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Indonesia is Moving Towards Potential Space Powers Countries: Who Has the Authority?

Ferera Ardine Jillian Naibaho[1*] Prita Amalia[2] Danrivanto Budhijanto[3]
1. Faculty of Law, Universitas Padjadjaran, Department of Transnational Business Law Bandung, West Java 40132, Indonesia
2. Associate Professor, Department of Transnational Business Law Research Center of Infrastructure Law, Faculty of Law, Universitas Padjadjaran, Bandung, West Java 40132, Indonesia
3. Associate Professor, Faculty of Law, Universitas Padjadjaran, Department of Technology Information Communication and IP Law, Bandung, West Java 40132, Indonesia
* E-mail of the corresponding author: ferera19001@mail.unpad.ac.id

Abstract
Indonesia is currently planning on building a spaceport in Biak, Papua. This development is a trigger for Indonesia moving towards becoming a potential space power country. This development raises criticism because of deficiencies in organizational terms. The agency serves as an authoritative entity with the responsibility of overseeing all space-related endeavors. There has been a fusion of the Indonesian space agency, *Lembaga Penerbangan dan Antariksa Nasional* (LAPAN), into *Badan Riset dan Inovasi Nasional* (BRIN), which is concerned about confusion over the authority to oversee space activities in Indonesia. The importance of institutional clarity will undoubtedly assist the process of space activity activities in Indonesia in the process toward potential space power countries. This writing uses a comparative method by exploring the practices of other space agencies, such as the United States, European Union, and Japan, to find potential forms of space agencies in Indonesia.
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1. Introduction

The space sector is playing an increasingly important role in the efficiency of the activities of modern society and its economic development. Outer space is one of the sources of economic growth, despite the relatively large investment required. The expanding space economy shows this, how it has dealt with financial crises, and the rise of new commercial activities in the field. The use of satellite technology in navigation communication, meteorology and earth observation encourages increased utilization of this technology in various fields such as transportation, natural resource management, agriculture, environmental and climate change monitoring, entertainment and so on, which will then create new markets (Maulana and Yulianti, 2019). The growth of space technology applications is expanding extremely fast, in keeping with the trend of realizing the mastery of space technology towards independence. This development can be seen from the increasing role and dependence of society on the use of space technology.

For most economists, technological progress is considered the most important and decisive resource in the process of development and economic growth. Technology is how the factors of production are combined to realize production goals, including products related to space technology. Space products contribute income to Indonesia, both directly and indirectly. The products produced involve both industries that are directly and indirectly related to economic development in Indonesia. The prospects for added value coming from space activities are immense because of their scope crosses many different domains and industries and involves several actors. The increased advantage and influence of stepping up space activities for businesses or actors in the non-space sectors, where they benefit directly from space services and indirectly from the development of space science and technology (Shinta, 2018). The initiation of the spaceport project marks a crucial milestone in attracting investments for the establishment of an international rocket launch center. Chris Dewanto, the Head of Cooperation Bureau at LAPAN, has reported that Turkey, along with a consortium of several countries, has expressed interest in investing in the development of an international spaceport, potentially situated in Biak. This endeavor will not only drive economic growth through infrastructure advancements but also foster potential collaborations with startups, indirectly benefiting the economy (BBC News, 2021).

In general, countries involved in space activities can be divided into three major groups, namely: First, the "Space Powers" as countries that are pioneers and show initiative in space activities, for example, the United States and the Soviet Union. Second, the "Potential Space Powers," namely countries that show enormous potential in space activities, such as European countries that are members of the European Space Agency (ESA), Japan, the People's Republic of China, India, and Brazil. Third, the "Late Comers" which generally consist of developing countries that are still passive towards space activities and are still limited as "Users" of the result of

scientific and technological advances in this field (Ida, 2006). Based on its history, Indonesia has several satellites whose lunches are not carried out in Indonesia (Priyanto, 2021). This explanation may lead to the conclusion that Indonesia to be included in the "Late Comers" countries as it still takes advantage of technological advances from other launching states. However, in this paper, Indonesia actually has great potential to join as the "Potential Space Powers" countries. This can be proven by explaining what potential Indonesia has.

Indonesia has great potential in the space sector, and this is supported by Indonesia's geographical location as a country crossed by the equator. Several areas in Indonesia are crossed by the equator, providing astronomical advantages. Its location close to the equator makes Indonesia a strategic location for a country to launch satellites into space, as it will be easier for rockets to reach orbit. With this strategic location, another advantage is being able to accelerate the rate of launch into Geostationary orbit (GEO) and still be able to save on the use of fuel used (Rajendra, 2021). Responding to this great potential, Indonesia has passed Law Number 21 of 2013 concerning Space ("the Space Law") to regulate several provisions, including spaceport development. In its journey to develop space potential, the construction and operation of spaceports are supported by an institution/agency. According to Article 44, paragraph (1) of Space Law, there will be an institution that builds and operate spaceports in Indonesia. The institution mentioned in the Space Law refers to government agencies that carry out government affairs in the field of aerospace research and development and its utilization as well as space administration. The agency mentioned is *Lembaga Penerbangan dan Antariksa Nasional* (LAPAN). According to Article 1 of the Presidential Regulation of the Republic of Indonesia Number 49 of 2015 concerning LAPAN ("Presidential Regulation 49 of 2015"), LAPAN is a non-ministerial government agency that is under and responsible to the President through the Minister in charge of government affairs in the field of research and technology (*Kementerian Riset dan Teknologi*).

The spaceport to be built in Indonesia is an area on land that will be used as a runway and/or launch of a spacecraft equipped with security and safety facilities and other supporting facilities. This mandate was reaffirmed in the Presidential Regulation of the Republic of Indonesia Number 45 of 2017 concerning Master Plan for Space Operations Year 2016-2040, which targeted that by 2040 Indonesia would already have and operate Indonesia's spaceport. In the Master Plan for Space Operations, the Government of Indonesia also stipulates space commercialization activities as one of the space management activities to be manifested by the Government of Indonesia.

The government is currently striving to realize the construction of spaceport infrastructure located on Biak Island, Papua Province. If we refer to the Master Plan, from 2021 to 2025, the government should have carried out the construction and initial operation of the spaceport. However, until now, there has been no sign of development taking place at the specified location. This delay in development is a public question as to why it happened. It turns out, one of the issues is the unclear authority that can manage space activities in Indonesia. Previously, Indonesia had the LAPAN. However, after LAPAN merged into *Badan Riset dan Inovasi Nasional* (BRIN) based on Presidential Regulation Number 74 of 2019 and Presidential Regulation Number 78 of 2021 regarding the National Research and Innovation Agency, its authority control became unclear.

Before the "merger" process, LAPAN was the only non-ministerial government agency tasked with conducting research and development on aerospace and its utilization, to be the space operator in Indonesia, and to be representative of the Indonesian government in international meetings related to space. After the merger occurs, the task of developing the space industry as a whole is segmented. Currently, the organization responsible for conducting aerospace research and development is the Aviation and Space Research Organization (*Organisasi Riset Penerbangan dan Antariksa*). This organization is a research organization within BRIN and is responsible to the Head of BRIN. BRIN also formed the Indonesian Space Agency (INASA), which now carries out the duties of the previous LAPAN, namely representing Indonesia in several international meetings related to outer space. This current merged process at BRIN is a considerable bureaucratic burden. Whereas with the previous decentralization of research institutions, research activities and the implementation of space in Indonesia can be carried out in a clear, directed manner and provide ease of implementation (Putro and Nugraha, 2023).

Even though the space industry has the potential for rapid development in the coming years, regulators, coaches, researchers, industry players, and end users of space products face a strategic environment that has not optimally supported the accelerated growth of space mastery (Susanto, 2016). Due to the hindrance mentioned above, especially in terms of the authority matter for space activities in Indonesia, this paper will further discuss several concerns about the importance of having clear authority, which can be one of the factors supporting the spaceport development process in Indonesia run well.

Therefore, this paper will be discussing two (2) research questions, namely:

1) How are the state practices of the space agency in various countries?
2) What state agency that able to manage space activities in Indonesia?

2. Research Methods

This study also uses a research approach with a comparative method. This approach method aims to find answers fundamentally about causation by analyzing the factors that cause a legal phenomenon by comparing two or more of a particular variable (Nazir, 2005). A comparative approach is utilized to compare space agencies that were formerly owned by different countries to learn about each nation's practices so that they can be considered in finding a suitable form of space agency in Indonesia. The space agency practices of numerous countries, including the United States, Europe, and Japan, will be used as sources in this study. These countries are those with established space agencies and space-related activities.

3. Discussion and Results

3.1 Commercialization of Space in Indonesia

To know the meaning of "commercialization of space", it is first necessary to explain "commercial". According to Black's Law Dictionary, the definition of "commercial" is: "relating to or connected with trade and traffic or commerce in general", while the word "commerce" is defined as (Black's Law Dictionary, 1951):

"Intercourse by way of trade and traffic between different people of states and citizens of inhabitants thereof, including not only purchase, sale and exchange of commodities, but also the instrumentalities and agencies by which it is promoted and the means and appliances by which carried on, and the transportation of person as well as goods both by land and by sea"

From the limitation of "commerce", according to Black's Law Dictionary, Jerzy Rzymanek argues that various forms of legal entities can be related to these activities, both countries, companies and individuals. Furthermore, he said that it is common knowledge that in the legal literature the word "commercialization" is only used in connection with space activities carried out by the private sector, which can fundamentally cause ambiguity in meaning (Rzymanek, 1987).

The characteristics inherent in the commercialization of space activities include (Ida, 2006):

1) The activity is carried out to obtain material benefits.
2) These activities can be carried out by the state, international organizations, private legal entities or individuals, both independently and in the form of cooperation.
3) There is government authorization and supervision of activities carried out by legal entities other than the state.

Potential areas of activity in the framework of the commercialization of space include:

1) Space Transportation
2) Telecommunication
3) Remote sensing
4) Space manufacturing industry
5) Space mining

The scope of commercial space activities is classified into three segments, namely first, the earth segment (earth stations, launch vehicles and operational personnel), second, the space segment (satellite, International Space Station, space tourism, space views, etc.), and the last segment of the communication connection (Art. 1 No. 4 The Space Law; Humas FH UI, 2023). These activities can be launching communication satellites, remote sensing, space transportation systems, live satellite broadcast, asteroid mining, and space tourism.

3.2 Space Agencies According to the State Practices

3.2.1 United States

National governments support civil space agencies as public bodies to advance national space capabilities. There is no single, all-encompassing strategy for creating a space agency. Instead, over time, many governments have given them a variety of diverse missions and responsibilities. One year after the Soviet Union launched the first artificial satellite into orbit, on October 1, 1958, the National Aeronautics and Space Administration ("NASA") was established marking the beginning of civilian space agencies (Ehrenfried, 2016).

President Eisenhower signed the National Aeronautics and Space Act of 1958 ("the Space Act") on July 29, 1958 establishing the NASA. The National Advisory Committee for Aeronautics ("NACA"), a U.S. federal agency founded on March 3, 1915, was absorbed by the newly formed NASA agency. NACA's mission was to conduct, encourage, and institutionalize aeronautical research. The impact of Sputnik I immediately set off a domino effect in the political management of space-related activity in the United States. By the beginning of the following year, the NACA director and a select group of individuals had developed a well-organized concept for a workable space program, based on a partnership between the Department of Defence (DoD), National Science Foundation, National Academy of Science, universities, and industry, all of which were centered on and under the management of NACA. The National Aeronautics and Space Act was the product of a protracted dispute over whether military or civilian control of space should be exercised. And from that Act, NACA was dissolved, and its assets and personnel formed a core of newly created NASA (Eisenhower, 2022).

After the reorganization, NASA could perform space mission including programs in the developing field of human spaceflight and aeronautics research for civilian applications. It is crucial to remember that, even though integrating existing national organizations with space-related goals was one of NASA's primary goals, NASA has never been and still isn't the only organization in the United States that conducts space activities and receives financing for them. For instance, the DoD assumes the tasks and responsibilities for military-focused space programs. Additionally, the National Oceanic and Atmospheric Organization (NOAA) is a scientific organization that conducts study in fields including meteorology, climate, coasts, and oceans. It uses space assistance to deliver goods and services to relevant stakeholders. The U.S. Government carefully considered two alternative organizational paths for developing space program: (1) to conduct all activities within the U.S. Department of Defense, or (2) to create a separate dedicated civilian space agency with a focus on science and exploration. NASA was directly related to the Cold War space race. The latter was chosen to show the peaceful purposes of the American space program and to guarantee that scientific, non-military missions would receive appropriate priority (Kommel, 2020).

NASA is a research and development organization and was never intended to serve as the government's regulatory authority. Therefore, the regulation of private space vehicles requires either the creation of a new administrative body specifically chartered to oversee civil space activities or the use of a minimal regulatory approach that combines already-existing state and federal laws with notices requirements mandated by the United States' treaty obligations (Dula, 1983).

According to Sec. 102. (c) of the Space Act identified numerous objectives for NASA, including:

1) expansion of human knowledge of the Earth and the phenomena in the atmosphere and space;
2) improvement of the usefulness, performance, speed, safety and efficiency of aeronautical and space vehicles;
3) the development and operation of vehicles capable of carrying instruments, equipment, supplies, and living organisms through space;
4) establishment of studies of the benefits from and problems involved in the use of space for peaceful and scientific purposes;
5) preservation of U.S. leadership in space science and technology and in the application thereof to the conduct of peaceful activities within and outside the atmosphere;
6) making available to agencies directly concerned with national defenses of discoveries that have military value or significance, to the civilian agency established to direct and control nonmilitary aeronautical and space activities, of information as to discoveries which have value or significance to that agency;
7) cooperation with other nations; and
8) the most effective utilization of the scientific and engineering of the U.S with close cooperation among all interested agencies of the U.S. in order to avoid unnecessary duplication of effort, facilities, and equipment.

The Space Act gives NASA the authority to purchase, build, renovate, manage, and maintain research facilities, labs, aircraft, spacecraft, and other real and personal property, or any interest therein. In addition, NASA is permitted to engage in "other transactions," often known as Space Act Agreements. These Space Act Agreements could be subsidized, non-funded, or reimbursable. For the Commercial Crew Program and the Commercial Orbital Transportation System ("COTS"), NASA employed Space Act Agreements that were funded by the Act. The Agreements made it easier to combine public and private funding, got beyond the Federal Acquisition Regulations' restrictions, and encouraged quick thinking to gain new capabilities. Additionally, they assisted in the development of the Dream Chaser spacecraft, which has since been awarded a NASA contract to provide cargo delivery, return, and disposal services for the international space station, as well as the commercial space launch vehicles developed by SpaceX, Orbital ATK, and Sierra Nevada Corporation Space Systems (Smith, 2021).

In 1985, the "National Aeronautics and Space Administration Authorization Act" amended NASA's governing statute and stated that NASA must "seek and encourage, to the maximum extent possible, the fullest commercial use of space" (Title 51 of the National and Commercial Space Programs). This was a crucial turning point that allowed later legislation to give NASA more direction, responsibilities, and authority with the private U.S. companies (European Space Policy Institute, 2019).

In addition to NASA, which is in charge of the U.S. civilian space program as well as aeronautical and space-related research, numerous other U.S. federal agencies are active in developing space policy and in regulating space-related activities. Other U.S. government agencies involved in space policy & regulation, namely (Georgetown Law Library, 2020):

- U.S. Department of Commerce
  The Commerce Department supports economic growth by compiling economic and demographic statistics to support in government and private sector decision-making as well as a by helping to establish uniform scientific and industrial standards.

- National Oceanic and Atmospheric Administration (NOAA)
  NOAA is a scientific agency within the Department of Commerce that conducts study in fields including meteorology, climate, coasts, and oceans.
  - Office of Space Commerce
    This NOAA office coordinates the Department of Commerce's formulation of commercial space policy. Its goal is to promote the growth of news space-related industries.
  - National Environmental Satellite, Data, and Information Service (NESDIS)
    The NESDIS oversees the management of information and data gathered by meteorological satellites.
  - Commercial Remote Sensing Regulatory Affairs (CRSRA)
    The CRSRA grants licenses for the commercial use of remote sensing satellites technology by people and organizations governed by American Law. These technologies capture images of the Earth's surface and related data.
- National Telecommunications and Information Administration (NTIA)
  Within the Department of Commerce, the NTIA is a scientific agency. The NTIA is jointly in charge of allocation the radio spectrum used by telecommunications satellites run by the federal government and by private business with the Federal Communications Commission (FCC), an independent body.

- U.S. Department of Defense
  The Defense Department oversees all components of the U.S. armed forces and coordinates the country's overall national security strategy.
  - Assistant Secretary of Defense for Homeland Defense and Global Security (ASD)
    Among other things, the ASD is in charge of developing a notional security strategy for outer space.
  - U.S. Space Force
    The U.S. Space Forces Act, a component of the Defense Authorization Act of 2020, was signed on December 19,2019, creating the newest branch of U.S. armed services. The Chief of Space Operations is in charge of it, which is organized as a military service branch within the Department of the Air Force.
- U.S. Department of State
  International relations and U.S. foreign policy are handled by the State Department.
  - Office of Emerging Security Challenges
    This office collaborates with American allies on matters relating to missile defense and space security.
  - Office of Space and Advanced Technology
    The regulation of artificial satellites, satellite navigation systems, and satellite-based earth observation systems are just a few of the many issues that this office assists in forming policy on. Other issues include space diplomacy, the commercial exploitation of space resources, and space resources development.
- U.S. Department of Transportation – Federal Aviation Administration (FAA)
  The FAA is a regulatory body under the Department of Transportation
  - Office of Commercial Space Transportation
    This FAA office is in charge of overseeing the developing commercial space transportation sector, making sure it complies with U.S. international space law obligations, as well as protecting the general public's health and safety. It also responsible for the development of policies that promote infrastructure improvements and strengthen the competitiveness of US spaceports, supporting launch and re-entry site licensing activities, providing technical assistance and guidance to existing and proposed new spaceports, and the domestic and global promotion of US spaceports. Additionally, it suggests modifying pertinent federal statutes and regulations (Federal Aviation Administration, official website).

3.2.2 European Union

In that it was born from the union of separate but linked space entities established at the dawn of the space age, the creation of European Space Agency (ESA) is comparable to that of NASA in certain ways. This notably took place in the context of recently formed, research-focused European intergovernmental entities. The European Organization for Nuclear Research (CERN) started this trend in 1954, and the European Space Research Organization (ESRO) and the European Organization for the Development and Construction of Space Vehicle Launchers (ELDO) followed in the fields of space science and technology in 1964. These organizations are both concerned with space and intergovernmental organizations (IGOs), but they have different missions,

memberships, and methods for cooperating. Political agreement was gained at the start of the 1970s to modify the ESRO and ELDO Conventions and finally unite the two forerunner organizations to become the new space agency in 1975, the ESA (ESA Legal Services Department, 2018).

The preamble to the ESA Convention explains the rationale behind seeking institutionalized collaboration in space operations. Another major difference between these cases is seen in ESA's initiating Convention, which states: in "considering that the magnitude of 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" (ESA Legal Services Department, 2018).

The "Convention for the Establishment of a European Space Agency" treaty, which established ESA, became operative on October 30, 1980, after being made available for signing on May 20, 1975. It is a global agreement with 26 articles and 5 annexes that has served as and continues to serve as the legal framework for European space activities. Other European nations later joined the founding states through an admission system, and as of today, there are 22 Member States, plus an Associate State and a Cooperating State. ESA has 22 Member States: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Hungary, Luxembourg, the Netherlands, Poland, Portugal, Norway, Romania, Spain, Sweden, Switzerland and the United Kingdom. Latvia, Lithuania and Slovenia are Associate Members (International Astronautical Federation, 2023). ESA member states "cooperate through ESA, and ESA cooperates with other partners" in order to accomplish its primary goal of facilitating space collaboration among European nations (ESA Legal Services Department, 2018). With relation to the first feature in particular, ESA might be seen as a tool for global state collaboration. ESA is viewed as a participant in global collaboration in the latter sense. The fact that space activities are normally carried out on a broad multilateral basis is what unites the two situations, though.

By combining the resources of its 22 Member States, ESA is able to carry out projects and activities that are much larger in scale than those of any one European nation. ESA programmes aim to advance European companies, create satellite-based products and services, and learn more about Earth, its immediate space environment, our solar system, and the universe. ESA collaborates closely with organizations in space based outside of Europe (The European Space Agency, 2017).

ESA is essentially characterized as a space agency "in the meaning used by space-faring States" in addition to being a facilitator and integrator of national space programs as well as the creator, coordinator, and administration of European-wide space programs. It must be active in areas including space policy, space operations, and space cooperation. The Council, which served as ESA's governing body, establishes the fundamental political principles under which ESA develops the European space program. No matter how large or how much it contributes financially, every Member State is represented on the Council and has one vote. The Director General of ESA is chosen every four years by the Council. With a separate Directorate and reporting directly to the Director General, each distinct research reactor is represented.

"To provide for and to promote, for exclusively peaceful purposes, cooperation among European States in space research and technology and their space applications" is the overarching goal of ESA according to Article II of the ESA Convention. It does so by:

- Elaborating and implementing a long-term European space policy, by recommending space objectives to the Member States, and by concerting the policies of the Member States with respect to other national and international organizations and institutions;
- Elaborating and implementing activities and programmes in the space field;
- Coordinating the European space programme and national programmes, and by integrating the latter progressively and as completely as possible into the European space programme, in particular as regards the development of applications satellites;
- Elaborating and implementing the industrial policy appropriate to its programme and by recommending a coherent industrial policy to the Member States.

When it comes to managing ESA programs specifically from a financial and budgetary perspective, the programs created by the Agency are divided into two categories: required and optional: A unique intergovernmental collaboration system is described as "key to the functioning of ESA" in Art. V of the ESA Convention. In terms of mandatory programs, they are carried out within the budget for the general and scientific program. Mandatory programs, as the name suggests, are a list of specified tasks that every ESA member state is required to participate in. As a result, the necessary ESA programs are supported by financial contributions from each of the Agency's member nations, which are determined based on each nation's GNP. These programs cover all of the fundamental ESA activities, including scientific programs, future project analysis, technological research, shared technical investments, information systems, and educational initiatives. Thus, the mandatory activities are of the utmost importance because each member state in Europe benefits from their scientific and technological content, which consistently advances knowledge, innovation, and competitiveness. The General Study Programme (GSP), the Basic Technology Research Programme (BTRP), and the Science Core

Technology Programme (CTP) are the three main required programs to which every member state contributes. According to Article V of the ESA Convention's provisions regarding these kinds of required activities, the Agency shall:

- Ensures the execution of basic activities, such as education, documentation, studies of future projects and technological research work;
- Ensures the elaboration and execution of a scientific programme including satellites and other space systems;
- Collects relevant information and disseminates it to Member States, draws attention to gaps and duplication, and provides advice and assistance for the harmonization of international and national programmes;
- Maintains regular contact with the users of space techniques and keeps itself informed of their requirements. In particular, several mandatory key programmes of ESA revolve around basic technology research and development, including: the Technology Research Programme (TRP), the General Support Technology Programme (GSTP), the Future Launchers Preparatory Programme (FLPP) and the Telecom/ARTES programmes – all of which account for about three quarters of the total of technology R&D conducted in ESA.

The European Space Agency (ESA) holds several responsibilities in the field of commercial space activity. These encompass the following (European Space Policy Institute, 2019):

- Facilitating the advancement of new commercial space technologies and services. ESA accomplishes this by financing research and development initiatives, offering technical aid to companies, and contributing to the creation of a favorable regulatory environment for commercial space endeavors.
- Encouraging the utilization of the International Space Station (ISS) for commercial purposes. As a significant partner in the ISS, ESA strives to ensure accessibility for commercial users. This involves granting access to the station's facilities and services and supporting the development of fresh commercial applications for the ISS.
- Guaranteeing the safety and security of commercial space activity. ESA works towards the safe and secure conduct of commercial space operations. This encompasses the formulation and enforcement of safety regulations, along with assisting in accident prevention and mitigation.

Notably, and in contrast to NASA, for instance, which is currently entirely focused on space science and human/robotic space exploration, ESA is active in all types of space activities, with the exception of those related to the military space domain, which are carried out at the national level in Europe. The ESA stands out among space organizations throughout the world as an intergovernmental organization (IGO). With a legal personality to facilitate its international structure and strategic goals, the ESA was created to address the space needs of the developing European context in the second half of the nineteenth century. The ESA structure serves as an effective platform for the cooperation and collaboration of each of its member states. ESA serves as a practical mechanism to realize European space goals in this regard. Space programs can be carried out at scales that cannot be achieved by any one-member state because of the pooling of multi-national resources. This benefits both the overall development and competitiveness of Europe as well as individual member states.

3.2.3 Japan

Since the choices made in 1969, Japan's space projects have only been used for research. The Self-Defense Forces (SDF), Japan's armed forces, had restricted access to space technology, hence space was not seen as a military or economic resource. Until the Basic Space Law (“Law No. 43 of 2008”) came into force, the government's interpretations and perspectives of the space domain remained unchanged (Aoki, 2009).

The first domestic law that specifies the role of the government in space development is the Basic Space Law. Japan's national space policy is decided by a council at the Cabinet level, which was established by the law. To achieve the objectives outlined in the national space policy, pertinent ministries and agencies are developing their own space objectives and programs. The bill also clearly marks a change from the prior space strategy, which was primarily science-focused. National security and the commercial sector are currently priorities. To satisfy government expectations, other nations are utilizing capabilities of the commercial sector. In order to accomplish government goals, Japan is also stepping up its attempts to make use of more commercially available technologies and services. The government currently has a legal foundation to create and make use of space systems for purposes of national security. Thus, the Basic Space Law gave the government the legal right to pursue a full-spectrum national space policy that includes goals for science, commerce, civil rights, and national security (Wakimoto, 2019).

Understanding who, where, and how Japan's space policies are being formulated is hampered by this full-spectrum approach. In order to understand Japan's goals in the space sector, analysts of space policy should now look beyond the initiatives of the Japan Aerospace Exploration Agency (JAXA, which is comparable to the US National Aeronautics and Space Administration). Instead, analysts must examine each ministry's and agency's functions and initiatives (i.e., who and what), as well as their administrative systems and decision-making procedures (i.e., how). Previous research has looked at how the Basic Space Law and the organizational reform of 2012 have affected the dynamism of Japan's space policy and how these changes will affect the future

development of Japan's space policy (Suzuki, 2007; Suzuki, 200; Kallender-Umezu, 2013). However, there are no easily readable government documents or scholarly works that pay close attention to the policy development processes of Japan's space policy (Wakimoto, 2019).

JAXA was born through the merger of three institutions, namely the Institute of Space and Astronautical Science ("ISAS"), the National Aerospace Laboratory of Japan ("NAL") and the National Space Development Agency of Japan ("NASDA"). To promote the entire development and use of aerospace by the Japanese government, it was designated as a core performance agency. Therefore, from fundamental research and development to utilization, JAXA can undertake integrated operations (Japan Aerospace Exploration Agency, 2023).

Traditionally, JAXA has prioritized research missions. Today, JAXA has broadened its mandate beyond scientific missions to encompass industrial promotion and national security in accordance with the Basic Space Law. There are three key documents that JAXA uses to discuss its strategy and action plans for implementing the Basic Plan and Implementation Plan. The mid- to long-term aims are at the top of the hierarchy. It establishes the overall strategies for JAXA for the following five years as decided by the relevant ministries (MEXT, METI, MIC, and CAO). The mid- to long-term plan is then developed by JAXA based on the objectives in order to meet the goals established by the relevant ministries. The annual plans include revised and more specific targets. In order to reflect changes in national policy, JAXA and its competent ministries adapt strategy and programs. The third period of JAXA's mid-to-long-term objectives was revised in 2015, which was one of the significant adjustments to the organization's strategy. A new section called Ensuring National Security and Helping Make Society a Safe and Secure One was added to the objectives on March 18, 2015, and it places an emphasis on creating satellite systems to aid in achieving national security goals and enhancing the resilience and responsiveness of space systems (Wakimoto, 2019).

The fourth period of JAXA's mid-to-long-term goals is now in progress. Dr. Hiroshi Yamakawa, the newly elected president, thinks that the space industry is "now facing fierce competition." Consequently, JAXA is collaborating with new counterparts that were previously thought to be outside of JAXA's purview, such as "institutions that engage in national security."

JAXA has several responsibilities in commercial space activity, including:

- Regulating commercial space activities: JAXA is accountable for overseeing and regulating commercial space activities within Japan. This involves granting licenses to companies seeking to launch satellites or engage in other space-related operations.
- Providing launch services: JAXA offers launch services to commercial entities, facilitating the deployment of satellites into orbit and transporting individuals to the International Space Station (ISS).
- Facilitating international cooperation: JAXA actively fosters international collaboration in commercial space activities. This entails collaborating with other nations to develop novel space technologies and execute joint missions.
- Developing space-based services and products: JAXA is engaged in the development of diverse space-based services and products for commercial utilization. This includes satellite-based communication services, space-based navigation services, and space-based Earth observation services.
- Promoting space tourism: JAXA is actively involved in the promotion of space tourism. This includes collaborating with companies to create space tourism packages and offering training programs for prospective space tourists.

3.3 Indonesian Space Agency Practices in Comparisons with Other State Practices

3.3.1 LAPAN

The establishment of LAPAN cannot be separated from the "Astronautical Committee of the Aviation Council" or "*Panitya Astronautika Dewan Penerbangan*" which later changed to the Republic of Indonesia National Aeronautics and Space Council or *Dewan Penerbangan dan Antariksa Nasional Republik Indonesia*, which is hereinafter abbreviated as DEPANRI, is a high-level coordination forum in the field of policy on the utilization of national airspace and space for aviation, telecommunications and other national interests. DEPANRI is tasked with assisting the President of the Republic of Indonesia in formulating general policies in the field of aviation and space. The Republic of Indonesia's National Aeronautics and Space Council was dissolved on December 4, 2014 based on Presidential Regulation Number 176 of 2014 concerning the Dissolution of ten Non-structural Institutions. The duties and functions of the National Aeronautics and Space Council are carried out by the Indonesian Ministry of Research, Technology and Higher Education. Meanwhile, for financing, employees, equipment, and document management were transferred to the National Institute of Aeronautics and Space or LAPAN (Humas, 2014).

LAPAN is an Indonesian Non-ministerial Government Agency that carries out government duties in aerospace research and development and its utilization. LAPAN's four main areas (core competence) are remote sensing, aerospace technology, space science, and aerospace policy (Ahimsa, 2018). The formation of LAPAN is

closely related to the emergence of an institution called the Astronautics Committee. On instructions from the President of the Republic of Indonesia Soekarno, the First Minister of the Republic of Indonesia, Ir. Juanda (Chairman of the Indonesian Aviation Council) and R.J. Salatun (Secretary of the Indonesian Aviation Council) established the Astronautics Committee on May 31, 1962. Furthermore, on September 22, 1962, a project was formed which was named the Initial Scientific and Military Rocket Project (PRIMA) affiliated with the Air Force and ITB. The Astronautics Committee succeeded in making and launching two Kartika series rockets along with their telemetry. A year later, on November 27, 1963, the new Indonesian government officially formed LAPAN or the National Aeronautics and Space Agency. The formation of LAPAN at that time was based on Presidential Regulation Number 236 of 1963. The figure who became the first head of LAPAN was Air Force Commodore Nurtanio Pringgodigdo. Nurtanio also pioneered the Indonesian aviation industry in the 1950s and 1960s. Nurtanio even designed the RI-X light aircraft during the independence revolution (Wakidah, 2022).

After passing through the 1960s, there were several improvements to LAPAN's organization, namely through the issuance of Presidential Regulations and Presidential Regulations as follows:

- Presidential Regulation Number 18 of 1974 concerning the National Aeronautics and Space Agency,
- Presidential Regulation Number 33 of 1988 concerning the National Aeronautics and Space Agency,
- Presidential Regulation Number 24 of 1994 concerning Amendments to Presidential Regulation Number 33 of 1988 concerning the National Aeronautics and Space Agency,
- Presidential Regulation Number 49 of 2015 concerning the National Aeronautics and Space Agency.

The Space Law is the regulations related to the implementation of LAPAN's functions and duties. Based on Article 38 paragraph (4) of the Space Law, it is necessary to stipulate a Presidential Regulation concerning the National Aeronautics and Space Agency. Therefore, later, LAPAN was designated as the National Aeronautics and Space Agency based on Presidential Regulation Number 49 of 2015. According to Article 2 of the Presidential Regulation 49 of 2015, LAPAN has the task of carrying out government tasks in the field of aerospace research and development and its utilization and space administration under statutory provisions. In carrying out these tasks, according to Article 3, LAPAN carries out the following functions:

1) Formulation of national policies in the field of research and development of space and atmospheric science, aviation and space technology, and remote sensing and their use;
2) Carry out research and development of space and atmospheric science, aviation and space technology, and remote sensing and their use;
3) Space administration;
4) Coordinating functional activities in carrying out LAPAN's duties;
5) Implementation of coaching and providing administrative support to all organizational units within LAPAN;
6) Implementation of strategic aviation and space policy studies;
7) Implementation of the propagation of aviation and space technology;
8) Implementation of management of standardization and flight and space information systems;
9) Supervision of the implementation of LAPAN's tasks;
10) Submission of reports, suggestions and considerations in the fields of research and development of space and atmospheric science, aviation and space technology, and remote sensing and their utilization.

3.3.2 BRIN

On the commemoration of the 26th National Technology Awakening Day which took place on August 10, 2021, President Joko Widodo asked the National Research and Innovation Agency (BRIN) to consolidate and integrate national research and innovation forces immediately. This is as stipulated in Article 48 paragraph (1) and Explanation of Article 48 paragraph (1) of Law Number 11 of 2019 concerning the National System of Science and Technology ("UU Sisnas Iptek"). Several independent research institution that were previously merged into BRIN: Indonesian Institute of Sciences (LIPI), National Nuclear Energy Agency (BATAN), Agency for the Assessment and Application of Technology (BPPT), and LAPAN.

The function of the Central Government is only in the coordination function or as a coordinator. This is because the UU Sinas Iptek has explicitly stated that BRIN is the central body for research, development, assessment and application activities, as well as inventions and innovations. So that BRIN is a body that coordinates various institutions that carry out research, development, assessment, and application, as well as inventions and innovations such as BATAN, BPPT, LIPI, and LAPAN (Pujianti, 2021). Thus, the function of BRIN is to coordinate tasks outside of research and innovation, such as preparing plans, programs, budgets, and scientific and technological resources in the fields of research, development, study, and application to produce inventions and innovations that have so far spread (Susetyo, 2022).

BRIN was founded by President Joko Widodo through Presidential Regulation Number 74 of 2019 concerning the National Research and Innovation Agency. Based on Presidential Regulation Number 74 of 2019 and Presidential Regulation Number 78 of 2021, BRIN's duties are to carry out research, development, study and

application, as well as integrated inventions and innovations. In carrying out these tasks, BRIN carries out the following functions:

1) Implementation of direction and synergy in the preparation of plans, programs, budgets, and Science and Technology Resources in the field of Research, Development, Assessment and Application.
2) Formulation and establishment of policies in the field of quality standards for research institutions, human resources, research and technology facilities and infrastructure, strengthening innovation and research and technology development, mastery over technology transfer, strengthening technology audit capabilities, protecting Intellectual Property Rights, accelerating mastery, utilization and the advancement of research and technology.
3) Coordination of the implementation of the National System of Science and Technology.
4) Preparation of science and technology master plan.
5) Facilities for protecting Intellectual Property and its utilization as a result of national Inventions and Innovations in accordance with statutory provisions.
6) Determination of mandatory submission and mandatory storage of all primary data and output of research, development, assessment and application results.
7) Determination of the professional qualifications of researchers, engineers, and human resources in Science and Technology.
8) Facilitate the exchange of information on Science and Technology between elements of the Science and Technology Institution.
9) Management of the National Science and Technology information system.
10) Development of the implementation of Science and Technology.
11) Licensing for the implementation of Research, Development, Assessment, and implementation activities as well as Inventions and Innovations that are high risk and dangerous by taking into account national standards and provisions that apply internationally.
12) Supervision of the planning and implementation of the Implementation of Science and Technology in accordance with the master plan for the promotion of Science and Technology.
13) Coordination and synchronization of policy implementation in the fields of institutions, resources, strengthening research and development, and strengthening science and technology innovation.
14) Granting written permission for research and development activities by foreign universities, foreign research and development institutions, foreign business entities, and foreigners in the territory of the Unitary State of the Republic of Indonesia.
15) Granting written permission for research and development of applied science and technology that is high risk and dangerous in accordance with the provisions of laws and regulations.
16) Coordinating the implementation of tasks, coaching, and providing administrative support to all organizational elements within BRIN.
17) Management of state property/wealth which is the responsibility of BRIN.
18) Supervision of the implementation of tasks within BRIN.

The “merger” of LAPAN into BRIN raised issues especially the unclear authority of the agency that can manage this space activity. Previously, Indonesia had LAPAN. However, after LAPAN merged into BRIN, its authority control became unclear. Before the merging process took place, LAPAN was the only non-ministerial government agency whose job was to carry out research and development of aerospace and its utilization, to become space organizers in Indonesia, and to represent the Indonesian government in international meetings related to space. Previously, LAPAN had clear duties to carry out aerospace research and development and its utilization, become a space operator in Indonesia, and represent the Indonesian government in international meetings. The space agency formed by the country is none other than for the same purpose, namely for the needs of outer space. With LAPAN's merging, the activities previously assigned to LAPAN became divided into various institutions. With so many institutions, the main issue that comes out of mind is that there is not clear who is responsible for space activities. However, this is not the case. Even other space agencies such as NASA, ESA, JAXA, have a history of being merged and each space agency has other institutions that help complement their tasks to achieve their main goal.

After merging occurs, the task of developing the space industry becomes divided. Currently, the organization responsible for conducting aerospace research and development is the Aviation and Space Research Organization. The organization is a research organization within BRIN and is responsible to the Head of BRIN. As regulated by BRIN, Research Organization for Aeronautics and Space (Organisasi Riset Penerbangan dan Antariksa/ORPA) has 7 research centers, i.e., Rocket Technology Center, Satellite Technology Center, Aeronautics Technology Center, Center for Remote Sensing Technology and Data, Space Science Research Center, Atmospheric Science Research Center, and Aerospace Standard Research Center. In addition to perform research, the centers will support the national space activities, especially those that have impacts on food security, natural resources management, disaster mitigation, urban planning, transportation (in context of space weather

service), and telecommunications (in context of ionospheric modeling service). Additionally, BRIN also formed the Indonesian Space Agency (INASA) whose task was to represent Indonesia at a number of international meetings related to outer space, a task that LAPAN previously carried out. The current process at BRIN is a considerable bureaucratic burden. In fact, with the previous decentralization of research institutions, research activities and implementation of space in Indonesia can be carried out in a clear, directed manner and provide ease of implementation (Putro and Nugraha, 2023).

According to Robertus Triharjanto, Head of Research Organization for BRIN, in principle there is no difference regarding the control of the space authority at LAPAN and at BRIN. This activity certainly does not become a burden for BRIN as the Space Law is one of the considerations for the Presidential Regulation Number 78 of 2021 concerning BRIN. This is proven by the fact that other services, such as remote sensing data services are still tunning as usual. Here's an example of other LAPAN tasks that are not ruled out due to the merged activity:

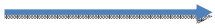
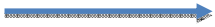
The Space Law		
Until 2021 Presidential Regulation Number 49 of 2015 **(LAPAN)**		Starting 2022 Presidential Regulation Number 78 of 2021 **(BRIN)**
Space Research		Aviation and Space Research Organization (ORPA); Infrastructure Deputy
Space Operation (Remote Sensing)		Center for Data and Information Technology (Pusdatin), Deputy for Infrastructure, Deputy for Regional Research and Innovation Agency, Deputy for Utilization, ORPA.
Space Policy		Deputy for Research and Innovation Policy, Deputy for Development Policy, Deputy for Facilitation
Space Diplomacy		INASA Secretariate
Space Education		Deputi Sumber Daya Manusia Ilmu Pengetahuan, ORPA

Figure 1. Change of Authority from LAPAN to BRIN

This table shows that even when the merge occurred, BRIN already consider to which activity might have the authority to fulfil with. LAPAN's duties in space research are now become the responsibility of the research organization and deputy for infrastructure. Space operation is now the responsibility of the data and information center, deputy for Infrastructure, and research operation. Space policy is now the responsibility of the deputy for research and innovation, deputy for development policy, and deputy for facilitation. Space diplomacy is now the responsibility of the INASA Secretariate. Space Education is now the responsibility of the deputy for human resources and research organization. So, it can be concluded that the task of LAPAN has never been lost, instead it has been strengthened by transferring responsibility to other institutions, but it is still under the responsibility of BRIN.

3.4 Comparison between the state practices

The following is a summary of the compilation of the commercialization of space responsibilities carried out by various space agencies:

NASA	ESA	JAXA	BRIN
1 Fostering the commercial space sector (including providing funding and support to commercial space companies). 2 Partnering with commercial space companies. 3 Regulating commercial space activities. 4 Providing space-based services and products.	1 Fostering the development of new commercial space technologies and services. 2 Promoting the use of the International Space Station (ISS) for commercial purposes. 3 Ensuring the safety and security of commercial space activity.	1 Regulating commercial space activities. 2 Providing launch services. 3 Promoting international cooperation. 4 Developing space-based services and products. 5 Promoting space tourism.	1 Provide research and development funding. 2 Promote international cooperation. 3 Develop standards and regulations.

Figure 2. Comparison of Space Agency's Responsibility for Commercial Space Activities

From the table mentioned above, BRIN does not have as many roles as other space agencies. As with space in general, BRIN provides research and development funds, encourages international cooperation and makes policies and regulations related to space activities. Given that Indonesia has not yet commenced its development of commercial space activities, it lacks extensive experience in this field. Consequently, Indonesia does not possess responsibilities as detailed as other space agencies. Meanwhile, NASA has more responsibilities than that, including partnering with commercial space companies whose activities include providing space-related services and products. ESA also has the responsibility to develop new technologies and services related to the commercialization of space, then support commercial goals by leveraging the use of the international space station and pay attention to the security aspects of space commercialization. JAXA also has a similar responsibility with additional regards to the promotion of space tourism. From this comparison, several inputs can be found for Indonesia to pay more attention to other matters related to the commercialization of space, including but not limited to the importance of promoting partnerships with other companies in services to be provided by the Institution, develop services, technologies, and products related to space also promote space tourism in order to support space commercialization activities.

It is important to understand that Indonesia has been preparing for the advancement of space utilization, as outlined in Presidential Regulation Number 45 of 2017 concerning the Master Plan for the Implementation of Space Affairs 2016-2040. The vision for space affairs outlined in this regulation is to establish an independent, progressive, and sustainable Indonesian space sector. To achieve this vision, the following missions will be pursued:

a. Enhancing research and development in the field of space and atmospheric sciences, as well as their utilization.
b. Strengthening the implementation of remote sensing.
c. Enhancing research, development, and enrichment of aviation and space technology, as well as their utilization towards national self-reliance.
d. Establishing self-sufficiency in spacecraft launches through the development of a spaceport in Indonesian territory.
e. Promoting commercial space activities by involving the domestic industry.

Regarding commercial space activities, Indonesia possesses a geographically advantageous position for the development of space launch businesses. Furthermore, Indonesia has experience in utilizing remote sensing imagery for commercial purposes and possesses space assets located and spanning across one-eighth of the equatorial region, providing high access to satellites. Based on its long-term roadmap (strategic long-term plan), Indonesia has the following plans for the period of 2016-2040:

Year	Target
Year 2015-2020	a. Availability of service industry in data processing and analysis that has been certified. b. The operation of STOL air transportation products by the national industry.
Year 2021-2025	Availability of the national aircraft industry with class 45-70 (forty-five to seventy) passengers.
Year 2026-2030	a. Able to provide services to design and build remote sensing satellites for national needs. b. Able to provide services for designing and building drones for national needs. c. Able to provide services related to the development of aeronautical technology.
Year 2031-2035	Capable of serving domestic satellite launch services into LEO orbit from Indonesia's launch station or spaceport
Year 2036-2040	a. The ability to provide domestic and foreign launch services to LEO orbit using its own satellite orbiting rocket from launch stations or spaceports in the territory of Indonesia. b. Able to serve and/or provide telecommunication services through national communication satellites

Figure 3. Indonesian Commercial Space Activities Roadmap for 2015-2040

The economic impact that can be generated by outer space is enormous. This is because the implementation will involve all actors, both public and private sectors who participate in the development, supply and use of multi-space products and services from research and development, manufacture, and use of space infrastructure, including ground stations, launch vehicles and satellites. to various space-based applications including navigation equipment, satellite telephones, meteorological services, as well as the knowledge generated from these activities. Indonesia has the potential to compete in the commercialization of space. BRIN has indeed fulfilled the requirements as a Space Agency that assists the development of Space activities. However, further arrangements regarding commercial space activity need to be further explored by this Institute. This requires a mandate from applicable regulations to be used by BRIN. So far, Indonesia has

formed a Draft Government Regulation which further regulates the authority and scope of the commercialization of space in Indonesia.

The government has supported the development of space in Indonesia, starting from providing the agency, plans, and mandated in national regulation. With these supporting tools, there must be limits on the extent to which the agency's authority is able to carry out their responsibilities. So, the question at hand is what kind of institution or agency is ideal for a country to carry out the commercialization of space. Indonesia itself can follow the example of agencies that already have experience in this field. These limits can be mentioned through the draft regulation that is being formed by the government. The Draft Government Regulation in question has not yet come into effect. The absence of regulation will constrain Indonesia's ability to attract foreign investment. What needs to be considered in this arrangement is the importance of setting the authority of the space agency which can support the targets that the State of Indonesia aspires to according to presidential regulations.

5. Conclusion

The issue in state practices of the space agency in various countries, NASA's primarily functions as a research and development organization and was not initially intended to serve as the government's regulatory authority. However, it is important to note that NASA's responsibilities extend beyond research and development and also encompass the commercial space sector. The Space Act, which established NASA, grants the agency the authority to not only conduct research but also engage in commercial activities such as purchasing, building, renovating, managing, and maintaining research facilities, labs, aircraft, spacecraft, and other real and personal property. In Europe, the ESA was established with a similar structure to NASA. ESA serves as the space agency for Europe and plays a crucial role in promoting and regulating commercial space activities. In addition to its involvement in space cooperation, space operations, and space policy, ESA places a strong emphasis on ensuring the safety and security of commercial space ventures. Similarly, Japan's space agency, known as JAXA, goes beyond research missions and actively promotes and supports commercial space endeavors. JAXA plays a significant role in industrial promotion, commercial promotion, and national security in the context of the commercial space sector. This highlights Japan's commitment to harnessing the economic potential of space and fostering a thriving commercial space industry. Overall, while these space agencies have their foundations in research and development, they also recognize the importance of commercial activities in the space sector. They actively engage in promoting, regulating, and supporting commercial space endeavors to harness the economic and technological benefits offered by space exploration and utilization.

The issue in state agency that managing space activities in Indonesia, LAPAN's responsibilities have been transferred to other institutions under the purview of BRIN. This transfer of responsibilities does not impede BRIN's ongoing research and development efforts in space activities. While BRIN has already taken on several essential space-related activities, the Indonesian space agency must consider aspects about the commercialization of space, drawing from the practices of other nations engaged in space launches. These aspects include overseeing spaceport construction, securing development financing, issuing launch licenses, promoting space tourism, developing space-based services and products, formulating safety regulations, and establishing other regulations that facilitate investment in space activities. Although Indonesia currently lacks a spaceport for initiating commercialization of space, the country must prepare adequate regulations as a proactive measure in anticipation of forthcoming activities. These regulations should align with the roadmap outlined in the Presidential Regulation.

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