Going Airborne

The Teledyne Slocum Glider is Launched from Navy Helicopter

by Rhonda J. Moniz

TELEDYNE MARINE


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The United States Navy was established in 1775 when the Continental Congress needed to defend its seas and ports from the British. It has long been at the forefront of technological innovation, especially regarding ocean science, surveillance, and exploration. Recently, a remarkable collaboration between Teledyne Marine and the U.S. Navy saw the successful deployment of a Teledyne Marine Slocum glider from a U.S. military helicopter. The Teledyne Marine Slocum Glider from Teledyne's Webb Research division is a versatile autonomous underwater vehicle (AUV) that has proven invaluable in gathering critical oceanographic data for the military. The successful deployment of the Slocum glider was significant and highlighted the capabilities of the glider and its contributions to marine research and military operations.

Helicopters were first used for ship-based operations during the Second World War. Their unique ability to take off and land vertically made them invaluable for anti-submarine warfare, rescue missions, and reconnaissance. Following the war, helicopter design and technology advancements allowed them to operate more efficiently from ships, expanding their roles in maritime operations. Helicopters have become indispensable assets for various tasks at sea. The deployment of a Teledyne Slocum glider from a U.S. military helicopter in the Arabian Sea marks a significant milestone in underwater technology and operational capabilities (Figure 1). The significance of this successful deployment highlights the capabilities of the Slocum glider and its contributions to marine research and military operations. This achievement showcases the Navy's commitment to harnessing cutting-edge technology for scientific and military purposes. The glider's autonomous capabilities, versatility, and data collection capabilities make it valuable for marine research and military operations. As technology evolves, integrating innovative platforms like the Teledyne Slocum glider into operational strategies promises even more significant advancements in oceanographic research and maritime security.

The Teledyne Slocum glider is well known for its long-duration missions and efficient operation. The glider was equipped with several sensors for this mission, including a Seabird CTD (conductivity, temperature, and depth) sensor and a Sequoia LISST-Tau transmissometer. Teledyne Slocum glider is designed for extended missions in challenging marine environments. Its unique propulsion system enables it to operate efficiently, silently, and with minimal disturbance to the marine ecosystem. Deployment from a helicopter extends its operational range and allows access to remote areas that were previously inaccessible. This deployment method provides enhanced surveillance capabilities for military operations in coastal and maritime security missions. The glider's autonomous and silent operation allows careful monitoring of marine areas of interest, providing real-time data on temperature gradients, currents, and potential threats. Its ability to be deployed rapidly from a helicopter offers a flexible and responsive platform for intelligence gathering, mine countermeasures, and anti-submarine warfare, among other applications.

This is a game changer for scientists as well. In marine research, the glider's ability to autonomously collect a wide range of oceanographic data over extended periods and large spatial scales provides invaluable insights into various ecological and physical processes. It will enable researchers to study critical ecosystems and monitor oceanographic changes that could improve our understanding of climate change in the marine environment.

The Deployment

Teledyne engineers worked closely with the U.S. Navy to design the Concept of Operations. First, the team needed to consider the capabilities and limitations of the MH-53E helicopter. Wind and weather can make helicopter operations challenging. Identifying mission objectives, assessing weather conditions and potential operation constraints, and determining optimal deployment locations are crucial to mission success. The Slocum

Figure 1: The deployment of a Teledyne Slocum glider from a U.S. military helicopter in the Arabian Sea marks a significant milestone in underwater technology and operational capabilities. The glider's autonomous capabilities, versatility, and data collection capabilities make it valuable for marine research and military operations.

glider also underwent rigorous approval by the team, undergoing pre-deployment checks and calibration to ensure all sensors, communication systems, and navigation capabilities function. The glider's data storage device to collect and store data throughout the mission had to be verified along with any other specialized sensors or instruments in the system's payload that were tailored to specific objectives throughout the task. This meticulous planning ensured a comprehensive understanding of the deployment objectives and a well-coordinated approach to achieving them.

In preparation for the deployment, the glider was transported to the site and securely attached to a specially designed deployment system. The release of the AUV was controlled and carefully timed to execute the glider's trajectory for a smooth transition from the helicopter into the sea (Figure 2). Once the glider was deployed, its autonomous capabilities came into play as it began its programmed mission and navigated through the water column, changing its buoyancy and propelling itself forward while periodically surfacing to communicate with satellites. Satellite communication allows it to send

Figure 2: In preparation for the deployment, the glider was transported to the site and securely attached to a specially designed deployment system. The release of the autonomous underwater vehicle (AUV) was controlled and carefully timed to execute the glider's trajectory for a smooth transition from the helicopter into the sea.

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data transmissions and receive updated mission instructions, if required, throughout the mission. The Teledyne team created specific flight control missions tailored for the glider's first-ever deployment from an aircraft. Additionally, Teledyne engineers developed protocols for piloting the glider in the operational area designated for the demonstration. These efforts ensured the glider's readiness and optimized its performance during the deployment.

Next, the team turned its attention to mission monitoring. While the glider operated in the Arabian Sea, the monitoring and actual piloting took place in the U.S. at Teledyne's North Falmouth facility in Massachusetts. This remote monitoring capability exemplifies the glider's advanced technology and ability to be controlled and monitored separately. Real-time monitoring enabled the glider operations team to make necessary adjustments to mission parameters and ensure the success of the deployment.

The Future of Remote Operations

Remote technology holds immense opportunities and potential for advancing our understanding, exploration, defence, and management of our ocean. As the technology develops, allowing for enhanced autonomy, improved sensor capabilities, longer endurance, and advanced processing techniques, the future of remote technology in the ocean holds great promise. From maritime domain awareness and surveillance to intelligence analysis and environmental monitoring, remote sensing plays a vital role in protecting national interests, ensuring maritime safety, and safeguarding critical marine environments. The collaboration between the U.S. Navy and Teledyne Marine in successfully launching a Slocum glider from a military helicopter pushes the boundaries of collaboration and innovation. It demonstrates the potential impacts on ocean exploration, scientific research, and maritime operations, benefiting science and defence. Integrating remote sensing in vast areas of the ocean that are inherently difficult to access by other means will undoubtedly open a new world in contributing to the preservation and sustainable use of our planet's most remote and critical marine environments. It also does not hurt that it is a cool way to launch a glider.

Rhonda J. Moniz is a highly accomplished and renowned underwater forensics expert specializing in diving technologies and subsea systems. With over 25 years of experience as a remotely operated vehicle pilot, master dive instructor, scientific diver, and dive safety officer, she has demonstrated exceptional expertise in overseeing multiple investigations, diverse field projects, expeditions, and training programs. In addition to her work as an explorer and diver, Ms. Moniz has made significant contributions to the media industry as a journalist and filmmaker. She has served as a subject matter expert for renowned media outlets such as CBS, CNN, Discovery, the Oxygen Channel, and PBS productions, lending her expertise to various television shows. She served most recently as a subject matter expert for CNN in its coverage of the Titan submersible tragedy. She is the president of the board of directors for the Northeastern Regional Association of Coastal Ocean Observing Systems and heads the Technology Subcommittee for the Regional Wildlife Science Collaborative for Offshore Wind.