

AMI PROJECT REPORT

AMI INTERNATIONAL, INC. – P.O. Box 30, Bremerton, WA 98337, USA – 360-373-2686

ITALY

Italy – Bergamini Class Frigate (NGF)

Rewritten – June 2009

Program Status:

Batch I: In Progress. The first two units are under construction at Fincantieri's Riva Trigoso yard. Both units will be commissioned by 2013.

Batch II: Four units (three through six) were ordered in January 2008. Will commence construction in 2010 through 2013 with commissioning from 2013 through 2017. These four units were financed by the Ministry of Industry.

Batch III: Two units (seven and eight) will probably be ordered in 2013 with delivery by 2019.

Batch IV: The final two units (nine and ten) will probably be ordered by 2015 with commissioning by 2021.

Operational Requirement: The Italian Navy (IN) has a requirement for a new class of multipurpose frigates to perform a wide range of patrol, anti-submarine warfare (ASW), anti-surface warfare (ASuW), and probably land attack missions.

Program Background: The IN is facing a block obsolescence problem as many of its existing surface combatants begin reaching the end of their operational service lives over the next fifteen years. Classes due for decommissioning over that time period include:

- Eight Maestrale class frigates, commissioned between 1982 and 1985, are due to begin decommissioning around 2011.
- Four Lupo class frigates were decommissioned in November 2003.

On 09 April 2002, the Italian Senate and House Parliament Committees approved a new program to develop, design and construct ten New Generation Frigates.

Program Acquisition Plan: On 09 April 2002, the Defense Commission of the Chamber of Deputies for Parliament approved a new program to design, develop and construct ten new generation frigates (NGF). On 26 September 2005, construction contracts were completed for the Italian (NGF) and French (FREMM) portions of the program. The Italian Government finalized its agreement with Orizzonte Sistemi Navali (a joint subsidiary of Fincantieri and Finmeccanica) and the French Government with DCNS. The finality of the Italian and French agreements was contingent upon the signing of an official Memorandum of Understanding (MoU) between the Presidents of France and Italy which was scheduled for 04 October 2005. However, due to funding issues on the part of the Italians, the MoU signing was delayed until 12 July 2006. The MoU serves as the vehicle in which the funds for the program (French and Italian) were allocated. In order to keep this program moving, some of the units were funded by the Ministry of Industry, vice the Ministry of Defense.

The first batch of two units was ordered in 2006, while the second batch of four was ordered in January 2008. It is expected that a third batch (units seven and eight) will be ordered by 2013 while the final batch (units nine and ten) will be ordered by 2015. This would bring the total number of Bergamini class frigates to ten. The entire NGF program will cost approximately US\$6.7B with an estimated cost of US\$670M per unit. The project is expected to continue through 2021 when unit 10 commissions.

Current plans call for four of the ten frigates to be used primarily in an ASW capacity, with the remaining six to be multi-purpose. The construction schedule for the class is as follows:

Design and Construction Considerations: The Bergamini class frigates will be approximately 139 meters in length (456 ft), and have a width of 19 meters (62.3 ft). Displacing approximately 5,900 tons, the frigates will be capable of attaining 27 knots. To reduce cost and risk, Fincantieri will probably incorporate significant aspects of other combatant construction programs, including the Horizon class destroyers, and the Cigala Fulgosi (P-1500) class offshore patrol vessels (OPVs – the New Minor Combatants/Nuova Unità Minore Combattentes [NUMCs]).



Multipurpose Frigate from Fincantieri



Lupo Class Frigate



Maestrale Class Frigate

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Hull	Name	Construction Start	Launched	Commissioned
1	<i>Carlo Bergamini</i>	4-Feb-08	2010	2012
2	<i>Carlo Margottini</i>	2009	2011	2013
3	<i>Unnamed</i>	2010	2012	2014
4	<i>Unnamed</i>	2011	2013	2015
5	<i>Unnamed</i>	2012	2014	2016
6	<i>Unnamed</i>	2013	2015	2017
7	<i>Unnamed</i>	2014	2016	2018
8	<i>Unnamed</i>	2015	2017	2019
9	<i>Unnamed</i>	2016	2018	2020
10	<i>Unnamed</i>	2017	2019	2021

A. **Hull, Mechanical, and Electrical (HM&E):** The NGF will probably feature many of the stealth characteristics found in the Cigala Fulgosi (P-1500/NUMC) class OPVs, including:

1. Inclined hull and superstructure surfaces to reduce the ship's radar cross-section (RCS).
2. The use of a radar reflecting mesh to screen the side openings in the superstructure housing the ship's boats.
3. Installation of an exhaust cooling system to reduce the infrared signature.
4. Extensive use of fiber reinforced plastic (FRP) composite materials in the superstructure and mast, thus saving weight, lowering maintenance requirements, providing enhanced ballistic protection, and reducing both the radar and infrared signature. Intermarine S.p.A was awarded a contract from Fincantieri to construct the superstructure and mast structure for the fourth unit of the Cigala Fulgosi (P-1500/NUMC) class OPVs, *Foscari*, out of FRP composite materials.

The Bergamini class frigate will be powered by a combined diesel and gas turbine (CODAG) arrangement. On 24 October 2006, the IN selected General Electric's LM2500+G4 engine built under license by Fiat/Avio. Isotta Fraschini (part of Fincantieri) will manufacture the 2,100kW generators for the Bergamini class frigates.

B. Combat Systems:

1. **Combat Management System (CMS):** The frigate will employ a variant of the SELEX and Datamat combat management systems produced for the Horizon program.
2. **Anti-Air Warfare (AAW) Systems:** The frigate will be equipped with the Systeme d'Autodefense Anti-Missile/Italian (SAAM/IT) point defense AAW system, which has the following components:
 - α. **The Aster 15 Surface-to-Air Missile (SAM).** The Aster 15 is a two-stage naval point defense missile manufactured by MBDA. The first stage, a solid propellant booster, separates from the second stage, the Aster "dart" a few seconds after launch. The Aster "dart" is equipped with a sustainer motor, a proximity fuse and a fragmentation warhead. Until mid-course, the missile is guided inertially, with target data being refreshed via an uplink from the EMPAR Multi-Function Radar (MFR). During the terminal phase the missile is guided by its intercept by an on-board active terminal seeker. The Aster 15 has a terminal velocity of Mach 3.5, and a range of between 2 and 30 km (1 to 16.2nm).

Series production of the Aster 15 began in late 1999 at MBDA's facility in Bourges-Subdray, France. *Charles de Gaulle* received the first production missiles in early 2000, and is the first ship to employ the missile in an operational environment.
 - β. **Aster 30 SAM:** The frigates will be equipped with A50 launchers (vice A43) for the Aster 30 long range SAM also manufactured by MBDA. The Aster 30 has a velocity of Mach 4.5 with a range between 3 and 120 km (2 to 70nm).

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- α. **The SYLVER (SYsteme de Launcement VERTical) Vertical Launch System (VLS).** The Aster 15 and 30 missiles are launched from the SYLVER VLS. The frigate will be equipped with two eight-cell SYLVER launchers. Direction des Construction Navales Service (DCNS) Ruelle, France initially developed the SYLVER VLS for Eurosam under a subcontract to Alenia.
- β. **The European Multi-function Phased Array Radar (EMPAR).** The MM/SPY-790
- γ. **EMPAR**, produced by SELEX, is a passive G-band, multi-functional radar (MFR) capable of providing:

- Long-range and medium-range search. Maximum detection range for 10m² radar cross-section (RCS) target is 120km (64.8nm), while a 0.1m² RCS target can be tracked at 50km (27nm).

- Multi-target tracking. EMPAR will be able to track 300 targets simultaneously (69 high-priority and 231 low-priority) and can engage up to 50 targets.

- Missile guidance support, including multiple channel fire control for in-flight guidance of up to 30 missiles.

The EMPAR is a single-faced radar that rotates at a rate of 60rpm.

3. Anti-Surface Warfare (ASuW) Systems: The IN, like many other Western navies, is showing increasing interest in naval surface fire support (NSFS) and land attack as capabilities needed to support expeditionary warfare operations in littoral waters.

Towards that end, Italy is developing both gun and missile systems intended to strike land targets from extended range.

- α. **Guns:** The IN main gun armament for the frigates will be the OTO Melara 127mm/54
- β. Lightweight (LW) gun mount. The prototype LW gun is a variant of the existing OTO Melara dual-purpose 127mm/54 "Compact" automatic naval gun mount, which is in service aboard a number of Italian and foreign navy warships. The LW gun will be able to fire all standard 5-inch ammunition, and OTO Melara plans to ensure that the mount will be interoperable with the newly developed extended-range ammunition, most notably the US (Raytheon) Extended Range Guided Munition (ERGM). OTO Melara is also developing a new family of 127mm rounds, including guided munitions and its own extended-range, fin-stabilized unguided round. The LW gun mount weighs 22 tons, can fire 35 rounds per minute, and is meant for installation in ships of corvette size and larger. Initial design work recommends the NGF have one 127mm installed.
- γ. **Surface-to-Surface Missiles (SSMs):** MBDA is currently developing prototype
- δ. components for the advanced Teseo (Otomat) Mk3 SSM (also known as the Ulysses), which is envisioned as a multi-role missile with both anti-ship and land strike capabilities. The Mk3 will be an advanced derivative of the earlier Mk2 SSM, and both will be turbojet-powered. The Mk3 will cruise at high subsonic speed before going transonic during its terminal approach. Autonomous guidance capabilities (INS and GPS) will be complemented by a datalink for in-flight re-targeting. Onboard radar and IR seekers will provide terminal guidance. The Mk3 missile body will be shaped to reduce its radar cross section (RCS), the radar and IR seekers will be located in a faired shark nose, and the missile will have a reduced infrared signature.

4. Anti-Submarine Warfare (ASW) Systems: The frigate will be equipped with the Thales Underwater Systems (TUS) 4110CL hull-mounted, active search and attack sonar, which is the same system on the



EMPAR



OTO Melara 127mm LWT



Teseo Mk3 Ulysses

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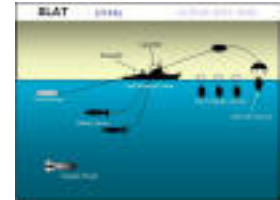
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Horizon class destroyers. The TUS 4110CL is part of the TUS 4100 family of hull-mounted sonars, and builds on the experience derived from the earlier Spherion and SONAR 2050 hull-mounted sonars.

The SALTO, or SLAT (Système de Lutte Anti-Torpille), surface ship torpedo countermeasures (TCM) system will provide the future frigates with a soft-kill TCM capability. The SLAT is a joint Italian/French system developed by Thomson Marconi Sonar, Direction des Construction Navales Service (DCNS), and Whitehead Alenia Sistemi Subacquei (WASS).

The SLAT is a fully integrated system that consists of the Alto 42-element towed sonar array for detection and the Contralto decoy system. In addition, the ASW variant of the Bergamini class frigate will receive an, as of yet unknown, active, hull-mounted sonar, as well as eight MBDA Milas ASW missiles.



SLAT

5. Electronic Warfare (EW) Systems: Electronic Warfare (EW) Systems: The Horizon class will also provide the baseline EW system for the future frigate. In the Horizon class, the EW system is being developed collaboratively by Thales and Elettronica. Thales is responsible for developing the passive portion of the system while Elettronica will develop the solid-state jammer.

6. Integrated Platform Management System (IPMS): The new frigates will be equipped with a Datamat IPMS.

7. Integrated Bridge System (IBS): The Bergamini class will be equipped with a Datamat IBS.

8. Integrated Communications Suite (ICS): The frigates will be equipped with a Datamat ICS.

Ship Characteristics:

Vessel Type	Frigate
Country	Italy
Program	New Generation Frigate (NGF)
Total Number	10
Unit Cost (US\$)	670M (€550M) (Est.)
Builder	Fincantieri's Riva Trigoso shipyard.
Hull Material	Steel
Displ. Tons	5,900 (full load)
Length	139m (456ft)
Beam	19m (62.3ft) (Est.)
Draft	4.5m (14.8ft) (Est.)
Machinery	Combined Diesel and Gas Turbine (CODAG); Two General Electric (GE)/Fiat/Avio LM 2500+G4 gas turbines; two Fincantieri VL1716T2ME diesel engines; two Isotta Fraschini 2,100kW diesel generators; two shafts; two controllable pitch propellers; two reduction gear sets.
Speed	27 knots (Est.)
Range	6,000nm at 15kts.
Complement	165
Weapons	Guns: One OTO Melara 127mm/54 Lightweight (LW) gun mount; two OTO Melara 76mm/62 Super Rapid gun mounts.
	Torpedoes: Four 324mm fixed torpedo tubes (two twin launchers) with Eurotorp MU-90 Impact lightweight ASW torpedoes. ASW Variant will likely have eight MBDA Milas missiles.

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Missiles	Surface-to-Surface Missiles: Eight MBDA Teseo (Otomat) Mk2 Block IV SSMs. In the future, the ships will likely carry the Teseo (Otomat) Mk 3.
CMS/Fire Control	Surface-to-air Missiles (SAMs): A mix of Aster 15 and Aster 30 SAMs in two 8-cell SYLVER A50 Vertical Launch System (VLS) launchers.
	CMS: Variant of the SELEX SADOC series.
Integrated Platform Management System (IPMS)	Fire control: Variant of the SELEX NA 30 (Dardo) combined radar/electro-optical fire control system x 2.
	Datamat IPMS
Integrated Bridge System (IBS)	Datamat IBS
Integrated Communications System (ICS)	Datamat ICS
Radar	Multi-Function Radar (MFR): SELEX MM/SPY-790. EMPAR (G band), also performing surface search, fire control, and navigation functions.
	Surface/air search: SELEX RASS (E/F band).
	Navigation: Sagem SIGMA 40.
Countermeasures	Fire Control: SELEX MM/RTN-25.
	Decoys: Two OTO Melara SCLAR chaff and decoy launchers.
	ESM: Thales Aerospace Systems ESM system.
Sonar	ECM: Elettronica solid-state jammer.
	Torpedo Countermeasures (TCM): Open. Likely SLAT.
Helicopter	TUS 4110CL hull-mounted active search and attack sonar (medium frequency).
	Flight deck and hangar for two mid-sized helicopter (NH-90) (Est.)