

## QUASI-ZENITH SATELLITES SYSTEMS AND INTERNATIONAL COOPERATION UNDER SPACE LAW

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### ABSTRACT

Global Navigation Satellite Systems (GNSS) have been recognized in general as space military asset originally developed for military purpose (e.g. GPS, GLONASS). At present it offers multiple applications for commercial and military uses. Japan has been developing Quasi-Zenith Satellite Systems (QZSS) for purely commercial uses, since Article IX of the Constitution of Japan, namely 'renunciation of war', influences on space activities in Japan.

For QZSS project, the Advanced Satellite Business Corporation (ASBC), a private company, was established to promote business plans and to foster space industry. In the beginning of feasibility study, QZSS applications were to be for Asia-Pacific regional uses, however, at present it has changed service area only for domestic market in Japan without any international cooperation. It is worth suggesting ASBC to broaden QZSS service area to Asia-Pacific region under international cooperation.

### 1. BACKGROUND

Demand for satellite applications is increasing in both public and private sectors in Japan. For positioning and navigation systems in transportation, Japan has relied on the signal provision of Global Positioning Systems (GPS). Since GPS uses in Japan have been secured under the US-Japan Joint Statement of 1999<sup>1</sup>, it is not necessary for Japan to build up new satellite systems as substitutes. However, due to geological reason that more than 70 % of Japanese land is mountainous, such areas need satellite systems that provides signals from the vertical point.

### 2. QUASI-ZENITH SATELLITE SYSTEMS (QZSS)

The Quasi-Zenith Satellite Systems (QZSS) are complementary and augmentative to GPS signals. It would be deployed in Quasi-Zenith Orbit in 2008 with an inclination of 45 degree, using three orbit plane and three satellites in altitude of Geostationary Orbit. It offers (1) mobile communications (land-mobile services of data broadcasting and internet-access) (2) efficient use of frequencies (Quasi-zenith and geosynchronous satellites can share the same frequencies, as they are at different directions when viewed from ground stations) (3) navigation application (4) polar-region observations.

A government budget for R&B of QZSS was assigned to Communication Research Laboratory (CRL) in 1999, in the same year when European Commission announced Galileo project. The goal for QZSS project is not for independence from GPS reliance, but for fostering space industries and enhancing precision of signals in mountainous areas in Japan.

In July 2001, the Japan Business Federation proposed 'A grand strategy to expand the use of space frontier', and the Society of Japanese Aerospace Companies launched a feasibility study on QZSS in December 2001, resulting into establishment of a new working group for 'Advanced Satellite Business'. Such studies concluded that QZSS should be promoted under Public Private Partnership (PPP) for long-term benefits.

### 3. QZSS UNDER PPP

Under PPP, which is a key word to promote a long-term business plan, the roles of both public

and private sectors were clarified separately in the Commission for the Development and Promotions of QZSS. In public sector, four ministries<sup>2</sup> cooperate for QZSS uses in the field of public services<sup>3</sup>. In private sector, several satellite companies established the Advanced Satellite Business Corporation (ASBC) in November 2002, with the aim of creating a new market in space industry<sup>4</sup>, space communication and broadcasting<sup>5</sup>, and related-equipment production industry<sup>6</sup>. In addition, feasibility study is conducted by a working group of the Association of the Development and Promotion of QZSS and ASBC.

In the phase of operation, ASBC would be the main actor for QZSS uses and Japan would support its activities as a launching state.

#### 4. CURRENT IMPLICATION OF GPS USES

Since the US uses GPS for supporting military acts in several wars and for demonstrating National Missile Defense (NMD), such uses raise global debate against weaponization of outer space. In the case of QZSS, due to Article IX of the Constitution, which reflects historical background of Japan, the 'peaceful' uses of QZSS would be rather close to 'non-military', although this definition is changeable under the new Cabinet of Japan in September 2003.

##### 4.1. GPS of US

In the US, originally GPS was designed and developed in the late 1960s and early 1970s as joint program of Navy and Air Force as the space-based sensors for communications and navigation for military purposes. Its scope was extended early in its development for complementary civilian uses as well.

Due to dual-use technology, the functions of GPS are not easily divided into civilian or military purposes since both sectors use it for communications, navigation, weather-forecasting, and remote sensing/reconnaissance.

Basically military space assets are categorized into 'non-aggressive' or 'aggressive'. Communication satellites, sensor satellites and navigation satellites which do not carry 'kinetic kill vehicles' are in the former, even though the military would use them for their interest of

reconnaissance, surveillance and communications. And GPS is categorized into 'non-aggressive' satellites; however, it is deeply involved in NMD. Both NMD in space or on the ground requires GPS for early warning, communications and other support functions. The above testing relies on data from a GPS beacon for targeting ICBM to help detection of the intercept and assist mid-range tracking. Such military uses of outer space has started since the first 'space war', the 1990-1991 Persian Gulf War, when the U.S. army used GPS as space-based sensors to furnish communications at all levels in near real-time. In addition, military uses of GPS were conducted for the strikes on Yugoslavia in 1999, the Afghanistan War of 2001 and Iraq War of 2003.

In the definition of 'peaceful' of the Article IV of the 1967 OST, the US interpreted it into 'non-aggressive' that can read rather subjective in the above cases, although the 1959 Antarctic Treaty, which influenced on Article IV, uses 'peaceful' as 'non-military'.

Since the US withdrawal of the ABM Treaty, there is no arms control regime to prevent the US from deploying military asset in outer space. In 18 January 2002, the DOD of the US demonstrated the operational and live-fire testing of 161 military systems, which failed to prove the confident capability of the space-based interceptor for NMD<sup>7</sup>. Such military demonstration has continued for 1 year already even though it does not reach to the sufficient level yet.

##### 4.2. QZSS of Japan

In Japan, the definition of 'peaceful' in the Article VI of the 1967 OST is based on Article IX of the Constitution of Japan which requires space activities to be conducted for purely scientific and technological progress under international cooperation.

Article IX of the Constitution of Japan (hereinafter the Constitution)<sup>8</sup> stipulates in Chapter II of Renunciation of War as follows;

#### **Article IX**

*(1) Aspiring sincerely to an international peace based on justice and order, the Japanese people forever renounce war as a sovereign right of the nation and the threat*

*or use of force as means of settling international disputes.*

*(2) In order to accomplish the aim of the preceding paragraph, land, sea, and air forces, as well as other war potential, will never be maintained. The right of aggression of the state will not be recognized.*

Based on the Article IX, the utilization of QZSS is allowed only for peaceful purposes which irrelevant to NMD. It leads to security issues in public service for disaster management in Japan.

The author believes that Japan has fundamental background to enhance international cooperation for space benefit in conformity with space treaties and the Constitution.

#### *ABSC*

The Advanced Satellite Business Corporation (ASBC), established in 2002 would promote business and broaden business plan for QZSS service. Such business strategy is secured by the Joint Announcement<sup>9</sup> from the Second Japan-US GPS Plenary Meeting in 6 October 2002<sup>10</sup>. Both Governments decided to establish a technical working group to coordinate technical aspects related to QZSS and GPS.

### 5. LEGAL ASPECT OF LAUNCHING AND OPERATION OF QZSS

#### 5.1. A Launching States of Japan

Since the first satellite of QZSS would be launched by Japanese government, the rest would be by ASBC from Japanese territory of Tanegashima island, it is clear that Japan is a launching state under Article II of the 1972 Liability Convention<sup>11</sup> (hereinafter the 1972 LC).

#### *International Liability for QZSS Launching*

In the phase of launching QZSS, in accordance with Article VII of the 1967 Outer Space Treaty<sup>12</sup> (hereinafter the 1967 OST), Japan would be liable for damage to another State Party to the Treaty, and to natural or juridical persons. In addition, in the case of damage on the surface of

the Earth or aircraft flight, Japan would be absolutely liable under Article II of the 1972 LC.

#### *International Liability for QZSS Operation*

For QZSS operation, Japan is the only launching state responsible for the damage from collision with foreign satellites in outer space in accordance with Article VII of the 1967 OST<sup>13</sup>. Since QZSS consists of three satellites being deployed in GEO<sup>14</sup> with 45 degree of inclination, it increases the possibility of collision with foreign satellites or space debris.

If the case of collision in outer space, Article II, III, IV, V, VI, and VII of the 1972 LC<sup>15</sup> would be applicable for compensation. In accordance with Article III of the 1972 LC, if damage caused elsewhere than on the surface of the Earth, Japan would be liable for damage only if the damage is due to its fault or the fault of persons for whom Japan is responsible.

#### 5.2. QZSS Application under International Cooperation

In the beginning of QZSS project, service area of QZSS uses covers Asia-Pacific region including north part of Australia. However, the present feasibility studies for business promotion concluded that service area would be limited for domestic market, without international cooperation for space benefit. Regardless massive potential of QZSS applications, limitation of service area does not lead to a long-term benefit. The author examined possible reasons for limitation as follows;

##### (1) Geological Demand

Since more than 70 % of land is mountainous in Japan, it needs higher precision of positioning signals from the vertical point. If QZSS service area is broadened, the signal precision would not reach sufficient level inside of Japan.

##### (2) Fragile for Continuous Service

Since QZSS consists of three satellites and each provides signal for eight hours per day, in the case of service area focused in Japan, continuous service is not assured in technical study. In addition, if it covers the neighboring countries, the

time of satellite operation would be longer than time for solar power charging, it is necessary for Japan to prove its technology before involving the neighboring countries into QZSS project.

### (3) Liability Issues

Since QZSS would be operational by the private company, ASBC, it is lower risk if service area is limited for domestic market, especially in order to avoid liability issue under Article VII of the 1967 OST and Article II-CII of the 1972 LC.

However, since the neighboring countries have possibility to join QZSS business plan in future when technical and financial problem are solved, it is recommendable to involve them into PPP for a long-term space benefit.

## 6. INTERNATIONAL COOPERATION ON QZSS PROJECT

Under Article IX of the Constitution, satellite applications of Earth Observation and Communications have been conducted under international cooperation in Japan. However, for QZSS applications, the first priority is given to commercial interests by ASBC and its business plans seek for a short-term benefit by reducing service area. The author believes it is worth reminding PPP in Japan what principles and law are applicable to QZSS international cooperation.

### 6.1. Principle of International Cooperation

Besides the economical aspect, the political and legal issues have been increasingly focused on by the states concerned of Navigation Satellite System (NSS). The implementation of NSS for navigation and positioning needs international cooperation in order to realize seamless satellite navigation and positioning system. Especially for the world civilian aviation community, it is indispensable to implement it under cooperation with the space powers and developing countries with regard to the transport sector which several states are already dependent on the GNSS.

Principle of International Cooperation bases on the UN Charter and the 1970 Declaration of Principle of Friendship and Cooperation<sup>16</sup> to be regarded as international customary law. Under

Article III of the 1967 OST, the Principle reflects in Article I, IX and X of the 1967 OST.

The above Declaration has the same purpose and principles of Article I and II of the UN Charter, and it obliges States Parties to cooperate each other to maintain international peace and security. In addition, such cooperation needs to be consistent with the UN Charter, even in outer space, to contribute to develop the mutual understanding, strengthen the friendly relations between States and peoples recalling the preamble of the 1967 OST.

Therefore, as long as QZSS applications are for peaceful purposes, it is recommendable to broaden QZSS service to Asia-Pacific region by involving neighboring countries into PPP of Japan.

### 6.2. Space Benefit Declaration<sup>17</sup>

NSS has potential application to create, maintain and share 'Space Benefit'<sup>18</sup> and Space Benefit Declaration provides an authoritative interpretation to Principle of International Cooperation. In 1988, Legal Sub-Committee of the Committee on the Peaceful Uses of Outer Space (COPUOS)<sup>19</sup> decided to add the 'space benefit' issue on the agenda of its 1989 session<sup>20</sup> and to establish a working group on that agenda item<sup>21</sup> in the same year. Such an attempt was realized during the 1991 session<sup>22</sup> resulting in 'Space Benefit Declaration', adopted by the General Assembly of the United Nations in 1996. Afterward, in 1999, this Declaration<sup>23</sup> contributed to the UNISPACEIII<sup>24</sup> resulting in the Vienna Declaration<sup>25</sup>.

In the case of broadening QZSS service area, the following analysis of 'space benefit' would be recommendable to ASBC business plan.

[Space Benefit Declaration] confirmed that the freedom of the exploration and utilization of outer space as well as reminds the space powers - in a productive and mutually fruitful manner - to fulfill their obligation to conduct their activities for the benefit of all countries, which means that the space powers should foster international cooperation -

on an equitable and mutually acceptable basis<sup>26</sup>.

In accordance with Principle I, international cooperation should be taken into consideration in conformity with international law including the UN Charter and the 1967 OST. And Principle III encouraged space-faring countries to contribute to promoting and fostering international cooperation on an equitable and mutually acceptable basis. However, Principle III raises an issue for ASBC to consider the benefit and the interests of developing countries into business plans. Thus, this Declaration clarifies that space powers should involve developing countries into space activities 'on an equitable and mutually acceptable bases'.

### 6.3. Principle of Mutual Assistance

It is recommendable to consider marketing of QZSS applications to be based on mutual assistance with neighboring countries.

The definition of 'benefit' and 'interests' of Article I (1) of the 1967 OST clarified that Principle of Mutual Assistance prohibits space activities for the benefit and in the interests of 'specific' countries or region. However, those definitions should be interpreted in case of regional security as disaster management in Asia-Pacific region. In order to promote QZSS business plans, mutual assistance should be considered to involve the neighboring countries under international cooperation.

## 7. CONCLUSION

In 1999 Japan started a feasibility study on QZSS project for commercial benefit in Asia-Pacific regional uses. Since 70% of land is mountainous in Japan, it is necessary for positioning systems to obtain higher precision of signals from the vertical point. QZSS is complementary and augmentative to GPS signals, however, its goal is not independence from GPS reliance.

In order to promote business plans of QZSS for a long-term benefit, Japan has collaborated with four ministries and established one private company under PPP. When QZSS is be

operational, the private company of ASBC would be responsible for all applications, therefore, QZSS is not for military uses but for commercial uses.

While the US GPS has been used for military purposes during several wars, and currently used for testing the capability of the ICBM interceptor for NMD after the withdrawal of the ABM Treaty. Japanese space activities are restricted for scientific and technological purposes under Article IX of the Constitution of Japan, namely 'renunciation of war'.

Feasibility studies on QZSS currently concluded into limitation of service area for domestic market. Regardless potential QZSS applications, ASBC does not promote business plan under international cooperation any more. However, the author believes Japan has fundamental background to promote international cooperation based on the Constitution.

It is worth reminding Japan as a State Party to space treaties that Principle of International Cooperation is applicable to QZSS which has potential application for Space Benefit in Asia-Pacific region. In order to promote QZSS business plans, it is possible to involve the neighboring countries into feasibility studies under international cooperation, which leads to a long-term benefit for Japanese space industries.

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<sup>1</sup> The US-Japan Joint Statement on GPS Uses, in 1999, made by US former president Clinton and Japanese former prime minister Obuchi.

<sup>2</sup> Ministry of Public Management, Home Affairs, Posts and Telecommunications, Ministry of Education, Culture, Sports, Science, and Technology, Ministry of Economy, Trade and Industry, Ministry of Land, Infrastructure and Transport.

<sup>3</sup> E.g. defense, national security, law enforcement, fire fighting, emergency, crisis management, next-generation ITS, transport administration, remote education, and warning system of global environment.

<sup>4</sup> E.g. the industry of satellites, rockets, ground control stations, and satellite operators.

<sup>5</sup> E.g. platform industry, telecommunication service, broadcasters, positioning information service, internet service billing service, and advertising.

<sup>6</sup> E.g. mobile terminals, semi-conductor, information system integrator, contents creators, automobile, aerospace, shipbuilding, transport and logistics, construction, utilities (electricity and gas), insurance, medical services, education, surveying, agriculture, forestry and fisheries.

<sup>7</sup> Arms Control Association: Arms Control Today, Boese, W., "December Missile Defense Tests Yield One Success, One Failure", online at <[http://www.armscontrol.org/act/2002\\_01-02/misdefestjanfeb02.asp](http://www.armscontrol.org/act/2002_01-02/misdefestjanfeb02.asp)> (Last accessed: 02 Sept. 2002)

<sup>8</sup> Adopted on 3 November 1946, effective since: 3 May 1947, text is available at <[http://www.oefre.unibe.ch/law/icl/ja00000\\_.html](http://www.oefre.unibe.ch/law/icl/ja00000_.html)>

<sup>9</sup> Text is available at <[http://www.soumu.go.jp/s-news/2002/021016\\_11\\_e.html](http://www.soumu.go.jp/s-news/2002/021016_11_e.html)>

<sup>10</sup> Both governments reconfirmed the US principle to continue to provide the GPS for peaceful, civil, commercial and scientific use, on a continuous and worldwide basis, and free of direct user fees.

<sup>11</sup> Convention on International Liability for Damage Caused by Space Object, UNGA resolution 2777 (XXVI), annex [24 UST 2389; TIAS 7762; 961 UNTS 187]

<sup>12</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, UNGA resolution 2222 (XXI), annex [18 UST 2410; TIAS 6347; 610 UNTS 205]

<sup>13</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, adopted on 19 Dec. 1966, opened for signature on 27 Jan. 1967, entered into force on 10 Oct. 1967. UNGA resolution 2222 (XXI) annex; 610 UNTS 205; UKTS No. 10 (1968), Comnd. 3519; 18 UST 2410, TIAS No. 6347.

<sup>14</sup> Geostationary Orbit, altitude: 36,000 km/

<sup>15</sup> Convention on International Liability for Damage Caused by Space Objects, adopted on 29 Nov. 1971, opened for signature on 29 Mar. 1972, entered into force on 1 Sept. 1972. UNGA resolution 2777 (XXVI) annex; 961 UNTS 187; UKTS No. 16 (1974), Comnd. 5551, 24 UST 2389; TIAS 7762.

<sup>16</sup> Declaration on Principles of International Law Concerning Friendly Relations and Co-operation Among states in Accordance with the Charter of the United Nations, UNResolution2625 (XXV), 24 Oct. 1970

<sup>17</sup> Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries, UNGA Resolution 51/122, 13 Dec. 1996

<sup>18</sup> On the early handling the subject, see, Jasentuliyana, N., "Article I of the Outer Space treaty Revisited", *Journal of Space Law* 1989, (17,2), at 129-144, here at 130-136

<sup>19</sup> COPUOS was established on 12 December 1959 by UNGA Resolution 1472 (XIV)

<sup>20</sup> See, the Report of the Legal Subcommittee on the Work of Its twenty-seventh session, UN Doc. A/AC.105/411 of April 8, 1988, paras. 37-72.

<sup>21</sup> See, the Report of the Legal Subcommittee on the Work of Its Twenty-Eighth Session, UN Doc. A/AC.105/430 of April 26, 1989, paras. 53 and 60.

<sup>22</sup> See, the Main Committee the Report of UNCOPUOS 1990, UN Doc. A/45/20, para. 120

<sup>23</sup> See, UN Doc. A/AC.105/385, 411 and 430

<sup>24</sup> Based on UNGA Resolution 52/56: International Cooperation in the Peaceful Uses of Outer Space, UN Doc. A/Res/52/56 (1997).

<sup>25</sup> See, The Space Millennium: Vienna Declaration on Space and Human Development, which was the final resolution to be adopted by UNISPACE III.

<sup>26</sup> See; Marietta Benko and Kai-uwe Schrogl, "The UN Committee on the Peaceful Uses of Outer Space Adoption of a Declaration on 'Space Benefits' and Other Recent Developments", in ZLW, Jg 2/1997 at 233.