

## Establishing Application System of KOMPSAT-1

Gi-Hyuk Choi, Joo-Hee Lee, and Hong-Yul Paik

Korea Aerospace Research Institute

**Abstract :** Korea Multi-Purpose Satellite-1 (KOMPSAT-1) has been developed by the Korea Aerospace Research Institute (KARI) with the aid of TRW and will be launched on the December 21, 1999 at the Vandenberg Air Base in CA, U.S. Now, the satellite application group in KARI is preparing for the service with the KOMPSAT-1 satellite data. For the purpose of supplying good service to the users, data application planning has to be established before launching satellite. To use satellite data effectively, KARI makes a plan for data policy, data price, mission planning, and commercializing strategy. This study was carried out with the purpose of effective use of satellite data. For this purpose, KARI, first, made 60 user groups to use KOMPSAT-1 data for public welfare and research sectors. These user groups include government, public corporations, institutes, and universities. KARI will offer the service to users through online using Internet. Secondly, KARI made a policy for the priority of KOMPSAT-1 missions. These are classified by the mission priority, payloads, and operational states etc. Thirdly, KARI will make data policy and data price of KOMPSAT-1 based on the basic master plan. Especially, data price will be determined at the KOMPSAT-1 committee including Ministry of Science and Technology (MOST). KARI is also trying to commercialize the data with the domestic and foreign companies to expand the use of KOMPSAT-1 data in the industries sector. Afterward in this study, KARI will continue the improvement for the effective distribution of KOMPSAT-1 data for all users.

**Key Words :** KOMPSAT-1, satellite data, data distribution

### 1. Introduction

KOMPSAT-1 is the earth observing satellite for practical use mainly in remote sensing area which includes the cartography of Korea peninsula, ocean research, environmental monitoring, and space research etc. and it will be launched on the December 21, 1999. KOMPSAT-1 will affect the promotion of remote sensing sector after launch and we hope that it will contribute to public welfare growth through information uplift of our country. Therefore, the goal of this research is to

make an application basis for KOMPSAT-1 utilizing in home and abroad. The followings are the summary of our research.

- Making application system of KOMPSAT-1 data for effective use: Basic principles for application (Data policy), Application plan, Formation of data user group, Distribution Policy etc.
- Establishing mission plans of KOMPSAT-1 with investigating the performance of payload, application field of user group, and observing

area by user's demands.

- Interfacing between the users and KARI: Web site, Workshop, and Distribution of explanatory note for KOMPSAT-1 user, Publication of papers on KOMPSAT-1 etc.

## 2. KOMPSAT-1 Application System

### 1) Data Policy

Data policy describes the basic strategy on the KOMPSAT-1 data application. The basic objectives of the KOMPSAT-1 data policy are to maximize the use of KOMPSAT-1 data and to stimulate a balanced development of public, academic and commercial applications. To achieve these purposes, we describe the basic policy of data distribution, prices, user groups, commercializing plans, and overseas applications. The following six categories of data policy are defined:

- The objectives of KOMPSAT-1 data policy are to promote applications and to enlarge the data use through the easy access and acquisition to the KOMPSAT-1 data.
- KARI takes the role of data distribution entity for KOMPSAT-1 unless the KOMPSAT-1 committee sets other framework.
- Data distribution entity (KARI) offers KOMPSAT-1 data to the public and academic

sectors with minimum cost and free of charge if necessary.

- Data distribution entity (KARI) takes the responsibility of commercializing data of KOMPSAT-1 in home and overseas.
- KOMPSAT-1 committee determines data prices and the special organization for data distribution.
- Data distribution entity (KARI) can offer data to the public and research institute in overseas when the MOU is concluded between two countries or institutes, and will cooperate to improve the international research activities for welfare of human beings according to the international custom.

### 2) Principles of Data Application

It is necessary for us to establish the application plans and distribution system of KOMPSAT-1 data because of readiness of satellite operation. Table 1 is the summary of our plans.

KOMPSAT-1 data applications in public sector have the priority over the others but users who want to use data in academic and industrial sectors can also acquire data with easy access. These are the basic principles to make an application system. The ownership of data and application system responsibility belongs to the KARI according to the agreements with government. Therefore, KARI will conduct the data application on the basis of the agreement.

Table 1. KOMPSAT-1 Application Plan

Period	Application Plans
1999. 01 ~ 1999. 07	Establishing user group for KOMPSAT-1 data in public and research sector
1999. 08 ~ 1999. 11	Investigation of demands from user groups
1999. 12 ~ 2000. 02	Launch of KOMPSAT-1, The early operation and data calibration
2000. 03 ~ 2000. 06	Estimation of data performances and trial distribution of data for promoting data application
2000. 07 ~ End of life	Establishment of application system and a regular distribution of data

To make basic policy of data distribution for users, we investigate requirement of users. For the results of this investigation, there are requisitions of three parts.

- National Security and Public sectors:
  - Having priority of KOMPSAT-1 application
  - Use data with the minimum expenses or free of charge
- Science sectors in domestic area:
  - Registered users only
  - Use data with the minimum expenses
- Commercial sector:
  - Domestic R Selection of many agencies, Data supplies with low price
  - Overseas R MOU, A license fee for the right to receive data

We have five kinds of plans for data application. The summary is in the followings.

- Conducting works on the base of the “2nd satellite data application project” sponsored by MOST
- Data distribution and public relations
  - Web interface, Workshop
- Trial distribution and verification of KOMPSAT-1 data
  - Period: Minimum 6 Months
  - Price: Minimum expenses or free of charge
  - Establishing of test product team during early

operation including user group

- Enlargement of data use and promotion of the related fields
- Harmony between public and commercial sectors

### 3) Establishing User Groups for Domestic Public and Academic Sectors

Domestic user groups are for the noncommercial, public and research use of KOMPSAT-1 data. User groups, which want to use data, have to register first as an institution, and then individual registration is possible. We sent the official documents 76 institutes from March to May 1999. Table 2 shows 60 registered institutions and universities from the registration result. Fig. 1 shows the structure of user groups for public, researches and overseas. We find that many people want to use KOMPSAT-1 data for the purpose of their research and actual applications.

### 3. EOC/ OSMI/ SPS Mission Plan

We carried out the investigation for 5months to look into user’s needs. Users have various demands for KOMPSAT-1 according to the payloads. Table 3 under below is for the summary about user’s needs. And Table 4 shows the observing area of users when KOMPSAT-1

Table 2. Present conditions of User Group

Classification	Number of User Group
National Security	6
Government Authorities & Affiliated Organization	10
Local Government	7
Research Institution	10
University	27

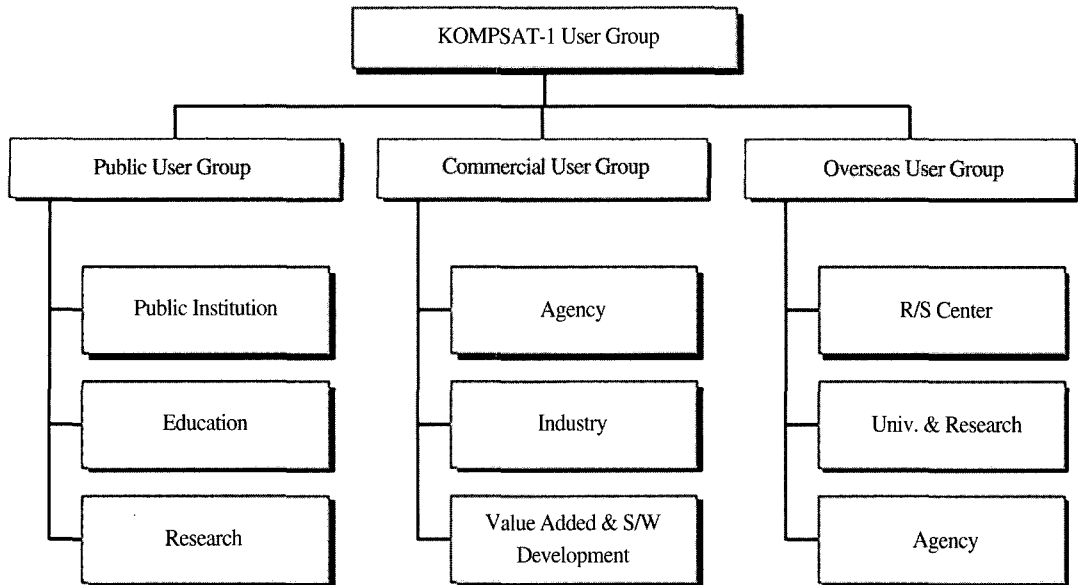


Fig. 1. Structure of KOMPSAT-1 User Group

Table 3. User's Demands for Payloads

Payloads	Demands of Users
EOC	Remote sensing including: Cartography, Analysis of topography, National territory utilization & management, Coastal management, Disaster monitoring and prevention, Environmental monitoring, Ocean monitoring, Geographical and earth physics, Utilization of agriculture and forestry, Development of water resources, Land development, Development of S/W, Information of North Korea etc.
OSMI	Remote sensing including: Environmental monitoring, Management of coast and harbor, Temperature of sea water, Research of an ocean current, Research of vegetation, Development of natural resources, Use data in Meteorology, Development of S/W, Information of coast near North Korea etc.
SPS	Research on ionosphere, cosmic ray, space environment, Estimation of RAM performance etc.

Table 4. Observing Area by User's Request

Payloads	Test Area
EOC	Taejeon~Dukyoo Mt., KyungGi Province, Korean Peninsula, All Areas of South Korea, ChungBuk Province, Seoul, South Coast, KwangJu, CheonNam Province etc.
OSMI	South Coast, KyungGi Bay, Korean Area, Coast of Northeast Asia, Nearby Korea, Sea area of Korea etc.
SPS	Ionosphere, High Energy Cosmic Ray

normally conducts mission in the early operation period after launch.

The mission concepts of KOMPSAT-1 are

classified according to the primary and secondary mission, priority of mission, payloads, operating situations etc. Next seven categories explain

priorities of KOMPSAT-1 mission.

- Normal Operation
  - Primary mission: Accumulation of EOC (Electro Optical Camera) image data for Cartography
  - Secondary mission: Accumulation of OSMI image data for oceanic & environmental research, SPS (Space Physics Sensor) data
- Emergency Operation
  - Check and management for safe operation of KOMPSAT-1
- Priority of Urgent Mission
  - The highest priority for KOMPSAT-1 safety, - National security and natural disaster,
  - Primary mission, - Secondary mission,
  - Worldwide data collection in urgent situation,
  - Request of overseas remote sensing center and company
- Payloads
  - Primary payload: EOC, - Secondary payloads: OSMI & SPS
- Geographical & Spatial Situation
  - Territory of the Korea, - Interesting area of our government,
  - Adjacent seas of Korea, - Atmosphere of Korea,
  - Foreign land, - Ocean, - Ionosphere
- Operating Mode
  - Emergency operation: Check and management of malfunction
  - Normal Operation: Observation, calibration and validation
- Time and Seasonal Situation

There is no priority for time and seasonal situation and we can expect the operating ratio of KOMPSAT-1 during the total operating time.

- Spring: Yellow sand, Paddy field, Blooming chlorophyll
  - Summer: Disaster (Typhoon, Landslide, A localized torrential downpour etc.), Analysis of vegetation
  - Fall: Typhoon, Blooming chlorophyll, Red tides, Harvest
  - Winter: Snows, Fisheries of the East China Sea
- This is for the operating ratio.
- Primary mission: 50%
  - Secondary mission: 25%
  - Safety checking: 15%
  - Urgent security mission: 10%

According to the above mission priorities, we should make weekly and monthly mission plans.

Data distribution entity (KARI) distributes stored EOC/ OSMI/ SPS data in common case, but in case of national security and disaster, it distributes data immediately after receiving the observation request. During the normal operation time, registered users can acquire KOMPSAT-1 data with the procedure shown in the Fig. 2 (EOC, OSMI data) and 3 (SPS data).

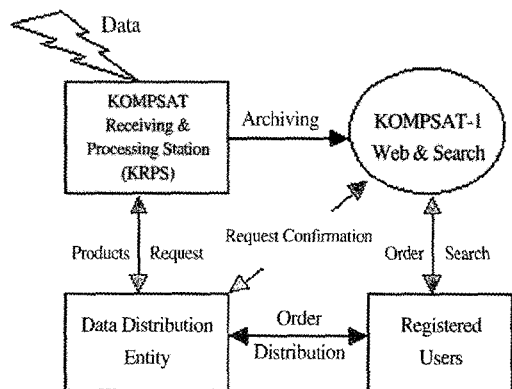


Fig. 2. Data distribution system (EOC, OSMI)

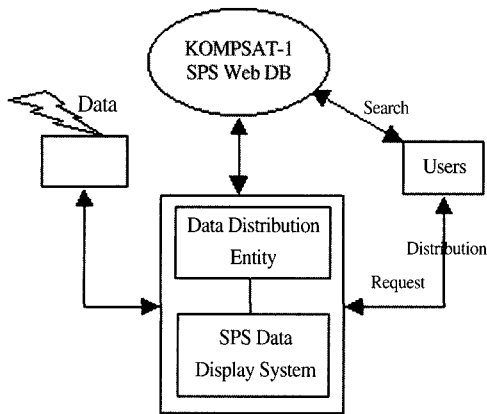


Fig. 3. Data distribution system (SPS)

#### 4. User Interface

It is necessary to promote data application through the smooth interchange of information between user groups and KARI. The user interface system (Data distribution entity) has the following characteristics.

- User Interface via Internet
  - \* Web site is accessible at any time
  - \* Contents of KOMPSAT-1 homepage
    - Introduction
    - KOMPSAT-1 System
    - Application
    - User Group
    - Library
    - News and Announcement
    - Related web link
    - Contact us
  - \* Data service including:
    - Data product search
    - On-line image browsing
    - Data ordering (plan)

Fig. 4 is the main homepage of KOMPSAT-1. Full contexts of KOMPSAT-1 homepage we

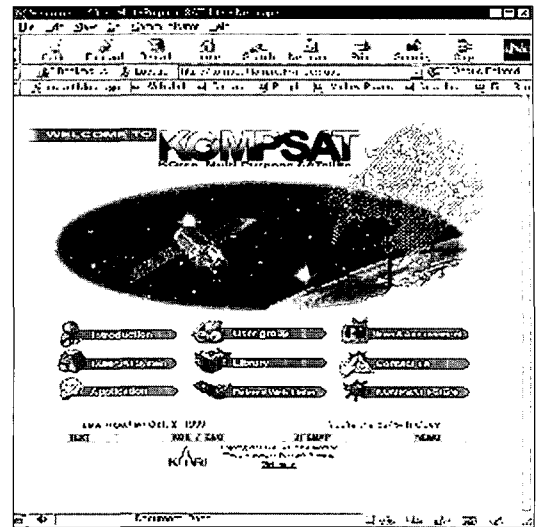


Fig. 4. Homepage of KOMPSAT-1

describe here can be found as following URL:

URL: <http://kompsat.kari.re.kr>.

Data distribution center is trying to give a user-friendly interface using WWW, ASP (Active Server Page). Operation of this system can be achieved with the simple use of a mouse. And now, we have the system and space for users. Any user that doesn't have satellite image processing system (S/W, H/W) can use this facility. The system will be equipped with as follows:

- Office: 45m<sup>2</sup> for 4 persons
- Equipment: Pentium III (CPU 550 MHz, Memory 256 MHz)
- S/W: IDL5.3 & ER Mapper 6.1

KOMPSAT Receiving and Processing Station (KRPS) is establishing on-line data catalog search system of KOMPSAT-1 data and Fig. 5 shows the system via Internet. Any people of registered user groups can find EOC and OSMI data. And data distribution facility of KARI is trying to build up on-line service system of KOMPSAT-1 SPS data.

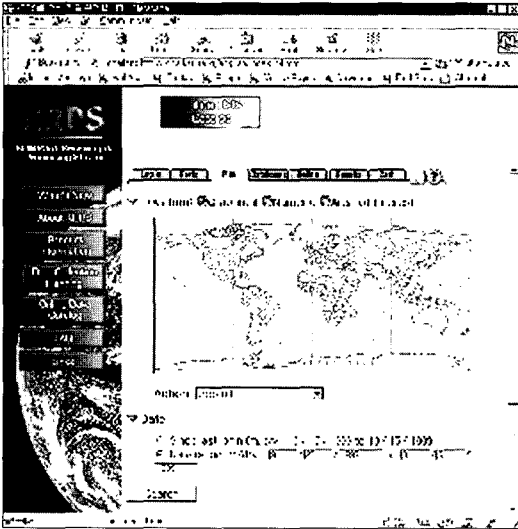


Fig. 5. KRPS On-line Catalog Search System

Registered users can acquire SPS data for research via Internet search system.

## 5. Data Marketing

Every company that has the ability of KOMPSAT-1 data handling can take part in KOMPSAT-1 data sales for enlargement of data use. KARI is planning to contract with these companies after confirmation of data policy by KOMPSAT-1 committee. KARI is going to promote a development of value-added products together with companies and customers (e.g. local government). We accepted commercialization proposals from the three companies that wanted to sell KOMPSAT-1 data for profit. Some company wanted to participate in the related project with KARI for making value-added products.

For the data price policy in domestic area, we made a price proposal on the base of commercialization proposal of KOMPSAT-1 data from companies and the result of our

investigation.

- Data Level for Distribution: Radiometric and geometric correction for EOC/ OSMI, Raw data for SPS
- Delivery Media: CD-ROM
- Proposed Data Price
  - EOC (16km × 16km): 100,000 Won (Commercial); 50,000 Won (Public)
  - OSMI (800km × 800km): 100,000 Won (Commercial); 50,000 Won (Public)
  - SPS: 10,000 Won (per CD)

KARI is planning to contract with the foreign companies (e.g. Space Imaging, Orbimage) for the global marketing of KOMPSAT-1 data. And KARI is reviewing a plan for allowing regional receiving rights for remote sensing centers in the Europe and the East Asia.

- Keeping preliminary contacts with Space Imaging and Orbimage for commercializing KOMPSAT-1 data
- Received a commercializing proposal of OSMI data from ANITE in U.K.
- RESTEC in Japan: Showing interests in OSMI data
- Preparation of preliminary contacts for regional marketing with Eurimage, Swedish Space Cooperation

## 6. Analysis of questionnaire investigation of domestic remote sensing fields

The objective of this questionnaire about the domestic remote sensing fields is to make database of KOMPSAT-1 data needs and user

Table 5. The Major Results of Questionnaires

Question	Rank
1. Working Place?	Univ. > Research Inst. > Government > Industry
2. Major?	Applied Sci. > Natural Sci. > General Sci. > Social Sci. & Management
3. Future Usage?	Surface Research > Undecided > Atmosphere Research > Payloads & System
4. Current Usage?	Research > Education > Commercial > National Security
5. About H/W?	PC & Workstation > PC Sys. > Workstation Sys.
6. About S/W?	ERDAS > ENVI > ER Mapper etc.
7. Data Use?	TM > SPOT > MSS > AVHRR
8. KOMPSAT-1 Sensor Use?	EOC > OSMI > SPS > Undecided
9. Field of Data Use?	Meteorology & Environment > Natural Resources Research > Land Development & Topography
10. Data Merging?	MSS, TM, SPOT > Meteorological & Oceanic Sat. > Radar etc.
11. Requisition for KOMPSAT-1 Data Use?	Low Price of Data > Development of Parameter for Application > High-quality Human Resources

analysis. It will support the application system of KOMPSAT-1 data. User database is the basic part of the investigation for the application system of KOMPSAT-1. It was conducted by "The Korean Society of Remote Sensing" and "Kookmin University (Professor Kim Cheon)" during 1998 and 1999. User database includes government, research institute, university, industry, and the press. For the analysis of questionnaires, we selected 70 replies from 77 persons. Table 5 shows the major results of questionnaires. It will help data application for user groups.

## 7. Conclusions

The main objective of the KOMPSAT-1 application system is to provide required products to the users. In this paper, user find KOMPSAT-1 application system that explains data policy, data application plan, mission plan,

user interface and data marketing. The KOMPSAT-1 application system will provide the interface to the user group for data requests, acquisition system, data processing, and delivery of the corresponding data products. The KOMPSAT-1 user services are open and available to all potential users on the base of KOMPSAT-1 application system.

## References

- Paik, H. Y. *et al*, 1998, *Development of Technologies for Satellite Imaging Data Processing and Applications - Development of EOC/OSMI Mission Plan and Application System*, KARI, Korea.
- Satellite Application Group, 1999, *KOMPSAT Home Page*, <http://kompsat.kari.re.kr>
- KOMPSAT Receiving and Processing Station, 1999, *KRPS Home Page*, <http://krps.kari.re.kr>