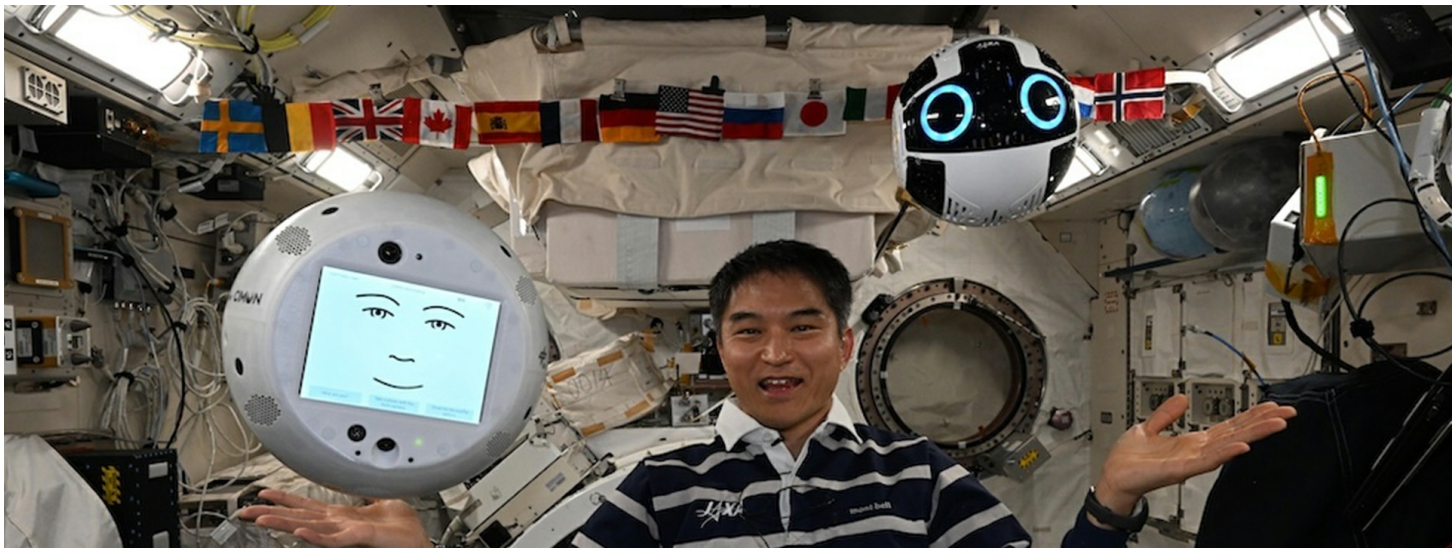
IBM UK Newsroom

German, Japanese Space Agencies Achieve Robotics Milestone Aboard International Space Station

Two AI-powered robots played hide-and-seek in space – the first-ever direct collaboration between astronaut assistance systems from different space agencies

JAXA, DLR, Airbus, and SEC jointly enabled the multi-robot collaboration with the support of IBM

Experiment paves the way for human spaceflight enhanced by robotics and AI



July 31st 2025 - Today, the German Space Agency at DLR and the Japan Aerospace Exploration Agency (JAXA) announced a robotics milestone aboard the International Space Station (ISS), paving the way for more advanced human-robot teaming in space.

In the ICHIBAN mission (Japanese for “The First”) completed on July 29, two separately developed astronaut assistance robots communicated and cooperated with each other across two different IT networks for the first time ever.

Collaboration between the two distinct free-flying robotic systems opens new opportunities for space agencies to augment and enhance astronauts’ work with robotics and AI. For example, agencies and systems can now work together to accelerate ISS experiments, inspect the ISS for defects, and improve astronaut safety.

“IBM has been a vital technology partner to the space industry for many decades, from the Apollo Moon missions to innovation aboard the International Space Station. The ICHIBAN mission marks the next decisive step: combining artificial intelligence and robotics to improve astronauts’ capabilities and safety. Secure, cross-system communication and cooperation between robots from different space agencies, powered by IBM watsonx technology, opens up completely new possibilities for space travel,” said Matthias Biniok, Head of IBM Client Engineering DACH.

The two robots - JAXA’s Int-Ball2 and DLR’s CIMON* - were not originally designed for these tasks. The teams involved developed new, AI-powered extensions to securely connect both robots.

Robotic helpers aboard the ISS

CIMON was developed on behalf of the German Space Agency at DLR by Airbus and with the support of IBM as an autonomous assistant robot for astronauts aboard the ISS. Using natural language processing and image recognition technology, CIMON can interact with the crew via voice commands and perceive its environment visually and acoustically. CIMON is powered by watsonx, IBM's flagship portfolio of AI technology. For the ICHIBAN mission, CIMON integration, operations planning and execution were achieved with support from the European Space Agency (ESA) and BIOTESC, the responsible operations center based in Switzerland.

Int-Ball2 is a JAXA's camera drone supporting the camera work of the astronauts, while SEC supported the development of its integrated management software and ground operation systems. It has been deployed in the Japanese Kibo module of the ISS since 2023 and is remotely controlled from JAXA Tsukuba Space Center in Japan. Int-Ball2 allows the ground control team to film and monitor astronauts' work in the Kibo module without the need to continually set up cameras. Astronauts aboard the ISS already spend about ten percent of their working time just taking photographs.

Playing hide-and-seek

The ICHIBAN mission objectives included:

- Demonstrating advanced communication and action execution capabilities of multiple distinct robots operating in real-time onboard the ISS
- Showcasing the first-ever bi-directional communication between hardware systems residing in different module networks on the ISS
- Stimulating public engagement and outreach highlighting the power of international collaboration in advancing human spaceflight activities

To achieve these objectives, JAXA astronaut Takuya Onishi gave voice commands through CIMON to remotely control Int-Ball2, which was located in a separate ISS module. Int-Ball2 would transmit images back to CIMON's monitor, allowing Onishi to successfully seek out items hidden elsewhere on the station. Previously, photos from Int-Ball2 could only be transmitted to the Japanese control station on Earth, not another agency's robot aboard the ISS. The hide-and-seek items included a Rubik's Cube; hammer and screwdrivers; and an older, retired version of Int-Ball.

For the experiment, IBM developed new dialog functions for CIMON based on watsonx technology and deployed them via wireless update. With these new features, it is intended that the ISS astronauts can now control Int-Ball2 in the Japanese Kibo module via voice commands to CIMON. CIMON's Robot Operation System (ROS) is designed to recognize these commands and where feasible transmit them to Int-Ball2 via the ISS networks. Int-Ball2 is then programmed to execute the commands in the Kibo module.

This milestone highlights the immense potential for future missions where astronauts and multiple robots work together in an integrated and intuitive manner, advancing human capabilities in challenging space environments. Further trials are already being planned to explore new applications. The experiment was conducted in accordance with applicable ISS safety standards.

Testimonials

“The ICHIBAN demonstration on the ISS in cooperation with our colleagues at JAXA represents a significant milestone in space robotics. The first communication between the independently developed systems CIMON and IntBall-2 paves the way for the networking of artificial intelligence and robotics in exploration. This achievement will significantly improve support for astronauts.” says Dr Christian Rogon from the German Space Agency at the German Aerospace Center (DLR)

“The ICHIBAN mission marks a pivotal step toward seamless robotic collaboration in space. By enabling Int-Ball2 and CIMON to work together, we not only demonstrate technical synergy but also highlight the power of integrated human-robot teamwork. This mission showcases how collaboration -between robots and humans - can unlock new possibilities for supporting astronauts and advancing space exploration.” says Seiko Piotr Yamaguchi, Engineer at JAXA Human Spaceflight Technology Center (Robotics System Integration Team)

About Airbus

Airbus is the largest aeronautics and space company in Europe, providing products, services and solutions for the commercial aircraft, helicopter, defence and space sectors. Drawing on over half a century of aerospace engineering expertise, Airbus products are defined by innovation. From the commercial aircraft and helicopters that connect and unite people around the world to the military aircraft and satellites that protect citizens and countries, Airbus products enable modern and connected life.

About BIOTESC

BIOTESC is the Swiss User Support and Operations Center of ESA responsible for the planning, testing, and implementation of CIMON operations on the ISS. The BIOTESC team has been involved in the ICHIBAN mission from the very beginning. During operations on the ISS, BIOTESC staff supported both the participating astronauts and CIMON from their control room in Switzerland. BIOTESC is based at the Lucerne University of Applied Sciences and Arts.

About DLR

The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) is Germany's national research and technology center for aeronautics, space, energy, transport, security and defense. DLR's work spans a wide range of applications, delivering results and innovations that benefit industry and business, government agencies and the public sector. At the heart of DLR's mission is its commitment to society, which it fulfils through extensive knowledge sharing and targeted technology transfer. The German Space Agency at DLR is responsible for planning and implementing German space activities on behalf of the federal government. Additionally, two project management agencies at DLR manage research and industrial funding programmes.

Earth's climate is changing, along with global mobility and technology. DLR harnesses the expertise of its 51 research institutes

and facilities to develop solutions to these challenges. All 11,000 employees share a common mission: to explore Earth and space while developing technologies for a sustainable future. DLR's technologies are not confined to the laboratory, but are transferred to wider society, strengthening Germany's position as a prime location for research and industrial innovation.

About the European Space Agency

The European Space Agency (ESA) provides Europe's gateway to space.

ESA is an intergovernmental organization, created in 1975, with the mission to shape the development of Europe’s space capability and ensure that investment in space delivers benefits to the citizens of Europe and the world.

ESA has 23 Member States: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland and the United Kingdom. Latvia, Lithuania and Slovakia are Associate Members.

It is working with the EU on implementing the Galileo and Copernicus programmes as well as with Eumetsat for the development of meteorological missions. Learn more about ESA at www.esa.int

About IBM

IBM is a leading provider of global hybrid cloud and AI, as well as consulting expertise. We help customers in more than 175 countries leverage insights from their data, optimize business processes, reduce costs, and gain competitive advantage in their industries. More than 4,000 government and corporate entities in critical infrastructure sectors such as financial services, telecommunications, and healthcare rely on the IBM and Red Hat OpenShift hybrid cloud platform to enable their digital transformation to be fast, efficient, and secure. IBM's groundbreaking innovations in AI, quantum computing, industry-specific cloud solutions, and consulting provide our clients with open and flexible options. All of this is supported by IBM's long-standing commitment to trust, transparency, accountability, inclusion and service. Visit ibm.com for more information.

About JAXA Human Spaceflight Technology Directorate

The Japan Aerospace Exploration Agency (JAXA) is a core executive organization technically supporting aerospace development and utilization for the Japanese Government. JAXA’s Human Spaceflight Technology Directorate is engaged in expanding human activity areas, promoting utilization of the unique space environment through operation of the ISS Japan Experimental Module “Kibo”. We aim to enhance scientific utilization of space and to return benefits to humanity and activities on Earth. Beyond the ISS, the Human Space Technology Directorate is actively advancing projects for the future human space exploration, including the development of Lunar Gateway, crewed (Pressurized Rover) and uncrewed (LUPEX) missions to the Moon. JAXA is also actively working on research and development of robotics assistance anticipated to enhance future human spaceflight missions.

About SEC

Systems Engineering Consultants (SEC) is a software development company specialized in real-time technology, contributing to the safety and development of society. Real-time technology is a universal form of technology used for developing advanced computer systems. We offer real-time software in four different business fields: mobile networking, internet technology, public infrastructure, space, robotics, and advanced technologies. For the International Space Station, we are developing "Int-Ball2" and the payload transportation and handling robot system "PORTRS."

*Crew Interactive MObile CompanioN (CIMON®) is a scientific project of the German Space Agency at DLR, developed and implemented by Airbus and IBM Germany, supervised by scientists at the Ludwig Maximilian University Hospital and financed with federal funds. CIMON® is an EU-registered trademark of the German Aerospace Center (DLR).

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Picture
Caption: JAXA astronaut Takuya Onishi with robots CIMON and Int-Ball2 on the ISS in the Japanese Kibo Module
Credits: DLR/ESA/JAXA/NASA

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