“Safeguard” – Preparing to Fulfill the Mission at the Time of Disaster –

No one can tell when a disaster occurs. In preparation for disaster, GSI maintains equipment and conducts disaster response drills and related monitoring as its daily activities.

- **GSI Land-Bird (GSI-LB)**

GSI Land-Bird (GSI-LB) is an organization established in GSI, consisting of personnel familiar with Unmanned Aerial Vehicle (UAV). Normally, GSI-LB members work on new technology to contribute to improving productivity in the field of surveying, while in case of a disaster, they take images and videos, operating the UAV by themselves at the forefront of the site to provide useful information for rescue, restoration, and reconstruction. In preparation for a disaster that could occur at any time, by being able to respond to the site with the latest technology while securing safety, GSI is keenly working on developing personnel with excellent expertise in safety and skills every day through its training program and the licensing system.

- **GSI-LB logo**

(The ocher-colored part represents “the land”, as target of photographing, and the blue part represents “the sky”, where UAVs are flying.)

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**Safeguard by “Humans”**

- **Kunikaze Operations**

GSI strives to secure the operation system of survey airplane (Kunikaze III) that is used to expeditiously gather information about disaster-stricken areas.

- **REGMOS (Remote GNSS Monitoring System)**

Using REGMOS, GSI conducts GNSS observation in active volcanoes even without power lines or communication lines and detects crustal movement in detail by supplementing the existing CORS network.

- **InSAR Analysis**

(Interferometric Synthetic Aperture Radar: InSAR)

<table>
<thead>
<tr>
<th>Analysis example (crustal movement caused by volcanic activity on Sakurajima Island)</th>
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**Safeguard with “Map”**

- **Data on Designated Emergency Evacuation Sites – To Safeguard Oneself from Disaster –**

Regarding the designated emergency evacuation sites and designated evacuation sites provided by the Disaster Countermeasures Basic Act, GSI has developed and now maintains a location database (containing location information based on facility names and their addresses, with about 110,000 items of data prepared in total) in cooperation with municipalities, etc., across Japan. Since February 2017, GSI has released the data on the designated emergency evacuation sites on its web maps (GSI Maps). By overlaying with various kinds of GIS data, these data can be utilized in formulating evacuation plans and taking other actions.

“Where should you evacuate when the risk of disaster is imminent?”

Check your commuting or school route and evacuation sites near your home.

(* As of November 2017*)

**Aerial photo of disaster-hit area (the 2016 Kumamoto Earthquake)**

**Designated emergency evacuation sites shown in GSI Maps (Takamatsu City, Kagawa Pref.)**

**Kunikaze III standing by**

**Inside Kunikaze III during disaster response**

**Background: flood response drill along Tone River**

**Disaster response for the Northern Kyushu Heavy Rainfall in July 2017 (UAV video capture)**

- **Upshift**

- **Second observation**

- **First observation**

- **Ground surface**

- **Difference in two observations**

- **Total movement (uplift)**

- **InSAR image**

- **Second observation**

- **First observation**

- **Ground surface**

- **Difference in two observations**

- **Total movement (uplift)**

- **InSAR image**
Promptly Acquiring and Disseminating the Latest Geospatial Information on Disaster Situations by Using Various Technologies Including Unmanned Aerial Vehicle (UAV)

GSI, as a Designated Government Organization in the Disaster Countermeasures Basic Act, promotes disaster response-related measures against frequently occurring disasters by employing the latest geospatial technology to protect national land and people’s lives and assets. GSI acquires geospatial information necessary for grasping the disaster situation by emergently taking aerial photographs and conducting surveys and then promptly disseminating the information. The provided information is utilized by the national and local governments for disaster response, restoration and reconstruction, as well as by citizens for disaster prevention.

Floodings

- **Northern Kyushu Heavy Rainfall in July 2017**
  The Northern Kyushu Heavy Rainfall in July 2017 caused not only the flooding of rivers and natural damming but also sediment disasters such as debris flow and landslide, resulting in enormous damage, including washouts of bridges and the collapse of road shoulders. GSI emergently took photographs with survey aircraft and Unmanned Aerial Vehicle (UAV), and provided the aerial photographs and videos, while making a disaster situation map covering the estimated flood area and the sites of landslide and accumulated driftwood.

- **Heavy Rainfall Associated with the Seasonal Rain Front since July 22 (July 2017)**
  The heavy rainfall associated with the seasonal rain front since July 22, 2017 caused embankment to collapse and inundation damage around the Omono River.
  GSI emergently took photographs with survey aircraft and provided the aerial photographs, while conducting a damage survey and making an estimated map of the flooded area.

Volcano

- **Volcanic Eruption of Mt Kirishima (Shinmoedake) (October 2017)**
  On October 11, 2017, Mt Kirishima (Shinmoedake) erupted for the first time in about six years. GSI immediately conducted SAR observation with a survey aircraft, which observed the detailed topography around the post-eruption crater that was not visible due to the volume of ash. GSI has also enhanced the monitoring of crustal movements around Mt Kirishima using REGMOS newly installed (see p. 12) around the crater and the existing CORS nearby.

Earthquake

- **The 2016 Kumamoto Earthquake (April 2016)**
  Significant crustal deformation was observed at CORS in a wide area around the Kumamoto district. GSI provided the observation results to the government’s Earthquake Investigation Committee and other relevant organizations for their investigation and analysis, such as estimating the fault that caused the earthquake. GSI also conducted surveys with an Unmanned Aerial Vehicle (UAV) and a terrestrial laser scanner to support the restoration of Kumamoto Castle at the request of Kumamoto City.