# ENRI

2025 Profile

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Electronic Navigation Research Institute

ENRI Electronic Navigation Research Institute

National Institute of Maritime, Port and Aviation Technology

## Contents

## Greetings

FUKUSHIMA Sonosuke
Director General,
Electronic Navigation Research Institute (ENRI)

Navigation is the art and science of determining the position of an airplane or any other vehicle and guiding it to a specific destination. Electronic navigation is a form of navigation relying on electronic information and communication technology. Currently, each day more than 1,000 flights take off and land at Tokyo International Airport, and more than 5,000 flights operate within Japanese airspace, including international and domestic flights that take off and land at domestic airports, as well as overflights. Passenger travel demand expressed as Revenue Passenger Kilometers (RPKs) is growing at a constant rate of 3.98%, and is predicted to double in twenty years. To ensure safe and efficient aircraft operations, it is vital to promote the introduction of new technologies, such as next-generation air traffic systems, and advancement of air traffic management in response to this increase in air transportation.

ENRI is the only national public research institute in Japan focusing on air traffic systems, including communications, navigation, and surveillance (CNS), and air traffic management (ATM) technologies. We are engaged in research and development with the aim of realizing technology that will further advance air traffic management, improve safety, and preserve the global environment. In addition, we intend to focus on realizing the long-term vision for future air traffic systems, named Collaborative Actions for Renovation of Air Traffic Systems (CARATS), advocated by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) of Japan. We are also engaged in research and development in areas related to digital transformation, carbon neutrality, and next-generation mobility.

On January 2, 2024, an accident occurred on the runway of Tokyo International Airport in which a passenger plane collided with another aircraft and caught fire. Our research institute has collaborated with domestic and international research institutes to improve air traffic safety to mitigate such accidents. We have also contributed to activities toward international standardization for the development of future systems. Hereafter, with the aim of further strengthening the safety and security, we will enhance our technical support and research and development on future systems in a timely manner.

In 2016, ENRI was integrated with the National Maritime Research Institute (NMRI) and the Port and Airport Research Institute (PARI) and became a part of the National Institute of Maritime, Port and Aviation Technology (MPAT). This has enabled multi-disciplinary research projects on not only aviation but also marine and port technologies, and has paved the way to greater contributions to society by expanding our research in the transportation domain. We will continue to collaborate with stakeholders and organizations toward the development and safety of aviation and transportation.

April 1, 2025

## Basic Policy in Business Operation

**ENRI and its Research Staff are committed to**

**Play a cornerstone role in the development of the aviation industry**

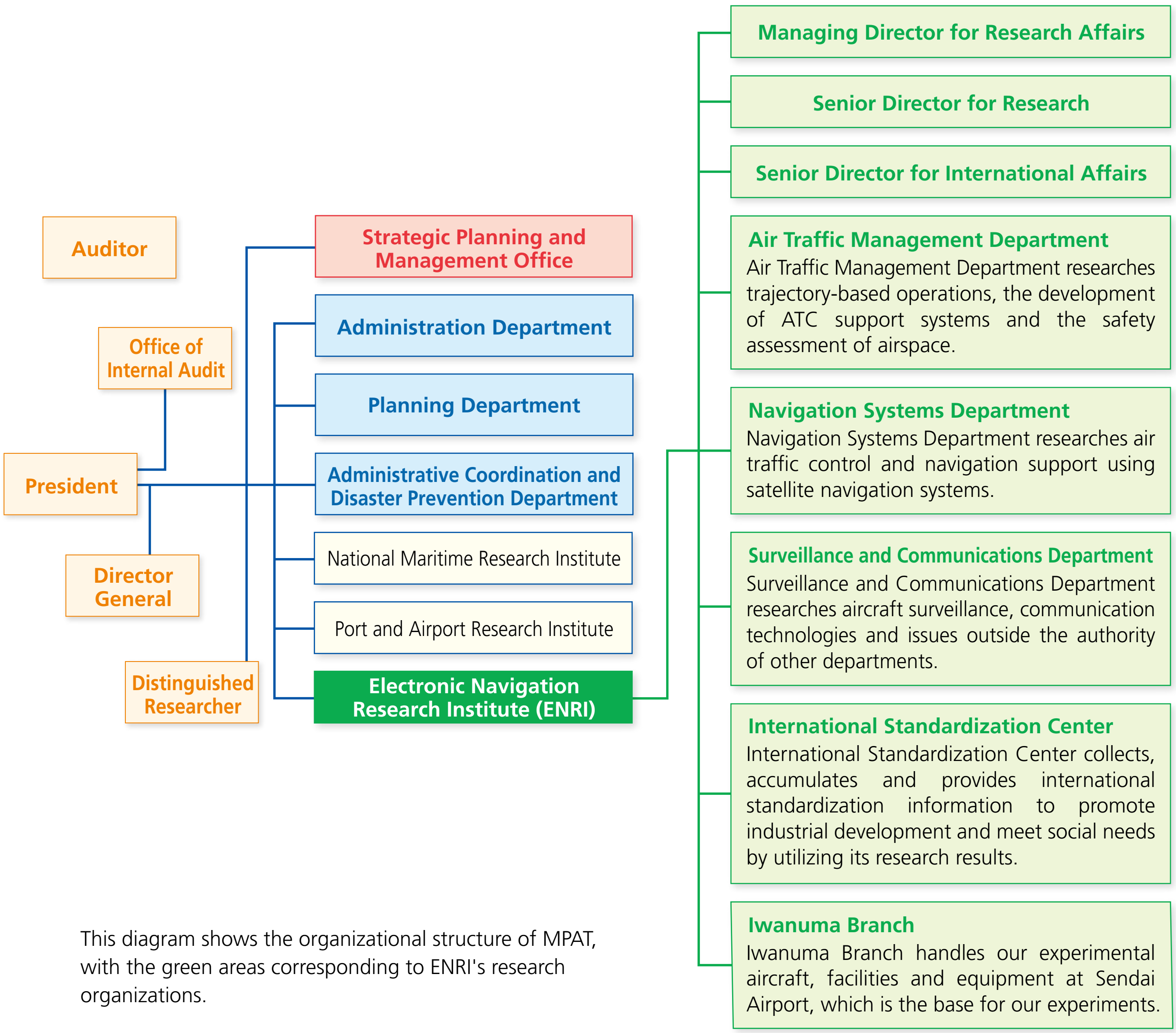
**Contribute to improvements in the safety and efficiency of air traffic and the preservation of the global environment**

**Aim at becoming an international core research organization**

## History

| | |
|---|---|
| **Apr. 1961** | The Electronic Navigation Section was established at the Transport Technology Research Institute. |
| **Apr. 1963** | The Transport Technology Research Institute was reorganized and the Electronic Navigation Division of the Ship Research Institute was established. |
| **Jul. 1965** | The Beechcraft Super H18 was introduced as the first experimental aircraft. |
| **Jul. 1967** | The Electronic Navigation Research Institute (ENRI) was established, comprising the General Affairs Division, Planning and Program Office, Electronic Navigation Division, and Satellite Navigation Division. |
| **Mar. 1969** | The ATC laboratory was set up. |
| **Apr. 1971** | An anechoic chamber was set up. |
| **Oct. 1975** | Beechcraft B99 was introduced as a successor to the experimental aircraft. |
| **Oct. 1976** | The Iwanuma Branch was opened in Iwanuma City. |
| **Apr. 1977** | An antenna test building was constructed. |
| **Jan. 2001** | ENRI, Ministry of Transport was renamed ENRI, Ministry of Land, Infrastructure and Transport as part of the reorganization of central government ministries. |
| **Apr. 2001** | The Electronic Navigation Research Institute, Independent Administrative Institution was established.<br>The Planning Office was established in the General Affairs Division. |
| **May 2013** | The Beechcraft B300 was introduced as a successor to the experimental aircraft and named "Yotsuba." |
| **Apr. 2015** | The National Research and Development Agency was established. |
| **Apr. 2016** | Electronic Navigation Research Institute, National Institute of Maritime, Port and Aviation Technology was established. |
| **Nov. 2021** | A new hangar was constructed at the Iwanuma Branch. |

## Organization



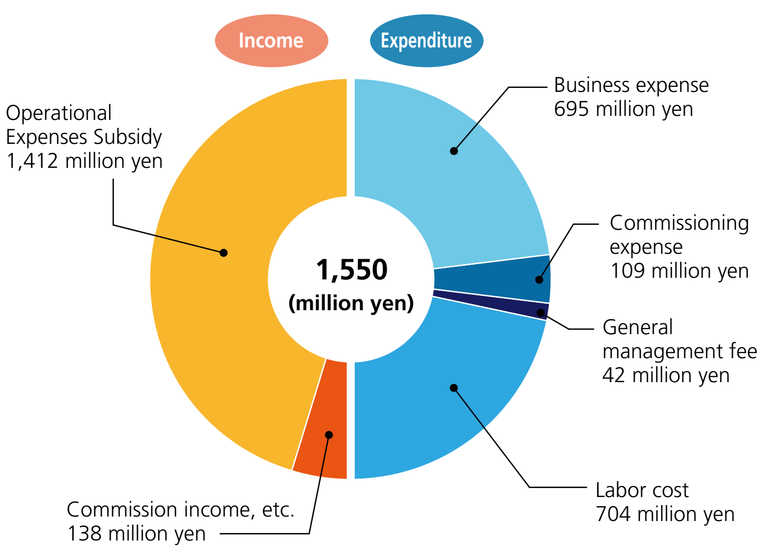

This diagram shows the organizational structure of MPAT, with the green areas corresponding to ENRI's research organizations.

## Employees and budget

| | |
|---|---|
| President | 1 |
| Director General for Strategic Planning and Management Office | 1 |
| Director General, ENRI | 1 |
| Auditor | 2 |
| Managing Director for Research Affairs | 1 |
| Senior Director for Research / Distinguished Researcher | 1 |
| Senior Director for International Affairs | 1 |
| Administrative staff | 13 |
| Researcher | 39 |

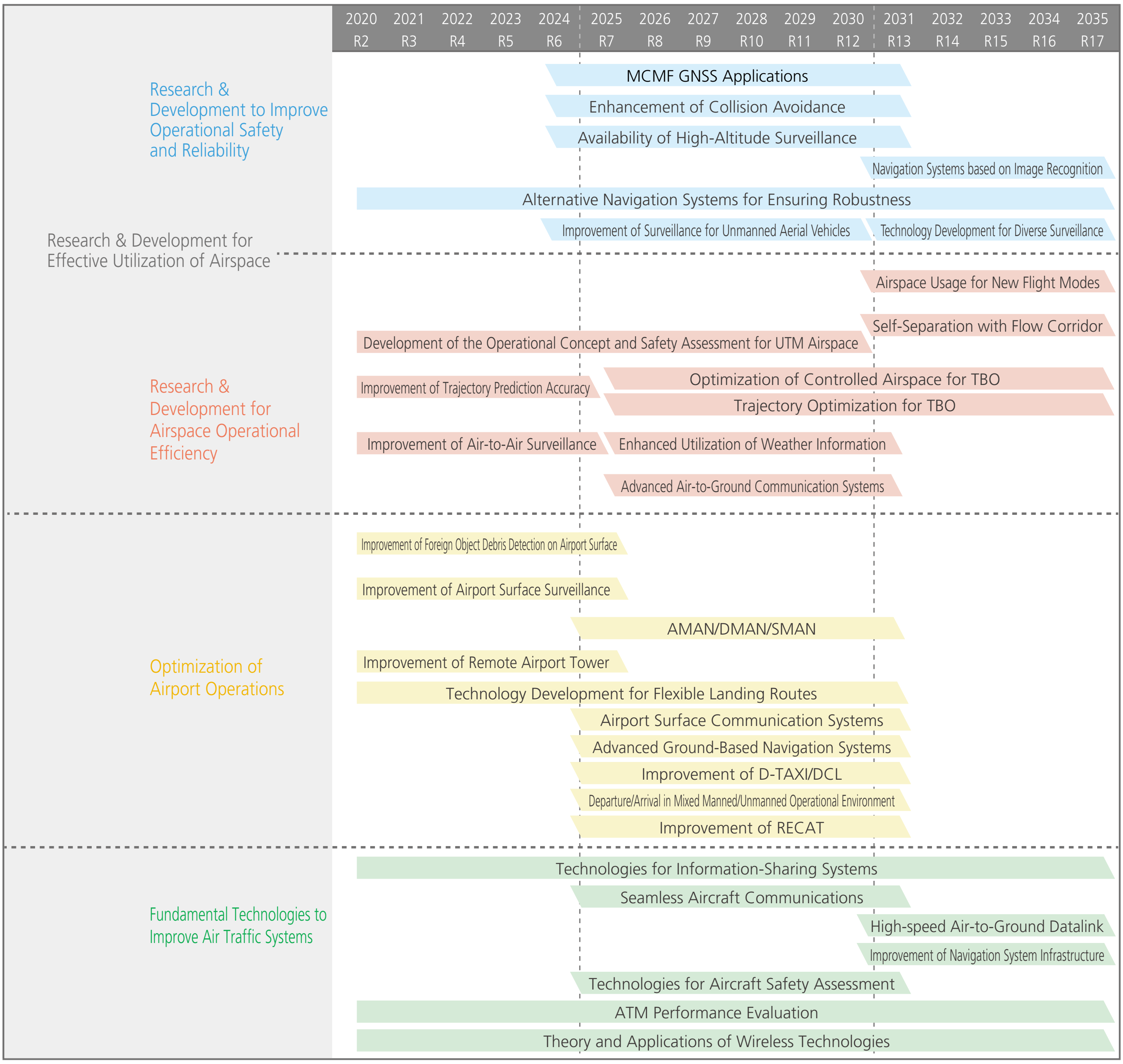
As of April 1, 2025

### ENRI's FY2025 budget



## Basic Policy in Business Operation

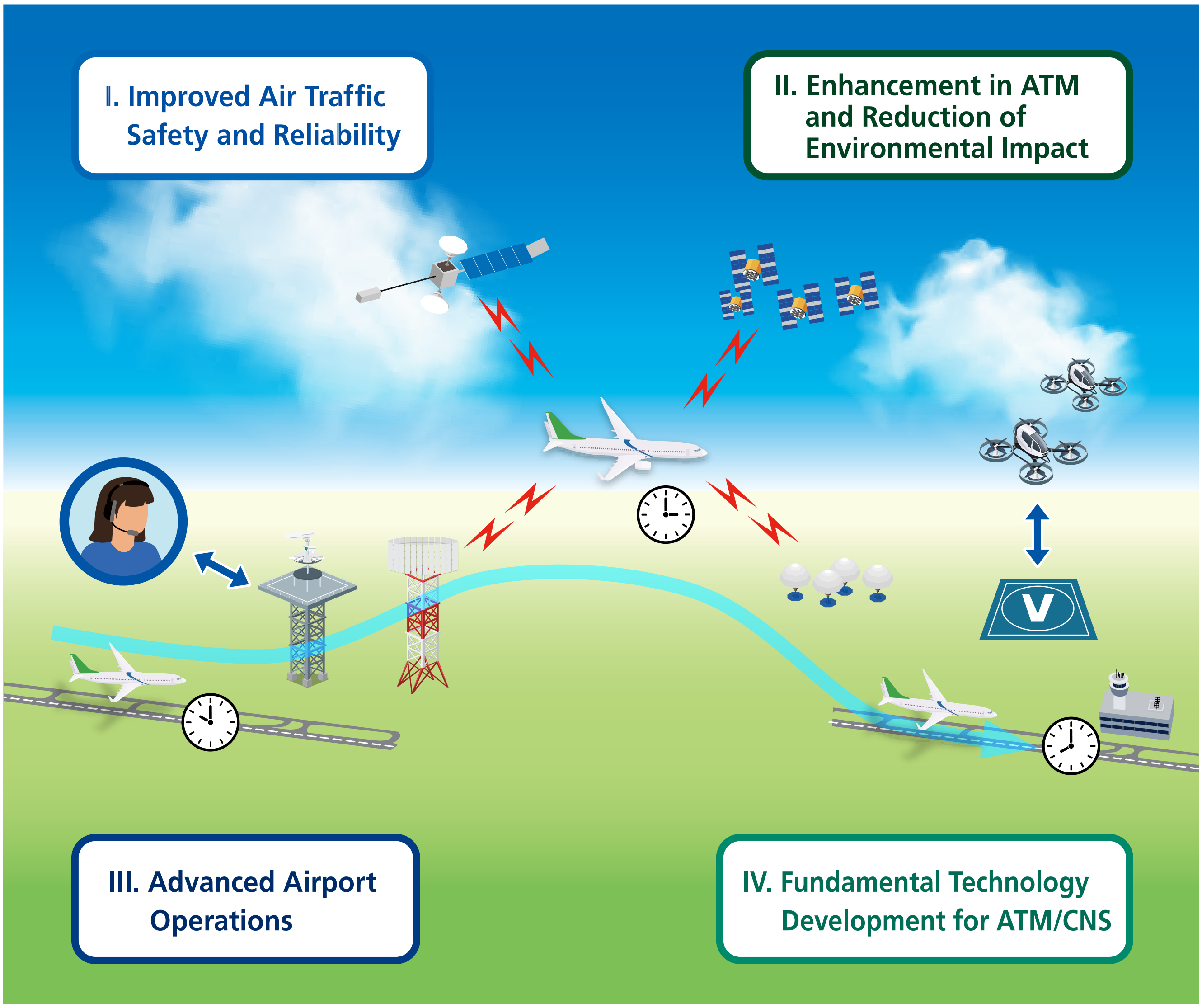
The Global ATM Operational Concept (GATMOC) was established by ICAO to realize safe, sustainable, and environmentally-friendly air traffic operations while accommodating an increased traffic volume. Seeking to support the fulfilment of this concept, ENRI has been engaging in research as well as development and dissemination of the achievements worldwide, and announced its latest long-term research vision in 2019. The long-term research vision of an institute should be reviewed in response to changes in the social environment and introduction of newly developed technologies. Accordingly, ENRI regularly reviews its long-term research vision, ensuring harmony with other long-term visions for air traffic systems, such as CARATS* and GANP**. The GATMOC aims at establishing Trajectory-Based Operations (TBO), in which flight trajectories defined in space and time are agreed and adjusted in advance, improving predictability and efficiency and improving the management of ATM resources. Flexible air traffic management is essential to cope with the expected increase in various types of aircraft with different performances and purposes. The latest research vision explains our research topics for the coming decades as a roadmap in which the topics are broadly categorized into four research areas: "Effective use of airspace by improving operational safety and reliability," "Effective use of airspace by ensuring airspace operational efficiency," "Optimization of airport operations," and "Fundamental technologies to improve air traffic systems." The latest research vision focuses on enhancing the research potential and contributing to society on an ongoing and long-term basis. ENRI will conduct its research and development activities based on this long-term vision.




*CARATS: Collaborative Actions for Renovation of Air Traffic Systems
**GANP: Global Air Navigation Plan

# ■ Major ENRI Research Areas

Our institute's mission is to contribute to the realization of policies promoted by the Ministry of Land, Infrastructure, Transport and Tourism. These policies relate to the realization of safe and secure air transportation, appropriate responses to demand recovery and increase, green measures in the aviation sector, and aviation innovation while also focusing on air traffic control and other air safety operations to ensure safe, orderly, and efficient air traffic. In the second mid- to long-term target period (7 years) of the National Institute of Maritime, Port and Aviation Technology which began in FY2023, our institute has set the following four priority topics for research and development to address technical issues in policy promotion and support air safety operations.

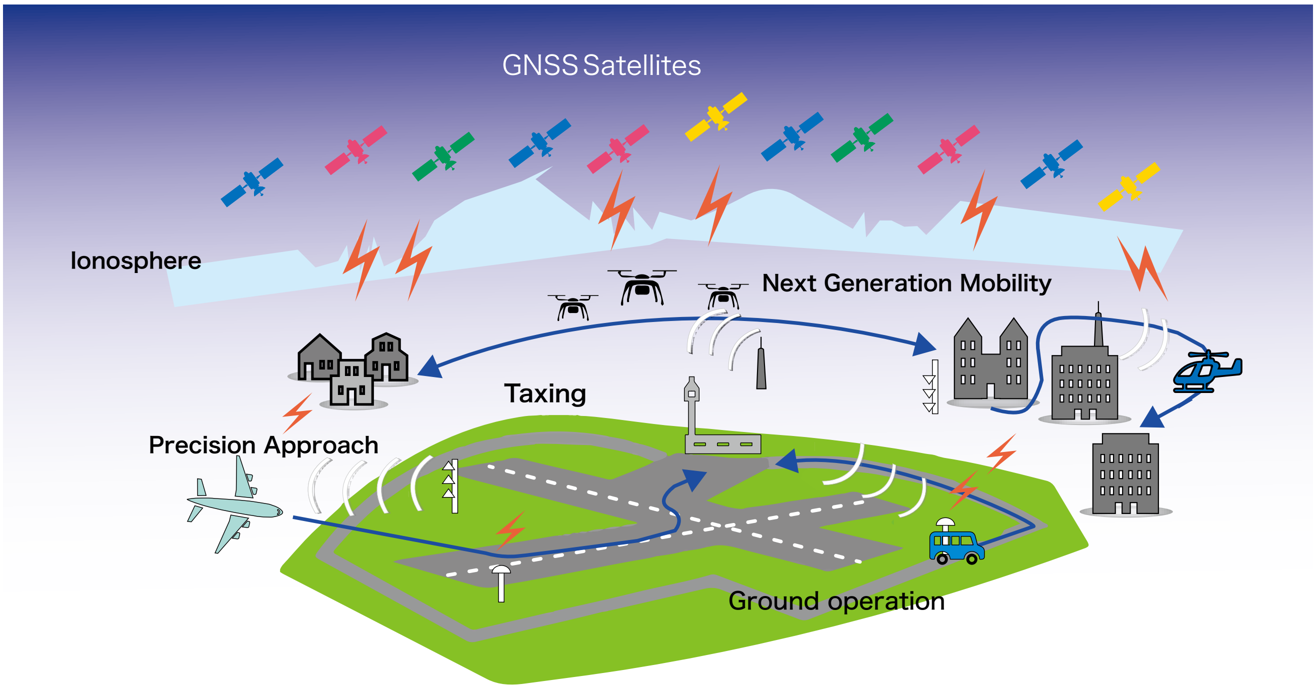


# I. Improved Air Traffic Safety and Reliability

To expand the air traffic capacity in response to the increase in air travel demand, it is necessary to improve the safety and reliability of air traffic. Accordingly, we are engaged in the research and development of technologies that improve the safety and performance of satellite and ground-based facilities to support current and future aircraft operations, and minimize the impact of facility failures on daily operations.

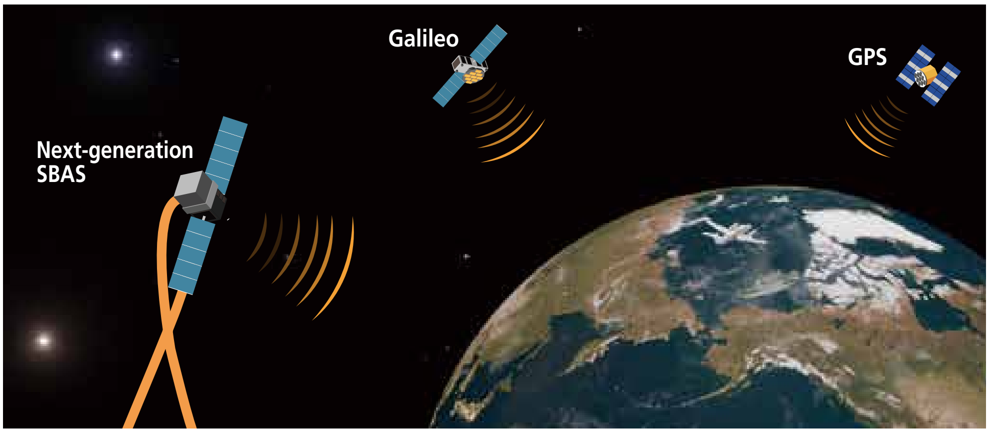
## 1. Development of safe and available navigation systems by utilizing dual-frequency and multi-constellation GNSS

The global navigation satellite system (GNSS) including GPS (US), GLONASS (Russia), Galileo (Europe), and BDS (China) is now available for air navigation. Augmentation systems for these dual-frequency and multi-constellation (DFMC) GNSS are being standardized and developed. In this study, we develop navigation systems with the new DFMC GNSS to provide safe and always available navigation in various phases of operations.



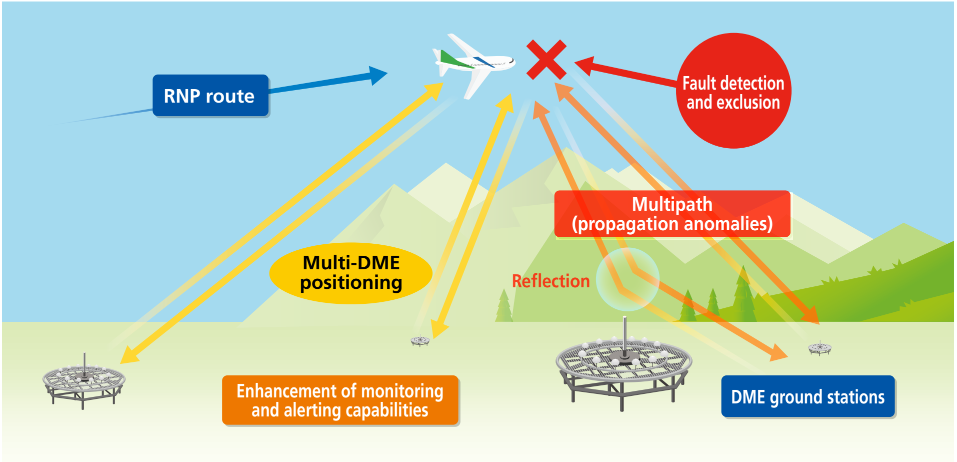

## 2. Research on Arctic Region Augmentation using Next-generation SBAS

GNSS can be used in air and ocean routes that pass through the Arctic region, but SBAS, which is a type of augmentation system, cannot be used to ensure safe navigation. This is because the current standards of SBAS broadcast signals from geostationary orbit. Hence, those signals cannot be received in the Arctic region. In contrast, the next generation standards of SBAS will be also able to broadcast signals from inclined geosynchronous orbit (IGSO). This is expected to enable the use of SBAS in the Arctic region, as signals will be broadcast from mid-latitude outer space. However, the characteristics of the Arctic environment, including those of the ionosphere, are known to significantly differ from those of Japan, where SBAS technology has been developed thus far. Therefore, an augmentation technology adapted to the environment needs to be developed for SBAS to ensure sufficient safety in the Arctic region.



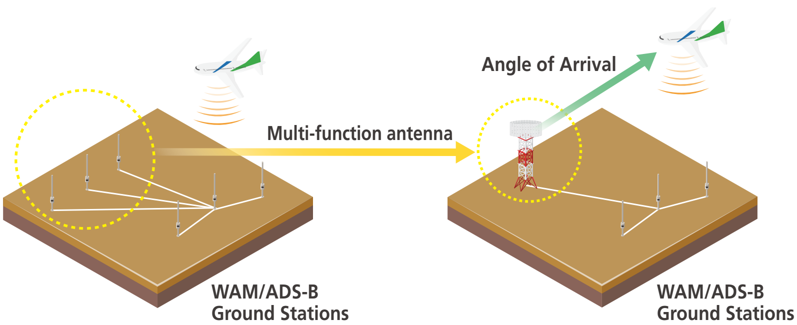
## 3. Construction of Satellite Navigation Backup (APNT) for RNP Deployment in all Flight Phases

The introduction of RNP routes in all flight phases to ensure efficient aircraft operation is progressing. Since the ability to autonomously fly a route is required in RNP routes, only GNSS equipment with monitoring and alert capabilities are currently used. However, GNSS technology can be vulnerable. Hence, backup navigation needs to be built. In this study, we are advancing research that uses positioning via DME as a backup by enhancing the monitoring and alert capabilities of ground DME facilities. In addition, we are conducting research on a multi-DME method that realizes high-precision positioning by using multiple ground DME facilities while enhancing monitoring and alert capabilities by detecting and eliminating DME ground stations that are above the limit, owing to multipath properties.




## 4. Study on Efficient Enroute Surveillance using Multi-function Antenna for WAM and ADS-B

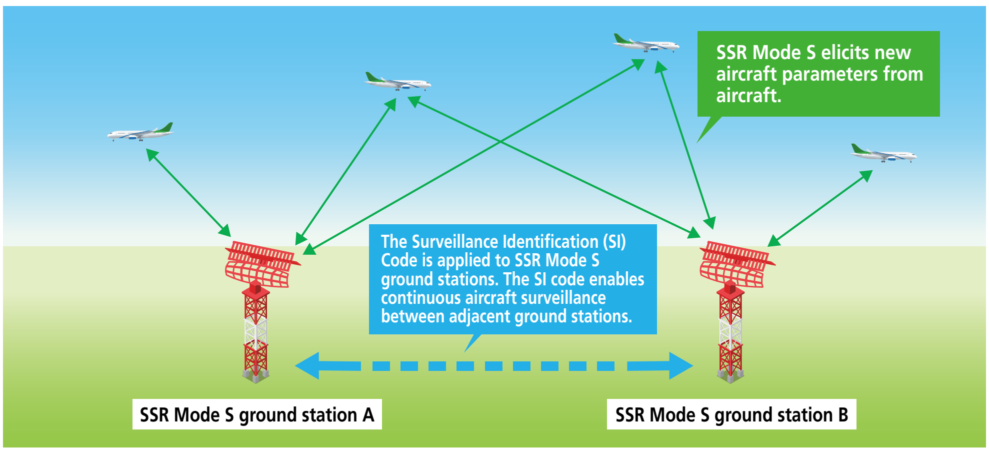
To date, SSRs*1 are primarily used for enroute surveillance. Recently, the operation of WAM*2 and plans to implement ADS-B*3 have commenced. However, the increase in the number of ground stations is an emerging challenge. Therefore, this research focused on a multi-function antenna that enables efficient implementation of WAM and ADS-B. This multi-function antenna, equipped with various functions such as angle-of-arrival estimation, aims to realize the required surveillance performance.




*1 Secondary Surveillance Radar
*2 Wide-Area Multilateration
*3 Automatic Dependent Surveillance–Broadcast

## 5. Research on New Techniques for Secondary Surveillance Radar (SSR) Mode S

More than 20 years have passed since the first Secondary Surveillance Radar (SSR) Mode S ground station was deployed in Japan. SSR Mode S operational environment has been changing, and SSR Mode S is required to suit the environment. In this research, we are going to research two techniques. The first technique enables SSR Mode S ground stations to operate cooperatively with multiple ground stations. The second technique elicits new downlink aircraft parameters (DAPS) from aircraft. The new parameters will improve aircraft position prediction in trajectory-based operations.

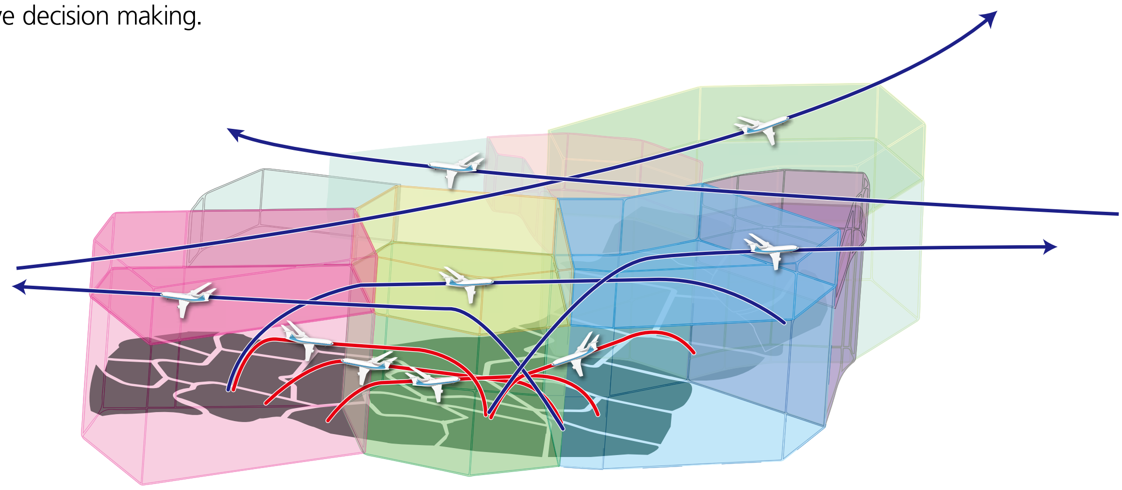


# II. Enhancement in ATM and Reduction of Environmental Impact

As part of the efforts to enhance the airspace capacity, improve the environment, and ensure timeliness, studies on advanced ATM for robust operations, management of new airspace tailored for enhanced advanced air mobility, and reduction of delays at congested airports are underway.

## 1. Flexible Airspace Management to Facilitate Traffic Flow

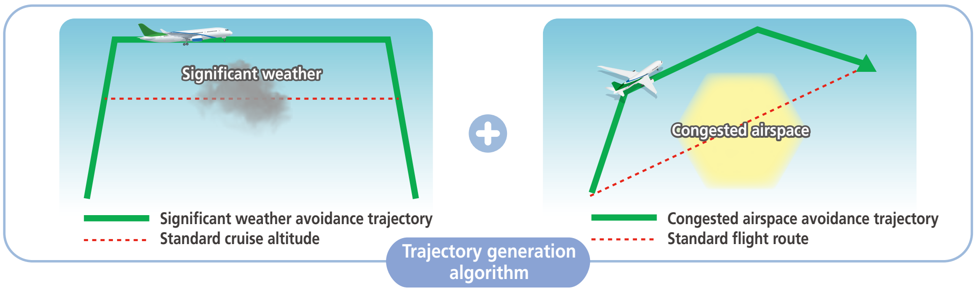
The en-route radar-controlled airspace in the Fukuoka Flight Information Region (FIR) is being divided into upper and lower sectors to better match air traffic control and airspace management to the traffic flow characteristics. However, the fixed altitude of the current vertical division limits the extent to which the airspace configuration can respond to variations in the vertical trajectories of aircraft and seasonal changes in cruising altitudes. This research aims to develop airspace-capacity prediction methods and to further improve flight trajectory efficiency. Given that traffic flows can be smoothed by suitable management of airspace capacity and flexible airspace sectorization, we aim to improve the efficiency of cruising flights in the upper airspaces of the Fukuoka FIR overflight and domestic flights. To improve the accuracy of trajectory prediction, we consider trajectory-based air traffic flow management measures such as time-based control at airspace boundaries. We also examine ways by which airspace stakeholders can participate in traffic management through collaborative decision making.

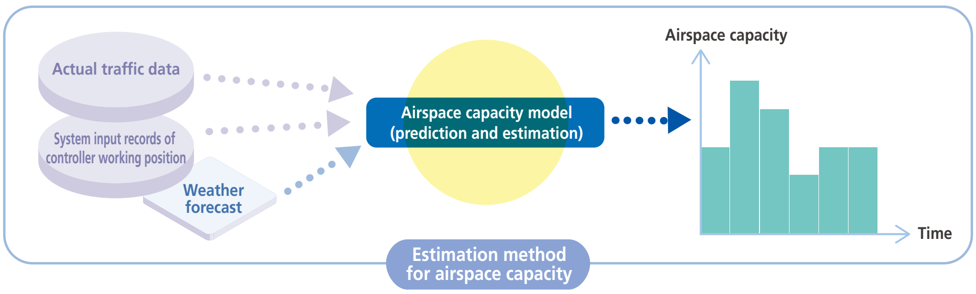


Airspace allocation according to traffic flow

## 2. Study on Trajectory Coordination Considering Meteorological Information and Air Traffic Flow

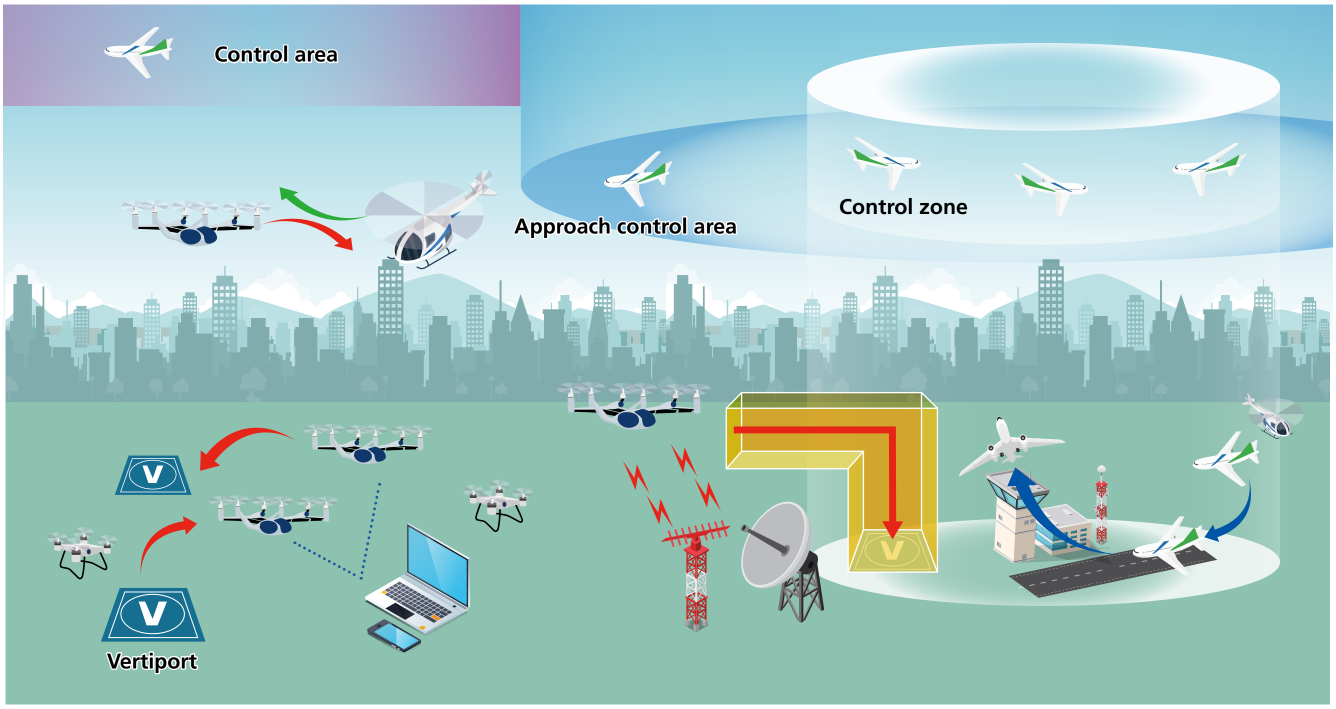
Globally harmonized air traffic systems will be essential in the future to ensure cooperative planned trajectory coordination prior to departure. Accordingly, research and development on efficient and optimal trajectory coordination considering forecast weather, aircraft operation, and airspace capacity are expected. In this study, we are developing a trajectory generation algorithm that considers significant weather avoidance and air traffic flow control by adding altitude change to a significant weather avoidance model and using predicted airspace congestion for congested airspace avoidance. We are also developing and evaluating a method for estimating airspace capacity that will reflect uncertainty caused by significant weather. The method will use data including flight trajectories and air traffic controller system input records, and will incorporate a model that predicts airspace capacity changes from forecast weather.



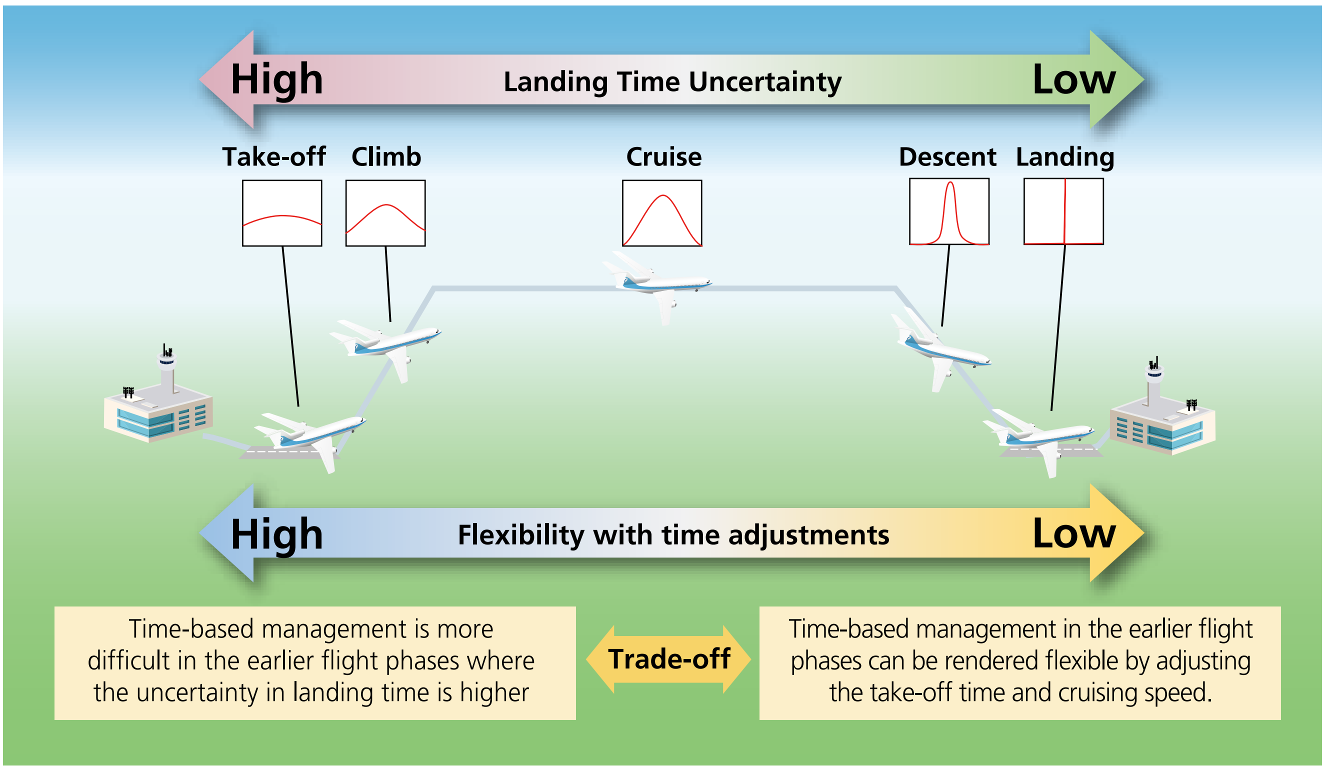
## 3. Investigation of Operational Environment for Advanced Air Mobility and Urban Air Mobility

With the emergence of Advance Air Mobility (AAM) and Urban Air Mobility (UAM), there is a need to determine how best to integrate AAM/UAM into low-altitude airspace. AAM/UAM is expected to fly at lower altitudes than existing aircraft, but their flight areas partially overlap. To help integrate AAM/UAM into low-altitude airspace safely and efficiently, this research investigates the appropriate operational environment for AAM/UAM in low-altitude airspace.




## 4. Time-based management in air traffic control systems considering the aircraft flight phases

With the continuous increase in air traffic demand, maintaining operational efficiency around airports has become increasingly difficult. Additionally, concerns over the expanding environmental impact have also intensified. Congestion-related delays around arrival airports are currently mitigated through air traffic flow management, and advanced time-based management is being considered for future introduction. Effective time-based management requires accurate prediction of the "trajectory" (three-dimensional position and time) of an aircraft. Toward efficient time-based management, this study aims to develop a trajectory prediction method that adapts to the operational phases of flight.



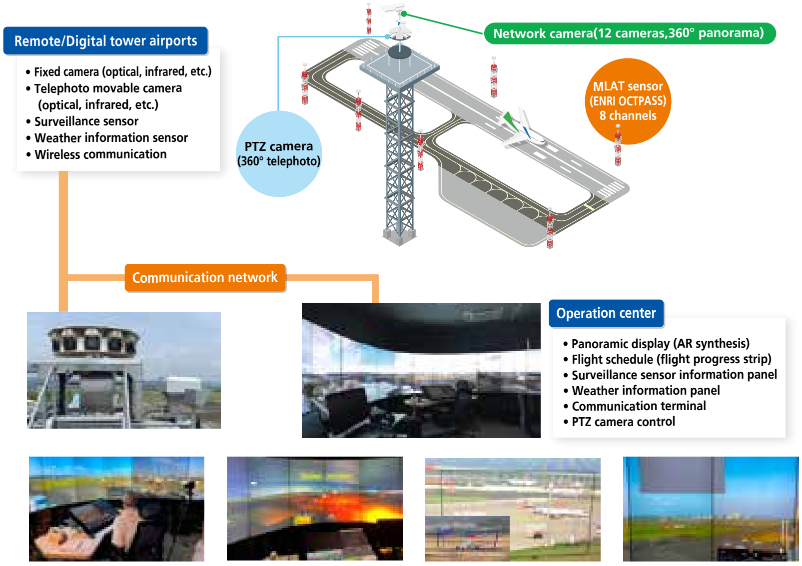
# III. Advanced Airport Operations

Air traffic control and airport surface management are some of the operations performed at airports. It is necessary to utilize new technologies to streamline these operations and increase the efficiency of runway operations in order to maximize the airport's functionality. To this end, we will perform research and development of technologies to streamline the control tower operations, introduce new surveillance technologies for aircrafts, and establish flexible takeoff and landing routes with low environmental influence.

## 1. Advanced supporting function for Remote Digital Tower

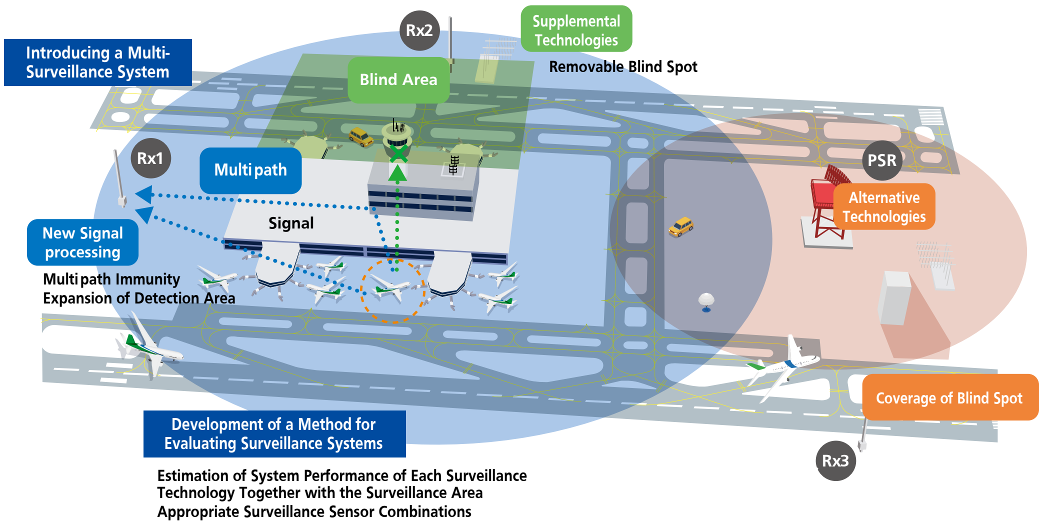
The "Remote Digital Tower (RDT)" is a system that uses "digital "technology such as cameras, surveillance sensors and networks. This is a new type of tower operation system that allows operations to be performed at an operation center separate from the airport. Otherwise, this new system can also help controllers work by visual supporting function combined with various sensors information in the conventional tower operation.

There are three main research parts for developing RDT systems: highly integrated visual function with various sensors information such as automatic target detecting and tracking. Augmented Reality(AR) vision & integrated HMI are also important part for developing human conscious systems. And, advanced supporting function by using AI will contribute to reduce operators' workload and keep safety operation. The RDT system is expected to achieve both safety and efficiency in the future.



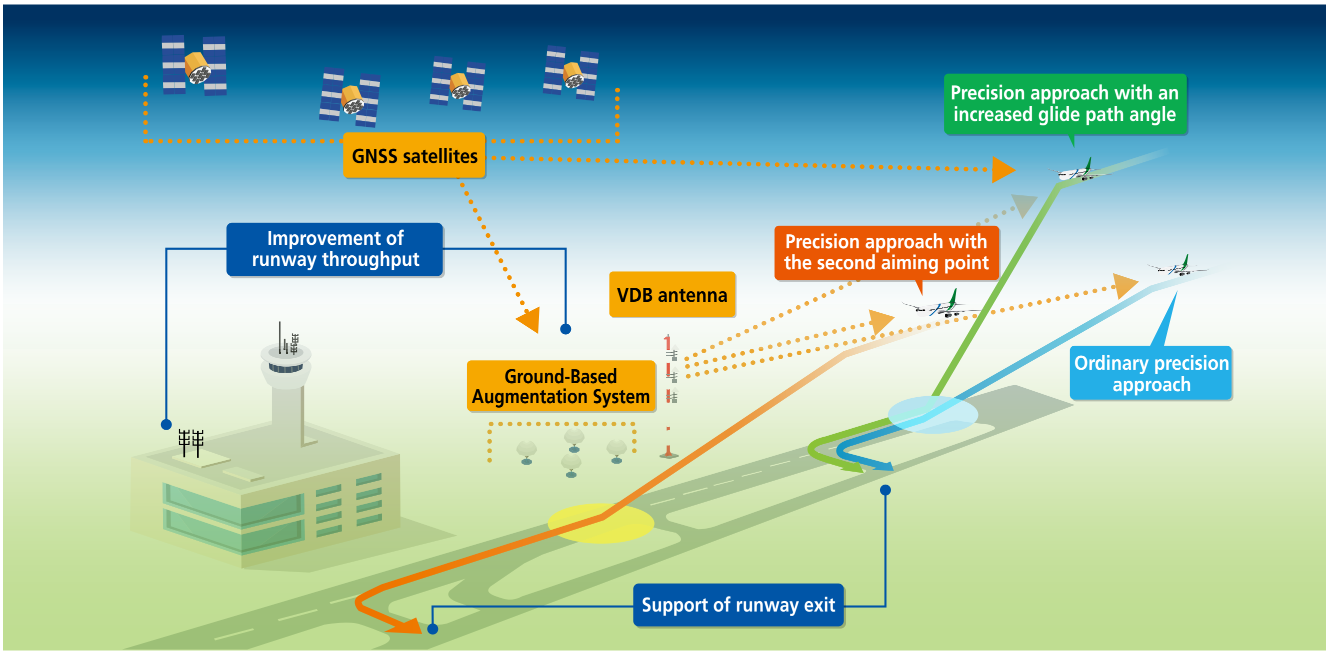

## 2. Study on the Application of Multi-Surveillance Systems in the Vicinity of Airports

A multi-surveillance system comprises a combination of various surveillance systems to provide appropriate information corresponding to airspace and operation for air traffic services. Therefore, the overall specifications of the surveillance system must meet the requirement. Although ENRI has mainly focused on enroute and airport surveillance systems thus far, several airport surface issues persist because signal disturbance degrades the surveillance system performance, such as the positional accuracy, detection rate, and update rate. ENRI is investigating the method for evaluating the performance of the surveillance system in the vicinity of an airport.



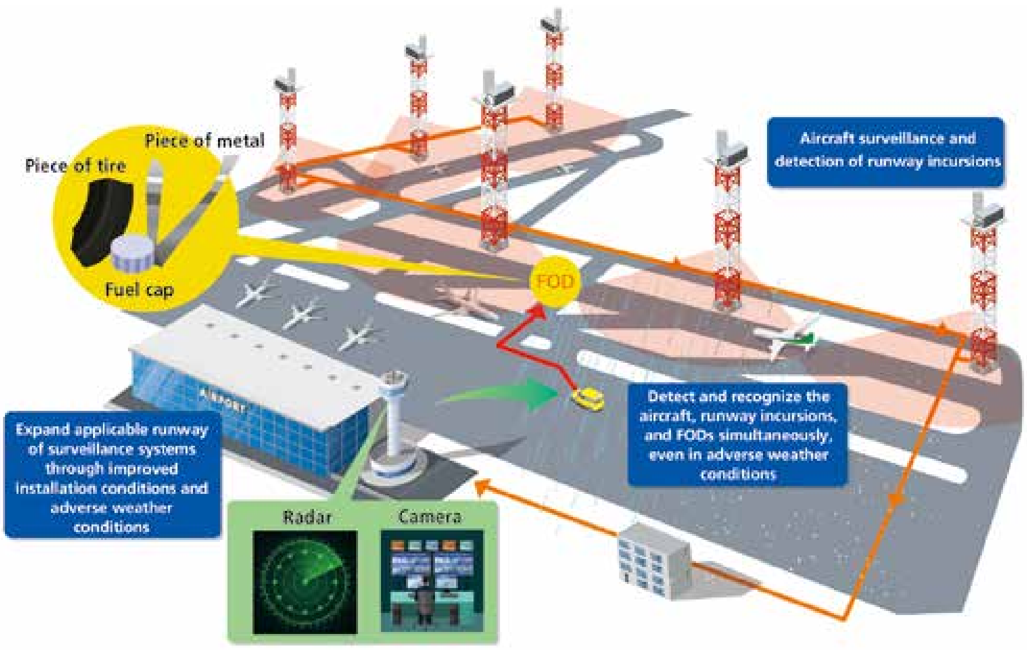
## 3. Study on Advanced Approach and Landing Operations Utilizing GBAS

The Ground-Based Augmentation System (GBAS) supports safe approach and landing, even under weather conditions with low visibility. As well as additional information to enhance the reliability of GNSS satellite signals, its ground facility also broadcasts data blocks on approach paths. When the GBAS is compared with a conventional instrument landing system (ILS), prominent GBAS advantages include not only scope to support precision approaches with multiple approach paths but also eliminating the need for protection areas of ILS radio waves on runways, which might improve runway throughput. Leveraging these advantages could allow a more flexible approach and landing operations and reduce environmental loads. Expected benefits include reduced fuel consumption and noise and enhanced capacity of congested airports.




## 4.Research and development of runway safety improvement technologies based on millimeter-wave radars and cameras

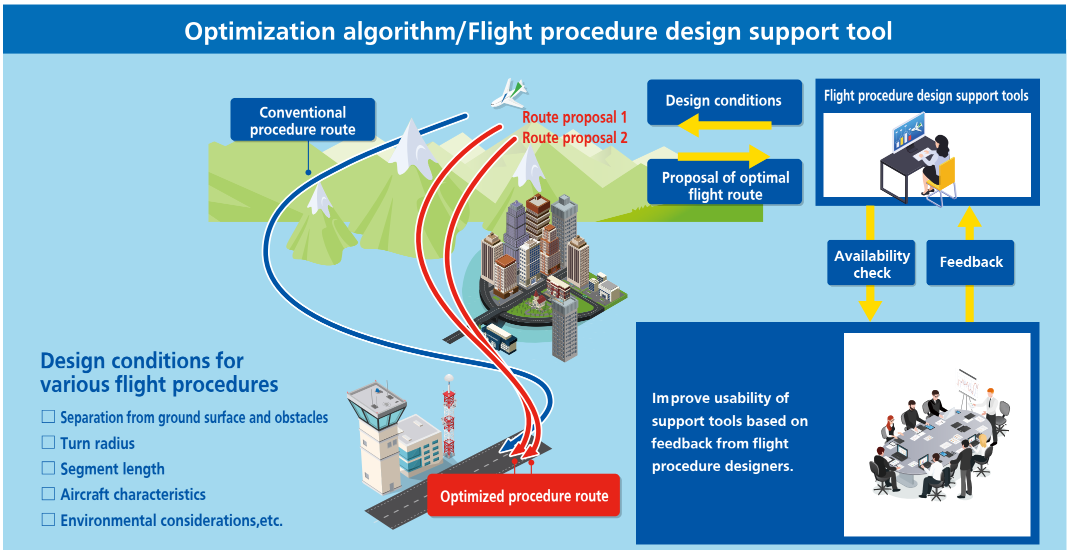
To meet the increasing demand for aircraft surveillance and detection of runway incursions, conventional systems could be replaced with more accurate and reliable measures utilizing independent sensors such as millimeter-wave radars and cameras, which have undergone technological innovations in recent years. In addition, plans to install a foreign object debris (FOD) detection system at airports are underway. The FOD detection system automatically detects FODs and provides their information to airport operators, improving the safety and efficiency of airport operations. The present research aims to develop sensors that simultaneously detect and recognize aircraft, runway incursions, and FODs even under adverse weather conditions.



## 5. Research on Improving Safety and Efficiency of Flight Procedures

Flight procedures from the departure airport to its destination are generated by flight procedure designers using specialized tools by considering the ICAO standards. The process requires expert insights and experience to design a safe and efficient route that satisfies the given criteria, thus ensuring aircraft safety while meeting various conditions such as the terrain around the airport. Flight route design is a time-consuming process involving considerable trial and error. Hence, it requires streamlining.

This research is expected to support the efforts of flight procedure designers to design safer and more efficient flight procedures.

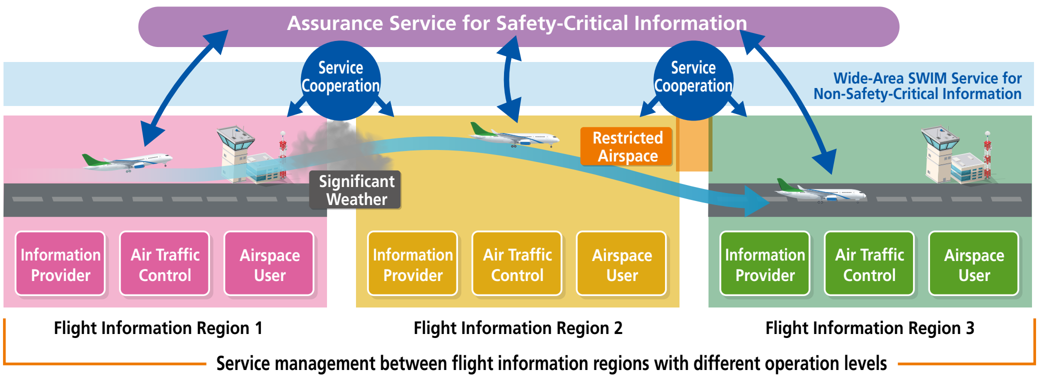



# IV. Fundamental Technology Development for ATM/CNS

It is necessary to develop fundamental technologies that contribute to the improvement of sophisticated systems that support air traffic management and to resolve technical issues. Hence, we will focus on the research and development of fundamental technologies to promote digitalization of air traffic and fundamental technologies that support wireless communication with aircraft.

## 1. Study on Construction and Evaluation of SWIM Information Service for Collaborative Decision-Making

In Europe and the United States, the development of SWIM has helped promote interoperability and harmonization of systems by sharing full operational information among related systems and stakeholders. In addition, to achieve collaborative decision-making and trajectory-based operations, the ICAO has promoted FF-ICE and air–ground integrated SWIM for information sharing during both the pre-and post-departure phases. Accordingly, meeting the needs of these applications will require not only sharing of various types of information based on standard information exchange models but also ensuring the quality of information provided by advanced SWIM information services. In this research, to achieve global collaborative decision-making, a wide SWIM service construction technology capable of adapting to different operation levels and assurance technology to ensure operational safety will be proposed. An international joint evaluation using practical services will also be conducted.

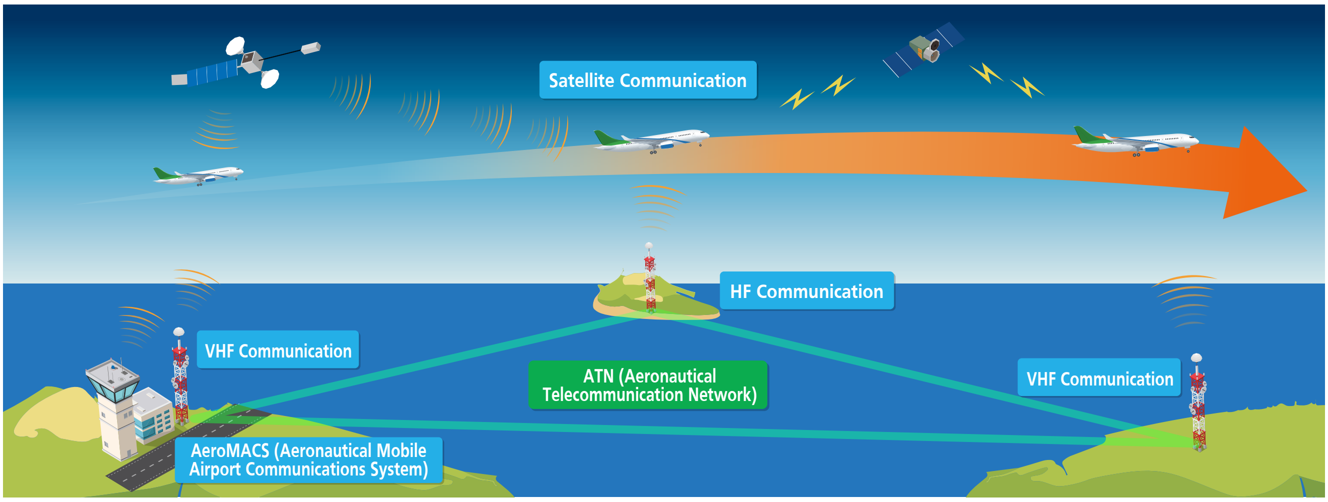



*SWIM: System-Wide Information Management
**FF-ICE: Flight & Flow Information for a Collaborative Environment

## 2. Study on Communication Capacity Enhancement of ATC Data Link

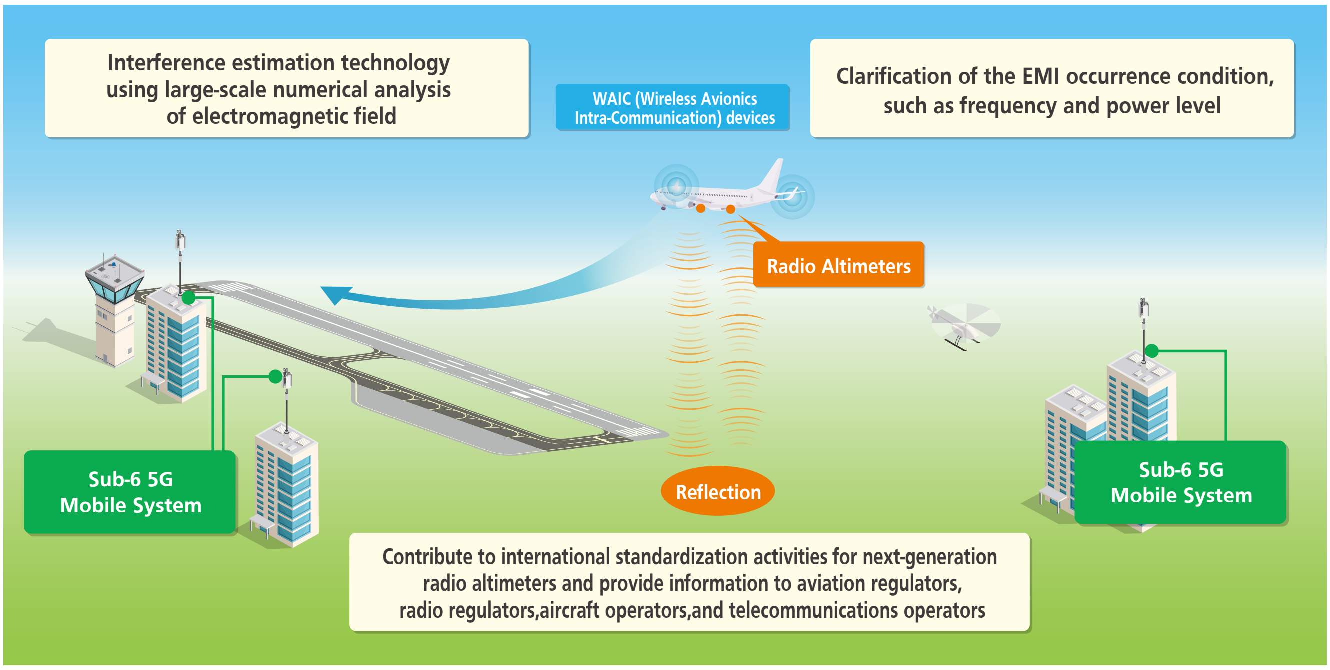
Aircraft operation is mainly supported by voice and data communication between aircraft and air traffic control authorities. Currently, the data-link communication mainly uses text-based communication, and the amount of data is limited. In the near future, it will be necessary to handle a variety of information to support situational awareness of air traffic controllers and pilots by sharing aircraft trajectory information (i.e., trajectory-based operation) among stakeholders.

This study aims to make technical proposals that contribute to the realization of the air–ground information sharing applications through design and development of air–ground communication control techniques.



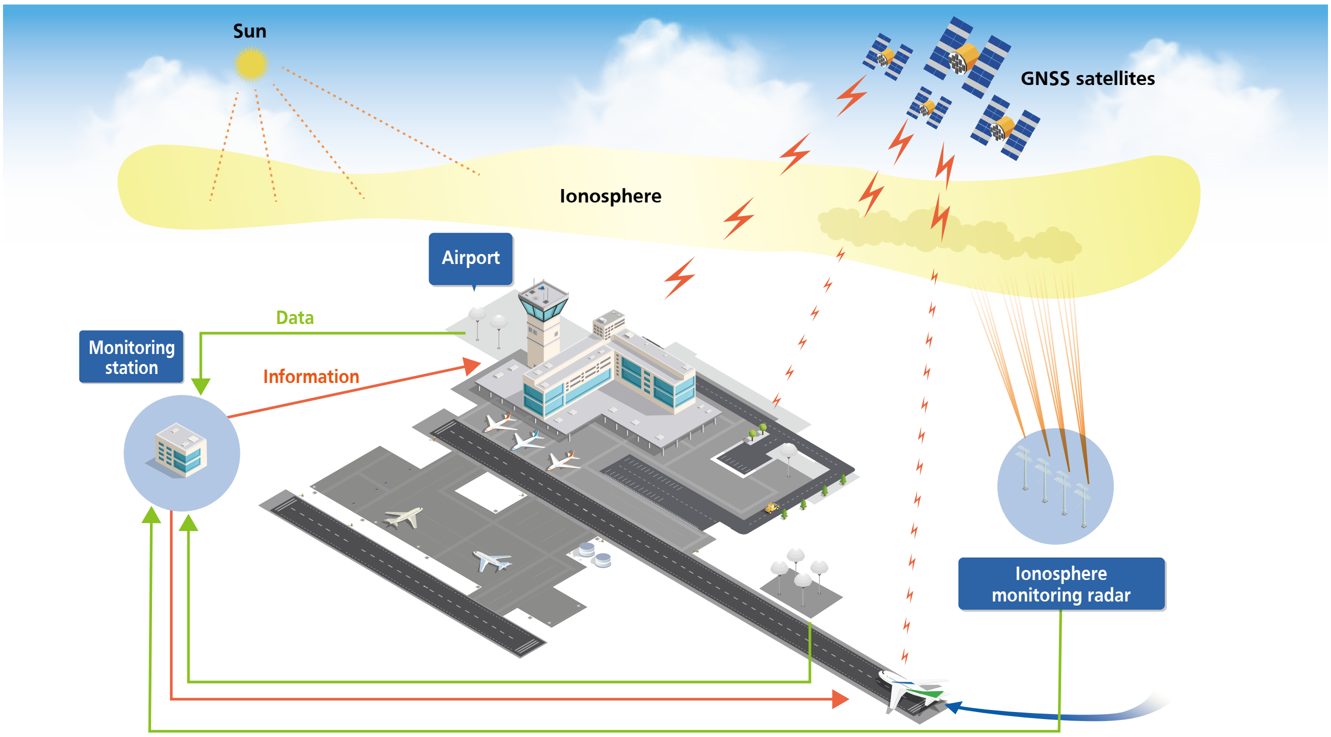

## 3. Research on Spectrum Sharing with Aircraft Radio Altimeters and Co-/Adjacent Frequency-using Systems

Aircraft radio altimeters (operating at frequencies between 4.2 and 4.4 GHz) are avionics that use radio waves to measure the distance between the aircraft and the ground. Their data are used as input parameters for aircraft control systems throughout a range of flight phases as well as landing. The data are also used in airborne collision avoidance systems and wing control. The main purposes of the research project include clarification of the conditions under which EMI occurs, such as frequency and power level. We also aim to develop an EMI estimation technology for radio altimeters using large-scale numerical analysis of electromagnetic fields.



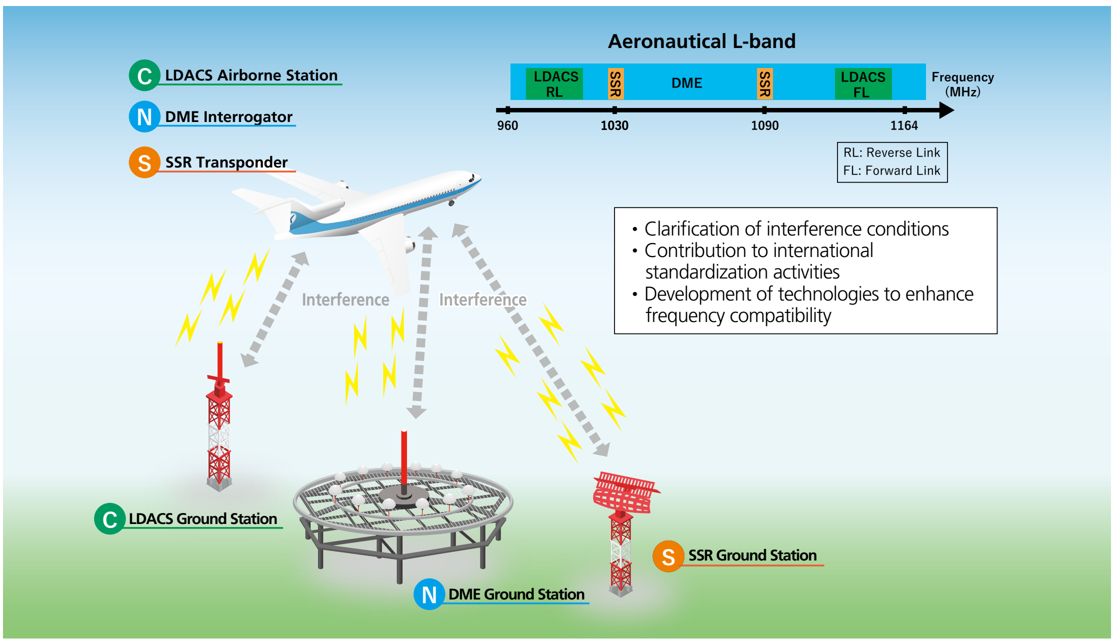
## 4. Research on the Improvement of GNSS Performance and Development of Performance Evaluation Technology in Low Magnetic Latitude Regions

Satellite navigation (GNSS) is affected by various phenomena on the paths through which radio waves propagate. In the low magnetic latitude region where Japan is located, high ionospheric activity is one of the limiting factor of GNSS performance for air navigation. We utilize space weather information to enhance safety and availability of air navigation systems in the low magnetic latitude region.




## 5.Study on CNS Frequency Compatibility in the L-Band

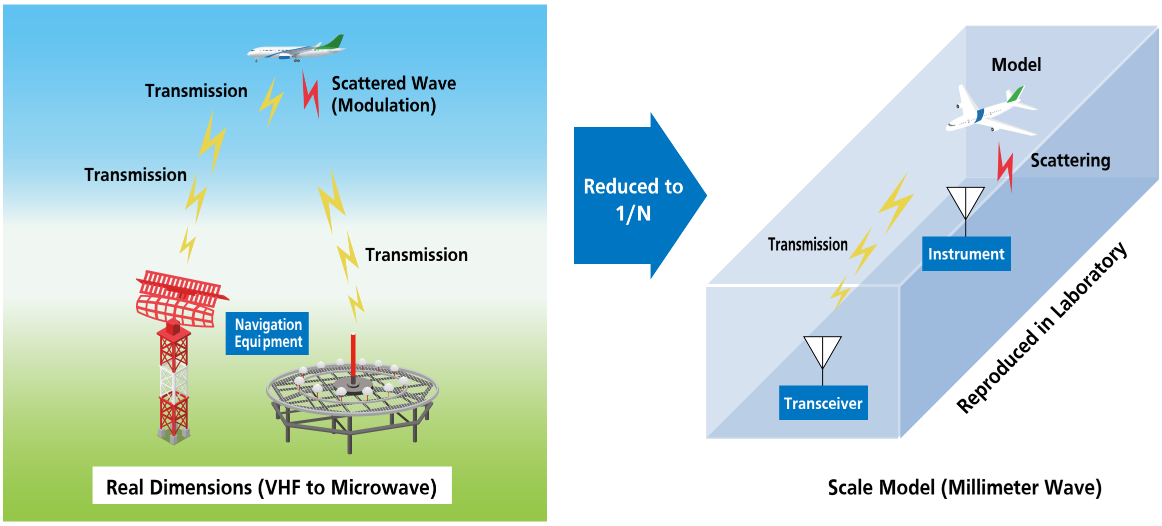
With the growing volume of air traffic and the emergence of new airspace usage, the aeronautical frequency band has become increasingly congested. To alleviate overload of the VHF band, LDACS—a next-generation air–ground communication system using the L-band — is being standardized. However, as the L-band is already used by critical systems such as SSR and DME, interference prevention presents another major challenge. This study explores the conditions ensuring safe and efficient frequency compatibility in the aeronautical L-band and investigates technologies for effective use of the L-band.



# Exploratory Research

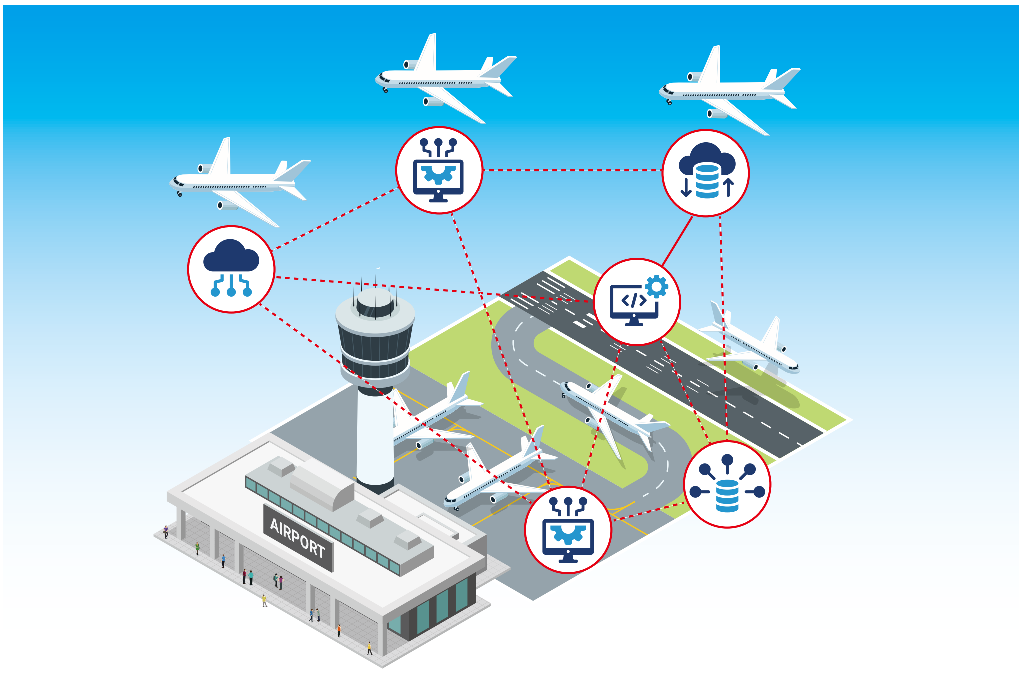
## Research on Measurement Technology for Large-Scale and Movable Scale Models

Conventionally, a scale model that uses a small-sized model to simulate an actual radio wave environment is a widely used method to estimate the impacts of buildings or other structures. Higher frequencies have been measured and enabled increases in the reduction ratio. It also simulate smaller models or larger environments that could not be applied until now. In this study, we aim to develop technology to measure the phase characteristics of tested radio waves using high reduction ratios and the influence of modulation of radio waves generated by movable models. We also aim to determine the applicable range and conditions for future scale model simulations.




## A Study on Fundamental Techniques for Departure Time Prediction

At major airports and in the surrounding airspace, mitigating air traffic congestion remains a critical challenge. To address this, it is essential to introduce digital technologies that centralize information such as aircraft departure times from parking stands, movements on taxiways, and positions within various airspace sectors. These technologies play a key role in alleviating air traffic congestion. This research focuses on improving the accuracy of core technologies such as departure time prediction within the integrated AMAN/DMAN/SMAN system, which manages aircraft arrival, departure, and surface movements. Additionally, we aim to develop efficient methods for implementing digital technologies into airport systems.



# ■ Expansion of Research and Development

## CARATS Open Data for Research and Development

Promotion of research and development (R&D) is crucial for building safe and efficient air traffic systems. To this end, the Japan Civil Aviation Bureau is distributing "CARATS open data", which include flight tracks and flight-plan route information for commercial flights, along with weather data such as METAR. The Electronic Navigation Research Institute supports R&D promotion through data conversion and tool development. Collaborating with NTT DATA Japan corporation, we have additionally created operational characteristic data (cruise speed, climb and descent rates) for analysis and simulations, which are published on our website. Users of CARATS open data can conduct various research and development activities contributing to future improvements of Air Traffic Management systems.

* CARATS : Collaborative Actions for Renovation of Air Traffic Systems


Trajectory Viewer (in-flight)

| Alt[ft], | CruiseTAS[kt], | ROC[fpm], | ROD[fpm] |
|---|---|---|---|
| 30000, | 457.69, | 1080, | 960 |
| 31000, | 457.57, | 960, | 960 |
| 32000, | 457.21, | 960, | 960 |

An example of the operational characteristic data

**Application Process**
**(CARATS Official Website)**
**https://www.mlit.go.jp/koku/carats/en/**

**ENRI's CARATS Open Data related information**
**https://www.enri.go.jp/en/carats_open_data.html**

## Collaboration with External Organizations

To disseminate the results of our research with a larger group, we are promoting initiatives such as collaborative research and contract research with universities, private companies, and other national research and development organizations as well as commissioned research using government funding, personnel exchanges, and deputation of researchers to other institutes.

## International Activities

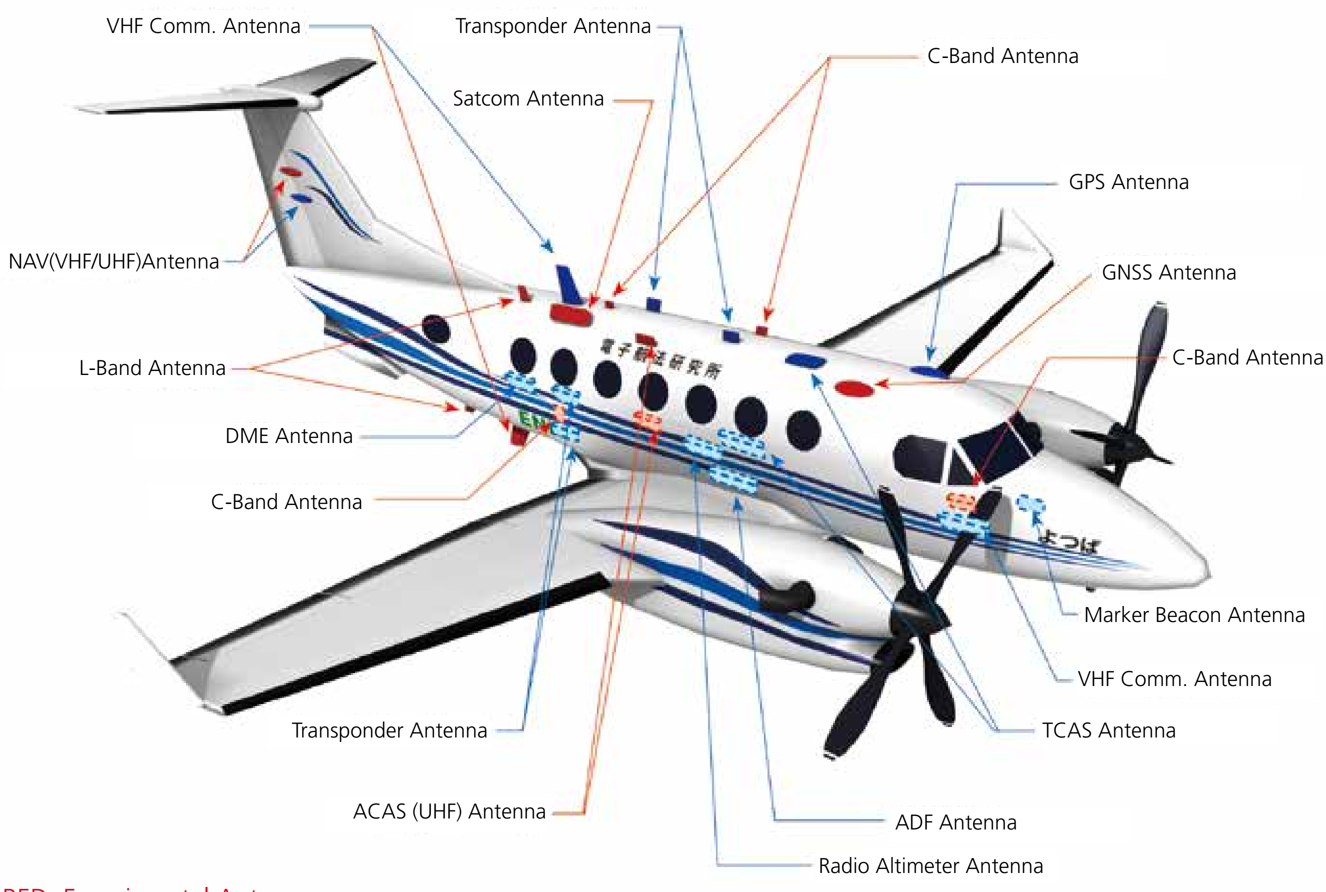
Using the results of our research and development, our institute actively participates in standardization activities by Civil Aviation Organization (ICAO) and other private organizations and promotes hosting/co-hosting of and participation in international conferences. In addition, we are engaged in strategic activities such as supporting the overseas distribution of Japanese technologies and systems through collaboration with overseas organizations.

# ■ Main Facilities

## Aircraft for Flight Experiment (Nickname: Yotsuba)

This is an experimental aircraft equipped with research systems prototyped and developed by our institute and used for actual flight experiments and evaluation tests. It is utilized in various research areas, such as communications, navigation, and surveillance.

**Yotsuba introductory video and flight status (Experimental aircraft page)**
**https://www.enri.go.jp/en/research/facility/aircraft.html**




RED: Experimental Antenna
BLUE: Standard Antenna

| | | | |
|---|---|---|---|
| **Reg. No.** | JA35EN | **Max. Weight** | 6.8 t |
| **Model** | Beechcraft B300(KingAir 350) | **Engines** | Pratt & Whitney PT6A-60A |
| **Length** | 14.23 m | **Propellers** | Hartzell HC-B4MP-3C |
| **Width** | 17.65 m | **Avionics** | Collins Pro Line 21 |
| **Height** | 4.36 m | | |

## SSR Mode S Ground Station

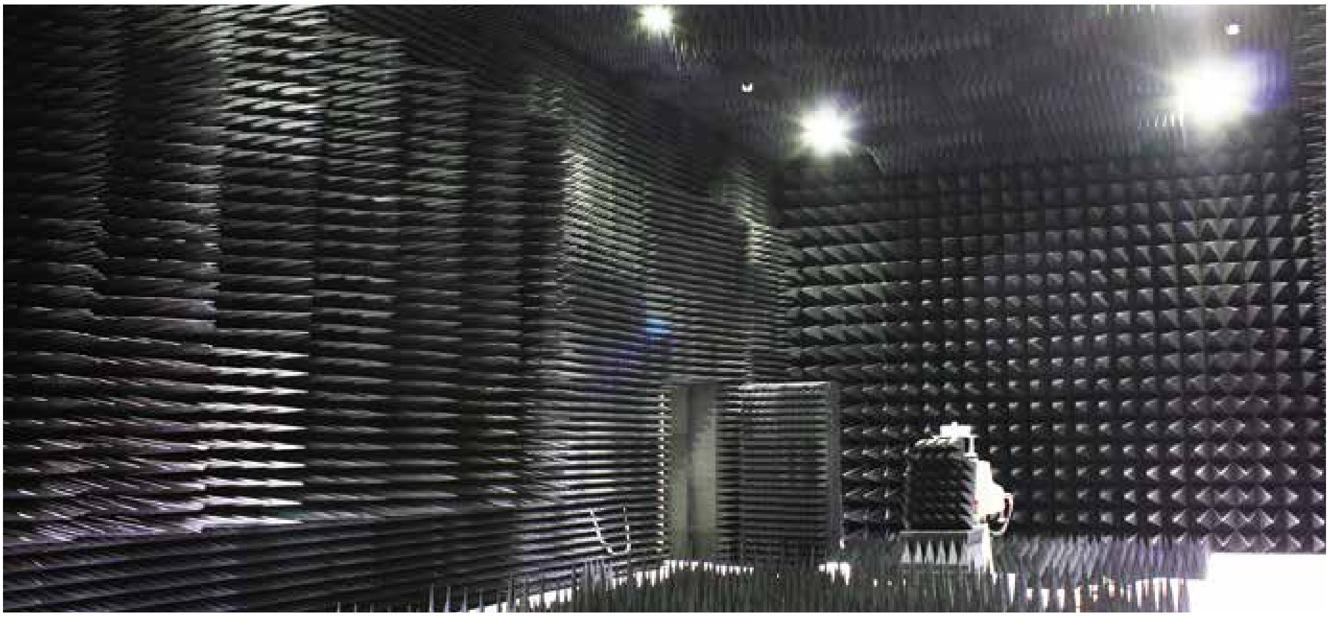
Secondary Surveillance Radar (SSR) Mode S is an air traffic control radar system with improved surveillance and datalink capabilities. European states are preparing to use this new mode with ground station coordination. To prepare for the future deployment of this technology in Japan, ENRI has developed an SSR Mode S ground station and is performing test monitoring on a real aircraft.

SSR mode S antenna


Radar Display

## Radio Anechoic Chamber

The radio anechoic chamber provides ideal conditions as an infinite space for testing of radio equipment. The chamber is built in a large shielded box with iron plates to prevent external intrusion and internal leakage. Moreover, the chamber creates non-reflective conditions to extinguish radio waves emitted inside by the wall, floor, and ceiling covered with radio absorbers. Performance tests for radars or communication systems emitting radio waves or measurements for antennas are conducted within the chamber.



| | | | |
|---|---|---|---|
| Dimensions (Available Space) | 32.0 m×6.2 m×4.2 m | Reflection Attenuation (At the center) | 50 dB and over |
| Frequency Band | 1–110 GHz | Shield Attenuation (At the center) | 90 dB and over |
| Non-Reflective Range | 23 m and over | | |

# Publicity of Research Results

## Events

### ENRI Annual Seminar

Every year around June, ENRI's researchers hold presentations on their research.
A summary of the presentations is available on the Institute's website.

### IWAC (International Workshop on ATM/CNS)

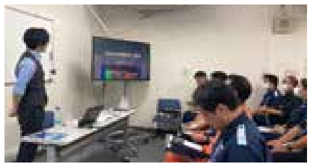
ENRI holds an international workshop every two years, with keynote speeches from the representatives of international organizations in addition to lectures and participation from researchers on air traffic control, communications, navigation and surveillance as well as experts from government agencies and companies from all over the world.

### ENRI Workshop

ENRI select topics of high interest from within our research projects and holds lectures every two years in Tokyo, which are widely attended by people from companies, government agencies, and the general public.

### Open Lecture Service

ENRI visit government agencies, companies, educational institutions, etc., to present our research work and exchange opinions.



### Open House Day

As part of the Science and Technology Week held every April, the two neighboring research institutes jointly open their facilities to the public and introduce some of their daily research activities and efforts.

## Publications

- **Electronic Navigation Research Institute Papers (Non-Periodicals)**

  ENRI publishes detailed reports on individual research items conducted at ENRI.

  ISSN 2758-2973 (Online)1341-9102 (Booklet)

- **Electronic Navigation Research Institute Annual Report (Annual publication in Japanese)**

  ENRI publishes annual reports containing overviews of its research activities conducted in the previous year.

  ISSN 2759-0887 (Online only)

**Download the Electronic Navigation Research Institute papers (Japanese version only)**
**https://www.enri.go.jp/jp/research/outcome/report.html**

**Download the Electronic Navigation Research Institute Annual Report (Japanese version only)**
**https://www.enri.go.jp/jp/about/publication.html**

# ■ Access map

ENRI access
https://www.enri.go.jp/en/about/access.html

## Headquarters

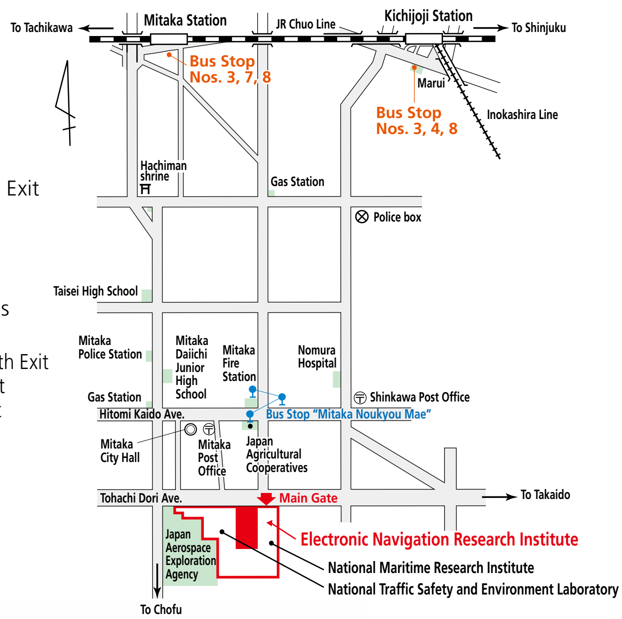
### ●Address

7-42-23, Jindaijihigashi-machi, Chofu, Tokyo 182-0012, Japan
TEL. +81-422-41-3165　FAX. +81-422-41-3169

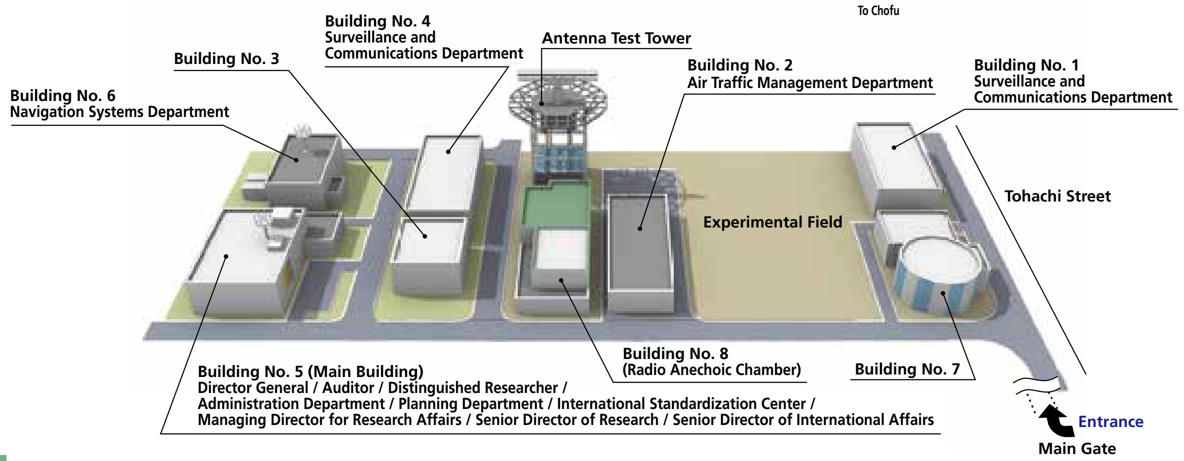
### ●Directions

Take a local bus from the nearest station.
The nearest bus stop from the main gate is "Mitaka Nokyo-mae."

1. From the South Exit of Mitaka Station (JR)
   **3** bus stop: Take bus number "Taka 66"(鷹66) bound for Chofu Station North Exit
   **7** bus stop: Take bus number "Taka 54"(鷹54) bound for Sengawa
   or bus number "Taka 61"(鷹61) bound Chofu Station North Exit
   or bus number "Taka 62"(鷹62) bound for Kouka Gakuen East
   **8** bus stop: Take bus number "Taka 55"(鷹55) bound for Nogaya
   or bus number "Taka 59"(鷹59) bound for Mitaka Station loop bus
2. From the South Exit of Kichijoji Station (JR/Keio Inokashira Line)
   **3** bus stop: Take bus number "Kichi 01"(吉01) bound for Musashi-Sakai Station South Exit
   **4** bus stop: Take bus number "Kichi 06"(吉06) bound for Chofu Station North Exit
   **8** bus stop: Take bus number "Kichi 14"(吉14) bound for Chofu Station North Exit
3. From the North Exit of Chofu Station (Keio Line)
   **11** bus stop: Take bus number "Kichi 14"(吉14) bound for Kichijoji Station
   or bus number "Taka 66"(鷹66) bound for Mitaka Station
   **12** bus stop: Take bus number "Kichi 06"(吉06) bound for Kichijoji Station




### ●Locations of Facilities




## Iwanuma Branch

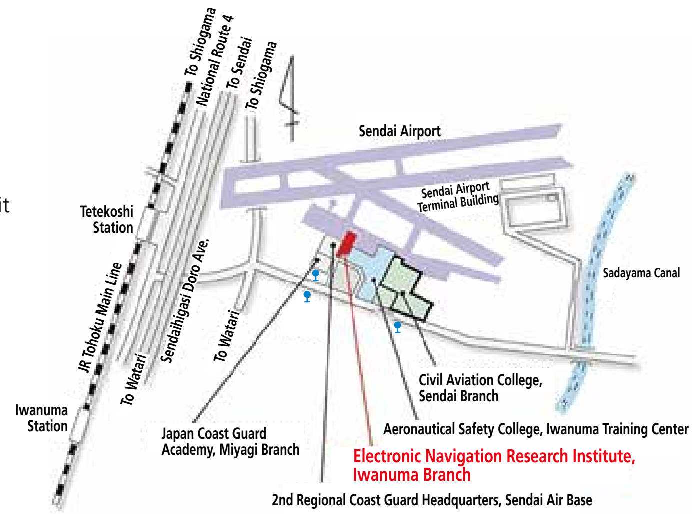
### ●Address

4, Kitanaganuma, Shimonogo, Iwanuma, Miyagi 989-2421, Japan
TEL. +81-223-24-3871　FAX. +81-223-24-3892

### ●Directions

Take a local bus from Sendai Airport or the nearest station.

1. From the Sendai Airport Terminal Building
   - Take the Iwanuma City Bus Airport Line to Iwanuma Station East Exit and deboard at "Kouku Daigakkou-mae."
   - Take the Sendai Bus/Rinku Loop Bus to Iwanuma Station East Exit and deboard at "Kouku-Daigakkou."
2. From Tatekoshi Station (JR)
   - Take the Sendai Bus/Rinku Loop Bus bound for Sendai Airport and deboard at "Sekimukai."
3. From Iwanuma Station (JR)
   - Take the Sendai Bus/Rinku Loop Bus bound for Sendai Airport and deboard at "Sekimukai."
   - Take the Iwanuma City Bus Airport Line bound for Sendai Airport and deboard at "Kaijyo-Hoangakkou" or "Kouku-Daigakkou."



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