

## Installation of Pipeline Stabilization Mattresses

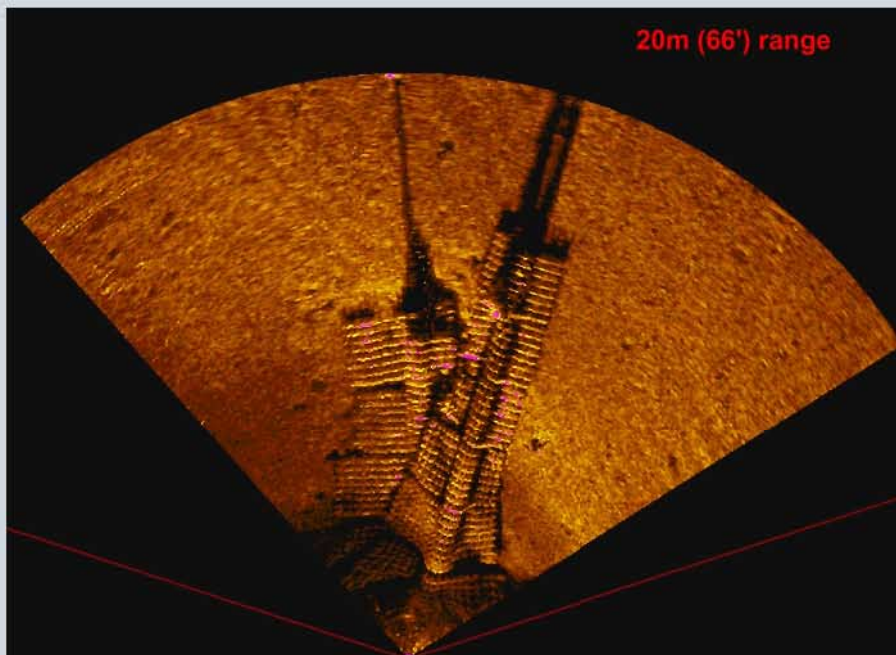
Stabilization mattresses are used to weight a pipeline to minimize flex due to current, provide a protective cover, and to prevent frictional wear at pipeline crossings. The MS 1000 is ideally suited to for this application **with or without ROV intervention**.

The first use of the **Mesotech** (now Kongsberg Mesotech Ltd.) scanning sonar for **remote stabilization mats installation** was in water depths to 90m (295') in the Straits of Georgia, British Columbia (1990). Deployed from an anchored barge, the sonar image showed the pipeline and attached, and the position of the mattresses hanging from the barge crane in a custom-built frame. During installation, the crane operator was instructed to move the boom/mattress to location where its orientation on the pipeline was confirmed by the sonar and a frame-mounted camera before activating the remote hydraulic mat release. A navigation receiver on the tip of the crane boom provided the X,Y geographic coordinate of the mattress.

### ROV sonar configuration:

Because of known underwater visibility limitations in the mat deployment area, Kongsberg Mesotech was asked to provide an acoustic solution for mattress placement. The installation was completed using two work-class ROVs. The primary ROV was fitted with a single high resolution imaging sonar and two profilers heads; a single profiling head was required on the second vehicle. Although vehicle 2 had an MS 1000 imaging sonar, it was not needed for the mat installation.

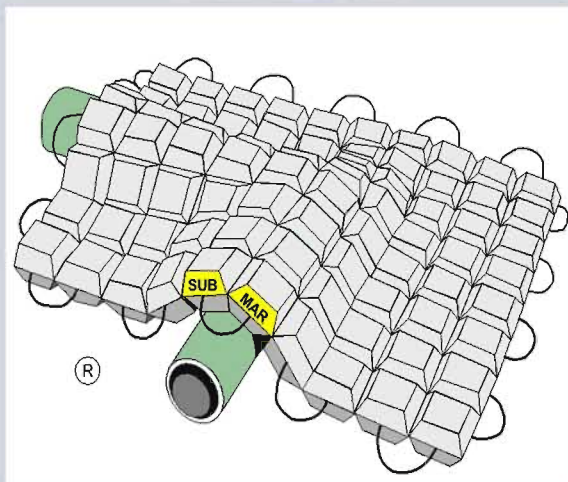
Two MS 1000 images show **Submar®** mattresses placed on pipelines in the Gulf of Mexico at 350m (1148') depth. With less than 1m (3.2') visibility, the complement of scanning sonars was used to place the mats, confirm their position and document their orientation on the pipeline.



30m (98') range



illustration of stabilization mattress on pipeline  
courtesy Submar, Inc.

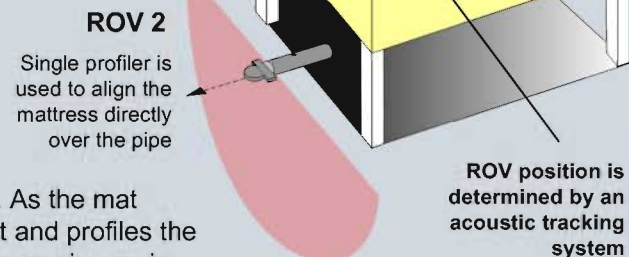
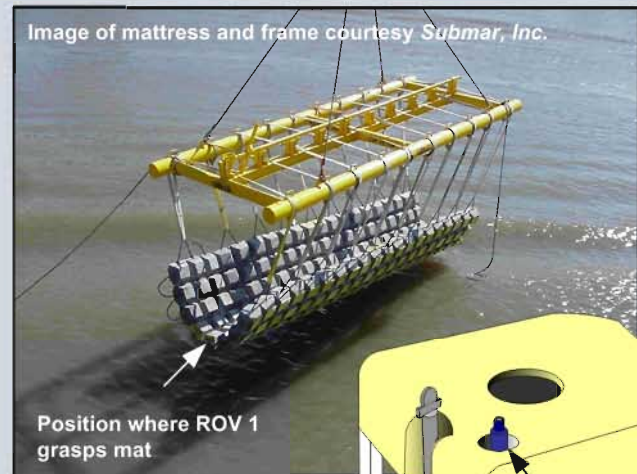
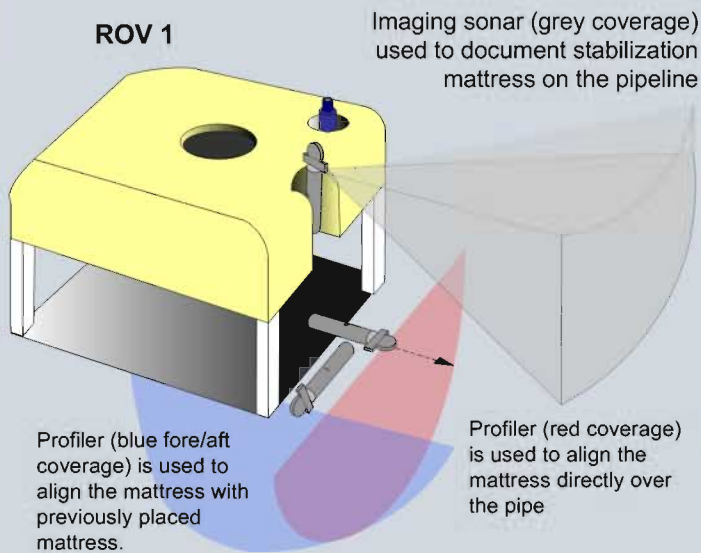


Data collected by **Subsea 7**, and **Kongsberg Mesotech Ltd.**

## Sonar system configuration to install pipeline stabilization mattresses:

### Dual Work-class ROV Deployment:

- 2 Computers with MS 1000 PC-based Sonar Software
- 2 MS 1000 Interface Units
- 675 kHz High Resolution Scanning Sonar Head with Fan transducer (or Multi Frequency High Resolution Sonar Head)
- 3 MS 1000-Series, 1171 multi-frequency profilers
- Acoustic tracking system



### Dual ROV stabilization mat deployment:

Two ROVs follow the mattress and deployment frame to the seabed. As the mat nears bottom, ROV 1 uses its manipulator to hold one end of the mat and profiles the seabed with both red and blue coverage sonars. The red coverage sonar image is used to position the ROV directly over top of the pipeline; the image from the blue coverage unit is used to position the ROV over the edge of the previously laid mat.

When ROV 1 is in position, ROV 2 uses its manipulator to grab **the opposite end of the mat** and its red coverage sonar to position it directly above the pipeline. When this is completed, the mattress is lowered to bottom and released.

After placement, the imaging sonar on ROV 1 (grey coverage shown) is used to document the mattress orientation.

### Shallow water remote stabilization mattress deployment:

Use a deployment arrangement that prevents the head from turning when lowered from the crane barge. Only one imaging scanning sonar is needed for this method.

Lower the head close to the seabed and observe the custom designed mattress frame enter the sonar image.

Incorporate into the design of the mattress deployment frame a pan and tilt camera/light and remotely operated release mat mechanism. The alignment of the mattress relative to the pipeline is controlled by either using tag lines or thrusters on the frame (design dependant).

Establish the mattress geographic position by mounting a gimbaled GPS receiver on the tip of the crane boom; record the GPS position when the mat is lowered onto the pipeline.

**NOTE:** One of the challenges of this deployment is whether the mattress alignment meets minimum edge-of-mat to pipeline specifications. **Contact the Application Group at Kongsberg Mesotech for the answer.**