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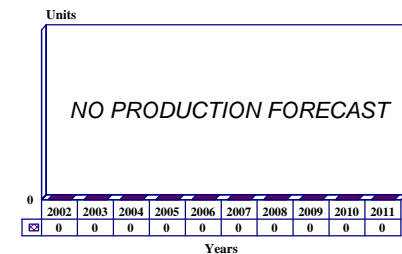
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F-17 Torpedo - Archived 5/2003

Outlook

- Production concluded
- Upgrades are being offered for the F-17
- France could offer for export F-17 torpedoes from its inventory
- This torpedo could be exported as part of larger arms deals involving the transfer of French surface combatants or submarines
- F-17's market is being taken over by newer heavyweight torpedoes

10 Year Unit Production Forecast
2002 - 2011



Orientation

Description. Wire-guided heavyweight acoustic homing torpedo with electric propulsion.

Sponsor. Délégation Générale pour l'Armement, Paris Armées, France. Export authority lies with the Commission Inter-ministérielle d'Exportation des Matériels de Guerre.

Contractors. DCN International, Paris, France, and ECAN, Saint-Tropez, France.

Status. Production and service.

Total Produced. The total production numbers are commercially classified. Analysis based on platform procurement and spares holdings suggests that about

500 units in all variants have been produced to date. This would also include conversions from the previous E-18 torpedo to F-17s with retrofit kits.

Application. The F-17 torpedo is intended for the destruction of both submarines and surface ships. However, the Mod 1 version was only designed against submarine targets or submarines which have a high noise profile and operate near the surface.

Price Range. The F-17 was estimated to cost between \$650,000 and \$700,000 in mid-1980s US dollars. Based on unofficial reports of recent bid offers, the current cost of the Mod 2 version is estimated to be close to \$1.2 million each.

Technical Data

Design Features. Fundamentally, the F-17 heavyweight torpedo series consists of two different calibers: the early models had a 550 millimeter diameter, while the current F-17 Mod 2 series comes in a 533 millimeter size that can be fitted up in 550 millimeter tubes if necessary.

The normal launch procedure calls for the torpedo to be wire-guided for the initial post-firing run. While being steered from the launching vessel, the torpedo is given a course and depth to steer for the post-wire run. If the

target is a surface ship, the torpedo remains on passive guidance for the entire terminal homing run. If the target is a submarine, the torpedo relies on passive guidance for the initial run and switches to active guidance for the final portion. In addition to the torpedo's 18,000 meters of wire, a typical French submarine carries 4,000 meters of wire. German submarines such as the Type 209 typically carry 8,000 meters of wire.

In the wireless launch mode, the torpedo steers a preprogrammed course and depth to the target, using its passive and active guidance modes for the terminal run.

The F-17 Mod 2 is very stealthy in its design, but in order to maximize the advantage drawn from the design and the ability to avoid enemy detection, the torpedo can be fired at two different speed configurations. Either the torpedo travels the entire distance at one speed, or it begins the approach at a slower speed and accelerates to top speed for the final leg of the delivery.

The latter option provides a longer total operating distance.

Furthermore, a special shallow-water operating mode can be selected and preset before the launch. In that mode, the sonar scan is limited in elevation, thus ignoring some of the reflection from the surface. Launch depth can be as much as 400 meters and maximum operating depth, 600 meters. Trim angle is no more than 40° and maximum turn rate, 12° per second.

	<u>Metric</u> F-17	<u>Metric</u> F-17 Mod 2	<u>US</u> F-17	<u>US</u> F-17 Mod 2
Dimensions				
Length	5.91 m	5.38 m	232.0 in	212.0 in
Diameter	550 mm	533 mm	21.7 in	21 in
Weight	1,428 kg	1,397 kg	3,145 lb	3,079 lb
Weight, warhead	250 kg	250 kg	550 lb	550 lb
Performance				
Range, maximum	18.5 km	20 km	20,200 yd	22,000 yd
Speed, maximum	65 km/h	74 km/h	35 kt	40 kt
Depth, maximum	500 m	600 m	1,640 ft	1,968 ft

Propulsion. The torpedo’s electrical propulsion system utilizes a silver-zinc battery to power an electric motor. This drives two counter-rotating propellers by means of a reverse differential gearbox.

Control & Guidance. The F-17 originally had a passive acoustic homing head. It was later replaced by an updated version, the F-17 Mod 1, which has an active/passive guidance system and is designed primarily for anti-submarine warfare.

The early models were designed for attacks against surface targets only. The F-17P, a dual-target version that permitted targeting of both surface ships and submarines, was introduced in 1985.

The Mod 2 and F-17S models have built-in counter-countermeasures systems that distinguish decoy activity and real target signature from clutter and enable these torpedoes to hit their targets even under the most adverse conditions. Additionally, the torpedo combines a relatively long operating range (18.5-20 km), high-speed capability (up to 40 knots), and great operating depths (maximum 600 m) with a capability to function with a great deal of stealth.

The maintenance concept of the torpedo has also been redesigned to improve on the record of earlier models, which have been in use with the French Navy since the 1970s. This has led to lengthening of the regular maintenance intervals to 18 months and has simplified those procedures considerably.

Launcher Mode. The torpedo can be launched off submarines or surface ships, in a wire guidance or alternatively automatic homing mode. Launching from a submarine can be done by either a pneumatic ram or a water ram (including turbo-pump set), or by allowing the torpedo to swim out of the tube.

This torpedo is standard equipment on all French submarines, including the Agosta class SSKs, Rubis and Amethyste class SSNs, and Le Redoubtable and L’Inflexible class SSBNs. Export users include Spanish and Pakistani Agosta class SSKs and the Saudi Arabian Type F 2000 and F 3000S frigates.

Warhead. The Mod 1 has a powerful warhead charge that consists of 250 kilograms of die-cast HBX explosive, equivalent to 450 kilograms of TNT. It is detonated by either a contact-initiated inertial fuze or an electric induction primer.



F-17 Mod 2B
Source: DCN

Variants/Upgrades

In addition to the original, several versions of the F-17 were developed, including the following:

F-17 Mod 1 – intended for submarine installations;

F-17P – the first polyvalent (multiuse) configuration;

F-17P Mod 1 – optimized for surface ships;

F-17P Mod 2 – a submarine-optimized version;

F-17 Mod 2 – upgraded model of the F-17 Mod 1;

F-17S – defunct series that would have had enhanced counter-countermeasures capabilities;

F-17 Mod 2 AWD – a new variant which incorporates a supplemental wake-homing sensor system (AWD or Acoustic Wake Detector); and the

F-17 Mod 1 AH-8 – an improvement and upgrade package that adds a new AH-8 homing head and replaces the existing batteries.

Fiber-Optic Guidance Wire. Thomson-Sintra has tested use of fiber optics for the torpedoes' wire guidance. The first trial, using 2 kilometers of cable, took place on December 22, 1987, and a second trial, with 20

kilometers of cable, on February 9, 1988. These were concept feasibility trials rather than tests aimed at a specific product. A data transmission rate of 41 megabits per second was achieved.

Conversion Packages. The manufacturer offers packages to convert other French heavyweight torpedo models to the F-17 Mod 2 standard using premanufactured kits. Spain has agreed to a modification package for converting 16 of their E-15 torpedoes to the new performance level.

A special version of the Mod 2 has reportedly been developed for installation on A-209 and TR-1700 submarines, with consideration for their mechanical interfaces and adaptation for swim-out discharge. Other modifications include those on fire control systems interoperability. Such upgrades are believed to be possible for most platforms with few changes.

All of the French Navy's F-17 Mod 1s have been brought up to the Mod 2 level. The key improvements include those on propulsion, homing head, and the CCM capabilities.

Program Review

Background. Although the French Navy had a wide range of torpedoes in the mid-1970s, new anti-torpedo countermeasures threatened to render them obsolete before the end of the decade. In the late 1970s, the Direction Techniques Constructions Navales (DTCN), which handled procurement for the French Navy, began research on a new submarine-launched anti-surface-ship torpedo with better guidance, one that would be less susceptible to countermeasures.

The improvements in surface ship anti-torpedo defenses and the growing capabilities of nuclear-powered submarines made a new torpedo, one that would replace the E-15 and the L-5, an urgent necessity. The L-5 had already been criticized for its short range, and when the E-15 was designed, there was criticism that it did not match the performance of many other Western torpedoes. The E-15 was primarily an anti-surface-ship weapon with a very limited anti-submarine capability. The French Navy saw a need for a dual-purpose weapon.

The new torpedo was designed primarily as an anti-surface ship counterpart to the L-5 Mod 4 anti-submarine torpedo which was being tested at that time. The first models were supposed to have been

ready for trials in late 1980, but problems in development forced the French to postpone the tests. The sea trials were held successfully during 1981 and 1982. The first operational models entered French service in 1983.

The new generation of nuclear submarines entering service in the 1970s created a need for an improved version with upgraded wire guidance. The F-17 Mod 1 was developed in the early 1980s and entered service in 1985. This was developed parallel to the F-17P, a modified version of the original F-17 anti-ship torpedo produced for Pakistan. While the F-17 Mod 1 was entering operational service, the French Navy and Thomson began developing a further upgrade, the F-17 Mod 2. This version underwent preproduction trials in mid-1986, with service trials taking place in mid-1987. The French Navy was simultaneously developing modification kits to upgrade the F-17 and the E-18 torpedoes to the F-17 Mod 2 standard.

Torpedo Models. Several versions of the F-17 were developed over the years. The following provides information on these systems.

F-17. F-17 is the original passive guidance torpedo introduced in 1973. It was built for submarine launches

only. Its diameter was 550 millimeters, or 21.7 inches. The original F-17 torpedoes can be upgraded to the Mod 2 or S standard.

When estimating the volume of existing F-17 inventories, it is worth noting that some F-17s are rebuilds based on older E-18 torpedoes, making the total assessment even more difficult.

F-17 Mod 1. This is an improved version of the original F-17 design. It is intended for submarine installations, and has search capability of 6 to 20 meters for surface ships and 30, 100, or 200 meters in submarine (passive) mode.

F-17 Mod 1: AH-8. DCN has also announced an improvement and upgrade package for the F-17 Mod 1. This adds a new AH-8 homing head on that torpedo and replaces the existing batteries with nickel-cadmium type. Performance enhancements include a detection range of 2,000 meters, a search depth of 25 meters, and a preset attack depth of 6-18 meters.

F-17P. This was the first polyvalent (multi-use) configuration of the basic original design, initially modified for service with the Pakistani Navy. Usable against both surface and submerged targets, it became available in 1985. Its range and operational depth (500+ m) are greater than the original F-17's, and it features active guidance for anti-submarine warfare.

F-17P Mod 1. Optimized for surface ships, this version of the F-17P dual-platform capability is 5,910 millimeters long and weighs in at 1,428 kilograms, offering a range of 20,000 yards at 35 knots.

F-17P Mod 2. A submarine-optimized version. Its length is only 5,620 mm and it weighs 1,320 kilograms. Powered by a PB32 Ag-Zn battery, its range at 35 knots is rated at 32,000 yards (29 kilometers). Two running speeds are available: 28 knots in quiet operation, with a range of 18 kilometers; and 40 knots, with a reach of 11 kilometers. The search depth can be set at either 6 to 20 meters against surface ships or 30 or 60 meters against submarines.

F-17 Mod 2. This is the most recent, upgraded model of the F-17 Mod 1 that was first introduced in 1988. It features the industry-standard 533.4 mm (21 in) diameter, and its counter-countermeasures capabilities are highly sophisticated. It can make a 20 kilometer (22,000 yd) run at the speed of 40 knots, or, alternatively, it can utilize two different speeds for an even more effective coverage. The run can be started at 28 knots for up to 18,000 meters, switching over to a

high-speed attack mode, at 40 knots, for a final distance of no more than 11,000 meters. At 85 kW, the motor is more powerful than its predecessors, making possible the described dual-speed option. At high speed, the F-17 has the capability to pass even the most evasive targets. Maximum effective depth is about 600 meters.

According to French reports, the F-17 Mod 2 can very effectively discriminate between most torpedo countermeasures systems and background ambient noise, thus increasing the probability of scoring a hit.

The Mod 2 version is available with a wake-homing retrofit modification. This system incorporates the German STN-Atlas Elektronik's AWD (Acoustic Wake Detector) system as an adjunct to the existing acoustics suite. The system is fitted in a 150 mm compartment immediately behind the transducer. The wake-homer is intended specifically to improve target discrimination against acoustic countermeasures.

A special version of this variant has also been built specifically for the Type A209 and TR-1700 submarines. This features mechanical interfaces and has been adapted for swim-out discharge (in lieu of pneumatic or water ram method).

F-17 Mod 2 - AWD. In May 1994, DCN announced a new variant of the F-17 Mod 2, which incorporates a supplemental wake-homing sensor system – AWD, Acoustic Wake Detector – developed by Germany's STN-Atlas Elektronik. This wake-homing system is supplemental to, rather than an alternative for, the existing acoustic homing seeker. The effect is to greatly enhance the torpedo capability against surface ships and to provide additional defense against countermeasures. This option includes an additional 15 centimeter (6 inch) segment behind the transducer section and a shorter tail fin so that the weapon retains the correct attitude in water.

F-17 Mod 2B. A version designated Mod 2B offers a brushless, low-speed synchronous motor to further reduce the torpedo's radiated noise. The warhead on this particular variant consists of a 250 kilogram Cast PBX pack, which equals 450 kilograms of TNT.

F-17S. A now-defunct series that evolved from the original F-17 design. Its counter-countermeasures capabilities were more sophisticated than those of the original F-17 but not at the same level as those of the current Mod 2. The range and speed properties were the same as those of the F-17P and Mod 1, but maximum attack depth had been increased to 600 meters.

Funding

The development and procurement of the F-17 torpedo and its variants were undertaken under French government contract through the Délégation Générale pour l'Armement.

US government funding specifically pertaining to the F-17 program has not been identified. The product has been developed under a corporate-funded program by the manufacturer. The procurement of the finished products takes place within the defense budgets of each customer navy.

Recent Contracts

No contractual information is currently available.

Timetable

<u>Year</u>	<u>Major Development</u>
1973	Development begins
1981	Initial sea trials commenced
1983	F-17 enters service
1985	F-17P (Mod 1) becomes available
1986	Spain and Portugal order F-17 Mod 2
1987	F-17 Mod 2 enters service
1988	F-17P Mod 2 available
1991	Tri-national MoU for Mod 2 replacement signed
1994	Wake-following sensor (AWD) offered for F-17
1999	Saudi Arabia's first F 3000S frigate delivered, using F-17s
1999	Pakistan's first Agosta 90B submarine delivered, also using F-17s

Worldwide Distribution

A small number of additional sales of the F-17 are possible. Saudi Arabia and Spain could procure additional F-17s to arm their French-built warships. Also, Pakistan may want to modernize its F-17 inventory through the procurement of upgrade kits. In 1998, **France** has offered Taiwan the F-17 torpedo, but so far no order has been placed.

User Countries. **France** (372), **Pakistan** (F-17/F-17 Mod 2: 40+), **Saudi Arabia** (40), and **Spain** (F-17/F-17 Mod 2: 40+). **Indonesia** is rumored to have procured the F-17 Mod 2 torpedo in 1994, but this sale remains unconfirmed.

Forecast Rationale

Although France is expected to see a steady stream of orders for its Scorpene submarine, further purchases of its F-17 heavyweight torpedo are not anticipated. With the arrival of newer alternatives, the market potential of the F-17 has slowly faded.

Now, further activity related to the F-17 is expected to be restricted to the procurement of upgrade packages for existing weapons. France could make available for export F-17s from its own inventory. These torpedoes

could be supplied as part of larger naval arms deals involving the transfer of surface combatants and/or submarines.

Overall, the market for the F-17 will likely be usurped by the newer torpedoes like the Black Shark and the DM2A4. A new national heavyweight torpedo design effort is not expected to be launched by France. One reason for this lack of activity is a shortage of resources within the French defense budget and a need to fund

other higher-priority programs. Instead, Paris could become involved in a new or ongoing multinational development program possibly involving Italy or another European nation.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

Missile	(Engine)	thru 01	<u>High Confidence Level</u>				<u>Good Confidence Level</u>				<u>Speculative</u>		Total 02-11	
			02	03	04	05	06	07	08	09	10	11		
DCN														
F-17 (a)	UNSPECIFIED	372	0	0	0	0	0	0	0	0	0	0	0	0
F-17 (b)	UNSPECIFIED	170	0	0	0	0	0	0	0	0	0	0	0	0
Total Production		542	0	0	0	0	0	0	0	0	0	0	0	0

(a) Procurement by France.

(b) Exports.