix of independent capabilities of Galileo and Copernicus, with

launching capabilities of Ariane 5 and Ariane 6 rockets on one side, and dependency/cooperation at the ISS on the other. All together making the EU an attractive partner for the US, Russia, and the PRC (Lippert, Ondarza, Perthes, 2019). This approach does not however reflect the current realities of the current geopolitical competition and the role of the space domain in it as demonstrated by the previous section.

Therefore, when assessing the best institutional organization of the European space program concerning the Union's security, such a structure has to be the one that offers the biggest degree of strategic autonomy. Looking at the previous section it is clear that the driver behind this approach is that of "Emancipation."

To further develop what emancipation means in the context of the EU space program, this dissertation will use Fiott's way of thinking about strategic autonomy using three questions. Autonomy for, autonomy to, and autonomy from (Fiott, 2020). Together with the matrix used by Marco Aliberti, Matteo Cappella, and Tomas Hrozensky in their book *Measuring Space Power: A Theoretical and Empirical Investigation of Europe* divides strategic autonomy into capacity and autonomy which are further divided into hard capacity and soft capacity, whereas autonomy splits into technical autonomy and political autonomy (Aliberti, Cappella and Hrozensky, 2019). Using these two concepts together will set a clear boundary on what an optimal institutional organization of the European space programme with regards to security should look like and what steps need to be taken to achieve it.

When it comes to the first question, "autonomy for". This thesis is talking about the autonomy of the EU (Fiott, 2020). That means the ability to make decisions without slowdowns and setbacks, together with issues of overlapping responsibilities and competencies (Aliberti, Cappella and Hrozensky, 2019). For the EU that means the internal dependency on the political positions of the member states as well as multiple EU agencies having similar or overlapping agendas. The political will to be more autonomous depends on the importance of the sphere at hand. Both in the 2003 invasion of Iraq and 2011 Libya, the political divide within the EU has limited the EU's strategic autonomy (Helwig, 2020). But when it comes to space, there is political unity across the EU member states to develop space capabilities and be more autonomous. This unity and determination were demonstrated by past steps such as stressing the topic of space security and autonomy in the space domain in the 2016 EU Global Strategy (Council of the European Union, 2016), the creation of the European Union Space Programme Agency (EUSPA) in 2021, and the

focus on autonomy in space domain in the 2022 EU Strategic Compass (Council of the European Union, 2022). Furthermore, this resolve is currently being transformed into the first EU Space Strategy for Security and Defence to be published in the near future. Therefore, the optimal organization have to provide autonomy for the EU through increased internal political autonomy from the member states. Attention should be also paid to the internal EU structure to avoid duplication of agendas among various EU agencies which may slow down decision processes as well as dilute priorities. Moreover, due to the complexities of the European space programme political autonomy have to be increased also from other non-EU space actors such as EUMETSAT. Looking at the second question "autonomy to", means the autonomy of the EU to make decisions regarding the direction of the space program, such as specific missions, and R&D. Lastly, to be able to mobilize and employ diplomatic resources to engage in multilateral efforts that are crucial for space development (Fiott, 2020). In other words, it is a soft capacity capability. These are defined as the ability to use assets and expertise to pursue foreign policies to create the soft power narrative, or security and defence policies integrating space security in national military strategies (Aliberti, Cappella and Hrozensky, 2019). When it comes to decision-making, currently that is being done by the Commission's DG DEFIS which is in charge of implementing the EU space programme as well as maintaining the EU's autonomous, reliable, and cost-effective access to space (European Comission, 2022). The European External Action Service (EEAS) through its Space Task Force is responsible for the diplomatic and foreign policy aspect of the EU space programme (European Union, 2022). The development of the space capabilities is realized under the European Defence Agency (EDA) specifically those capabilities that have been identified where the EU is lacking satellite communication (SatCom), Space-Based Earth Observation (SBEO), positioning, navigation, and timing (PNT), and space situational awareness (SSA) (European DefenceAgency, 2022). Therefore, when we talk about "autonomy to" decision-making, capacity building, financing, and international cooperation we talk about these EU institutions whose autonomy should be strengthened and developed.

Lastly, "autonomy from" is then the push to lower any dependency that is or may negatively impact the EU's interests in space (Fiott, 2020). This can be translated as external political autonomy but in the context of the ability to pursue goals without the restriction of third countries and norms. The second part of this then reflects the technical autonomy, that is the ability to access and operate in the space domain without relying on the external sources of supply. Together with hard capacity

capabilities which are the material assets that allow the actor to operate in the space domain. For example, launchers, ground segments, operational space systems, and human space flight. It does not have to be complete self-reliance but more of mission independence in case of a crisis such as war, natural disasters, or trade disputes (Aliberti, Cappella and Hrozensky, 2019). This is relevant for multiple dimensions. Firstly, alleviating dependency on strategic resources, supplies, technologies, and industries. This dependency is illustrated in the fact that in 2006 just 25% of electrical, electronic, and electro-mechanical (EEE) components on the ESA spacecraft mission were European sources. This increased to 35% in 2010 and 50% in 2015. Even with the gap reduction, the EU is far from gaining industrial autonomy (Caito, 2015).[3] This translates also to gaining autonomy from other international space actors as not all of them may have a similar strategic interest. In other words external political autonomy (Aliberti, Cappella and Hrozensky, 2019). Geopolitics is always first and space is second as the Russian invasion of Ukraine confirmed. The project ExoMars for example was dependent on the Russian Proton rocket for which the EU does not have a suitable domestic replacement. (Ariane 6 is still under development) (Gibney, 2022). Therefore, cooperation and partnerships with other actors should be pursued but not at the expense of autonomy. This extends not only to international actors but to non-EU supranational institutions as well. Another aspect is the constraints posed by international norms and regulations. As of now, the number of international binding laws is minimal but in the future, this may change. Therefore, the EU must be in the position to be a rule-maker, rather than a rule-taker (Fiott, 2020). For these reasons, when we talk about "autonomy from" technological dependency, partnerships with international and non-EU supranational actors and institutions at the expense of strategic autonomy, and international rules and norms, we talk about strengthening the position of the EU space program through building domestic capabilities and international independence.

Therefore, the optimal organizational structure of the European space programme with the regard to the member states' security should adhere to multiple political and capacity principles. Firstly EU should have enough autonomy to set the directions of the space programme without any prolonged periods of time and avoid duplication of agendas and priorities within the EU structures. European space programme should be able to mobilize political capital to promote its programme abroad through a set of policies strengthening the position of the EU in the international sphere.

[3] Newer data are not available.

At the same time, the European space programme should be independent enough to not be constrained by coercion or rules imposed by other states and international organizations. Furthermore, the programme should allow for technical autonomy across critical supply chains to components manufacturing increasing Europe's hard capacities that allow for not-restrained access to space and the ability to operate in it.

5. Current State

This section of the dissertation will explore multiple aspects that are defining Europe's space programme. Firstly, it will address the relationship between the EU and ESA through the main official documents that are framing their respective relationship. Secondly, this section will explore the topic of the industrial space policy. Both from the ESA's and the EU's understanding. What are the key aspects of said policy and what it should achieve? Lastly, this section will look into two flagship projects that the European nations were able to create. Galileo and EU GOVSATCOM are now referred to as the EU Space-based Secure Connectivity System. Using the official EU documents that were and still are defining the parameters of the programme regarding its financing, organization, and responsibilities structure will help in the analysis section to find the answer to this dissertation research question.

5.1. Cooperation between the European Union and European Space Agency

The fundamental documents to assess the EU-ESA relationship, as well as their approach to the space domain, chronologically is the 2004 *Framework Agreement between the European Community and the European Space Agency*, the 2005 *ESA Convention* specifically *Articles 2 and 5,* the 2012 *Treaty on the Functioning of the European Union* specifically *Article 189*, the 2016 *Join statement on shared vision and goals for the future of Europe in space by the European Union and the European Space Agency*, and the 2021 *REGULATION (EU) 2021/696 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme* which repealed *Regulations (EU) No 912/2010, (EU) No 1285/2013 and (EU) No 377/2014 and Decision No 541/2014/EU.*

The first document is the *2004 Framework Agreement* signed by the ESA and the EU. The Framework Agreement is to address the coherent and progressive development of the overall European Space Policy. Under this agreement both parties, that is the EU and the ESA, aim to secure independent and cost-effective access to space and the development of other fields of strategic interest necessary for the independent use and application of space technologies in Europe (Framework Agreement, 2004).

The cooperation is set to be in spheres of science, R&D, EO, satellite navigation and communication, launchers, and human space flight, with the possibility for new areas to be added.

Joint initiatives can have many forms. From simple ones such as scientific exchanges, and personnel and equipment exchanges, to more complex one that needs to be coordinated, implemented, and funded together, such as Galileo. These complex joint missions should have detailed specifications e.g. overall mission definition, description of the objectives, the role and financial implications of the EU and ESA, as well as the rules of intellectual property rights, rules of ownership including the transfer of ownership, the implementation principles including voting rights, and the participation of the third parties. Furthermore, the EU must not be bound by the rule of "geographic distribution" contained in the ESA Convention, especially its Annex V. Moreover, compliance with the rules relating to financial control and auditing of the Party contributing to the joint initiatives, or of both Parties in case of joint contribution, shall apply to any joint activity (Framework Agreement, 2004).

In addition to that, both parties are encouraged multiple times to consult each other regarding future projects, progress, or in case of involvement of third parties in their projects. The agreement also sets up a framework for regular meetings between the Council of the European Union and the ESA council to discuss previously mentioned topics as well as amendments and the duration of this agreement. Duration is set for four years, automatically being renewed, until one party decides to opt out. Doing so will not have an impact on projects that already started (Framework Agreement, 2004).

For ESA's functioning, it is mainly the 2005 ESA Convention.[4] Article II of the ESA Convention deals with the agency's purpose. That is: "*to provide for, and to promote, for exclusively peaceful purposes, cooperation among the European States in space research and technology and their space applications, with a view to their being used for scientific purposes and for operational space applications systems:"* this to be done by elaborating and implementing long term European space policy, and industrial policy, coordinating the member states national space programmes (ESA, 2005).

Article V, Activities and Programmes the activities of ESA are mandatory, for each member state to take part in it. These are education, documentation, research and development, assisting the member states, and harmonization to avoid duplication. Optional activities are only for those

[4] This publication is issued for purposes of public communication only, and is not intended to contain any authentic version of the Convention. There is no publicly available document having similar or better value for the purpose of this thesis. Therefore, this document has been deemed valid for the purpose of the research as ESA uses it as a way to communicate its mission to the public.

member states that wish to participate consisting of the development and launching of satellites, and other space systems. On top of that, the ESA can carry out other activities that are approved by the ESA's council by a majority vote. Such as providing other agencies with ESA's facilities, or launching satellites of other entities, at the expense of the users (ESA, 2005).

When it comes to new space programmes the decision to undertake them has to be unanimous. Furthermore, each state initiating a project has to notify the Director-General, well in advance to give other member states time to assess their participation and give time to address responses and discrepancies of other member states. Lastly, ESA member states are allowed to conduct bilateral and multilateral space projects with other partners, but attention has to be given to not prejudicing the scientific, economic, or industrial objectives of ESA (ESA, 2005).

The next relevant part of the ESA Convention is its Industrial Policy: Article VII and Annex V. When giving the contracts the ESA will prefer member states' industrial capacities with the exception of optional programmes where the priority will be given to the participating country. Decision markers are such as the location of the enterprise's registered office, decision and research centres, together with the geographical location of the manufacturing facilities.

The ESA is known for distributing its contract to the member states based on the so-called "geographical distribution". That is: "*Member State's overall return coefficient shall be the ratio between its percentage share of the total value of all contracts awarded among all Member States and its total percentage contributions."* Other weight in factors can apply, based on technological interests and are always defined by the ESA's council. The overall return coefficient should be 1 and never lower than 0.8. In case of a substantial deviation from these figures, the Director-General will present the ESA's council with steps to remedy this situation (ESA, 2005).

The next relevant document is the *2012 Treaty of the Functioning of the European Union*, more specifically its Article 189. Even though it is not a dedicated document dealing with the EU-ESA relationship this article mandates the EU to promote scientific and technical progress and to draw up a European space policy. Furthermore, it compels the EU to promote joint initiatives and coordinate the efforts needed for the exploration and exploitation of space. To achieve these goals the EP and the EC should create necessary legislation and measures. Lastly the EU *"shall establish any appropriate relations with the European Space Agency"* (Treaty on the Functioning of the European Union, 2012).

The next relevant official document is the 2016 Joint statement on shared vision and goals for the future of Europe in space by the European Union and the European Space Agency. This document reaffirms the EU's and the ESA's dedication to the common endeavour of space utilization. With the goal of Europe remaining a top-class space power to further boost knowledge, scientific development, and economic benefits for the European citizens (EU and ESA, 2016).

Moreover, both sides emphasize their dedication to working together and reaffirm the cooperation in the future through a promise to adhere to the 2004 EU-ESA Framework Agreement, the 2005 ESA Convention, and the 2012 Treaty of the Functioning of the European Union specifically Article 189 (EU and ESA, 2016).

The latest document important for the EU-ESA relations is the *2021 REGULATION (EU) 2021/696 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme*, dividing tasks between the EUSPA and ESA, therefore having an impact on their cooperation.

The EUSPA is responsible for the management and exploitation of EU space programmes like EGNOS and Galileo, whereas ESA is responsible for more technical aspects of the programmes, such as systems evolution, together with the design and development of the parts for both ground and space systems, including testing and validation. This technical orientation in the European space program is echoed throughout the whole document regarding all major EU space programmes e.g. GOVSATCOM, SST, and Copernicus. When it comes to the governance of these projects, the documents urge to split the tasks appropriately to avoid duplication and maintain transparency (Regulation (EU) 2021/696, 2021).

When it comes to access to space (Article 5) this document designates the EU's space program to support the development of the launch vehicles for the need of the EU's space programme as well as the EU member states and potentially the international institutions. But this support of developing new technologies and innovative systems of access to space, and adaptation of respective ground infrastructure should be done *"in synergies with other Union programmes and funding schemes, and without prejudice to ESA's activities in the area of access to space."* (Regulation (EU) 2021/696, 2021).

Furthermore, the document reflects ESA as a partner of the EU with which appropriate relations should be concluded. That is explained as an adherence to the 2004 Framework Agreement, articles

II and V, together with establishing a Financial Framework Partnership Agreement (FFPA) between the EC, EUSPA, and ESA. On the other hand, the document reflects the reality of the ESA not being an EU institution and expects of ESA to take *"appropriate measures to ensure the protection of the interests of the Union and its Member States and, as regards budget implementation, that tasks entrusted to it comply with the decisions taken by the Commission."* (Regulation (EU) 2021/696, 2021).

5.2. European Industrial Policy

The next crucial aspect is the industrial policy. It is crucial to realize that the European space programme consists of the member states' individual activities, member states' activities through ESA, ESA's initiatives, EUMETSAT, and then the European Union space programme through various EU agencies notably EUSPA, but also EDA, EEAS etc. Because of that each previously mentioned stakeholder has a different understanding of what an optimal industrial policy would be and how it should be implemented.

Both ESA and EC brought forward their visions for European industrial space policy. For ESA the backbone is the policy of geographic returns that is defined by Article VII and Annex V in the ESA convention described above. The second relevant document for ESA is the Resolution on ESA Programmes: Addressing the Challenges Ahead. In this document, ESA recognizes the importance of a comprehensive European space policy that will foster the competitiveness of European industries worldwide. It recognizes the importance of the Large Systems Integrators (LSIs) in the European industrial ecosystem such as Airbus Defence and Space, Ariane Space, and Thales Alenia Space. These LSIs together with the Small Medium businesses (SMEs) and start-ups are all needed for the success of the European space programme. The documents realize the need to secure the supply chains of the critical components and technological gaps and dependency on the non-European suppliers/competitors. In this approach, ESA encourages avoiding the creation of monopolies and recognizes the importance of the SMEs which should become an integral part of the ESA's overall industrial policy that should lead to better integration within the European supply chains and increase their global competitiveness. Furthermore, when appropriate ESA supports the engagements in the public-private partnerships (Resolution on ESA programmes: addressing the challenges ahead, 2019)

For the EU's space industrial policy there are two important documents. The first one is the 2016 *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Space Strategy for Europe*. This document raises four main strategic objectives of what the European space industrial policy should achieve. Firstly, it should foster a globally competitive and innovative European space sector. Secondly, it should strengthen Europe's role as a global space actor. Thirdly, it should maximize the benefits for society. Lastly, it should reinforce Europe's autonomy in accessing and using space (Space Strategy for Europe, 2016).

The second relevant document that the European Commission published is from March 2020 entitled the *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A New Industrial Strategy for Europe.* This document does not specifically deal with space industrial policy but European industrial policy as such. The document reflects on the fact that 99% of all European industries are SMEs and therefore need to be supported by creating a fair environment that will foster both internal competitiveness as well as a global one. A big emphasis is given to modern technologies such as 5G and 6G which will then downstream into more business opportunities. But to be able to develop and build such a high-tech infrastructure stable and secure supply chain of both raw materials and components such s semiconductors as well as other EEE components have to be secured. When it comes to defence and space industries we can observe fragmentation within the EU which hampers the EU's ability to build next-generation defence capabilities. For that reason, a European Defence Fund was established to foster an integrated defence industrial base across the EU. This fund aims to support open supply chains, SMEs, as well as start-ups. Space industries are facing similar issues together with huge international competition, therefore the EU initiated a plan on synergies between civil, space, and defence industries to make them more resource-effective, and to gain benefits from economy of scale (A New Industrial Strategy for Europe, 2020).

This manifested into a *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Action Plan on*

Synergies between Civil, Defence and Space Industries published in February 2021. It is a three points plan. Firstly, enhancing complementarity between relevant EU programmes and instruments to increase the efficiency of investments and effectiveness of results (the synergies). With increased investments, the EU will maintain the leading position in technological development and innovation. Moreover, with widespread and still increasing number of emerging and disruptive technologies in civil, military, and space industries represents an opportunity for synergies among the EU programmes and instruments (Action Plan on Synergies between Civil, Defence and Space Industries, 2021).

Secondly, promoting that EU funding for research and development, including defence and space, has economic and technological dividends for EU citizens (the spin-offs). Increased investments into defence must also benefit society. In the past multiple European companies benefited from the spin-offs of the European defence research initiatives and the situation, today should not be any different. Public awareness about the increased spending is crucial for EU security as well as helping to keep the public support for such investments (Action Plan on Synergies between Civil, Defence and Space Industries, 2021).

Thirdly, facilitating the use of civil industry research achievements and civil-driven innovation in European defence cooperation projects (the spin-ins). In some areas, it is difficult to distinguish between civil and defence research. Civil applications are becoming cheaper due to access to data and globalization of knowledge, while at the same time many of these technologies have defence potential. Innovation in these areas usually comes from start-ups, SMEs, and Research & Technology Organizations (RTOs). To avoid duplication of efforts it is crucial for the defence industry to draw on the EU civilian industry research (Action Plan on Synergies between Civil, Defence and Space Industries, 2021).

5.3. European Space Projects

The next section will look into the two European space flagship projects of Galileo and EU Space-based Secure Connectivity Systems formerly known as the EU GOVSATCOM. Looking into how these projects were devised, proposed, and organized will help this dissertation in the analysis section to assess whether the current strategy is suitable in regard to the member states' security or whether some adjustments are needed.

5.3.1. Galileo

Galileo is a European global navigation satellite system (GNSS) and hallmarked as the flagship project of the cooperation between the European Space Agency (ESA) and the European Commission. Firstly, approved in 1999 and funding by the Transport Ministers was approved in 2002. The project was initiated to decrease the dependency on the American GPS which has also been deemed less advanced, less efficient, and less reliable (Lindstrom and Gasparini, 2003).

The development of the project was divided into four parts. The definition phase, the development and validation phase, the deployment phase, and the exploitation phase (Regulation (EC) 683/2008, 2008). The ESA was tasked with the definition phase in 1999 with a goal to provide technical feasibility to reflect the Galileo requirements set by the European Union (Council Resolution 1999/C 221/01, 1999). The program entered the development phase in 2001 to validate and test the assumptions made during the definition phase (Council Regulation (EC) No 876/2002, 2002). The whole project ought to be financed by the combination of funds from the European Commission, ESA, and public-private partnerships. EC and ESA would finance the definition phase, together with the development and validation phase, while the PPP would finance the deployment and operation phase. The European Global Navigation Satellite Systems Supervisory Authority (GSA)[5] would then be the supervising authority (Bertran and Vidal, 2005). Even though the PPP model was approved unanimously, it ultimately failed due to differences among the member states, the 2004 EU enlargement, and through which entity, EC or ESA, should additional national funds be added (Galileo's New PPP: Public-Public Partnership? 2007). With the mounting issues with PPP financing, the European Parliament issued a resolution in favour of abandoning the PPP model and proposed the complete financing of the project from the EU budget (EP Resolution P6_TA(2007)0272, 2007).

In 2008 the EC reflected and approved changes in the financing of Galileo. The development and validation phase will be paid for by the EC and ESA. The deployment phase will be financed by the EC. These approved changes were designed for the 2008-2013 time period during which the first satellites were to be built and deployed to orbit for in-orbit validation, and the ground infrastructure necessary for this operation to be built (Regulation (EC) 683/2008, 2008).

In 2013 passed regulation regulating the development of the Galileo system was passed. This document planned for the development and validation phase to finish et the end of 2013, and the

[5] Preceding agency to European Space Program Agency (EUSPA)

deployment phase to be finished by 2020. With the deployment of the first operational satellites the exploitation phase would begin progressively, focused on maintaining, improving, and developing future generations of the system. (Regulation (EU) 1285/2013, 2013).

The actual deployment of the Galileo satellites started in 2014 and reached the early operational capability in 2016 (Galileo begins serving the globe, 2016). The full operational capacity will be reached with 24 operational satellites, expected in 2022, and 6 spare satellites (Galileo FAQ, 2022).

The last document relevant for Galileo is the *2021 REGULATION (EU) 2021/696*. Apart from further specific details regarding the Galileo project it also established the European Space Program Agency (EUSPA) (Regulation (EU) 2021/696, 2021).

Because of the creation of EUSPA, this document specifies the roles of EC, EUSPA, and ESA in Galileo's future. Firstly, EUSPA is responsible for the security accreditation of all components of the programme (Galileo included). Secondly, EUSPA is responsible for the utilization of the Galileo, and implementation of activities relating to the development of downstream applications. ESA is then responsible for the system's evolution together with the design and development of both space and ground systems (Regulation (EU) 2021/696, 2021).

5.3.2. EU GOVSATCOM / EU Space-based Secure Connectivity System

European Union Governmental Satellite Communications (EU GOVSATCOM) has been conceived by the European Commission in 2016. Specifically, in the EC's strategy, GOVSATCOM falls under the initiative of reinforcing the synergies between the civilian and security space activities. The emphasis on this topic was stressed by the 2016 *Global Strategy for the EU's Foreign and Security Policy* as well. In 2016 the commission vouched to: *"propose a Govsatcom initiative to ensure reliable, secured and cost-effective satellite communication services for EU and national public authorities and infrastructure"* (Space Strategy for Europe, 2016).

The preparatory action was initiated in 2019 by the European Parliament passing the *legislative resolution of 17 April 2019 on the proposal for a regulation of the European Parliament and of the Council establishing the space programme of the Union and the European Union Agency for the Space Programme.* In this document, the EP welcomes the GOVSATCOM project and sees its strategic significance. Furthermore, the project itself is envisioned to be used in security and

safety-critical mission, therefore, an appropriate level of non-dependence from third parties (state and non-state actors) is required and should cover all parts of the project e.g. space and ground components, subsystems, manufacturing industries, ownership of space systems, and physical location of ground systems (P8_TA(2019)0402, 2019).

In 2021 the project was officially launched with an approved budget of EUR 0.442 billion[6] for the 2021-2027 Multinational Financial Framework (MFF). The project is divided into two phases. The first phase, expected to be finished in 2025, is designed to use already existing capacities of the EU member states and commercial satellite communication or service providers. Through this phase analysis of future supply and demand will be conducted with two possible outcomes. Either the existing capabilities are sufficient and this model of operation is satisfactory or the project will move into the second phase where the additional space/land infrastructure will be developed through one or more PPPs (Regulation (EU) 2021/696, 2021).

Responsibilities and tasks for the implementation of the project are distributed among the relevant actors. EDA, EEAS, ESA, EUSPA, and other EU agencies.

Moreover, GOVSATOM is a user-centric program primarily designed to serve the EU member states, European Council, European Commission, and the EEAS. It is up to the member states whether they decide to participate in the project either by providing capacities or authorising national users. The cases in which the GOVSATCOM should be employed are separated into three main families: Crisis management, including both civilian and military Common Security and Defence missions, natural and man-made disasters, humanitarian crises, and maritime emergencies. The second family is surveillance, from the border, through maritime, to pre-frontier surveillance. The third one is the key infrastructure that includes a diplomatic network, police communications, digital and critical infrastructures such as data centres, energy, dams, and space infrastructure (Regulation (EU) 2021/696, 2021).

In February 2022, the EC put forward a proposal establishing the Union Secure Connectivity Programme for the time period 2023 – 2027. The reason behind this decision stems from the EU Regulation 2021/696 which establishes the functioning of the GOVSATCOM programme mainly through sharing and pooling of existing member states' infrastructure. Because of the limited lifespan of satellites and expected further demand from the member states and other actors for secure satellite communication the EC deemed it necessary to move to the second stage of the

[6] The budget is combined with the Space Situational Awareness (SSA)

project by developing and deploying new ground-based and space-based infrastructure through one or more PPPs with European Union's satellite operators for example (2022/0039 (COD), 2022).

With this decision, the EC realizes the current position of the EU. That is, currently there are being developed, deployed, or already functioning public supported or subsidized non-EU low latency mega-constellations in the US and China. Together with the shortage of orbital slots and available frequency fillings because of these mega constellations and the already mentioned limited lifespan of GOVSATCOM creates an urgent need for such as system (2022/0039 (COD), 2022).

Due to envisioned financing through the PPPs, the programme will allow the private sector to use its infrastructure to provide commercial services to EU citizens. It is envisioned that this would be particularly true for the geographically remote areas within the EU together with geographical areas of strategic interest outside of the EU (2022/0039 (COD), 2022).

When it comes to the governance of the programme it will be the European Commission that will have the highest authority and will be responsible for the implementation of the project including its security. Moreover, it will be the EC that will distribute the task among other entities responsible. The main tasks will be given to the EUSPA and ESA. EUSPA will be in charge of the security accreditation of the governmental infrastructure through its Security Accreditation Board. Furthermore, like in the case of Galileo and Copernicus, EUSPA will be in charge of the operation of the governmental infrastructure of the programme and it will also provide the services to the member states and the EU. Lastly, EUSPA will coordinate with other EU bodies such as European External Action Service for better coordination when providing the service (2022/0039 (COD), 2022).

The role of ESA in the Secure Connectivity project is to provide mainly technical expertise and supervision of the development and validation phases meaning the construction and launch of the space-based infrastructure together with the development of the ground-based systems as well (2022/0039 (COD), 2022).

The project's total cost is estimated to be 6 billion euros. Throughout the 2022-2027 period the EU will contribute 2.4 billion euros. The rest of the funding will come from other public sources such as ESA, and member states, together with private funding coming from PPPs. With the PPPs the EC expects the optimization of the cost, as well as sharing the development and deployment risks. Allowing the private sector to participate should foster a better New Space industrial ecosystem

and enhance the competitiveness of the European space industries. Furthermore, with the participation of the private sector, the project allows for its exploitation for commercial services. Fostering additional benefits for downstream applications (Questions and Answers: Secure Connectivity, 2022)

6. Analysis

This analytical section will aim to answer the research question What would be the optimal institutional organization of the EU space program for ensuring the security of the EU member states? To answer this question this part will use the data from the previous chapter together with the data gathered from the interviews.

For the purpose of this dissertation, three interviews were conducted with experts dealing with European space security. Furthermore, each expert comes from a different background in the European space environment to get perspective and data from different points of view. European space efforts comprise multiple actors such as the member states, EU and its respective agencies like EUSPA, European Defence Agency, European Commission etc., together with supranational non-EU institutions such as ESA and EUMETSAT. All of these together are creating the European space environment. This creates an environment that is very delicate because each actor has their own interests, goals, objectives, and visions of where the space program should go. At the heart of these lies the socio-economic interests of each actor because each new space project presents member states or organizations with great economic benefits and prestige. For these reasons people working in this system, no matter which specific actor, realise this delicate balance. Therefore, talking openly about the issues that are of a systemic nature could cause disruptions in future negotiations and have not only a negative impact on the actor they are representing in the system but also on their personal lives. Because those experts interviewed for this dissertation are anonymized so that they are protected but also can speak openly about the flaws in the system, thus data gathered from them have high relevance and importance for the work. Any parts in the interview transcript that could lead to the identification of the interviewee are blackened for ensuring their protection

Data collected are in the form of the official EU, ESA, and EUSPA documents that are defining crucial aspects of the European space programme. These are the cooperation and relationship between the European Space Agency and the European Union. Industrial policy of those two said actors and their vision for it in the future. And lastly, two flagship projects of Galileo and EU GOVSATCOM/EU Space-based Secure Connectivity Systems have been and are today at the centre of the European space efforts. Therefore, their examination, development, organization and division of responsibilities will also offer an insight into the functioning of the programme as well as demonstrate which parts can be seen as optimal the way they are or on the other hand

problematic and need a better solution. Furthermore, the way these two projects are organized and run is interconnected with the EU – ESA relationship as well as the industrial policy, thus it is a vital part of this dissertation.

This analytical part will be guided by the theoretical framework of Strategic autonomy. This theoretical framework is the most suitable because it reflects the actual discussion within the European Union and applies to the various spheres such as medical supplies the issues highlighted by the Covid-19 pandemic or the space sector that among others were underscored by the Russian invasion of Ukraine. Firstly, it is important to define the driver behind the approach of the strategic autonomy that will be driving the optimal institutional organization of the EU space programme with regards to security. Three drivers of strategic autonomy were presented. That is Responsibility coming from the notion that the EU member states should contribute more to the security and defence within NATO, preferably through the EU frameworks. Hedging does not decrease overall dependency or increase autonomy. Instead, it offers to maintain good relations with the US in areas such as economy and diplomacy while at the same time it gives space to focus on strategic areas such as defence industries. Lastly, Emancipation is the continuation of the responsibility approach as it allows for the EU's defence-industrial autonomy. Moreover, it comes from the premise that hedging can increase the dependency on the US, and hedging is the representation of the acceptance of the EU's dependency on the US. Furthermore, the logic behind this approach is not only detaching from the US but also preventing the creation of new dependencies on other powers such as the People's Republic of China. For that reason, emancipation is the only way how to unlock the EU's full potential to become a global power (Fiott, 2018).

The first aspect that has to be answered is whether there is even a need for a re-organization of the European space programme. It is important to point out the defining aspects of today's space environment. In the environment we can see looser restrictions on space technology proliferation for both military and civilian projects, giving more space for public-private partnerships. Looser restrictions caused bigger international cooperation, commercialization, and expansion of the global space market. Making the space cheaper and accessible to new both private and public entities. This is in stark contrast to the Cold War space era which was defined by the dominance of the state actors, the US and the USSR, with their respective allies. All space projects in this era were stemming from the national security perspective such as space-based intelligence. Moreover, the superpowers channelled their hostilities into a non-violent competition. With the development

of space technologies during the Cold War, both superpowers realized that space technologies are inherent of dual-use nature and thus space development become a strategic and prestigious endeavour for powerful countries. This is the main difference between today's space environment and the past. Paikowski speaks of two different ecosystems. Old Space ecosystems are dominated by superpowers and New Space ecosystems are dominated by a multitude of actors and commercialization. That is where we are today (Paikowski, 2017).

The increased number of actors in the New Space ecosystem introduces a new security dynamic. It is not the dynamic of securitization of space as the space has been securitized as well as weaponized since the beginning of the Space Race. Today's security dynamics are those of anarchy and strategic interaction.

With the proliferation of space technology and space becoming ever so cheaper and more accessible we have increased the number of actors operating in space. We have an unprecedented number of satellites deployed in orbit every year. In 2020, 114 launches deployed over 1300 satellites surpassing the mark of 1000 satellites deployed a year for the first time. Another 1400 satellites were deployed in 2021. It is only expected that the number of new actors and deployed satellites will grow (Chakrabarti, 2021). With this the chance of actual physical interaction in space increases. Under the Old Space ecosystem, the chances that objects will physically interact in space were extremely low. Today with new satellites, space debris, and debris from recent ASAT tests give a rise to the security issue of actual contact among the objects in space (Interview 2, 2022).

Secondly, space competition under the Old Space ecosystem was governed by the rules that have been defined early on in the 1960s such as the Outer Space treaty of 1967. This means that actors took multiple self-imposed restrictions such as the denial of making territorial claims. The reason behind this was that there was no available technology allowing them to colonize celestial bodies. In other words, it did not pose any real constraint on the actors (Interview 2, 2022). But what we start to see today is that these self-imposed constraints are actually starting to negatively impact the actors due to the advancements in technology. This is then combined with the lack of proper regulations that are keeping up with the technological development, and that are reflective of the New Space ecosystem dynamics. This effectively makes today's space domain anarchical. This is further demonstrated by the increase of reckless actions of actors such as kinetic destructive ASAT tests conducted by India in 2019 (Set, 2019), Russia in 2021 (Pobjie, 2021), as well as destabilizing activities such as jamming, spoofing, blinding, cyber-attacks on the space infrastructure, etc.

(Interview 1, 2022). Not only that, today more and more state actors are interested in acquiring more offensive and defensive counter capabilities. These capabilities are the ones that can deny, disrupt, or destroy space assets and consequentially the services that are derived from space-based infrastructure (Interview 3, 2022).

This has to be taken in the context of extreme dependency on the space infrastructure. That is true for both civilian and military spheres. Today's level of dependence for both groups is at its highest and losing the space-based assets and all that comes from them would have devastating impacts on how our society functions as well as the ability of a modern army to conduct any operations. Because of this high level of dependency, we observe increasing pressure to protect space assets. That is particularly true for state actors. This creates competition among the national actors to not only protect their assets but to have capabilities to operate freely in the domain. And again it pushes other states to develop more counter-space capabilities. The result is the security dilemma, and that is the current state of the space domain (Interview 2, 2022).

With the need for re-organization and the driver in mind, the strategic autonomy in the context of this thesis then comprises a multitude of aspects that have to be kept in mind when thinking about optimal organizational structure. Combining Fiott's thinking through three questions of autonomy for, autonomy to, and autonomy from together with Aliberti's, Cappella's, and Hrozensky's matrix presented in their book *Measuring Space Power: A Theoretical and Empirical Investigation of Europe* offers a recipe on how should the organizational structure should look like and what it should offer so that the security of the member states is ensured.

6.1. Autonomy For

The first aspect that the optimal organizational structure should offer is what Fiott calls "autonomy for". This translates as the "autonomy for" the EU (Fiott, 2020). In other words, a political autonomy to make decisions, without slowdowns and setbacks as well as to avoid overlapping responsibilities and competencies (Aliberti, Cappella and Hrozensky, 2019).

Today there are multiple decision centres when it comes to the political decisions about the European space programme. There are member states that have their own space programmes with different objectives and national needs. There is the European Space Agency and even though the majority of the ESA's members are the EU member states, European Space Agency is not an EU agency. Furthermore, some of the ESA's members are not EU member states e.g. Switzerland,

Norway, and the United Kingdom (ESA Member States, Canada, Latvia, Lithuania and Slovenia, 2022). Moreover, ESA has mandatory activities and optional programmes. As the name suggests the ESA member states have to contribute to mandatory activities and can contribute to optional programmes (ESA programmes and activities of interest to SMEs, 2022). When it comes to the decision-making, ESA's main body is the Council which consists of the member states' representatives. This council then approves activities by 2/3 majority and programmes by majority vote. The budget has to be approved unanimously. Furthermore, the Council elects by 2/3 majority a Director General who is responsible for executing all ESA's projects (ESA, 2005).

The third main actor within the European space programme is then the European Union through the European Commission. EC is employing other EU agencies and directorates for drafting the space policy as well as executing the space programme itself.

Having multiple decision-making centres together with various stakeholders significantly diminishes the political autonomy when it comes to the space sector. Looking at the examples of Galileo and Secure Connectivity systems it is clear that the approval for these projects always comes from the member states. That is true regardless it was in the European Union or European Space Agency. If the EU and the ESA would serve as a vessel for member states to discuss and agree on the security of space projects that would not constitute a problem. What is crucial to realize is that some projects can be effectively realized on the national level, while others can be done well on the European community level. The Galileo project for example could have not been realized on the national level as any European state does not have the means to do so. It has to be done on the community level. When it comes to managing projects such as Galileo or Secure Connectivity it could not be done on the ESA level but some other entity had to be entrusted to run it. In this case, it was EUSPA (Interview 1, 2022).

There is a misconception within the EU, more specifically the European Commission, a misconception that EC is pushing to the outside world. That is if the EU or EC is not proposing, doing, or leading Europe-wide initiative then it is not European autonomy. Because of that, the EU through the EC is trying to venture into the security and defence areas and tries to build a defence union for which it does not have the mandate from the member states (Interview 1, 2022).

Because of that, gaining more internal political autonomy de facto means taking the political autonomy from the member states. The member states can entrust the EU with the decision-making authority but this constitutes a problem regarding the distribution of contracts for European space

projects as each country would like to benefit economically. From the security perspective having a universal solution of transferring decision-making powers to the EU does not have to serve all the nations equally. Therefore, as Interviewee 1 suggested, for the security field in particular having a tailor-made arrangement should serve the purpose of all member states the best (Interview 1).

Even though the security-related projects can have a tailor-made arrangement the reality is that the EU member states have already done the decision to entrust more political autonomy to the EU by passing the 2021 *REGULATION (EU) 2021/696 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme*. With that, the EUSPA was entrusted with managing the security elements of the programme which was not the case before (Interview 3, 2022).

6.2. Autonomy To

The second aspect of the optimal organizational structure should offer what Fiott calls "autonomy to." To make decisions regarding the direction of the space programme, such as specific missions, and Research and Development, together with the ability to mobilize and employ diplomatic resources to engage in multilateral efforts critical for space development (Fiott, 2020). That would correspond to the soft capacity capabilities. These are defined as the ability to use assets and expertise to pursue foreign policies to create the soft power narrative, or security and defence policies integrating space security in national military strategies (Aliberti, Cappella and Hrozensky, 2019).

There is an overlap with the previous section's concern with "autonomy for" when it comes to the direction regarding R&D, specific missions etc. What this refers to is the division of tasks among various EU actors such as the Commission's DG DEFIS which is in charge of implementing the EU space programme (European Comission, 2022). The European External Action Service (EEAS) through its Space Task Force is responsible for the diplomatic and foreign policy aspect of the EU space programme (European Union, 2022). The development of the space capabilities is realized under the European Defence Agency (EDA) specifically those capabilities that have been identified where the EU is lacking satellite SatCom, Space-Based Earth Observation (SBEO), positioning, navigation, and timing (PNT), and space situational awareness (SSA) (European DefenceAgency, 2022).

On the European macro level, we then have ESA which has a vital position in giving the direction of the European space programme. For example, its Science Programme going back to 1985 is a backbone of ESA's programmes with Missions such as Solar and Heliospheric Observatory (SOHO), Gaia, and LISA Pathfinder were vital in pointing the direction of the European space programme (Science Programme, 2022). It is also important to realize that the ESA programme is still three times bigger than the EU's space programme. ESA is lately also getting more involved in the security area, be it the security aspect of Galileo, to quantum encrypted space telecommunication. Furthermore, ESA is working on these security-related issues with EDA, EU, SATCEN, and other related national organizations (Interview 1, 2022).

These multiple actors have multiple voices that are used to present and represent the European space programme on the outside. This on one hand has a great advantage in that different actors have a wide range and can deliver the message to various spheres all over the world. What constitutes an issue is a fact that the message is not united, what more it can be even contradictory. An example of this internal division is the 3SOS initiative a public diplomacy initiative for safety, security, and sustainability of outer space activities that have been presented by the EU through EEAS in 2019 (3SOS initiative: a new public diplomacy initiative for safety, security and sustainability of outer space activities, 2019). This initiative was later contradicted by the EU member states. This lowers the credibility of the European space programme in the international sphere, as well as its effectiveness. Of course, the member states should not be just blindly following the EU, ESA's, or other actors' decisions, there should be internal convergence among the stakeholders and then the message should be presented. Furthermore, there is no need to have just one entity presenting the message, like EEAS for example, but the system of multiple voices, one message. It cannot be just the EEAS or the EC, as the EC for example only has observer status at COPUOS (Interview 2, 2022). Only by achieving this internal convergence when it comes to the outside messaging can the European space programme fully benefit from the soft capacity. Utilizing space for diplomatic purposes, in the European context means a soft power narrative or normative power narrative (Interview 1, 2022) which can be leveraged by all stakeholders within the European space programme environment, from the member states, through the EU, to ESA. Without the internal convergence on the basic principles, there will be inner fights among the stakeholders (Interview 2, 2022) and with the worsening security environment of the space

domain, the importance of this will only rise and having an internal convergence will be ever more critical to ensure the security of the member states.

What we can see today is that representatives from the member states sitting on the ministerial board of ESA do not talk to their countrymen who are working in the various working groups dealing with space issues within the EU structures (Interview 3, 2022).

Furthermore, this division in the voice is also responsible that internationally we do not hear much about the European space programme. Lately, the US, China, Russia, and India were very vocal in their plans and strategies concerning space compare to Europe. This issue with internal convergence adds to the confusion among European partners such as the EU and Japan. This will be increasingly crucial because of the aggressive posturing of China in the Indo-Pacific region and the European Union's attention towards that region with the Indo-Pacific strategy. Moreover, this internal convergence is important for NATO. With the alliance taking a more important role in space it will be important, especially for countries outside of Europe, to understand where the Europeans are heading as this will be then reflected in the NATO abilities and approaches in the domain (Interview 3, 2022).

To achieve this internal convergence it is primarily a matter of political and diplomatic will. If we look at Galileo we could see the internal convergence, especially at the beginning of the project at the time when it was seen as a competitor to the American GPS (Sample, 2003). Similarly, today when it comes to the Security Connectivity systems there is a universal agreement in the message that this system is needed, to be developed by Europeans, and will serve the security needs of member states (Secure connectivity, 2021), (EU Space-based Secure Connectivity System, 2022), (Evroux, 2022), (EU budget 2023: Empowering Europe to continue shaping a changing world, 2022), (De Selding, 2022), (Taylor, 2022).

A positive development is that there are already institutional mechanisms that can help to increase internal convergence. These are the regular meetings of the representatives of different stakeholders such as the 4th – 2022 Space Summit held in France where the member state leaders could meet with each other together with the ESA Director General (N° 4–2022: Decisions from the 2022 Space Summit, 2022). But to reach an internal convergence more meetings and forums are needed to have space and time where the disagreements can be solved and common ground found. In this regard, the EC is doing well with its communications of synergies that were put out a year and a half ago. But security issues still require more consultation amongst the actors both

on the European level as well as national level. The Europeans do not have that discussion and the little debates they have do not really work well (Interview 1, 2022). The European-wide communication on the basic principles means that it has to be shared by the EU itself, other European international organizations like ESA and EUMETSAT, and most importantly the member states. Because within the European space programme there are shared competencies which means the EU does not have the strongest position. In order to benefit from the programme, the two options are either giving more power to the EU which means that the member states would transfer their sovereignty to European institutions. The second option is for member states to align their national policy to reinforce the European objectives (Interview 2, 2022).

From the security perspective, the best way forward is to strengthen the role of the EU. Firstly, security projects such as Galileo or Secure Connectivity cannot be done by a single member state and EU-wide funding and leadership are needed to get this project off the ground. This was demonstrated with the Galileo and proposed public-private partnership that did not manage to succeed and strong EU involvement was needed (EP Resolution P6_TA(2007)0272, 2007). Secondly, in the last ten years or so we can observe a dramatic change in the leadership position on the European space scene. Historically it was ESA giving the direction but lately, the EU has asserted itself in the leading position. Taking over the management of programmes, proposing new programmes, bigger funding for the programmes the EU runs as well as the contribution of 28% to ESA's budget (ESA Budget 2022, 2022). Therefore, it is quite apparent what the trend is (Interview 3, 2022).

6.3. Autonomy From

This issue of internal convergence leads to the last question and that is "autonomy from." That is defined as the push to lower any dependence that is or may negatively impact the EU's interests in space (Fiott, 2020). This can be translated as external political autonomy but in the context of the ability to pursue goals without the restriction of third countries and norms. The second part of this then reflects the technical autonomy, that is the ability to access and operate in the space domain without relying on the external sources of supply. Together with hard capacity capabilities which are the material assets that allow the actor to operate in the space domain. For example, launchers, ground segments, operational space systems, and human space flight. It does not have

to be complete self-reliance but more of mission independence in case of a crisis such as war, natural disasters, or trade disputes (Aliberti, Cappella and Hrozensky, 2019).

When it comes to technical autonomy, in some areas Europe has already started in the 1970s and 1980s with the Autonomous Access Launchers as a response to the US decision to refuse to launch European commercial satellites. At that time the European countries did not apply the logic of economic returns to the project. The most important factor was to gain unrestricted access to space. Afterwards, Europeans discovered that the launcher was extremely successful, in economic terms. The decision was made that further investments into new launcher technology will be done only if they pay off from the commercial perspective. Later the successful commercial marker focusing on launch and telecommunications made Europe move away from the value of autonomy and focus more and more on the economic dimensions. These returns of investments work from a public policy perspective but they do not work from a strategic perspective (Interview 2, 2022).

When we look at the European technical autonomy from the perspective of projects the picture seems to be optimistic. Europe decided to gain autonomy in navigation with its Galileo project, and earth observation capabilities through Copernicus. Today Europe is increasing its capabilities when it comes to Space Surveillance and Tracking (SST) by putting together the capabilities of member states, and EU Space-based Secure Connectivity systems for a secure space-based communication network. Where Europe is not autonomous is the human space flight where Europe is dependent on the US systems. (Interview 1, 2022).

But the way of thinking in economic returns like in the example of the launchers applied to these projects as well. This dependency is illustrated in the fact that in 2006 just 25% of electrical, electronic, and electro-mechanical (EEE) components on the ESA spacecraft mission were European sources. This increased to 35% in 2010 and 50% in 2015. Even with the gap reduction, the EU is far from gaining industrial autonomy (Caito, 2015).[7] The reason behind this is Europe-specific. There is not a big enough institutional demand for satellites or components. This prevents the creation of an economy of scale. Why invest in the development of components that would be used only 3 times per year, when this component is available on the market. This creates an incentive to not have full autonomy. The logic of autonomy lies on the opposite side of the scale to the logic of economic returns. Europeans tend to invest in new technology, or domestic

[7] Newer data are not available.

industrial capabilities only if it provides an economic return. But when dealing with strategic autonomy pure economic logic cannot be used (Interview 2, 2022).

Therefore, it is important for Europeans to agree on what strategic autonomy in industrial capabilities means. There is a feeling that any kind of dependency even on a partner like the USA is making Europe uncomfortable. Firstly, it is not clear what strategic autonomy means in terms of collaboration with its partners. One viable option can be a willingness to collaborate on the elements of its strategic autonomy. Explaining and translating the concept of strategic autonomy to its key partners, such as the US, Japan and others will go a long way in the establishment of a viable collaborative architecture. In other words, strategic autonomy does not have to be something straightforward and trying to be independent in everything (Interview 3, 2022). This approach would allow for economic/strategic compromise because technical autonomy means acquiring more indigenous capabilities. To do so, billions of EUR would have to be invested. Given the current harsh economic realities, the European countries have to weigh what is feasible for them. However, in an era of growing commercial capabilities, there is a possibility to delegate some of the capabilities to commercial companies. A concept where several private companies are supporting the concept of technical autonomy (Interview 3, 2022).

The other, costlier approach is to indeed acquire total technical autonomy. For that, a programmatic development is needed. Continuous investments in those areas where Europe does not have full autonomous capacity. This applies to elements such as secure connectivity, but also to other areas where Europeans are lagging behind e.g. the field of access to space where we have autonomy in a sense of accessing the space but this autonomy needs to be protected. A similar applies to the commercial front. This does not necessarily mean a final product such as a launcher but all the underpinning technologies that are needed have to be produced in Europe. This was demonstrated by Russia withdrawing the Soyuz from French Guiana or the fact that Vega rockers are using the Ukrainian upper stage. This approach would also need to solve the issue of EEE components mentioned prior where 50% of them are of foreign origin Therefore, in order to have a technically autonomous space programme the whole supply chain from raw materials, through processing capacities, component manufacturing, software development to final assembly is needed (Interview 2, 2022).

This approach however would require immense investments and big political will and unity, therefore, looking at the recent steps where the EU is heading is not full autonomy but rather non-

dependence, to reduce dependence and ensure non-dependence. In practice, this means unrestricted access to state-of-the-art technology but not necessary that you have full autonomy. On top of reducing the percentage of EEE components from outside of the EU, it is also diversification of sources mainly lowering dependency on the US and bigger cooperation with Japan Aerospace Exploration Agency (JAXA) (Interview 2, 2022).

It has to be reflected that the change in this direction is happening especially under Ursula von der Leyen's commission which is talking about the "Geopolitical European Commission" together with Thierry Breton the Commissioner for the Internal Market at DG DEFIS. Even though the change is slow the topic of strategic autonomy is higher on the political agenda of DG DEFIS, EDA, ESA, EC, EEAS, etc.(Interview 2, 2022).

What is needed at this stage is to decide what the EU wants to achieve and what is the priority because of the limited resources. How to prioritize the investments into the critical technologies? If the goal is to achieve technological independence there exist several perspectives on what it means. Is it a critical technology for the industry or is it critical from a strategic perspective? If you are an institution or industry player, you have a different view on what critical technology for strategic autonomy is (Interview 2, 2022). This again gravitates back towards the issue of internal convergence on the fundamental issues and with relation to technical autonomy, this issue is the industrial policy.

The industrial policy of the European space programme is one of the most important topics that have to be solved not only to gain internal convergence but also to increase strategic autonomy and consequentially the member states' security.

Both the European Union and European Space Agency agree on what the industrial policy should do. It should strengthen the competitiveness, efficiency and reliability of the European space industry. It should enhance the European technological non-dependence, it should be on the top level of industrial and technological capabilities. It should contribute to balanced industrial development across the European industries and it should bring socio-economic benefits to the EU citizens (Interview 2, Interview 1, 2022). Even though everyone agrees on the objectives the issue is how to get there. Firstly, when we talk about the European industrial space policy the EU, and member states together with other stakeholders like ESA and EUMETSAT have to agree.

On paper, both ESA and the EU realize the importance of large enterprises but they both stress the importance of medium-sized enterprises in the European market (Resolution on ESA programmes:

addressing the challenges ahead, 2019) (A New Industrial Strategy for Europe, 2020). On the national level, the vision somewhat differs. From a German perspective, the industrial policy puts more emphasis on socio-economic benefits and therefore big support for start-ups and middle-size enterprises. This will bring a benefit to the ordinary citizens as monopolies and oligopolies will not abuse their position in the market. This will also support inner-EU competition as it allows new players to enter the market, unlike in the case of technological giants (Interview 2, 2022). Thus, the German approach is mostly aligned with the EU and ESA's vision for industrial policy. On the other hand, the French approach favours the creation of big champions so they can compete internationally with companies such as SpaceX or OneWeb (Interview 2, 2022). Moreover, the role of the French military has to be taken into consideration which has a big influence on the French approach to this topic on the EU scene. Thus, the French are the ones who do not specifically not accept the role of the EU and make it very difficult for the European joint and common space security approach (Interview 1, 2022).

At the moment we have two different approaches to the issues. The first approach could be called the EU approach which is favoring the big champions. Under commissioner Breton, the EC which would be the EU is shaping an agenda which is extremely benefiting the French industry. This creates frustration. For example, it will be mainly the French big industries that will be benefiting from the EU Space-based Secure Connectivity systems. Another example is the contracts for the second generation of the Galileo project. They have been given mainly to Thales leaving out the German industries. Therefore, the current EU direction could be described as "the most competitive gets it all". But competition in this respect means where the capacities are. In Europe, 50% of the space industrial capacities and research are in France. Over time 50% of the EU space budget will go to France while the GDP of France within the EU is only 15%. So they get 50% out of the investment of 15% and it will be paid by the rest of the member states (Interview 1, 2022).

The second approach could be called the ESA approach which favours geographic returns and thus smaller companies have a bigger chance of getting the contracts. "*Member State's overall return coefficient shall be the ratio between its percentage share of the total value of all contracts awarded among all Member States and its total percentage contributions."* Other weight in factors can apply, based on technological interests and are always defined by the ESA's council. The overall return coefficient should be 1 and never lower than 0.8. In case of a substantial deviation from these figures, the Director-General will present the ESA's council with steps to remedy this

situation (ESA, 2005). Moreover, with a lower financial contribution and a smaller population of the ESA member state, the state is more in favour of keeping the geographical return of investments (Farkac, 2018). ESA's geographic distribution in essence is that a state gets what they pay (Interview 1, 2022).

However, on paper, it is an effective and impressive system but in reality, it has issues. It is extremely complicated and there is a lot of political bargaining. Even though it has been extremely important in shaping the European space industries because if we would employ pure market competition our industries would be nowhere where they are today. Looking into the future there are limitations connected with this system. In Europe, we have one component from one country, the other from a different country, and then the integration of the components in the third country. That is the case because it has to be taken into consideration that if one state put in 20 million EUR then slightly more than 20 million EUR have to return to that state. This creates layers of complexity and hampers competitiveness in the long term. (Interview 2, 2022)

Therefore, the starting point is to find a convergence for industrial policy. Policy which will take into consideration the interest of the different constituencies such as the EU, ESA, and member states (Interview 2, 2022). The policy will effectively distribute limited financial resources between the international competitiveness approach to create big champions and the internal approach favouring start-ups and SMEs (Interview 2, 2022). This means that the better positioning of the EU has to start there. A fair policy by the EU, by the EC, and then an institutional arrangement which is effective and which will not benefit one specific actor in the European ecosystem and frustrate all other member states because they are paying the French industry (Interview 1, 2022). This is a short-term priority number one. A Europe-wide dedicated space industrial policy in those two areas. A policy that addresses the industry and commercial space sector and a dedicated policy that addresses space security and defence (Interview 2, 2022). Then for example it can be considered to put ESA under the EU roof. Or to put it under the council secretariat which would then allow also for optional programmes and not as an agency under the EC. Then put all the elements: EDA, SATCEN, and EUSPA into ESA to merge it. But to keep ESA with its character of doing business under such double scheme competition (Interview 1, 2022).

The second aspect of the "Autonomy from" is the autonomy from other international space actors as not all of them may have a similar strategic interest. In other words, an external political

autonomy (Aliberti, Cappella and Hrozensky, 2019). Geopolitics is always first and space is second as the Russian invasion of Ukraine confirmed. The project ExoMars for example was dependent on the Russian Proton rocket for which the EU does not have a suitable domestic replacement. (Ariane 6 is still under development) (Gibney, 2022). Therefore, cooperation and partnerships with other actors should be pursued but not at the expense of autonomy. An important part of this is the constraints posed by international norms and regulations. As of now, the number of international binding laws is minimal but in the future, this may change. Therefore, the EU must be in the position to be a rule-maker, rather than a rule-taker (Fiott, 2020).

Therefore, as technical autonomy is important to alleviate the technological and component dependency political autonomy is critical to alleviating the constraints for the European institutions. For example, when a decision is to be made the third parties have to be consulted for permission. In the past, that was the case with Galileo and possible cooperation with PRC when the permission had to be obtained from the US because we were dependent on their EEE components (Interview 2, 2022). In the context of European naivety in international space cooperation with authoritarian regimes Russian invasion of Ukraine and in the past International Traffic in Arms Regulations (ITAR) helped to limit the cooperation to the areas that are of no strategic or military importance (Interview 1, 2022).

Still, political dependency persisted in the European space programme. But why Europe has been accepting this dependence? Political autonomy stems from technological autonomy. For other space-faring nations including India, Japan, Russia, USA and China, autonomy is the most important no matter what. That is their political decision. They want to be autonomous and do what they wish. Europe, on the other hand, has accepted the lower autonomy because autonomy and sovereignty is not so big motivator to justify the expenditures in the areas of technological independence and politics for that matter. Because achieving independence is very costly (Interview 2, 2022).

Europe even today plays an immensely important role in terms of trying to preserve the vision for space exploration and space activities including sustainability and security for space that is shared by the democratic countries. The status quo of space activities is now being contested by China and Russia which promote dependency-inducing international space partnerships (Interview 3, 2022).

To do so Europe needs to ensure the ability to properly deploy the tools that it has. In this regard, the EU is wisely and progressively acquiring a bigger role within the overall European space sector. It has found a key area of intervention starting with the application and gradually expanding its mandate by means of communication, strategic documents etc. (Interview 1, Interview 2, Interview 3, 2022). To be able to continue on this path the EU needs to reach internal convergence on the diplomatic front (Interview 2, 2022) through better communication with its member states about what is at stake in space and what is happening in the space security domain. In order to, better position itself to assert the leadership role in space governance discussion (Interview 3, 2022). What is needed is a faster EU to react to changing international situations for example if the EU is not able to react to the US proposal EU will never be a prime mover, and never will have a prime mover advantage (Interview 2, 2022). There needs to be a clear joint strategy, potentially led by the EEAS to position itself in the global space governance discussions. Rather than reforms in terms of capabilities, the question is how can the EU position itself with its capabilities to put forward some useful principles for space governance (Interview 3, 2022)?

It is crucial to explain our position on the concept of political autonomy to European key partners, such as the US, Japan and others will go a long way in the establishment of viable collaborative architecture. A similar applies to India as well due to the focus of the EC in the Indo-Pacific region. With regards to the US and Europe, it is important that they are both competitors as well as partners, therefore sole political autonomy may not be the best option, rather a joint posture with regards to space governance issues may be more optimal (Interview 3, 2022).

7. Recommendations

This section will offer four recommendations based on the analysis part. These recommendations will serve as the answer to the dissertation's research question as they will be focusing on how to optimize the European space programme organization in order to increase the member states' security. These four recommendations will be in the following areas:

1. Internal Convergence
2. Industrial Policy
3. Domestic Capabilities
4. External Messaging

7.1. Internal Convergence

The first recommendation is to improve the internal convergence. That is the convergence between all stakeholders that are comprising the European space environment. The European Union and its agencies together with European Commission, the European Space Agency, EUMETSAT, and the member states. It is important to stress that the issue of internal convergence is related to the other three areas as well. Furthermore, the internal convergence has to be assessed from the perspective of the member states' security.

From the analysis part, we can observe that the EU through EC and other agencies such as EUSPA and EEAS is taking more leadership roles in the space domain and space security questions. In doing so, the EU challenges the system that has existed here since the 1970s in which the leadership role had the ESA and the member states. This creates friction or outright disagreements between these stakeholders. These have a then a direct impact on the security of the member states because it diminishes their credibility to be reliable and consistent partners. These frictions also lower the response time therefore in terms of crisis the negative impacts can be bigger on the member states, and lastly developing new projects needed to increase the security of the member states is severely slowed down therefore in a rapidly evolving space environment with countless new players and disruptive technologies they can lose the edge.

In the short term, it is absolutely crucial to develop new mechanisms and platforms where the stakeholders can meet and discuss their positions to increase cohesion. As it was pointed out the people from the same member state working in different agencies such as the EU and ESA are not

even communicating with each other. Such mechanisms and platforms would be in form of increased intensity of meeting not only at the ministerial levels but also at agency heads and EU-ESA forums. Furthermore, under the EU regulation, the member states could be tasked with creating a unit under their corresponding space agency[8] that would be responsible for European convergence. Its tasks would be to move regularly with their counterparts and continuously discuss, present, and find common ground on the topics where the stakeholders disagree.

We can already see some progress when it comes to an understanding that the fact that space security projects are needed such as Galileo and Secure Connectivity systems. If we compare the time how long it took Galileo to move forward with Secure Connectivity we can see improved internal convergence at least in the terms of understating the need for such projects and the fact they have to be done collectively.

In the medium, to long term, the consolidation of powers should go to the EU. The trajectory of the EU taking more initiative and responsibilities from other actors such as ESA and putting them under its framework will most likely continue. This will have a positive impact on the member states' security as the decision-making process will become most likely faster as less relevant stakeholders will be present and achieving internal convergence will be easier for the same reason.

7.2. Industrial Policy

The second recommendation concerns the industrial policy. The topic of industrial policy is tightly connected with internal convergence as it is the most sensitive topic among the stakeholders. This constitutes an issue. On one hand, the industrial policy is tightly connected with the internal convergence that is critical for the member states' security. Therefore, the industrial policy should be fair to all stakeholders, more specifically to the member states. On the other hand, industrial policy has to be set up in a manner that can create an industrial base that will strengthen the security capabilities of the member states.

Therefore, industrial policy of geographic returns may be fairer towards the member states, supports start-up and give more opportunities to the SMEs, thus increasing the internal convergence as the member states prefer the economic returns. But it also creates complexities, and slowdowns, and lowers the agility, reaction time, and international competitiveness. The

[8] Or other national institution responsible for space

second model pushed by the EU of pure economic competition supports the creation of big champions that can foster strategic autonomy, and compete internationally. But this means focusing the financial resources on a few companies in certain member states at the expense of others, thus lowering the internal convergence.

It is apparent that is an issue of balancing the two as the interviewees agreed. Some kind of compromise of fair redistribution of the limited financial resources among the member states together with the support of large industries will increase the international competitiveness and lowers the complexities. A possibility would be to have dedicated budgets one for SMEs and the other for big champions. The first step that is absolutely needed is a dedicated space industrial policy that would address this issue. A possible compromise between the two is connected with the third recommendation of domestic capabilities.

7.3. Domestic Capabilities

From the analysis, it is apparent that all stakeholders within the European space environment do realize the issue of the technological dependency on third parties. Building domestic capabilities have been neglected because of the stress that was given to the economic viability and commercial success of the projects. Under the current commission together with the harsh realities such as the disruption of the global supply chain due to the Covid-19 pandemic, and the Russian invasion of Ukraine strategic autonomy in terms of domestic technical capabilities has become a more prominent topic and priority.

Because all the stakeholders within Europe do realize that it is and will be an even bigger issue in the future to secure the domestic technical capabilities there is already an internal convergence on this topic. The issue is that securing technical autonomy is extremely expensive as the whole manufacturing process from raw materials processing through components manufacturing to assembly have to be created within Europe. Total independence would be too costly therefore, it should strive for a multitude of solutions.

Diversification of the suppliers and partners like in the case of the US and JAXA together with building domestic capabilities for example the semiconductors capacities to be built in the EU in order to increase the technical autonomy. This also represents an opportunity how to solve the industrial policy conundrum.

On one hand, there is an internal convergence on the fact that new domestic capacities have to be built. These capacities may not be specifically rocket engines but the EEE component factories that will be needed for the space systems. Therefore, these new European capacities could be directed to the geographical areas that will be losing economically at the expense of the big space champions to offset these economic losses. This solution will thus have a positive impact on the internal convergence as the balance of the economic investments will be fairer and will allow for the support of the big champions which will then have a positive impact on the member states' security. Of course, dispersing the domestic capabilities will introduce some limitations in terms of increased logistical issues, and increased delivery times between the factories but the overall benefit outweighs these negatives.

Therefore, in the short to medium term, it is important to mobilize the EU's resources to invest in building the domestic capabilities and relocate the supply and manufacturing chains to Europe. Total independence would be too costly but a combination of diversification and development of domestic capabilities should be a reasonable compromise. Furthermore, new domestic capabilities should be strategically positioned to disperse the investments among the member states to further support the internal convergence and offset the economic losses from supporting the big champions.

7.4. External Messaging

The last recommendation of external messaging is again very tightly connected to the issue of internal convergence. Because of the multiple voices within the European space environment speaking externally, multiple versions of the same message can be presented or in the worse scenario even contradictory statements. From the security perspective, this constitutes an issue as the decreases the European standing on the international scene and decreases the appeal of a reliable partner.

To improve the situation, the solution is not to decrease the number of voices within the European space environment by for example everyone listening to the EU. Multiple voices system presents an advantage as member states, EU through EEAS, EUSPA, EDA or EC, and ESA can reach a different audience than just one entity amplifying Europe's message. The solution is to increase the internal convergence and apply a "one message multiple voices" system. To do so in the short term a European-wide space policy is needed in which it will be clearly defined its priorities and

goals. This one message then will be presented by a multitude of voices from the lowest levels on the national scale to the highest position in the EU structures.

This system will have a positive impact on the member states' security because the unified position would be that of the major space player and would give a possibility to be a rule maker rather than a rule-taker. This is especially crucial now with the proliferation of space technology and countless new actors entering the space domain. Being able to define norms of behaviour in space will not only solidify a primary position within the system but also help to make the domain safer and rule-based therefore increasing one's own security. Furthermore, a unified position allows for better coordination and communication with partners/competitors like the US or Japan as well as other democratic countries that can help to find a unified position against the Russian and Chinese activities to destabilize the space domain.

8. Conclusion

This dissertation was answering the following research question: *What would be the optimal institutional organization of the EU space program for ensuring the security of the EU member states?* In the 21st century, the realities of the space domain are rapidly changing. From the Old Space environment of the Cold War, defined by the domination of two superpowers and their allied state actors into the New Space environment which is defined by a big number of state actors and countless commercial actors with increased proliferation of space technology and increased commercialization of space. This creates the space domain today more contested and congested introducing new security challenges. This is then put together with the unprecedented dependency of both civilian and military on the space-based infrastructure and space-derived applications. All of which create the drive to develop new systems and technologies to protect already existing state infrastructure as well as means to deny and disrupt access to others.

Europe is one of the main space actors. But because all of its space activities are done together by the member states either through ESA or EU this creates obstacles to effectively reacting to the ever faster developments. Because all stakeholders in the European space system have to agree such as the member states, EU, and ESA and all of them have different interests it makes cooperation more difficult and can have a negative impact on the member states' security. This dissertation was exploring where lies the issues and what can be done to mitigate them in order to increase the member states' security.

Four key areas have been identified. Internal convergence, industrial policy, domestic capabilities, and external messaging. There has to be a proactive approach to communication between the stakeholders in order to agree on fundamental issues such as industrial policy. To do so more regular forums and platforms need to be created together with national working groups dealing with this specific topic of internal convergence. A new dedicated space industrial policy has to be created to balance the redistribution of the limited financial resources among the member states together with the support of large industries which will increase the international competitiveness and lowers the complexities. Thirdly, developing domestic capabilities will greatly increase the strategic autonomy of the European space programme. Developing these capacities can be used as compensation to other member states which would be financing the development of large industries. The last area to be improved is the external messaging. The system of "multiple voices one message" is recommended as it offers the biggest external reach. Furthermore, unified

diplomatic action can be used as a tool to be a norm maker especially when it comes to the responsible norms of behaviour in space that are currently being threatened by Russia and PRC. This also allows for better coordination with partners such as the US, Japan, and India.

This research offers the initial look into the possible institutional optimization of the European space programme. It succeeded in defining the key areas that have to be solved in the short term in order to move forward with rearranging or merging the agencies. Further research can build on these initial findings as each key could be potentially developed into an individual research project.

References

- *2022/0039 (COD) Proposal for: REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing the Union Secure Connectivity Programme for the period 2023-2027.* 2022. Available at: https://ec.europa.eu/info/sites/default/files/proposal_regulation_union_secure_connectivity_programme.pdf. [Accessed 25 June 2022].
- Aliberti, M., Cappella, M. and Hrozensky, T., 2019. *Measuring Space Power: A Theoretical and Empirical Investigation on Europe*. Springer.
- Barret, E., 2022. *How Elon Musk's SpaceX lost 40 Starlink satellites—worth $20M—all at once*. Fortune. Available at: https://fortune.com/2022/02/10/spacex-starlink-satellites-solar-storm-lost-elon-musk-internet/. [Accessed 2 April 2022].
- Bertrán, X. and Vidal, A., 2005. The Implementation of a Public-Private Partnership for Galileo. *In Proceedings of the 18th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS 2005).* (pp. 390-399). Available at: https://spacejournal.ohio.edu/issue9/pdf/Implement_Public-Private.pdf. [Accessed 6 May 2022].
- Billion-Galland, A. and Thomson, A., 2018. *European Strategic Autonomy: Stop Talking, Start Planning*. The European Leadership Network. Available at: https://www.jstor.org/stable/resrep22125?seq=1#metadata_info_tab_contents. [Accessed 12 March 2022].
- Braun, V. and Clarke, V., 2012. Thematic analysis. Washington DC: American Psychological Association.
- Caito, L., 2015. *European Technological Non-Dependence*. Espi.or.at. Available at: https://espi.or.at/archive/report-51-european-technological-non-dependence-issued. [Accessed 17 April 2022].
- Chakrabarti, S., 2022. *How many satellites are orbiting Earth?*. Space.com. Available at: https://www.space.com/how-many-satellites-are-orbiting-earth. [Accessed 1 July 2022].
- *CODE OF CONDUCT FOR OUTER SPACE ACTIVITIES 17175/08.* 2008. Council of the European Union, Brussels. Available at: https://data.consilium.europa.eu/doc/document/ST-17175-2008-INIT/en/pdf. [Accessed 6 April 2022].

- *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Action Plan on synergies between civil, defence and space industries.* 2021. Available at: https://ec.europa.eu/info/sites/default/files/action_plan_on_synergies_en_1.pdf. [Accessed 25 June 2022].
- *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Space Strategy for Europe.* 2016. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016DC0705&qid=1652271998204. [Accessed 11 May 2022].
- *COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A New Industrial Strategy for Europe.* 2020. Available at: https://ec.europa.eu/info/sites/default/files/communication-eu-industrial-strategy-march-2020_en.pdf. [Accessed 25 June 2022].
- Consolidated version of the Treaty on the Functioning of the European Union PART THREE - UNION POLICIES AND INTERNAL ACTIONS TITLE XIX - RESEARCH AND TECHNOLOGICAL DEVELOPMENT AND SPACE Article 189. 2009. *Official Journal C202, 07/06/2016,* p. 131-132.
- *CONSOLIDATED VERSION OF THE TREATY ON THE FUNCTIONING OF THE EUROPEAN UNION 12012E/TXT*. 2012. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A12012E%2FTXT. [Accessed 18 May 2022].
- Council of the European Union, 2016. 14149/16 Council conclusions on implementing the EU Global Strategy in the area of Security and Defence. Available at: https://www.consilium.europa.eu/media/22459/eugs-conclusions-st14149en16.pdf. [Accessed 12 March 2022].
- Council of the European Union, 2022. 7371/22 A Strategic Compass for Security and Defence – For a European Union that protects its citizens, values and interests and

contributes to international peace and security. Available at: https://data.consilium.europa.eu/doc/document/ST-7371-2022-INIT/en/pdf. [Accessed 16 May 2022].

- *COUNCIL REGULATION (EC) No 876/2002 of 21 May 2002 setting up the Galileo Joint Undertaking*. 2002. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002R0876&from=EN. [Accessed 6 May 2022].
- Council Resolution of 16 November 2000 on a European space strategy. 2000. *Official Journal C 371, 23/12/2000,* p. 3.
- *COUNCIL RESOLUTION of 19 July 1999 on the involvement of Europe in a new generation of satellite navigation services - Galileo-Definition phase (1999/C 221/01).* 1999. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31999Y0803%2801%29. [Accessed 6 May 2022].
- Czechspaceportal.cz, 2022. *EU SPACE-BASED SECURE CONNECTIVITY SYSTEM*. Available at: https://www.czechspaceportal.cz/wp-content/uploads/2022/05/factsheet-eu-secure-connectivity.pdf. [Accessed 5 July 2022].
- EEAS - European External Action Service - European Commission, 2020. *Why European strategic autonomy matters*. Available at: https://eeas.europa.eu/headquarters/headquarters-homepage/89865/why-european-strategic-autonomy-matters_en. [Accessed 12 March 2022].
- Eeas.europa.eu, 2019. *3SOS initiative: a new public diplomacy initiative for safety, security and sustainability of outer space activities*. Available at: https://www.eeas.europa.eu/eeas/3sos-initiative-new-public-diplomacy-initiative-safety-security-and-sustainability-outer-space_en?s=70. [Accessed 5 July 2022].
- Entrusted.eu, 2022. *What is EU GOVSATCOM?*. Available at: https://entrusted.eu/faq/questions-answers/govsatcom. [Accessed 11 May 2022].
- ESA, 2005. *Convention of the European Space Agency.* Available at: https://aerospace.org/sites/default/files/policy_archives/ESA%20Convention%20Sep05.pdf. [Accessed 18 May 2022].
- ESA, 2005. ESA Turns 30! A successful track record for Europe in space. Available at: https://www.esa.int/About_Us/ESA_history/30years/ESA_turns_30!_A_successful_track_record_for_Europe_in_space. [Accessed: November 19 2021].

- ESA, 2006. *Agenda 2011 A document by the ESA Director General and the ESA Directors – October 2006*. Available at: https://www.esa.int/esapub/br/br268/br268.pdf. [Accessed 14 May 2022].
- ESA, 2016. *Galileo begins serving the globe*. Available at: https://www.esa.int/Applications/Navigation/Galileo_begins_serving_the_globe. [Accessed 8 May 2022].
- ESA, 2019. "Resolution on ESA programmes: addressing the challenges ahead." Available at: https://esamultimedia.esa.int/docs/corporate/Resolution_3_Space19+Final-28Nov-12h30.pdf. [Accessed 25 June 2022].
- Esa.int, 2022. *ESA Budget 2022*. Available at: https://www.esa.int/ESA_Multimedia/Images/2022/01/ESA_budget_2022. [Accessed 10 July 2022].
- Esa.int, 2022. *ESA Member States, Canada, Latvia, Lithuania and Slovenia*. Available at: https://www.esa.int/Education/ESA_Member_States_Canada_Latvia_Lithuania_and_Slovenia#:~:text=ESA%20Member%20States%3A%20Austria%2C%20Belgium,Switzerland%20and%20the%20United%20Kingdom. [Accessed 14 May 2022].
- Esa.int, 2022. *ESA programmes and activities of interest to SMEs*. Available at: https://www.esa.int/About_Us/Business_with_ESA/Small_and_Medium_Sized_Enterprises/ESA_programmes_and_activities_of_interest_to_SMEs. [Accessed 4 July 2022].
- Esa.int, 2022. *N° 4–2022: Decisions from the 2022 Space Summit*. Available at: https://www.esa.int/Newsroom/Press_Releases/Decisions_from_the_2022_Space_Summit. [Accessed 5 July 2022].
- Esa.int, 2022. *Science Programme*. Available at: https://www.esa.int/About_Us/Business_with_ESA/Business_Opportunities/Science_Programme. [Accessed 5 July 2022].
- Esa.int, 2022. *Secure connectivity*. Available at: https://www.esa.int/ESA_Multimedia/Images/2021/06/Secure_connectivity. [Accessed 5 July 2022].
- EU, ESA, 2016. *Joint statement on shared vision and goals for the future of Europe in space by the European Union and the European Space Agency.* Available at:

https://ec.europa.eu/docsroom/documents/19562/attachments/1/translations/en/renditions/native. [Accessed 20 May 2022].

- European Commission, 2022 "Questions and Answers: Secure Connectivity." Available at: https://ec.europa.eu/commission/presscorner/detail/en/QANDA_22_922. [Accessed 25 June 2022].
- European Commission, 2022. *Defence Industry and Space*. Available at: https://ec.europa.eu/info/departments/defence-industry-and-space_en. [Accessed 17 April 2022].
- European Commission, 2022. *EU budget 2023: Empowering Europe to continue shaping a changing world*. Available at: https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3473. [Accessed 5 July 2022].
- European Council, 2013. *EUCO 217/13 CONCLUSIONS of 19/20 DECEMBER 2013*. Available at: https://www.consilium.europa.eu/uedocs/cms_Data/docs/pressdata/en/ec/140245.pdf. [Accessed 12 March 2022].
- European Defence Agency, 2022. *Space*. Available at: https://eda.europa.eu/what-we-do/capability-development/space. [Accessed 17 April 2022].
- *European Parliament resolution P6_TA(2007)0272 of 20 June 2007 on the financing of the European programme of satellite radio navigation (Galileo) under the Interinstitutional Agreement of 17 May 2006 and the multiannual financial framework 2007-2013*. 2007. Available at: https://www.europarl.europa.eu/doceo/document/TA-6-2007-0272_EN.html. [Accessed 6 May 2022].
- European Union, 2022. *European External Action Service (EEAS)*. Available at: https://european-union.europa.eu/institutions-law-budget/institutions-and-bodies/institutions-and-bodies-profiles/eeas_en#:~:text=Overview&text=The%20European%20External%20Action%20Service,thus%20increasing%20Europe%27s%20global%20influence. [Accessed 17 April 2022].
- Euspa.europa.eu, 2022. *Galileo FAQ*. Available at: https://www.euspa.europa.eu/european-space/galileo/faq. [Accessed 8 May 2022].

- Evroux, C., 2022. *EU secure connectivity programme: Building a multi-orbital satellite constellation [EU Legislation in Progress]*. Epthinktank. Available at: https://epthinktank.eu/2022/05/24/eu-secure-connectivity-programme-building-a-multi-orbital-satellite-constellation-eu-legislation-in-progress/. [Accessed 5 July 2022].
- Farkač, M., 2018. ESA - A Hindrance for Further Supranationalization?.
- Fiott, D., 2018. Strategic autonomy: towards 'European sovereignty' in defence? Available at: https://www.iss.europa.eu/content/strategic-autonomy-towards-'european-sovereignty'-defence. [Accessed: 5 March 2022].
- Fiott, D., 2020. *The European space sector as an enabler of EU strategic autonomy*. Iss.europa.eu. Available at: https://www.iss.europa.eu/content/european-space-sector-enabler-eu-strategic-autonomy. [Accessed 12 March 2022].
- Fletcher, B., 2021. *OneWeb launches 36 more satellites for LEO broadband fleet*. Fierce Wireless. Available at: https://www.fiercewireless.com/wireless/oneweb-launches-36-more-satellites-for-leo-broadband-fleet. [Accessed 3 April 2022].
- Foust, J., 2022. *SpaceX launches fourth dedicated rideshare mission*. SpaceNews. Available at: https://spacenews.com/spacex-launches-fourth-dedicated-rideshare-mission/. [Accessed 5 April 2022].
- *FRAMEWORK AGREEMENT between the European Community and the European Space Agency*. 2004. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A22004A0806%2803%29. [Accessed 19 May 2022].
- Freund, A., 2022. *Ukraine is using Elon Musk's Starlink for drone strikes*. DW.COM. Available at: https://www.dw.com/en/ukraine-is-using-elon-musks-starlink-for-drone-strikes/a-61270528. [Accessed 3 April 2022].
- Gaubert, A. and Lebeau, A., 2009. Reforming European space governance. *Space Policy*, *25*(1), pp.37-44.
- Gibney, E., 2022. *Ukraine conflict jeopardizes launch of Europe's first Mars rover*. Nature.com. Available at: https://www.nature.com/articles/d41586-022-00608-3. [Accessed 17 April 2022].
- Gohd, C., 2021. *Russian anti-satellite missile test draws condemnation from space companies and countries*. Space.com. Available at: https://www.space.com/crussian-anti-satellite-missile-test-world-condemnation. [Accessed 11 April 2022].

- Helwig, N., 2020. *EU STRATEGIC AUTONOMY: A REALITY CHECK FOR EUROPE'S GLOBAL AGENDA*. Fiia.fi. Available at: https://www.fiia.fi/wp-content/uploads/2020/10/wp119_strategic_autonomy-2.pdf. [Accessed 16 April 2022].
- Hobe, S., 2004. Prospects for a European space administration. *Space Policy*, *20*(1), pp.25-29.
- Inside GNSS - Global Navigation Satellite Systems Engineering, Policy, and Design. 2007. *Galileo's New PPP: Public-Public Partnership?*. Available at: https://insidegnss.com/galileos-new-ppp-public-public-partnership/. [Accessed 6 May 2022].
- Interview 1. *What Would be the Optimal Institutional Organization of the European Space Program in regards to member states' security?* Interview by Frantisek Avrat.
- Interview 2. *What Would be the Optimal Institutional Organization of the European Space Program in regards to member states' security?* Interview by Frantisek Avrat.
- Interview 3 *What Would be the Optimal Institutional Organization of the European Space Program in regards to member states' security?* Interview by Frantisek Avrat.
- Iss.europa.eu, 2019. *The EU, space and defence: a reflection on strategy, complementarity and capabilities*. Available at: https://www.iss.europa.eu/content/eu-space-and-defence-reflection-strategy-complementarity-and-capabilities. [Accessed 6 April 2022].
- Johnson-Freese, J., 2017. *Space warfare in the 21st Century: Arming the Heavens*. New York: Routledge. ISBN 978-1-315-52917-2.
- Joint Declaration on European Defence, 1998. *Joint Declaration issued at the British-French Summit, Saint-Malo, 3-4 December 1998. Foreign and Commonwealth Office of the United Kingdom.* Available at: http://www.fco.gov.uk/en/newsroom/latest-news/?view=News&id=2244063. [Accessed 12 March 2022].
- Jones, A., 2021. *China is developing plans for a 13,000-satellite megaconstellation*. SpaceNews. Available at: https://spacenews.com/china-is-developing-plans-for-a-13000-satellite-communications-megaconstellation/. [Accessed 3 April 2022].
- Kalyanaraman, S., 2015. *Aravind Devanathan asked: What is 'strategic autonomy'? How does it help India's security?* Available at: https://idsa.in/askanexpert/strategicautonomy_indiasecurity. [Accessed: 5 March 2022].

- Khol, R., 2000. European Security and Defence Policy – A Response to European Security Ambitions?. *Czech Journal of International Relations*, 35(4), pp.29-40. Available at: http://file:///C:/Users/Frenk/Downloads/1279-Article%20Text-2578-1-10-20140917.pdf. [Accessed 12 March 2022].
- King, G., Keohane, R.O. and Verba, S., 1994. *Designing social inquiry*. Princeton University Press.
- Kohonen, I., 2009. The space race and Soviet utopian thinking. *The Sociological Review*, *57*, pp.114-131. Available at: https://journals-sagepub-com.ezproxy.lib.gla.ac.uk/doi/pdf/10.1111/j.1467-954X.2009.01820.x. [Accessed 27 March 2022].
- Lee Mayers, S., 2021. *China and Russia Agree to Explore the Moon Together*. Nytimes.com. Available at: https://www.nytimes.com/2021/03/10/world/asia/china-russia-moon.html. [Accessed 7 April 2022].
- Lindstrom, G. and Gasparini, G., 2003. *The Galileo Satellite System and its security implications*. EU Institute of Security Studies. Available at: https://www.iss.europa.eu/sites/default/files/EUISSFiles/occ44.pdf. [Accessed 2 May 2022].
- Lippert, B., Ordanza, N. and Perthes, V., 2019. European strategic autonomy: actors, issues, conflicts of interests. *Berlin: Stiftung Wissenschaft und Politik -SWP- Deutsches Institut für Internationale Politik und Sicherheit, p.25.* Available at: https://doi.org/10.18449/2019RP04. [Accessed 26 March 2022].
- Mai'a, K., 2021. 'United Space in Europe'? The European Space Agency and the EU Space Program. *European Foreign Affairs Review*, *26* (Special).
- McDowell, J., 2021. *Jonathan's Space Report | Space Statistics*. Planet4589.org. Available at: https://planet4589.org/space/stats/stats1.html. [Accessed 2 April 2022].
- N2YO.com - real time satellite tracking and predictions. 2022. *N2YO.com - real time satellite tracking*. Available at: https://www.n2yo.com. [Accessed 2 April 2022].
- Nasa.gov, 2020. *ARTEMIS Plan*. Available at: https://www.nasa.gov/sites/default/files/atoms/files/artemis_plan-20200921.pdf. [Accessed 7 April 2022].
- O'Reilly, K., 2008. *Key concepts in ethnography*. Sage.

- Paikowski, D., 2017. What is new space? The changing ecosystem of global space activity. *New Space*, *5*(2), pp.84-88.
- Pawlyk, O., 2019. *It's Official: President Trump Has Signed Space Force Into Existence*. Military.com. Available at: https://www.military.com/daily-news/2019/12/20/its-official-president-trump-has-signed-space-force-existence.html. [Accessed 11 April 2022].
- Peter, N. and Stoffl, K., 2009. Global space exploration 2025: Europe's perspectives for partnerships. *Space Policy*, *25*(1), pp.29-36.
- Pinnock, H., Huby, G., Powell, A., Kielmann, T., Price, D., Williams, S. and Sheikh, A., 2008. The process of planning, development and implementation of a General Practitioner with a Special Interest service in Primary Care Organisations in England and Wales: a comparative prospective case study. *Report for the National Co-ordinating Centre for NHS Service Delivery and Organisation R&D (NCCSDO)*. Available at: http://www.sdo.nihr.ac.uk/files/project/99-final-report.pdf. [Accessed: 13 November 2021].
- Pobjie, E., 2021. *The Threat from Outer Space: Russia Tests Kinetic DA-ASAT Weapon*. Just Security. Available at: https://www.justsecurity.org/79320/the-threat-from-outer-space-russia-tests-kinetic-da-asat-weapon/. [Accessed 1 July 2022].
- Pollpeter, K., 2016. Space, the new domain: Space operations and Chinese military reforms. *Journal of Strategic Studies*, *39*(5-6), pp.709-727. Available at: https://www.tandfonline.com/doi/full/10.1080/01402390.2016.1219946. [Accessed 11 April 2022].
- Pražák, J., 2021. *Dual-use conundrum: Towards the weaponization of outer space?* sciencedirect.com. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0094576520307943. [Accessed 6 April 2022].
- Quintana, E., 2017. The new space age: Questions for defence and security. *The RUSI Journal*, *162*(3), pp.88-109.
- *REGULATION (EC) No 683/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 July 2008 on the further implementation of the European satellite navigation programmes (EGNOS and Galileo).* 2008. Available at: https://eur-

lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32008R0683. [Accessed 5 May 2022].

- *REGULATION (EU) 2021/696 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 28 April 2021 establishing the Union Space Programme and the European Union Agency for the Space Programme* that repeals *Regulations (EU) No 912/2010, (EU) No 1285/2013 and (EU) No 377/2014 and Decision No 541/2014/EU*. 2021. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R0696&qid=1652016339988. [Accessed 8 May 2022].
- *REGULATION (EU) No 1285/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2013 on the implementation and exploitation of European satellite navigation systems and repealing Council Regulation (EC) No 876/2002 and Regulation (EC) No 683/2008 of the European Parliament and of the Council*. 2013. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R1285&rid=8. [Accessed 7 May 2022].
- Sample, I., 2003. *Europe and US clash on satellite system*. the Guardian. Available at: https://www.theguardian.com/uk/2003/dec/08/world.internationaleducationnews. [Accessed 5 July 2022].
- Selding, P., 2022. *EU governments propose $2.52-billion ceiling on secure satellite connectivity network for 2023-2027 – Space Intel Report*. Spaceintelreport.com. Available at: https://www.spaceintelreport.com/eu-governments-propose-2-52-billion-ceiling-2023-2027-on-secure-satellite-connectivity-network/. [Accessed 5 July 2022].
- Set, S., 2019. *India's Space Power: Revisiting the Anti-Satellite Test*. Carnegie India. Available at: https://carnegieindia.org/2019/09/06/india-s-space-power-revisiting-anti-satellite-test-pub-79797#:~:text=Around%20three%20decades%20later%2C%20on,%2C%20Russia%2C%20and%20China).. [Accessed 1 July 2022].
- Smith, M., 2022. *NASA CONFIRMS RUSSIAN ASAT TEST DOUBLED DEBRIS RISK TO ISS*. spacepolicyonline.com. Available at: https://spacepolicyonline.com/news/nasa-confirms-russian-asat-test-doubled-debris-risk-to-iss/. [Accessed 3 April 2022].

- Space Foundation, 2016. *FIND GLOBAL SPACE FACTS IN THE SPACE REPORT 2016*. Available at: https://www.spacefoundation.org/2016/07/29/find-global-space-facts-in-the-space-report-2016/. [Accessed 2 April 2022].
- Stake, R.E., 1995. *The art of case study research*. Sage. Available at: https://aabmc.org/sites/default/files/webform/stories-photos/pdf-the-art-of-case-study-research-robert-e-stake-pdf-download-free-book-cc89dea.pdf. [Accessed: 13 November 2021].
- Taylor, P., 2022. *Europe can help prevent disaster in outer space*. POLITICO. Available at: https://www.politico.eu/article/europe-can-help-prevent-disaster-in-outer-space/. [Accessed 5 July 2022].
- Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community. 2007. *Official Journal of the European Union*, C 306, pp.1-230. Available at: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2007:306:FULL:EN:PDF. [Accessed 12 March 2022].
- Tripathi, S., 2021. *Gaganyaan mission: The why and how of Isro's ambitious project to send Indians to space*. indiatoday.in. Available at: https://www.indiatoday.in/science/story/gaganyaan-mission-isro-human-space-exploration-iaf-nasa-k-sivan-1812352-2021-06-08. [Accessed 7 April 2022].
- Von der Dunk, F., 2003. Towards one captain on the European spaceship—why the EU should join ESA. *Space Policy*, *19*(2), pp.83-86.
- Yin, R.K., 2009. *Case study research: Design and methods* (Vol. 5). sage.

Appendices

Appendix 1 Interview Questions

1. How would you describe the security dynamics of today's space competition?
2. In the context of Chinese, Indian, and American plans for the future of space development, where does the European space program stand?
3. Given the EU member states' capacities, and capabilities and keeping security elements in mind, what would be an ideal future direction for the EU space program?
4. How would you describe the strategic autonomy of the EU's space program?
5. In your opinion, would the EU space program benefit from bigger strategic autonomy?
6. What would you say are some necessary reforms that the EU may undertake to be better prepared for the more contested space competition?
7. What role do you envision the European Union space program will play?

Appendix 2: Interview 1. "What Would be the Optimal Institutional Organization of the European Space Program in regards to member states' security?" Interview by Frantisek Avrat.

- **How would you describe the security dynamics of today's space competition?**

I must say that I see dynamics which are turning more into anarchy in space. We of course had security dynamics since the beginning of the space age since space has been used all the time, in a dual-use way. We have also seen in the past 10 years an increase in countries using space for military purposes but what we see now with the more widespread, let's say aggressive attitude. More and more cyber-attacks, blinding, spoofing, jamming, etc. I must say that while we had a kind of regulated competition and dynamics in security, we are turning now it into a stage where also the rule of law is not respected anymore by all the participants. We have to be scared that there is also conflict, a conflict with aggressive means that can extend into outer space. That is my brief assessment. Of course, there are also ways and means of trying to control this trend but I am a little bit worried and rather pessimist I must say.

- **In the context of Chinese, Indian, and American plans for the future of space development, where does the European space program stands?**

Do you mean for security or for overall space activities?

- **Overall first please and then we can get to the security.**

Russia is, of course, missing there and it has a kinda new topicality. But I would say Europe for the past 30 years or so actually already tried to become autonomous in the key strategic areas. We started that journey already in the 1970s and 1980s with the Autonomous Access Launchers. Then we continued with the key application areas, telecom, meteorology, and maritime services, and continued with Earth observation and then navigation. Now we are getting into not really autonomous but more activities of our own in SST and we are now looking into secure connectivity. However, we already have more or less some but it is scattered all over Europe.

I would not say we are not very bad off in Europe. It is just that we have to optimize the fields we have. Where we are still dependent is human space flight. This might be one of the very few areas where we are not autonomous. So the overall picture is not so bad it is just a matter of how to organize it, where to invest, and what priorities to give. And in this context, I think we have to see that the Russian attack on Ukraine led not only to a reassessment of cooperation with Russia, which is more or less dead for the next decade. But also to a reconsideration of the cooperation with China on a broader scale. We can see how big our dependence on export to China and in the context of supply chains and related trade issues. But in space we have been reluctant to cooperate with China already so it is not that we are completely naïve we learned our lessons and we already said years ago that we cooperate with China only in areas which are not of strategic and certainly of military relevance. Of course, ITAR helped us in being so restrictive with China.

So this is where I see Europe now. It is also an opportunity for Europe now to further shape its profile on the international scene but of course, it requires investments and it also is an issue of everybody working together. Member states, ESA, and the EU.

- **Given the EU member states' capacities, and capabilities and keeping security elements in mind, what would be an ideal future direction for the EU space program?**

[redacted] ESA is getting more involved in security areas and ESA has a tradition of not military procurement and not real military development but of technology development which can be used also for let's say a broader field of security GMES (Global

Monitoring for Environment and Security) has security in its title. GMES is the building block or the precursor of Copernicus. [redacted]

So it is ESA who is doing the quantum encrypted space telecommunications. ESA is also dealing with the EDA, EU SATCEN, and national organizations. [redacted]

Now for the EU, I would first of all expect that it will set its constitutional obligations and rights because in the EU there is no competence for security and military and defence. So the approach by the commission president Ursula von der Leyen to develop the European defence union is of course outside of the mandate of the EU. Certainly, it is good to do that but there has to be also a legal mandate. You can only go a little bit outside of your mandate which is good but it cannot be too much and it cannot be for a long period of time.

So the first thing is that the overall mandate for the EU in the field of security and defence is developed and accepted by the member states. Then we might have a situation where a number of the organizations, the council organizations like EDA, SATCEN might be merged, moved or put together with EUSPA and possibly even the ESA getting under the EU council mandate for example but this is something which is constitutionally extremely tricky.

Now what the commission is doing and is doing well is to be prepared for that with the communications of synergies which has been tabled I think one and half years ago. The fields of secure connectivity, and space traffic management. These all are elements which are security and safety-relevant. So I think we are on a good track. It requires much more consultation amongst the actors on the European as well as national level. We do not have that discussion and so far it is not really working well. But I am confident that this is developing. But you should also see how important the role of the French military is in this respect. Because the French are the ones who do not specifically not accept the role of the EU and make it very difficult for the European joint and common space security approach. So these are the points I would see as particularly relevant and important for the further, let's say steps we should take on the European level.

- **How would you describe the strategic autonomy of the EU's space program?**

I will refer to what I said regarding question number one. It is not bad at all. We have strategic autonomy in practically all areas. Here you should explicitly mention the strategic autonomy of

the European space program, combining the EU's activities, with ESA activities, and with the activities of the member states. Because not only one of those elements is constituting strategic autonomy, but all three together. You also should see that some things can be done very well on the national level, even maybe more efficient. While others have to be done on the community level. So navigation certainly cannot be done on the national level it has to be done on the community level. And it cannot be done as an operating activity in ESA but it has to be done outside of ESA like EUMENTSAT or as we have decided the EU with the EUSPA. Now for each of the areas and in particular the security field, we can make tailor-made arrangements and do not have to say autonomy is only what the EU is doing.

This is possibly a bit of misunderstanding, the EU and the EC, in particular, want to make people believe that if the EC is not doing something it is not European autonomy. That is not the case. It can also be done through ESA which is providing autonomy in launchers, in access to space, but also provides a big chunk of EO. And it is also member states who constitute, or together put together European autonomy in the field of SST and also secure connectivity. We have these elements together with spy satellites which are operated on the national level but, through SATCEN this infrastructure can be of use for other countries within the EU.

- **Regarding the human space flight you mentioned. With the renewed engagement of the US, India, and China in human space flights to the moon or regard to the Chinese space station, do you see this as a future important element of the European space programme?**

It is certainly a very important element of the space programme but I would not put it explicitly in the context of security. It has elements of the geostrategic, economy, and certain importance to society.

From a geostrategic aspect, Europe cannot be the only country, I call it country, besides the US, Russia, China, and India which have no autonomy in that field. Other countries will not regard us as a real senior partner anymore

Regarding the economy, there will be a near-Earth economy where astronauts will play the role and when we think of a Moon exploration it is clear it will be done with humans.

The third element in society. It is also a matter of pride for Europe, European identity, European astronauts etc. Which also is worth the investment. [redacted]

[redacted]

- **In your opinion, would the EU space program benefit from bigger strategic autonomy?**

Well of course but what do you mean by benefits? The space program is already guided and directed to strategic autonomy. It is a goal and it has to be fulfilled. It is fulfilled in many areas already and now they are working on secure connectivity which is just a matter of how to organize that. So of course it is benefiting the question is who is benefitting? Are the citizens of the EU benefiting from strategic autonomy? Is the industry benefiting? Are policy areas, and member states benefiting?

I must say all of them are benefiting when we achieve autonomy in each of these areas. This is why there is also broad consensus on the topic, also speeded up by the war in Ukraine. Why the strategic autonomy in the respective fields of space has to be achieved in order to secure our room for manoeuvring, our freedom of operating, and our chances also to create economic and social benefits. The answer is absolute yes. But you should possibly rephrase it a little bit, whether the EU and its member states and society would benefit as a whole from the strategic autonomy.

- **What would you say are some necessary reforms that the EU may undertake to be better prepared for the more contested space competition?**

[redacted]

[redacted]

This is something which has to be avoided. Better positioning of the EU has to start there. If this is changed then we can say ok, let us see how we can handle all these things and in the end, it may be useful to put ESA under the roof of the EU. There is an option to do so to put it under the council secretariat which would then allow also for optional programmes with variable geometries, not as an agency under the EC. Then put all the elements we have, EDA, SATCEN, and EUSPA into ESA to merge it. But to keep ESA with its character of doing business under such double scheme competition.

I think this is the key but currently, the tactics of the EC are to take out of ESA step by step single issue area one by one and control it by the EU and move it to EUSPA which is completely overburdened already. With this, they will be completely overburdened. EUSPA has only a few hundred people while ESA has five thousand people.

So this is in my view the key question which we have to answer. A fair policy by the EU, [redacted]

- **If I got it right, that industry policy correction would be in some form similar to ESA geographic returns policy?**

Yes yes.

- **What role do you envision the European Union space program will play?**

So far we have not made a lot out of what we have. Copernicus is good and the open data policy is fantastic but with regards to Galileo, we have not really tapped into its potential. Unfortunately, the EU is still not in the position to declare the full operation capability (FOC). Before entering other areas you should do your homework and put things right.
But in the end, the EU will have the task to promote and to make out many more socio-economic benefits and global standing of Europe of these programmes which are under their authority.

[redacted] How on a global scale you can influence your programmes. So again it is what you envision the European space program will play in the future.
If ESA through its science, exploration and launcher programme will then also become a senior partner in these fields, we then together with the EU can project also European interests. Also to play a bit of a specific European role. The notion of the EU as soft power, or a normative actor in international relations. The EU is a regulatory superpower. All these things are not related to military power but rather normative power. With power and a normative approach would be something where Europe could even have a stronger impact on the global scheme of things. For that you of course need your capacities first before the other will take you seriously.

- **Regarding the EU – ESA relationship it is very up and down in recent years, so what would be the optimal direction for their relationship to go forward in regards to having an effective partnership so these future programmes we spoke about could be effectively utilized and conducted?**

[redacted] The EU wants to have control over activities, over policy areas. The EU is established to further integration and everything which is outside its control, even if it is a joint European activity, is something they don't like because it should be theirs to do that. [redacted]
This is in their genetics so from their perspective they say they cannot be any multilateral activity in Europe which is not under the EU. Unfortunately, there is this field "space" which is organized and governed by a multilateral arrangement. And from the perspective of the EC it is apparent that they want to grab not ESA as such but all the activities the ESA is undertaking and bring them under their control. [redacted]

[redacted]

[redacted] They just want to control a policy area. If we cannot find a solution to that, things go bad and worse every time. [redacted]

First of all, we need a rationalization of the debate. Then in the mid-term, we have to find a solution where either ESA is integrated into the EU as a council organization or that make a real cut with ESA reduce it to an organization which is doing science and exploration like NASA is doing but keeping it then out of the EU and open it up for many other countries like Canada, Australia, South Africa, Brazil etc. like CERN for example. [redacted]

Appendix 3: Interview 2. "What Would be the Optimal Institutional Organization of the European Space Program in regards to member states' security?" Interview by Frantisek Avrat.

- **How would you describe the security dynamics of today's space competition?**

I would describe today's security dynamics from a more international perspective. Indeed as a trend, we see there is an increasing securitization of space, but the security dimension is not new. It has been present since the beginning of the space age, and the space race was a proxy of international competition. But the circumstances that strengthen the securitization. Why do I say so? Because of the element that we often tend to neglect. This element, from an international relations perspective, is related to the concept of strategic interaction.

If we look at space as a domain of strategic interaction, like any other domain, land, sea, air, and now space. We know that the interaction that players have can generate repercussions, what do the actors do, or prefer to achieve. So we can have a situation of pure conflict, the zero-sum game we

witnessed during the Cold war, through a situation of pure harmony, when everyone can do what they please without affecting others, passing through a situation of coordination and cooperation. We have complete freedom of action, we have a situation in which the actors want to avoid specific outcomes, for instance keeping space safe and secure, or we have zero-sum competition. Of course, this configuration of space as a domain of strategic interaction is shaped by different stuff, including the physical characteristics of the space environment. For these reasons, I am always worried to make comparisons to the land, air and sea domains. But also by the degree of the interaction and the key factor that we always forget to look at, that the interaction even during the cold war has been very limited.

The third dynamic is the earthly dynamics. It is important to realize that even when we had, in the heat of the space race, we had many important instances of convergences of behaviour between the US and the USSR and how was it possible? Because the bulk of the international space regime was negotiated during the 60s and early 70s. How was that possible? Because fact that the regime was liberated, like the Outer Space Treaty, the strategic interaction was very limited. There was no major concern about the activities of other actors. Most space issues have been characterized by the situation of harmony of interests. Meaning that any state could do what it wanted without affecting the interests of the others. And this is reflected in Article 1 of the Outer Space treaty. We also had situations where restrictions have been accepted but those did not pose real constrain on the actors. For instance, denial of the claim of sovereignty over the celestial bodies or the ban on placing WMD in space has been costless concessions because the state of technology at the time would not allow for such behaviour anyway. For many activities, the individual states could do what they wanted without affecting others.

Now the situation today is changing. Because now we have, and those are the factors that trigger the increasing securitization of space, many many new actors with ambitious projects, for example, the mega-constellations. When you have more actors that means you have more interactions among them so the possibility that the interests of actors would clash increases. When you have only two actors, like during the Cold War, when the actual chance of meeting them, there is a smaller chance of to clash.

Then we have many new enabling technologies and uses of space that were not the case before. Today we are reaching the point when we enable the exploitation of resources. Before it was organised that you cannot claim other celestial bodies because you did not have the technology to

do so. Today it changes because we have new technologies. We also have technology like Randevous and Proximity Operations etc. which changes the game.

Thirdly, and this is equally important, and increased, in my view critical dependence on space for both civil and military which was not the case before. Before our military and our society were not dependent on space infrastructure. Just imagine what would happen if we lost access to our satellites?

So these dependencies we have on space change the game and the configuration of interests and equally important we have a new political context that is characterized by what Richard Husk calls "the unravelling of the post cold war order" characterized by the power transition and so more geopolitical splits and cleavages are present.

All of this is contributing to increased strategic interaction in space and contributing to a stronger security dimension in the current space competition. A competition that takes the shape of pursuit by the individual actors of distinct advantage, in most cases a military advantage and in general it is a security advantage, through space control. Or through counter space capabilities by more and more states. Counter space efforts that

What I want to stress again is that the dependence that we have on space infrastructure today, which was not present before, especially for the military, makes it possible and actually very likely a target (space infrastructure) in war. So this is why more and more nations are developing several destructive and non-destructive means to increase their space control counter-space capabilities. Jammers, ground-based lasers, orbital ASATs, and direct kinetic vehicles.

All the underlined objectives of all these are to achieve the pursuit of the military advantage that takes the form of space superiority, which is the ability to use space for your interests while denying the adversary.

To conclude, if you seek the military advantage, other actors will of course seek their military advantage and there we have a class theory of the security dilemma that spires upwards even though all actors have an interest in preventing this scenario there is no guarantee that the other actor will not cheat so this creates this upward trend increasing the securitization of space. This creates a byproduct of misunderstanding, miss trust and even mishaps that may become more likely.

- **In the context of Chinese, Indian, and American plans for the future of space development, where does the European space program stands?**

Here it's more a comparative point of view. [redacted] since the 1960s Europe as a whole is one of the most experienced actors and operates a very highly regarded space programme, thanks to the efforts of different stakeholders in the programme, the EU, ESA, HUMENSAT, but also the private sector and member states. Europe has mastered a wide array of capabilities. From access to space, telecommunications, EO, navigation, space science, and space exploration. What is lacking is in the field of counter-space capabilities. Overall it has a very high level of what we call, hard capacities, the technical capabilities.

Together with the hard capacities is the ability, that is what I call, soft capacity. The taxonomy is of course up to debate. But soft capacity means the ability to integrate space with the policy objectives, infrastructure, etc. One thing is to launch a satellite and have it in orbit and the second is to make use of the satellite. For example, if you compare it to Russia, it has an important infrastructure in place but they have a more limited capacity to exploit the assets. For example app development. Outside of the military domain, there are few application developments in Russia.

Hard and soft capacity has a long arrange of capabilities that make it one of the most prominent actors in the world on par with China, Russia, or even more than Russia in some cases, and then the US. While ahead years ahead of other players like India, Japan, and emerging players like Australia.

Where Europe fails to reach the same level of autonomy as its international partners and competitors. To answer the question I wanted to show you this. [redacted] By mapping their level of capacity and level of autonomy. You see here that according to this matrix, then you can dig into the parameters that were used to map the capacities and autonomy. Capacity has these dimensions both hard and soft. Hard capacity means users of the technical aspects such as launchers, EO, communication satellites etc. Soft capacity then integration.

From a capacity perspective, Europe scores really high above Russia, Japan and India, and is on a similar level as China. Of course, it does not reach the overall capacity of the US but it scores quite well.

What Europe fails is to achieve a level of autonomy. Technical autonomy and political autonomy. Tech. autonomy to create systems, use satellites etc.
Political autonomy relates to what we would call sovereignty in general. Possibility to decide. Not only to do the things but also what things you want to do. If you want to cooperate with partners or not, without needing to ask others. You will see that Europe fails to reach the same level of pol. autonomy even those of India and Japan. This places Europe outside of the domain of the space power quadrant where only the US, China and Russia are. Because they have the level of both capacities that make them full-pledged space power. While Europe continues to be what we call a space-faring nation.

- **Given the EU member states' capacities, and capabilities and keeping security elements in mind, what would be an ideal future direction for the EU space program?**

I would differentiate my answer on three fronts. I would differentiate on what actions or directions rather could be taken. Actions that could or should be taken on the programmatic front. Actions that could or should be taken on the policy front. Actions that could or should be taken on the diplomatic front
On the programmatic front. The ideal direction, again if we look at the current situation where Europe stands, we need to engage in programmatic developments – investments into programmes in those areas where we do not have a full autonomous capacity. This applies to elements such as secure connectivity, but also to other areas where we are lagging behind e.g. the field of access to space where we have autonomy in a sense of accessing the space but this autonomy needs to be protected. Also on the commercial front with continuous investments. And more importantly, it needs to be protected with the full-fledged autonomy of accessing space with that I mean and this is my first priority on the programmatic front.
We do not have to have a final end product – the launcher. But all the underpinning technologies need to be there and produced in Europe. For example, we clearly have seen what happened with Russia, withdrawing the Soyuz from French Guiana. We also need to be clear that we were using the Ukrainian upper stage for the Vega rockers and this is not gonna be the case anymore. That is not even the main problem. The problem is that at the very bottom that to produce whatever we produce including launchers and whatever satellites we mostly use components from other countries. And this especially applies to EEE components. And this dependence of approximately

50% of the EEE components to create our own need space programs and infrastructure is reliant on technology from abroad, specifically the US. We have been trying to diversify this a little bit, but we still have a lot of reliance on that front. What would I highlight to answer this question is that there is a need to invest not only in programmatic areas and packages but to look at the baseline to develop an autonomous space programme which is basically materials, components, and software this is the baseline for what you need to produce anything.

On the policy front. We have seen a lot of advancements on the policy fronts, also on the EU side. On the ESA side as well, they proceed and adapt strategy with greater synergies with the ESA council. From an overall perspective, we have seen many developments. But we have an overall policy – vision – overall European strategy. But what we need is a dedicated sectorial policy that informs both the internal and external actions and serves the interests of the European space sector. In line with basically a clear and shared among the member states political vision for Europe in space and for space in Europe [redacted] Namely a Europe-wide space industrial policy and then a Europe-wide space security policy. Europe-wide space industry policy should contain different elements

When I talk about Europe-wide I do not talk about EU policy. Europe-wide means that it must be shared by the EU, other stakeholders like ESA and EUMETSAT and most importantly the member states. This is something we see in STM (space traffic management). The EU can enact a policy but if this policy is not endorsed by the member states or does not find a full convergence in all European constituencies we do not go anywhere. So we need such a policy to reach a certain convergence among the real stakeholders.

[redacted]

[redacted]

What is important is to reach this convergence not only within the EU but also among the constituency, and most importantly among the member states.

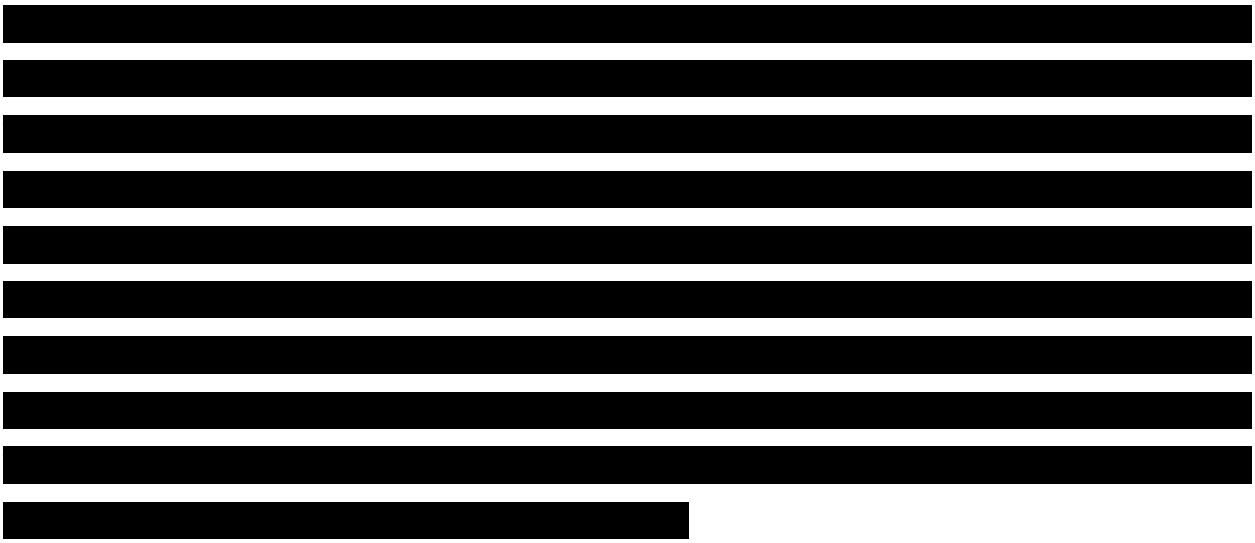
On the diplomatic front. Complete set of actions on the diplomatic front. We need to ensure the ability to properly deploy the tools that we have a lot of them. For instance, how do we support our industrial competitiveness in the external markets? But also how do we advance in a consistent manner and ensure that we have one voice in the international system. How do we ensure that the message we deliver within COPUOS or ISO is consistent? To have full-fledged and effective space diplomacy on the European level we need to reach convergence and this is where the policy could also help. This policy should also form diplomatic actions. But I would say in the future the European space program should put emphasis on the actions that are needed in the diplomatic form.

To conclude, If we tackle all these three aspects, programmatic, policy, and diplomatic in the manner I was mentioning that would be in my opinion the ideal action for the future.

- **Follow-up questions regarding the policy and diplomatic front. What would be the driving Entity behind this? I am asking because of the different perspectives on the industrial policy pushed by the French, at the expense of the others. On the other hand, ESA has a policy of geographic returns that seems to be fairer. So who would be an ideal main entity to deal with this issue?**

Speaking more about the diplomatic front. We cannot have just one entity. So it would not be just the EEAS or the EC, mainly because the EC is for example only an observer at COPUOUS. The

point that I want to make is that we need multiple voices – one message system! So you have all actors such as Germany, France, Italy, EC, and ESA conveying the same message. What happens sometimes is that EC or EEAS comes up with an idea which is not backed by the member states, this was the case with the 3SOS mission. And if the member states do contradict the international initiative of the EEAS then we will not go anywhere. I am not saying that they should follow. I am saying that before talking on the international stage we should have an internal convergence on what we want to achieve. This is the same stuff the other interviewees mentioned, we have different views so before taking action, we all do want something a competitive industry that creates socio-economic benefits, let's sit together and discuss how we balance and reconcile the potentially clashing principles. Because we are back there, this is not only about objectives. Without an internal convergence and the basic principles, we will have inter-fights.



We need to decide what we want to achieve and what is the priority. Also because money is limited and we need to prioritize the investments. How do we prioritize the investments into critical technologies? If you want to achieve independence you may have different perspectives. Is it critical technology because it is critical for the industry or because critical from a strategic perspective? If you are an institution or industry player, you have a different view on what critical technology for strategic autonomy is.

The whole point is that we need a convergence for this basic stuff. Policy where we express the convergence about the interest of the different constituencies because we do have a different strategy. The strategy of ESA, EU, and member states and we need to reconcile these if we want to make Europe count.

- **How would you describe the strategic autonomy of the EU's space program?**

As I said in previous parts there are different perspectives on, what is strategic autonomy. In my understanding does not simply rely upon the capacity of an individual actor to do or make things happen. So it is not only the material capability but also the ability that an actor has to decide what things it wants to do or make happen. That's the way I would like to frame it.

[redacted]

So how would I describe it? In my impression, I would say that if we look at all the actions that Europe is taking in the field of technological development and look at the technological dimension of strategic autonomy, at least traditionally what emerged is that those activities have been driven by the objective to avoid growing dependencies on foreign sources but also avoid cases where you would procure or be dependent on a single source. Ensuring greater security, security of supply basically. Ensuring you have the access to the right technology. That was the objective, that we have to ensure a possibility for our industry to have unrestricted access to state-of-the-art technology in all space-related fields, independent from broader sovereignty considerations. Those were the objectives that we got at the ESA or EU level. The objective was not what we would call full autonomy but rather what we would call non-dependence, To reduce dependence and ensure non-dependence. As I said to ensure unrestricted access to state-of-the-art technology but not necessary that you have full autonomy.

We have been investing more and more and the current situation improved compared to early 2000. we reduced the dependency on non-European EEE components significantly and we also reduced the dependence with regard to the US by diversification of sources of supply in this case by cooperation with JAXA.

But we noticed that the gap is still there in technological development when it comes to materials, and the gap is still too big for Europe. Because we did not invest enough money and progress is made in individual components or materials not systematically. What I have been arguing we have so far accepted a substantial level of dependence on the US suppliers. This dependence on suppliers is inside the European mindset. This is in our culture. We are much more prone to international cooperation than international competition. But this is changing that is true, especially with the new von der Lyan commission, which is talking about the geopolitical EC and Breton at DG

DEFIS. Things are changing but so far we have been more inclined to cooperate. Thus when it comes to strategic autonomy we did not change it much but things are moving and there are more considerations to the topic. It has been put higher on the political agenda of DG DEFIS, EDA, ESA, EEAS etc. there are more efforts to achieve the objective.

So we are aware, that this situation of dependency is creating many constraints not only for our industries but also for our institutions because we are subject to the situation, when we want to make a decision we had to ask the permission of the 3rd parties for example when we wanted to cooperate with China in Galileo we had to ask permission the US due to using of their components. This is exactly what Fiott was calling emancipation approach to strategic autonomy. This is the way we tend to frame it (emancipation). But why have been accepting this dependence? Because like other space-faring nations including India, Japan, Russia, and China, for which autonomy is the most important no matter what, this political decision I want to be autonomous, I do not want to do as I wish. We have accepted the lower autonomy because autonomy and sovereignty is not so big motivator to justify the expenditures in the areas of technological independence. Because achieving independence is very costly.

Our space sector has some very specific features. We do not have a big institutional demand for satellites. This prevents the creation of an economy of scale. Why would you invest in the development of our components that you only use 3 times per year, when this component is available on the market. This creates an incentive to not have full autonomy. Because the logic of autonomy was so far a subject of the logic of economic returns. I invest in something when it provides an economic return. But of course, when you deal with strategic autonomy you cannot apply pure economic logic.

[redacted] There is a mismatch of the drivers of why you seek autonomy. You seek it for political reasons and security reasons, supply chain security. We invest because it brings competition, creates jobs, benefits society and the economy, and we create applications. But if you invest for the sake of the economy you are not investing in autonomy because you rely on the market and the technology of others. And due to low institutional demands, there is no need to fund a technology if you use it only two or three times a year. That is the European problem. Either we will develop it all together and we are willing to pay the cost that is associated with the strategic autonomy or we have nothing. Here lies a question that needs to be addressed. Chapter4. It is the question of political will. Do we have

a political will to tackle the issue or not? It is not about economics, it costs what it costs, but if I want autonomy I have to ensure necessary investments that are required.

So Europe can attain strategic autonomy but it needs political will. When we began our space journey we did not apply the logic of economic return. When we discovered (symphony of satellites) that the US did not want to launch a commercial satellite then we said you know what no matter the cost we (Europe) will make our own launcher. The original idea wasn't about making it affordable or competitive, no we wanted our own launcher to gain unrestricted access to space. Then we discovered that the launcher was extremely successful (economically) so we said we will invest in the new technology of the launcher if they pay off from the commercial perspective. Then the very success in the commercial market (telecom and launch) made us a little bit move away from the value of autonomy and focus more and more on the economic dimensions. These returns of investments work from a public policy perspective but then it does not work from a strategic perspective. And this is a matter of political will.

- **In your opinion, would the EU space program benefit from bigger strategic autonomy?**

My answer is: absolutely! The EU would benefit from a bigger strategic autonomy, from a political standpoint of view and from a security standpoint of view. Political + security = strategic. This formula makes sense. What does not make sense is the industrial or economic perspective. From an economic perspective, it may not make sense to have full strategic autonomy. (basically previous question)

I want to highlight the miss match. We need to decide what benefit we want for ourselves. We want to push the political benefits including that I can decide thus I am a more credible actor without the need to ask permission from anyone. I value strategic autonomy I cannot afford to have a disruption in the supply chain so as von der Lyen said a few months ago we need to invest in semiconductors here, we just cannot procure from China and then have a disruption. It may be costly because it will be cheaper just being from Taiwan. But then it depends on what we value the most.

The following question is, what are the parameters on which you want to assess the success of the European space programme? If you judge it from a socio-economic perspective, it does not

necessarily make sense to invest in strategic autonomy. But if you assess it from a political, security and strategic angle then it makes sense to invest in it.

- **What would you say are some necessary reforms that the EU may undertake to be better prepared for the more contested space competition?**

We already touched upon this in another question so I will just recap. The most important thing we need, no matter if programmatic or political side, we need a strategic, assertive and united (convergence) European plan. This requires revisiting the concept of shared competence in space affairs. Shared competence means that the EU does not have full competence, but if we want to benefit from the EU space programme we need a stronger role in the EU. To do that we need to address the member states' reluctance to agree on the transfer of sovereignty power to European institutions or to align their national policy to reinforce what the European objectives are. We need to avoid the situations when the EU says something and then member states contradict it. Either aligned or transferred sovereignty to the EU. Thus the need to revise the concept of shared competence. So when the EC then engages in the international discussion with the US or presents something within COPUOS then the same message is repeated by France, Germany, Italy etc. Multiple voices one message system. This is to ensure that we have a coherent and ideally unified European space diplomacy and internally that we have unified European space policies, but also dedicated space policy in such areas as space economy, industrial development, security and defence. This is the most challenging but the most important.

Of course, we can take a lot of steps but there is a need for a fundamental shift in the thinking on the matter if we want to have a full-fledged and effective space program.

- **What role do you envision the European Union space program will play?**

The EU space programme is wisely and progressively acquiring a bigger role within the overall European space sector. It has found a key area of intervention starting with the application and gradually expanding its mandate by means of communication, strategic documents etc. it is gradually expanding. This is a step-by-step very cautious process with a clear objective. The problem that I see here is that we would need faster action in the area. Together with bigger flexibility and faster reaction times because we cannot take years to gradually acquire new competence or develop new programmes. We need that because the international context is

changing fast. I will close with something that von der Lyan recommended. We need a faster geopolitical commission and the EU that can answer and quickly take action. Because we need to take action for example when we are presented with a US proposal and if you cannot react promptly and we take years to come up with our reply then we will never be able to be a prime mover, we will never have a prime mover advantage. And we will not be able to respond properly to potential challenges and new developments. In many respects for many political decisions must be taken as well as programmatic decisions we need the ability to answer and tackle these issues quickly.

So the role will be bigger, and there will be expansions in the programmatic areas where the EC is involved but it should be quicker.

Appendix 4: Interview 3. "What Would be the Optimal Institutional Organization of the European Space Program in regards to member states' security?" Interview by Frantisek Avrat.

- **How would you describe the security dynamics of today's space competition?**

I would probably identify three main trends in the global space competition. That is, the space is more diversified, more commercial, and it is likewise more contested. When I talk about more diversified, I mainly mean more actors are entering space and conducting more activities, that means nation-states. More commercial, there are more actors beyond nation-states. More industry players are entering space. More contested, it is because there are more and more nations who are interested in acquiring more offensive and defensive counter-space capabilities. Those are capabilities that can deny, disrupt, or destroy space assets and the services that are derived from space.

- **In the context of Chinese, Indian, and American plans for the future of space development, where does the European space program stands?**

First of all, we have to identify what the European space programme means because we have supranational space programmes that are under the umbrella of the EU. That means currently the Galileo, the Copernicus observational programme, and there is currently a commitment on part of the countries to also develop indigenes capabilities for the SSA and government GOVSATCOM. That is under the EU but then we have also the European Space Agency (ESA) which has several

important scientific and security-related programmes for Europe. So first of all what I would say if we compare it with the Chinese, Indian, and American plans I think Europe is more diversified in terms of how it plans its space activities. Also, I would say that we both Americans, and Europeans really have to look very carefully into the Chinese space programme and its ambitions. Because it is also relevant to how Europe will position itself in the future of space activities. India for that matter is an important player because it can represent a country that can represent similar values as Europeans as they configure their future space activities. I would say that outreach to India is more important, especially with the pivot to the Indo-pacific by not only the US but also the EU. With regards to the US and Europe. We are both competitors as well as partners. I would say that it would be wise to continue that kind of joint posture concerning space governance issues.

- **Given the EU member states' capacities, and capabilities and keeping security elements in mind, what would be an ideal future direction for the EU space program?**

When you are talking about the EU space programme, are you talking about the EU space programme under the umbrella of the European Union?

- **Yes.**

I think it has already taken on a new direction because of the legislation that establishes the EU space programme as such. That is a new development because in the past the programmes were run by different entities and currently, for example, the establishment of the agency in Prague for the space programme gives it a firmer setting in terms of managing the security element of the programmes but also more of the policy and international cooperation issues which before was not the case. I would think that there is already a new direction being set which I think is very positive. It will be important to understand what Europe wants in terms of the configuration of the security aspect of the programmes in line with the competencies of individual member states because the individual member states also have commitments in bilateral and multinational arrangements, for example, NATO. This is still yet to be clarified. And with NATO taking on a more important role in space I think it will be critical that countries outside of Europe understand where Europe is heading. The ideal future will be actually trying to better configure the scope of the security activities under the EU programme and whether there can be any contribution by the national security activities of the individual member states.

- **How would you describe the strategic autonomy of the EU's space program?**

Strategic autonomy is a concept that was put forward by the EU at least that is my understanding because Europe felt the need to acquire independence in some strategic capabilities. Europe has already made the correct decision to acquire its own global navigation satellite system and it also invested in Copernicus which are both of strategic nature. Nevertheless, I think the feeling was that Europe needs more, currently with the main focus on SSA. So there is a feeling that any kind of dependency even on a partner like the USA is making Europe uncomfortable. What is not clear today is how will the strategic autonomy play out in terms of collaborating with partners. For example, we could also say that strategic autonomy does not necessarily mean independence meaning Europe needs to think about and identify, where it is willing to collaborate on the elements of its strategic autonomy. Explaining and translating the concept of strategic autonomy to its key partners, such as the US, Japan and others will go a long way in the establishment of viable collaborative architecture. In that sense, I don't see strategic autonomy as something necessarily straightforward and trying to be independent in everything.

- **In your opinion, would the EU space program benefit from bigger strategic autonomy?**

It is a fine balance to make just because if we are talking about autonomy as acquiring more indigenous capabilities, we are talking about billions of EUR or investments. I think that the European countries have to weigh what is feasible in the current harsh economic realities, but also in an era where we have growing commercial capabilities. Potentially you can delegate some of the capabilities to the commercial companies. You can even get a concept where you have several companies supporting the concept of autonomy.

- **What would you say are some necessary reforms that the EU may undertake to be better prepared for the more contested space competition?**

I will talk more about what the EU can do and that is to set some kind of leadership in space governance discussions. To be better prepared, I think we need to better communicate within the individual member states in terms of what is at stake in space and what is happening in space security because things have really escalated in terms of development in the space security field.

There needs to be a clear joint strategy, potentially led by the EEAS to position itself in the global space governance discussions. Because right now you hear a lot from the US, you hear a lot from China and Russia, but you do not really hear much about what kind of vision Europe has for space security. Rather than reforms in terms of capabilities only, how can we position ourselves with our capabilities to put forward some useful principles for space governance?

- **I would like to ask about the relationship between the EU and ESA. Where should ESA stand in all this?**

Traditionally ESA is an agency that helps develop technology. It drives forward innovation and technical capabilities for space exploration. It is a civil agency under civil control, that's what it states. And as such, it has an important role in Europe to generate funding for hard programmes such as human space flight or exploration of the far parts of the solar systems etc. With regards to the EU, the relationship has really changed between ESA and the EU. Because in the past the EU did not have really much to say about space but with the growing interest but also capabilities developed under the umbrella of the EU, suddenly we have an organization that is actually a space operator. EU is responsible for the programmes it runs and it is an entity that also promotes a certain vision. And I think there have been a lot of clashes between ESA, who traditionally was the leader, and the EU which has asserted itself more than in the past. What is also the reality is that a number of the programmes, for example, Galileo is developed by ESA. So there is a relationship where over half of the ESA funding comes from the EU. That shapes the dynamic between these two organizations as well. I think there is an interest on both sides to actually improve the exchange and improve the dialogue. But naturally, they are set up differently including the industry elements, ESA with geo returns, and EU with its different systems of awarding contracts. It is not a natural fit but I think a lot of effort is now being made to start at least thinking of differentiating who should do what and what should be whose role. But I think it is getting increasingly clear that the EU is becoming a bigger driver of the activities. It would be useful if the people who sit on the ministerial board of ESA coordinated with their countrymen that sit on the different working groups on space within the EU.

- **What role do you envision the European Union space program will play?**

In what context?

- **In the context of US-China competition, Russia's decline, and Indian rise, where the EU will be?**

It plays an immensely important role in terms of trying to preserve the vision for space exploration and space activities including sustainability and security for space that is shared by the democratic countries. The status quo of space activities is now being contested by China and Russia which promote dependency-inducing international space partnerships. So I think Europe can, and should, play an immensely important role in driving forward a sustainable international cooperation model. The European space programme can serve as a tool to operationalize it.