Distinguished Education and Research

Research into development and practical application of compact, lightweight electric motorization systems

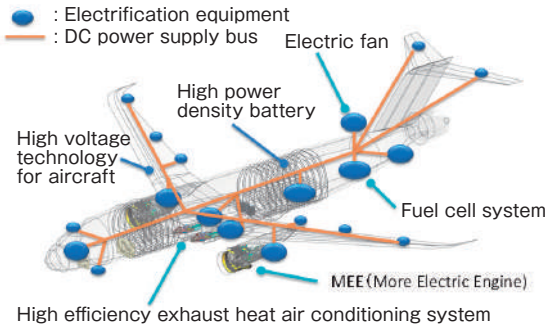
(Project duration: 2020 to 2027)

Today's aircraft are typically controlled by a combination of electricity, air pressure and oil pressure. These mechanisms are complex and require continuous maintenance. It therefore makes sense to look for ways to utilize electrification throughout the engineering process as a whole. Electrification of the propulsion mechanism is considered to be a way of reducing carbon dioxide emissions. This topic is a key focus for Akita University. We are actively engaged in promoting research activities through the Akita Research Initiative, involving volunteer researchers from both Akita University and Akita Prefectural University. As well as this, both universities are collaborating with local industries in the "Industrial creation initiative based on R&D for compact and lightweight electrification systems" which applies to automated vehicles in general, including aircraft. The project was selected for a Grant for Regional Universities and Regional Industry Revitalization for 2021 by the Cabinet Office. In April 2021, the University established the Joint Research Center for Electric Architecture, operated jointly with Akita Prefectural University. The center will play a central role in promoting research and development and contributing to the development of regional human resources and industry.

In April, we opened a major research facility, the Evaluation Laboratory for Next Generation Motors. This laboratory can be used for performance evaluation testing, endurance testing (environmental resistance tests) for motorized equipment, and systems testing using the grid (power lines). It is available for use both by local companies and for companies from further afield. Utilizing this lab, since March 2023, in collaboration with Akita Prefectural University, IHI Corporation, and various companies in Akita, we have successfully worked on a prototype 250kW aircraft propulsion system high output electric motor (Halbach motor). Furthermore, part of this project has been adopted as a framework for grant-funded projects, and this is being expanded into other industries.

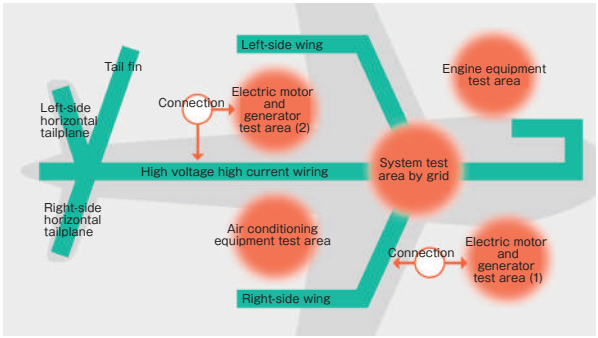
One of the largest motor characteristics testing facilities in Japan
*Establishment of Evaluation Laboratory for Next Generation Motors

(Example of electrification system for 2030)



Source: IHI Corporation website

(Full-size aircraft frame test facility)



Source: Evaluation Laboratory for Next Generation Motors website
https://www.akita-u.ac.jp/dendouka/motorlab/ja/about/

A panoramic view of the system test equipment (known as copper pheasant) using the grid
*Establishment of Evaluation Laboratory for Next Generation Motors

You can find more information on the following websites and the dedicated YouTube channel.

Joint Research Center for Electric Architecture — Japanese version — English version

YouTube channel

Evaluation Laboratory for Next Generation Motors — Japanese version — English version

Distinguished Education and Research

JICA/JST Science and Technology Research Partnership for Sustainable Development
"Construction of a Decarbonized Heat Energy Supply System using Groundwater Resources"

(Project duration: 2021 to 2026; 2021 was a preparation year)

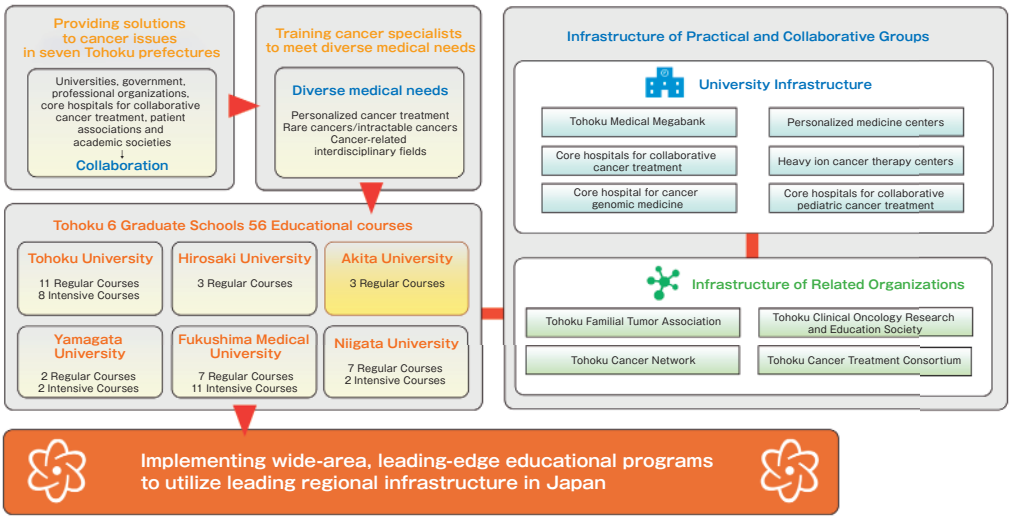
Tajikistan suffers from temperature extremes and lacks oil and natural gas resources. This research contributes to the country's regional stability and countermeasures for global warming by enhancing the energy situation and creating jobs. To achieve these goals, we are dedicated to promoting "Advanced Arid Region Geothermal Heat Pump System ("Tajikistan Model")", which integrates ICT technology such as AI, making use of the country's rich underground water resources.
Specifically, the project focuses on the following three research topics:
(1) The development of groundwater flow and heat transport model based on field surveys, GIS data and AI for maps of potential use of geothermal and groundwater heat energy
(2) The implementation of long-term heating and cooling tests using a demonstration plant based on multi-modal measurements and AI
(3) Planning a system for dissemination for the "Tajikistan model"

The plan is to develop an optimal geothermal heating and cooling system based on (1) and (2) using AI, which will be reflected in the system planning for (3). The project involves working with stakeholders to develop and introduce a system for the industrialization of geothermal systems and the creation of jobs as a result, including the provision of financing.

For more information, please see the following websites Japanese version English version

Tohoku Next Generation Cancer Professional Training Plan (Project duration: 2023 to 2028)

Akita University is participating in the "Next Generation Cancer Professional Training Plan" a training program sponsored by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) in 2023. The lead university for this plan is Tohoku University, supported by Hirosaki University, Yamagata University, Fukushima Medical University and Niigata University, with six participating universities on total.
The plan's objective is to find solutions to the problems of cancer care in the seven Tohoku prefectures, including Iwate, through nurturing the academic knowledge, skills and promotion capabilities required for emerging cancer care issues and the latest cancer treatments, and by training cancer specialists who can meet diverse medical needs, such as personalized cancer care, rare and intractable cancers, and cancer-related interdisciplinary fields, through cooperation between universities, government, professional organizations, core hospitals



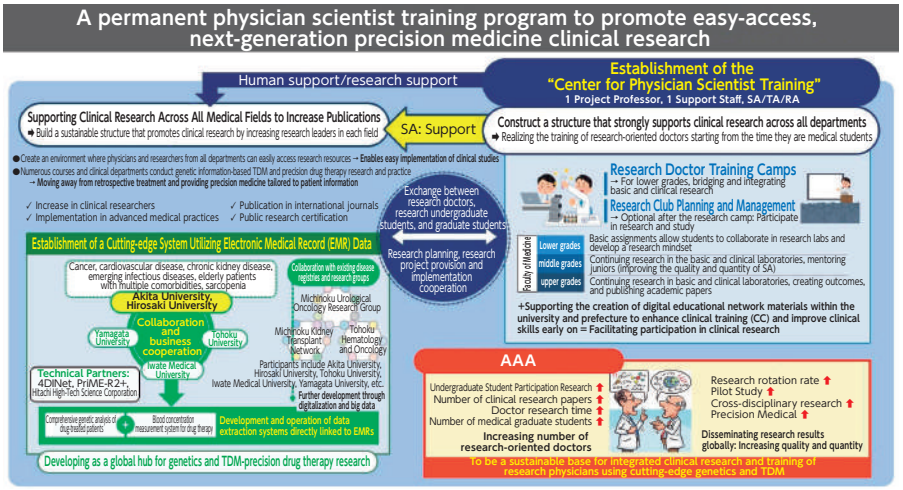
for collaborative cancer treatment, patient associations and academic societies.
To achieve this, 56 new educational courses will be established at six graduate schools, with wide-ranging, innovative educational programs implemented that utilize university infrastructure, such as the Tohoku Medical Megabank, personalized medicine centers, clinical research centers, heavy ion cancer therapy centers, core hospitals for collaborative cancer treatment, core hospitals for cancer genomic medicine, and core hospitals for collaborative pediatric cancer treatment. These courses will also leverage the infrastructure of leading cancer-related organizations in the region, including the Tohoku Familial Tumor Association, Tohoku Clinical Oncology Research and Education Society, Tohoku Cancer Network and Tohoku Cancer Treatment Consortium. The plan will serve as a foundation for supporting the cancer medical care system and contribute to cancer prevention efforts in all prefectures across the Tohoku region.

Project to establish a training center for advanced medical personnel (supporting the development of doctors with advanced clinical and research expertise)

Permanent program for training physician scientists to promote easy-access, next-generation precision medical clinical research

(Duration of project: 2024 to 2029)

In 2024, the University's "Permanent program for training physician scientists to promote easy-access, next-generation precision medical clinical research" was selected by MEXT as a "Project to establish a training center for advanced medical personnel (supporting the development of doctors with advanced clinical and research expertise). This program has been launched in partnership with Hirosaki University, and Tohoku University, Yamagata University, Iwate Medical University, 4DIN Ltd., Hitachi High-Tech Science Corporation, and the New Medical Real World Data Research Organization Inc. (PRiME-R) as collaborating institutions. The two pillars of this program are research and education.



The Center for Physician Scientist Training, affiliated with the Graduate School of Medicine, was established on December 1 2024 to support the research and education departments of this project.

The research division is developing and operates a system for extracting data from electronic medical records with the aim of establishing a database that can be easily accessed by clinicians and increasing the number of clinical studies. It also aims to establish comprehensive methods of genetic analysis for patients undergoing drug therapy and a system for measuring blood concentration in drug therapy. Advancing research on drug therapy based on genetic information with the participation of various subject areas and medical departments within the University as well as multi-facility research institutions, is expected to support the clinical application of precision medicine tailored in accordance with patient data. Through these research efforts, the Center for Physician Scientist Training provides support for medical research, and aims to develop into a global hub for drug therapy research driving the development of 1) precision medicine, utilizing the databases established by this University and our partner university, Hirosaki University and 2) genetic and therapeutic drug monitoring.

In the education department, medical students with a research orientation are assigned to basic and clinical departments as student assistants (SAs). The aim is to cultivate clinical researchers with a balance between medical care and research. These SAs assist with research for each course, as well as conducting their own research. In addition, we are currently laying the foundations for participating in database research and drug therapy research in the research department. The Center for Physician Scientist Training will support the results of their research so that these can be disseminated via presentations at academic conferences and journal submissions. In addition, a research doctor training camp is held jointly every year by Akita University and Hirosaki University. This is a forum for SA students to present their research results. The FY2024 camp was held at Sun Rural Ogata in Ogata from March 1st to March 2nd, 2025. The academic advisors participating in the camp were impressed by the advanced level of results presented by SA students from both universities. By supporting medical students' participation in research as SAs, we hope that Northern Tohoku will establish a model scheme for training clinical researchers.

For more information, please visit the following website https://www.med.akita-u.ac.jp/center/easy/