

# Liberdade XRay Advanced Underwater Glider

Unmanned underwater surveillance vehicles are an important component of the Navy's ability to protect its personnel and vessels from hostile submarines. One such vehicle, the Liberdade series of advanced underwater gliders, is being developed as a part of the Navy's Persistent Littoral Undersea Surveillance Network (PLUSNet) system of semi-autonomous controlled mobile assets. PLUSNet uses unmanned underwater vehicles (UUVs) and autonomous underwater vehicles (AUVs) to monitor shallow-water environments from fixed positions on the ocean floor or by moving through the water to scan large areas for extended periods of time.

The most recent Liberdade prototype, the XRay, is the world's largest underwater glider. Size is an advantage in terms of hydrodynamic efficiency and space for energy storage and payload. The glider is designed to track quiet diesel-electric submarines operating in shallow-water environments. It can be deployed quickly and covertly, then stay in operation for a matter of months. It can be programmed to monitor large areas of the ocean (maximum ranges exceeding 1000 km with on-board energy supplies). The glider is very quiet, making it hard to detect using passive acoustic sensing.



The Liberdade XRay is equipped for autonomous operation. Its payload includes acoustics and electric field sensors, along with acoustic and satellite communications capabilities. It was designed for low-cost acquisition, deployment, and retrieval, as well as greater payload carrying capability, cross-country speed, and horizontal point-to-point transport efficiency than existing gliders.

The first major PLUSNet field experiment for the Liberdade XRay is scheduled for August 2006 in Monterey Bay, California. The experiments will test the glider's ability to surpass range capabilities at equivalent speeds and using less energy than most advanced UUV/AUVs, as well as the glider's ability to achieve long on-station time while cruising at substantially greater cross-country speeds than existing gliders.

Objectives of the Liberdade program include designing underwater gliders that can achieve 1–3 knot cruise speeds, a 1200–1500 km range, and the ability to remain on-station up to 6 months in loitering glides at partial buoyancy.

ONR's academic partners in developing Liberdade include the Marine Physical Lab at Scripps Institution of Oceanography, the University of Washington's Applied Physics Lab, the University of Texas at Austin's Applied Research Lab, the Applied Research Lab at Penn State University, MIT, Woods Hole Oceanographic Institute, and Harvard University. Industry partners include SAIC, Bluefin Robotics, Metron, and Heat, Light, and Sound (HLS) Research. The Space and Naval Warfare (SPAWAR) Systems Center in San Diego has also participated in this project.

