

A Study of the First Taiwan's Space Law: Space Development Act

Feng-Tai Hwang *

Abstract

In the end of 2019, a controversy over the launch of a sounding rocket by a domestic commercial company in Taiwan attracted the attention of many Taiwanese media and the public. Through this event, the public realized that Taiwan had no regulations related to space activities.

As a response to this situation, the Ministry of Science and Technology (MOST) drafted the "Space Development Act" (SDA). This SDA was passed by the Legislative Yuan on May 31 of 2021, marking an important milestone in the history of Taiwan's space development.

Through the SDA, Taiwan expresses its position of the space development based on principle of peaceful use to the world and demonstrates the government's determination to promote the space industry to its citizens. This paper introduces the Taiwan's space development, the background of the development of Taiwan's national space law, as well as the contents of the SDA.

Keywords: National Space Law, Space Development Act

1. Introduction

Taiwan's space development has been 30 years since the establishment of National Space Organization (NSPO) in 1991. In the past, Taiwan's space development mainly focused on the establishment of space infrastructure, the development of space technology and the implementation of satellite programs, and seldom paid much attention to the legislative work of the national space law.

With the advancement of science and technology, Taiwan's space development has gradually expanded from institutional space to commercial space development. In 2019, a private rocket company conducted a sounding rocket test activity in southern Taiwan, causing controversy. Now Taiwanese are aware that Taiwan lacks a space legal system to regulate its booming civilian space activities. In order to solve the problem of the lack of domestic space law, Taiwan successfully completed the Space Development Act (SDA)

* National Space Organization, Hsinchu City, Taiwan.

legislative process in 2021 under the high consensus of the ruling party and the opposition parties.

This paper first introduces the Taiwan's space development, and then explains the history and background of the development of Taiwan's national space law, and finally illustrates the contents of the SDA, with particular emphasis on the mechanisms for ensuring space security and sustainable development in the process of Taiwan's space development.

2. Space Development in Taiwan

Taiwan's space development can be traced back to the 1960s, when Taiwan established a Geostationary Orbit (GSO) satellite ground station in Taipei for satellite TV broadcasting service. However, the actual launch of the space program was not until the 1990s. In 1991, Taiwan started its first phase of the National Space Science and Technology Development Long-term Plan (1991~2006) (referred to as the National Space Plan), and established NSPO, an organization for space development in Taiwan. At this phase, Taiwan completed its space infrastructure, and acquired FORMOSAT-1 scientific satellite from the United States, FORMOSAT-2 Earth Observation (EO) satellite from France, and 6 FORMOSAT-3 weather satellites using radio occultation technique from the United States. In the second phase of the National Space Plan (2004-2018), NSPO began to develop its first reliant high resolution EO satellite FORMOSAT-5 from satellite mission planning to satellite design, assembly and test. This satellite project lasted for nearly 10 years, and this satellite successfully launched in 2017. Through the FORMOSAT-5 project, Taiwan demonstrated its capability to develop a high-resolution EO satellite using domestic technologies. At this phase, Taiwan also launched several sounding rockets to perform sub-orbital scientific experiments.

Taiwan's third phase of the National Space Plan (2019-2028) was officially approved by the Executive Yuan in early 2019, with a total budget of approximately New Taiwan Dollar (NTD) 25.1 billion. During this phase, Taiwan will establish 3 EO satellite systems, including: (1) 6 high-resolution optical EO satellites, (2) 2 ultra-high-resolution optical EO satellites, and (3) 2 Synthetic Aperture Radar (SAR) EO satellite. In addition, at this phase, Taiwan will also challenge the outer space exploration mission to pave the way for subsequent space development. After the approval of the third phase of the National Space Plan, the government also initiate a top-down project, so called Beyond 5G (B5G) satellite communication project to response the global LEO satellite communications industry development. The project includes the development of 2 experimental communication satellites and the development of ground communication equipment.

Except for the traditional space development, some entrepreneurs in Taiwan also seized the wave of NewSpace and established commercial space

companies. In the early days, there was only Gran Systems. However, in recent years, more private commercial space companies were established, such as TI Space, Odysseus, Trident Pacific, HelioX Cosmos and Tensor technology. Table 1 lists information of commercial space companies in Taiwan.¹

Table 1. Business of Commercial Space Companies in Taiwan

Company Name	Established Year	Business
Gran Systems	2008	CubeSat deployer Space education Launch service broker
Odysseus	2016	Satellite & innovative deep space solution Launch service broker
Ti Space	2016	Launch vehicle, Sounding rocket Launch service
Trident Pacific	2017	Satellite Image Value-added Service
HelioX Cosmos	2018	Launch service broker Space architecture Space education
Tensor Technology	2019	Attitude control component

After 30 years of space development, commercial space has gradually begun to develop in Taiwan. It is believed that more and more private enterprises will invest in the development of space industry in the future. Therefore, more importantly, Taiwan needs domestic space laws to regulate increasingly active private/commercial space activities.

3. Legislation History of Taiwan's Space Law

3.1. Space Law Study Period

Taiwan didn't have systematic studies on space laws until 2014. Some major events related to space law studies are listed below:

- In April 2014, NSPO commissioned Professor Huang, Chu-Cheng from National Tsing Hua University (NTHU) to conduct research on the legislation of National Space Law.

¹ F.-T. Hwang, S.-Ning Chen, A Proposed Approach for NewSpace Industry Development in Taiwan, IAC-20-E3.3.5, 71st International Astronautical Congress – The CyberSpace Edition, 12-14 October 2020.

- In September 2014, the draft of the “National Space Basic Law” was completed by NSPO with Professor Huang’s team.² NSPO held a domestic seminar to discuss this draft in order to gather consensus among stakeholders
- In November 2015, Professor Huang, Chu-Cheng, invited by the Republic of China (ROC) Society of Aeronautics and Astronautics, gave a report on the “National Space Basic Law” at the Aerospace Regulation Forum, promoting the issues of domestic space law to the people from the aerospace field.
- In October 2017, the revised version of the “National Space Basic Law” was completed by NSPO with domestic lawyer team.
- In December 2018, the draft of the “Space Activities Management Act” was completed by NSPO with Professor Huang’s team.³

During this period, a series of research on space laws were also conducted in NSPO, and the topics include “A comparative analysis on satellite remote sensing laws” in 2018,⁴ “A study on registration convention and Taiwan’s satellite registration issues” in 2019,⁵ and “A study on the issues of liability convention and space insurance for Taiwan’s space development and space law” in 2020.⁶

These studies on space law played an important role in subsequent legislation, and these research results were later used as an important reference for the government when drafting SDA.

3.2. Space Law Legislation Period (2020-2021)

The controversy arising from the test launch of sounding rocket by domestic private companies in the southeast of Taiwan from the end of 2019 to the beginning of 2020 highlighted the dilemma of Taiwan’s lack of space-related regulations. This event also triggered an opportunity for Taiwan to accelerate the legislative process for the national space law. Some major milestone for domestic space law legislation are marked according to the chronicle.

- On April 10, 2020, a draft of SDA (Su version) was proposed by Su, Chiao-Hui, a legislator from the ruling party-DPP.

2 C.-C Huang, Research and Analysis of Taiwan's National Space Basic Law Legislation, NSPO Internal Report, 2014. (in Chinese)

3 C.-C Huang, Research and Analysis of Taiwan's Space Activities Law Legislation, NSPO Internal Report, 2018. (in Chinese)

4 F.-T Hwang, S.-C Chou, A Comparative Analysis on Satellite Sensing Laws, 2018 Conference on Survey and Geoinformatics, 2018. (in Chinese)

5 F.-T Hwang, C.-J Fong, A Comparative Analysis on Satellite Sensing Laws, 2019 AASRC, 2019. (in Chinese)

6 F.-T Hwang, A Study on the Issues of Liability Convention and Space Insurance for Taiwan’s Space Development and Space Law, 2020 AASRC, 2020. (in Chinese)

- On October 20, 2020, a public hearing on “Space Law Legislation and the Development of Taiwan's Space Industry” was held by the legislative office of Su, Chiao-Hui.
- On October 23, 2020, a draft of the government version of SDA (MOST version) was issued for preview by the MOST.
- On February 18, 2021, the draft of the SDA, proposed and modified by the MOST, was passed through the Executive Yuan.
- On April 8, 2021, the draft of the SDA was review through answer-to-inquiries process by the Education and Culture Committee of the Legislative Yuan.
- On April 22, 2021, a public hearing on the SDA was held by the Education and Culture Committee of the Legislative Yuan to collect more opinions, comments, and suggestions from domain experts.
- On April 26 and 28, 2021, the draft of the SDA was completed the article-by-article review through Education and Culture Committee of the Legislative Yuan.
- On May 31, the draft of the SDA was completed the third reading process.
- On June 16, the SDA was decreed by the President.

3.3. Legislative Strategies of National Space Law

In the past, the urgency and social atmosphere for national space law legislation in Taiwan were not formed. In order to enable the legislation to proceed smoothly, three different legislative strategies were proposed and analyzed pros and cons by NSPO during the space law study period.

The first strategy is to adopt a model of separate legislation for the space basic law and other related space related acts, similar to Japan’s Space Basic law and Space Activity Act as well as Remote Sensing Data Act. The second strategy is a single legislation model for the space activity law only, and the third strategy is a legislative model that combines the basic law and the space activity law, like the case of Korea’s Space Development Promotion Act. These three strategies are placed in Taiwan's internal political environment, and each has its own advantages and disadvantages, as described in Table 2. Later, Taiwan adopted strategy 3 to carry out the legislative work for the National Space Law.

Table 2. Comparison of advantages and disadvantages of proposed Taiwan's space law legislation strategies

Strategy	Advantages	Disadvantages
1	The legal structure of space development is clear, and various space-related laws can be added under the space basic law as needed.	From the priority of domestic legislation, it is difficult to carry out multiple legislation for space development issues. Even after the passage of the basic law, the legislation of the activity law related to the practical operation of space may be delayed.
2	The activity law regulates domestic space activities, including registration, launch permits, and compensation for damages in space accidents, with little legislative resistance	Once the activity law is passed, it will be difficult to enact higher-level basic law legislation.
3	Combining strategy 1 and strategy 2 can make the basic law and activity law in place at once	It does not have the advantages of strategy 1 and strategy 2.

4. The structure of the SDA and its main contents

4.1. The Framework of the SDA

The SDA contains 6 chapters and 22 articles. These 6 chapters are (1) the general provisions, (2) the basic principles of space development, (3) the space activities and the space industry, (4) the handling of space accidents, (5) penalties, and (6) supplementary provisions.

The main contents are as follows:

1. Basic principles of space development: This Act highlights several basic principles for Taiwan space development, including: principle of respecting for international conventions and other regulations (Article 6), principle of environmental protection and sustainable development (Article 7), principle of information transparency under the considerations of national security and interests (Article 9), and principle of protecting the rights and interests of indigenous peoples (Article 12). Among them, areas for environmental protection and sustainable development include not only for the ground part but also for the space field.

2. Competent authority and management of space activities: This Act defines that the competent authority of SDA and space activities is the MOST (Article 2 and 10), and there is a legal entity responsible for implementing space policies and plans, and assisting in promoting space development related matters (Article 4).
Launch vehicle and spacecraft used for space activities shall be registered to the competent authority, if these vehicles are (1) developed by government subsidies, entrusted, funded, or budgeted by public research institutions, or (2) scheduled to be launched within the territory of Taiwan, or (3) other conditions where registration is required by the competent authority (Article 10). Conducting a launch activity in Taiwan must apply to the competent authority before launching (Article 11).
3. Handling of accidents in space activities: This Act stipulates that those conducting space activities must provide appropriate liability insurance or financial guarantees before launching (Article 16) and in the event of a space accident, those conducting space activities shall be liable for damages (Article 15 Paragraph 1). The investigation of space accidents is handled by the Taiwan Transportation Safety Board (Article 18).
4. Establishment of the national launch site: This Act specifies that the competent authority shall set up the national launch site in order to promote space activities and provide suitable and safe launch sites (Article 13). In addition, when launch vehicles are launched within the territory of Taiwan, launch operations shall be carried out at the national launch site (Article 11, Paragraph 1).
5. Promotion of the space industry: For a sound development of Taiwan space industry, the competent authority shall work with the Ministry of Economic Affairs (MOEA) and other applicable authorities.

Except for the above five main contents, the SDA also contains relevant penalties. For example, anyone who launches a launch vehicle without permission within the territory of Taiwan shall be sentenced to fixed-term imprisonment of not more than five years, and a penalty of more than NTD 1 million and less than NTD 10 million may be imposed. (Article 19). Those who fail to register in accordance with the SDA shall be fined between NTD 200,000 and NTD 2 million. (Article 21) etc.

On the other hand, according the SDA, the other 4 sub-regulations are needed to be completed, namely, (1) Regulations for registration of launch vehicle and spacecraft, (2) Regulations for Launch Permit for Launch Vehicle and Handling of Space Accidents, (3) Regulations for Selection of the Land, Establishment, Operation, Management, and Compensation and Rewards for Launch Center, and (4) Regulations for Provision and Compensation for Information Obtained by Private Sector with Spacecraft.

4.2. The Framework of the SDA Mechanism For Ensuring Space Security and Sustainable Development in the SDA

Article 6 of the SDA clearly states that Taiwan's space development should be based on the principles of environmental protection and sustainable development to ensure domestic, international, and space environmental safety, and reduce adverse effects on the environment.

This shows that the development of space in Taiwan not only pays attention on the issue of ground environmental protection also covers the space environment, especially the mitigation of space debris.

After the implementation of SDA, Taiwan's launch vehicles or spacecraft must undergo the review process before launch. The review standards are based on international standards, such as the Inter-Agency Space Debris Coordination Committee (IADC) Space Debris Mitigation Guidelines and Space Debris Mitigation Requirements from the International Organization for Standardization (ISO) etc.

4.3. Comparison Between the SDA and the United Nations Model Law

A framework of model law for space activity was proposed by the United Nations (UN) Committee on the Peaceful Use of Outer Space in 2013.⁷ This framework includes 13 articles and main contents of this model law can be summarized as follows:

1. Scope and national jurisdiction
The definition of space activities and the scope of the jurisdiction of space activities shall be specified by the law. Generally speaking, the scope of application of the space activity law includes space activities carried out by citizens of that country or legal persons registered in that country, and on ships or aircraft registered within or registered in that country.
2. Competent authority
The law shall specify the competent authority for space activities and its related powers.
3. License conditions
Space activities are authorized under the following conditions: (a) Space activities are permitted under the technical capabilities and financial conditions of the operator; (b) Space activities will not cause damage to the earth and the outer space environment, and minimize any possibility as much as possible space debris; (c) Space activities comply with public safety standards, do not violate national security interests, international obligations and national foreign policy interests;

⁷ Committee on the Peaceful Uses of Outer Space, Draft model law on national space legislation and explanatory notes, Committee on the Peaceful Uses of Outer Space, 2013

(d) Operators comply with the relevant frequency allocation and orbital positions of the International Telecommunication Union (ITU) regulations; (e) Operators subject to the insurance requirements of this law.

4. Continuous Monitoring of Space Activities

All space activities are subject to continuous supervision by the competent authority. Such details should be specified in the implementing decree/regulation.

5. Registration of Space Objects

The competent authority need to establish and maintain a national satellite register for registering domestic space objects.

6. Third-Party Liability

The operators conducting space activities should bear the insurance liability to cover damages caused to third parties.

Table 3 lists articles of model law and corresponding articles of the SDA and/or sub-regulation of the SDA. From Table 3, it can be observed that Taiwan's SDA is quite completed in terms of the regulation of space activities.

Table 3. Comparison between the UN Model Law and the SDA

UN model law	Corresponding articles and/or sub-regulation of the SDA
Scope of application	<p>Article 10</p> <p>If one of the following circumstances applies to a launch vehicle or spacecraft used in space activities, the vehicle should be registered with the competent authority:</p> <ol style="list-style-type: none"> 1. Is developed with government subsidies, sponsorship, funding or with the budgets allocated by a public research authority/organization in accordance with the applicable laws. 2. Is scheduled for launch in the territory of the Republic of China. 3. Is otherwise required to be registered by the competent authority. <p>For registrations stipulated in the preceding paragraph, the competent authority should complete the registration and notify the applicant in writing within three months from the date of acceptance of an application. This period may be extended for two months if necessary.</p> <p>The competent authority shall establish</p>

PROCEEDINGS OF THE INTERNATIONAL INSTITUTE OF SPACE LAW 2021

	regulations governing registration, tracking, management and returning of a launch vehicle or spacecraft and other matters.
Definitions-Use of terms	<p>Article 3</p> <p>The terms as used in the Act shall have the meanings as below.</p> <ol style="list-style-type: none"> 1. Space activities: Activities such as space exploration, observation of the earth from outer space, construction of communication networks, development or use of resources in the outer space and other celestial objects by using launch vehicles or spacecraft. 2. Launch vehicles: Rockets or aircrafts that launch a spacecraft or appliances and equipment for space activities. 3. Spacecraft: Satellites, unmanned or manned space capsule and payload thereof. 4. Space industry: Sectors including launch of spacecraft, space science research, manufacturing of space related (and ground receiver) equipment, satellite application services (including operation), and new types of services arising from space activities. 5. Space accidents: Malfunction, collapse, collision, explosion and other accidents during the launch of a launch vehicle or operation of a spacecraft. 6. Launch centre: A launch site exclusively used for launch of a vehicle.
Authorization	<p>Article 2</p> <p>The competent authority of the Act is the Ministry of Science and Technology.</p> <p>Such matters provided under the Act that pertain to the powers and duties of a central competent authority for the enterprise in question shall be handled by that authority.</p>
Conditions for authorization	<p>Regulations for registration of launch vehicle and spacecraft</p> <p>Regulations for Launch Permit for Launch Vehicle and Handling of Space Accidents</p>
Supervision	Regulations for registration of launch vehicle and spacecraft

A STUDY OF THE FIRST TAIWAN'S SPACE LAW- SPACE DEVELOPMENT ACT

Withdrawal, suspension or amendment of authorization	Regulations for registration of launch vehicle and spacecraft Regulation for launch permit
Protection of the environment	Article 7 Space development should follow the principles of environmental protection and sustainable development to ensure safety of domestic, international and outer space environment and reduce adverse impacts on the environment. Space activities should comply with the domestic environmental protection laws and regulations
Mitigation of space Debris	Article 7
Transfer of space activity	Regulations for registration of launch vehicle and spacecraft
Registration	Article 10
Liability and recourse	Article 15 The owner or user of a launch vehicle or spacecraft shall be liable for compensation for death and injury sustained by humans or damage to another person caused by space accident due to willful act or negligence. If a space accident occurs to space activities, the competent authority may order the owner or user of the launch vehicle or spacecraft to make corrections within a specified period of time, and may order a termination of a program or revoke its launch permit for failing to make corrections within the time frame. The competent authority shall determine the regulations for correction deadline, reason for termination of a program, and revocation of a launch permit and other matters for compliance in the preceding paragraph.
Insurance	Article 16 The owner or user of a launch vehicle or spacecraft shall provide an adequate liability insurance or financial guarantee during the term of the launch permit, subject to approval of the competent authority, before the launch may take place. If the insurer of the liability insurance stipulated in

PROCEEDINGS OF THE INTERNATIONAL INSTITUTE OF SPACE LAW 2021

	<p>the preceding paragraph, the owner and user of the launch vehicle or spacecraft, or the guarantor of the financial guarantee suspends, terminates or changes the subject or contents of its liability insurance or financial guarantee during the term of insurance or guarantee, it shall send a 60-day written notice to the other parties to the contract. The owner and user of the launch vehicle or spacecraft should notify the competent authority within three days from the day immediately following notification to the other parties to the contract or their receipt of such notice. Failure to do that may result in revocation of the launch permit by the competent authority pursuant to the requirements under Article 11, paragraph 3.</p> <p>Article 17</p> <p>Where the owner or user of a launch vehicle or spacecraft becomes liable for damage compensation due to space accident, the maximum liability is NT\$5 billion and the liable party may cover the losses with the money from the liability insurance or financial guarantee in the preceding article.</p> <p>The maximum liability stipulated in the preceding paragraph does not include interest or litigation costs.</p> <p>If a party entitled to claim damage compensation for damages arising from space accident is able to prove the damages were caused by intention or gross negligence of the owner or user of the launch vehicle or spacecraft, the limitation of maximum liability in the first paragraph shall not apply.</p>
<p>Procedure</p>	<p>Article 10</p> <p>Article 11</p> <p>Where a launch vehicle is to be launched in the territory of the Republic of China, the launch shall take place in the national launch center. No launch may take place until after completion of registration pursuant to the preceding article. Or a launch plan, accompanied with information for registration, should be submitted to the competent authority for permit no later than six months before the scheduled launch date, in which case</p>

A STUDY OF THE FIRST TAIWAN'S SPACE LAW- SPACE DEVELOPMENT ACT

	<p>the launch shall not take place without approval. The following documents or information are required for application for launch permit in the preceding paragraph:</p> <ol style="list-style-type: none"> 1. Expertise or experience of the staff who will operate the launch vehicle. 2. Liability insurance or financial guarantee comparable to the launch plan. 3. Necessary measures to ensure the public safety during the operation of the launch vehicle. 4. Other documents required by the competent authority. <p>For permit applications stipulated in the preceding paragraph, the competent authority should complete the review and notify the applicant in writing within three months from the date of acceptance of an application. This period may be extended for two months if necessary.</p> <p>The competent authority shall, in consultation with the relevant central competent authority for the enterprise in question, establish the regulations for procedure, deadline, required documents or information, review process and criteria, reason for revoking a permit and other matters for compliance for the permit application in paragraphs 1 and 2 above.</p> <p>The competent authority shall refer to the international standards and publish the technical guidelines for launch vehicle.</p> <p>Article 16</p> <p>The owner or user of a launch vehicle or spacecraft shall provide an adequate liability insurance or financial guarantee during the term of the launch permit, subject to approval of the competent authority, before the launch may take place.</p> <p>If the insurer of the liability insurance stipulated in the preceding paragraph, the owner and user of the launch vehicle or spacecraft, or the guarantor of the financial guarantee suspends, terminates or changes the subject or contents of its liability insurance or financial guarantee during the term of insurance or guarantee, it shall send a 60-day</p>
--	--

	<p>written notice to the other parties to the contract. The owner and user of the launch vehicle or spacecraft should notify the competent authority within three days from the day immediately following notification to the other parties to the contract or their receipt of such notice. Failure to do that may result in revocation of the launch permit by the competent authority pursuant to the requirements under Article 11, paragraph 3. Regulations for registration of launch vehicle and spacecraft Regulation for launch permit</p>
Sanctions	<p>Article 19 Violation of Article 11, paragraph 1 by launching a launch vehicle in the territory of the Republic of China without permit is subject to imprisonment for not more than five years, or in addition thereto, a fine of not less than NTD 1 million and more than NTD10 million may be imposed. Article 20 Violation of Article 13, paragraph 2 by not providing information to the government or authorizing another person for use and failing to act as ordered by the competent authority within the specified time limit is subject to a fine of not less than NTD 500,000 and more than NTD5 million. Article 21 Violation of Article 10, paragraph 1 by not completing registration is subject to a fine of not less than NTD 200,000 and more than NTD 2 million.</p>

5. Conclusions

After years of hard work, the SDA was finally passed smoothly on May 31, 2021, and decreed by the President on June 16, 2021. Now, once the relevant procedures of the four sub-regulations of the SDA are completed, it is expected that the SDA will be officially implemented in 2022.

The SDA is an important part of Taiwan's space development and will lay a solid legal foundation for the sustainable development of Taiwan's space technology.