



Science, Technology and ICT Newsletter(No.81)

Digital technology to merge with safety to address issues in workplaces, living areas, and catastrophic situations

Korean Government announced the Digital Measures to improve the Citizen Safety, which is jointly established by the Ministry of Science and ICT, the Ministry of Employment and Labor, the Ministry of Interior and Safety, the Ministry of Trade, Industry and Energy, and the Ministry of Environment. In order to enhance the safety management capacity of Korea, the government will converge and utilize the digitally innovative technologies in workplaces, living areas, and catastrophic situations.

Recently, with the acceleration of digital innovation, leading-edge safety services became possible to monitor the inaccessible dangerous districts and predict, response, and remote control the risks. Thus, Korean government drew up these measures to establish the digital safety industries and effectively response to the catastrophes.

1. Safety in the workplaces – Avoiding hazards in the workplaces with digital safety technologies

Korea will secure the safety in the field site of manufacture, logistics, construction, and

emotional services using ultra-low latency 5G network and IoT sensors. Also, a digital safety system will be built for industry clusters, closed workplaces and labs, and marine sites to prevent highly hazardous risks. MSIT will collaborate with the Ministry of Employment and Labor to discover the new digital safety services and to support the adoption of such services for businesses with 50 or less employees.

2. Safety in the living areas – Forming digital safety net to tackle the blind spots

Korea will secure the golden hours of rescue in the indoor emergencies such as indoor fire or stalking crimes by establishing a precise indoor positioning system. Also, digital technologies will help prevent safety blind spots by sensing abnormal activities without privacy intrusion. Ultra-wideband and GPS technologies will realize ‘safe streets’ by sensing crimes, and help safe return home for elderly dementia patients and young children.

3. Safety in the catastrophic situations – Managing risks for various catastrophes

The digital based risk management system will be reinforced in order to respond properly to various catastrophes including disasters caused by the climate change. MSIT will collaborate with the Ministry of Environment to minimize the damages of natural disasters. To respond to floods, digital twin technology will predict the scale of the damage and AI technology will help the decision making for evacuation and water release. In cases of sudden and torrential downpour in urban areas, the system will be demonstrated to help damage prediction and public evacuation. For wildfires, government will support establishment of AI fire monitoring system. Also, government will secure the stability of nation’s essential infrastructures for preemptive management of physical accidents and network breakdowns using sensors and AI technologies.

4. Building the infrastructure – Building strong foundation through private-public cooperation

MSIT will collaborate with the Ministry of Interior and Safety in supports for the establishment of the shared platform for safety data and AI learning data. ‘Mid-to-long term Technology Development Roadmap’ will be drawn up to form and operate the private sector committee to standardize and discuss the regulation improvements.

Minister Lee Jong-Ho of Science and ICT expressed the positive outlook that this digital safety model will minimize the safety blind spots and strengthen the public safety in workplaces, living areas, and catastrophic situations. He added, “MSIT will

make full-fledged efforts in converging and utilizing the digital technologies in safety sectors to make society more safe.”

For further information, please contact the Public Relations Division (Phone: +82-44-202-4034, E-mail: msitpress@korea.kr) of the Ministry of Science and ICT.

Going Global

The KPLO Danuri Embarks on a Journey to the Moon

The Ministry of Science and ICT (“MSIT”; Minister Lee Jong-Ho) announced that Korea’s first moon orbiter Danuri was launched Friday from Cape Canaveral on a SpaceX Falcon 9 rocket, at 8:08:48 am, August 5, 2022 (EDT 19:08:48 Thursday, August 4, 2022), and successfully entered its planned trajectory toward the moon as of 2 p.m.

Danuri separated from its carrier rocket at an altitude of about 703 km at around 8:48 am., and made its first communication with the ground station around 92 minutes after liftoff at 9:40 a.m. (KST)

The Korea Aerospace Research Institute's ("KARI"; President Lee Sang-ryool) ground control center analyzed the SpaceX data on the lunar orbiter's projectile separation (speed and direction, etc.) and confirmed that Danuri was separated from the projectile and entered its planned trajectory.

An analysis of the received satellite information signal confirmed that Danuri's solar panels started generating electricity and communication between the onboard computer and other devices functioned smoothly. The temperature detected on each device was also within the expected range, indicating that Danuri was operating normally.

As Danuri is on a low-power, fuel-efficient ballistic lunar transfer trajectory, it will initially set off on a trajectory heading towards the L1 Lagrangian point, where the gravitational forces of the Earth and the Moon are balanced. Then, on September 2, Danuri will conduct Trajectory Correction Maneuver (TCM), adjusting the orbiter’s cruising direction, position and speed using a thruster.

Danuri should arrive at its destination around mid-December after about four-and-a-half months of travel and enter its mission orbit at the end of December 2022.

Once Danuri reaches the Moon, the lunar orbiter will orbit for a year at 100 kilometers above the lunar surface, conducting its mission* from January 2023.

*Identifying potential landing sites for future lunar missions, conducting lunar scientific research (e.g. analyzing surface mineral and observing magnetic field and radiation) and verifying space internet technology.

Korea started building its first lunar orbiter from 2016 in line with its Mid to Long Term Space Development Plan.

With the development of Danuri, Korea laid the foundation for full-scale space exploration activities in the future. For instance, Korea secured the orbital operation capability for ballistic lunar transfer (BLT) method for deep space navigation, developed an independent large-capacity high thrust propulsion system, and secured deep space antenna for deep space communication, which is 35 meters in diameter.

The KPLO carries six science instruments and technology demonstration payloads. Among the six payloads, five were made in Korea, designed and developed by Korean research institutes and universities*, except for NASA's Shadow Cam.

* Korean Aerospace Research Institute, Korea Astronomy and Space Science Institute, Electronics and Telecommunications Research Institute, Korea Institute of Geoscience and Mineral Resources, Kyung Hee University

The First Vice Minister Oh Tae-Seog of Science and ICT said, “The Danuri is the first lunar orbiter that Korea has built, and along with the development of the Nuri, it will enhance Korea’s international standing in space and set the stage for Korea to become a space power.” He added, “The technology acquired through the development of Danuri and the scientific data obtained through Danuri's mission are expected to greatly contribute to Korea's lunar science research, not to mention sparking public interest in space development.”

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“Space for Women,” One Step Towards Embracing Diversity and Enhancing Coexistence

A large-scale international event participated by 31 member countries of the Committee on the Peaceful Uses of Outer Space (COPUOS), and about 100 attendees

Hackathon and student program to be hosted in efforts to promote the international community’s Space4Women initiative

To host a workshop for experts in four topics: Train-the-trainers; 2) Women space entrepreneurs; 3) Measuring the participation of women in the space workforce; 4) Analysis and impact of gender empowerment activities (August 17-19)

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The Ministry of Science and ICT (“MSIT”; Minister Lee Jong-Ho) announced that the “UN Space for Women Expert Meeting”, which is an international event to promote women’s empowerment in the space sector will be hosted for four days, from August 16 to 19, in Science Cultural Center in IBS, Daejeon and the Korea Aerospace Research Institute (KARI).

The expert meeting is hosted by the United Nations Office for Outer Space Affairs (UN OOSA) and MSIT. Korea has taken over the host country status, following Brazil as the first host country in 2021, and this is the second expert meeting to be held in the world.

The UN Space for Women Expert Meeting has been launched to work towards the “Space 2030 Agenda (Attached file 1)”, which is a resolution adopted in the UN Committee on the Peaceful Uses of Outer Space (COPUOS).

As the international community’s interest for promoting gender equality and women’s participation in space has increased recently, this year’s expert meeting will be hosted as a large-scale international event, where approximately 100 people take part, from 31 UN COPUOS member states and 62 organizations.

This expert meeting holds great significance in that it is the second space-related UN event hosted by Korea, since the “second UN Space Law Workshop” back in 2003.

The opening ceremony will take place on August 16, and hackathon and student program will be held as side events before the expert meeting on August 17.

Under the leadership of the Space Generation Advisory Council* (SGAC), the hackathon will be held under the theme of “how space technology can contribute to promoting gender equality.”

* The global network for students and young professionals supporting the UN; it holds the observer status of the UN COPUOS and the outcomes of the meeting will be reported to the UN COPUOS.

The student program is categorized into special lectures and mentoring by experts on the topic of “Space is open to everyone”, and also involves visiting space-related research institutes.

※ About 40 male and female high school students were selected in advance, based on the pre-registration that took place until August 8.

- The special lecture will be given by Ms. Natercia Rodrigues, Chief of the Office of the Director at the UN OOSA on the topic of the UN’s role in the space sector. There will be visits around research institutes, including the Korea Aerospace Research Institute (KARI) and the Korea Astronomy and Space Science Institute (KASI).

- After that, the students will go to see an exhibition on the Korea Pathfinder Lunar Orbiter (KPLO, Danuri) at the National Science Museum located in Daejeon.

The Space for Women Workshop will be divided into expert groups in four fields*, and the current status, obstacles, future strategy, and major tasks by each field will be discussed at the workshop from August 17 to 19.

* ① (Education) Provide training for those involved in educating women in STEM, specifically space science, ② Boost female entrepreneurship, ③ (Statistics) Conduct a survey on the statistics of women’s participation in the space sector, ④ (Achievements) Analyze the impact of gender empowerment activities focusing on the space sector

At the workshop, where women experts in space from around the world gather together, there will be in-depth discussions on topics such as the statistics of women participation, ways for supporting activists responsible for educating women and how to support starting new businesses.

The results of the discussion will be disclosed in the official UN report format in the UN COPUOS session for next year, and it will be utilized to set the direction for the “third Space for Women Expert Meeting” to be held in Canada in 2023.

During the time of the workshop, KARI and KASI will introduce and promote the activities* carried out by women in the space sector through the female council in the

research institute, along with other activities for educating female students on space science such as “She Space-Korea**”.

Category	Main contents
Activities of the female council	The female committee in the Korean Society for Aeronautical and Space Sciences (KSAS), S&T committee in the Korean Women Scientists and Engineers (KWSE) (space, aerospace, astronomy), and the Women in Science, Engineering and Technology (WISET) participate in the activities to discuss agendas such as empowering women in the space sector
She Space-Korea	The KARI Academy will operate the “She Space-Korea” program, as part of the “project to expand the landscape of women in the space sector” (2022~2026) of the MSIT. Under the program, activities including providing basic lectures for female high school students, the research project on climate change using satellite images, and exchanges with overseas teams will be implemented.

In the opening ceremony of August 16, Director General Kwon Hyun-joon of the Space, Nuclear and Big Science Policy Bureau of MSIT said, “Only a few women are engaged in the space sector globally, and Korea also has a few women participating in the space sector.”

* (OECD survey in 2019) Female workforce employed in space-related research institutes: (UK) 48%, (US) 35%, (Korea) 8%

Director General Kwon plans to send the message that “I hope that a global workshop just like this expert meeting will contribute to fostering active policies of each government, for promoting women’s participation in the space sector.”

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Going cooperation

MSIT to build strong foundation for ‘Korea-U.S. tech alliance’

Minister Lee Jong-Ho of Science and ICT visited Washington D.C. on August 1 to meet with key government officials in order to discuss the measures to strengthen the Korea-U.S. alliance in the field of cutting edge technologies.

Minister Lee met with the Director Alondra Nelson of the White House Office of Science and Technology Policy to reaffirm the tech alliance concurred at the Korea-U.S. Summit Meeting on May. Both parties agreed to strengthen the tech partnership based on the mutual understanding on the importance of critical and emerging technologies in economy and security. Specifically, both agreed to declare joint statement on quantum cooperation at the end of this year to enforce the strong cooperation of both countries in quantum field. Minister Lee also suggested the establishment of talent exchange channel in STEM field. Both parties decided to hold ‘the 11th Korea-U.S. Joint Committee on Science and Technology’ this year, and anticipated the signing of ‘Korea-U.S. Science and Technology Cooperation Agreement’ to systematically support the alliance.

Minister Lee discussed cooperation in space technology as well with the Executive Secretary Chirag Parikh of White House National Space Council (NSpC) and Administrator Bill Nelson of NASA. MSIT and NASA both agreed that cross-border cooperation in space technology is crucial, and expected the wider cooperation from Artemis projects to Moon-to-Mars Exploration. Then both parties discussed on the involvement of private sectors in the space technology. In the talk with NSpC, MSIT requested flexibility in ITAR application, and NSpC agreed to further discuss later on. Both parties acknowledged the importance of Korean Positioning System (KPS), and reaffirmed the cooperation in the development.

Minister Lee will then travel to Orlando, Florida to direct the launch of Korea’s first lunar orbiter, Danuri, in an effort to encourage the researchers.

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Vice Minister Oh Tae-Seog Attends the 31st IAUGA

Vice Minister Oh Tae-Seog of Science and ICT attended the 31st International Astronomical Union General Assembly (IAUGA) on August 2 and gave congratulatory remarks and encouraged over 1,800 astronomers from 83 countries.

The IAUGA, which was held in BEXCO, Busan this year, is one of the most prominent academic events in the field of astronomy where experts share their recent findings and

discuss and make decisions* on key issues. The host country's head of state usually makes welcoming remarks**, which shows the event's high international standing.

* The 2006 IAUGA held in the Czech Republic garnered attention because of the decision to re-classify Pluto as a dwarf planet.

** President Xi Jinping of China attended the 2012 IAUGA held in Beijing.

Vice Minister Oh asked President Debra Meloy Elmegreen of the International Astronomical Union (IAU) for her attention to Korean astronomers so that they can play greater roles in the IAU.

He also asked for her attention to the 45th Committee on Space Research (COSPAR), which will be held in Busan in 2024.

Vice Minister Oh said, “ I hope that the 31st IAUGA, which will be held for 10 days with the theme of “Astronomy for All,” provides an opportunity for strengthening global research cooperation and serves as a platform for mutual exchange that can contribute to the peace and progress of humanity.“

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The 10th Korea-Israel JCM on S&T Cooperation Held

The Ministry of Science and ICT (MSIT) announced that the 10th Korea-Israel Joint Committee Meeting (JCM) on Science and Technology Cooperation was held virtually with the Israeli Ministry of Science and Technology (MST) on August 23.

The 10th Korea-Israel JCM on S&T Cooperation was held based on the Agreement on Scientific and Technological Cooperation between Korea and Israel signed in November 1994. Since the first JCM in 1995, a total of nine JCMs have been held and 44 S&T joint research projects have been carried out.

Korea and Israel discussed concrete cooperation measures, including bilateral S&T policy exchange and research collaboration.

- The meeting was chaired by Director-General Kim Seong-gyu of the International Cooperation Bureau of the MSIT and Chief Scientist Avi Domb of the MST.

Korea and Israel first took the stock of the past S&T achievements and explored new measures for cooperation.

Both countries reviewed the selection process of the topics for new joint research projects and agreed to promote new joint research in quantum technology, artificial

intelligence (AI) and alternative energy, after approvals from the heads of both delegations.

(Quantum Optics) Development of cutting-edge imaging technology using photon pair and multidimensional photon detector
(Korea University – Weizmann Institute of Science)

(AI 1) Markov game-based deep reinforcement learning for smart city distributed traffic management
(KAIST – Bar-Illan University)

(AI 2) Development of Deep Learning Algorithm for the Prediction of Genomic Breeding Values of Livestock
(Chungnam National Univeristy – Agricultural Research Organization (ARO))

(Alternative Energy) Storage of Green Hydrogen Energy Through Urea Oxidation
(Yonsei University – Technion IIT)

Then, Korean and Israeli researchers gave presentations on the topics selected for the new joint projects, and both sides confirmed their respective roles and expected outcomes.

Director-General Kim Seong-gyu said, “This year’s JCM is highly meaningful as it provided a venue for discussing new areas of scientific and technological cooperation that can create synergies from respective strengths of Korea and Israel, opening a new chapter of advanced S&T cooperation.”

He said, “I hope that the new joint projects boost advanced S&T cooperation between our two countries.”

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Achievement

Korea to develop the world's first testing equipment for the SPHEREx

The Ministry of Science and ICT (MSIT, Minister: Lee Jong-Ho) and the Korea Astronomy and Space Science Institute (KASI) announced the successful development of the testing equipment for the NASA SPHEREx, which stands for Spectro-Photometer for the History of the Universe, Epoch of Reionization, and Ices Explorer. The SPHEREx is an all-sky spectral survey telescope project that 12 institutes including NASA Jet Propulsion Laboratory (JPL), California Institute of Technology (Caltech), and KASI participate. It took KASI three years to develop with an aim to test the performance of the telescope on the ground.

The core device of the developed equipment is the cryogenic vacuum chamber. This chamber was specifically designed to suit the SPHEREx, and will create the vacuum and cryogenic state below minus 220 degrees Celsius, the state that telescope will face in the space. The SPHEREx will go into the chamber to test imaging performance under extreme environment. KASI also developed loading devices and other optic devices for the SPHEREx. Using the cryogenic vacuum chamber, KASI will lead the space environment testing, develop data investigation software, and participate in the core science researches.

A SPHEREx instrument scientist and a researcher at Caltech said “It’s absolutely essential that we get this thing sharply into focus before we fly, and the only way to accomplish that is through specific cryogenic optical testing in the environment provided by the KASI chamber.”

Director-General Kwon Hyun-Joon of Space, Nuclear, and Big Science Policy Bureau of MSIT said “The equipment that Korea developed is one of the most major hardware equipment in the SPHEREx project.” He added, “MSIT plans to expand the cooperative research projects with various global research institutes in order to secure core technologies that can lead the field of space survey.”

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