Harsh Environment Drone Challenge (HEDC)

Section 2
Mission Scenario and Evaluation Criteria

15 January 2025

Secretariat of WRS2025
Harsh Environment F-REI Challenge

World Robot Summit
Harsh Environment F-REI Challenge

Harsh Environment Drone Challenge

Fukushima Institute for Research, Education and Innovation
F-REI

Host:

Fukushima Institute for Research, Education and Innovation (F-REI)

Co-host:

Ministry of Economy, Trade and Industry (METI)

Date: October 10 (Fri.), 11 (Sat.), 12 (Sun.), 2025

Location:

Hamadori, Fukushima Prefecture (Round trip from The Fukushima Robot Test Field (RTF) Namie Runway, Namie-town to Odaka District and the RTF, Minamisouma-city)

Mission Theme:

Long-distance flight mission to collect disaster response information and transport supplies (Mission 3 has a round-trip flight distance of approximately 30 km)

1. Purpose of "WRS2025 Harsh Environment F-REI Challenge" hosted by F-REI

Fukushima Institute for Research, Education and Innovation (abbreviation: "F-REI") is a special corporation established on April 1, 2023, based on the Fukushima Reconstruction and Revitalization Special Measures Act. F-REI becomes an aspiration and hope for the realization of the reconstruction of Fukushima and other Tohoku regions, and will lead the strengthening of Japan's scientific and technological capabilities and industrial competitiveness, contributing to economic growth and improving the lives of the people. F-REI aims to become a ″core base for creative recovery.″ The research facility is scheduled to be built by the government in Namie Town, Futaba District, Fukushima Prefecture by 2030.

F-REI's research areas are: (1) Robotics, (2) Agriculture, forestry and fisheries, (3) Energy, (4) Radiation science, and (5) Accumulation and dissemination of data and knowledge related to nuclear disasters. When designing research projects, F-REI primarily considers the issues facing Japan and the world as well as the current situation in the region.

Regarding research and development in the field of robots (robots and drones), "In Fukushima, which has experienced a complex disaster, we will conduct research and development of robots and drones that can function in the harsh environments that occur during decommissioning and natural disasters." F-REI's policies for setting up research topics are "development of highly mobile robots with radiation resistance, water resistance, heat resistance, etc., and intelligent research to realize autonomous control and group control." We will conduct functional expansion research to enhance the sensory functions of living beings. Utilizing these results, we will develop highly mobile robots that can operate in harsh environments such as decommissioning, disasters, and outer space, with high payloads. We will promote the development of highly functional drones that can fly for lengthy periods of time, as well as autonomous mobile robots.

From the above perspective, the F-REI hosts the ″WRS2025 Harsh Environment F-REI Challenge″ held in October 2025 at Fukushima Robot Test Field.

According to the definition, "A harsh environment (extreme environment) can be defined as an environment in which temperature, pressure, radiation, gravity, magnetic field, pH, etc. significantly deviate from the conditions in which ordinary living things (including humans) can live." The most ideal use of robots is using robots to perform tasks in place of humans in such harsh environments. This requires robot technology that can withstand such harsh environments. Furthermore, the harsher the environment, the more autonomous the robot is required to be.

Next, we will introduce specific examples of harsh environments. These are not all, but the major cases to be covered. Among 1-19, 1-15 are environments that cannot be easily achieved, so in this competition, we will create an environment specialized for 16-19 and implement the ″Harsh Environment Drone Challenge (HEDC).″

1. High radiation environment (nuclear accident building, exposed parts of

spacecraft, moon surface, Mars, battlefield areas where depleted uranium ammunition is used, etc.)

2. Extremely low pressure/vacuum environment (space environment, lunar surface, etc.)
3. Extremely high pressure environment (deep sea survey, seabed resource survey, sunken ship exploration, etc.)
4. High-temperature environments (near debris after a meltdown, lifesaving during fire spread, firefighting, inspections at operating blast furnaces, etc. volcanic crater investigation, solar observation satellite, daytime exposed part of spacecraft)
5. Cryogenic environments (Arctic and Antarctic research, pipeline inspection work in Canada, Siberia, etc., exposed parts of spacecraft at the night)
6. Microgravity environment and zero gravity environment (outer space, etc.)
7. Minefield environment (anti-tank/anti-personnel mine burial areas, unexploded ordnance areas, etc., related to Ukraine reconstruction)
8. High humidity environment (hot and humidity environment due to debris cooling, limestone cave investigation, etc., hydroelectric power plant water pipe inspection, sewer inspection, etc.)
9. High dust environment (dust environment generated when debris is broken into small pieces, inspection and investigation of chimneys, garbage incinerators, etc.)
10. High electromagnetic field environment (inspection and investigation near power equipment such as power transmission lines and steel towers, and inspection and investigation near ferromagnetic materials such as steel works)
11. High altitude environment (alpine survey, inspection survey of power lines, steel towers, bridge piers, roofs, walls of high-rise buildings, etc.)
12. Special environment (hurricane eye survey, typhoon eye survey, etc.)
13. Soft ground environment (UGV activities in debris flows, landslides, mud, lunar regolith, etc.)
14. Rapidly changing environment (extreme temperature difference between day and night in space for spacecraft and space robots)
15. Cyber attack area environment (hacking for aircraft hijacking, jamming of radio waves, pilot impersonation, etc.)
16. **Airspaces (regions, sea areas, underwater areas) where a wide variety of UAVs (UGVs, USVs, UUVs) fly (move) at high density.**
17. **Environment where communication is interrupted or delayed**

18. Adverse weather conditions (wind, rain, snow, thunder, fog, etc.)
19. Obstacle environment (power lines, service lines, trees, towers)

Please note that each mission is based on current plan, and it may change without advance notice. Please always check our website for the latest information.

2. Mission overview

Immediately after a large-scale disaster occurs, emergency missions to investigate the damage situation, rescue victims, and deliver necessary supplies to those in need are carried out using multiple large and small drones such as rotary-wing, fixed-wing, VTOL aircraft, and UAVs.

The mission overview is shown in Figure 1, but the three specific missions are as follows.

❶A major disaster has occurred, but the extent of the damage is unknown, so conduct a comprehensive survey of the damage in this area. In this case, the roads are cut off, so a route search for a rescue vehicle is performed.

❷Detecting disaster victims from the air and understanding their situation, and also identifying victims' needs for relief supplies. Furthermore, identify the letters written on the ground from the air, the supply delivery drone delivers the supplies to the designated location.

❸There are victims who have barely escaped collapse, but are trapped under furniture and unable to move, so the situation of these victims must be investigated by entering the building and reporting back.

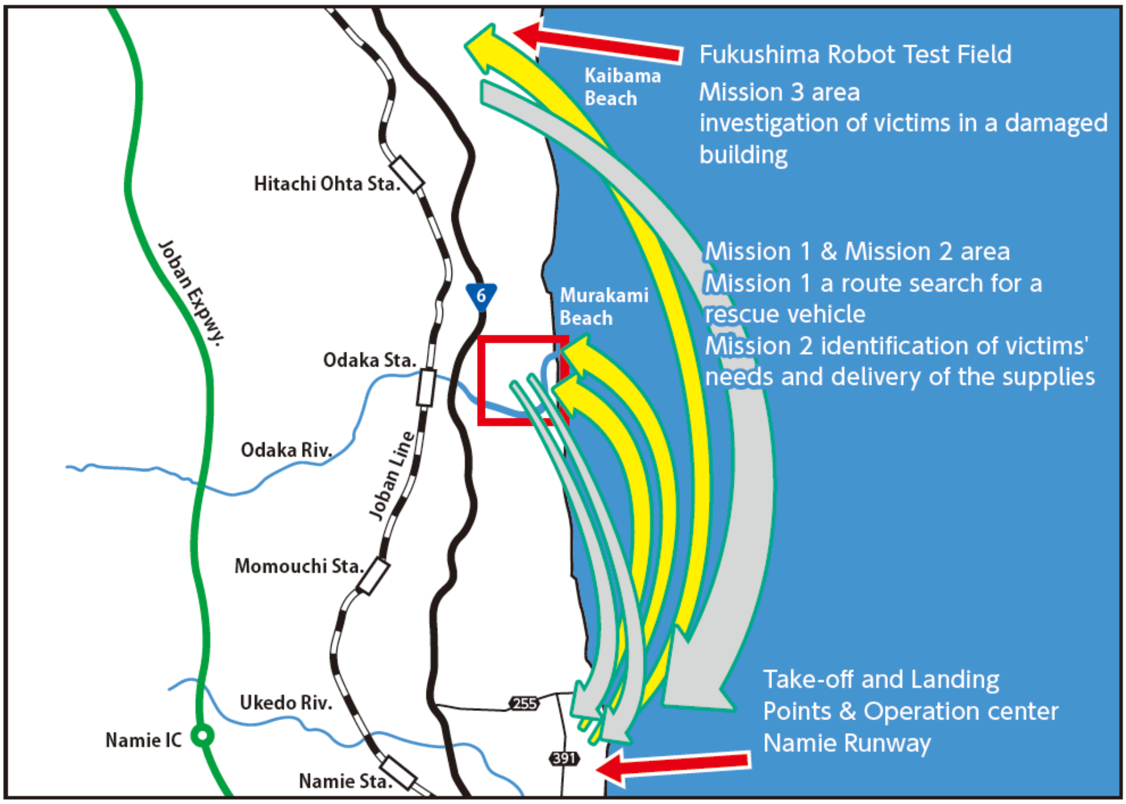


Figure 1 HEDC mission overview; the RTF, the RTF Namie Runway, and areas of each mission, and flight route.

As a disaster occurred in the Odaka area of Hamadori, Fukushima Prefecture, near the RTF main base in Minamisoma City, the Drone Rescue Team set up a disaster response headquarters at the RTF Namie Runway in Namie Town, Fukushima Prefecture, and immediately dispatched flying robots from the takeoff point.

Mission 1 is to conduct a detailed investigation of the disaster occurrence and damage situation in the Odaka area, and transmit clear images to the disaster response headquarters set up at the RTF Namie Runway. Since roads are cut off, rescue vehicles will search for alternative routes. Mark possible routes on a map and report them to the disaster response headquarters.

Mission 2 is to find disaster victims in multiple locations in the Odaka area and provide them with the relief supplies. The goal is to understand the relief supplies by reading the letters written on the ground, and quickly and accurately deliver the relief supplies to the designated location using another supply delivery drone.

Mission 3 is a mission to rescue people who have survived the collapse and trapped under debris of earthquake. Small drones, ground robots, etc., will be used to investigate how many people need rescue in what locations and conditions. In this case, all small drones, ground robots, etc. would need to be transported from the disaster response headquarters at the RTF Namie Runway. Therefore, a large drone loaded with a small UAV or small UGV, flies to an urban field within the RTF and after landing or while hovering, the small UAV or small UGV will separate from the large drone. Then only the small UAV or small UGV enters the building. They will go inside and investigate. The surveyed data can be reported to the disaster response headquarters in real time via the main UAVs (large drone), or the survey data can be reported after waiting for the main UAVs to return. In this case, the investigation inside the building will be conducted by fully autonomous flight or driving using SLAM, etc., or by FPV type flight or driving with some kind of base station or radio relay equipment installed nearby.

For Missions 1 and 2, we recommend using multiple aircraft such as information gathering drones and supply transport drones. For Mission 3, large drones that can carry small UAVs and small UGVs are recommended. Due to poor radio communication conditions in this Challenge area, radio relay is required to carry out the mission safely and reliably. Even so, for teams that have difficulty in radio relay, the use of LTE communications is acceptable in HEDC, but the evaluation will be lower if LTE communications is used. Furthermore, in Missions 1 to 3, all UAVs other than the small UAV or small UGV that conducted the building inspection must return to the RTF Namie Runway.

Flight distance (round trip)

In Mission 1 and 2, the flight distance is approximately 20 km from the RTF Namie Runway, to the Odaka area (7 km one way, round trip, multiple flights, approximately 20 km), and in Mission 3 the flight distance is approximately 30 km to the RTF (approximately 13 km one way, round trip, multiple flights approximately 30 km).

Competitive points

1. The accuracy and speed of disaster occurrence situation investigation, disaster damage situation investigation, and rescue vehicle route search.
2. The accuracy and speed of searching for disaster victims, deciphering the relief supplies needed by the disaster victims, and transporting the supplies.
3. The accuracy and speed of investigating the damage situation inside the building, searching for disaster victims, and providing disaster victim information.
4. The reliability and safety of multiple aircraft formations, including radio wave relay.

3. Mission details

Mission 1 Points (Figure 2)

Route planning by aerial exploration using a flying robot

(1) Explore pre-designated areas in the Hamadori and Odaka districts of Fukushima Prefecture

(2) Identify the location and type of obstacles and report to the disaster response headquarters

(3) If there is a person in need of rescue, also report their exact location.

(4) While completing the above tasks, establishing a route for dispatching rescue teams. It is best to show vehicle routes using orthophoto images.

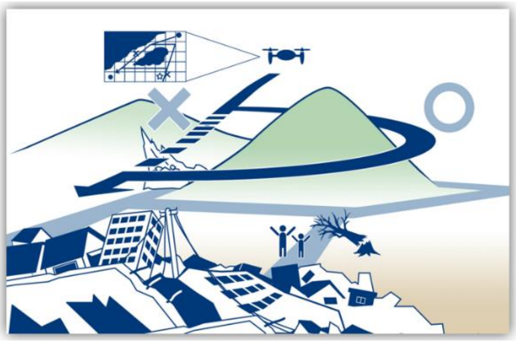


Figure 2 Rescue vehicle route search using a flying robot

Mission 2 Points (Figure 3)

Ascertaining and transporting support supplies needed by rescuers and caregivers

(1) Search for multiple victims and report their exact location and condition.
(2) Fly close to the person in need of rescue and understand the type of relief supplies requested by recognizing the letters painted on the ground.
(3) Deliver supplies requested by rescuers by landing of dropping at designated locations.
(4) It is recommended that relief supplies be transported by a separate drone from the information gathering drone to save time.

Figure 3 Identifying the location of people in need of rescue, understanding and transporting requested support supplies

Mission 3 Points (Figure 4)

Ascertaining the situation of survivors in a collapsed facility in a remote location (unknown environment)

(1) For collapsed facilities in RTF. Approach with a flying robot.
(2) Recognize appropriate intrusion routes and infiltrate (flying robot or ground robot)
(3) Identify the number of survivors, their locations and situations through internal exploration.
(4) Create a 3D map of the inside of the facility, mark and report the location of people in need of rescue.

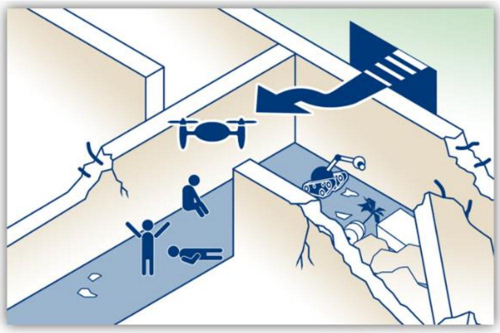


Figure 4 Understanding the situation of disaster victims in remote buildings

4. Mission evaluation criteria

Mission 1 evaluation criteria

(1) Since the search will cover a vast area as shown in Figure 10 of the reference materials, it is recommended to use multiple UAVs. In particular, it is necessary to freely select fixed wings, rotary wings, VTOL, etc., and consider combinations that take privilege of above advantages. In this case, the various formation flights (formation flight, swarm flight) of multiple aircraft, autonomous control, group control, cooperative control, etc. are highly evaluated. Furthermore, collision avoidance through inter-machine communication is essential, and these are also highly evaluated.

(2) Reports to the Disaster Control Headquarters must be submitted as wide-area electronic data like orthoimages and 3D maps. Although it takes time to create electronic data, time saving is important when considering disaster response, and this point is highly evaluated.

(3) It is recommended that AI etc. be used to recognize the location and condition of disaster victims. Team can define them by themselves based on photos, but will be subject to point reduction.

(4) Regarding the above, fully automatic recognition using AI technology is the best, but it is also possible for humans to make the final decision after extracting information using AI. While fully automatic recognition by AI technology is the best, human judgment is also acceptable.

(5) Technologies such as transmitting data to the cloud during flight to speed up processing are highly praised.

Mission 2 evaluation criteria

(1) Alphabet letters are drawn somewhere in the areas shown in Figure 10 of the reference materials, and the supplies transport location is also designated near that area. When it comes to deciphering and recognizing alphabetic characters, there are human judgments and AI judgments, but if it is an AI judgment, it will be highly rated. Also, the altitude above the ground during interpretation is important, and if the altitude is high, it will be subject to evaluation.

(2) After deciphering and understanding the text, the relief supplies delivery drone immediately takes off from the RTF Namie Runway and delivers the supplies. The time takes for the supplies to arrive is important here, and the shorter the time, the higher the evaluation.

(3) High points will be awarded if you can accurately land or drop supplies at the designated supply drop area without damaging the supplies while maintaining a safe distance from the victims.

(4) In particular, if the location of a designated landing or drop point is automatically recognized using AI, etc., and a high-precision landing or drop is successfully achieved, it will be highly evaluated.

(5) Regarding the release of supplies from the aircraft, it is possible to release the supplies by remote control from an operation center installed at the RTF Namie Runway, or autonomously to release supplies using autonomous control and AI technology. If it's the latter, it will receive a high rating.

Mission 3 evaluation criteria

(1) Since it is not possible to completely explore indoors without a small UAVs, a large flying robot transports a small UAVs or UGVs to a designated location within the urban field (urban field intersection, Reference Material Figure 11 ~ Figure 13). There are two possible methods for detachment, remote control and automatic/autonomous, the latter of which highly evaluated.

(2) It will be highly evaluated if a small UAV or UGV approaches the building from the operation center installed on the RTF Namie Runway and collects information autonomously. Alternatively, FPV control via some kind of radio repeater is also assumed. In this case, the autonomous type is highly valued. It is also possible to start Mission 3 from near the urban field, but this will result in a significant points deduction.

(3) It is possible to use small UAVs and/or small UGVs to conduct inspections inside the building, and in that case, the collaboration between the UAVs and his UGVs is highly evaluated.

(4) The search for disaster victims using AI technology is highly rated. Furthermore, if a 3D map can be created to identify the location and number of survivors, and the accuracy of the prepared map will be highly evaluated.

(5) It is also possible to recognize the voices and body temperature of survivors and use those data for identification, which is highly evaluated.

(6)

5. About the overall evaluation of HEDC

What HEDC is looking for is not a strategy to win a competition but a proposal for innovation useful in disaster relief. In particular, the following points will be comprehensively evaluated.

(1) The applicant's correct understanding of the current situation and issues in the field of disaster response robotics, and what kind of solutions and innovations you are proposing.

(2) Imagination of a disaster relief situation beyond the competition scenario (preliminary research is impossible) and think carefully about what kind of development and preparation should be done.

(3) What kind of backgrounds and expertise will make up the team, and how will the team approach the initial response system in the event of a real disaster through industry-academia collaboration.

(4) The multiple aircraft bodies, onboard equipment, peripheral equipment, are able to carry out the plan appropriate for the disaster response mission.

(5) On the disaster situation, multiple drones are expected to take off from disaster response headquarters simultaneously. Therefore, in order to be utilized at disaster response sites, it is desirable that drones can autonomously detect and avoid obstacles. Accordingly, teams that carry out their missions at the same location and time with other teams are highly recommended and highly evaluated in this competition.

6. Regarding radio wave relay etc.

As explained in the mission overview, the radio wave situation in Hamadori, Fukushima Prefecture is not good, in order to ensure mission accomplishment and ensure reliability and safety, we have decided to operate radio wave relay drones as shown in Figure 5. At the time of disaster, normally utilized LTE communication is unable to be used. For this reason, all participating teams will be flying their own radio relay drones. For Missions 1 and 2, there is a small hill approximately 30m high between the site of the disaster response headquarters (HEDC operations center and GCS site) and the RTF Namie Runway.

For this reason, to complete Missions 1 and 2, it is necessary to maintain the drone flight altitude at around 60m if radio waves are not relayed. In the case of Mission 3, there is a small hill at an altitude of 70m between the RTF Namie Runway, so radio relay is essential.

The Radio Act in Japan is as described in the "Japanese Radio Regulations for UAV Operations" (attached). When relaying radio waves, please take Japanese Radio Regulations into account. However, for teams that have difficulty complying with Japanese Radio Regulations, the use of LTE communications is acceptable, but the evaluation will be substantially lower if LTE communications is used.

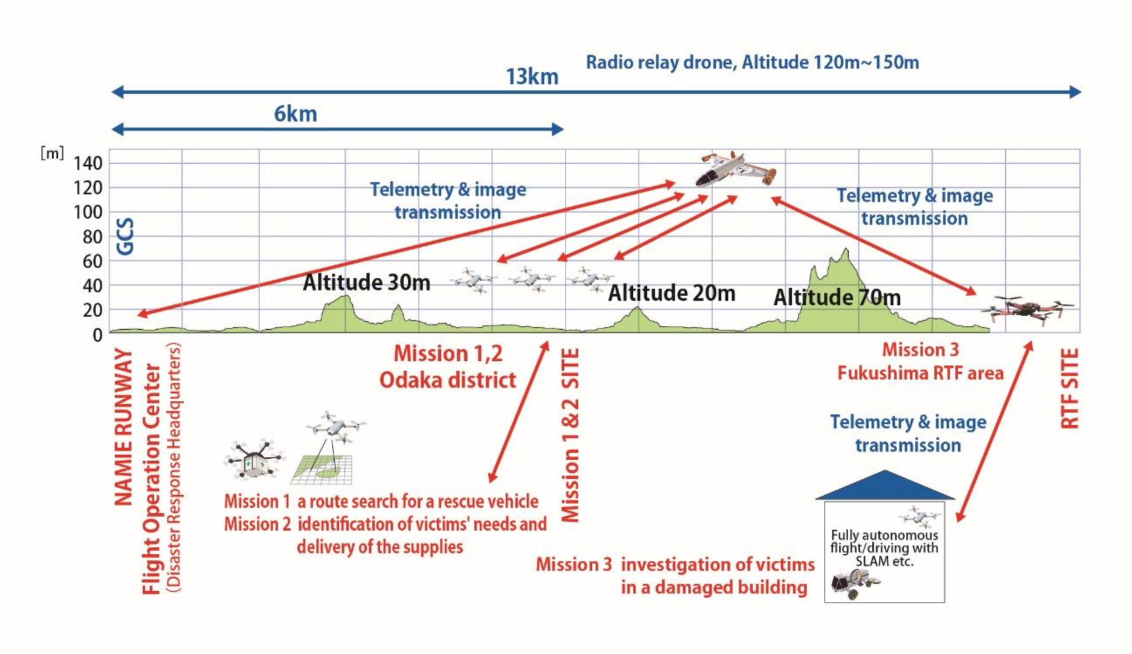


Figure 5 Radio wave relay system to realize safe and reliable operation of multiple drones

7. Additional information

(1) Regarding the number of people per team, up to 10 people can be officially registered at the RTF Namie Runway Operation Center (in the control room or in a tent set up on the runway). In addition, personnel required to transport, maintain, and inspect the UAVs outside the operation center must be notified separately in advance.

(2) If the mission is not completed within the time limit, the competition will be over, but this does not mean disqualification. The evaluation will be the total score of the evaluations performed within the time limit.

(3) The practicality and safety of the UAV are highly emphasised. Any deviation from the UAV's flight zones, crashes, or loss of location information after a crash will be significant point deductions. However, if safety devices etc. operate properly, this will be subject to evaluation.

(4) Although it is assumed that multiple UAVs will be operated, advanced initiatives such as formation flight and swarm flight, as well as collision avoidance features, etc., are highly evaluated.

(5) The takeoff point is the RTF Namie Runway, as shown in Figure 7 to Figure 9 in the reference materials, even fixed-wing aircraft that take off and land can also participate.

(6) Achieve mission requirements with high efficiency by using one or more UAVs for the purpose of "gathering information via equipped cameras" and one or more UAVs for transporting goods. In this case, there is no limit to the number of drones, so we think it would be a good idea to use a large number of drones to accomplish the mission.

(7) For Missions 1 and 2, use an UAV capable of long-distance flight of approximately 20km round trip, and for Mission 3, use an UAV capable of long-distance flight of approximately 30km round trip.

(8) The original aircraft is highly appreciated. Although it is possible to use a purchased general-purpose UAVs, it is recommended that there has to be novelty in either the UAV itself, peripheral equipment, or the method of operation.

(9) After takeoff, the flight is BVLOS level 3. Therefore, flying over private houses is prohibited, so set up a no-fly zone using geofences, etc.

(10) In Mission 3, you will fly over high-voltage power transmission lines managed by Tohoku Electric Power Company and land in the urban field of the RTF, so be sure to take all possible safety precautions.

(11) Keep in mind that the Hamadori area shown in Figure 1 is a harsh environment for drones, with winds of approximately 5m/s～10 m/s blowing at all times.

(12) In principle, the main competition in October 2025 will be held as scheduled (unless there is extreme weather such as an approaching typhoon or torrential rain). The date and time of the competition for participating teams will be decided by drawing lots.

(13) As mentioned above, the competition will be held even if it's rainy or sunny, so all UAVs must be waterproof, and in case they land on water during a sea flight, they must be equipped with Automatic inflating buoys etc. Be prepared for such situations.

(14) The UAV shall be equipped with lights compliant with the navigation lights of manned aircraft (Green steady light on the starboard, Red steady light on the port, White strobe light on both side) to increase visibility from manned aircraft and the ground, which shall be turned on during the competition. For the avoidance of confusion, other lighting styles (such as DJI style: Red steady on front side and Green flashing light on back side) are prohibited. Please programmatically or physically turn off those inappropriate lighting

system and implement appropriate lighting systems (Green steady light on the starboard, Red steady light on the port, White strobe light on both side).

(15) All UAVs shall be equipped with a location reporting system (Trackimo, SPOT, etc.) so that their location can be determined (reporting interval must be less than 5 minutes) in the event of a crash.

(16) UAVs shall be equipped with an emergency parachute (automatic or command-activated) to prepare for other UAVs of other teams and any potential crashes.

(17) Teams wishing to fly simultaneously with other teams must equip their drones with obstacle detection and autonomous collision avoidance capabilities. Furthermore, as team pairings for simultaneous flights will be determined by lottery, drones must be capable of avoiding collisions regardless of the type of drone used by other teams.

(18) For both Missions 1, 2 and 3, aircraft must be flown over the sea except for the survey area. In the unlikely event that any flights are made over houses, the applicant will be disqualified immediately. Therefore, must take all possible measures to prevent such occurrence.

(19) The flight path to the Mission 3 area includes high-voltage power lines and towers (Figure 13). When passing that area, a minimum clearance from the top of the tower must be 30 meters. The height of the tower is 68.3 meters from the ground, and an altitude must be at least 100 meters when passing over the tower.

(20) The relief supplies sought by disaster victims must be approximately 5 in weight and must have the ability to be accurately transported or dropped to designated locations in the Odaka area. For this reason, it is recommended that multiple drones be used to transport goods as necessary.

(21) Mission 2's landing/takeoff commands, material release commands, and drop commands will be radio commands from the GCS ground station at the RTF Namie Runway, or automatic/autonomous types, and the latter is highly praised.

(22) Telemetry communication, image transmission, etc. should be carried out in harsh environments, assuming that mobile phone LTE communication or internet connection are not possible, so consideration should be given to operating a unique radio communication relay drone.

(23) Wireless communications such as telemetry communications and image transmission must comply with Japanese Radio Regulations. Japanese Radio Regulations is as described in "Japanese Radio Regulations for UAV Operations" (attached), and a webinar will be held to explain the Act to participating

teams.

(24) All UAVs used in this competition must apply for and obtain flight permission from the Japan Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism. This procedure will be handled by the Secretariat. UAV operated indoors also has to be proceeded with this procedure, because UAV operated indoors also has to fly from the main UAVs (large drone) to the building through the outdoors. Therefore, each team is requested to cooperate with the secretariat to ensure smooth communication.
However, the drone to be flown must be registered in advance and an aircraft registration number must be obtained. This procedure must be carried out by the team.

(25) All UAVs used for the Challenge will be covered by drone-specific liability insurance against injury to property or persons of third parties (3 billion yen for bodily injury and 3 billion yen for property damage). This insurance will be handled by the Secretariat. Regarding insurance for the aircraft itself (property insurance, which is so to speak, automobile physical damage insurance for cars), each team is responsible for purchasing their own insurance coverage.

(26) All of the Challenge events are planned to be recorded with drone aerial photography. In this case, the hovering position and altitude of the aircraft will be notified in advance to avoid collision.

(27) Spectators for the Challenge will be able to watch at the RTF. The organizers are planning to set up a large monitor and stream the images from the UAV's onboard camera. Live streaming on YouTube and other media also planned.

8. Matters related to competition management, and safety assurance

(1) HEDC of the WRS2025 Harsh Environment F-REI Challenge will be conducted by the steering committee. On the other hand, an independent HEDC review committee will be formed to conduct a strict review. Please note that detailed examination guidelines will be announced separately.

(2) The Secretariat will be responsible for setting up the venue for the RTF Namie Runway takeoff and landing site. Therefore, it is recommended to use the tents, desks, chairs, power supplies, and other equipment set up at the venue for competitions.

(3) In order to ensure the safe and accident-free execution of the HEDC, safety management personnel will be stationed at appropriate locations in Mission 1,

2 areas and Mission 3 area.

(4) High-speed boats, etc. will be chartered and placed on the sea near Hamadori area as shown in Figure 1 in preparation for any accidents that may occur at sea.

(5) Radio communication relay is important during the flight, but in principle, the participating teams will arrange the necessary equipment. However, the requirement is to obtain a technical certification to comply with the Radio Law of the Ministry of Internal Affairs and Communications, which is Japan's domestic law.

9. Schedule until the Challenge

The approximate schedule up to the Challenge in October 2025 is shown in Figure 6.

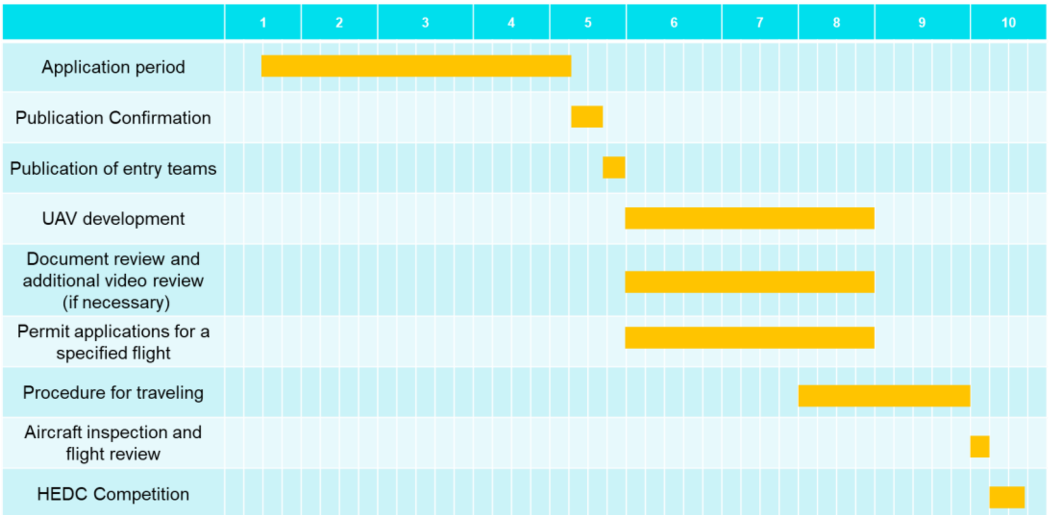


Figure 6 Approximate schedule up to the Challenge

Reference materials

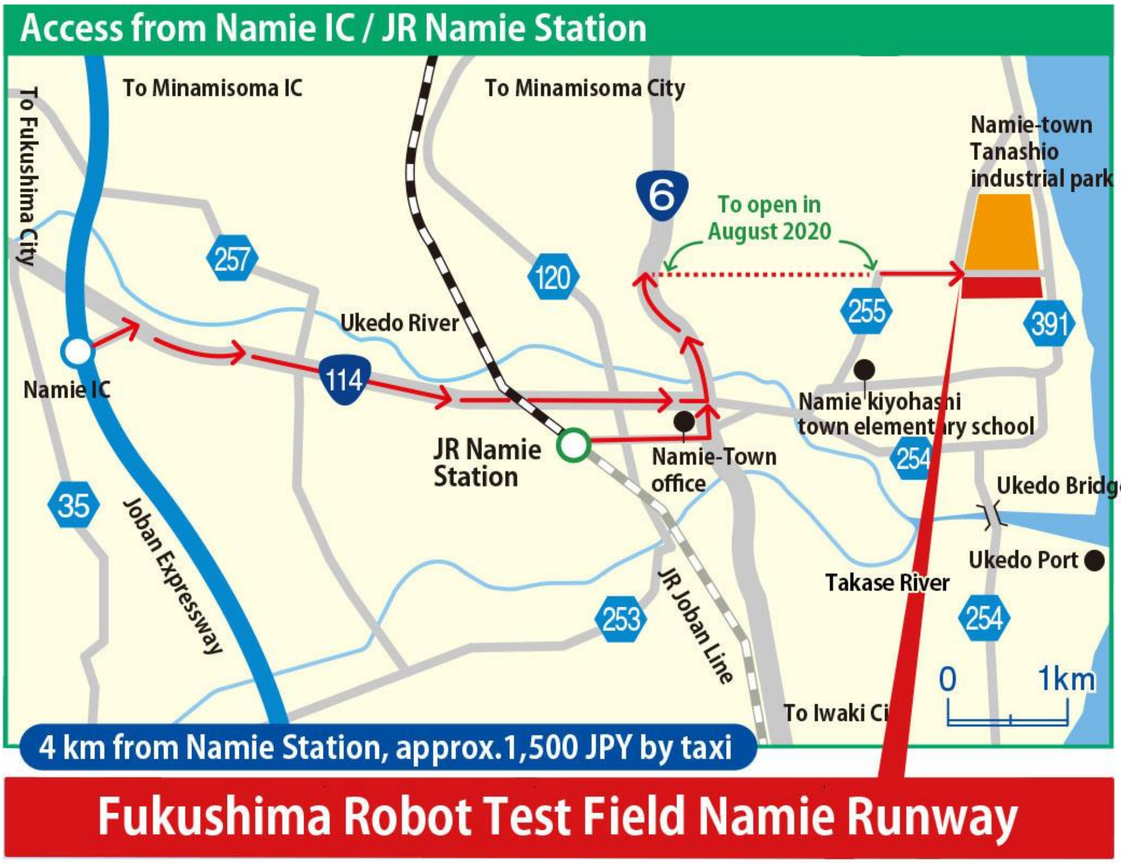


Figure 7 Access to the RTF Namie Runway

(Source: the RTF website)

Figure 8 The RTF Namie Runway (location of disaster response headquarters and ground station GCS)

(Source: the RTF website)

Figure 9 The RTF Namie Runway (red circles are 100V power supply locations installed at 6 locations)

(Source: the RTF website partially modified)

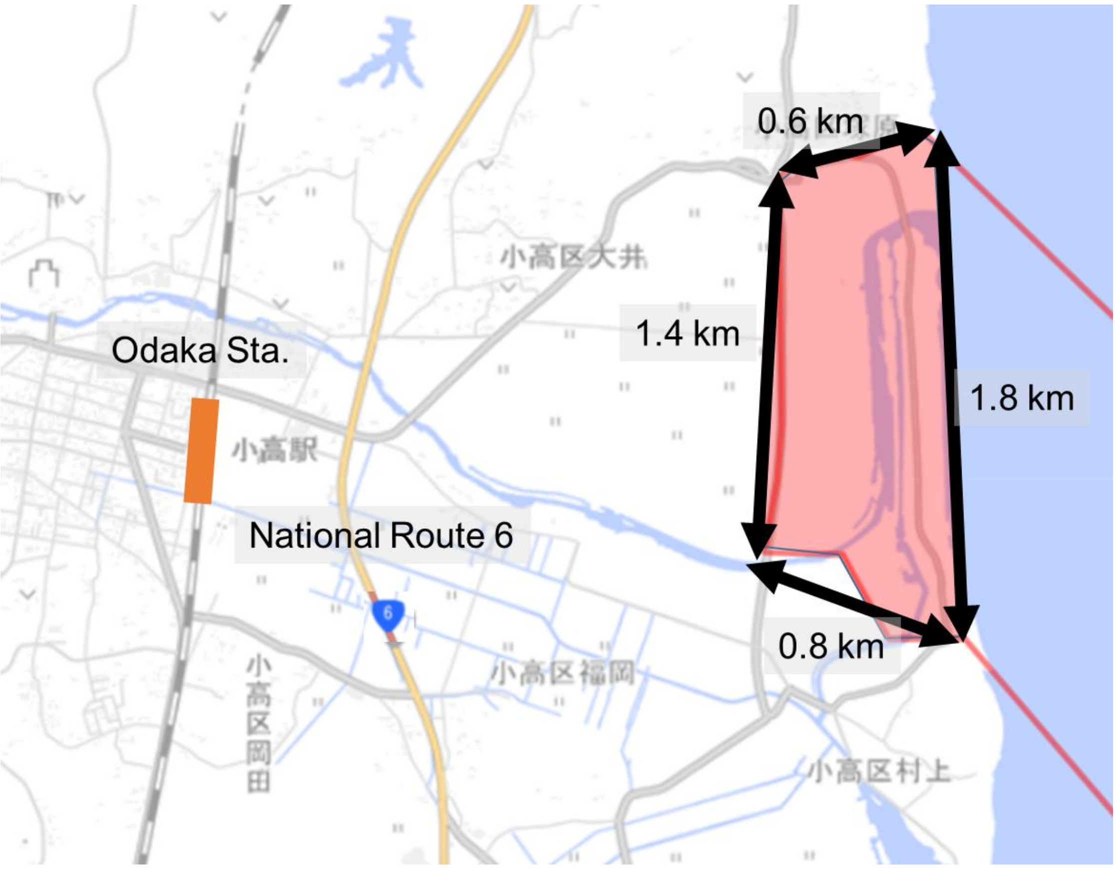
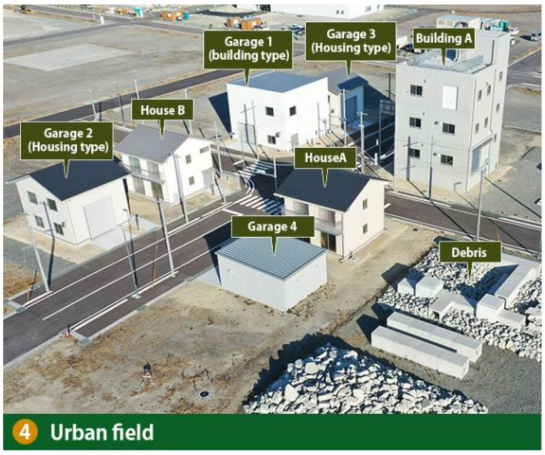


Figure 10 Area of Mission 1 and 2 in Odaka district highlighted in red
(Created using maps from the Geospatial Information Authority of Japan)



4 Urban field

5G base station (Established by NTT DoCoMo, Inc. Scheduled to start service in September.)	
Building A	Reinforced concrete construction, 3 stories, each floor 100㎡
House A	Wooden construction, 2 stories, each floor space 53㎡ (Simulate the inside house and simulate damage)
House B	Wooden construction, 2 stories, each floor 53 ㎡ (simulates the inside house)
Garage 1 (building type)	Steel construction, 1 story, 110㎡ Inside can be used as a warehouse
Garage 2 (Housing type)	Steel construction, 1 story, 56㎡ inside can be used as a warehouse
Garage 3 (Housing type)	Steel construction, 1 story, 56㎡ inside can be used as a warehouse
Garage 4	Light gauge steel construction, 1 story, 47 ㎡ Inside can be used as a warehouse

Figure 11 Mission 3 area (the RTF urban field)
(Source: the RTF website)

Figure 12 Urban field location of the RTF in Mission 3

(Source: the RTF website partially modified)

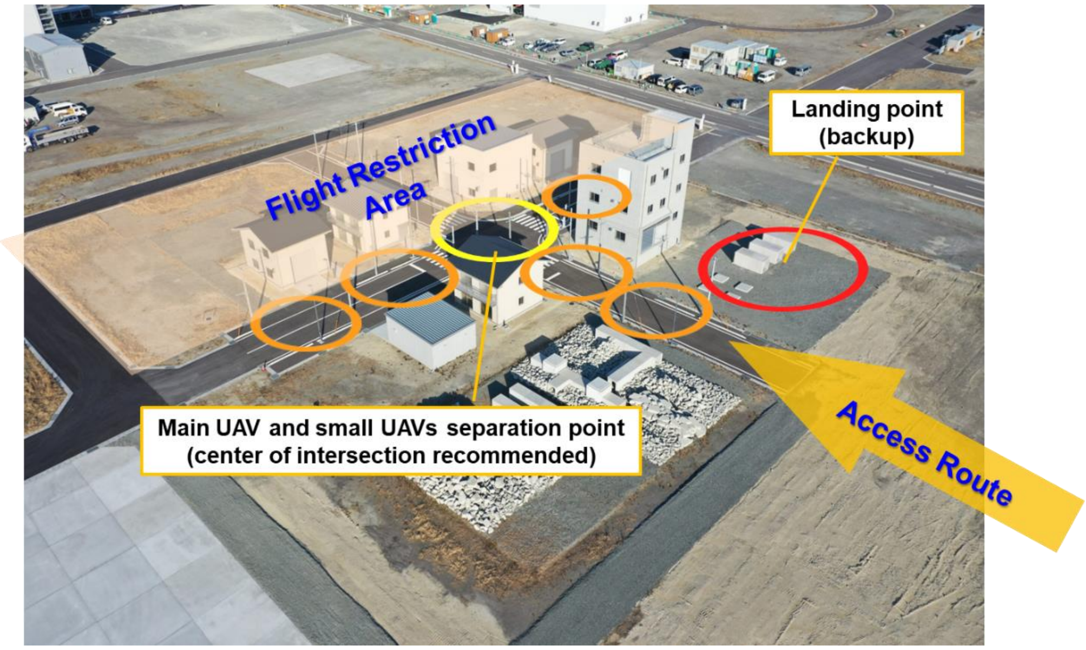


Figure 13 Mission 3 main UAV landing site

(as a general rule, land in the center of the intersection)

(Source: the RTF website partially modified)

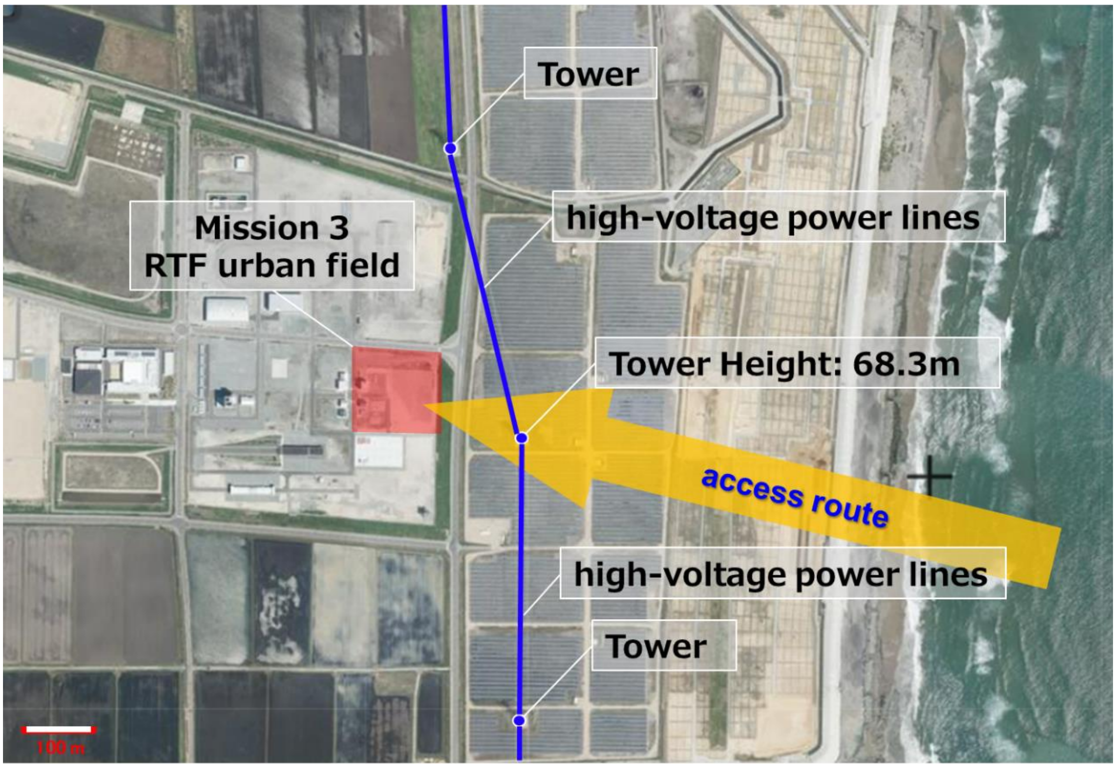


Figure 14: Towers and high-voltage power lines on the access route to Mission 3
(Created using maps from the Geospatial Information Authority of Japan)