

Laboratory / Center profile

Space System Laboratory

Representative: Associate Professor Naohiko Kohtake, Associate Professor Seiko Shirasaka, Professor Hidekazu Nishimura, Project Associate Professor Nobuaki Minato, Guest Associate Professor Hajime Yano, Executive Advisor of SDM Research Institute Yoshiaki Ohkami, Executive Advisor of SDM Research Institute Taketoshi Hibiya and others

The Space System Laboratory aims to address issues related to space systems by applying methodologies and methods based on systems thinking, design thinking and management thinking developed by Keio SDM. Our activities include research on design and development of spacecraft systems such as rockets, satellites and space stations; research for space system utilization, including collaboration with other systems; research for materializing each space system as a sustainable social infrastructure from business and policy perspectives. Many of our faculty members have professional experience in the space industry, both inside and outside Japan. Additionally, we have various business, government

and academic professionals conducting research, all of whom deal with space systems on a daily basis. Through discussion of these members, the laboratory produces results in various forms. Having members with such diverse expertise, the laboratory also focuses on various space-related educational activities. The laboratory welcomes international students and organizes lectures and seminars in which laboratory members collaborate with one another. We place importance on international coordination and promote exchange programs with MIT (US), Purdue University (US) and the Delft University of Technology (Netherlands) in pursuing various international coordination projects.

Examples of Research and Educational Projects

- **Research on Seaplane-type Horizontal Take-off and Landing Sub-orbital Space Vehicles With an Eye Toward Manned Space Flight (Leader: Ohkami)**

In pursuit of a concept for seaplane-type horizontal take-off and landing sub-orbital space vehicles that utilize topographical characteristics that are particular to Japan, we design demonstration experiments and business models with an eye toward realizing manned space flight.

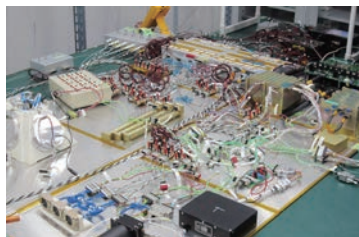
We plan to launch a joint experiment with Tokyo Institute of Technology and Tokyo University of Science.



Research on seaplane-type horizontal take-off and landing sub-orbital space vehicles

- **Research on Methodology for Developing Nano Satellites (Leader: Shirasaka)**

In collaboration with the University of Tokyo, Wakayama University and others, we are developing "Hodoyoshi" and "UNIFORM", which are 50kg class satellites. In this context, we are researching a methodology to develop new nano-satellites.



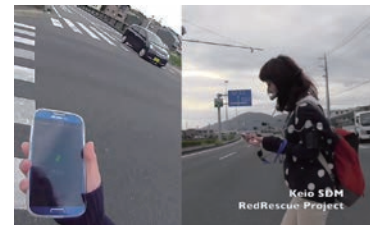
Research on methodology for developing nano satellites

- **Research on Thermophysical Measurement of Metallic Melt under Microgravity (Leader: Hibiya)**

In 2014, we plan to conduct an experiment involving thermophysical measurement of semiconductor melt by using an electromagnetic levitator loaded onto the European physiology module of the ISS.

- **Research on a Real-time Disaster Prevention Message Delivery System Using Quasi-Zenith Satellites (Leader: Kohtake)**

We are conducting research on a system that can provide disaster prevention information without relying on communication infrastructures on the ground by using terminals with an internal GPS receiver and Japanese quasi-zenith satellites. We are conducting verification across Japan as well as in Thailand and Indonesia, while pursuing international collaboration with European institutions.



Research on a real-time disaster prevention message delivery system

- **Research on Business System Design for Hypersonic Airliners (Leader: Minato)**

We are designing a sustainable business system with JAXA for the planned hypersonic transport service connecting Tokyo and Los Angeles in about two hours by creating business concepts, building economic evaluation models and running simulations.



Computer image of a hypersonic business airliner ©JAXA

- **Educational Research on System Design and Management concerning Spacecraft and Space Services**

By collaborating with various academic societies, companies and governmental institutions, we organize periodic educational events and workshops related to system design and management regarding the creation and management of spacecraft development and space services.

Related events:

Seminar organized by the Japan Society of Mechanical Engineers: "Systems Engineering in Space Development"

▶ <http://www.jsme.or.jp/event/detail.php?id=2652> (in Japanese)

Ideathon report on expanding use of quasi-zenith satellites

▶ <http://www.qzs.jp/events/131112/report.html> (in Japanese)



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