

Headed towards “Air Mobility Revolution”

January 2019

Manufacturing Industries Bureau

Ministry of Economy, Trade and Industry

Drastic Reform in Mobility

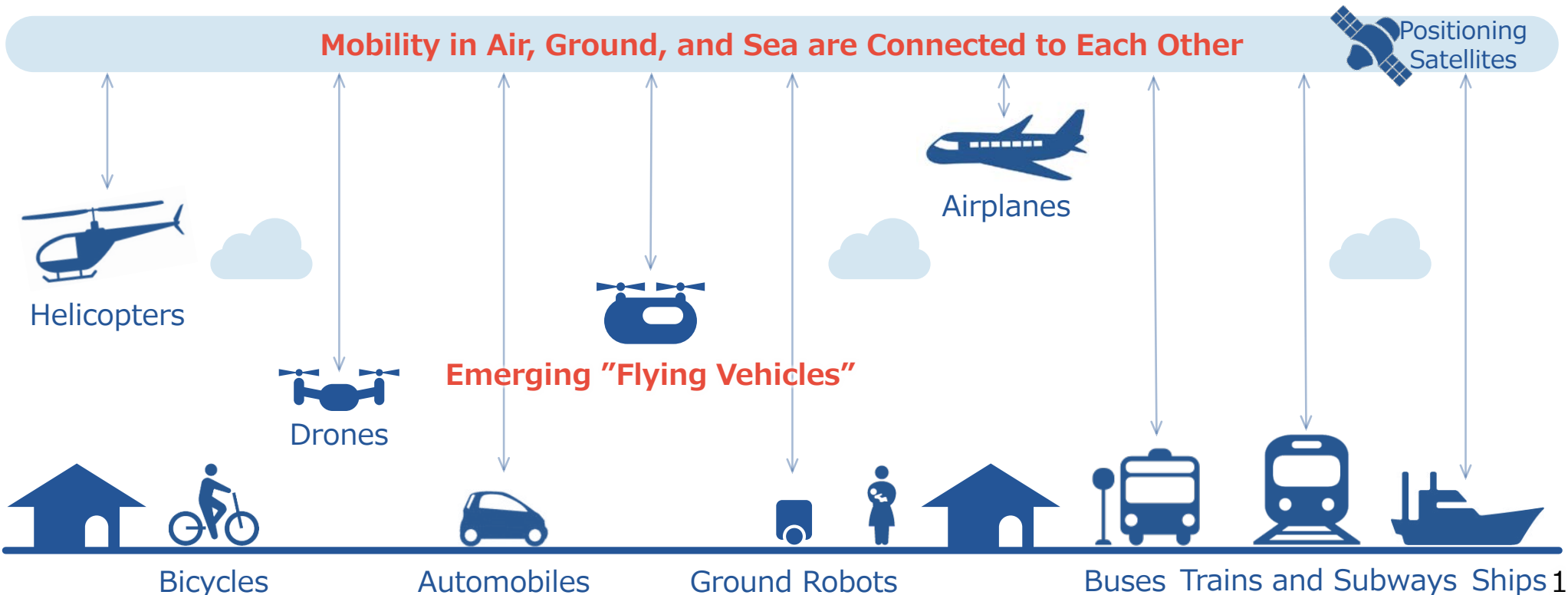
- The field of mobility has been confronted by a revolutionary change due to emergence of drones and autonomous driving.

1. Total Mobility Services: Connecting Air, Land, and Sea Mobility

“Hedges” among players and regulations of each mobility will be removed. The society will be established in which mobility in air, ground, and sea become seamless. Diverse services will be introduced to meet with customers’ needs.

2. Air Mobility Revolution: Emerging “Flying Vehicles”

“Flying Vehicles” have emerged to take a role between airplanes and drones. The tide of electrification and automation have already taken place not only on the ground but also in the air. The substantial use of the “sky” in the world is still limited. Competition surrounding **air mobility** should be fiercer in the near future.

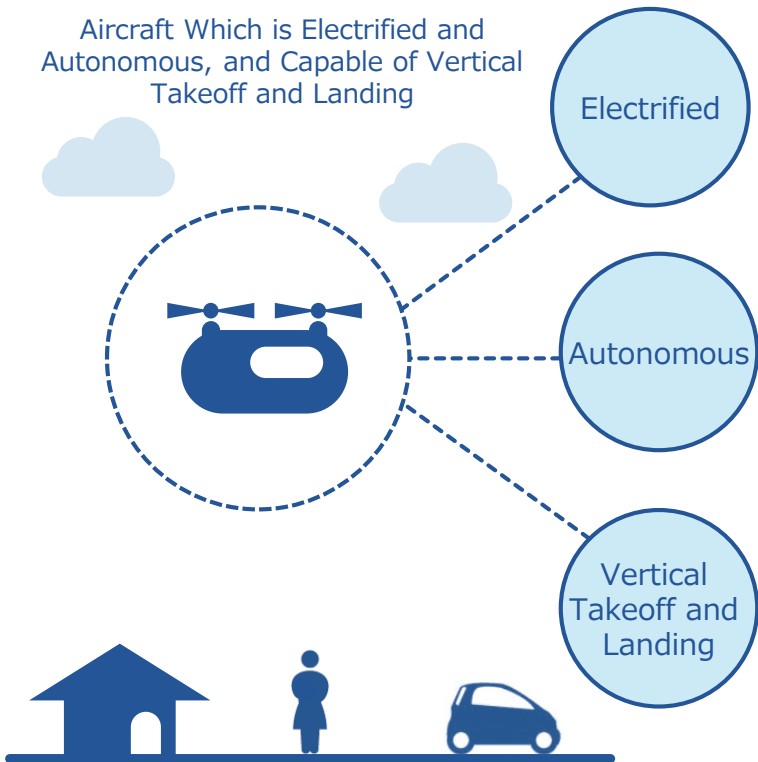


What is “Air Mobility”?

- Amongst various definitions, “air mobility” includes “flying vehicles”, whose typical features are “electrified”, “autonomous”, and “vertical takeoff and landing”. Flying vehicles require less costs for production, operation, and infrastructure, thus enabling “popularized air mobility”, that is, fast and convenient mobility of people and goods with less cost.
- By realization of such advanced mobility society with “flying vehicles” which offers rides to people and goods “at any time” and “to anywhere from point to point”, development of Japanese industries and overcoming social issues inside and outside Japan would be expected.

“Flying Vehicles”

Aircraft Which is Electrified and Autonomous, and Capable of Vertical Takeoff and Landing



Comparison to Helicopter

Number of Components: Fewer

Maintenance Cost: Lower

Noise: Lower

Compatibility with Autonomous Drive: Higher

↓
Human Pilots: Not Required

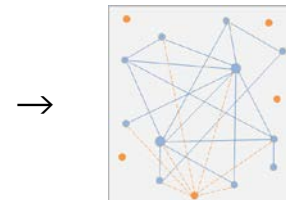
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Operational Costs: Lower

Concept of Mobility Will be Changed

Linear Mobility



Point to Point Mobility



“Air Mobility Will be Popularized”



“Flying vehicles” offer mobility with optimum speed and distance without relying on existing infrastructures



Global Trend in “Air Mobility”

- Various players from venture companies to large enterprises in Europe, the United States, and China have launched projects pertaining to “air mobility”, and have conducted a number of research and development as well as feasibility study projects. Governments of countries such as Dubai and Singapore have been active towards implementation of “flying vehicles” to overcome social issues such as traffic congestion.

<Private Companies in EU, US, China, and Japan>

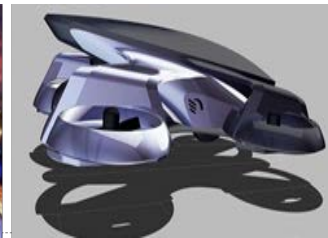
Uber 

- By cooperation with NASA, aiming for ride share services including “Sky Area” by 2023 (initially human-piloted)




CART!VATOR 

- An aspired organization supported by TOYOTA, and planning to release their “SkyDrive” by 2020.



<Governments>

Dubai 

- RTA (Roads and Transport Authority) leads air mobility projects to autonomize 25% of all vehicles by 2030
- RTA leads the “air mobility” projects, providing test fields to Volocopter and Uber

Airbus 


- Announcing various concepts: a four-seater flying vehicle called “City Airbus” will be put on practical use by 2023



Ehang 

- Chinese drone maker. Developing a one-seater vehicle “184”. Having conducted test flights in China and Dubai.



Singapore 

- Actively promoting “Air Mobility” implementation project to address social problems, as Singapore having limited land being faced with population increase
- Airbus is conducting feasibility studies under cooperation with Ministry of Transport, Singapore

Expected Use Cases

Urbanized Areas

Speedy and Comfortable Transportation

(Eliminating Ground Traffic Congestion without Vast Investment to Infrastructures)



Disaster Sites

Prompt Provision of Rescue as Well as Supply of Emergency and Disaster Relief Goods

(Enabling Rescue and Support without Relying on Ground Infrastructures to be Recovered)



Remote Islands and Mountainous Areas

Offering Easier Access to Rural Areas Which are Inconvenient and Difficult to Access

(Creating Use to Revitalize Depopulated Areas for Sightseeing and Other Recreational Purposes)



Issues Surrounding “*Air Mobility*”

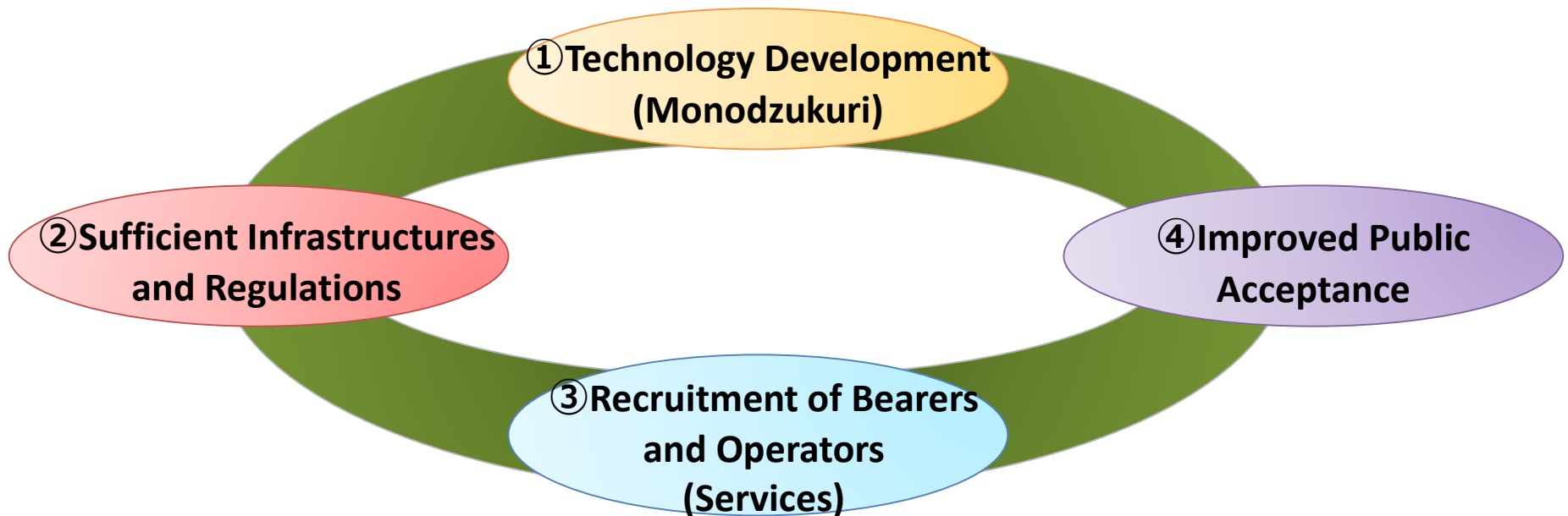
- In order to realize “*air mobility*” ahead of the world, the following main issues should be addressed.

① Technology Development - Electrification and Autonomization

② Sufficient Infrastructures and Regulations – Operation Management and Airworthiness Certificate Based on Feasibility Studies

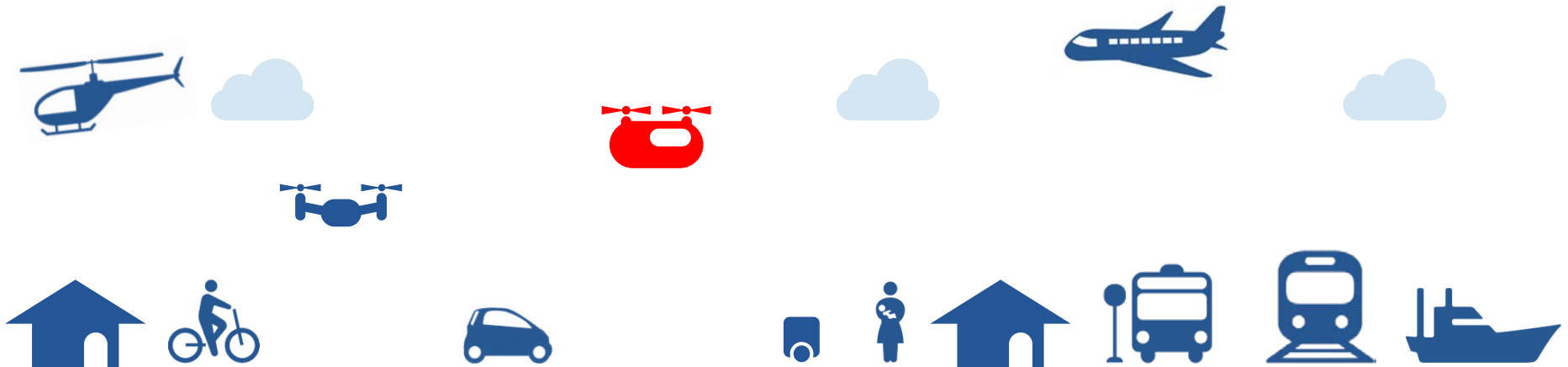
③ Recruitment of Bearers and Operators – Establishment of Basis for Social Implementation

④ Improved Public Acceptance – Increased Understanding on “*air mobility*”



Headed towards “Air Mobility Revolution”

- Effective full use of the “grand sky” with “flying vehicles”, that is, “air mobility”, has substantial potential to create a totally new society and at the same time to overcome numerous social issues with innovation, as it happened with the post-war automobile diffusion (motorization) in Japan.
- In spite of trends in overseas that vast numbers of players having been participating in manufacturing and services related to “*air mobility*”, **almost any of such trends has currently been observed in Japan.**
- In order to invite potential domestic players to participate in the market while generating “a centripetal force” to attract overseas players, for Japan to thereby lead global innovation,
 - **the elements ① - ④, that are, ①Technology Development (Monodzukuri), ②Sufficient Infrastructures and Regulations, ③Recruitment of Bearers and Operators (Services), and ④Improved Public Acceptance, should be progressed simultaneously,** under ensured public-private cooperation and international cooperation.
 - In order to attain that, the Japanese government determined in the “Future Investment Strategy 2018” “**to establish a council for public and private sectors to discuss necessary technology developments and regulations and to formulate a roadmap by the end of this year (2018)**” (Cabinet Decision on June 15, 2018), and the council was established on August 29, 2018.



Public-Private Council for Air Transportation Revolution



Public

- Manufacturing Industries Bureau, Ministry of Economy, Trade and Industry
- Civil Aviation Bureau, Ministry of Land, Infrastructure, Transport and Tourism
- Observers : Divisions in MIC, FDMA, MLIT

Private

- Shinji Suzuki, Professor, Department of Aeronautics and Astronautics, Graduate School of Engineering, University of Tokyo
- Masaru Nakano, Professor, Graduate School of System Design and Management, Keio University
- Gaku Minorikawa, Professor, Faculty of Science and Engineering, Department of Mechanical Engineering, Hosei University

- Hisashi Sano, Vice President, Director General, Aeronautical Technology Directorate, Japan Aerospace Exploration Agency
- Toshinori Ogure, Vice President, Helicopter Chairperson, All Japan Air Transport and Service Association
- Kosuke Imashimizu, President, The Society of Japanese Aerospace Companies
- Kiwamu Tezuka, CEO, AirX Inc.
- Matsuoka Yuhiro, Vice President, Strategy & Marketing, Airbus Japan K.K.
- Toyoyuki Nagamine, Member of the Board of Directors, Senior Executive Vice President, ANA HOLDINGS INC.
- James Masao Toyama, Director, Public Policy and Government Relations Japan, Uber Japan Co., Ltd.
- Tsubasa Nakamura, Representative, CARTIVATOR
- Keiichi Nagayama, Associate Officer, General Manager, Helicopter Project Division, Aerospace Systems Company, Kawasaki Heavy Industries, Ltd.
- Ohta Hiroaki, President, Autonomous Control Systems Laboratory Ltd.
- Fukuzawa Tomohiro, President, SkyDrive Inc.
- Shoichiro Tozuka, Aerospace Company President, SUBARU Corporation
- Tasuku Nakai, CEO, teTra aviation corp.
- Hiroji Hukui, CEO, Temma Inc.
- Kotaro Chiba, Founder/ Managing Partner, Drone Fund
- Nishihata Tomohiro, Executive Officer Innovation, Japan Airlines Co., Ltd
- Norihiko Ishiguro, Senior Executive Vice President and Member of the Board, NEC Corporation
- Masakazu Kono, CEO, PRODRONE Co., Ltd.
- Takuya Masamura, Regional Sales Manager, Bell
- Miwa Kobayashi, Director, Government and Corporate Affairs, Boeing Japan, The Boeing Company
- Shinji Makiura, Managing Executive Officer, Yamato Holdings Co., Ltd.
- Koji Ando, Group Managing Executive Officer, Rakuten, Inc.

Roadmap towards Air Transportation Revolution

20 December 2018 Public-Private Council for Air Transportation Revolution

2019~

Test Flights and Feasibility Studies (Target: 2019)

Proposal of Business Models by Operators

Feedback Experiences Accumulated from Helicopters and Drones Business Projects

Feedback Results of Feasibility Studies

Insurances and Compensation Reliefs

Goals of Use by Manufacturers / Operators

Preparation of Regulations and Social Systems

Development of Vehicle Bodies and Technologies

Hardware and Software Aspects

Preparation of Necessary Regulations

Studies on how to Ensure User Usability

Preparation of Regulation for Air Transport and Aerial Work Services

Preparation of Standard for Airman Licensing

Airman Licensing

Formulation and Examination Based on International Discussions

Preparation of Safety Standard of Aircraft

Type/Airworthiness Certification

Coordinating and Preparation of Takeoff and Landing Areas and Air Spaces for Test Flights

Coordinating and Preparation of Takeoff and Landing Spaces, Air Spaces, and Radio Waves

In Conformity with Current Aviation Environment

Establishment of Fukushima Robot Test Field as a Test Flight Base

Accomplishment of Electrified Passenger Vehicles

Technology to Secure and Certify Safety and Reliability

Automatic Traffic/Operation Management

Technology Development on Built-in Vehicle System and Ground System (Technologies to Facilitate Flights, etc.)

Electric Propulsion

Technology Development to Attain Required Cruising Distance and Quietness, etc. Necessary for Business Operation

Including Hybrid Propulsion

Ensuring the Equal Level of Safety and Quietness as of Aircrafts

Mid-2020s

Starting of Business Services (Target: 2023)

2030s~

Expanding Practical Use

Air Transportation of People in Urban Areas

Air Transportation of People in Rural Areas

Air Transportation of Goods

Effective Uses for Disaster Relief, Emergency, Leisure, etc.

Accomplishing Level Necessary for Public Acceptance (Safety, Noise, Environment, etc.)

Review Regulation for Air Transport and Aerial Work Services Adapted to New Business Model

Furnishing with Regulation According to Technology Development such as Remote Control from Ground and Advanced Automatic Flight by Built-in and/or Ground System

Implementation Based on International Discussions

Review Safety Standard and Examination Method According to Technology Development

Establishment of Condition to Use Air Spaces and Radio Waves in Anticipation of Development of Business Operation

Provision of Comprehensive Traffic / Operation Management Service

Business and Service Expansion

Preparation of Takeoff and Landing Areas for Continuous Use (Arrangements with Local Government and Landowners etc. by Business Operators, and Smooth Transfer to Other Transportations such as Ground Transportation)

Preparation of a Heliport etc. Adapted to a New Business Model

Expansion of Flight Areas from Remote Islands and Mountainous Regions to Urban Areas

Regularized Full Operation of Flights in Urban Areas

Studying Air Traffic Rules According to Technology Development

Further Improvements of Safety and Reliability

• Advanced Human Pilot Assistance with a Built-in System (Automatic Flight)
• Remote Control from Ground

Simultaneous Traffic / Operation Management and Collision Avoidance for Multiple Vehicles in the Air, etc.

Advanced Automatic Flight

• Increased Cruising Distance : Development of Battery, Motor, Hybrid, and Weight Saving Technologies, etc.
• Improved Quietness : Development of Technologies to Reduce Noise from Rotors, etc.

Future Images



Fukushima Robot Test Field



Fukushima Innovation Coast Concept

Fukushima Robot Test Field

STARTS FY 2018!



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Airfield with impact absorption net/
Runway attached hangar



Test bridge



Test tunnel



Test plant



City area field



Debris/landslide field



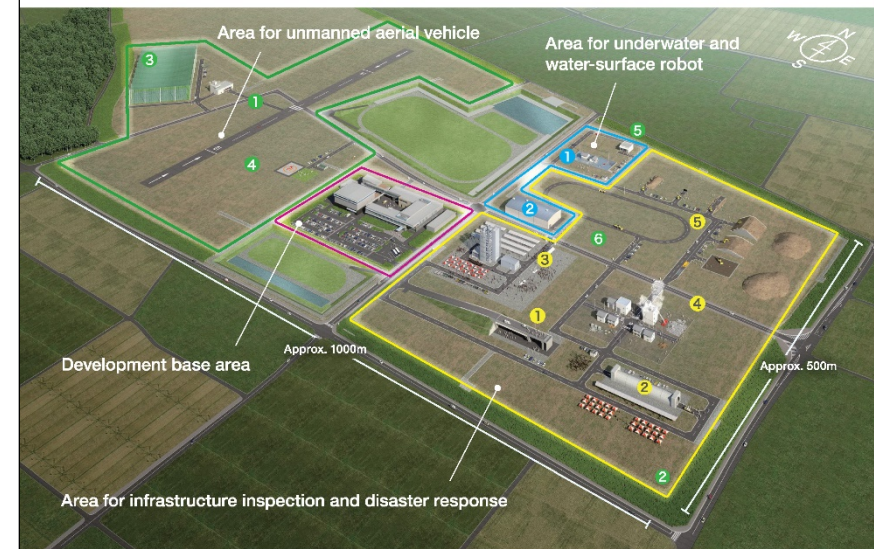
Building for indoor water tank test



Field for submerged city area

Fukushima Robot Test Field

"Fukushima Robot Test Field" to be developed based on Fukushima Innovation Coast Concept is one of the largest research and development bases in the world, where R&D, verification test, performance evaluation and maneuver training can be carried out while reproducing the actual use environment within the base, mainly for the field robots of land, sea and sky such as unmanned aerial vehicles, disaster response robots, underwater exploration robots that are expected to be utilized for logistic, infrastructure inspection, large-scale disaster time, and etc. This base is planned to develop a runway for long distance flight test in Namie-machi Tanashio industrial complex, as well as to establish "Area for unmanned aerial vehicle area", "Area for infrastructure inspection and disaster response", "Area for underwater/water-surface robot area" and "Development base area", securing the area of approx. 1000m east-west and approx. 500m north-south within the Restoration industrial complex site in Minamisōma city, and will be opened sequentially after FY 2018.



Fukushima Innovation Coast Concept

The Fukushima Innovation Coast Concept aims at building a new industrial base in this region, in order to restore industries in Hama-dori and other areas that have been lost due to the Great East Japan Earthquake and nuclear disasters. We are working on industrial clusters, human resource development, and expansion of interaction population, as well as promoting the implementation of projects relating to decommissioning of reactor, robots, energy, agriculture, forestry and fisheries.