

ARCHIVED REPORT

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Le Triomphant Class

Outlook

- *Le Terrible* commissioned September 20, 2010
- No additional construction in this program
- New SSBN program will be needed in next few years
- Slow construction rate has preserved French industrial base and design skills

Orientation

Description. Nuclear-powered ballistic missile submarine, designated SNLE-NG (Sous-Marin Nucleaire Lance Engines-Nouvelle Génération).

Status. In service.

Total Produced. There are four submarines in the class.

Sponsor

DCN International
19 -21, rue du Colonel Pierre Avia
B.P. 532
F-75015 Paris
France
Tel: + 33 1 4736 8080
Fax: + 33 1 4097 5772

Pennant List

<u>Ship</u>	<u>Builder</u>	<u>Launch Date</u>	<u>Commission Date</u>
S616 <i>Le Triomphant</i>	DCN Cherbourg Dockyard	7/1993	3/1997
S617 <i>Le Temeraire</i>	DCN Cherbourg Dockyard	8/1997	12/1999
S618 <i>Le Vigilant</i>	DCN Cherbourg Dockyard	4/2003	11/2004
S619 <i>Le Terrible</i>	DCN Cherbourg Dockyard	3/2008	9/2010

Mission. French ballistic missile submarines are designed to carry the M5 submarine-launched ballistic missile (SLBM).

Price Range. The overall program cost for the first two submarines was \$16.5 billion as of March 1993. The unit cost for each submarine has since been estimated at \$7 billion.

Contractors

Prime

Le Triomphant Class

DCNS	http://www.dcnsgroup.com , 40-42, rue du Docteur Finlay, Paris, 75732 France, Tel: + 33 1 40 59 50 00, Fax: + 33 1 40 59 56 48, Email: info@dcn.fr, Prime
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Subcontractor

Eurotorp	http://www.eurotorp.com , 399 route des Cretes-Les Bouillides, B.P. 113, Sophia Antipolis, 06902 France, Tel: + 33 4 92 96 38 50, Fax: + 33 4 92 96 38 55, Email: et@eurotorp.com (Torpedoes)
Technicatome	120 Ave Pierre Latecoere, 31700, Blagnac, France, Tel: + 33 61 30 03 03, Fax: + 33 61 30 46 44 (Nuclear Reactor)
Thales Underwater Systems	http://www.thalesgroup.com/naval , 525 Route des Dolines, BP 157, Sophia Antipolis, 06903 France, Tel: + 33 4 92 96 30 00, Fax: + 33 4 92 96 41 24, Email: TUS@thales-underwater.com (DMUX-80 Sonar)

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Technical Data

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Length	138 m	453 ft
Beam	12.5 m	41 ft
Beam with Aft Planes Out	17 m	55.8 ft
Draft	12.5 m	41 ft
Height from Keel to Top of Fin	21.3 m	69.9 ft
Displacement		
Surfaced		12,640 tons
Submerged		14,335 tons
Performance		
Speed, Submerged	46 kmph	25 kt
Speed, Surface	37 kmph	20 kt
Diving Depth	300 m+	1,000 ft
Endurance	60 days	
Crew	15 officers, 96 NCOs and sailors	
Armament		
Missiles	M45/TN71 (to be replaced with M5/TN75)	16
Torpedoes	SM39 Sub Exocet L-5 Mod 3	18
Electronics		
Sonars		
Active/Passive Bow	DMUX-80	1
Passive Intercept	DUUX-5	1
Passive Towed Array	DSUV-61	1
Radar	DRUA-33	
Electronic Warfare		
ESM	DR-3000U	1
Command & Control	SAD	1
Fire Control	DLA-4A weapons system	
	<u>Type</u>	<u>Number</u>

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	<u>Type</u>	<u>Number</u>
Periscopes	Sagem SMS	2
Propulsion		
Main Propulsion		
Reactor	K-15 PWR	1x 150 MW
Electric Motor		1x 41,500 shp
Turbo Alternators		2
Auxiliary Diesel	SEMT-Pielstick 8PA4V200	1x 900 kW
Propeller	Pump-jet propulsor	1

Design Features. The early designs for the Le Triomphant class called for a length of 550 feet (170 m) and a submerged tonnage of 16,000 tons, but the design was scaled back. The final design is very similar in many respects to the British Vanguard class. A major visual difference is the placing of the flank sonar arrays in a single, continuous panel along the ship's side rather than in a group of three arrays at the bow, midships, and stern.

The submarine is powered by a K-15 pressurized water reactor generating 150 MW. This is an enlarged version of the CAS-48 reactor designed for the Rubis class attack submarines. It employs a triple pass for the reactor coolant and also exploits the more generous hull dimensions available to improve the layout of the piping and heat exchanger ducting. The reactor still uses a low-enrichment fuel called Caramel, and as a result requires more frequent fueling than the equivalent British or U.S. reactors.

The hull is built from HLES 100 steel (similar to the U.S. standard HY 130), which provides the submarine with a capability to withstand water pressures of more than 100 kg/mm². Diving depth is estimated to be at least 300 meters, but some sources quote figures as high as 500 meters (1,640 ft).

Operational Characteristics. *Le Triomphant* and *Le Temeraire* are commissioned with the M45/TN71 ballistic missile. The M45 is a three-stage solid fuel missile with a 2,860-nautical-mile (5,300-km) range and six multiple independently targetable re-entry vehicles (MIRVs), at 150 kilotons apiece. The M45 is an upgraded version of the M4/TN71, which uses the M4's first and second stages but has an improved third stage, new electronics, and new warheads. The new M5/TN71 was introduced with the third submarine. It is a three-stage solid-fuel missile with a 6,000-nautical-mile (11,115-km) range, and it carries at least five MIRVs.

As of the beginning of 2001, French nuclear forces included 60 ASMP missiles (Air-Sol Moyenne Portee, or air-to-surface medium-range stand-off nuclear missiles), with 42 TN81 warheads allotted to Mirage 2000N planes belonging to the Air Force and 24 ASMP missiles with 20 TN81 warheads assigned to the Super Etendards attached to the aircraft carrier *Charles de Gaulle*. At the beginning of 2001, France had 350 nuclear warheads with a total yield of 57 megatons in service. In other words, more than 83 percent of France's nuclear weapons in number and 75 percent in total yield are deployed aboard the country's SSBN fleet.

The Le Triomphant class boats have four torpedo tubes and 18 reload torpedoes. The L-5 torpedo and the SM39 submarine-launched Exocet missile are both carried. The torpedo has a range and speed in excess of 9.5 nautical miles and 35 knots, while the missile has a 38-nautical-mile range.

An all-new bow sonar, designated the DMUX-80, was developed for the Le Triomphant class. This is a spherical multifunction sonar with a bow-mounted passive/active sonar, and a series of passive hydrophones on the port and starboard sides. A computer and several control consoles integrate the output from the sensors. The submarines are equipped with the DSUV 61 passive towed array sonar and a DRUA-33 Calypso navigation radar, as well as a surface navigation radar.

The command and control system consists of two integrated subcomponents. The first is the SAD (Système d'Armes de Dissuasion), which controls the nuclear missiles; the other is the SAT (Système d'Armes Tactique), which integrates the information from the ship's sensors with the DLT-4A torpedo and anti-ship missile fire control system.

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Variants/Upgrades

The only upgrade currently scheduled is to replace the existing strategic missiles with the new M-51 as the submarines come in for refueling and refit. Plans to lengthen the hull in ships S-617 onward were scrapped.



FS Le Triomphant

Source: French Navy

Program Review

Background. The French government announced plans for a new ballistic missile submarine class in July 1981. The submarine, designed by the French Navy's Directorate des Construction Navales (DCN), would be the first of a new class of six ballistic missile submarines that would replace the Le Redoutable class submarines between 1996 and 2008. In 1983, the French Navy began building a large, covered facility at the Cherbourg Naval Dockyard for construction of the new submarines.

Funding the Deterrent

Funding for the first SNLE-NG was approved in 1985, and the French Navy ordered the submarine in June 1986. The French government also announced that the Le Triomphant class would be ordered at two- or three-year intervals during the 1990s. *Le Triomphant's* keel

was laid in June 1988. Shortly thereafter, the French Navy began ordering long-lead items for the second Le Triomphant class submarine.

In 1992, the French Minister of Defense announced that construction of the Le Triomphant class SSBNs would be curtailed at two units. Plans for the remaining four ships were canceled as a result of declining international tensions and the reduced threat. President François Mitterrand also stated that the number of ballistic missile submarines kept on patrol was to be reduced from three to one. U.K. Royal Navy sources, however, are quite adamant that the French Navy has never managed to have more than two ballistic missile boats at sea at any one time. Usually only one was so deployed – an effect of the French submarines requiring much longer refit times between patrols.

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Entering Service

Le Triomphant was launched from its building cradle on July 13, 1993, and entered service on October 24, 1996. The second ship of this class, *Le Téméraire*, was launched in August 1997 and carried out firing tests on the M45 missile in May 1999. The ship's service entry date repeatedly slipped, but it finally began service in July 1999.

During the launch ceremony of the lead ship, it was announced that the French Navy was to design a new, third-generation class of SSBNs, designated the *Le Vigilant* class, with construction starting in 2001. The first two ships of the new class would replace the old *Le Tonnant* (commissioned 1980) and *L'Inflexible* (commissioned 1985) in 2011 and 2012, respectively. The second pair would eventually replace the two existing *Le Triomphant* class subs. The 1992-1994 French budget contained \$2 billion for initial design studies on the new class, and final expenditure was estimated at \$15 billion. However, by late 1994, this plan had been abandoned due to financial stringencies, which made the development of a new class impractical.

As a result, two of the canceled submarines of the original *Le Triomphant* class were reinstated in 1996. *Le Vigilant*, which now became the third boat of the *Le Triomphant* class, was launched in March 2002 and was commissioned in November 2004. The fourth and last boat of this class, *Le Terrible*, was ordered in August 2000, with construction authorized at the end of August 2001. Originally, plans called for its completion

in 2008, but late in 2002 it was admitted that the ship would not enter service until July 2010. The ship was finally launched in March 2008, three years later than planned, and was scheduled for commissioning in July 2010. The submarine actually commissioned on September 20, 2010.

First Overhaul

The first submarine of this class was brought in for overhaul in April 2002. The overhaul was planned to cost \$133 million and to take 29 months, the submarine returning to service at the end of 2004; the ship actually returned to service in October 2004. The work performed on it included "removal of the nuclear propulsion system" (highly unlikely – more probably, removal of the existing reactor cores and refueling of the reactor), reactor tank work, hull repairs, and improvements to nuclear and conventional security arrangements. The work was undertaken in the drydock used to build the aircraft carrier *Charles de Gaulle*. The reactor cores were identified as having a life of five years.

In February 2012, Laurent Collet-Billon, Chief Executive of the Direction Generale de l'Armement (DGA), said that research and development expenditure on French strategic systems would increase to \$132 million per year from 2012. Much of this funding will be used to develop the new 3G (standing for third generation) class of SSBNs to replace the *Le Triomphant* class.

Related News

France Maintaining Nuclear Deterrent Force – France is maintaining a strong nuclear deterrent force. This force includes air-launched cruise and submarine-launched ballistic missiles. The air-launched missile is the ASMP-A (Air-Sol Moyenne Portee Ameliore). The ASMP-A has a 500-kilometer range and is carried by Mirage 2000N fighters. A squadron is based at Istres in Bouches-du-Rhone, southern France. In July 2010, a squadron of new Rafale jets stationed at Saint-Dizier in northeastern France took on part of the nuclear role. The Force Oceanique Strategique (FOST) is made up of four nuclear-powered Triomphant-class ballistic-missile submarines. These submarines will be gradually equipped with a new ballistic missile – the M51. France may introduce further upgrades to the M51 in the future. France's nuclear arsenal currently consists of fewer than 300 warheads. (BBC, 3/12)

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Funding

This program is funded by Direction Generale pour l'Armement (DGA) for the French Navy. The total program cost is estimated at \$16.5 billion. In the FY01 French defense budget, a total of \$260.3 million was authorized to fund the start of construction on the fourth and last submarine of this class.

Le Triomphant Class

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1981	France announces plans for new-generation ballistic missile submarine
Mar	1986	New missile submarine ordered
Oct	1986	First steel cut
Jun	1988	<i>Le Triomphant</i> laid down
May	1993	Second boat ordered
Jul	1993	<i>Le Triomphant</i> launched
Apr	1994	Sea trials begin
Jul	1995	First sea cruise
Oct	1996	<i>Le Triomphant</i> commissioned
	1997	<i>Le Triomphant</i> fully operational, with M-45 aboard
Mar	1997	First patrol mission for <i>Le Triomphant</i>
Jun	1997	<i>Le Temeraire</i> rolled out, with final outfitting and basin trials to follow
Aug	1997	<i>Le Temeraire</i> launched
Apr	1998	<i>Le Temeraire</i> officially begins trials
May	1999	M-45 missile fired successfully off <i>Le Temeraire</i>
Late	1999	<i>Le Temeraire</i> commissioned
Mar	2001	Original <i>Le Vigilant</i> projected launch date
Aug	2001	<i>Le Terrible</i> construction authorized
Apr	2002	<i>Le Triomphant</i> goes in for first refit/refueling
	2004	<i>Le Vigilant</i> commissioned; <i>Le Triomphant</i> completes first refit/refueling
	2008	<i>Le Terrible</i> launched
Sep	2010	<i>Le Terrible</i> commissioned
	2010	Refit with M-51 missiles

Worldwide Distribution/Inventories

France. Four in service.

Forecast Rationale

With the announcement by Laurent Collet-Billon, Chief Executive of the Direction Generale de l'Armement (DGA), that French government funding is now being allocated to the construction of a third generation of ballistic missile submarines, France has joined the U.K. and U.S. in the continued development of its strategic deterrent. The current research and development funding is scheduled to continue to 2016-2017, after which the detail design phase of the new submarines will commence. Assuming that existing construction patterns are maintained, the first submarines of the new class will be ready to start construction just as the last Barracuda class submarines are completed. This means the yards can shift smoothly to the 3G program.

This raises an interesting point. Britain has just started to spend serious money on a replacement for the Vanguard class SSBNs. Known as the SSBN(R) (see separate report in this tab) or Successor class, this procurement will stretch British defense funding far beyond the breaking point. A new French SSBN will be equally burdensome to procurement budgets and it is

already recognized that the nuclear research and development program will squeeze out French non-nuclear efforts. It has already been suggested that the British and French should combine their efforts in this area to produce a combined force that will serve both nations' interests.

An obvious problem here is the commonality between the British and U.S. SSBN fleets. SSBN(R) will have a high level of commonality with the U.S. SSBN(X) program (see separate report in this tab). Recent delays to SSBN(X) have put the U.S. Navy effort into much the same timescale as the British and French programs.

The problem is that the totally different French missile system does not lend itself to integration with a U.S. or British submarine design. However, it might be possible to produce a common submarine design that could accommodate either missile compartment. This would be an interesting example of modularity that would give the respective design teams some challenging opportunities.

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A more difficult problem to overcome would be the fact that ballistic missile submarines are the ultimate symbol of a great power. Sacrificing the ability to build their own, regardless of the economic and technical advantages from cooperation, is a step so filled with

political negatives that any government will be reluctant to move in that direction. The British and U.S. with their common missile compartment have probably gone as far as is possible in the present circumstances.

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