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Armaments, Disarmament and International Security

French nuclear forces

PHILLIP SCHELL AND HANS M. KRISTENSEN



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Contents

Table 6.5. French nuclear forces, January 2013

304

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IV. French nuclear forces

PHILLIP SCHELL AND HANS M. KRISTENSEN

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. France is currently upgrading its SSBNs to the new M51.1 SLBM, replacing the ageing M45 missile. As of early 2013 two submarines, *Le Terrible* and *Le Vigilant*, are equipped to be armed with up to 16 M51.1 SLBMs. *Le Vigilant* completed its overhaul in October 2012 and is expected to be fully operational again in the summer of 2013.² The third SSBN, *Le Triomphant*, is preparing to begin this process. The overhaul of all four submarines is expected to be completed by 2018.³ An improved version of the M51.1 SLBM, the M51.2, is designed to carry the new Tête Nucléaire Océanique (TNO, Oceanic Nuclear Warhead) with a yield of up to 150 kilotons and will replace the M51.1 after 2015.⁴

The air-based component of the French nuclear forces consists of two types of land-based (Mirage 2000N and Rafale F3) and one type of sea-based (Rafale M F3) nuclear-capable combat aircraft. The Mirage 2000Ns are scheduled to be replaced by Rafales in 2018. The aircraft are equipped with the Air-Sol Moyenne Portée-Améliorée (ASMP-A, Medium-Range Air-to-Surface-Improved) missile. The missiles are armed with the Tête Nucléaire Aeroportée (TNA, Airborne Nuclear Warhead), a new thermo-nuclear warhead that is reported to have a selectable yield of 20, 90 or 300 kilotons.⁵

¹ For an in-depth review of French nuclear forces see Kristensen, H. M., 'France', ed. R. Acheson, *Assuring Destruction Forever: Nuclear Weapon Modernization around the World* (Reaching Critical Will: New York, 2012), pp. 27–33.

² 'Le SNLE Le Vigilant retrouve l'Île Longue' [The SSBN Le Vigilant returns to Île Longue], *Mer et Marine*, 22 Oct. 2012, <<http://www.meretmarine.com/fr/content/le-snle-le-vigilant-retrouve-lile-longue>>.

³ Lennox, D. (ed.), *Jane's Strategic Weapon Systems*, no. 54 (IHS Global Limited: Coulsdon, 2011), p. 51; and 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 2013* [Opinions submitted on behalf of the Committee on Foreign Affairs, Defence and Armed Forces (1) on the finance bill for 2013], vol. 8, *Défense: Equipement des forces* [Defence: equipping the forces], no. 150 (French Senate: Paris, 22 Nov. 2012), pp. 46–47.

⁴ ed. Lennox (note 3), p. 50.

⁵ 'Les derniers ASMPA ont été livrés fin 2011' [The last ASMPAs were delivered in late 2011], *Mer et Marine*, 26 Feb. 2012, <<http://www.meretmarine.com/fr/content/les-derniers-asmpa-ont-ete-livres-fin-2011>>; and ed. Lennox (note 3), p. 48.

Table 6.5. French nuclear forces, January 2013

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 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^b</i>					
M45	32	1996	6 000 ^c	4-6 x 100 kt TN-75	160 ^d
M51.1	16	2010-11	6 000	4-6 x 100 kt TN-75	80
M51.2	-	(2015)	6 000	4-6 x TNO	-
Total					-290^e

() = uncertain figure; kt = kiloton; TNA = Tête Nucléaire Aéroportée; TNO = Tête Nucléaire Océanique.

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

^b France transitioned to a posture of 4 SSBNs in the mid-1990s, which meant having enough SLBMs to equip 3 operational SSBNs, with the 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 The missile upgrade started with the *Le Vigilant* submarine does not affect its warheads, which will be fitted back to the new M51.1 missiles.

^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, 17 June 2008, <http://archives.livreblancdefenseetsecurite.gouv.fr/information/les_dossiers_actualites_19/livre_blanc_sur_defense_875/livre_blanc_1337/discours_president_republique_1338/>; Sarkozy, N., French President, 'Presentation of SSBM "Le Terrible"', Speech, Cherbourg, 21 Mar. 2008, <<https://pastel.diplomatie.gouv.fr/editorial/actual/ael2/bulletin.gb.asp?liste=20080331.gb.html>>; 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.