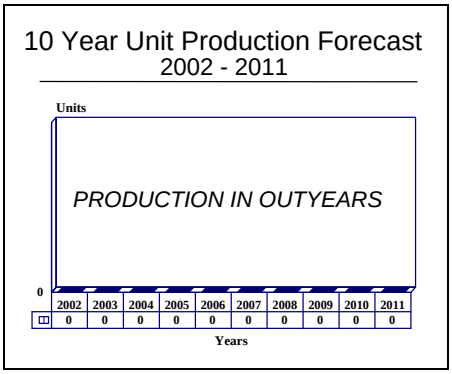
# UK Unmanned Underwater Vehicles - Archived 10/2003

## Outlook

- Concepts being studied
- UK interest in unmanned vehicles has been growing since September 11
- Royal Navy could acquire a mine disposal vehicle, one option being Archerfish
- Unmanned undersea vehicles could be installed on submarines and surface combatants to perform reconnaissance and other missions




## Orientation

**Description.** Unmanned underwater vehicles for various maritime mission applications.

**Sponsor.** Private industry with some support from the United Kingdom Ministry of Defence and other governmental agencies.

**Contractors.** Various. The main civilian contractors for the United Kingdom's first autonomous underwater vehicle (AUV) are GEC-Marconi, Marconi Underwater Systems Ltd, Waterlooville, Hampshire; Chelsea Instruments Ltd, East Molesey, Surrey; and Moog Controls Ltd, Tewkesbury, Gloucestershire. GEC has since sold Marconi to BAE Systems.

**Licensee.** No licensing agreements have been negotiated or signed.

**Status.** Concept studies and experimentation proceeding. No specific requirement for an autonomous underwater vehicle has been issued.

**Total Produced.** Full-scale production has not commenced.

**Application.** Surveillance/reconnaissance, sensor placement, anti-mine, and -submarine warfare missions.

**Price Range.** No specific information on the unit price of this system is available.

## Technical Data

Since this report deals with a number of systems for varying mission requirements, no specific technical data can be provided within this section. Please see the pertinent entries in the **Program Review** section.

## Variants/Upgrades

Three systems are covered within this report: the DOGGIE and DOLPHIN under the AUTOSUB program and the Autonomous Underwater Vehicle (AUV) which is being developed by Marconi, Chelsea Instruments Ltd, and Moog. For additional information, please see the pertinent entries in the **Program Review** section.

# Program Review

**Background.** The United Kingdom, like the United States and other countries, is considering possible military applications for unmanned underwater vehicles. For the near term, mission applications are expected to center on undersea surveillance, mine avoidance, and countermeasures. Although the UK is not developing a dedicated military autonomous underwater vehicle, the Maritime Division of the Defence Evaluation and Research Agency (DERA) in association with UK industry is undertaking studies into the potential benefits and the technological implications of AUVs. It has identified over 30 military uses, ranging from the simple to the complex, embracing a wide range of operational and non-operational tasks.

Royal Navy Plan. Under the UK's Strategic Defence Review, the Royal Navy's attack submarine fleet will shrink from 12 to 10 boats by 2006. Two additional Astute class SSNs are planned for this decade, with the new Future Attack Submarine (FASM) to be phased in during the next. The FASM could be equipped with an unmanned underwater vehicle.

The Royal Navy's new Future Escort vessel could carry an unmanned undersea vehicle. A trimaran design has been proposed to meet this need, but no final decision has been made.

Neither the Future Escort vessel nor the FASM will enter service within the next 10 years.

**UUV Programs.** Various unmanned underwater vehicle programs are researching potential applications.

Archerfish. This is another of the new generation of mine disposal vehicles (MDVs). The Archerfish is a low-cost, expendable system intended to speed up the clearing of ground and buoyant mine threats but at the same time decrease the risk to MCM personnel.

Archerfish is a small self-propelled torpedo-shaped vehicle containing a directed energy warhead. Powered by twin mid-body propulsors, it receives guidance commands via a fiber-optic link from the minehunting platform. For target acquisition, Archerfish activates its own short-range sonar and video link, transmitting sonar images and video pictures to the minehunting platform for identification and classification. Final placement of the MDV enables the mine target to be control detonated by substituting the mine's own firing chain with the Archerfish warhead, leading to a full order detonation of even insensitive mine warheads.

The Archerfish system is being developed by BAE Systems with company funds and in collaboration with Raytheon and SNPE of France. Besides the United Kingdom and the United States, the Archerfish has been offered to the Indian Navy.

The Archerfish is being offered as a competitor to the Seafox MDV.

AUTOSUB. The AUTOSUB program is a National Environmental Research Council (NERC) community research project funded by the UK Ministry of Defence. NERC is cooperating with several other research councils. This project is to assess the potential of military autonomous underwater vehicles and the engineering and technological challenges to be overcome. The Institute of Oceanographic Sciences, Deacon Laboratory, has overall responsibility for AUTOSUB, which has been under way since 1988.

The primary goal of this program is to develop two long-range autonomous underwater vehicles capable of gathering information between the sea surface and the seabed while on a transoceanic voyage. The vehicle would also be required to perform remote autonomous sensing of the deep ocean floor. The two vehicles are known as DOGGIE (Deep Ocean & Geophysical Instrumented Explorer) and DOLPHIN (Deep Ocean Long Path Hydrographic Instrument).

DOGGIE's mission is to enable features identified in a primary survey of the deep ocean floor to be investigated with a much higher level of spatial resolution. During a typical three- to five-day mission, DOGGIE will cruise at a height of approximately 500 meters above the sea floor and will map an area of about 50 x 50 kilometers using acoustic remote sensing equipment such as multifrequency sidescan sonars, a sub-bottom profiler, and a magnetometer.

The DOLPHIN is designed to address the needs of climate research. As it navigates across the ocean, undulating between the surface and the sea floor, it will conduct a continuous series of hydrographic measurements, surfacing at regular intervals to take position fixes from the Global Positioning System (GPS) and to transmit data relating to the condition of its onboard equipment. Data derived from DOLPHIN are expected to contribute to key programs such as the World Ocean Circulation Experiment and international efforts to develop models for predicting climate change.

The AUTOSUB program is being conducted in four phases. Phase 1, a series of 26 detailed feasibility studies, was completed in 1989. Phase 2 of the program, subsystem development, which was completed in 1994, involved the development of technology

demonstrators in certain key subsystem areas. The basic subsystem includes a full depth pressure vessel using advanced composites, simulation and model verification of vehicle dynamics and control, vehicle buoyancy and trim control, the propulsion system, simulation and implementation of the mission management system, distribution and control of the energy source, GPS position fixing/satellite telemetry-link tests, and deployment/retrieval and logistics.

Phase 3 began in 1994, building on Phases 1 and 2 by combining the various subsystems in an operational test vehicle with a range of 1,000 kilometers. This prototype vehicle formed the basis of DOLPHIN and DOGGIE development in Phase 4.

BAE AUV. BAE Systems (formerly Marconi Underwater Systems), Chelsea Instruments Ltd, and Moog Controls Ltd have been jointly developing a new AUV for anti-submarine warfare, minehunting, and training since June 1991. The system was developed under private funding with some financial assistance from the UK government's Trade and Industry Department. Marconi, responsible for overall system engineering, is the lead firm in this development program, while Moog Controls will design and build the propulsion system and motor controls, with Chelsea Instruments providing the sensor package. This AUV is a testbed providing a platform for the development of modular subsystems.

The new vehicle is 21.5 feet long and 21 inches in diameter; it has a range of 250 miles, an endurance of 36 hours at a speed of 5 knots, and an operating depth of 990+ feet. It is preprogrammed for operations from a mother craft. The vehicle can obtain information for both military and civilian purposes. The prototype UUV is a testbed and research vehicle that carries a sensor package designed to obtain and record oceanographic data, such as the type used for predicting sonar performance. The system could also be used as a target simulator for ASW training (the Royal Navy used diesel-electric Oberon class submarines in this role).

In 1998, BAE Systems was awarded a multimillion-pound contract by the Defence Evaluation and Research Agency (DERA) to develop and build an unmanned underwater vehicle (UUV) for technology evaluation. The effort will provide DERA with a vehicle for evaluating the feasibility of deploying UUVs in reconnaissance operations for future Royal Navy requirements.

This undersea vehicle will draw heavily on the company's torpedo technologies and seven years of UUV research and will advance several important areas such as fiber-optic telemetry, precision navigation, and autonomous control. The undersea vehicle was to begin sea trials before the end of 2000.

SSOL UUV. The UK Atomic Energy Authority (AEA) and SubSea Offshore Ltd (SSOL) have teamed to attempt to clean up undersea chemical weapons dumps in the Baltic Sea and other European waters. According to recent reports, the market for undersea chemical weapons recovery and destruction is valued at approximately $8 billion, with fully 16 percent of that market being in Europe due to both Allied and Axis dumping after World War II.

## Funding

No specific information is available concerning UK funding levels for the development of unmanned underwater vehicles.

## Recent Contracts

None

## Timetable

A timetable is not applicable for this report.

## Worldwide Distribution

No export sales are expected in the near term due to the sensitivity of the technology involved and the uncertainty of system development. The United Kingdom could cooperate with Australia on the development of unmanned underwater vehicles.

In 1999, **Australia** unveiled a three-year program to study possible military applications of unmanned undersea vehicles (UUVs). The program is being headed up by Australia's Defence Science and Technology Organization (DSTO) Maritime Platforms Division. The program will study the possible acquisition of an operational unmanned undersea vehicle capability as part of the Royal Australian Navy's Project Sea 1439 Phase 3 Next-Generation submarine project. Australia was ready to begin testing a new UUV in early 2000. The unmanned undersea vehicle is known as Wayamba. The vehicle is designed to operate at depths of 600 meters and have a maximum speed of 5 knots.

**User Country.** The **UK Royal Navy** is expected to be the initial, and in some cases exclusive, operator of most of these unmanned underwater vehicles.

# Forecast Rationale

In the wake of the September 11 terrorist attacks, interest in all types of unmanned vehicles has steadily increased around the globe. In the United Kingdom, the Royal Navy has repeatedly stated its interest in acquiring unmanned undersea vehicles as a means to maximize the combat proficiency of its surface and sub-surface combatants.

The first unmanned undersea system acquired by the United Kingdom's Royal Navy could be a mine disposal vehicle. This system will provide the Royal Navy with an expendable, single-shot munition that will greatly increase the speed at which naval mines are cleared. BAE Systems is hoping to win an order for its Archerfish from the Royal Navy, but will face competition from systems such as Seafox and Minesniper. BAE Systems is marketing Archerfish to the United States and India as well as the United Kingdom.

Besides the anti-mine warfare mission, the United Kingdom could acquire unmanned undersea vehicles to perform other missions such as long-endurance surveillance at strategic chokepoints or harbor entrances, or near important naval facilities. Applications also include undersea mapping and surveying for both military and civilian needs. Nevertheless, even if procurement should commence and the number of missions widen, the number of systems procured to meet these missions would likely remain limited.

In the future, unmanned undersea vehicles could become a common component on all major surface and subsurface warships. But for now, London is closely following UUV developments in the United States, which could lead to a joint effort in the future. No final design selections have been made, and procurement of a new unmanned undersea vehicle will probably not occur within the next 10 years.

# Ten-Year Outlook

**ESTIMATED CALENDAR YEAR PRODUCTION**

| | | | High Confidence Level | | | | Good Confidence Level | | | | Speculative | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Missile | (Engine) | thru 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | Total 02-11 |
| NOT SELECTED | | | | | | | | | | | | | |
| UK UUV | UNSPECIFIED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Production | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |