

ARCHIVED REPORT

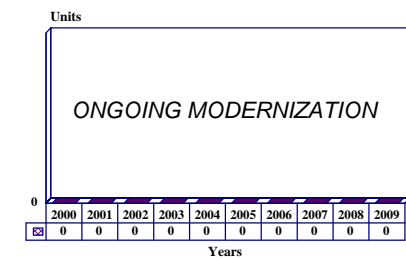
For data and forecasts on current programs please visit
www.forecastinternational.com or call +1 203.426.0800

Tripartite Minehunter - Archived 11/2001

Outlook

- Production run ended; future orders unlikely
- New generation of stand-off minehunters will take over role
- Exports will be of existing hulls surplus to requirements
- Ongoing enhancements to sonars and countermeasures likely
- Rare example of successful multinational program

10 Year Unit Production Forecast
2000-2009



Orientation

Description. Mine countermeasures vessel (MCMV) originally designed to locate and neutralize mines in coastal and ocean waters.

Sponsor

Direction des Constructions Navales (DCN)
 DCN Lorient
 F-56998 Lorient
 France
 Tel: +33 9721 1401
 Fax: +33 9721 1214

DCN

Lorient Naval Dockyard
 Lorient
 France

Beliard Polyship N.V.
 Oostende
 Belgium

Status. Production and service.

Total Produced. A total of 40 ships have been built.

Contractors

Van der Giessen de Noord
 Alblasterdam
 The Netherlands

Pennant List

<u>Name</u>	<u>Nation</u>	<u>Builder</u>	<u>Ordered</u>	<u>Commissioned</u>
M915 <i>Aster</i>	Belgium	Mercantile-Beliard	2/1981	12/1985
M916 <i>Bellis</i>	Belgium	Mercantile-Beliard	2/1981	8/1986
M917 <i>Crocus</i>	Belgium	Mercantile-Beliard	2/1981	7/1987
M921 <i>Lobelia</i>	Belgium	Mercantile-Beliard	2/1981	5/1989
M922 <i>Myosotis</i>	Belgium	Mercantile-Beliard	2/1981	12/1989
M923 <i>Narcis</i>	Belgium	Mercantile-Beliard	2/1981	9/1990
M924 <i>Primula</i>	Belgium	Mercantile-Beliard	2/1981	5/1991
M641 <i>Eridan</i>	France	Lorient Naval Yard	1977	4/1984
M642 <i>Cassiopee</i>	France	Lorient Naval Yard	1977	5/1984
M643 <i>Andromède</i>	France	Lorient Naval Yard	1977	10/1984

<u>Name</u>	<u>Nation</u>	<u>Builder</u>	<u>Ordered</u>	<u>Commissioned</u>
M644 <i>Pégase</i>	France	Lorient Naval Yard	1977	5/1985
M645 <i>Orion</i>	France	Lorient Naval Yard	1978	1/1986
M646 <i>Croix du Sud</i>	France	Lorient Naval Yard	1978	11/1986
M647 <i>Aigle</i>	France	Lorient Naval Yard	1979	1/1987
M648 <i>Lyre</i>	France	Lorient Naval Yard	1979	12/1987
M649 <i>Persee</i>	France	Lorient Naval Yard	1982	11/1988
M650 <i>Sagittaire</i> ^(a)	France	Lorient Naval Yard	1/1992	7/1996
M651 <i>Verseau</i> ^(b)	France	Mercantile-Beliard	n/a	10/1988
M652 <i>Cephee</i> ^(b)	France	Mercantile-Beliard	n/a	2/1988
M653 <i>Capricorne</i> ^(b)	France	Mercantile-Beliard	n/a	8/1987
711 <i>Pulau Rengat</i>	Indonesia	Van der Giessen	4/1985	3/1988
712 <i>Pulau Rupert</i>	Indonesia	Van der Giessen	4/1985	3/1988
M850 <i>Alkmaar</i>	Netherlands	Van der Giessen	7/1977	5/1983
M851 <i>Delfzijl</i>	Netherlands	Van der Giessen	7/1977	8/1983
M852 <i>Dordrecht</i>	Netherlands	Van der Giessen	1/1979	11/1983
M853 <i>Haarlem</i>	Netherlands	Van der Giessen	1/1979	1/1984
M854 <i>Harlingen</i>	Netherlands	Van der Giessen	3/1981	4/1984
M855 <i>Scheveningen</i>	Netherlands	Van der Giessen	3/1981	7/1984
M856 <i>Maassluis</i>	Netherlands	Van der Giessen	12/1981	12/1984
M857 <i>Makkum</i>	Netherlands	Van der Giessen	12/1981	5/1985
M858 <i>Middelburg</i>	Netherlands	Van der Giessen	7/1982	12/1986
M859 <i>Hellevoetsluis</i>	Netherlands	Van der Giessen	7/1982	2/1987
M860 <i>Schiedam</i>	Netherlands	Van der Giessen	12/1983	7/1986
M861 <i>Urk</i>	Netherlands	Van der Giessen	12/1983	12/1986
M862 <i>Zierikzee</i>	Netherlands	Van der Giessen	7/1984	5/1987
M863 <i>Vlaardingen</i>	Netherlands	Van der Giessen	1985	3/1989
M864 <i>Willemstad</i>	Netherlands	Van der Giessen	1985	9/1989
M166 <i>Munsif</i> ^(c)	Pakistan	Lorient Naval Yard	1992	7/1989
M163 <i>Muhafiz</i>	Pakistan	Lorient Naval Yard	1992	5/1996
M164 <i>Mujahid</i>	Pakistan	Lorient/Karachi	1992	7/1998

^(a) This ship replaces the earlier ship of the same name, transferred to Pakistan as part of 1992 contract.

^(b) These ships have been transferred from Belgium in 1997 (ex-*Iris*, *Fuchsia* and *Dianthus*).

^(c) Ex-*Sagittaire*.

Mission. These multifunction minehunters can be used for locating, classifying and neutralizing mines. However, the actual missions vary from one country to another. The components can be boarded in five-ton containers, and their modular structure facilitates multiple tasks, including research, patrol, HQ support, extended diving, and drone control. One Belgian ship has been converted to ammunition transport functions.

Price Range. Based on the 1992 order from Pakistan, the price for the construction, delivery, and support of a ship was between US\$70 and \$75 million. In 1998 Pakistan stated that the cost of its third ship, assembled locally, was US\$64 million, suggesting cost savings of about US\$15 million over the vessels built in France.

Technical Data

	<u>Metric</u>	<u>US</u>
Dimensions		
Length (Overall):	51.5 m	168.9 ft
Beam:	8.9 m	29.2 ft

	<u>Metric</u>	<u>US</u>
Draft:	2.45 m	8.0 ft
Displacement (Standard):		562 tons
Displacement (Full Load):		595 tons
Performance		
Speed (Maximum):	28 km/h	15 kts
Speed (Hunting):	13 km/h	7 kts
Range:	5,500 km at 22 km/h	3,000 nm at 12 kts
Crew:	5 officers, 44 enlisted	

	<u>Type</u>	<u>Quantity</u>
Electronics		
Radar – Navigation:	Decca 1229	1
Sonars – Hull-Mounted:	DUBM-21B	1
Mine Countermeasures		
Submersibles:	PAP-104 Mk 5	2
Oropesa Sweep:	OD-3	1
Command System:	Sewaco IX	1
Navigation – Radio Nav aids:	Loran	
	Syledis	
	Decca HiFix-6	
Doppler Log:	TSM 5700	
	Gyrocompass	SAGEM

Armament

Guns:	20 mm Giat	1
	12.7 mm machine gun	2

Machinery

Main Propulsion:	Brons-Werkspoor RUB 215 V12	1x1,860 hp
Propeller:	acbLIPS 5-bladed cp	1
Gearbox:	Rademakers epicyclic reduction	1
Auxiliary Propulsion:	ACEC active rudders, 6-bl prop.	2x88 kW
Auxiliary Propulsion Power:	ASTAZOU IVB gt alternators	3x750 hp
Bow Thruster:	Schottel	1x2 propellers
Backup Power:	Diesel engine generator	1

Design Features. The ship is built almost entirely of fiberglass. This material was chosen as having the best combination of shock-resistance, rot-resistance and low magnetic signature. The hull, decks and bulkheads are built as a single unit, with trapezoidal sections used as strengtheners. Fastening between longitudinal and transverse framing is achieved using polyfibre pins.

The superstructure is made of fiberglass and balsa. A light alloy is used for the navigation bridge and gas turbine room overheads. A series of overall and local degaussing coils, automatically controlled by an IMAI P3 magnetometric degaussing system, also helps in lowering the magnetic signature.

The main propulsion for the class is a Werkspoor RUB 215 V12 diesel, driving a controllable pitch propeller. This engine is used for cruising and minehunting at speeds of 8-15 kts. For speeds below 8

kts, three Astazou IV B alternators, each providing 250 kW, are used. These drive two electric rudder motors, which in turn control the active rudders. Active rudders are two rudders with propellers slung underneath in tunnels.

A supplementary bow propulsion system consists of two electric motors, each driving a propeller mounted in a tunnel on each side of the bow.

The class has a prewetting system for their superstructures and weatherdecks, while a series of filter stations in the air conditioning system protects against NBC (nuclear, biological, chemical) warfare.

Operational Characteristics. Mines are neutralized by a combination of precise localization and remote controlled destruction. An EVEC 20 automatic plotting table receives input from the ship's radar, minehunting sonar, gyrocompass, and Doppler underwater log. It

provides a continual display of the ship's position, sonar contacts, radar echoes, and minehunting zone. The DUBM-21B sonar detects and classifies mines. It consists of a stabilization/remote control/hoisting mechanical ensemble to control movement, and an electro/mechanical ensemble, comprised of two transducers that can be controlled separately in bearing and elevation.

The class also carries two PAP 104 underwater remote control vehicles. The PAP is a mini-submersible carrying a closed-circuit TV camera and a variety of payloads. These include a 200 lb explosive charge, explosive cutters or a combination of the two. A TV monitor and control desk in the mother ship's Operations Room allow personnel to identify and

classify ground and moored mines 1,600 ft away from, and 400 ft below the mother ship. Once a mine has been identified and classified, the mother ship can send a destruction command over the wire-guidance system. The submersible then drops an explosive charge on ground mines or cuts the cables of moored mines.

The PAP 104 is 8 ft long by 4 ft wide and weighs 1,500 lb. Should the command decide not to use the PAP 104, they can use the OD-3 mechanical sweep, equipped with explosive cutters effective at up to 8 kts at a 300 ft depth. The class also carries two rubber dinghies and a decompression chamber for up to six divers. The armament includes one 20 mm gun by Giat, and two 12.7 mm machine guns (not installed in Belgian ships).

Variants/Upgrades

All the ships of the class are of the same basic design. This section shows the differences between those, if any.

Advanced Eridan. DCN has developed two different versions of the base ship known as the Eridan class in France, one being slightly larger and the other slightly smaller than the base model. The Advanced Eridan is 52.09 m long, has a draft of 2.87 m and a displacement of 597 tonnes standard; it is designed to carry a crew of 45 and should have an operating range of 1,800 nautical miles.

Alkmaar Class. The Dutch version of the ship has the capability of carrying US Stinger missiles during deployment, in addition to the Giat 20 mm gun. They are equipped with the SEWACO-IX mine warfare system. Two of these ships have been converted to serve as ammunition ships. The rest have been scheduled to be modernized with Troika drone control and new sonar systems. Manning of the ships varies between 29 and 42, depending on the task.

The upgrade program, which was reportedly nearly ready for signing in late 1997, was to include the following: conversion of three Alkmaars to control vessels for the Troika minesweeping drone; purchase of 14 of those drones with the German Navy's assistance; purchase of 900 single-shot mine disposal systems; modernization of the hull-mounted minehunting sonar on all 15 Alkmaars; and purchase of a self-propelled VDS for four ships.

After some delays in having the funds available for the project, the Netherlands was the first to grant a contract, in August 1998 to the Norwegian company GECO Defence. This was for a prototype of an active acoustic minesweeping system that would operate in low, medium and high acoustic frequencies. GECO already

had a study contract previously and did produce a prototype that has been demonstrated to various navies at the company's site in Bergen, Norway. The system is to be used as a guidance and control platform (GCP), linked by radio to an unmanned Sweeping Simulation Craft (SSC), i.e., a drone. It is designed to survive a mine detonation and will be built in the Netherlands. GECO's responsibility is for the controlling system on the minesweeper and the robust acoustic sensors, electronics, and software controlling and monitoring the system on the SSC.

Compact Eridan. A slightly smaller version of the base Eridan has been designed as well, featuring a length of 40.07 m, a draft of 2.90 m and a standard displacement of 350 tonnes. With a crew of 24, this downsized version should have an effective operating range of 1,500 nautical miles.

The external design of Compact Eridan's superstructure differs somewhat from that of the standard Eridan. It has two smokestacks, one on each side, as opposed to one in the center, and features a less cluttered profile.

Both the Advanced Eridan and Compact Eridan have been designed to feature a Variable Depth Sonar (VDS) or Propelled Variable Depth Sonar (PVDS), Voith-Schneider propellers or orientable thrusters, and a non-specified self-defense system. Neither the Advanced Eridan or Compact Eridan version are believed to have been sold to any navies as of today.

Eridan Class. The French ships have EVEC 20 automatic plotting system and Syledis radio processing system. In 1985 they began to receive the AP-4 acoustic sweep.

The modernization project is being carried out in concert with the Dutch and Belgian versions. In March

1999 France announced that a contract worth “several hundred million Francs” had been granted to Thomson Marconi Sonar for their Type 2022 Mk 3 to be used as part of the ships’ new-generation mine warfare combat system. Other components of that system will be PVDS propelled sonars and the associated tactical systems. The modernization program is expected to take about six years on the French ships, with the first sea trials of the modernized version beginning by the end of 2001.

The modernization program is expected to improve the Eridans’ capability to combat new-generation sea mines at all depths. Besides offering enhanced operator aids, the new sonar is said to provide wide-band detection capability and high resolution for the system.

Flower Class. The Belgian versions have an automatic pilot and the TORAN navigation system. The ships are equipped with the SEWACO-IX mine warfare system. Like the French Eridans, Flower class ships have a DCN 20 mm/20 gun and a 12.7 mm machine gun. France bought three of these ships in 1997.

The Belgian plans for upgrading their ships will focus on the command, navigation and ship positioning systems, but will also include improvements on the ships’ DUBM-21B hull-mounted minehunting sonar and mine neutralization system (modernization or replacement of PAP 104s).

Part of the plan also includes updating or replacing the EVEC tactical system to increase data flow; installing a drifting mine detection system; and improving system integration and automation, in order to allow operation with less crew.

By July 1999, the Belgian Navy also had announced an invitation to interested bidders for a 5-year standing offer maintenance contract with technical support. This is intended to keep the ships in commission until 2015 - 2020.

Munsif Class. Contrary to many reports, the Pakistani versions of the Tripartite minehunters are virtually identical to the Eridans in the French Navy, the only differences being items of minor equipment no longer available from the original suppliers.

Pulau Rengat Class. The two Indonesian ships have a slightly different propulsion system than the others in the series. They are fitted with two MTU diesel engines, each with 1,850 hp, driving dual controllable-pitch propellers. They, too, have two electrically driven retractable Schottel propellers for precision maneuvering.

The ships’ superstructure is slightly different from that of their European counterparts. The variations are attributed to the different missions of the Indonesian Navy, assigning these ships with minehunting, minesweeping, and patrolling roles. At 502 tons standard and 568 tons in full load, the ships’ displacement is also lower than others’ in the series.

During minehunting operations, the entire engineering plant can be run from the bridge, thereby eliminating the need for any personnel to be stationed below the main deck. They have the TSM-2022 export derivative of the DUBM-21. A plan to construct up to ten more of these ships did not materialize.

Upgrade Program. In early 1995, the three original members of the Tripartite project agreed on a combined modernization program for the ships. This would be applied to ten French, fifteen Dutch, and seven Belgian hulls. The improvements include changes to the DUBM-21A sonar system in order to improve detection and classification capabilities, and modifying the PAP-104B UUVs to reduce signatures and introducing GPS-based precision navigation. In addition, three of the Dutch ships are modified to act as Troika control platforms, or drones.

The Belgian Navy expected the capability upgrade program to last from 1997 to 2003, pending the availability of funding. However, the program was not finalized immediately, due to the last-minute request from France for a final review of the bids. This caused the entire process to be postponed until after the parliamentary election of May 1998.

Subsequently all three nations began the process of inviting bids and awarding contracts in early 1999, with Belgium estimating that the service life extension program will prolong the effectiveness of their Flower class to between 2015 and 2020.

Program Review

Background. The Tripartite Minehunter is the result of a collaboration by the French, Dutch and Belgian navies, grown out of their joint need for coastal minesweepers to replace their fleets of early 1950s vintage sweepers. The growing obsolescence of these post-Second World War coastal minesweepers led the French, Dutch and Belgian navies to undertake separate

studies for a coastal minehunter in the early 1970s. Both the Dutch and Belgians rejected the British Hunt design as being too large and expensive for their requirements. However, a design by Thomson-CSF was considered suitable, and initial discussions took place in April 1974. In May 1975, an agreement

covering design, construction and logistic support was signed.

The French government agency DTCN (Direction Technique des Constructions Navales) was designated as the program manager, receiving its instructions from a steering committee made up of French, Dutch and Belgian representatives. Under the agreement, France supplied the DUBM-21B minehunting sonar and the PAP 104 submersibles; the Netherlands was responsible for the main propulsion and mine warfare command system, while Belgium furnished the auxiliary propulsion. Subsequently, France unilaterally decided that the SEWACO-IX command system was too expensive and replaced it on their ships with the EVEC automatic plotting table.

The Dutch and the French placed their initial contracts in 1977. The French laid their first keel, the *Eridan*, in December 1977, while the keel of the first Dutch ship, *Alkmaar*, was laid in January 1979. Difficulties with the propulsion system plagued the program, and the *Eridan* spent nearly a year undergoing precommissioning trials. By the time *Eridan* was commissioned in April 1984, the *Alkmaar* had been in service for nearly a year. The Belgians had to reorder their ships in February 1981 from the Beliard Shipyards in Ostend and Antwerp after Polyships, the original constructors, dissolved.

While the three European nations were building minehunters, other navies were looking to rebuild their aging or tiny minehunter/sweeper forces. The first orders for export Tripartites were in March 1985, when Egypt and Indonesia ordered two each. Since there were export orders for four ships, and the Netherlands Navy had maintained close ties with the Indonesian Navy, the Netherlands took the hulls that were to be *Zierikzee* (M 862) and *Vlaarding* (M 863), and used those to fulfill the Indonesian order. The Egyptian order was subsequently canceled in lieu of upgrading eight Russian built minesweepers (four Project 254 and four Project 266) with new sonars and ROVs. This plan was, in turn, abandoned in favor of three Swiftships minehunters. Malaysia and Nigeria had also been considering the Tripartite design but chose the Italian Lerici instead.

In late 1982, Van der Giessen entered a partnership with Todd Pacific Shipyards to fulfill the US Navy's need for a mine sweeper/hunter (MSH). The Van der Giessen/Todd partnership submitted the Tripartite design and received a design contract from the US Navy on May 13, 1983. In August 1984 the US Navy decided not to use the Tripartite entrant. Had the USN chosen that design, Todd would have performed the construction, with technical assistance from the Dutch.

Due to financial and naval policy pressures during the mid-1980s, however, two of the Tripartite nations were forced to cut back on their programs. Since Belgium could not support a 15-ship program, it canceled the option for the last five ships in late 1984. In early 1985, the French Navy decided not to order the five ships that it had on option. Instead, it began designing a new class of 750-ton ocean-going minehunters, capable of operating in the open oceans and destroying mines located as deep as 1,000 ft. In late 1985, the Royal Netherlands Navy ordered two more Tripartites to make up for the two ships that went to Indonesia.

In 1986 the Dutch and the French made a major effort to market the Tripartite design to several Middle Eastern navies, including Kuwait and Saudi Arabia. In July 1987, the Netherlands government authorized the sale of two Tripartite ships to the Kuwait government but the sale never took place. Four other navies, from India, Pakistan, Portugal and Spain, announced an interest in the Tripartite program in 1987, for the mine warship programs they were planning for the 1990s.

During the Persian Gulf mine crisis in 1987/88, both France and the Netherlands sent Tripartite class minehunters to the Gulf as part of the Western mine countermeasures forces. In early 1988, a Gulf States Joint Minehunter Project office was formed by the navies of Bahrain, Oman, Qatar and the United Arab Emirates. Several designs were considered, including the Tripartite, the Lerici and the Sandown. In December 1988, Saudi Arabia ordered Sandown class minehunters from the United Kingdom, instead of Tripartites. Subsequently a policy decision was made that the Gulf states would not develop a mine warfare capability and would concentrate instead on enhancing surface warfare capabilities. This was based on a political perception that if Western countries wanted oil, they could take the responsibility for collecting it. Another factor in the decision was that mine warfare required a very large investment in capital equipment and training facilities, and that this investment could be better deployed elsewhere.

France continued to promote the Tripartite design as the *Eridan* class on the export market. On January 17, 1992, Pakistan signed a contract for three additional ships of this class. The first ship was the *Sagittaire*, then in the service of the French Navy. The Pakistani second ship was built at the Naval Dockyard at Lorient, and was taken into service on May 15, 1996. The third ship will be delivered in sections to Karachi and assembled there. It was launched on January 28, 1997, and commissioned on July 8 the following year. Completion of the ship reportedly took longer than had been anticipated.

It had been expected at one point that additional ships would be still ordered by Pakistan, although not in the immediate future. The planned Indonesian order for ten additional Tripartite minehunters was abandoned in August 1992 when Indonesia purchased the majority of the old East German Navy.

Also at this time, a potential Dutch order for additional Tripartite minehunters was superseded by a new tripartite joint venture (between the Netherlands, Belgium and Portugal) for a small coastal mine warfare vessel. This program was eventually suspended in 1993 for lack of funds.

In 1994, Belgium elected to continue with the coastal minehunter program on its own. Funding for this project would come from the sale of the three Tripartites. Belgian policy has always been to rotate three of the ten ships through reserve status in order to maximize hull life. The sale of the three ships therefore, did not constitute a force reduction *per se*. In early 1997, France transferred those ships to its fleet.

The Eridan class gained a very good reputation from its participation in mine clearance operations during and after the Persian Gulf war of 1990-91. Its favored mine warfare system, the TSM-2022/IBIS-V, is the market leader in its sector and has amassed a substantial background of successful operations in a wide variety of conditions.

The Netherlands had been planning a modernization program for its Alkmaar class, as the ships are known there, including the sonar systems and self-driven minehunting units with sonar detectors. Three of their Alkmaars had already begun converting to Troika drones in 1996. In late 1997, however, France exerted quite a bit of pressure on the Dutch decision-makers. It offered to cover the Dutch non-recurring costs that would be involved in the development of a new sonar upgrade shared by the two nations, on the condition that

the Dutch would not take it from Germany's STN-Atlas.

The request was honored by the Dutch state authority for defense procurement, State Secretary Gmelich Meijling, who postponed all decisions on the country's MCM modernization plans until after the May 1998 election. The outcome of that delayed process was a decision to continue with the plans which were presumably initiated earlier this year.

Belgium is modernizing the sonars and weapons systems on its remaining Flower class ships, at a cost of Bfr 1.8 billion, as part of the 1997-99 defense plan. While no more new ships of this design have been ordered, the existing ones will easily remain in service for another 5-10 years. The Netherlands has been planning to upgrade its Alkmaars for a while now. The French demand in late 1997 to once more review the best bids and its decision not to go with the German STN-Atlas Elektronik as the chosen supplier caused a major problem by delaying the modernization process by several months.

The actual modernization program was being implemented in late 1998/early 1999, with the Netherlands being the first to grant a contract, in August 1998. Even at that time, it was stated that an overall go-ahead still had not been released although it was imminent. Soon after that, all the other members of the team began announcing their upgrade programs as well. France chose Marconi's Type 2022 integrated hull-mounted sonars as part of its program, and Belgium came up with a detailed list of capability upgrades and modifications it intends to carry out onboard the Flower class ships. In general, all three navies are improving the capabilities of these ships with an eye on the increased operation in the littoral/shallow water zones. This means boosting the detection capabilities of the mine identification systems and, consequently, enhancing the dataprocessing capabilities.

Funding

This program is funded by each participating country's Ministry of Defense.

Recent Contracts

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
DCN	227.3	January 1992 – Manufacture of two ships for Pakistan, with delivery of kits for a third ship plus logistics support, training and technology transfer.
N/A	(Bfr120 bn)	January 1997 – Modernization of Belgian ships' sonars and weapons systems, as approved by the government in the 1997-99 defense plan.

<u>Contractor</u>	<u>Award</u> <u>(\$ millions)</u>	<u>Date/Description</u>
GECO Defence	N/A	July 1998 – Development and production of a prototype for active acoustic minesweeping system, as part of the Dutch Alkmaars' upgrade program.
Thomson Marconi	N/A	March 1999 – France chooses Type 2022 Mk 3 sonars for the 13 Eridans as part of their modernization package. Duration: 6 years, with first to go on trials in 2001.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Dec	1974	Joint staff requirement issued
Jul	1977	The Netherlands' M850, M851 ordered
	1977	France's M641 ordered
	1978	France orders two more ships
	1979	France orders two more ships
Feb	1981	First Belgian ship ordered
	1982	France orders the tenth ship of the series
Late	1982	US Todd Shipyards enters partnership with Dutch for joint design
May	1983	Dutch commission the <i>Alkmaar</i>
Apr	1984	France's <i>Eridan</i> commissioned
Aug	1984	US Navy abandons Tripartite program
	1985	France and Belgium decide not to order last five ships
Mar	1985	Indonesia orders two Tripartites
Dec	1985	Belgium commissions the <i>Aster</i>
	1985	Netherlands orders two additional Tripartites
	1987-88	Dutch, French Tripartites in service in Persian Gulf
Jan	1992	Pakistan signs contract with France
	1991	Pakistan's first ship in operation in Desert Storm with French ships
Sep	1992	First Pakistani ship recommissioned in service after duty in Gulf
Nov	1992	The <i>Munsif</i> begins transit to Pakistan
Apr	1995	The <i>Mujahid</i> transferred to Pakistan onboard ship
	1996	Three Dutch units begin converting to Troika control vessels
Apr	1996	Pakistan's second ship delivered
	1994	Belgium cuts force from ten to seven ships
	1996	Pakistan's second ship commissioned
Mar	1997	Belgium sells three ships to France
Oct	1997	France offers to cover part of cost if Dutch choose their upgrade
May	1998	Parliamentary election in the Netherlands, determining modernization
Jul	1998	The <i>Mujahid</i> commissioned to Pakistani Navy
	1999	Dutch modernization program begins
	2001	Belgian CUP to begin; first French ships with new sonars to begin trials
	2004	Belgium's CUP expected to be completed
	2005	France's sonar upgrade contract projected to be finished
	2020	Anticipated life duration of Belgian ships after undergoing SLEP

Worldwide Distribution

Belgium (10 purchased originally, 7 remaining)

France (13, including 3 former Belgian ships. One sold to Pakistan)

Indonesia (2)

Netherlands (15)

Pakistan (3)

Forecast Rationale

The Tripartite Minehunter program is probably the most successful of the European mine warfare shipbuilding efforts of the 1980s. With a total production run of 40 ships (although 45 were originally planned) the class is numerically the most significant in the European mine warfare fleet. In export terms however, it has been overshadowed by both its rivals, the British Sandown class and the Italian Lerici/Gaeta classes.

In many ways, this class was an early example in how to successfully run an international program. By eschewing rigidity and allowing the users to make alterations in the design where national preferences so required, the design and production processes went through quickly and efficiently. These lessons were applied by the Dutch for the later Trinational Frigate Consortium but ignored by the French in the Project Horizon Common New Generation Frigate. They remain a basic model for all multinational programs, and illustrate that flexibility, not rigid standardization, is the key to success.

Although assured of a viable home service base and an extensive production run, the Tripartite minehunters never saw any great export success. Orders were limited to two customers: Indonesia, which produced

two ships and Pakistan, which bought three. Outside this small success background, the type was usually beaten by the Italian Lerici or Gaeta classes or, more recently, the Swedish Landsort class. Exactly why the Tripartite Minehunter never achieved more success is something of a mystery; the design was competitively priced, equipped with reliable and well-proven systems and has a good combat record.

The Tripartite design has now been overtaken by the development of stand-off mine warfare techniques. These allow a mother ship to control unmanned vehicles that enter the suspect area for mine clearance. This technology means that the mother ship does not have to enter such areas and therefore does not have to be equipped with elaborate signature suppression techniques. The Tripartite Minehunters and their equivalents are being retrofitted with such equipment but their chances of winning additional orders in the medium and long term are significantly reduced.

This means that the modernization and upgrade projects undertaken in the three original user countries will remain the only activity for this family of ships. Similar upgrades may also be supplied for the five export ships but that probably represents the limits of future sales.

Ten-Year Outlook

No new production is projected – only modernization and upgrade activity of the onboard systems will continue throughout the forecasting period; the forecast chart is therefore omitted.

* * *