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Critical Spaces: European and U.S. Institutions for Outer Space

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ABSTRACT

Space is an area characterized by geopolitical positioning the past seven decades. Over that time, agencies and institutions have developed, charged with the task of ensuring the safe usage and exploration of orbits. In the United States, NASA is synonymous with space travel, and in Europe there is the European Space Agency in conjunction with the European Union and state actors all funded at a lower level than NASA and charged with fewer responsibilities. In this paper, we ask why these institutions developed in such different ways and to such different extents? Using the concept of historical institutionalism, we examine the history of each and discuss the path-dependent nature of the institutions in question. Broadening the discussion, we note that while institutional formation engenders a profound impact on the current activity of each agency, geopolitical factors cannot be disregarded, and power structures within the global system are of a greater impact than historical institutionalism.

Introduction

Europe's involvement in space technology and exploration is not a new pursuit. In the 1940s, Germany developed the forerunner to the modern rocket, the descendants of which have become fundamental instruments of space exploration. However, due to its start in life – the A-4/V-2 rocket was designed by the Nazi regime in Peenemunde, it was built using concentration camp labor, and it was used against the United Kingdom (UK) and Belgium during World War Two – propulsion rocket technology took a back seat in the post-war reconstruction and reconciliation period in Europe. In World War Two, geopolitics and the Nazi's desire to inflict great damage on allied powers drove space technological advances. Following the war, blueprints and rocket engineers followed the paths of the United States and the Soviet Union, while Europe focused on economic redevelopment and political integration.

However, European states have not ignored technological innovation, and during the ensuing decades many states in Europe promoted space activity through individual and cooperative initiatives. While Europe is not considered

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a space power on par with the United States, Russia, and China, through constellations of various organizational entities, it advances space initiatives whose benefits extend to Europe and beyond. Europe's approach to space exploration and the related technologies is varied: European spacefaring states have individual national space programs, cooperation through the European Space Agency (ESA), and integrated discussions on space activity through the European Union (EU). When compared to a national or federal space program, such as NASA, Europe's model is institutionally complicated.

This paper aims to disentangle the European framework for space by drawing on mixed methodologies. Comparative analysis will focus on the U.S. model, highlighted by the efforts of NASA, with the goal to shed light on the European model by comparison. Historical institutionalism will draw out the foundational differences within the two systems. The conceptual political frameworks of supranationalism and intergovernmentalism are used throughout this paper to explain how Europe's space efforts, on an organizational level, differ from those designed to serve the federal interests of the United States. Furthermore, this paper seeks to uncover critical junctures in the institutional frameworks employed in each, to discover at which points we can note a change of direction for space policy.

Institutions for space

In both Europe and the United States, institutions are prevalent in the governance of space activity, and they influence the trajectory of space innovation and space exploration. Despite several successes including the Rosetta mission, and the development of the Galileo navigation and positioning satellite constellation, Europe is not considered a space power on par with the United States, Russia, and China. Nonetheless, Europe's technological prowess harnessed through innovative institutions, primarily ESA, enables Europe as a global power in civil space pursuits. In contrast, NASA is synonymous with a large-scale and an innovative technical capability for space development and exploration. The institutions through which decisions are made on space activity and their guiding norms and principles are important to the study of space policy in the two geographic areas.

Given that institutions provide a structure for policy making with a level of stability that persists past elections and changeable political administrations or governments in democratic states, the impact of institutions on choices made in their field is undeniable. This is the basis of the statement that “institutions matter”, which March and Olsen used in 1989 to advance institutionalism. This version of institutionalism is varied and known as the “new institutionalism”.¹ March and Olsen split their view of institutions into three branches of: (1) rational choice institutionalism; (2) normative institutionalism; and (3) historical institutionalism. Each provides a different set of factors for analysis – the

people, the ideas and the founding principles, respectively, – while maintaining a focus on the institution and how the institution impacts the policy choices made in any given field.

In space, a highly technological, fast-moving field, some assert that any institution, a fixed set of rules, norms, operating procedures and ideas, holds back progress. How then is progress to be made without institutional knowledge and institutional guidance? Both stability and flexibility must be central to all institutions, but this is particularly important in those institutions charged with high paced, innovative subject matters. Can institutions for space remain stable enough to provide guidance and knowledge while also being flexible enough to accommodate new technology? Historical institutionalism is a theoretical framework, which addresses this dichotomy. As such, this paper draws on discussions of historical institutionalism, borrows terms and ideas from regime theory, and examines systems of cooperation – intergovernmentalism, supranationalism, and federalism – to ask whether regimes for space in Europe and the United States are flexible and adaptable.

European institutions for space

The EU is not an institution known for space activity given its focus on political integration and economic growth across Europe. Yet, there is a policy for space since the Lisbon Treaty entered force in 2009, and there exists the EU Agency for the Space Program (EUSPA) since 2021. ESA, on the other hand, is specifically focused on space activities. It is important to note that ESA is not an institution of the EU even though a portion of its funding comes through the European Commission. Rather, it is an intergovernmental institution with a remit to combine the technology, innovation, and expertise among its members for the development and exploration of space. Together, the institutions of the EU and ESA combine with Member State space institutions to provide European states with space programs.

ESA is a civilian institution, given legal status by the ESA Convention, which was ratified in 1975. The Convention founded ESA on the following principles: “The purpose of the Agency shall be to provide for and to promote, for exclusively peaceful purposes, cooperation among 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”.² Thus, stated from the earliest institutional juncture, ESA focused on the peaceful uses of space, research, science and application of space innovation. A further focus relates to European cooperation in space among member states. The recitals to the Convention state, “CONSIDERING that the magnitude of the human, technical and financial resources required for activities in the space field is such that these resources lie beyond the means of any single European country . . . the aim would be to integrate the European national

space programmes into a European space programme as far and as fast as reasonably possible . . . DESIRING to pursue and to strengthen European cooperation, for exclusively peaceful purposes . . . DESIRING, in order to achieve these aims, to establish a single European space organisation to increase the efficiency of the total of European space efforts by making better use of the resources at present devoted to space and to define a European space programme for exclusively peaceful purposes”.³ ESA by nature offers a unique collaborative vision and organizational culture, which is not possible within state-based programs.

Understanding the history of Europe's twentieth century helps to understand the way Europe engaged with space activity and the institutional approaches adopted. Moreover, understanding historical institutionalism offers interesting insights into the life of an institution and the extent to which institutional foundations continue to “shape the objectives of actors and distribute power among them”⁴ long into its existence. Path dependency suggests that factors built into an institution at its inception, rather than the exogenous and changeable actor-factors preferred by rational choice institutionalism, are responsible for their coherence and continuation. Principles, modes of operation, and thought patterns established at the outset of an institution guides the way for new and old actors within the institution. Positive institutional feedback allows for a reproduction of the institutional bricks and limits the options to change. Thus, within an institution such as ESA, the foundational non-geopolitical objectives and civilian aims provide the blueprint for all subsequent institutional and inter-state relations.

Space activity and ballistic missile technology progressed during the Cold War years, building upon technology established during the Second World War. Indeed, the impact of World War Two cannot be overstated in that politically and economically, the states of Europe came out of the 1940s destroyed or damaged. Institutionally, the first signs of recovery came with the foundation of the European Coal and Steel Community in 1950 as France and Germany sought to overcome past conflict. However, war is a time of technological advance and although neither financially nor in terms of security could states look to furthering this in the immediate war years, the technologies which had been used to fight their closest neighbors had been designed and developed. The V-2 rocket is the best known and most important of these innovations for the space industry, but in the immediate post-war years, its Nazi roots held back its further development, as much of the German scientific community was divided, teams were split and many European scientists were either forcefully deported or migrated to the United States and the Soviet Union immediately after the end of the war to avoid prosecution and trial. With Germany removed from contention, the UK became the post-war European leader in space innovation, followed by France. Following its decision not to enter into the six state Coal and Steel Community integration

project instigated by the 1950 Treaty of Paris, the UK instead followed the momentum of the Marshall Plan and the Organization for European Economic Cooperation and collaborated on trade and security with the United States. Thus, in 1955 began development of the UK's intermediate-range ballistic missile, Blue Streak.⁵ In France, the national space program experienced a significant boost when Charles de Gaulle came into power in 1958. He encouraged the establishment of the *Centre National d'Etudes Spatiales* (CNES) in 1961, through which France sent the first cat, Felicette, on a return journey to space in 1963⁶ and more importantly for history, created the first non-Cold War launcher, *Diamant*, which enabled the first French satellite entrance into orbit in 1965.⁷

As national space projects took place across Europe, two institutions were created in the 1960s to bring these efforts together. They were the European Launcher Development Organisation (ELDO) and the European Space Research Organisation (ESRO). Together these organizations planted the seeds for the establishment of the current ESA. Like ESA, ESRO and ELDO were international, intergovernmental organizations comprising member states, and similar to ESA they existed outside the supranational European Community (EC), the forerunner to the EU. EC Member States came together during the 1950s and 1960s to create common institutions to conduct certain policies jointly in a process, which became known as supranationalism. This was not the case for ERSO and ELDO; these remained in place to coordinate existing national endeavors and to advance science and technology, thus providing a path dependency for space institutions that has remained inter-governmental in nature.

On founding principles, we note that the initial goal of ESRO was to bring the various European national space programs, sometimes with redundant missions and initiatives, under the framework of a single organization, and group these programs “under three main branches of satellite development: telecommunications, air traffic control, and meteorology”.⁸ Under ESRO's satellite programs, satellites came to be used not only for scientific purposes, but also for commercial uses, such as in communications and other applications.⁹ This created a long-term alliance between state-based institutions and the commercial sector in the European space industry. We note that the culture of public–private relations on space, which also exists in the United States, is a norm within Europe's institutions for space and its industrial relations with its member states. This early mix of public and private posits several important outcomes. While ESA's founding Act states the importance of innovation to benefit society, largely through job creation and industrial advancement, we also suggest that this commercial, public-private intergovernmental structure helped to prevent inter-state conflict, and therefore, contributed to the strength of the institutional framework.

Under ELDO, members worked towards the goals of creating a launcher and related equipment to be used exclusively for peaceful purposes.¹⁰ The UK, France, and West Germany were each called upon to contribute to one stage of a three-stage European launcher; however, the end product was not successful; the Europa I project using the UK's Blue Streak, the French *Coralie*, and the West German *Astris* as first, second, and third launch stages¹¹ sought, between 1967 and 1970, to achieve orbit. The rocket development technologies of the UK and France each had a proven track record of success, but became less effective when combined to build one rocket.¹² Although neither Europa I, nor its four stage 1970 sibling Europa II were successful, institutionally they provided a stepping stone to the development of the successful Ariane rockets, and European collaboration through ESRO and ELDO led to a decision to merge the institutions to form ESA, with the aim to improve European collaborations in space and reduce institutional inefficiency. We thus note that the institutional model set by ELDO and ESRO remained, but flexed and changed with the times. While historical institutionalism at times comes under-fire for failing to adequately explain institutional change, even those commentators most wedded to the idea of institutional stability provide discussion on change that occurs. Kathleen Thelen's work provides a model that allows for "cross fertilization between historical institutionalism and sociological institutionalism" which can help us to understand the stability of norms and principles that have lasted across the institutional alterations that took ESRO and ELDO to ESA. Thelen's explanation provides "a more expansionist view of institutions, not just as strategic context, but as a set of shared understandings that affect the way problems are perceived and solutions are sought".¹³ Thelen thus tells us that those principles established in the foundation of an institution will remain in place and will impact upon all decisions subsequently made by actors; this includes those decisions relating to policy progress, and those decisions relating to institutional alteration.

Krasner's regime work assumes deep coordination and devolved decision-making which suits discussion of intergovernmental cooperation and, by dint of its path dependency, European space policy. This is an area in which member states wish to maintain their independence, unlike those areas devolved to the supranational European institutions, but an area on which progress can be made better together than apart through intergovernmental cooperation. Krasner's work on regimes notes that actors coordinate within regimes to "forgo independent decision-making to deal with the dilemmas of common interests and common aversions. They do so in their own self-interest, for, in both cases, jointly accessible outcomes are preferable to those that are or might be reached independently".¹⁴ Thus, states are assumed to prefer a state of equilibrium in which their options are limited by "arrangements [which] shape their subsequent behavior and allow expectations to converge".¹⁵ This model, which constrains choice through expectations and

norms, allows states to maintain their own voice and it is a preferable choice for many states to the model of a supranational institution whose rules and regulations enter directly into national law. On this, we see convergence of regime theory and intergovernmental cooperation through institutionalism. Just as Krasner suggests that actors converge through institutions to maintain flexibility of regimes, Thelen notes that the tendency to “separate the analysis of institutional stability from that of institutional change”¹⁶ is a weakness, one which we must aim to overcome by accepting the flexibility of historical institutionalism as a comparative tool. Stefes acknowledges this, noting the utility of historical institutionalism to analyze “mechanisms of both change and stability in societal transformations”.¹⁷

In terms of space policy, it is interesting to note Stein's assertion that regimes may change as distribution of power shifts as further knowledge is acquired or as technology advances.¹⁸ Space innovation is fast at times, incremental at others, and provides both small changes and fundamental changes to the global knowledge base, and to global space relations. With each step change in technology, space powers' relationships alter. Hence, the European Space Policy and its institutions' relationships with international regimes, powers, and institutions may change and punctuate longstanding path-dependency. As noted by Peters, this is derived from Darwinian theory, which posits that environmental change happens, and can punctuate long periods or stasis or equilibrium.¹⁹

The first formal step in ESA's creation thus came through a change to the regime for space in Europe. At the European Space Conference on 31 July 1973, an agreement was signed to merge ESRO and ELDO to form ESA (in 1975, ESA was created²⁰) This was intended as a European contribution to the post-Apollo era through the creation of Spacelab: Germany starting its construction, France leading the construction of a European launcher, and the UK taking responsibility for developing a series of communications satellites (MAROTS).²¹

These developments represent an institutional critical juncture, or in Peters' terms, a critical institutional moment.²² It is also explained as incremental change, which is instigated to solve some pre-existing problem or institutional lack. Stefes suggests that these processes are complementary; the “swift institutional alterations or even institutional collapses that are followed by the creation of new institutions from scratch” and the “endogenous dynamics that over time add up to substantive transformations” together allow for a winding, flexible path to be built.²³

A second critical juncture for the European space sector occurred only 5 years after the development of ESA when the European Parliament adopted its first resolution on EC participation in space research.²⁴ It highlighted the benefits the EC could gain from space initiatives that prioritized efforts within the fields of telecommunications, Earth observation, and scientific research.²⁵ Additionally, the resolution encouraged the EC to work with ESA in drafting a comprehensive space research program for the coming decade.²⁶ This

changed the direction of policy to include further commercial integration and industrial innovation, which is the remit of the EC. Competition with other states also prompted the European Parliament to advocate a more robust and better-financed European space sector. The resolution recognized the low level of finances committed to European space activities compared to other significant states in space, such as the United States and the then Soviet Union.²⁷ It also called upon ESA to accomplish ambitious space objectives and for the EC to support the organization's growth.²⁸

The formal establishment of the EU, when the Maastricht Treaty came into force in 1993, laid the foundation for a more politically and economically united Europe through increased supranationalism. At this point, however, European space policy remained intergovernmental and institutionally outside the remit of the EU. Indeed, a deeper integration of space policy into the *aquis* of the EU did not happen until the passage of the Treaty of Lisbon in 2009. According to Balogh, the entry into force on 1 December 2009 of the *Treaty of the Functioning of the European Union* (Treaty of Lisbon) gives the EU a limited shared competence in space, bringing it into the European space (policy) sector, alongside individual European country governments and intergovernmental organizations, like ESA.²⁹ The EU's role in European space policy enabled the creation of a European space policy and space program³⁰; for example, ESA's Space Council and EU ministers adopted an ESA/EU resolution on European Space Policy in 2007 to merge the objectives of the two organizations concerning space activities.³¹

The formation of a legitimate European space policy represents the integration of two institutions and the blending of two organizational approaches of intergovernmentalism and supranationalism. As per its institutional foundations, ESA operates as an intergovernmental organization. And, as per its institutional foundations, the EU utilizes a supranational style of governance, especially those with a strong European Commission presence.³² Through European space policy, ESA and the EU collaborate on projects, such as Galileo and Copernicus, despite differences in governance style and despite differing, although overlapping, memberships.

This collaborative institutional arrangement forms a basis of expertise for high budget space projects; given the size of the annual ESA budget, this is an important factor in the realm of European space policy. In 2021, the ESA budget amounted to 6.49 billion Euros, with 4.55 billion allocated to ESA activities and programs, and 1.94 billion dedicated to programs implemented for other institutional partners.³³ The ESA budget consists of contributions from its members based on gross national product (GNP) to fund mandatory projects and operates a process of *juste retour* (fair return) for optional programs.³⁴ ESA members are thereby reassured that tenders and contracts will be assigned as far as possible to match inputted funds. A state with no formal space agency can choose to “allocate its share of *juste retour* monies to

companies and sectors it feels are beneficial to its national economy”,³⁵ thus highlighting the structural importance of the private sector for European space projects. ESA relies on commercial entities to construct hardware and carry out essential aspects of all missions, and awards these tenders on the basis that “the global value of contracts awarded within a member state³⁶ should reflect as precisely as possible the amount of money that it subscribes”.³⁷ Albeit, this principle does not align with the EU's focus of an internal free market in Europe; it is a founding institutional aspect of ESA for optional programs, such as Earth observation, telecommunications, satellite navigation, and space transportation.³⁸

The fact that institutions with different ideologies work together is due to the culture of harmonization and cooperation seen throughout the institutions of the EU, and those to which EU Member States are signatories. According to Zabusky, ESA can bring states together and work with the EU due to its appreciation of harmonization.³⁹ Harmonization plays a role in pragmatic cooperation; it is a model that works towards achieving successes that have practical application. Zabusky⁴⁰ states,

[harmonization] is about efficiency; harmonization makes cooperation efficient- that is, both economically streamlined and technically focused. It enables ESA to take the idiosyncratic characteristics of the participants (e.g., national space policies, commercial industry's bottom lines, and national political goals) and weave together their distinctive interests without eliminating their differences.

This approach allows ESA to combine resources and unify its member states, and compete with programs like NASA, which operate more directly in the service of their own citizens and national interests. The broader institutional norms of the EU, which include peace, prosperity, trade, cooperation, and harmonization, allow European states to cooperate more closely on space than might otherwise have been the case without these norms.

Institutions for Space in the United States

Contrary to the creation of ESA, the formation of NASA was driven by national objectives. The hope was that a national U.S. agency could rival the technological capabilities of the Soviets, and boost American activity in outer space. Formed during the Cold War, the U.S. regime for space combined an exploratory focused space institution through NASA and a security focused space institution in the Department of Defense (DOD).

Looking first to NASA as an institution, we note that it differs from the space framework employed within Europe. NASA is an independent agency of the U.S. federal government employing just under 18,000 staff as of 2022.⁴¹ As an independent agency, its budget and missions are directed by the U.S. President. NASA's administrator, the top executive position within the

organization, is nominated by the U.S. President and must be approved by a vote in the U.S. Senate. This differs from ESA, in which the organization's leader, the Director General, is selected through a vote of member states on the ESA Council. Presidential nomination, however, means that NASA administrative change is likely with each U.S. Presidential change. This is a factor that can lead to lack of organizational and budgetary stability, as well as altered aims and objectives.

The National Aeronautics and Space Act of 1958, the founding document of NASA, outlines that NASA is to undertake research and technological projects for peaceful purposes. Indeed, the very first section of the Act states that, "The Congress hereby declares that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind."⁴² This, the Act notes, "shall be the responsibility of, and shall be directed by, a civilian agency exercising control over aeronautical and space activities sponsored by the United States".⁴³ NASA does, therefore, share ESA's founding principle of the peaceful use of space governed through a civilian institutional structure. Nonetheless, the NASA Act places a heavy emphasis on the U.S. use of space for defense purposes, and sets out in clear terms the ways in which NASA and DOD should work together in space. The institutional foundations of the U.S. space program are thus based upon two opposing central pillars of security and defense on one hand, and peaceful scientific pursuits on the other hand, which are upheld by two different institutions of the DOD and NASA respectively. According to records though, U.S. President Eisenhower preferred a situation in which DOD is responsible for all space activities; the division of competences between NASA and DOD meant that NASA's focus was on basic rather than applied space research.⁴⁴ The view on DOD's role in space is outlined in the National Aeronautics and Space Act, in which it is emphasized that an important aspect of space activity relates to "general welfare and security".⁴⁵ This section in the Act also asserts that certain space activities will be "primarily associated with the development of weapons systems, military operations, or the defense of the United States" and that these "shall be the responsibility of . . . the Department of Defense".⁴⁶

From the start, it was established that space be administered by two separate institutions with clear remits: (1) defense and security usage overseen by DOD; and (2) civilian and scientific exploration overseen by NASA. Both are funded by the federal government for the benefit of the United States. Examples include DOD's responsibility for the U.S. global positioning system (GPS), and all issues pertaining to security in space. Whereas, NASA oversees interplanetary missions, the International Space Station (ISS), and all exploratory activity. Of note, is that NASA is enabled to pursue peaceful promotion of space given DOD's mandate for military space.

This dual-operating procedure offers institutional stability and endures to the present. Within Section 102 (b) of the Act, it is stated that "The Congress declares that the general welfare and security of the United States require that

adequate provision be made for aeronautical and space activities” and further notes that any activity pertaining to security or defense must be overseen by DOD. The Act proposes that information regarding aeronautical and space activities, which has military value, be shared with the country's agencies concerned with national defense and that such defense agencies also share with NASA information relevant for non-military space activities. This emphasizes the notion that there should be at least some degree of coordination between civilian and defense units. The Act does, however, note a clear division between activities conducted by NASA and those that fall under the responsibility of the DOD. It states, “. . . activities peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the United States (including the research and development necessary to make effective provision for the defense of the United States) shall be the responsibility of, and shall be directed by, the Department of Defense.”⁴⁷ For example, the U.S. Space Force is responsible for GPS operationally and it tracks both natural meteorites and human-made orbital space debris considered to be space threats. Moreover, DOD's role was reinforced by the U.S. Space Policy of 2012. This reinforces those institutional norms set in the 1958 NASA Act by noting that DOD has a “multi-layered approach to deterrence in the space domain”, and that “purposeful interference with U.S. space systems and other space systems upon which the U.S. relies is irresponsible in peacetime and may be escalatory in a crisis”.⁴⁸

Despite this delineation of roles, government documents have alluded to the idea that NASA should not be completely detached from all U.S. military and defense activities and technologies. Rhetoric concerning the use of space technology for defense can be found in the Space Task Group report of 1969 to then U.S. President Nixon, regarding the post-Apollo space program. It states, “Exploitation of the unique characteristics of space systems by the Department of Defense can provide increased confidence in the ability of this Nation to defend itself from any aggressor and assurance that space will be used for peaceful purposes by all nations.”⁴⁹ To combine the expertise of the two, the Act provided for the establishment of a National Space Council (NSpC), headed by the President and later by the Vice President. Though there have been periods during which the NSpC ceased to function since 1958 (1974 to 1988 and 1994 to 2017), it evolved through several permutations showing institutional flexibility in the way that NASA and the DOD operate. In order to regain executive control over the space agenda, the NSpC was recently revived by the Trump Administration through Executive Order in 2017.⁵⁰ The 2017 Order specified the functions the NSpC to carry out revisiting its historical institutional roots and returning it to providing U.S. Presidential oversight in inter-institutional cooperation regarding “resolution of differences concerning major space and space-related policy matters”.⁵¹ The 2017 Order also places an emphasis on the commercial, private sector and its

involvement in future missions as the owner and provider of services to the government, which is a break in historical norms for the U.S. space program that followed a more traditional governmental contracting model.

Historical institutionalism allows for justification of the defense aspects of the U.S. space initiative; from the very start of the space age, the United States adopted a defensive strategy when it came to space efforts. During the Cold War, NASA became the vehicle for U.S. competition with the Soviet Union in space exploration. The launch of the Soviet satellite Sputnik 1 catalyzed an arms race to build-up American and Soviet military and destruction capability⁵²; and it also sparked a race to construct bigger and better technologies, and ultimately to place humans on the Moon. The fear that Sputnik instilled endured the length of the Cold War and led to talks about protective measures, which became manifest in more detailed proposals, such as U.S. President Reagan's proposed Strategic Defense Initiative (SDI) in the 1980s. Dubbed "Star Wars," SDI was a space-based laser system designed to intercept mid-flight any inter-continental ballistic missile attack from the Soviet Union directed at the United States and its allies.⁵³ This example, along with some of the U.S. government rhetoric at the time, underscores the reality that space and defense were blended concepts for the United States during this Cold War period. NASA played an important role in this conflict situation by promoting technological prowess and innovation, a role that is arguably as important to the hegemony of the United States (soft power) as the military side (hard power) of its Cold War effort.⁵⁴

In the United States, we thus note that the foundation of institutions for space, and the continued pursuance of space exploration more generally, offers a competitive edge, which not in terms of commercial gain, but rather in terms of security, knowledge, innovation, and power. As Lieberman notes, "... to display hegemonic power, and to create the weapons required to have military dominance, involves having the best ideas and the most inspirational technology. To do this and retain the support of the populace requires winning over the hearts and minds of the people. Space technology is the fulcrum at the center [of power] . . ." ⁵⁵ In fact, this is stated in the 1958 National Aeronautics and Space Act, which noted that one of its purposes was "the preservation of the role of the United States as a leader in aeronautical and space science and technology and in the application thereof to the conduct of peaceful activities within and outside the atmosphere".⁵⁶ This cannot be underestimated in terms of importance; the establishment of a regime for space incorporating defense and innovation is important, but the incorporation of knowledge and popular hegemony is what sets the United States apart from its competitors. Through NASA, the United States achieved space hegemony, and is perceived to have won the space race vis-à-vis the then Soviet Union. The hegemonic act of NASA's Apollo program brought about international prestige and global soft power projection for the United States retained into the 21st Century.

From its initial conception, hegemonic power is central to NASA; from the NASA Act onwards, the United States identified itself as a global leader in terms of science, technology, and agenda setting. And although satellite usage and space exploration have always had, and continue to have a clear dual purpose, NASA evolved to be the body central to space ventures and projects. Given that the international law of the Outer Space Treaty (OST) of 1967 specifies that space should be used for peaceful purposes only and that sovereignty should not extend to outer space and celestial bodies,⁵⁷ it falls to NASA to ensure that U.S. space projects are scientific, civilian, and of general interest and benefit to all humankind. Nonetheless, the dual-use nature of most space hardware and NASA's initial aim to increase the soft power and prestige of the United States, means that NASA, despite initial proclamations to the contrary, has played a significant role in national defense and security.

NASA is not alone in its contribution to the space enterprise in the United States. There exist eight other government departments with space budgets. In addition to DOD as discussed herein, there are in this context the National Reconnaissance Office (NRO), the National Oceanic and Atmospheric Administration (NOAA), the Department of Energy (DOE), the Federal Aviation Administration (FAA), the National Science Foundation (NSF), the Federal Communications Commission (FCC), and the United States Geological Survey (USGS).⁵⁸ This illustrates a broader and larger space enterprise than is assumed when just focusing on NASA and DOD, and it demonstrates a more diverse policy regime for space than NASA's hegemony and DOD's military space remit suggest.

In summary and in terms of critical institutional junctures, we note that for NASA as the global space hegemon, these are important moments globally. Following the U.S.' late 1950s inability to lead in space in the space race with the Soviet Union, U.S. President Kennedy supported a visit to the Moon with humans as a matter of the highest priority of national defense and security, which was realized in July 1969. The Apollo missions defined NASA and provided what we might now note to be the first critical juncture in its institutional status; this juncture brought it to international prominence and prestige, and boosted NASA to a hegemonic status that evaded other national space agencies. More recent junctures, such as the reinstatement of the National Space Council and a new focus on commercial, private partnerships for services both discussed here, are less resonant globally. However, they affect the direction and policies of space activities in the United States with impacts on global spacefaring endeavors.

Conclusions

We note that NASA and ESA have much in common. Both institutions have a focus on civilian space activity and on exploration for the good of humankind. These aspects are tied to the founding institutional principles suggesting

path dependency, which confirms theories of historical institutionalism. Moreover, there are also differences between the two. ESA exhibits a long history of commercial integration with the private sector, while NASA only recently began to tender work to commercial interests with the intent to privatize space activities matured in the commercial sector. NASA achieved global influence and space hegemony and is charged with ensuring that the United States remains ahead of competitors in space even in the domain of national security and defense. These aspects are not present within ESA; ESA is a stand-alone intergovernmental agency focused on intergovernmental cooperation to further knowledge, science, and technology development primarily for Europe.

Regarding their institutional frameworks, we note further differences. The federal versus intergovernmental structure lies at the forefront of differences between the two, and those institutional pillars shape decisions that each agency makes. The acts founding each organization point to civilian and peaceful space exploration and development goals that have endured. A significant difference between the two is their relationship to security and defense. The space regime in the United States prioritizes security and defense as is evident with DOD's space program. ESA and its relationship with the EU, specifically the EC, is characterized by industrial development and economic growth. More specifically, ESA is operational only in civilian projects. This retained path-dependent feature, extending from the founding ESA Convention remained in place despite institutional alterations, and due to the establishment of EUPSA in 2021. The notion that ESA must remain solely civilian and intergovernmental is an established norm that led to a new institution being formed, EUPSA, to undertake defense work that is necessitated by the ownership of dual-use space hardware.

The United States' military manages several space services used in the civil sector and commercially, such as GPS, which is developed and operated by the U.S. Space Force although overseen as to policy and guidance by a joint civil/military board.⁵⁹ Galileo, the European navigation and positioning system, is maintained by ESA in terms of its civilian operations, but operated by EUPSA in terms of security focused concerns relating to the Common Foreign Security Policy and national security issues. We suggest that since the establishment of EUPSA, the rhetoric and policy around the EU's Space Policy changed. Under ESA, the military and security applications of the Galileo constellation are a second priority to search and rescue and commercial interests. Though under EUPSA, the EU pursues security and defense aspects that are enabled by GPS since its conception.

Europe's space policy is characterized by the collaborative efforts of several Member States and harmonization of their interests. Also, European space policy represents coordination of different forms of governance, namely intergovernmentalism and supranationalism, through its joint ESA and EU

projects. ESA accounts for the intergovernmental dimension of European space policy, while the EU and the EC contribute on a supranational level, and the 2021 establishment of EUPSA provides a new supranational security and defense angle. While the integration of the two governance approaches is relatively new within Europe's space model, made possible by the Treaty of Lisbon, it already enabled significant achievements represented by Galileo and Copernicus. The incorporation of two distinct forms of governance into one space policy sets Europe's model apart from state-based national space agencies. Such agencies, like NASA, have the primary responsibility of coordinating their own national technologies and interests apart from international space collaborations. As such, NASA does not need to actively balance the interests of multiple states as ESA and the EU undertake daily.

Europe's current vision for space innovation and the benefits it can bring is different from the space race mentality of the Cold War where states, driven by political interests, competed to achieve risky and impressive feats in space for international prestige and national defense considerations. Of course, competition between states helps to encourage innovation, but it is not the chief goal of European space policy. ESA and its European partners are developing tools to primarily help Europeans. Attendant to this is how European space activities are serving to shift the way people think about space. What once seemed a reality that impacted only a minority group (i.e., astronauts, space engineers, and others working within the field), space is now becoming important for practical purposes (e.g., Galileo and Copernicus).

Europe's collaborative model for space technology and innovation allows it to further capitalize on soft power.⁶⁰ Europe's unique, path-dependent, contribution to modern space endeavors involved circumventing a strategy of military-led power politics focusing more diligently on technologies with a positive widespread impact. Europe created a unique ecosystem for the exchange of ideas and technology in the field of space through the blending of governmental approaches within European space policy and coordination of ESA Member State interests. The establishment of EUPSA in 2021 constitutes a critical juncture in historical institutional analysis of the EU's Space Policy, and more widely its integration into global space regimes. EUPSA allows states the opportunity to coalesce around space defense, security, and military applications without the need for the institutional path-breaking this would cause at the intergovernmental ESA or the supranational concern if addressed within the European Commission. Space Policy may grow and be able to flex around new innovations, but the institutions in place to constrain behavior and direction cannot; ESA, EU, and EUPSA examples demonstrate that new institutions are needed to address emergent issues as historical institutionalism mitigates larger scale internal alterations of norms or principles.

In terms of our analysis, we note that both ESA and NASA have strong institutional bases and were formed by institutional acts that set-out expected institutional behaviors and the limits to the choices each institution can make. This is particularly of note regarding the intergovernmental, non-military nature of ESA, and the federal inter-institutional nature of NASA, and can be seen clearly in the “exploration for all humankind” agenda of each. Nonetheless, we note that each agency experienced change across the years, and each adapted to the changing face of technology and the changing needs of those it serves. ESA moved to develop Galileo and Copernicus, while NASA shifted attention from Moon missions to other projects with expected hegemonic outcomes, such as Mars exploration and more recently with Artemis in a return to the lunar surface with humans by 2025. In both cases, the limits of the institutional foundations are not holding back progress in space.

Though, the differences between the institutions and the way in which they function relate to wider institutional factors. NASA was established for soft power projection at the height of the Cold War and remains the global hegemonic space agency. ESA was founded by the merger of institutions for space development and exploration by a consortium of cooperative states whose interests were already combined to promote peace, prosperity, and economic and political union through the EU. While the institutional foundations for each space agency provide a guiding structure for the development of space exploration, geopolitical factors are of importance. In the next decades, this discussion will become more salient as we watch new space powers develop their agencies and missions, and as we measure their success against those discussed herein.

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