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Current Challenges of the Czech Space Sector

ABSTRACT: *On Wednesday May 3, 2023, Czechia signed the Artemis Accords. With this signature, this Central European country joins an ever-growing list of ambitious and prominent state actors in the NewSpace era. This milestone for the Czech space industry is a clear display of intent to actively participate in the new era of space exploration. Czechia has admirable STEM capacities which continue to grow, and is involved in many international space projects. Despite the general practice of legislation following technical progress, based on documents available to the public the state's focus does not seem to extend beyond the scientific and business aspects of space. The National Space Strategy – published in 2019 with plans for the 2020-2025 period – makes no mention of national space legislation. This paper maps out the current state of the Czech Space Sector, and focuses on its associated challenges. It covers Czechia's participation in the international space industry, and its membership and activities in space-relevant international organisations. It also aims to summarise Czech history with space law, and elaborate on possible future challenges and developments in national space law and policy.*
KEYWORDS: *national space law, Czech space law, Czech space sector, Intercosmos, national space governance*

1. Introduction

In 2023 the Czech Republic – mainly referred to as Czechia in this article[1] celebrated 30 years since its establishment. Even as former Czechoslovakia, the country had a very strong track record in space, whether through science or industry. Now a proud member of the European Union and the European Space Agency, the state commits itself to the European approach to space and international cooperation. The ambitious phrase 'The space can become our sea' has appeared in the media recently,

1 Ministry of Foreign Affairs of the Czech Republic, 2016.

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hinting at how the countries that took part in the sea trade benefited immensely from it[2]. Viewing space as a business opportunity points to a shift in the Czech perception of outer space. Now, in addition to space being observed through science, Czechia recognises its business opportunities and strives to be an active participant in the NewSpace era.

In this paper, the author aims to summarise Czech engagement in space and elaborate on possible challenges. Firstly, the rich history of the Czech space industry is emphasised. Secondly, the national institutional structure for space activities is introduced and its impacts are weighted. And lastly, the core focus of this article is on Czech involvement in space law and policy, accompanied by an outlook into the future. A significant portion of Chapter 4 is based on interviews with employees of the Ministry of Transport, Department of Space Activities and New Technologies, whom the author thanks for their cooperation and the time they took for answering questions.

2.
A History with Outer Space

Providing a historical context is important for better understanding the development of Czechia's space industry. Czechs first distinguished themselves as a nation after the First World War, which resulted in the dissolution of the Austro-Hungarian Empire. Czechoslovakia was established in 1918 and had the tenth-strongest economy in the world by the 1920s. This promised a bright future, and amongst the strongest industries were weaponry and shoemaking[3]. However, this "brightness"lasted only until 1938. After the Second World War, Czechoslovakia fell within the sphere of influence of the Soviet Union. This development is significant, since involuntary membership of the 'Eastern Bloc' – which lasted for over half a century – set the path for Czechoslovakia and its industry. Thus, until 1989 Czech engagement in the space industry was closely tied to the USSR.

1.1. Intercosmos

The 1960s were for many reasons a memorable decade for space exploration. In the light of Cold War hostility, the two ultimate world powers – the USA and the USSR – engaged in the so-called 'space race'. The Intercosmos programme was a part of the

2 Kozelka, 2022.
3 Šrámek, 2015.

USSR's efforts to foster cooperation within the Soviet bloc in the exploration of outer space. It was inaugurated in 1967, and outlined by the Agreement of Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes of July 13, 1976[4].

The programme was designed to give nations which were on good and friendly terms with the USSR access to crewed and uncrewed space missions. In addition to Czechoslovakia, other participating countries were Bulgaria, Cuba, Hungary, Mongolia, Eastern Germany, Poland, Romania, and Vietnam. Cooperating countries also included India, Syria, France and Great Britain.

After the dissolution of the USSR, Western nations participated in the programme too, and Intercosmos joined the International Solar Terrestrial Programme with NASA and the European Space Agency[5].

1.2. MAGION satellites

The MAGION satellites were a prominent milestone in Czech space history. The five small satellites were manufactured in Czechia between the 1970s and 1990s, and were a part of the Czechoslovak space programme focused on research in the physics field. The name stands for both Magnetosphere and Ionosphere[6], and the satellites' scientific purpose was to study the parameters of, and collect data on, magnetic, ionospheric and plasma presence in Earth's orbit.

MAGION satellites 1, 2 and 3 were launched within the frame of the Intercosmos programme; MAGION-4 and MAGION-5 were designed as part of the INTERBALL project. The five MAGION satellites were also the first entries within the Czech Space Objects Registry (more on this in Chapter 4.3.1). They are no longer operational, with MAGION-1 having burned up in the atmosphere.

1.3. Cosmonauts and astronauts

Different terms can be used when referring to those individuals who fulfil the role of what the Outer Space Treaty (OST) calls "the envoys of mankind"'.[7] The most well-known term is 'astronaut', however terms such as 'cosmonaut'[8] or 'taikonaut' are in use as well. The difference is in the origin of the agency under which such a mission

4 Grant and Barker, 2009.
5 Dasch and O'Meara, 2018.
6 Magion History.
7 Article V of the Outer Space Treaty: "States Parties to the Treaty shall regard astronauts as envoys of mankind in outer space (...)".
8 Greek words cosmos (space) and nautes (sailor) put together.

is conducted. Cosmonauts are trained and certified by the Russian Space Agency (formerly the USSR Space Agency). Astronauts are trained and certified by NASA, the ESA, CSA, or JAXA[9], and taikonaut is a term used in the West for people undertaking Chinese space missions[10].

In the history of Czech space exploration, the term cosmonaut is more prevalent and important. On 2 March 1978, Czechoslovakia gained its first cosmonaut with Vladimír Remek, who - accompanied by Aleksei Gubarev of the USSR - flew on board Soyuz 28. Their mission was to spend several days on the Salyut 6 orbital space station. It was the first Intercosmos mission with another national on board, making the significance of the mission not purely scientific but also political[11]. They returned safely to Earth on 10 March, having spent almost 8 days in space. This made Czechoslovakia the third country in the world – after the US and the USSR – to reach outer space.

Debate exists on why the honour was even given to Czechoslovakia out of all participating Intercosmos countries. Some authors may credit this to participation in the Intercosmos programme, as up until 1978 45% of the experiments conducted on the satellites were of Czechoslovak origin[12].

Other sources, for example the recent multi-part documentary Czechoslovakian Space (Cz: *Československý vesmír*) by Czech Television, dive more into the political reasons. The USA considered plans for a rocket plane which could undertake numerous flights and transport into space not only American citizens but also nationals from European countries. This prompted the USSR to conduct a similar initiative, to also help other nations into space.

In 1976 the three westernmost countries of the Eastern Bloc were offered to present their candidates for spaceflight. Those were East Germany, Poland and Czechoslovakia. East Germany was likely aware that the milestone of a third nationality in space could not be granted to them so soon after the Second World War, so the final choice was between the latter two[13].

The final choice was between the pairs of Vladimír Remek-Aleksei Gubarev and Oldřich Pelčák[14]-Nikolai Rukavishnikov. The sources differ in who had the final pick between the cosmonaut pairs. The Soviet side alleges it was done by a commission voting in Prague, however we can confidently assume it was rather a Soviet decision. Gubarev was a member of the military, and this gave him more leverage to be chosen for the spaceflight. The Czechoslovak half of the two crews did nothing to tip

9 Frost, 2017.
10 Smith, 2005.
11 Human Spaceflights, 2021.
12 Grün, 1978.
13 Československý vesmír, 2023.
14 Mr. Pelčák was a fighter pilot, graduated from the Gagarin Air Force Academy and a cosmonaut candidate. He passed away on October 7th 2023.

the scales, even though it was suggested that Remek's parents' origin contributed: his father was a Slovak and his mother a Czech, with his background representing both nations.

Now, after 45 years Czechia has currently two more opportunities to send its second citizen to outer space. One chance is via the public sector, while the other is from the private sector. During the ESA astronaut call finalised in November 2022 – which produced five career astronauts – fighter pilot Aleš Svoboda was selected as one of the members of the ESA astronaut reserve[15].The twelve members of the reserve will not be permanent ESA staff, but could have the opportunity to be selected for specific projects and join the ranks of career astronauts in the future[16].

In June 2023, Czechia received an offer from US-based private company Axiom Space to fly Svoboda to conduct his research in space aboard the International Space Station[17]. Axiom provides this opportunity to individuals through the Crew Dragon spacecraft built by SpaceX. Amongst nations who will venture out to space with Axiom are Saudi Arabia[18] or Svoboda's colleagues from the ESA astronaut reserve[19], Sławosz Uznański from Poland[20] or Marcus Wandt from Sweden[21].

Taking up the offer to send a second Czech to space would cost the national budget roughly 41 million euros[22]. Despite these costs, such investment will be worth it and prove itself returnable in both scientific contribution and prestige, as pointed out by Svoboda himself[23]. In addition, he emphasises the positive exposure of local universities and researchers[24]. The question remains whether Czechia will decide to invest in this opportunity, or if the money will be acquired through private fundraising - if at all.[25]

The second person to possibly become the second Czech in outer space is an artist and Czech Goodwill Ambassador Yemi Akinyemi Dele, known as Yemi A.D. (Yemi A.D. n.d.) – via a private company project dearMoon – which selected him in December 2022 (ČTK 2022). The project was initiated by Japanese billionaire Yusaku Maezawa, and plans to send a group of 8 international artists towards the Moon and back, with half of the crew descending to the Moon's surface and the rest staying in

15 ESA presents new generation of astronauts, 2022.
16 Astronaut selection 2021-22 FAQs,
17 CT24zive, 2023.
18 Reuters, 2022.
19 Wandt.
20 A Pole among the ESA astronaut reserve, 2022.
21 Lea, 2023.
22 Denko, 2023.
23 Kužel, 2023.
24 Dolejší,, 2023.
25 In June 2024, Czechia has announced that the government will fund Mr. Svoboda's flight with Axiom, despite refusing the previous offer back in December 2023.

orbit. Yemi will be a member of the former group. The launch date, as of November 2023, is still undecided[26] as it is dependent on the Starship by SpaceX development and test schedule[27][28]

Sending humans to space is an important part of space exploration. Even historically, such a mission holds prestige and opens many opportunities for the state. For example, the recent European Space Policy Institute brief analyses the undoubtable economic benefits of such an endeavour[29]. Czechia now faces the challenge of how to gain a second national astronaut – whether to wait for the ESA mission, the dearMoon crew launch, or to actively seek funding for the flight with Axiom Space.

3.
Institutional Engagement

The beginnings of Czech space exploration were rooted in the Eastern Bloc. Since its newfound sovereignty in 1993, Czechia has become more involved in Western-led projects and sought memberships to many international organisations dealing with space activities. Building up its own space industry required the state to create and arrange a governing structure for management and supervision.

3.1. Governing Structure

At first, national space activities were led mainly by the Ministry of Education, Youth and Sport (MEYS). MEYS also deals with general research and development[30], suggesting that in the beginning space was seen more as a scientific research platform than a business opportunity.

The first National Space Plan (NSP) from 2010 provides the first comprehensive description of the governing structure, and discloses cooperation with a private non-governmental entity called the Czech Space Office (on which more in Chapter 3.2.1.) during the Czech ascension to the European Space Agency (ESA). Apart from MEYS, other ministries involved were and, in many ways still are, the Ministry of Transport (MT), the Ministry of Industry and Trade (MIT), the Ministry of Environment (ME) and the Ministry of Foreign Affairs (MFA). This fragmented structure is defended in

26 Announcement by dearMoon project, 2023.
27 Schedule.
28 The dearMoon project was cancelled in June 2024 due to delays in the SpaceX Starship development.
29 European Space Policy Institute, 2023.
30 From the History of the Ministry of Education

the NSP 2010 as necessary, due all the different aspects space utilisation provides, arguing that creating a singular authority would be too complicated. On the other hand, the NSP 2010 admits that this fragmentation may be an obstacle to the healthy and efficient development of the space sector[31].

The follow up National Space Plan for 2014-2019 puts forth in its review of NSP 2010 precisely this problem. It further establishes that, in April 2011, the Czech Government gave the authority over national space activities to the MT. This ministry handles the national coordination of space activities to this day.

The MT is responsible for national regulations and space activities support (preparation and implementation of the NSP; overall membership of the ESA; EU space policy and the EU space programme).

The MFA joins the MT in the UN Committee on the Peaceful Uses of Outer Space (COPUOS). MEYS still is involved in Czech space activities but on the level of research and development, and it also cooperates with the MT on ESA affairs. The MIT takes responsibility for state industrial and trade policy, and for support of business and Czech companies' visibility through CzechInvest or Czech Trade initiatives.

3.1.1. Coordination Council for Space Activities

In April 2011 the MT also established the Czech Coordination Council for Space Activities (hereafter: 'the council'). It is still active, with seven governmental members – namely the MT, MEYS, the ME, the MFA, the Ministry of Defence (MD), and the Office of Government of the Czech Republic (OGCZ)[32].

Other entities which are advised to participate when appropriate are the Ministry of Finance, the Ministry of Regional Development, the Ministry of the Interior, the Ministry of Agriculture, the Czech Telecommunication Office, the Czech Office for Surveying, Mapping and Cadastre, the National Cyber and Information Security Agency, the National Security Authority, the State Office for Nuclear Safety, the Czech Science Foundation, the Technology Agency of the Czech Republic and CzechInvest[33].

The council has three cross-sectional committees to share views with industry and academia, namely Industry and Applications, Science Activities, and Security and International Relations. Creating such a platform was necessary for tackling the fragmented structure, as it gives a platform for the representatives to meet and coordinate efforts. The council also contributes to the fulfilment of the National Space Plan.

31 Ministry of Education, Youth and Sports of the Czech Republic, 2011.
32 Koordinační rada pro kosmické aktivity.
33 Coordination of Czech Space Activities.

3.2. National Space Plan

Czechia has put forth three national space plans so far, each of which were in place for several years. The first National Space Plan (NSP) was published in 2010. The content was based on the National Space Strategy from December 2009. As mentioned previously, the authority over Czech space activities shifted to the MT only in 2011, and thus this first space plan was still facilitated under MEYS.

There were two main impulses for creating the NSP 2010. The first one was Czechia putting forth the candidacy of Prague as the seat of the European GNSS Agency (GSA), which resulted in being tasked by the EU to set up its national space programme. The second reason was the need to define the Czech space strategy for the CZECH/ESA Task Force working group (more on Czech ESA membership in Chapter 3.5.).

NSP 2010 set out medium-term objectives for the following six years, and reflected the needs of the Czech space sector at that time, stating explicitly in its preamble that its contents were addressed mainly to the relevant governmental bodies. Other possible recipients of the NSP contents were academia, industry, and the general public, to serve as a source of information more than any concrete recommendations or plans. However, even the first NSP emphasises the importance of space research and innovation for the competitiveness of Czech industries.

The second Czech NSP was for 2014-2019, this time put together by the MT. The reason for a new space plan so soon after the previous one is that Czechia had fulfilled the goals of NSP 2010 surprisingly quickly. The original deadline was 2016, however most of the medium-term objectives had been fulfilled by 2013. Now, the main goal of NSP 2014 was to increase competitiveness of the Czech space industry and advance its technological progress and innovations. It is also noticeably longer than the previous NSP, and dedicates more pages to relevant financing from the European Funds and its Czech Operational Programmes.

The third Czech NSP is the current one, as it plans for the period 2020-2025. The main objectives are building up Czech space capacities to increase excellence and competitiveness, as well as holding an active position in international relations. This should help increase the visibility of the country[34]. NSP 2020 includes an evaluation of NSP 2014 and introduces 46 measures for the five-year period. A substantive part of the NSP 2020 focuses on education and awareness spreading at all educational levels. Another portion is dedicated to financing and participating in ESA projects and missions.

34 National Space Plan 2020 – 2025.

3.2.1. National Space Agency

The idea of having a national space agency is not a novelty in Czechia. In 2011 the National Economic Advisory Board to the Government (NERV) put forth an analysis regarding Czech technological advancements[35]. It strongly recommended setting up a national space agency. According to the report, the lack of such an agency complicates cooperation on a higher international level with other national agencies such as NASA, JAXA in Japan, or the DLR in neighbouring Germany.

Apart from business opportunities for Czech companies, such an authority would be represented internationally, which could result in new jobs, better return on investments into space technologies, and overall improve the image of the Czech space industry. Bavaria is mentioned as an example of good practice when furthering the space field, as it mirrors Czechia in its size, population and schooling system[36]).

However, there are currently no explicit plans to establish a national space agency. While an intent to do so was mentioned in every single National Space Plan so far – and in NSP 2020 is listed as measure number 1[37] – the plan has not yet come to fruition. This is caused by several factors.

As the outline of the Czech national institutional structure suggests, space-related areas are quite fragmented. Uniting those under a sovereign separate agency would require consensus amongst all involved governmental bodies, who would possibly have to hand over their authority.[38] Such transfer of competencies will require a thorough, separate plan with a clear outline - while the NSP treats it as a suggestion only and does not elaborate. Another complication is the funding, because in addition to institutional willingness there must be political will to supply the money. It is up for debate whether Czechia, in its current economic and political climate, is ready to take a step in the direction of its own national space agency. The obvious benefit would be to appear unanimous on the international scene.

The Czech Space Office (Cz: *Česká kosmická kancelář*, or CSO) was already introduced in Chapter 3.1. It is a private, non-governmental, non-profit entity established in 2003 to provide the largest and most effective involvement of Czech research, development and industrial institutions in international space projects[39]. For years it has cooperated with MEYS and provided consulting of space activities. This was a unique arrangement, which has even been pointed out in NSP 2014, as it is unusual for a government to delegate a voice for its national space industry to a private entity.

35 NERV: V ČR by měla vzniknout Národní kosmická agentura, 2011.
36 NERV, 2011.
37 NSP, 2020, p. 54.
38 NSP, 2020, p. 117.
39 Kolář, 2012.

Nowadays it creates confusion on the international scene as to whether Czechia has an official space agency. As of November 2023, the CSO was even listed on a Wikipedia page of national space agencies[40]. Even though the CSO website holds a disclaimer at the bottom of its page that its operation is "Co-financed by the Ministry of Education, Youth and Sports within INTER-EXCELLENCE programme", it is unclear from the website information whether that is still the case, as the website is rarely updated. Most recent articles were published in 2015 or 2016. This suggests that the funding has been halted and the CSO does not actively engage in representation of the Czech space sector anymore. Nevertheless, the confusion still stands.

This may pose another challenge to Czechia's self-representation. Either the CSO should be clearer on the website that they are not an official governmental entity, or Czechia should include an explanation of this situation on the official Czech Space Portal run by the MT. The current situation is very confusing, not only for other state representatives but for foreign researchers, businesses and investors as well.

3.3. International involvement

3.3.1. UN COPUOS

The United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) was established after the launch of the first artificial satellite in 1958, due to growing concerns during the Cold War over what unregulated outer space may become[41]. Czechoslovakia was one of the 18 founding members, and has continued its membership as the Czech Republic since 1993. It regularly participates in both The Scientific and Technical Subcommittee (STSC) and The Legal Subcommittee.

3.3.2. European Union

In 2004 Czechia joined the European Union in its largest expansion to date – counting 10 countries, along with Slovakia, Poland and Hungary. The European GNSS Agency (GSA) was established in 2012 in Prague, and was followed by the European Union Agency for the Space Programme (EUSPA) in 2021. The GSA has been transformed to better cater to European needs in the growing space utilisation[42].

40 Wikipedia Contributors, 2023.
41 COPUOS History.
42 From GSA to EUSPA: space transforming business and the economy, 2019.

The current plans are to relocate EUSPA into a larger building by 2025, and increase the number of its employees[43]. The EU has also recently introduced plans to publish an EU Space Law. This will be elaborated on in Chapter 4.3.2.

3.4. Other relevant engagement

Apart from the ESA, the EU and the EUSPA, Czechia is involved in many more international organisations dealing with space. Since 2010 it has been a member of the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) – a European operational satellite agency for monitoring weather, climate and the environment from space[44]. Czechia takes part in the mandatory programmes but not the optional ones. Other memberships are of the European Southern Observatory (ESO, since 2006) NATO (since 1999), EUROCONTROL (since 1996), ICAO (since 1944, as Czechoslovakia), ITU (since 1920, as Czechoslovakia) and others.

These organisations are an important gateway for Czech engagement in the space industry. Based on how many Czechia takes part in, the intent of international cooperation and advertisement of local capacities is clear and well-handled.

Considering future plans, an interest has been expressed in becoming a member of Eurisy.[45] Looking at the nature of institutions that are current Eurisy members (space agencies, educational institutions, ministries), this will probably be done through the Ministry of Transport.

Apart from official memberships, Czechia is indirectly involved in other space-relevant organisations through private bodies. The International Astronomical Union (IAU), the International Aeronautical Federation (IAF; there are currently three Czech members in addition to the EUSPA – the Czech Space Alliance, the Czech Space Office, and most recently the Institute of Experimental and Applied Physics, of the Czech Technical University in Prague), and the Committee on Space Research (COSPAR).

In addition to engagement in international institutions, Czechia has also signed a three bilateral agreements or memoranda of understanding about space-related activities. Namely with Brazil in 2011, France (the UN Committee on the Peaceful Uses of Outer Space 2016) in 2014, and Luxembourg in 2018 (Luxembourg Ministry of the Economy and the Ministry of Transport of the Czech Republic 2018).

43 Hrabětová, 2022.
44 Who we are .
45 NSP 2020, measure 2.

3.5. European Space Agency

The predecessors of the European Space Agency were the European Launcher Development Organisation (ELDO) and the European Space Research Organisation (ESRO). ELDO, with six members (Belgium, France, Germany, Italy, the Netherlands, and the United Kingdom), was established to develop a heavy launcher. Another project, ESRO, followed soon after, with Denmark, Spain, Sweden and Switzerland joining the cause of undertaking scientific satellite programmes.

Both organisations were established by respective conventions, signed in 1962, that entered into force in 1964. Eventually ELDO and ESRO were merged to create the European Space Agency (ESA), which would respond more effectively to the different needs of the ever-evolving space sector[46]. On 30 May 1975 the ESA Convention was opened for signature.

According to Article II of the Convention, the purpose of the ESA is to "elaborate and implement a long-term European space policy, by recommending space objectives to the Member States, by concerting the policies of Member States, and with respect to other national and international organisations and institutions'"[47]. Furthermore, Article XIV can be used to meet different needs of international cooperation. The article has three paragraphs, with the first dealing with the general principle of cooperation and the latter two with specific examples of cooperation – participation in ESA programmes or associate member status (European Centre for Space Law 1998). Czech involvement in the ESA shows clear dedication to this mission.

3.5.1. Membership Procedure

For non-member states, the ESA offers cooperation through the Plan for European Cooperating States (PECS) scheme, which provides the possibility to cooperate on some ESA projects. It is a route to becoming an associate member and later possibly a full member [48]. This scheme has been used mostly by Central and Eastern European countries.

Since the ESA plays an important part in the European space industry, Czechia has strived for membership ever since the 1990s[49]. The Agreement between the

46 Tinjod, 2015.
47 Sagath et al. ,2018.
48 General overview.
49 Evropská kosmická agentura (ESA) .

Government of the Czech Republic and the European Space Agency was signed on 7 November 1996, and entered into force on 5 November 1998[50].

In June 2000 Czechia started participating in PRODEX (Programme de Développement d'Expériences scientifiques, or PRODEX 2001), which is an optional scientific programme established to fund initiatives proposed by institutes or universities[51].

The European Cooperating State Agreement between the European Space Agency and the Government of the Czech Republic was signed on 24 November 2003 and entered into force on 19 November 2004[52].

The Programme of the European Cooperating State was also signed on 24 November 2003, and entered into force on 24 November 2004[53].

The PECS for Czechia was valid for the next 5 years, during which the space sector soared. In 2008 Czechia gained full membership with the milestone of being the first Central and Eastern European country to do so [54].

3.5.2. Projects and Funding

According to the ESA 2022 Annual Report, Czechia contributed 46.2 million EUR to its activities and programmes, which equals 0.9% of the ESA budget[55]. Czech companies have been engaged in several significant projects, like the Ariane 6 launch system[56], the HERA mission and the PLATO mission. The participation of Czech companies seems to be increasing over the years, as well as Czechia's monetary contribution to the ESA. In 2022 it was announced that the budget would be raised to 62 million EUR[57].

In the same ESA 2022 report, it is stated that the agency currently employs nine Czech citizens (all A-grade positions[58]). Programmes by the ESA such as the Young Trainee Programme have been attended by Czech nationals; however, as opposed

50 Sdělení Ministerstva zahraničních věcí o sjednání Dohody mezi vládou České republiky a Evropskou kosmickou agenturou o spolupráci ve výzkumu a využívání kosmického prostoru pro mírové účely, 1998.
51 Program vývoje vědeckých experimentů (PRODEX).
52 Sdělení Ministerstva zahraničních věcí o sjednání Dohody evropského spolupracujícího státu mezi Českou republikou a Evropskou kosmickou agenturou, 2004.
53 Sdělení Ministerstva zahraničních věcí o sjednání Listiny Programu evropského spolupracujícího státu, 2004.
54 Czech Republic accedes to the ESA Convention, 2008.
55 ESA, 2023.
56 Majer, 2020.
57 ČTK, 2022.
58 Includes scientific or engineering activities within the position, or professional administration relating to law, finance, contracts or administration.

to some other member states Czechia does not have its own separate national programme for students and graduates.

The NSP 2020 does mention within its measures (numbers 13-15) an intent to establish a Czech Trainee Programme or support its citizens through the International Space University with student loans or scholarships. Unfortunately, no known steps have been taken, nor can any specific scheme can be found.

4.
Czechia and Space Law

Czechia has the privilege of being the birthplace of several important names, which have made a significant impact in international space law. Professor Vladimír Mandl is often credited as the author of the world's first comprehensive survey of space law[59] in the book Space Law: A Problem of Space Travel (De: *Das Weltraum-Recht: Ein Problem der Raumfahrt*).

Another space law expert, professor Vladimír Kopal, published one of his last works about this revolutionary legal persona[60]. Professor Kopal himself was a well-respected international law expert and served as a chairman of the Legal Subcommittee of COPUOS from 1999 to 2004 and from 2008 to 2010.

4.1. International Law

Czechia is a signatory of four out of five main space law treaties: the Outer Space Treaty,[61] the Rescue Agreement,[62] the Liability Convention[63] and the Registration Convention.[64] However, it has never signed nor considered signing the fifth known space treaty: the Moon Agreement.

59 Plavec, 2011.
60 Hofmannová, 2014.
61 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.
62 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.
63 Convention on International Liability for Damage Caused by Space Objects.
64 Convention on Registration of Objects Launched into Outer Space.

4.2. Artemis Accords

The Artemis program is a NASA mission to return humans to the Moon[65]. The initiative is accompanied by a bilateral document – the Artemis Accords – which with its 13 sections has managed to spark international discussion.

This is due to its approach to safety zones on the Moon and the ownership of space resources possibly extracted from it[66]. The document was drafted in 2020, and so far thirty-two countries and one territory have signed.[67]

Czechia joined as the 24th country when Minister of Foreign Affairs Jan Lipavský signed the document during his visit to Washington DC on 3 May 2023[68]. This was an important milestone for the Czech space sector, as it opened new cooperation opportunities.

4.3. National Space Legislation

We can observe a rising trend of states drafting their own national space legislation. According to UNOOSA, 43 states have a legislation that is somewhat related to outer space and outer space technologies[69]. This number can vary throughout other sources, as it is subjected to individual assessment of what is deemed to be 'space' law.

For example, the German laws related to space deal only with remote sensing (Gesetz zum Schutz vor Gefährdung der Sicherheit der Bundesrepublik Deutschland durch das Verbreiten von hochwertigen Erdfernerkundungsdaten, from 2007) or transfer of responsibilities for space activities (Gesetz zur Übertragung von Verwaltungsaufgaben auf dem Gebiet der Raumfahrt, from 1990). Amongst the most active countries in space laws are the USA and Luxembourg.

It is desirable for countries to pay more attention to their national space activities via legislation. However, attention should not be applied only to the existence of the legislation itself, but also to its contents. In the legal field, a unified language and clear meanings are essential. Different definitions or varying interpretations of international space treaties can cause problems, especially in an effort to conduct outer space activities safely[70].

The UN General Assembly (UNGA) resolution from 2013 (Resolution 68/74) put forth recommendations for states when regulating their national space activities.

65 Artemis Accords
66 Riordan, Machoň & Csajková, 2023.
67 As of November 9th, 2023.
68 Czechia joins the Artemis Accords, 2023.
69 National Space Law .
70 Frans von der Dunk, 2006.

As a desirable content of such legislation ("should include"), the UNGA puts forth the topics of the launching of objects into – and their return from – outer space; operation of a launch or re-entry sites; and operation and control of space objects in orbit.

Furthermore, topics of design and manufacturing of spacecraft, the application of space science and technology, and exploration activities and research, are advised to be at least considered for inclusion in such laws[71].

4.3.1. Czech Space Objects Registry

To fulfil obligations stemming from Article VIII of the Outer Space Treaty and Article II of the Registration Convention, each state is obliged to establish and maintain its national space object registry. The current Czech National Registry of Space Objects has been administered by the Ministry of Transport since 2014. It currently holds information about eight space objects, one of which (MAGION-1) has already decayed. The registry lists the launching state, registration number, date and territory or location of launch, basic orbit parameters and the general function of the space object.

MAGION-2 was originally registered by the USSR, but after 1990 the registration was transferred to Czechoslovakia. The United Nations registry which is kept by UNOOSA lists seven space objects registered under Czechia and four yet unregistered – VZLUSAT-2 (which can already be found in the Czech registry), BDSAT, PLANETUM1 and BDSAT-2 (the latter three are not noted within the Czech registry to this date).[72]

The curious fact about the Czech registry is that the ownership and authority over it was moved four times. From 1979 it was administrated by the Czechoslovak Academy of Sciences (as the Czechoslovak National Registry of Objects), the Institute of Atmospheric Physics of the Czech Republic took over in 1996 until the CSO managed the registry from 2009 until 2014. As mentioned in Chapter 3.2.1., it is unusual to entrust a private entity with access to and administration of the national space objects registry.

This was fixed in 2014 when the authority was handed over to the Ministry of Transport via a Government resolution from 5 May 2014, number 326, on the designation of responsibility for the management of the National Register of Space Objects. This resolution is possibly the only document eligible to be considered a Czech space 'law', as Czech government resolutions are considered *secundum et intra legem*.[73]

71 General Assembly resolution 68/74 Recommendations on national legislation relevant to the peaceful exploration and use of outer space, 2013.

72 October, 2023.

73 *Authorities may only act within the law.*

4.3.2. The Future (of) Czech Space Law

Outer space is subject to international law, and as such the state bears responsibility for all its activities. The most valid reasons for establishing a national space law are Article VI and Article VII of the OST, which deal with liability for space activities. Here it is up to the state to set further conditions for their companies to engage in space through legislation.

Czechia began working on its space law in 2018. Realising its great importance for furthering the space industry, discussions have been held about what the contents of national space law should be, so that they would cater to both state and private sector interests. These discussions, however, are never made public, and plans for national space legislation are not mentioned in the NSP 2020. No information about Czechia's intentions can be found online from official sources. By comparison, Poland is actively working on furthering a draft that has been mentioned in academic publications[74], and Slovakia and Hungary have informed COPUOS about their active works on national space legislation.

The only way to get a scope of the possible contents of the potential Czech Space Law is by contacting its Ministry of Transport directly. Thereby it seems the first challenge of Czech national space law is finding out whether plans for it exist or not. Some dated insight can be found in a thesis written by Klára Štenclová from April 2021, titled Article VI of the Outer Space Treaty and its implementation in Czech Republic[75]. Chapter 7 of the work is dedicated to the future of Czech national space legislation, and is based on an interview with Michal Reinöhl, a Czech delegate to the ESA at the Administrative and Finance Committee and International Relations Committee, and an employee from the Ministry of Transport Space Activities and New Technologies Department.

In 2021 Czech national space law was supposed to include authorisation and supervision of space activities of private companies, as well as obligation to inform the relevant state body (which should also be set up by the law), and the requirement of insurance when conducting space activities. Damages exceeding the arranged insurance amount might be covered by the state.

The company was to have its individual activity authorised – as opposed to just gaining a licence to operate – and was to commit to not creating unnecessary space debris. Furthermore, the law was also to regulate the national space registry – meaning how the individual objects should be registered and under what requirements. At the time of the referenced interview, the planned year for implementing the law was 2022. This clearly did not come to fruition, as we are now near the end of

74 Konert & von der Dunk, 2023.
75 Štenclová, 2021.

2024 and no space legislation has been published. The reason for this could have been Czechia's presidency of the Council of the EU, as well as different matters requiring the department's and the lawmakers' attention.

To get a better scope of Czech plans and priorities for its national space law at present, this author has also reached out to Michal Reinöhl with a request for information on the current state of the legislation. The interview took place online on 30 October 2023. Another interview was conducted on 8 November 2023 with Václav Kobera, the Director of Space Activities and New Technologies Department of the Ministry of Transport, Czech delegate to the ESA (ESA Council, AFC Committee) and Czech delegate to the EC space bodies.

It is important to emphasise that the interviews covered merely the scope and overall intent of the department, and are not binding reflections of what may be published by the Czech government in the future. Everything can be subject to change, as the document is put forth for comments from other ministries, interested bodies or parliament. Both interviewees have provided a valuable insight which greatly contributed to this article. The following information about the progress of Czech national space legislation is based on those interviews, and the author is sharing this with the interviewees' permission.

The reason why drafting a national space legislation is not mentioned in any of the NSPs is apparently that it is not seen by the ministry as the proper platform to do so. Though it covers visions and objectives, NSPs are focused on the space economy, industry, and innovation. In the author's judgement, however, this should not exclude establishing a legal framework. Better governance of space activities can further these objectives too, by – for example – embedding space resources' best practices into them[76].

However, this poses a question as to whether Czech space legislation should aim that far, as only a few countries out of the many with space laws (see Chapter 4.4.2.) have included space resources. According to the ministry, there are no plans for Czechia to cover the issue of property and ownership rights to space resources in its national law, and a change in this approach is highly unlikely. Czechia is however a party to the Artemis Accords (see Chapter 4.3.), which provides an indirect clue as to how government views this issue.

In the works on the national space legislation, the ministry has consulted several sources – the UN General Assembly Resolution 68/74, the Sofia Guidelines for a Model Law on National Space Legislation of the International Law Association, and ESA-organised consultations. In addition to that, some of the fellow ESA member states, which have already passed national space laws, have been informally consulted. Choice of these consultants was made with the size of Czechia and its space industry

76 Gatto and Goessler, 2023.

in mind, as it has different needs for its legislation compared to, for example, France, with a launcher. Due to the similarity in size and historical development of law, cooperation with Austria is the most likely. The Austrian space legislation consists of the Austrian Outer Space Act from 2011, which was later joined by the Outer Space Regulation in 2015.

The intended contents of the space law have not changed much since those covered in the thesis from 2021. What may have changed, however, is the timeframe and the feeling of urgency to adopt a national space law. The author believes the reason behind this seeming reluctance – apart from the limited personnel capacities of the ministry and willingness of politicians – is the matter of mandatory insurance for space companies. Or rather, as it is planned, individual projects and missions. The ministry would prefer to authorise individual projects rather than give generic authorisation to a company. The insurance may be too expensive for many Czech companies, which would hinder progress and work against the desired results.

Based on the interviews, Czechia does realise the international trend of writing a national space law. Not only with the hope to achieve legal certainty by regulating space activities and fulfilling obligations as per international law, but also to protect the interests of the state in the NewSpace age, especially regarding liability. At the same time however, Czechia does not wish to overly restrict the activities of companies in its laws, which could slow industry progress. That seems to the author to be the prominent factor in why the ministry is reluctant to focus on legislation in the current moment.

Another factor that may be delaying the development of the law is a recent initiative from the European Union to create an 'EU Space Law' (EUSL). The form of this, whether it will be a directive or a regulation, is currently unknown. The ministry is likely to contribute to the public consultation. Another official Czech entity, the Civil Aviation Authority, has encouraged the air traffic management community to participate due to the impact of launches and re-entry of space objects on their work[77]. The ministry believes the final EU law may cover some scope of the planned national space legislation, which could deem a national creation redundant.

The EUSL puts forth three pillars – safety, resilience, and sustainability[78]. The safety pillar should cover satellite traffic and space debris; the resilience pillar the protection of satellites against threats such as cyber-attacks; and the sustainability pillar long-term sustainability of space operations for economic growth. Security was not touched upon as a topic possibly included in the Czech space law; prevention of orbital debris is merely 'considered'. The main motivations for drafting it seem to be the registration of space objects, authorisation of Czech space missions, and insurance. These are not very likely to be included in the EUSL.

77 Konzultační průzkum – EU Space Law, 2023.
78 Targeted consultation EU Space Law, 2023.

5.
Conclusion

The Czech space sector is currently facing numerous challenges, and its success in tackling them varies. Firstly, we can assess that Czechia is successfully following up on its 20th century space industry through joining the ESA and the EU, which opened new possibilities for local companies and academia, hosting EUSPA headquarters, staying an active participant in COPUOS, and following industry trends through the strategic signing of the Artemis Accords.

Regarding national and international popularisation of the space industry, space gets more exposure on the news due to the efforts of the Ministry of Transport and local space companies. The most excessive exposure for the Czech space industry would be gaining another Czech astronaut.

Even though the governmental coordination of space activities has improved, the fragmented nature of the Czech space sector persists. Crucial steps towards this development were the establishment of the Coordination Council and moving the main responsibilities under the authority of the Ministry of Transport, such as maintaining the space objects registry. The establishment of a national space agency, which could help to alleviate the fragmented nature even more, unfortunately seems unlikely at present.

Legal aspects of space exploration do get some recognition in Czechia, and it remains committed to the four international space treaties it is a party to. Efforts to adopt a national space law are underway but are not treated as a priority. This is supported by the fact that plans for preparation have not been made public, nor have the contents been discussed with academia or stakeholders as of yet. The reluctance seems to stem from the limited capacities of the ministry, the worry of burdening the local private sector, and the announced development of space law by the European Union. Adopting a national space law seems like a challenge that will not be tackled anytime soon.

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