

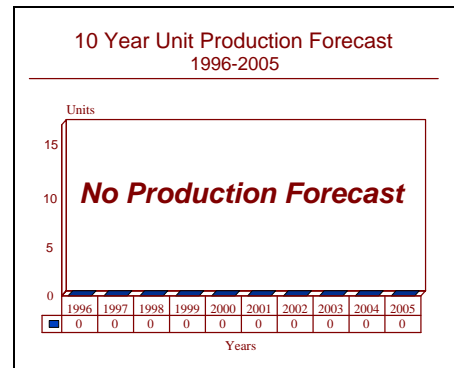
ARCHIVED REPORT

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FF-21 - Archived 8/97

Outlook

- Proposed for numerous requirements
- Production considered unlikely at this time
- Design being continually revised and improved



Orientation

Description. The FF-21 is a proposed design for a general-purpose frigate capable of being configured to meet user requirements.

Sponsor

Tenneco
Newport News Shipbuilding & Drydock Co
4101 Washington Ave
Newport News, Virginia (VA) 23607.
USA
Tel: +1 804 380 7447
Fax: +1 804 380 2778

Contractors

Tenneco
Newport News Shipbuilding & Drydock Co
4101 Washington Ave
Newport News, Virginia (VA) 23607.
USA
Tel: +1 804 380 7447
Fax: +1 804 380 2778
(Manufacturer)

John J. McMullen Assoc
Newport News, VA
USA
(Designer)

Licensee. No production licenses have been granted.

Status. Design project only.

Total Produced. No ships of this type have been ordered.

Platform. None.

Application. This design is intended to meet requirements from the export market. It can be outfitted for AAW, ASW or ASuW operations according to user requirements.

Price Range. According to statements released by Newport News representatives at the Navy League exhibition in Washington during 1993, the price of an FF-21 is estimated at approximately US\$400 million.

Technical Data

Dimensions (Light Frigate)

	<u>Metric</u>	<u>US</u>
Length:	87.8 m	290.6 ft
Beam:	12.7 m	42.0 ft
Draught:	3.75 m	12.3 ft
Displacement, standard:		1,750 tons
Displacement, full load		1,950 tons

Characteristics (Light Frigate)

Speed:	28 kts
Endurance	21 days
Range:	4350 nm at 10 kts
Crew:	15 officers, 57 enlisted)

Dimensions (Heavy Frigate)

	<u>Metric</u>	<u>US</u>
Length:	124.8 m	413.1 ft
Beam:	17.0 m	56.2 ft
Draught:	3.75 m	12.3 ft
Displacement, standard:		3,500 tons
Displacement, full load		3,870 tons

Characteristics (Heavy Frigate)

Speed:	31 kts
Endurance	30 days
Range:	5000 nm at 16 kts
Crew:	24 officers, 76 enlisted)

Weapons

	<u>Type</u>	<u>Quantity</u>
Missiles:	Mark 41 VLS	1x8 cell
	RAM Launcher	1x21
	Harpoon	2x4
Guns:		
Medium caliber:	5 in Mark 45	1
Small caliber:	40 mm	2x1
CIWS:	Phalanx Mark 15	2
Torpedoes:	Mark 32 tubes	2x3
Helicopter:	SH-60B	1

Propulsion

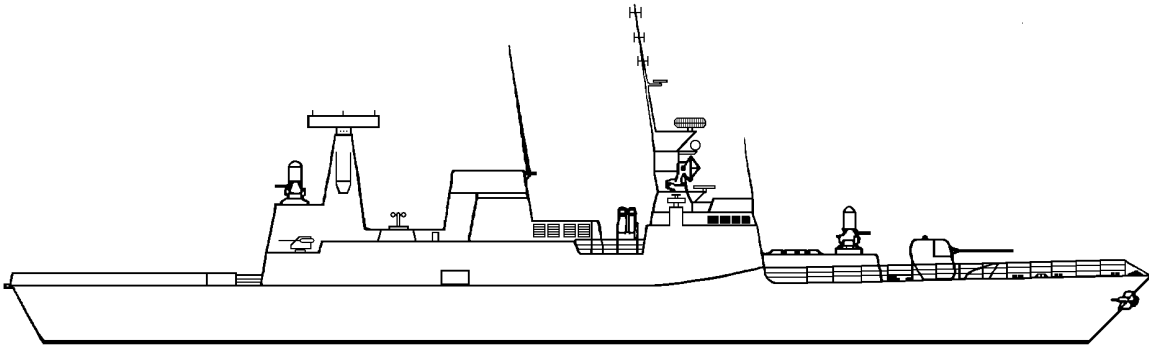
	<u>Type</u>	<u>Quantity</u>
Gas Turbines:	LM-2500	2x30,000 shp
Diesels:	MTU	2x4,420 shp

Design Features. The FF-21 appears to be a stretched and enlarged derivative of the Israeli Lahav class corvette. A more accurate assessment may be that the close resemblance between the designs results from a common design heritage and shared basic design principles. Examination of the original, light frigate design showed it to have a deep-vee hull form with a length-beam ratio of 6.4:1. This placed it perilously close to the S-90 "short, fat ship" design proposed (and discredited) in the UK during the 1970s and early 1980s. This design has now been substantially revised to a more conventional form. The propulsion plant is of the CODOG type using the diesels for long-range cruising and the gas turbines for high-speed runs.

Operational Characteristics. The electronics suite will be outfitted to a specific mission as stipulated by the customer. The sonar suite may consist of EDO's 796 hull-mounted sonar and the SQR-18 towed array sonar. The countermeasures will be a mix of active and passive units. The ships could have Raytheon's SLQ-32(V)2 receiver with the Sidekick ECM package, two Loral/Tracor Mark 36 SRBOC launchers, and the Aerojet SLQ-25 Nixie torpedo decoy system.

The weapons suite will be a mix of missiles, guns and torpedoes. The missiles can include a Mark 41 vertical launch system with eight cells, a 21-round RAM launcher, and two four-cell Harpoon anti-ship missile launchers. The guns will be two General Dynamics

Phalanx Mark 15 CIWS, one FMC 5 in L54 Mark 45 gun, and two 40 mm cannon. The torpedo tubes will consist of two Mark 32 triple tube launchers.



FF-21

Source: Forecast International

Variants/Upgrades

UAE Bid The version of the FF-21 offered to meet the UAE requirement for eight light frigates differed from the above-listed fit in many respects. These include a different sensor suite, featuring an SPS-49(V)5 search radar, an AWS-9 target acquisition radar and a Scout navigation radar. The electronic warfare system is the ARGOSystems APECS-II in place of the SLQ-32. The weapons fit has twin 30 mm Breda guns replacing the 40 mm weapons and two ten-round RALS missile launchers replacing the original 21-round RAM launcher. The RALS launchers are winged out to improve arcs of fire. The EDO sonar suite features a VDS rather than a towed array.

Light Frigate The version of the ship covered in this report is the basic light frigate variant.

Heavy Frigate A stretched version of the basic FF-21 design has been evolved to meet Turkish requirements. This features an enlarged Mark 41 system (to handle VL-ASROC) and other internal improvements.

Norwegian Frigate . A further enlargement of the Heavy Frigate design introduced to meet Norwegian requirements. This design is 125 meters in length, has further significant reductions in topweight and has a new weapons and sensors fit. This design is competing with a modified Lafayette class derivative for the Norwegian order.

Program Review

Background. In 1990, the Taiwanese Navy launched a requirement for a new class of light frigates to supplement the recently ordered Kwang Hua destroyers, a highly modified version of the US FFG-7 Perry class. These light frigates would be tasked with patrol, ASW and maritime policing roles. Newport New Shipbuilding & Drydock Company, with the assistance of John J McMullen, commenced work on designing a new class of light frigate to meet this requirement. Their bid was unsuccessful and the Taiwanese Navy selected the French Lafayette design as the basis for their light frigates.

This process was reversed when the French Government, under Chinese pressure, refused export clearance for the ships. The competition was reopened and the FF-21

design represented in competition with the German MEKO-140. The FF-21 was, once again rejected, this time in favor of the MEKO-140. However the German Government also refused an export license for the ships. Taiwan still refused to consider the FF-21. Eventually, Taiwan came to an agreement with France by which a group of six Lafayette class light frigates would be built in France but would be delivered disarmed and their weapons and sensors installed in Taiwanese yards. The second group of six ships would be entirely built in Taiwan.

In 1991, Newport News introduced the FF-21 design at the Defendory exhibition in Greece. This was followed by a presentation of the design at the US Navy League exhibition in 1992. At that time, Newport News stated

that the hull could be outfitted for any role from AAW to ASW. The new design would take approximately 42 months to build and would be fully operational when delivered to the client. This design was the subject of immediate and very severe criticism on structural, stability and general arrangement grounds.

Although the FF-21 design was included in the 1993 US Navy League exhibition, it was noticeably deemphasized. It returned to prominence in the 1994 exhibition when a modified version was presented. Although superficially similar to the earlier iteration, close inspection of the design model revealed many substantive changes. Discussions with Newport News representatives revealed that tank testing of the original design had confirmed that the criticisms made (summarized in an earlier edition of this report) were fully justified and that the design had many undesirable features.

Accordingly, the hull form was changed from a deep-vee design to a more conventional layout. This enabled the shaft line to be lowered, placing the machinery spaces deeper in the hull. This at once improved stability and increased internal volume available in the hull. The increased volume meant that ship functions previously located in the superstructure could now be placed inside the main hull, enabling the size of the superstructure to be reduced, further improving stability. Finally, a number of major changes were made to the bow profile to reduce wetness forward.

This drastically improved design which was offered to the UAE. In May, 1995, UAE sources stated that the FF-21 was placed third on the shortlist of three, the leading candidate being the Dutch Karel Doorman class followed by the French La Fayette. Although the FF-21 was still supposedly in the running for this contract at the end of 1995, a decision in favor of the Dutch proposals had, in fact, already been made by that point. The UAE eventually purchased two Kortenaer class frigates as an interim stage and between two and six LCF class destroyers as an ultimate solution. The deciding factor against the FF-21 is reported to have been the lack of any in-service ships of this type, making it an untried and experimental design.

An enlarged version of the FF-21 with increased armament and internal rearrangements has been offered to Turkey. A yet further enlarged version of the design was offered to Norway in response to that country's request for an Oslo replacement. The Norwegian variant is 125 meters in length and has further reductions in topweight to offset the load imposed by a strengthened weapons and sensors suite.

As of the time of writing, no decision has been taken on either program, but the FF-21 is not the favored candidate in either procurement. However, the design changes, made in response to customer specifications, and displayed for the first time at the 1996 Navy League Exposition, have turned the design into a realistic and acceptable warship.

Funding

The FF-21 program is a private venture, funded by corporate resources.

Recent Contracts

No contracts have been awarded.

Timetable

1990	Design work commenced
1991	New design introduced in Greece
1992	Design presented at US Navy League exhibition
1994	Design drastically modified

Worldwide Distribution

No ships are on order or in service.

Forecast Rationale

The FF-21 now being offered on the market is a much more conventional, realistic, and viable design than that originally presented to the market. The revised design introduced during the 1994 US Navy League exhibition answers many of the criticisms voiced by professional naval engineers. An assessment of the new design suggests that it will have lost some speed when steaming under ideal conditions, but will be as fast as or faster than the original design under realistic conditions. Seakeeping and sea-kindliness will be improved. Further improvements have rectified most of the original design's flaws. In reality, the 1996 FF-21 is a totally different ship from the original concept. Had the current design been offered five years ago, it probably would have stood a significantly higher chance of success.

While the current FF-21 design is a marked improvement over its predecessor, the basic situation still applies. In order to achieve penetration of this market, a new design has to offer very direct and tangible benefits over the competition at a competitive or lower price. Newport News claims this to be the case; the success or failure of FF-21 will hang on whether its claims can be justified. Here the FF-21 faces its most serious problem. It is a paper design based on theoretical projections competing with ships that really exist and are already at sea. This factor was successfully exploited by the Dutch in the UAE frigate competition, with a frigate identical to their proposal in the area for demonstrations purposes.

Even in its revised form, the FF-21 is claimed to be faster than the opposition, stealthier and having a longer operational radius. The hull design of the original FF-21 had a length-to-beam ratio of 6.4:1, a factor strongly against the achievement of any great speed. Now that the original deep-vee design has been eliminated, the new design indicates a length-to-beam ratio of 7.3:1, a distinct improvement. Some basic calculations suggest that the design will be unlikely to exceed more than 28-30 knots. This estimate was confirmed by data released in 1996, which showed a projected speed of 28 knots for the light frigate and 31 for the heavy frigate. This is very much in the same order as the MEKO-200 design. Operational experience has shown that this speed range is about ideal for a frigate. The power curve beyond this point is steep and the penalties for any further gain are very high for the minimal advantages so obtained.

Although the above-water layout shows attempts to reduce radar cross section, these are nullified by the

numerous excrescences on the hull and superstructure. No figures on tactical radius have been released, so the claims of superiority in this area are difficult to comment on; it seems unlikely that the ship has any great advantage in this respect. Claimed advantages in stealth and noise are of little import to the majority of potential buyers. The major advantage of FF-21, its low manning levels, are of crucial importance to the US and Royal Navy with their highly paid volunteer crews, but a matter of supreme disinterest to navies using low-paid conscript crews. Indeed, to those navies, minimal manning is a positive drawback since it severely limits the rate and volume at which they can train new sailors. In the UAE case, low manning is very attractive due to their small manpower pool.

Any cost advantages of the FF-21 design are a result of wishful thinking. The overwhelming majority of the costs on a modern warship are those of its weapons, sensors, and command systems. The hull only accounts for around 10 percent of the total. If substantial economies have been made, they must be in the weapons/sensors outfit and the costs of identical equipment will not differ greatly between designs. Indeed, MEKO probably has a significant advantage here because its adoption of a self-contained, containerized philosophy for its weapons makes systems integration very easy and facilitates economy of scale. This containerization adds to the hull cost of a MEKO, but the cost balances in warship construction minimize this penalty.

According to Newport News representatives, FF-21 will sell at around US\$400 million; this is more than 25 percent greater than the cost of a similarly configured MEKO-200 or Karel Doorman class frigate (and more than 33 percent greater than an FFG-7 or Type 23). This factor alone will kill the FF-21.

The fact is that FF-21 offers no significant merits, has a limited command system (and other, less obvious, weaknesses) and costs US\$100 million more per ship than the opposition. In this environment, no export sales can be anticipated. The Turkish requirement is likely to go to either a drastically modified FFG-7 or to a modified Type 23; the Norwegian contract to either the Lafayette or the modified Type. It is possible that the Israelis may acquire ships of this type as a follow-on to the Lahav class. The US Navy has no requirement for a ship of this type. The FF-21 will continue to be offered where requirements are stated, but unless there is a major US political effort to support the design and

unless the costs are subsidized to bring them into line with the competition, the FF-21 will vanish.

Ten-Year Outlook

No production is forecast.

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