

# ARCHIVED REPORT

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## UYS-503

### Outlook

- Operation and maintenance only
- Replaced by the UYS-504 and UYS-505
- Look for new or retrofit sales of the UYS-505
- Production complete. The forecast chart has been omitted
- This report will be archived next year

### Orientation

**Description.** The UYS-503 is a lightweight, airborne, ASW acoustic sonobuoy processor.

#### Sponsor

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Mission Systems - Canada  
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Website: <https://gdmissionsystems.ca>

**Status.** In service.

**Total Produced.** As of January 2024, an estimated 188 UYS-503 systems had been produced (all variants, including export versions).

**Application.** Intended for fixed- or rotary-wing deployment, the UYS-503 can be configured to process both sonobuoy and dipping sonar output.

**Price Range.** The per-unit cost of a UYS-503 initially was estimated to range between \$375,000 and \$750,000 (\$562,500 average) in U.S. 1990 dollars, based on comparative unit analysis and contract cost averaging. Adjusted for inflation, the current estimated average price is \$1,147,597 per unit.

### Contractors

#### Prime

General Dynamics Mission Systems - Canada

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Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 75 Glen Road, Suite 302, Sandy Hook, CT 06482, USA; [rich.pettibone@forecast1.com](mailto:rich.pettibone@forecast1.com)

**UYS-503****Technical Data**

	<u>Metric</u>	<u>U.S.</u>
<b>Characteristics</b>		
ATR unit dimensions	22.9 x 19.0 x 30.5 cm	9.0 x 7.5 x 12.0 in
<b>Weight</b>		
Electronics unit only	20 kg	44 lb
Total system	60 kg	132 lb
Power requirement	350 W, 115 V, 3-phase, 400 Hz	
Cooling air required	Cabin air not to exceed 45°C	
Input channels	8 standard sonobuoy receivers	
Input control	RS-232C or MIL-STD-1553B	
Output interface	RS-232, MIL-STD-1553, or customer-defined	
Frequency range	0-2,560 Hz	

**Design Features.** The UYS-503 is designed to interface with bus systems and onboard tactical navigation systems. It can be provided in a stand-alone configuration complete with a cathode ray tube (CRT) display and/or a hard-copy display and interface controls. It accepts inputs from any existing U.S. inventory sonobuoy through any standard sonobuoy telemetry receiver. Any buoy, including digital ones, can be demultiplexed without a specific digital receiver by using the integral demultiplexer. The UYS-503 inputs data from the receiver, producing, with passive buoys, a LOFAR (low-frequency analysis and recording) history. It stores 20 minutes of historic LOFAR data for all bands for all buoys, ready for instant display of operator-selected bands. The one air-transportable rack (ATR) unit houses four independent processors with eight-channel omni (4 DIFAR/DICASS) capability. Greater capacity is gained by adding more ATR units.

The UYS-503 uses slice architecture to offer a higher degree of flexibility than other processors. It can thus provide a complete single buoy processor that, once built, can be replicated *N* times to produce an *N*-buoy processor. The rationale behind this design philosophy is to reduce the complexity and cost of conventional architecture systems. Slice architecture avoids the traditional problems of processor design, where sonobuoy-synchronizing difficulties sometimes occur. All UYS-503 ATR cards are heavily duplicated, resulting in lower through-life costs. Slice architecture allows different mixes of omni-DIFAR/DICASS buoys to be processed.

The UYS-503 is an entirely modular system. To double the system's capacity, a second ATR can be installed and connected in parallel. Software changes are not required when increasing the capacity, thus allowing expansion in order to process eight DIFAR/16 LOFAR channels.

System capability growth is also possible, widening the range of compatible sonobuoys to include the Expendable Reliable Acoustic Path Sonobuoy (ERAPS), Communications command Active Multibeam Sonobuoy (CAMBS), and Vertical Line Array DIFAR (VLAD) sonobuoy. Standard analog receivers, such as the ARR-75, can be used for digital sonobuoys such as the ERAPS and can be handled by a universal demultiplexer made by Computing Devices Co (CDC).

The UYS-503's basic building block is a processing module that performs all the functions needed to process one buoy of any type or two LOFAR buoys. These functions include demultiplexing/digitizing, band selection/filtering, spectrum analysis, display quantification, and history storage. Four such modules and the necessary common circuitry are housed in one ATR unit. One advantage of the UYS-503 is its ability to maintain a proportional capability even after module failure, so that if one module fails, 75 percent of the system is still ready for operational use.

**Operational Characteristics.** For dipping sonar processing, each slice processes a 90-degree quadrant. When a target in a quadrant is acquired, the remaining three slices are reallocated to sonobuoy processing, allowing simultaneous sonobuoy and dipping sonar operation. Historical information is retained within the UYS-503, assisted by a large memory capacity of 16 million bits. In addition to the LOFAR history already mentioned, the system stores bearing information for all frequencies, bands, and buoys.

The UYS-503 display monitor is a standard 875-line TV. The screen is divided into four areas, each comprising 200 lines and 800 pixels.

**UYS-503**

Primary features of the UYS-503 include an operator-controlled cursor for alphanumeric readout of any display parameter (frequency, time, range, bearing, etc.), plus an ability to magnify the displayed data for more detailed analysis. The system calculates range and speed. Other features include electronic harmonic dividers, along with capabilities for instant readout of bearing and for automatic calculation of range and speed when the closest point of approach is identified by the operator. In the tactical mode, up to six preset

modes can be programmed. The system is somewhat easy to maintain because of the low number of card types used in the UYS-503. Fault isolation is in three phases, moving from slice to cards on a slice to single-card fault identification.

Owing to an initiative of the Canadian armed forces, the UYS-503 can be interfaced with the ASN-123 tactical navigation system within the existing UYS-503 architecture at little additional cost.

## Variants/Upgrades

**UYS-503(V)5.** The current version of the UYS-503 can process 32 DIFAR sonobuoys, can simultaneously process data from buoys and a dipping sonar, and has acoustic fusion algorithms that combine passive tracking with active acoustic data. Besides LOFAR analysis, it can detect and track on the basis of broadband and transient data. A new color display reduces operator workload.

**UYS-504 AIMP.** This successor to the UYS-503 was selected for the Canadian Aurora Incremental Modernization Project in 2001. It uses commercial off-the-shelf VME hardware and is available in 16-, 32-, or 64-buoy versions. It is compatible with both multistatic and monostatic active buoys and the usual passive buoys. It features color spectral analysis as an intrinsic part of the specialized processing to add a fourth dimension that reduces operator workload while enhancing detection localization and tracking capabilities. According to the contractor, proprietary algorithms provide outstanding detection and localization capability for broadband and transient emissions. This version also makes use of acoustic fusion algorithms that present the output in the form of an energy map.

**UYS-505 VENOM 3U.** The UYS-505 VENOM 3U provides passive acoustic processing for all common passive sonobuoy types, including LOFAR, DIFAR, and HIDAR. According to the manufacturer, advanced processing makes and maintains contact when other sources cannot, while the intuitive user interface offers tools that simplify the task of prosecuting increasingly large and complex sonobuoy fields. The system reportedly leverages commercial advances in hardware and the latest innovations in signal processing technologies to maximize the detection of submerged threats in deep and coastal waters.

While the VENOM 3U is capable of being operated as a stand-alone system, the integration of the sonobuoy processor with a platform's mission management system is important to the effective execution of the

anti-submarine warfare mission. The UYS-505 is currently integrated with mission management systems on multiple rotary- and fixed-wing platforms. It supports an open architecture "publish and subscribe" approach to data transfer for easy integration with external aircraft systems.

General Dynamics reports that the UYS-505 is available in a number of form factors, including "an airborne-qualified ½ ATR chassis, rack-mount options for ship applications, or zero-SWaP processing for ultra-embedded applications."

**ASW-503.** The ASW-503 data management system (DMS) is a flexible mission data-handling system designed to fully support maritime operations in the surface, subsurface, and air surveillance areas. It provides the tactical-processing, database-management, control, and display functions necessary to integrate and manipulate a suite of sensor, navigation, communication, and stores/armament subsystems.

Individual subsystem interfaces are accommodated without modification to the subsystem, making this DMS "unique and cost-effective." Thus, all integration activities are contained within the DMS, thereby giving weapons systems managers the option of procuring off-the-shelf systems in order to minimize integration costs. The DMS also provides a common operator interface for control and display of multiple sensors and systems, making operator training and operational missions more efficient.

The ASW-503 system is reportedly suited to all maritime platforms.

**AQA-801 Barra Side Processor.** This processor modifies the UYS-503 for operation with Barra sonobuoys.

In the Royal Australian Navy S-70 Seahawk configuration, the UYS-503 interfaces with the MIL-STD-1553B core tactical data system.

**UYS-503**



P-8A Poseidon Aircraft

Source: U.S. Navy



SH-2G Super Seasprite Helicopter

Source: Kaman



UYS-505 VENOM 3U VPX Integrated Processor for Sonobuoys

Source: General Dynamics Mission Systems - Canada

## Program Review

**Background.** The UYS-503 is the fourth airborne acoustic processor developed by Computing Devices Co since the early 1970s. (This company is now owned by General Dynamics.) Among other sales successes, CDC provided many of the subsystems for the AQS-901 acoustic processors that equip U.K. Royal Air Force (RAF) Nimrod MR Mk 2s and Royal Australian Air Force (RAAF) P-3C Orions.

In 1984, Sweden became the first nation to order the UYS-503, in an effort to build up its ASW forces following repeated violations of its territorial waters by Soviet submarines. Sweden ordered one UYS-503 to equip a CASA C-212 Series 200 Aviocar ASW aircraft, followed by two other orders. Canada was the next client, ordering 11 processors for four Tribal class destroyers and six Halifax class frigates. In 1986, the Canadian Navy's Maritime Air Group acquired UYS-503 processors for evaluation as part of the New Ships Aircraft (NSA) program. Processors were installed on Sea King helicopters prior to the tests, which were successful.

CDC won the Royal Australian Navy's Acoustic Sensor Processing Apparatus (ASPA) competition in February 1986, following the RAN's order for 16 Sikorsky S-70B-2 Seahawk helicopters. Because of the need for UYS-503s to operate in conjunction with the U.K./Australian Barra sonobuoy, CDC developed the Barra Side Processor 1 (BSP 1). In the RAN's Seahawks, the UYS-503 interfaces with the 1553B databus produced by Rockwell International. These UYS-503s also interface with and exert control over the CAE Electronics ASQ-504 Integrated Multisensor Airborne Display System (IMADS). MAD information is integrated with acoustic information when selected and presented on the displays.

### *Canadian Navy Buys In*

The Canadian Navy acquired six more UYS-503s for the second batch of six Halifax class frigates, which were ordered in 1987. In April 1987, the U.S. Navy evaluated the UYS-503 in competition with the AQS-902G as an alternative processor for the SH-2G ASW helicopter, there being no U.S.-built equivalent system. The UYS-503 was selected to fulfill this requirement in 1988. It was fitted to all new-build SH-2G helicopters and installed on existing SH-2Fs as they were upgraded to the 2G standard. Documentation does not clarify whether the SH-2Fs upgraded to the SH-2G standard for export to Australia and Egypt were modified to carry the UYS-503.

The RAAF announced in 1995 that it was upgrading its fleet of 18 P-3C Orion maritime patrol aircraft. A contract worth \$360 million was awarded in January 1995 to Raytheon E-Systems (USA), the prime contractor. Deliveries were completed by the end of 1999.

The Royal Netherlands Navy Maritime Patrol Group (MARPAT) released plans for a P-3 aircraft Capability Upkeep Program (CUP-Orion) that would run from 1997-2003. Some NLG209.4 million (approximately \$130.8 million in 1995 U.S. dollars) was reportedly reserved for this program, which called for the following: replacement of the ASQ-114 central computer with the Paramax ASQ-212; installation of the Texas Instruments APS-137 inverse synthetic aperture radar (ISAR); installation of ALR-66 electronic support measures (ESM); and replacement of the ARR-72 acoustic processor with the CDC UYS-503. Ten aircraft were upgraded to this standard.

On July 20, 2004, the government of the Netherlands announced that it had reached an agreement with Germany regarding the sale of P-3C CUP-Orion aircraft. Following approval from the German Parliament, the first aircraft was handed over to the German Navy at NAS Nordholz in November 2005; the next, and last, aircraft followed in March 2006.

The last five P-3C-II.5 Orion patrol aircraft were sold to Portugal for EUR9 million each, for a total contract price of approximately EUR70 million, including spare parts, ground equipment, and training of the crews by Dutch instructors. It appears that three of these aircraft are unmodified and two have been upgraded to CUP standard.

CDC supplied the UYS-503 along with upgraded acoustic receivers as part of Raytheon E-Systems' overall enhancement package. CDC is believed to have delivered 20 acoustic processors and six tactical training systems from August 1996 through 1999.

**Production Numbers.** During February 1999, Computing Devices Co stated that it had supplied a total of 150 UYS-503 systems to a variety of clients. This information suggested that only two P-3 aircraft operated by the Japan Maritime Self-Defense Force (JMSDF) carried the UYS-503, others presumably being equipped with a Japanese equivalent. At that time, the primary production programs for the UYS-503 were identified as being the U.K. Royal Air Force's Interim Nimrod Upgrade and Nimrod 2000 programs.

## UYS-503

In 2002, the number of aircraft to be updated to the Nimrod MRA.4 standard was reduced from 21 to 18. The number was further reduced to 16 in the 2004 defense review. The Nimrod upgrade program itself continued to suffer from a series of delays and cost overruns, and the full-service date of the rebuilt aircraft was pushed back to 2009, with deliveries to be

completed by 2011. Then, in the British defense review of October 2010, it was noted that the Nimrod MRA.4 in-service date had been pushed back to April 2012 and that several technical questions remained unresolved. For this reason, the entire program was subsequently canceled.

## Funding

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The UYS-503 acoustic processor is believed to have been developed primarily with company funding.

## Contracts/Orders & Options

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No recent contract awards have been identified.

## Worldwide Distribution/Inventories

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The UYS-503 is believed to be in service with the navies of the following countries (this list is not all-inclusive): Australia, Canada, Germany, Japan, Portugal, Sweden, and the United States.

## Forecast Rationale

An old but reliable system, the perfectly functional UYS-503 acoustic sonobuoy processor suffered severe blows when the Boeing USQ-78B acoustic processor was chosen over the UYS-503 to equip the P-8A Poseidon aircraft, and when the Nimrod MRA.4 aircraft program was canceled.

No new orders have been identified and in all likelihood the system has been replaced by the UYS-504 for new installs. In turn, the UYS-504 is likely to be replaced by the UYS-505 VENOM 3U acoustic processor, which is

available for sale. Still, given the large number of UYS-503 systems in active use worldwide, a few orders down the road for spares and replacements are possible from financially strapped nations operating older platforms.

With full unit production completed, the forecast chart has therefore been omitted.

Barring any significant production or procurement, this report will be archived next year.