

Korean Space Activities and Its Policies : Present and Future*

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I. Introduction

For the first two decades of the Space Age, space exploitation and

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utilization were almost entirely by the United States and the Soviet Union. However, Space power is rapidly proliferating now as more and more nations achieve significant space capabilities; China, India, Japan and European Space agency have the ability to launch satellites.

Moreover, the relationship between the USA and Russia, the two major space countries, has drastically changed with the end of the cold war in the international society. Thus, the focus is shifting from a period of competition to a period of harmony.

The programs which the space advanced countries propose set the stage for challenging and exciting achievements in pioneering the space frontier. Application of space technology in the field of communication and remote sensing becomes also increasingly important in human life. Advancement of communications means shrinks the size of our globe and that of remote sensing techniques improves the quality of human well-being. It's a world trend for each country to make its best effort in advancing its capabilities in these field sometimes independently and other time jointly with other nations. Korea being no exception to this world trend is planning various strategies in application and development of space technologies. However, unfortunately, Korea is a new comer in this field. Satellite Technology Research Center of Korea Advanced Institute of Science and Technology(KAIST) initiated to acquire satellite technology by sending its graduates abroad in 1989. As a result KITSAT-1 was launched in 1992 and KITSAT-2 was launched in 1993. They became Korea's first two satellites in orbits.

Academic program including on the Job-Training for Korean students at the University of Surrey, UK is also an innovative scheme of mixing education and practical know-how for successful technology transfer, which resulted in a small but very capable and effective satellite experts group in Korea for self-propelled research and development in space activities. Through the KITSAT-1 and 2 program, KAIST has

accumulated experiences in designing small satellite and ground tracking operations. Scientific activities such as voice and image data communication, picture taking of the Earth's surface and measurement of primary cosmic rays have been carried out.

To meet the increased demand of domestic and international communication and broadcast, Korea Telecommunication Corporation has developed "KOREASAT" communication satellites which were launched in 1995 and January 14, 1996. Now, I would like to introduce Korea's space-related organizations and their missions for your understanding. The first one is KARI(Korea Aerospace Research Institute), which is involved with development and system integration of satellites and scientific rockets. KARI is engaged in design, testing and assembling of satellites, too. The second one is ETRI, which stands for Electronic Telecommunication Research Institute. ETRI is involved with development of communication instruments of satellites and data receiving instruments. The third one is SERI, which stands for System Engineering Research Institute. SERI is involved with research of remote sensing technologies. The fourth one is KAIST, which was mentioned earlier. KAIST is involved with development of small satellite, KITSAT. The last one is Korea Telecom, which was also mentioned earlier. They are involved with procurement and operation of KOREASAT.

KARI was founded in 1989 in accordance with the Aerospace Industry Development & Promotion Act for the purpose of conduct researches on aircrafts, satellites, scientific rockets and supporting national aerospace development projects. KARI is engaged in not only developing aerospace-related technologies but also supporting the related industries.

In this paper, I would like to brief about firstly, current status of Korean space activities, secondly, long-term space development plan under consideration, thirdly, policy issues regarding present space activities and future space activities development. And finally, I conclude

with presentation of my personal observation and opinion on Korean space activities and policy for future direction.

II. Current status of Korean space activities

1. Koreasat Program

Koreasat is the first commercial satellite for the Republic of Korea. It uses the advanced digital technology for direct broadcasting and fixed satellite services in Korea. It will provide basic satellite communications facilities with small low cost remote stations for rural and remote areas presently having inadequate or no telecommunication facilities. It will also provide high speed data and video distributions for business television and other professional program services such as tele-educational video networks. High quality color television and high definition TV services will also be available anywhere in Korea.

The launching of the Koreasat 1, performed at August 3, 1995, by Delta II rocket, was a partial failure. Due to a separation failure of one of solid rocket motor, the spacecraft failed to reach to transfer orbit, so that the Korea Telecom, the operator of the system had no other choice than using propellant fuel of the spacecraft for the purpose of gaining geostationary orbit. As a result, the lifetime of spacecraft is reduced to only the half of the planned lifespan.

According to the launch insurance contract, the brokerage of which is assured by March & McLennan, England, this failure invokes the total constructive failure claim, which enables insured, the Korea Telecom, to get the full compensation. After the total constructive failure being confirmed by the broker and underwriters, the Korea Telecom has been assured to get financial compensation, while the ownership of the spacecraft now in orbit shall pass to the underwriters.

Korean government, and the Korea Telecom, however, are planning to

buy the Koreasat, the ownership of which is shared among various underwriters. Negotiation is in progress except regarding the price.

Fortunately, Koreasat 2, which was initially planned to operate as a secondary, back-up spacecraft, was successfully launched at January 14, 1996. The AKM (apogee kick motor) of the spacecraft has been successfully ignited in the morning (Korean Time) at January 17

2. KOMSAT (Korea Multipurpose Satellite) Program

The KARI (Korea Aerospace Research Institute) is launching a new scientific satellite program. KOMSAT is a low earth orbit satellite with an altitude of 800 km and weighs 500 kg. KOMSAT will be developed jointly with TRW, an U.S. aerospace co., to maximize related technology transfer. Many Korean universities and aerospace companies join the program for design, manufacturing and testing of the various subsystems. KOMSAT is scheduled to be launched in 1999. We expect the Korean aerospace industry's space technology capabilities will make a big jump through this program.

III. Long-term space development plan under consideration

Last year, Korean Aerospace Research Institute ("KARI") has presented its proposal regarding long-term National Space Development Plan. The KARI has played a leading role in establishing this plan.

1. Korean space development goals

The plan set forth fundamental goals of Korean space activities as followings:

firstly, promoting space industry under co-related development phase of space application industry sector, secondly, selecting specific area(s) of

development the best fitted with a current status of Korean industry and concentrating its efforts with a view to achieving the world's best technology level in the shortest time in that area(s), thirdly, acquiring advanced technology through close cooperation with foreign countries, and fourthly, establishing a systematic and integrated long-term industry development plan.

This goals seem to reflect the opinions presented and shared by many scholars, engineers, and business men interested in Korean space industry since 1980's. They are well aware of the importance of space industry in the perspective of national industry development in the 21st century, but also of the weakness of Korean space industry due to late start compared to other advanced technology countries, such as U.S.A., Japan and European countries.

While these goals are set up by specialist in the private sector, the KARI Plan proposes a national goal of space industry development plan. National goal, which is likely to be an ultimate goal of Korean space industry in the future, is to be ranked as top 10 advanced country in the space technology area in the beginning of the 21st century. More specifically, it means a maturing of Korean space industry so as to become a leading country at least in the Asian region, and to acquire a technology level almost equal with that of Japan, or China.

2. Major milestones of the Plan

The Plan includes some detailed milestones in diverse areas such as satellite manufacturing, launcher development and manufacturing.

2.1 Satellite Manufacturing

The Plan envisages the development under the Korean national technology of 19 satellites until 2015, including 5 Communication satellites, 7 Multipurpose satellites, and 7 Scientific experimental satellites.

Detailed goals of technology development are as following tables

Stage	Development Goals	Technology to be acquired
1st stage (1995 - 2000)	<ul style="list-style-type: none"> - launching and operating a communication satellite purchased from foreign country - developing a multipurpose satellite with technical assistance from foreign countries - acquiring a basic technology for satellite manufacturing 	<ul style="list-style-type: none"> - basic technology, such as satellite design, assembly, integration, test, and launch mission operations
2nd Stage (2001 - 2010)	<ul style="list-style-type: none"> - Developing communication satellite with cooperation of foreign countries - Developing a remote sensing satellite - Developing a meteorological and high resolution remote sensing satellite with cooperation of foreign countries - Active participation in the international space project 	<ul style="list-style-type: none"> - Manufacturing level technology for small satellites - Self-development level technology for satellite - Establishing a integration and test facilities in Korea
3rd Stage (2011 - 2015)	<ul style="list-style-type: none"> - Manufacturing communication satellite with Korean technology - Manufacturing mobile communication satellite with cooperation of foreign countries - Manufacturing a remote sensing satellite with Korean technology 	<ul style="list-style-type: none"> - Advanced level space technology - Leadership in international space project

2.2 Launch Vehicle Development

The launch vehicle development plan emphasizes the importance of launch vehicle in the space industry for authentic Korean space industry development. The ultimate goal envisaged is to have the capacity to

manufacture the launch vehicle for small satellite designed for low earth orbit. The Plan proposes to develop required technology until the year of 2010. The following table shows planned milestone in detail.

Stage	Development Goals	Technology acquired
1st Stage (1995 - 2000)	- Achieving a basic technology for 2 stage and 3 stage launch vehicle for scientific experimental satellite	- Basic technology - launch vehicle assembly and test technology - Mission Operation
2nd Stage (2001 - 2010)	- Developing and manufacturing 2 stage and 3 stage launch vehicle - Developing launch vehicle for low earth orbit satellite	- Developing liquid engine technology - Developing guidance technology
3rd Stage (2011 - 2015)	- Manufacturing launch vehicle	- Manufacturing technology

IV. Policy issues regarding present space activities

Current issues relating to present space activities lie mainly in the service and utilization plan of the Koreasat.

1. Issues regarding two separate governmental policies

Koreasat contains 3 DBS transponders, except 3 redundant DBS channels in the primary spacecraft and 6 DBS channels in the secondary spacecraft which is dedicated for back up use. Owing to digital compression technology, this 3 DBS transponders are capable of providing 12 TV channels.

Problem stems from such number of TV channels available through

the spacecraft. In Korea, presently, 4 terrestrial TV channels (2 KBS channels, 1 MBC, and 1 SBS) are in operation. Taking into consideration such structure of terrestrial broadcasting network, Ministry of Public Information (MPI) had made a strong opposition to the plan proposed by the Korea Telecom and the Ministry of Information and Communication (MIC) to adopt digital compression method for the Koreasat DBS transponders. According to the current Act of Governmental Organization, the MPI has the authority and competence to authorize and control the license for broadcasting. On the other hand, the MIC has the authority and competence to authorize the license for radio-communication station including space station such as Koreasat. However, in case of broadcasting station, the license for radio-communication standard, such as warranted non-interference to other radio-communication station, is to be given by the MIC only if express agreement of the MPI is noticed. In summary, a process for license for broadcasting stations consists in two stage, one with respect to MPI, and the other to MIC.

In this regard, both Ministries have the jurisdiction over the DBS service plan. After digital compression technology once adopted at 1992, the MPI has not changed its fundamental attitude toward a DBS service plan. The MPI strongly opposes to the plan which consists in the utilization of 12 channels as soon as possible after successful in-orbit testing of Koreasat spacecraft.

The position of the MIC is based on the idea that the maximization of the Koreasat capacity is of great important for fostering next generation communication and broadcasting satellite project. Along with this opinion, the Korea Telecom, operator of the Koreasat, insists on his right to make an effort to recover investment cost for Koreasat Project amounting up to 40 million US dollars. On the other hand, the MPI's position is conservative. For them, authorizing 12 DBS channels in one time would mean a revolutionary change in the current structure of

broadcasting network, which in turn would give an adverse impact to cultural life of Korean nations.

2. Issues regarding the participation of private company in the DBS service

As the Koreasat project is the first national communication satellite project, there subsists two sorts of perspective regarding its business value. While its positive side is stressed, its negative side, on the other hand, is not left out especially taken into account the fact that the service fee shall be higher than the case of other terrestrial communication service.

Whichever side of the perspective is well based upon the fact, it is heard that Korean big companies, so called Jae-Bul, are making a plan to participate in the DBS business by the utilization of the Koreasat. According to non-official survey targeted to the private business sector, these big companies have taken a position that to obtain a license for utilizing DBS channel is a direct road to big money guaranteed in the near future.

In such context, these companies have proposed to lease a DBS channel, and to do broadcasting business. They are also diligently making an effort to persuade the public opinion regarding their plan. Their rationale forwarded today is that big companies should bear a burden to utilize government invested facility such as Koreasat.

The MPI and the MIC have shared an almost same position regarding this participation, which is to allow such participation, while difference exists still in the schedule of allowing such participation. Last year, both Ministries have made an initial agreement upon that kind of participation, except the detailed schedule, and submit a bill of legislation to the Congress. So called "Integrated Broadcasting Act of 1995" contains some provisions for procedure and qualification requirement for satellite DBS

service providers, which in fact recognize the rights of the private big companies to do this business (different from the current law which prohibits the broadcasting business of big companies).

However, this bill is not passed through the Congress under the strong opposition from the opposition parties. The latter have made a strong case against this idea of allowing big companies to do DBS business. Surprise to both Ministries, Korea Telecom, and many scholars in this field, comes from the public opinion. It is realized that Korean people are affirmative and demanding the effective utilization of Koreasat, but they are negative for allowing the big companies to do DBS business by utilizing the Koreasat. The core of this opposition seems to lie in the deep rooted disconfidence against the morality of these companies, which lead to the opinion that giving to the big companies such media with strong influence potential is not consistent with the public interest.

V. Policy issues regarding future space activities development

1. Issues of organizing nation's efforts

As discussed above, an initiative for promoting space project such Kitsat Program and Koreasat Project has been taken in respectively different sector of government organization. The former is by the Ministry of Science and Technology, the latter by the MIC. In addition to this, the Ministry of Trade and Industry (MTI) is planning to provide a financial support to the Multipurpose Satellite Program (KOMSAT), the leading project manager is the KARI.

Since the inception of this forerunner of Korean space development program, many scholars, scientists, especially having work experience in the American company or NASA of the U.S.A., and bureaucrats, have

expressed in various ways the necessity of establishing a central organization for managing space project. Its rationale is simple, that is to say, concentrating national efforts on specialized sector for the purpose of assuring the most effective utilization of national human and technical resources. Foreign countries' precedences have been cited, such as NASA of U.S.A., CNES of France, and Space Development Committee and JASDA of Japan.

At the beginning of the present presidency, in 1994, a vague idea of establishing a committee organization with such mission under the direct guidance of the President is shared among the political elite group of governing political party. However, this idea was not adopted, knowingly because the main political guideline for new government is to making a "small government" but effective so as to give more freedom to the private sector.

After the launch of Koreasat, however, many concerns have been expressed as to this idea of central and unified organization. It is realized that the benefit of technology transfer gained through the Koreasat Project is not to be shared among Korean industry as well as national technology research institutes. For example, 30 engineers selected from various sector for participating to OJT (On-the Job-Training) Program of the Koreasat, and gained valuable skills and technics in the area of spacecraft design and testing, have lost an opportunity to utilize their knowledge, because space project is not under consideration by each respective organization. Only 2 or 3 of them are to participate in the KOMSAT Project.

In this regard, the Plan, as presented above, proposes to establish an organization under the direction of the President, whose mission is to integrate the overall efforts and resources for space project. To do that, it is proposed that this organization should assume an appropriate competence which is dispersed among divers governmental organization

such MIC, MTI, MST, and MPI, according to current law and regulations.

2. Issues of next generation communication satellite project

Witnessing a partial failure of Koreasat launch resulting in the reduced lifetime of spacecraft, public opinion shared among Korean people as well as many government bureaucrats demands that space project be conducted on the basis of rational utilization of national resources. In other words, space project should assure some more concrete benefit as compared to the big amount of money expended. As a way of such sort of rationalization, the idea of a regional communications satellite system is proposed in various channels. This idea is based upon a simple logic that expensive facility should be more extensively utilized and be shared among many users which transcend national frontier in the region of Asia.

Taking into account that concern, the MIC has announced their plan for regional satellite system, the first step of which is to acquire the orbital slot. According to the announcement, an application for at least two or four slots has been filed to the Radio Regulation Board of the ITU (International Telecommunication Union). On the other hand, DACOM, (Korea Data Communication Company), is knowingly planning to launch its first communication satellite for regional communication market within the next 4 years.

VI. Conclusion

As Korean space activities are at the stage of beginning, policy makers are inclined to focus upon practical matters, the solution of which is foreseeable, rather than some basic legal and policy matters. Ad hoc

approach to each case of space activities issues is prevailing, while a more organized approach, such as legislation or transparent and foreseeable regulation of government, is not to be taken in the near future.

While many experts and scholars insist that government should adopt more organized and transparent policy, the best way of which may consist in specific legislation, policy makers and some scholars are presenting their own rationale endorsing present approach. For the latter, a necessity to enact a legislation encompassing entire space activities areas is not yet mature. For example, according to them, competent authority, regarding a license for spacecraft launch and operation such as Koreasat Program, has not been in any difficulty in working out its ad hoc and informal license process, because there has been only one application for spacecraft operation without competition, which is Koreasat Program. There has been no issue regarding, for example, the selection of operator of the satellite communication system, a pre-determined qualification condition for application, etc. For such reason, it is claimed that an ad hoc approach is more suitable and adapted to promoting Korean space activities.

In this context, we understand that such differences in view point lie just in determining whether the necessity of regulatory basis exists or not. Therefore, it is expected that in the foreseeable future, more transparent and organized governmental regulation would be set up in face of various, extensive and ever growing Korean space activities.

Long-term space development policy should be also considered in terms of the following factors; ① Participation in international space activities as an active member to utilize international organization and to contribute to the peaceful use of space, ② Development of national defence structure for independent activities in space, ③ Enhancement of manpower utilization for space development and promotion of national

pride, ④ Education of youngsters for the extension of intellectual activities into the limitless space, and ⑤ Formulation of Korean Space Development Policy for the 21st Century. In order to make very costly space development project most efficiently, governmental level space development organization directed by the head of nation should be established and should manage all space development programs making full use of its all available resources including the advantage of the university based R&D capability.

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※ 本論文은 1996年 1月 日本의 宇宙利用制度 研究會에서 發表한 內容을 補完한 것임

〈要約文〉

韓國의 宇宙産業 活動과 政策 : 現在와 未來

이 論文은 韓國의 宇宙 産業 發達과 그 過程을 考察하고 현재 진행 중인 通信衛星의 開發과 그 事業을 뒷받침해 주는 國家의 政策을 살펴보고 있다.

KOREASAT라고 命名된 通信衛星 開發에 현재 여러 기관이 關係하고 있으나 그 중 KARI(韓國航空宇宙研究所), ETRI(電子通信研究所), SERI(시스템공학研究所), KAIST(韓國科學技術研究所) 등이 중추적인 研究를 하고 있다.

특히 이 論文에서는 아래와 같은 問題를 다루고 있다

첫째, 最近 韓國宇宙開發 狀況

둘째, 長期 宇宙開發 計劃

셋째, 現在 宇宙開發 狀況과 未來 宇宙開發에 관련한 政策적 問題

넷째, 韓國 宇宙開發과 政策 方向에 대한 意見

최근의 韓國宇宙開發 狀況은 크게 韓國의 通信衛星 事業인 Koresat program과 다목적 衛星事業인 KOMSAT로 나타나는데 韓國의 최초 商業用 衛星인 Koresat는 1호가 1995년도에 發射되었으나 正常軌道 進入에 問題가 발생하여 發射業體로부터 補償問題가 提起되기도 하였으나 2호는 성공리에 發射되었다. 美國航空宇宙會社와 共同으로 開發중인 새로운 科學衛星인 KOMSAT는 韓國宇宙科學技術을 한단계 더 發展시킬 수 있을 것이고 1999 년도에 發射 計劃이다.

韓國航空宇宙研究所 中心의 長期 宇宙開發 計劃에서 提示하는 4가지 宇宙 開發의 基本目標은

첫째, 宇宙産業應用産業의 相互協助開發에 의한 宇宙産業 育成

둘째, 韓國의 현재 宇宙産業狀況에 알맞은 特定分野를 選定하고 이 分野에서 최단기에 世界 최고의 技術수준을 成就하도록 集中

셋째, 外國과 긴밀한 協助로 先進技術의 習得

넷째, 체계적이고 統合된 長期宇宙産業發展 計劃 成立 등이다.

이러한 計劃에 주요 事案으로는 2015년까지 19기의 人工衛星 保有를 위한

製作計劃과 2010년까지 發射體 開發을 마련하는 것이다

현재 宇宙活動에 관련된 問題는 주로 Koreasat의 서비스와 使用計劃에 대한 것으로 衛星開發事業에 있어서 관련 政府部署間에 意見을 달리하고 있는 형태이다. 韓國通信과 情報通信部는 衛星의 DBS 트랜스폰더에 대해 디지털 方式을 適用할 것을 提案했지만 共報處는 反對의 立場을 表明한 것과 放送局의 管理와 統制는 共報處에 있고 無線通信標準에 대한 免許는 情報通信部에 있기 때문에 放送局에 대한 免許는 각기 다른 두 段階로 構成되는 問題가 發生한다. 또한 DBS 서비스에서 私企業의 參與와 관련하여 財閥의 參與를 許容하느냐의 與否의 論爭이다.

다음으로 未來 宇宙産業開發에 관한 政策問題를 살펴보면 國家的 次元에서 組織的인 育成策에 대한 問題로 현재 주관 부처가 科學技術處와 通商産業部로 나뉘어 推進되고 있다는 점이다. 그리고 次世代 通信衛星開發 計劃에 대한 問題로 최소 2~4개의 軌道確保와 이미 正常軌道 進入 失敗에 따른 Koreasat 1호의 生命短縮으로 새로운 通信衛星을 4년 이내에 發射해야 한다는 問題이다.

결론적으로 長期 宇宙開發計劃政策에 있어서 첫째, 국제적 宇宙開發事業에 대한 積極的 參與, 둘째, 宇宙에서 獨立的인 活動을 할 수 있는 國家安保體制의 開發, 셋째, 國家 位相의 發展과 宇宙開發을 위한 人力活用の 開發, 넷째, 무한한 宇宙에 挑戰할 수 있는 優秀한 人才의 教育, 다섯째, 21세기를 對備하여 韓國의 宇宙開發政策의 決定 등이 考慮되어야 할 5가지 要素들이다. 그리고 莫大한 費用이 드는 宇宙開發事業을 효율적으로 推進하기 위해서는 國家 最高 指導者의 直接指揮를 받는 政府機構가 樹立되어 政府次元에서 推進하되 産學研이 協助하여 宇宙開發計劃을 推進하여야 할 것으로 본다.