

Radiation measurement from air

Conducting the first test flight of an autonomous unmanned airplane

The white airplane slowly began its takeoff in front of a lot of cameramen and journalists watching from nearby. The engine soon roared and the airplane started speeding up, its nose lifting off the ground as it floated into the wind. The airplane, raising altitude by turning to the right, soon soared into the blue sky. On the ground, 50 staff and journalists showed grin with reassurance.



It was January 24 in the Ukedo district of Namie Town in Fukushima Prefecture where the Japan Aerospace Exploration Agency (JAXA) and Japan Atomic Energy Agency (JAEA) conducted tests on monitoring (radiation monitoring) using unmanned airplanes. JAXA and JAEA have jointly conducted research

and development for 3 years since 2012 in the project. This was the first time that monitoring from the air using unmanned airplanes in a real situation instead of a test environment was conducted in Japan.

The flight area in Namie Town is one of the areas where preparations are being made for the evacuation order to be lifted, and even today to enter the area certain procedures are required. Located just 800 m from the coast, the area was severely damaged by the tsunami, with each side of prefectural route 254 that was used as the runway still littered with debris.

The airplane measures 2.7 m in length and 4.2 m in width, and weighs approximately 50 kg. Flight control is conducted by the ground station (**photo 1, 2**) located on the ground. It was developed with the goal of allowing monitoring of locations 100 km away with programmed flights and can fly for up to 6 hours. A compact, lightweight radiation detector is mounted on the bottom part of the fuselage. JAXA was in charge of developing unmanned aircraft system and remote operation technology, and JAEA in charge of radiation measurement technology. The areas of expertise of both agencies were combined in the system.

The test flight was conducted for a 1 km-square area above the Ukedo district. After switching to automatic, the airplane flew along a programmed flight path going back and forth many times so as to cover the target area thoroughly. By the system the flight trajectory and measurement data were sent back to the ground station so that operator could check them in real time on a monitor (**photo 3**).

The airplane landed safely after having approximately 30-minute flight. Measurement data was also obtained without any hitches, and the test was a success. Both Koji Muraoka of JAXA, who



created the flight test plan, and Yukihiisa Sanada of JAEA showed signs of relief, and at the same time felt the importance of the flight test as well as the huge responsibility.

As the airplane took off from a public road, the road was temporarily shut off to traffic, and entry into the 2 km² area around the flight test path was prohibited during the test. To achieve this, many authorities provided their cooperation, including residents of Namie Town, the police and fire departments, and all those working within the area. The test successfully ended without any problems due to the great level of cooperation that all these people offered.

When discussing future plans, Tatsuo Torii of JAEA, who was in charge of the overall test, stated that “Fukushima Prefecture has large areas of forest, making speedy monitoring over a wide area important. Monitoring during emergency situations will also be possible by this system. We aim to increase reliability and reconnaissance flight capabilities of unmanned aerial monitoring system such as terrain-following flight, and will establish operation method.” **(photo 4)**. This test flight was indeed one of the first steps in developing new aerial radiation monitoring methods.



From left: Team Leader Koji Muraoka of JAXA, Senior Principal Researcher Tatsuo Torii and Assistant Principal Engineer Sanada Yukihiisa of JAEA