

Inspection support
technology
DX Technology
Unmanned
operation

“Flemolar” —Modular Boat-Type Drone

Adjusts its shape to match diverse field conditions—all in one unit.

Inspections and surveys in culverts, channels, and port facilities that require personnel to enter the site are time-consuming, labor-intensive, and pose significant safety risks. In recent years, inspections using remotely operated boats have become more common. However, challenges remain, including the unavailability of GPS for autonomous navigation in covered waterways, instability in strong winds or high waves, and erratic motion under rough operating conditions.

This boat-type drone can navigate autonomously and stably not only in narrow spaces but also in adverse environments with strong wind and high waves, enabling close visual inspections comparable to those conducted by humans.

Challenges Observed During Field Deployment

Limitation of Human-based and Conventional Inspection

Inspection work is physically demanding and subject to cost constraints, including difficulty in securing skilled personnel and increasing labor expenses. In addition, there are constant safety risks such as oxygen-deficient environments, toxic gases, and the risk of falling into the water.

On the other hand, conventional boat-type inspection devices have the following limitations:

- ▶ Multiple devices are needed for different sites and purposes.
- ▶ Limited signals and no GPS in confined spaces.

for the above reason, it is difficult for a single unit to handle a wide variety of field conditions.



▲ Left: Manual inspections involve constant safety risks
Right: No signal inside culverts and similar structures

◀ In port facilities with strong wind and high waves:
Risk of capsizing and unstable images.



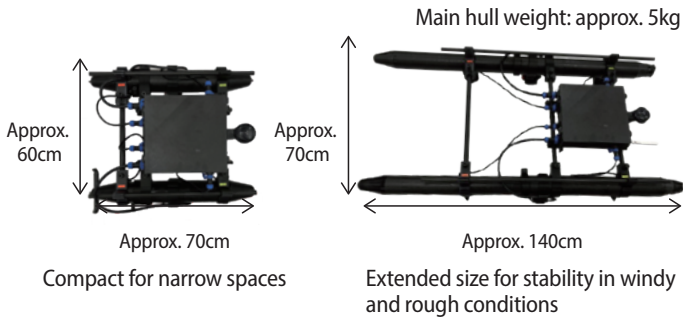
A Modular Boat-type Drone That Adapts to Site Conditions

This boat-type drone is designed with a reconfigurable hull to accommodate various sensors and equipment attachments. Its shape can be adjusted to suit on-site conditions—such as narrow spaces or windy, rough waters—allowing a single unit to operate effectively across a wide range of environments.

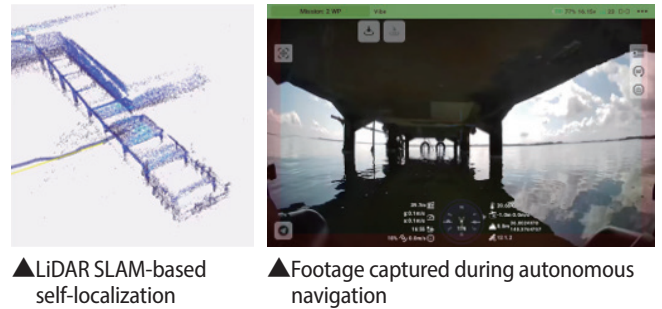
Key points

- ▶ Compact modular design for easy transport
- ▶ Navigate precisely even in narrow spaces
- ▶ Autonomous navigation in non-GPS environments (e.g., under piers, culverts, etc)
- ▶ Stable navigation on windy, rough water

Adjustable hull length to suit site conditions



Autonomous inspection under signal-denied piers



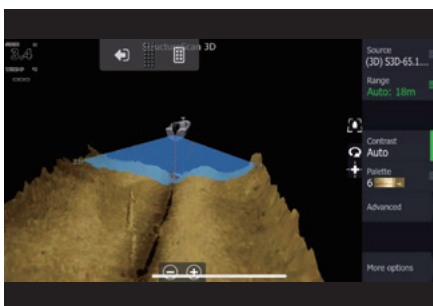
Supports Multi-Purpose Inspection and Survey

This boat-type drone allows flexible equipment configurations to match different inspection targets and purposes. A single unit handles surface and underwater imaging as well as 3D measurement.

Inspection of rough waves & strong wind port facilities



Underwater 3D terrain data acquired using StructureScan 3D (sonar)



Inspection of confined water pump station interiors



Interior view of a water pump station captured by a waterproof gimbal camera



Bridge inspection



0.1 mm crack detected on a bridge girder's underside even in 10m/s winds using a gimbal camera

