Luminis Applied Science and Engineering
ISSN: 3030-1831
Vol 2, No 3
2025

Examining the Use of Artificial Intelligence in Space Technologies, Taking Into Account the Dimensions of International Law

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https://doi.org/10.69760/lumin.2025003005

Abstract; With the remarkable developments in space technologies, artificial intelligence has gradually been used instead of humans in decision-making. Artificial intelligence has the ability to think logically, manage its own actions, and correct decisions in the event of changes in external conditions. New smart space technologies are being developed with the aim of performing various space activities such as processing space data and information, removing space debris, extracting natural space resources, and exploring without human intervention.
However, the regulation of the activities of space actors, especially private actors, and the supervision of these activities by states in the use of these types of technologies has become one of the new issues in the field of international space law.
Since the obligations of States within the framework of international space law are explained on the basis of human behavior, in the face of monitoring the performance of intelligent space technologies and compensation for damage resulting from their performance, the question arises as to whether the existing international space regulations on the international responsibility of States for monitoring space activities and compensation for damage, which are based on human behavior, can also be applied to the use of these technologies, or should the regulations be A new space law should be developed.
With a broad interpretation of Articles 6 and 7 of the 1967 Outer Space Treaty regarding the responsibility of States for monitoring space activities and also the responsibility for compensation for damage, these provisions can still be considered applicable.
Nevertheless, it seems that the development of new international space regulations could be an important step in better defining and recognizing the responsibility of states to monitor the use of intelligent space technologies by space actors and to compensate for damages resulting from them.

***Keywords**: International Law, Artificial Intelligence, Space Technology, Liability*

Introduction

Artificial intelligence is a computer system that operates to some extent similar to the human mind and includes cognitive technology that imitates the human mind. To the extent that artificial intelligence can make decisions for humans, the role of the human agent becomes less important. Therefore, with the development of the use of artificial intelligence in new technologies, including space technologies, human intervention in decision-making has gradually decreased and artificial intelligence has gained the ability to make decisions instead of humans in various situations. (Abashidze et al., 2022:. 1)

Since the beginning of space activities, from the 1960s to the present, the use of space technologies such as spacecraft and satellites or the use of space robots in the extraction of natural resources Celestial missions have usually been carried out by astronauts who have human intelligence and behavior.

However, in recent years, there have been remarkable developments in space technologies, especially satellite systems and space-based services, which use artificial intelligence to make decisions instead of humans.

Since the nature of spacecraft provides a suitable platform for the development of artificial intelligence, and almost all space activities such as remote sensing and remote communications have the ability to use artificial intelligence, modern intelligent space technologies are currently being used for space debris removal, natural resource extraction in space, and exploration.

By using these technologies, better services in various fields, including transportation, smart city management, ensuring national and cybersecurity security, agricultural services, and monitoring climate change, are provided to the public.

Despite the benefits of using artificial intelligence in space technologies, with the expansion of intelligent space-based services, new challenges have emerged in the field of space activities. The use of technologies equipped with artificial intelligence for the purpose of exploring outer space, as well as participating in commercial space applications and services, will have unintended consequences regarding the obligations and responsibilities of States.

These consequences arise from the correct or incorrect use of such technologies and cannot be ignored. It is possible that due to inefficiency in the functioning of artificial intelligence, which makes decisions independently of humans, damage to life and property of people on Earth or in space could occur.

Also, the use of space-based applications equipped with artificial intelligence increases the possibility that the rights related to the privacy of individuals will be violated or the security of citizens will be jeopardized.

With the increase in the volume of data, spatial information and its processing through artificial intelligence, a lot of information is becoming widely available to the public. Among this information and data, confidential or private information of real and legal persons may also be disclosed without their consent.(Martin &.Freeland, 2020: 278)

Whereas the issue of State control over space activities and compensation for damage is clarified in international space law and the responsibility to prevent the commission of internationally wrongful acts under Article 6 and the responsibility to compensate for damage under Article 7 of the Convention on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967 (the Outer Space Treaty) requires a connection between It has been proven that negligence and damage are caused by human behavior. The question arises whether the responsibility for monitoring the activities of space actors, including private actors, can be specified and determined based on these regulations, while human behavior is reduced or completely ineffective with artificial intelligence decision-making.

In this article, current international space law and the possibility of applying international regulations to the challenges posed by the use of artificial intelligence in determining the responsibility of States for surveillance and compensation for damages will be examined. By interpreting these articles broadly, with regard to the competent State, responsibilities for space activities in space technologies that use artificial intelligence can also be determined for States.

Also, clarifying the responsibility of Contracting States in the use of space technologies that use artificial intelligence in treaty law could be an important step in international law. Be spatial.

International Space Law Approach to the Use of Artificial Intelligence

In general, the development of artificial intelligence in space technologies currently faces a lack of binding international regulations and has not yet been explicitly and directly addressed within the framework of space "hard law" and "soft law."

Space "soft law," which has played a significant role in regulating space activities in recent years, has not provided regulations or guidelines for dealing with states regarding liability for the use of artificial intelligence in space technologies. Although in 2018, issues related to the use of artificial intelligence technologies in space were raised as part of the activities of the Committee on the Peaceful Uses of Outer Space (COPOS), and the topic of the work order this year was specifically the use of artificial intelligence for processing satellite images, the examination of this issue was removed from the work order of this committee without any concrete results or legal achievements. Since then, the topic of artificial intelligence has not been included as a separate and independent topic in the COPUS agenda. (Report of the Committee on the Peaceful Uses of Outer Space, 2018)

The "hard law" of space, which has so far been ratified by the United Nations in the framework of five international treaties, governs space activities. Of these five treaties, four are international space treaties – namely, the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Spheres, 1967 (Outer Space Treaty), the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Abandoned in Outer Space, 1968, and the Convention on International Liability for Damage Caused by Space Objects, 1972 (Space Liability Convention). (1972) and the Convention on Registration of Objects Launched into Outer Space (1974) have been put into force, and the fifth treaty, the Agreement Governing the Activities of States on the Moon (and Other Celestial Bodies), (1978) has not yet been put into force, despite the passage of more than 45 years since its ratification (Mahulena, 2019, p. 32). (Masson-Zwaan & Mahulena, 2019: 32) These five treaties contain explicit provisions on the use of intelligent technologies. They are not artificial and only state general principles for all space activities.

In general, these general principles and rules mainly concern the following:

(1) The exploration and use of outer space shall be for the benefit of all States.

(2) Space shall not be subject to the national occupation and possession of any State and space activities shall be conducted in accordance with international law.

(3) Space activities shall be based on the principle of cooperation and the obligation to take into account The interests of other States in this regard shall be taken into account.

(4) States shall inform the general public and the scientific community of the nature, course, locations and results of their space activities.

(5) States shall be responsible for all national activities in the international arena and vis-à-vis other States and, in the event of damage, shall make reparation for the damage.

Among the principles mentioned, since the principle of responsibility enshrined in international space regulations and the There are no clear and transparent governments and regulations on AI issues in space technologies, especially in the area of liability, it can be argued that the starting point of the legal challenge should be the use of AI to adapt the rules and principles of liability to the performance of AI.

The use of AI systems in space activities will cause gradual changes from human analysis and selection with the help of computers and computer selection by humans to Information analysis and machine automation without the need for human performance, and decision-making and its implementation have been made independently by artificial intelligence. (Cuellar, 2017:. 30)

Challenges of International Space Responsibility

The deployment and use of artificially intelligent space objects by new space actors in space has raised the issue of how to assign international responsibility to contracting states; Because the principles of liability in these treaties on issues such as surveillance of space activities, compensation for damage to property and persons, and ultimately the disclosure of data and information of individuals and the violation of their privacy in space activities are based on human-centered behavior, and their application to behavior based on artificial intelligence requires new examination. (Stewart, 2019: 2)

To respond to this new challenge, it is necessary to first examine existing international space law. It should also be clarified whether existing international rules on liability are also applicable to the consequences of the use of artificial intelligence.

Liability for the supervision and regulation of space activities

The 1967 Outer Space Treaty of the United Nations recognizes States as internationally responsible for space activities. Article 6 of the Outer Space Treaty states that "States Parties to the Treaty have an international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried out by governmental agencies or non-governmental entities, and to ensure that national activities are carried out in accordance with the provisions set forth in the present Treaty."

Activities of non-governmental organizations in outer space, including the moon and other celestial bodies, shall require the authorization and continuous supervision of the appropriate State Party to the Treaty.

Whenever an international organization carries out activities in outer space, including the moon and other celestial bodies, the responsibility for compliance with this Treaty shall lie with that international organization and with the States Parties to the Treaty participating in that organization.

According to Article 6 of the Outer Space Treaty, it is the international responsibility of States to supervise space activities, whether these activities are carried out by a State or by a private entity under the jurisdiction of a State. Two essential elements, namely the issuance of the necessary permits and the supervision of space activities, play a fundamental role in attributing responsibility to States.

The activities of private companies in outer space will require authorization from and ongoing supervision by a Contracting State that has the necessary authority for this responsibility.

Indeed, States have been recognized as the main players in space activities, regardless of whether the space activities are scientific or commercial in nature and whether they are governmental or private. States that are parties to the treaty undertake to issue licenses for the space activities of their companies in accordance with national laws and to continuously monitor their performance. (von der Dunk, 2015:. 1)

On the one hand, it follows from Article 6 of the Outer Space Treaty that States are obliged to monitor the performance of their public and private sectors on the basis of the occurrence of internationally wrongful conduct and unlawful acts.

International law is violated by any Contracting State when space activities of its public or private entities are carried out without a valid license or when the Contracting State does not maintain continuous surveillance of space activities. On the other hand, it is inferred from the contrary meaning of this article that a State that properly and effectively implements a licensing and surveillance regime for its domestic entities is not held responsible.

Therefore, the non-realization of the responsibility of a Contracting State is proven when it is proven that, despite the necessary supervision of space activities by the State, the activities that have caused the damage were carried out by the private sector illegally and without authorization in the territory of that State or under the jurisdiction of a third State.

It is also inferred from Article 6 of the Outer Space Treaty that the doctrine of wrongful act allows a claim of liability against a State that has failed to fulfill its obligation to authorize and supervise space activities within its jurisdiction, even if no damage has been caused. Under this article, sufficient evidence is found for the international responsibility of a State that authorizes space activities under its jurisdiction without proper and reasonable supervision.

Therefore, the space law treaty regime does not impose any direct obligations on non-governmental entities. In return, it assigns all responsibilities and obligations to space actors, i.e., states, and states that the space activities of non-governmental organizations are subject to limited state oversight and that the treaty regime does not apply directly to the private sector.

Therefore, if space actors do not conduct space activities under the supervision of their own State and conduct space activities under the authority of a third State, the question arises as to which State – the State of those actors or the third State – bears the international responsibility of these private space actors (Cheng, 1995:307). In international space law, in the case of liability for compensation for damage or liability for the registration of a space object, the State The launcher is recognized as the responsible State in the 1972 Liability Convention and the 1974 Convention on Registration of Space Objects, respectively.

However, this term is not used in Article 6 of the Outer Space Treaty, which deals with the supervision of space activities. This article refers to the “appropriate State or competent State” and requires it to ensure that the space activities of its governmental and non-governmental entities are in accordance with the Outer Space Treaty.

Since neither this article nor any other article of the treaty regime on space law defines the term “competent State”, there is no agreed legal standard for determining the “competent State”. Of course, with a narrow interpretation based on the two Liability Conventions and the Registration Convention, the launching State can be considered the same as the competent State, while with a broad interpretation, the competent State can be extended to States that are more suitable for supervising their subordinate institutions, even though they are not the launching State. (Cheng, 1998:. 7)

The Contracting State shall also exercise its responsibility for the supervision of the intelligent space object under the standard of care. The Responsible State shall ensure that it has issued the necessary authorization for an intelligent space object launched by a non-State entity and has exercised appropriate supervision over its activities, whether or not it is owned or operated by one of its nationals. Therefore, by analyzing the standard of care for the occurrence of a specific event that caused the damage, the answer to the question of whether the competent government has issued the necessary permits for the activities carried out by the intelligent space object and has exercised sufficient supervision over it or not is different.

Here, if a state’s public or private sector plays a role in the use of artificial intelligence in space technology and is not the launching state, this state can also be held liable based on a broad interpretation, even though

it is not the launching state. However, if only the launching State is held internationally responsible, new rules must be established in space law. (Dennerley, 2018: 281)

Therefore, compliance with the standard of care of the competent State requires ensuring that that State issues a permit and monitors space activities carried out using an intelligent space object. Compliance with this standard is an expression of the provision of a flexible standard in space law.

The obligation to "due care" is not an obligation to achieve a specific result. Rather, it is an obligation of conduct and of means that requires a contracting state to exercise sufficient and necessary diligence to prevent harm or injury to another state or its nationals. Violation of this duty is not limited to the actions of the state, but also includes the conduct of its own citizens (Messerschmidt, 2013:. 303).

However, based on flexible standards of oversight, it seems that the performance of the intelligent space object determines whether or not human intervention or oversight is needed and, if so, what is the appropriate degree and extent of such oversight.

The flexibility of the standard of supervision is in line with the approach generally recognised by the European Commission (EC) on AI. (European Commission, White Paper on Artificial Intelligence, COM, 2020)

The EU's position is that human supervision is a necessary component of the use of AI, arguing that human supervision ensures that "the AI system does not undermine human autonomy or create other adverse effects." "Human oversight" requires appropriate human(s) participation, which may vary depending on the "intended use of the AI system" and its impact on individuals and legal entities, "if any." The European Union has also identified some manifestations of human oversight in the use of AI, including:

(1) Reviewing and validating AI decisions before or immediately after the decision is made.

(2) Monitoring the AI system while it is operating and being able to intervene in real time and deactivate the AI system.

(3) Implementing operational constraints to ensure that certain decisions are not made by the AI system. Artificial.

According to the above, the European policy on providing a flexible framework for the specific issue of artificial intelligence in space technology could be a model for the future use of explicit international space law.

This approach determines whether the competent State's performance is consistent with its standards of oversight in the case of a non-State intelligent space object that has caused harm in outer space. The standard could, by hypothesis, be "due care" and supervision for the liability of the armed State for damage caused by an intelligent space object. This flexible standard allows the launching State, which is held liable in contractual cases, to argue that the State of origin of the non-State space actor has a greater role and responsibility than the launching State.

Accordingly, the launching State can deny liability on the grounds that the State whose citizens are using the space object The State Party that has an effective role should exercise due diligence in issuing adequate licenses and oversight.

This shifts the oversight obligation from the launching State to the home country of the non-State space actor. Failure by the space actor's State Party to properly implement due diligence standards in this regard may, depending on the circumstances, result in exemption or reduction of the liability of the launching State Party.

Liability for Compensation

According to Article 7 of the Outer Space Treaty, in the event of damage caused by space activities, the damage must be compensated by the responsible State to the injured State. Article 7 of the Treaty states that "any State Party to the Treaty which launches or causes to be launched an object into outer space, including the moon and other celestial bodies, and any State Party from whose territory or installations an object is launched, shall be liable for damage caused by the said object or its constituent parts on the earth, in the air or in outer space, including the moon and other celestial bodies, to any other State Party to the Treaty or to its actual or legal nationals." Internationally, it is responsible."

The basic rules in Article 7 of the Outer Space Treaty of 1967 regarding liability for damage are set out in detail in Articles 2 and 3 of the Convention on International Liability for Damage Caused by Space Objects of 1972. However, Article 7 of the said Treaty is very general and does not specify on what basis compensation should be awarded.

According to the appearance of Article 7 of the said treaty, it is inferred that the launching State has absolute responsibility. The above-mentioned Liability Convention has explained the subject of liability for compensation for damage in a comprehensive manner and has distinguished the basis of liability for damage caused in outer space from damage caused on the ground and in the air, and has made the criteria for liability the place of occurrence of the damage, i.e. the surface of the earth and the air above the earth on the one hand, and outer space, such as orbits or celestial bodies, on the other hand. (Lee, 2003:. 4)

Article 2 of the Liability Convention 1972 states that "the launching State shall be fully liable for damage caused by its space object to the surface of the earth or to aircraft in flight." Also, Article 3 of the Convention expressly states that "where damage is caused in a place other than the surface of the Earth to a space object of the launching State or to persons or property on board that space object by a space object of another launching State, the latter State shall be held liable if the damage is caused by the fault of that State or by the fault of persons for whom it is responsible."

According to the two articles above, liability is based on strict liability (or specific liability) for damage caused by a space object to property and life on the ground or to aircraft in flight, and liability based on fault is recognized for damage caused by a spacecraft in outer space or to a celestial body such as the moon.

Furthermore, the Convention emphasizes that the responsibility for compensation lies solely with States; Because non-state actors cannot be held accountable under international space law. With the development of space technologies and the use of artificial intelligence in them, the potential for activities in the dangerous environment of outer space has become even more complex, such that the attribution and enforcement of liability for damage resulting from the use of space technologies that use artificial intelligence is challenged under Articles 2 and 3 of the Liability Convention.

Attribution to artificial intelligence should replace attribution to the behavior of individuals who have played a role in the breach of obligation and liability, and the question will arise as to whether the provisions contained in the Outer Space Treaty and the Liability Convention can also be applied to the breach of obligations and damages caused by artificial intelligence

Absolute Liability

According to Article 2 of the Liability Convention, if a space object causes damage to persons or property on the surface of the earth or to aircraft in flight, absolute liability lies with the launching State.

By accepting the principle of absolute liability, which usually deprives the responsible individual of any right of defense, there is no difference between damage resulting from an artificial intelligence decision and

damage resulting from human behavior, and the launching state must compensate for the damage caused without resorting to the right of defense.

However, the Liability Convention still recognizes the right of the launching State to “effectively compensate for damage caused by the negligence, fault or recklessness of the injured party”. According to Article 2 of the Liability Convention, launching States are fully liable for damage caused by their space objects on the surface of the Earth.

At the same time, in these circumstances, there is no obstacle to the legal prosecution of countries that use artificial intelligence technologies and are not the launching State. The complexity of the issue becomes apparent when such liability is to be established within the framework of Article 6 of the Liability Convention, which states the abolition of the strict rule of Article 2.

This article states that if “the launching State establishes that the damage was caused in whole or in part by gross negligence or by an act or omission of the claimant State or of natural or legal persons acting on its behalf with intent to cause damage, the claimant State cannot rely on the damage caused by the claimant State, since the claimant itself played a significant role in causing the damage.”

It is practically impossible to exclude liability for damages caused by a space object equipped with artificial intelligence, because gross negligence is conduct that occurs by a human being, not a machine. The concept of “gross negligence” is not defined by the Convention and only refers to the “standard of care”.

Some scientists conclude that “gross negligence” is, above all, a personal criterion and the result of the activity of the human mind, which in principle cannot be matched by the characteristics of a machine.

Therefore, in the absence of clear criteria for expressing the "standard of care" and taking into account the fact that it has been established depending on the level of scientific and technological progress, the implementation of the relevant provisions in the Convention on Liability for Space Technologies Using Artificial Intelligence is accompanied by great complexity, and it seems that new rules should be established in international space law..

Liability based on fault

Article 3 of the Convention establishes liability for various activities in outer space as being based on fault, but does not provide a definition of the concept of “fault”. There are no clear criteria for assessing fault, and countries broaden or narrow this definition based on their own legal systems. It is relatively difficult to prove fault in the event of a collision between two spacecraft in outer space, and so far, no known case of damage in outer space due to a collision between spacecraft has been cited under the Liability Convention. (Long, 2014: 8)

Now, the extent to which the use of artificial intelligence has led to damage and injury in outer space must be added to the difficulty of using artificial intelligence in technology in the event of a collision between two spacecraft.

If the limits and scope of the interference of artificial intelligence are determined and its interference is less than the usual limit, the state that controls the spacecraft will be held liable under the Liability Convention. In other words, it is important to determine at what stage and to what extent artificial intelligence has been used in such technologies in the conduct of space operations.

Damages resulting from decisions made by AI or arising from data generated using AI technologies should be eligible. This depends on determining the extent of the direct and substantial impact of AI on space activities.

The term “persons” used in Article 3 of the Liability Convention also raises questions regarding the use of AI in space technologies. The term “person”, as used in Article 3, usually refers to an entity, such as a natural or legal person, having legal rights, duties and obligations.

In interpreting Article 3 of the Convention, the responsibility for compensation for damage caused by a group or class of individuals must be assumed by the launching State. In a broader sense, this responsibility includes all individuals and all types of space activities.

Generally, we refer to an individual or person as a human being. In the context of law, the term “person/individual” generally refers to an identity and nature that is subject to legal rights and duties. Legal rules grant legal persons to companies and legal entities and subject them to duties and rights. In addition, in some specific cases, the law formally recognizes legal rights and obligations for some inanimate objects such as ships, lands and goods, and grants them rights and imposes duties on them that are subject to judicial jurisdiction and also to rulings against them.

However, in all cases of the aforementioned, the legal rights and duties imposed on artificial entities such as corporations or inanimate objects arise from acts or conduct performed by humans. The question now arises as to whether this basis should be extended to the issue of artificial intelligence (Solum, 1992: 1235).

The position of rights and obligations on persons is not necessarily true with regard to actions or behavior that are performed based on machine intelligence. A machine can learn independently of human information and behavior and make decisions based on the learning and information available, but this ability is necessarily accompanied by the acquisition of personality. Real or legal is not equal to him.

Decisions and behavior of individuals, both real and legal, are ultimately decisions made by humans; in this sense, decision-making is not based solely on reason or data, but is the product of various factors of human behavior such as consciousness, emotions, and choices. In the event that decisions and behaviors based on artificial intelligence are outside the scope of human supervision and management, without taking into account the factors Various human behaviors such as consciousness, emotions, and willpower, would be difficult to attribute to human behavior (Karnow, 1996: 190).

Therefore, since fault-based liability, under Article 3 of the Convention on the assumption of State fault, is based on the behavior of natural or legal persons, decision-making by an intelligent space object may not be attributable to “fault of individuals.”

Accordingly, the assessment of liability The liability based on fault, under this Article, in respect of a decision taken by an intelligent space vehicle depends on whether such decision-making can be attributed to the launching State or the armed State. The liability based on fault of a Contracting State should not be based solely on the decision to launch the intelligent space object; since the acceptance of such a broad basis for liability is essential in the development and deployment of intelligent space objects and Their use in space will have an impact.

Therefore, the question of liability in these circumstances depends on the answer to the following question: When the damage is caused by an intelligent space object and human control is not involved in the occurrence of that damage, what conduct is necessary to attribute fault-based liability to a State (Kowert, 2017: 183)?

In view of the above, since Article 3 of the Convention does not establish liability for “fault of the State” or “fault of individuals”, It is difficult to determine how a decision made by an intelligent space object can be considered at fault.

In the event of a collision between two spacecraft, it would be quite problematic to determine the liability of the launching State for damage caused by such an object acting completely independently. To solve this problem, it is necessary to consider innovative and complex issues concerning the standard of care, foreseeability of danger and damage, and proximate cause. Damages arise and the essential elements for establishing damages in liability cases should be analyzed with regard to the issue of artificial intelligence and it should be clarified how an intelligent space object can make decisions without the need for human action.

Responsibility for data protection and privacy

In general, one of the main concerns of space law in recent years has been the sharing of data and information of individuals in space technologies, which is likely to lead to a violation of the privacy of members of society. For example, data obtained through Earth observation can be analyzed using intelligent facial recognition technologies and combined with location data and data obtained from security cameras, and ultimately this information can be disclosed. Therefore, the issue of maintaining their confidentiality and preventing access to them without the necessary permissions, as well as, if these matters are ignored, compensation for damages, is seriously raised.(Soroka & Kurkova, 2019: 135)

In space management, the use of artificial intelligence puts the identity of individuals at greater risk. For example, very high-resolution imaging satellites are used to scan landscapes and streets, inspect them, record and capture images of buildings, cars, etc. for various purposes, including public advertising.

Users of these images may identify the observed areas or individuals in their vicinity. They are aware of and can recognize them and their movements, as well as their social patterns, and misuse this information. The real danger of placing this information in an unprotected location and the possibility of misuse of this information for any possible and unpredictable purpose and reason is

Active and advanced satellites can process data and information about people on the active satellite itself in orbit, without These satellites would need to be processed by humans at centers on the ground. In this case, only ground-related information would be transmitted, thus not only saving on communication costs with the ground and vice versa, but also allowing ground analysts to focus on the information that is most important.

Specialists could develop algorithms using artificial intelligence to analyze data, recognize images, and automatically correct and provide users with the ability to track individuals' assets and any kind of movement in any country. Therefore, with the use of artificial intelligence in data processing, the risk of misuse of data and spatial information increases.

Also, the use of artificial intelligence in space technologies by government agencies for extensive surveillance is of great importance for ensuring security. Thanks to satellite images, illegal cultivation of drugs in farms can be seen and Legal institutions can take legal action against violators based on evidence. However, these uses may violate laws related to the protection of personal data and information.

The use of these spatial data and information can violate human rights, especially in cases of discrimination and when there is arbitrary intervention by state and non-state institutions, and no trace of human activity can be found that can attribute these actions to him.

According to the above, the issue of The management and supervision of non-disclosure of information and the correct and lawful use of space data and information, and the exercise of State responsibility for the protection of individuals' privacy within the framework of State responsibility for monitoring space activities and compensation for damage, should be reviewed from an international perspective. On the one

hand, existing international regulations, in particular Articles 6 and 7 of the Outer Space Treaty, 1967, should be adapted to these conditions to determine whether they are applicable to these conditions or not. No, and, on the other hand, due to the importance of the issue, new specific regulations should be established for the use of data and information generated by space technologies equipped with artificial intelligence in order to eliminate legal gaps. (von der Dunk, 2013: 249)

First, to cover the liability of states against surveillance and damages caused by artificial intelligence decision-making regarding data and information generated by space technologies, the regulations contained in international space treaties should be

As stated above, Articles 6 and 7 of the Outer Space Treaty, without exception or condition, impose international liability on the launching State or the launching State. Therefore, in the event that the operation of intelligent space technologies is incompatible with the launching State or the registering State of the space object, international liability rules are applicable.

However, as stated in the previous section, these space treaties do not provide for liability based on fault. In the absence of human intervention, damages are not foreseeable and, in order to ensure liability for data surveillance and invasion of privacy, it may be necessary to pursue and consider other means of compensating for damage caused in space by an intelligent space object.

If a claimant State seeks compensation for damage or injury caused by an intelligent space object that falls within the meaning of "damage" as defined in Article 1(a) of the Liability Convention, 1972 It is not stated, such as damage resulting from the publication of data and the violation of the privacy of individuals, may be remedied by a broad interpretation of Article 7 of the Outer Space Treaty, because this article does not limit damages to material damages.

The 1972 Liability Convention expressly states that one of the main purposes of its codification is to establish rules and procedures relating to liability for damage caused by space objects, but the Convention does not claim that its rules and procedures should be excluded when assessing liabilities arising from means other than the Liability Convention.

Neither the Outer Space Treaty nor the Liability Convention precludes compensation for damage under Article 7 of the Outer Space Treaty. This is of great importance in view of the general principle of international law that "What is not prohibited is permitted."

In other words, in a particular case, it is not necessary to indicate the rules of permissibility as long as there is no prohibition. If, under Article 7 of the Outer Space Treaty, compensation for damage is not available under the Liability Convention, the interpretation of Article 7 of the Outer Space Treaty provides sufficient flexibility to address issues related to liability for the operation of intelligent space objects to address liability for the surveillance of their activities, as well as potential damages from disclosure of information and violation of the privacy of individuals. It will happen. (Tricot & Sander, 2010: 323)

Despite the broad interpretation of Article 7 of the Outer Space Treaty to protect individuals and their privacy, new international rules and regulations are needed; because clear and transparent rules can help resolve disputes between States regarding liability and compensation for damages.

Currently, there are no separate rules and regulations to address issues related to the use of artificial intelligence. In the processing of data and information, some legislators at the regional and national levels have developed guidelines that can be used as a model in space law to deal with artificial intelligence decision-making at the international level.

As mentioned earlier, one of the important and noteworthy documents is the General Data Protection Regulation in the European Union, which came into force in 2018 (Shaping Europe's digital future, "A European Strategy for data").

European Strategy for the Use of Artificial Intelligence in In addition to providing information to create an agile, secure and dynamic economy in the world and to improve decision-making and provide a better life for all citizens, technologies are set to define a supervisory framework for the future by creating a "trust/assurance ecosystem". To do this, it is necessary to ensure compliance with EU law, including the laws protecting fundamental rights and consumer rights, in particular regarding systems Artificial intelligence has been described as high-risk. Therefore, EU regulations focus on building trust between consumers and various stakeholders in the field of artificial intelligence and informing them about the risks of artificial intelligence (European Commission, White Paper on Artificial Intelligence, COM, 2020). The United States is also among the technologically advanced countries that are trying to formalize legal measures against AI-related events and regulate such measures. Compile. Generally, legal actions for damages caused by a device or machine are recognized as a form of negligence on the part of the owner or user, and are based on the theory of producer liability, which requires human intervention to be established.

It seems logical to hold the producer liable for defects in design or construction of software and failure to warn of foreseeable harm. Design Defects A product or technology is defective when there is a risk of foreseeable harm and the designer could have avoided that risk or reduced the likelihood of that risk by using a reasonable alternative design. A defective manufacturing design occurs when a product is not manufactured to specifications and standards. Accordingly, negligence also occurs when the responsible party fails to properly follow "instructions for the safe use of software." (Giuffrida, 2019: 440)

Conclusion

The use of artificial intelligence in space technologies in enhancing its applications is undeniable. The development of artificial intelligence technologies creates unprecedented opportunities for space exploration and the implementation of new types of space activities.

However, space objects launched into space by governments and private players are becoming increasingly technologically sophisticated and increasingly equipped with artificial intelligence technologies that enable space technologies to operate without human intervention. Such devices are used in particular to monitor the performance of satellites, act as assistants to astronauts, and conduct research when conditions are dangerous to humans.

The use of space technologies equipped with artificial intelligence will be accompanied by unintended consequences that arise from the use or misuse of such tools. Just as the use of artificial intelligence can be very useful and beneficial for the provision of social services, the use of this technology for the wrong purposes or by the wrong people can also cause significant damage to governments and people.

Space law should seek to address issues of oversight of the performance of artificial intelligence in space technologies, as well as liability for harm caused. Harm can be both material, such as endangering the safety and health of individuals, loss of life, damage to property, and non-material, such as violation of privacy, restrictions on the right to freedom of expression, human dignity, or discriminatory actions in various matters.

In addition to the responsibility for monitoring activities and liability for damages, space law should also address the monitoring of data and information storage, as well as the protection of individuals' privacy; in particular, the lack of a specific monitoring framework for non-state space actors, who often do not pay attention to individuals' privacy, could seriously harm the regulation of space activities in the future.

The mandatory space treaties do not explicitly address the use of AI, and no other international space regulation addresses the use of AI in space. The lack of international regulation on AI creates complex and potential problems regarding the applicable law in resolving disputes between States over liability for the use of AI in space technologies. If the use of artificial intelligence in space activities or a space object causes damage to another space object that is identifiable under the Convention on International Liability for Damage Caused by Space Objects, it is unclear whether the substantive rules and regulations that are used to determine issues related to the resolution of the level and quality of the claim, such as the standard of care and what constitutes fault-based liability, would be applicable.

According to a broad interpretation of Article 6 of the Outer Space Treaty, the responsibility of States in international space law is considered within the framework of surveillance based on the standard of "surveillance and oversight." A Contracting State must also exercise its responsibility for surveillance over a space object that uses artificial intelligence, according to the standard of surveillance.

The responsible State has a duty to ensure that the necessary authorization is issued for the launch of an intelligent space object by a non-state entity and to supervise it; if a State's space actor plays a role in the use of artificial intelligence in space technology, this State can be held liable based on a broad interpretation.

Compliance with the standard of due diligence requires that the competent State ensure that the necessary authorization is issued for space activities carried out using an intelligent space object and that that State supervises those activities.

The subject of compliance with this standard is the provision of a flexible standard in space law. The obligation to "due diligence" is a behavioral obligation that a Contracting State must take supervisory measures to prevent harm to another State or its nationals.

Also, in order to determine the liability of States for compensation for damage, with a broad interpretation of Article 7 of the Outer Space Treaty, in addition to establishing the absolute liability of States for damage to property and persons on the ground and on aircraft caused by their intelligent space technologies, States can be held liable for the conduct and performance of natural and legal persons based on the fault of which their intelligent space technology has caused damage in outer space. The determination of liability for damage caused by an intelligent space object in outer space is related to the ability to attribute fault-based liability to a State.

As mentioned, in addition to the possibility of a broad interpretation of Articles 6 and 7 of the Outer Space Treaty of 1967, it is possible to model the national space laws of some countries and encourage other countries to adopt this type of laws. European policy-making on the specific issue of artificial intelligence in space technology could be a model for the explicit use of international space law in the future.

This approach aligns the armed state's performance with its standards of care in the event of an intelligent space object causing damage in outer space. Arguably, a "due care" and oversight standard could be adopted for the armed state's liability for damage caused by an intelligent space object. This flexible standard allows the state of the primary space actor to be held liable.

Since these regulations lack the clarity and transparency necessary to address the issue of artificial intelligence, and Contracting States do not play an effective role in decision-making on artificial intelligence in space technologies, given the growth of private sector space players, it is desirable for the international space community of States to develop specific regulations within the framework of soft space law, i.e., guidelines and resolutions, and to encourage Contracting States to follow their example. Develop and implement national space regulations related to the oversight of space actors that use artificial intelligence in their space technology, and then, after establishing a specific procedure in the national space

laws of countries, international space institutions, such as COPUS, develop international regulations to establish the responsibility of the state responsible for overseeing the performance of the space actor.

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Received: 07.19.2025
Revised: 07.20.2025
Accepted: 07.26.2025
Published: 08.04.2025