

IV. French nuclear forces

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France's nuclear arsenal consists of approximately 300 warheads for delivery by submarine-launched ballistic missiles (SLBMs) and air-launched cruise missiles (see table 6.5).¹ Four Triomphant class nuclear-powered ballistic missile submarines (SSBNs) form the backbone of France's nuclear deterrent, complemented by nuclear-capable combat aircraft.

France maintains one SSBN on patrol at all times. While the second and third SSBNs can be put to sea rapidly, the fourth would take longer because of its cycle of extensive overhaul and maintenance. France is currently upgrading its SSBNs to the new M51 SLBM, replacing the ageing M45 missile. The overhaul of the four submarines is expected to be completed by 2019.² As of early 2014, two submarines were each equipped with 16 M51.1 SLBMs. The second two submarines will be equipped with the M51.2 SLBM, an improved version of the M51.1. The first of the latter began this process in the summer of 2013 and is expected to return to service in 2016.³ The M51.2 is designed to carry the new Tête Nucléaire Océanique (TNO, Oceanic Nuclear Warhead) with a yield of up to 150 kilotons.⁴ France is also developing the M51.3, a future version of the M51 SLBM.⁵

Government documents indicate that France is beginning preliminary development work on a third-generation SSBN, with the goal to have an operational successor SSBN to the Triomphant class by 2030.⁶

On 5 May 2013 a test firing of a M51.1 SLBM failed and the missile self-destructed shortly after its launch in Audierne Bay, off Brittany, north-western France. The French Ministry of Defence disclosed no information on the cause of the failure but stressed that the incident did not call into

¹ For an in-depth review of French nuclear forces see Patton, T., Podvig, P. and Schell, P., *A New START Model for Transparency in Nuclear Disarmament: Individual Country Reports* (United Nations Institute for Disarmament Research: Geneva, 2013), pp. 17–23.

² French Senate, *Avis présenté au nom de la commission des affaires étrangères, de la défense et des forces armées (1) sur le projet de loi de finances pour 2014* [Opinions submitted on behalf of the Committee on Foreign Affairs, Defence and Armed Forces (1) on the finance bill for 2014], vol. 8, *Défense: Equipement des forces* [Defence: equipping the forces], no. 158 (French Senate: Paris, 21 Nov. 2013), pp. 51–52; and Lennox, D. (ed.), *Jane's Strategic Weapon Systems*, no. 54 (IHS Global Ltd: Coulsdon, 2011), p. 51.

³ 'Le SNLE Le Triomphant en refonte' [The SSBN Le Triomphant in overhaul], *Mere et Marine*, 20 Sep. 2013, <<http://www.meretmarine.com/fr/content/le-snle-le-triomphant-en-refonte>>.

⁴ French Senate (note 2); and Lennox (note 2), p. 50.

⁵ French Law no. 2013-1168 of 18 December 2013 on the military programme for the years 2014 to 2019 and miscellaneous provisions for defense and national security (1), 1 Jan. 2014, <<http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000028338825>> (in French).

⁶ French Law no. 2013-1168 (note 5); and 'La modernisation des forces nucléaires françaises' [The modernization of French nuclear forces], *Mere et Marine*, 5 Aug. 2013, <<http://www.meretmarine.com/fr/content/la-modernisation-des-forces-nucleaires-francaises>>.

Table 6.5. French nuclear forces, January 2014

Type	No. deployed	Year first deployed	Range (km) ^a	Warheads x yield	No. of warheads
<i>Land-based aircraft</i>					
Mirage 2000N	-20	1988	2 750	1 x up to 300 kt TNA	-20
Rafale C F3	-20	2010–11	2 000	1 x up to 300 kt TNA	-20
<i>Carrier-based aircraft</i>					
Rafale M F3	-10	2010–11	2 000	1 x up to 300 kt TNA	-10
<i>Submarine-launched ballistic missiles (SLBMs)^b</i>					
M45	16	1996	6 000 ^c	4–6 x 100 kt TN-75	80 ^d
M51.1	32	2010–11	6 000	4–6 x 100 kt TN-75	160 ^d
M51.2	–	(2015)	6 000	4–6 x up to 150 kt TNO	–
M51.3	–	–
Total					~290^e

() = uncertain figure; kt = kiloton; TNA = Tête Nucléaire Aéroportée (Airborne Nuclear Warhead); TNO = Tête Nucléaire Océanique (Oceanic Nuclear Warhead).

^a Aircraft range is for illustrative purposes only; actual mission range will vary according to flight profile and weapon loading.

^b France maintains sufficient SLBMs to equip 3 operational nuclear-powered ballistic missile submarines (SSBNs), with its 4th SSBN being overhauled.

^c The range of the M45 is listed as only 4000 km in a 2001 report from the French National Assembly's National Defence Commission.

^d Although the SLBMs have the capability to carry up to 6 warheads, President Jacques Chirac declared in 2006 that the number of warheads had been reduced on some SLBMs to improve targeting flexibility against regional powers.

^e France does not have a reserve but may have a small inventory of spare warheads for a total stockpile of c. 300 warheads.

Sources: Sarkozy, N., French President, Speech on defence and national security, Porte de Versailles, Paris, 17 June 2008; Sarkozy, N., French President, 'Presentation of SSBM "Le Terrible"', Speech, Cherbourg, 21 Mar. 2008; Chirac, J., French President, Speech during visit to the Strategic Forces, Landivisiau–L'Île Longue, Brest, 19 Jan. 2006; French Ministry of Defence, various publications, <<http://www.defense.gouv.fr/>>; French National Assembly, various defence bills; Norris, R. S. et al., *Nuclear Weapons Databook*, vol. 5, *British, French, and Chinese Nuclear Weapons* (Westview: Boulder, CO, 1994), p. 10; *Air Actualités*, various issues; *Aviation Week & Space Technology*, various issues; 'Nuclear notebook', *Bulletin of the Atomic Scientists*, various issues; and authors' estimates.

question the credibility of the French nuclear deterrent and that all five previous launch tests of the M51.1 had been successful.⁷

The airborne component of the French nuclear forces consists of two types of land-based (Mirage 2000N and Rafale C F3) and one type of sea-based (Rafale M F3) nuclear-capable combat aircraft. The Mirage 2000Ns are scheduled to be replaced by Rafale B aircraft in 2019. The aircraft

⁷ 'Le SNLE Le Triomphant en refonte' (note 3).

are equipped with the Air-Sol Moyenne Portée-Améliorée (ASMP-A, Medium-Range Air-to-Surface-Improved) missile. A mid-life refurbishment programme for the ASMP-A is scheduled to begin in 2022.⁸ The missiles are armed with the Tête Nucléaire Aeroportée (TNA, Airborne Nuclear Warhead) with selectable yields up to 300 kilotons.

⁸ French Senate (note 2), p. 52.