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NUCLEAR WEAPONS INVENTORIES
OF THE EIGHT KNOWN NUCLEAR POWERS

Compiled by Bob Aldridge

This paper will describe the nuclear weapons inventories of the eight known nuclear powers: the United States, Russia, Britain, France, China, India and Pakistan who have all declared their nuclear capability, and Israel who has not.

I. NUCLEAR WEAPONS OF THE U.S.

Nuclear weapons deployed by the US are relatively easy to determine because they are announced and observable. Nuclear weapons which have been removed from service and stored are not as easy to keep track of. For instance, the INF Treaty specified that ground-launched cruise missiles and Pershing-2s removed from Europe were to be destroyed, but the nuclear warheads can be stored or recycled. There is no easy way to determine what warheads are still in the stockpile. Under various treaties and unilateral initiatives, some weapons are to be destroyed and others stored. The status of what is being held in reserve is also indeterminable without some sort of civilian verification method. So this paper is a best effort to outline the US nuclear potential of weapons actually deployed or in the active stockpile.

The US is developing computer simulations to monitor the nuclear stockpile. In mid-August 2001< Lawrence Livermore National Laboratory (LLNL) revealed the world's most powerful supercomputer made by IBM. Called the Accelerated Strategic Computing Initiative White (ASCI White), it has the power of 50,000 personal computers. Delivered to LLNL in 28 tractor-trailer semi-trucks, it has 8,192 microprocessors housed in a string or refrigerator-size boxes with a giant 3-megawatt air conditioning system. It occupies a space the size of two basketball courts.

A. AMERICA'S STRATEGIC NUCLEAR TRIAD.

The United States has since the outbreak of the cold war operated a strategic nuclear triad of weapons which can be launched from land, air, and sea. Today the land and air components of this triad have been ordered to stand down. The sea-based portion, however, remains as active as ever.

1. ICBMs -- The Land Leg.

Silo-based intercontinental ballistic missiles (ICBMs) compose the land leg of the triad. They are broken down to 50 MX missiles (euphemistically dubbed "peacekeeper" by the Reagan administration), and 500 Minuteman-3 missiles.

a. Missile-X (MX). Fifty MX missiles are deployed in converted Minuteman-3 silos. Each missile carries ten Mark-21 MIRVs. Each MIRV carries a 330-kiloton W-87 bomb. Under the START treaties all of these MX missiles will be removed. Deactivation will commence in October 2002.

b. Minuteman-3. 150 Minuteman-3 ICBMs have been downloaded per START-1 requirements to only carry one Mark-12 warhead with a 170 kiloton W-62 bomb. 50 Minuteman-3s still carry three Mark-12 MIRVs, each of which encases a 170-kiloton W-62 bomb. The other 300 Minuteman-3s are fitted with three Mark-12A MIRVs each, and each of these MIRVs hold a 335-kiloton W-78 bomb.

Minuteman-3 missiles have gone through a continuous string of improvements over the past decades, most notably in regard to its guidance system. The latest upgrade to be installed on all Minuteman-3s by 2008 will extend the service life until 2020 and provide the 300-foot accuracy of MX. The NS-20 guidance system is being replaced with the NS-50. Remotoring is another upgrade underway which entails recasting the solid propellant in the first and second stages and rebuilding the third stage. The liquid-fueled post-boost control engine to deploy the MIRVS (4^{th} stage) is also being refurbished.

Under the START-2 Treaty, all Minuteman-3 missiles will have their payload reduced to one warhead each. Then the 500 Mark-21/W-87 warheads removed from MX missiles -- which have advanced safety features and which will have the service life extended to 40 years -- will likely be used on the Minuteman-3s.

2. Bombers and Cruise Missiles -- The Air Wing.

Two types of heavy, long-range strategic bombers make up the air wing of the triad -- B-52s and B-2s.[1] These bombers can carry gravity bombs or air-launched cruise missiles (ALCMs). The new advanced cruise missile (ACM), of which some have been produced, is interchangeable with the older ALCMs.

In September 1991, strategic bombers were taken off 24-hour airstrip alert and their weapons stored. Under the START-2 Treaty a substantial portion of the strategic bomber force will be converted to primarily conventional use.

a. B-52H High-Altitude Bombers. There are currently 76 B-52H bombers active in the US strategic forces. They can carry 20 ALCMs each (12 externally under the wings and 8 internally on the rotary launcher). The Defense Department plans to maintain 44 to 56 of them in full operational status.[2]

b. B-2 Stealth Bombers. Twenty one B-2 radar-evading bombers have been deployed, including one test aircraft (prototype). The B-2 is a subsonic (slower than the speed of sound)

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[1]The Pentagon reports that all 93 B-1 supersonic bombers have now been converted for a conventional weapons role. They are still accountable under START-1 but would not be accountable under START-2.

[2]Cohen-1998, p. 58.

aircraft which is a high-tech resurrection of the flying wing from the 1950s, built by the same company. All 21 are deployed -- 16 of them will be kept at full operational status.

B-2s can carry up to sixteen B-61 or B-83 strategic nuclear bombs, or sixteen advanced cruise missiles (ACMs). In October 1992, the 4th B-2 made a practice drop of a Mark-84 conventional 2,000 pound bomb -- the biggest used in the Persian Gulf war. A conventional role for the B-2 has been demonstrated in the air strikes against Serbia.

3. SLBMs -- The Sea Leg.

The sea leg of the US strategic triad is made up of Trident-1 (C-4) and Trident-2 (D-5) submarine-launched ballistic missiles (SLBMs) carried in 18 Trident submarines. Two Poseidon submarines which have been converted to Special Operations Force use are also still accountable.

a. Trident-1 (C-4) SLBMs. There were originally 192 Trident-1 missiles deployed in eight Trident submarines (24 missiles each) based at Bangor, Washington on the west coast. Four of these submarines will be deactivated and converted to carry Tomahawk and other tactical missiles.[3] The other four are being refitted to carry Trident-2 missiles (one has completed refit and the second is in progress).

A Trident-1 missile can carry up to eight Mark-4/W-76 warheads. Each has 100 kilotons yield. A lesser number can be installed to achieve a greater range. It is reported that the Trident-1 missiles have been downloaded to 6 warheads each in compliance with START treaties.

b. Trident-2 (D-5) SLBMs. There are 240 Trident-2 missiles deployed in ten Trident submarines (24 missiles each) based at Kings Bay, Georgia on the east coast. No more than 400 of the 475-kiloton Mark-5/W-88 warheads for Trident-2 missiles were produced before they were canceled because of production and safety reasons. They are deployed on Trident-2 missiles along with 100-kiloton Mark-4/W-76 warheads. Both warheads can be on the same submarine but they are not mixed on a missile.

Two of the east-coast Trident submarines, carrying Trident-2 missiles, will be reassigned to the west coast in the fall of 2002.

B. US TACTICAL NUCLEAR WEAPONS.

Deployed tactical nuclear weapons are now restricted to tactical versions of the B-61 bomb and nuclear-tipped Tomahawk cruise missiles. All other tactical nukes which are based on land or on surface ships have been removed by treaty mandate or unilateral initiatives. Some have been destroyed and others stockpiled.

1. Tactical B-61 Nuclear Bomb.

Various tactical modifications of the B-61 bomb, including the Mod 11 earth-penetrating bomb, can be delivered by virtually any military fighter or attack aircraft. Such short-range air-delivered nuclear weapons, controlled by the US Air Force, have not been curtailed by any treaty or unilateral initiative. US aircraft capable of delivering this weapon are the A-4, A-6, A-7, AV-8B,

[3]Because there are no plans to remove the SLBM launch tubes, these four submarines will still be accountable under the START agreements.

F-4, F-15, F-16, F-18, F-111, and presumably the F-117 stealth fighter. NATO aircraft so capable are the F-4, F-100, F-104, and the Tornado.

2. Nuclear Tomahawk Cruise Missiles.

Nuclear-tipped Tomahawk cruise missiles have been removed from all US Navy surface ships. But the Pentagon still maintains the option to deploy them on submarines. There are perhaps 325 nuclear Tomahawks still available. Many of the original inventory have been converted to carry conventional warheads and used in regional wars.

3. Low-Yield, Earth-Penetrating Nuclear Weapon Study.

During Fiscal Year 2001, the Pentagon and the Energy Department were studying a new low-yield nuclear bomb that could be used in a regional war to penetrate deeply-buried command bunkers.[4] This study is mandated by a provision buried in the 2001 Defense Authorization Bill by Senators John Warner and Wayne Allard. A 1994 law currently forbids research and development on nuclear weapons of less than 5 kilotons yield because "low-yield nuclear weapons blur the distinction between nuclear and conventional war."[5] This law would have to be overturned before the low-yield bombs can progress beyond the study stage.

Nevertheless, in compliance with he Bush administration's Nuclear Posture Review, the national laboratories have been ordered to perform a $45 million feasibility study on low-yield, earth-penetrating nuclear weapons. Called the "Robust Nuclear Earth Penetrator," Work, which will last several years, began in April 2002. Scientists of the national laboratories agreed that it is more favorable to look at modifications of existing weapons that starting from scratch. Lawrence Livermore National Laboratory looking at modifying the B-83 hydrogen bomb. Los Alamos National Laboratory is investigating further modifications to the B-61 bomb.

For fiscal year 2003, which begins 1 October 2002, the House approved $15 million to continue studies of the Robust Nuclear Earth Penetrator. The Senate approved nothing. Status as of 6 September 2002 is that the House-Senate conferees will try to reach a compromise.

C. US NUCLEAR BOMB ACTIVE STOCKPILE.

This section, compiled from public sources and as accurate as those sources allow, reflects the active US stockpile only and does not include weapons that are waiting for disassembly at Pantex or are being held in reserve. The bombs are listed numerically by DOE warhead designation.

B-61, Mods 3 & 4 tactical bombs.

YIELD:	Selectable: 100-500 kilotons
SAFETY:	OPS, ENDS & IHE.
IOC:	1980
LABORATORY:	LANL
QUANTITY:	600 of Mods 3, 4 and 10 combined.
CARRIER:	US A-4, A-6, A-7, AV-8B, F-4, F-15, F-16, FA-18 NATO F-4, F-100, F-104, F-111, F-117 & Tornado.

[4]See Nelson. Also Pincus, 15 April 2001.

[5]Cited in Nelson.

B-61, Mod 7 strategic bomb.

YIELD:	Selectable: 300 tons-340 kilotons
SAFETY:	OPS, ENDS & IHE.
IOC:	1985
LABORATORY:	LANL
QUANTITY:	750
CARRIER:	US B-52

B-61, Mod 10 tactical bomb.

YIELD:	Selectable: 10-175 kilotons
SAFETY:	OPS, ENDS & IHE.
IOC:	1990
LABORATORY:	LANL
QUANTITY:	600 of Mods 3, 4 and 10 combined.
CARRIER:	US A-4, A-6, A-7, AV-8B, F-4, F-15, F-16, FA-18 NATO F-4, F-100, F-104, F-111, F-117 & Tornado.
REMARKS:	Converted back from W-85 Pershing-2 warheads.

B-61, Mod 11 earth-penetrating tactical/strategic bomb.

YIELD:	Selectable: 300 tons-340 kilotons
SAFETY:	OPS, ENDS & IHE.
IOC:	1997
LABORATORY:	LANL
QUANTITY:	600 tactical, 750 strategic.
CARRIER:	Reported that only the B-2 bomber is presently outfitted to carry this bomb.
REMARKS:	Started development prior to 1991. Conversion kit modifies Mod 7 (450 pounds heavier than Mod 7. Can penetrate up to 30 feet.

W-62 warhead for Mark-12 reentry vehicle on Minuteman-3.

YIELD:	170 kilotons
SAFETY:	No safety devices other than OPS.
IOC:	1970
LABORATORY:	LLNL
QUANTITY:	610
CARRIER:	Minuteman-3 ICBM.

W-76 warhead for Mark-4 reentry vehicle for Trident.

YIELD:	100 kilotons
SAFETY:	OPS & ENDS.
IOC:	1979
LABORATORY:	LANL
QUANTITY:	2,480
CARRIER:	Trident-1 and Trident-2 SLBMs.

W-78 warhead for Mark-12A reentry body on Minuteman-3.

YIELD:	335 kilotons
SAFETY:	OPS & ENDS.
IOC:	1980
LABORATORY:	LANL
QUANTITY:	920
CARRIER:	Minuteman-3 ICBM.

W-80, Mod 0 warhead for sea-launched cruise missile.

YIELD:	5-150 kilotons
SAFETY:	OPS, ENDS & IHE.
IOC:	1984
LABORATORY:	LANL
QUANTITY:	350
CARRIER:	Nuclear Tomahawk SLCMs.
REMARKS:	All stored since September 1991.

W-80, Mod 1 warhead for ALCM & ACM.

YIELD:	5-150 kilotons
SAFETY:	OPS, ENDS & IHE.
IOC:	1982
LABORATORY:	LANL
QUANTITY:	1,200
CARRIER:	B-1 and B-52 bombers.
REMARKS:	Taken off alert since September 1991

B-83 strategic bomb.

YIELD:	Low-yield to 1.2 megatons
SAFETY:	OPS, ENDS, IHE & FRP.
IOC:	1983
LABORATORY:	LLNL
QUANTITY:	3000 produced as of December 1986.
CARRIER:	US B-1, B-52, F-111, A-4, A-6, A-7, F-4, F-15, F-16 & F-18 aircraft. NATO F-4 & F-104 aircraft.

W-87, Mod 0 warhead for Mark-21 reentry vehicle (MX missile).

YIELD:	330 kilotons
SAFETY:	OPS, ENDS, IHE & FRP.
IOC:	1986
LABORATORY:	LLNL
QUANTITY :	525
CARRIER:	MX ICBM.

W-88 warhead for Mark-5 reentry Vehicle on Trident-2.

YIELD:	475 kilotons.
SAFETY:	OPS & ENDS.
IOC:	1990
LABORATORY:	LANL
QUANTITY:	400
CARRIER:	Trident-2 SLBM.
REMARKS:	Production halted, partly because of safety problems.

II. NUCLEAR WEAPONS OF RUSSIA.

After the collapse of the Soviet Union, the Soviet nuclear arsenal was spread among four countries: Russia, Ukraine, Kazakhstan and Belarus. All nuclear warheads have now been returned

to Russia and the other three countries have entered the Nuclear Nonproliferation Treaty as nuclear-free states. All missiles and silos have not yet been destroyed, to meet START-1 requirements, but that process is ongoing. Russia remains the only former Soviet republic with nuclear weapons.

This section will not try to itemize the nuclear weapons awaiting destruction or being held in reserve. It will only detail the strategic and non-strategic nuclear weapons believed to be actually deployed and operational in Russia.

A. RUSSIA'S STRATEGIC NUCLEAR WEAPONS.

Like the US and France, Russia has a strategic triad of nuclear weapons launched from land, air and sea. The land leg is the strongest.

1. Land-Based ICBMs.

This section will detail each ICBM based in the Russia. As of December 2000, it had some 762 ICBMs carrying about 3,546 warheads. . Specifications for each type follow.

SS-18 Satan (RS-20), Mods 4/5/6 ICBM

RANGE:	5,900 nautical miles
NO. DEPLOYED:	144 in silos
RVs/MISSILE:	10 MIRVs
YIELD/RV:	550/750 kilotons
CEP:	0.14 naut. miles (Mod 4)
FUEL:	2 stage liquid
LAUNCH:	Cold
IOC:	1979

SS-19 Stiletto (RS-18), Mod 3 ICBM

RANGE:	5,400 nautical miles
NO. DEPLOYED:	137 in silos
RVs/MISSILE:	6 MIRVs
YIELD/RV:	550/750 kilotons
CEP:	0.16 nautical mile
FUEL:	2 stage liquid
LAUNCH:	Hot
IOC:	1979

SS-24 Scalpel (RS-22), Mods 1 & 2 ICBM

RANGE:	5,400 nautical miles
NO. DEPLOYED:	36 rail mobile
RVs/MISSILE:	10 MIRVs
YIELD/RV:	550 kilotons
CEP:	0.1 nautical mile
FUEL:	Solid
LAUNCH:	Cold
IOC:	1987

SS-25 Sickle (RS-12M) ICBM

RANGE:	5,400 nautical miles
NO. DEPLOYED:	360 road mobile
RVs/MISSILE:	1
YIELD/RV:	550 kilotons
CEP:	0.1 nautical mile
FUEL:	Solid
LAUNCH:	Cold
IOC:	1985

SS-27 Topal-Ms ICBM

RANGE:	5,400 nautical miles
NO. DEPLOYED:	29 in silos
RVs/MISSILE:	1
YIELD/RV:	550 kilotons
CEP:	0.1 nautical mile
FUEL:	Solid
LAUNCH:	Cold
IOC:	1998
REMARKS:	A modified SS-25

2. Intercontinental Bombers.

Only three Russian bombers (counting two variants of the Bear H) are classified strategic because they are the only two with round trip intercontinental range without refueling. As of December 1997, Russia had 78 strategic bombers which could carry some 898 nuclear warheads. Details on the bombers follow. For convenience, missiles and bombs will be described under tactical weapons.

Blackjack (Tu-160) Strategic Bomber.

RANGE:	3,930 nautical miles
NO. DEPLOYED:	15
WEAPONS LOAD:	12 AS-15B ALCMs or 12 AS-16 SRAMs or 12 bombs
IOC:	1987
SPEED:	Mach 2.3
COMMENTS:	4 turbofan engines.

Bear H6 (Tu-95 MS6) Strategic Bomber.

RANGE:	3,720 nautical miles
NO. DEPLOYED:	32
WEAPONS LOAD:	6 AS-15A ALCMs or 6 AS-16 SRAMs or bombs
IOC:	1984
SPEED:	Mach 0.8
COMMENTS:	4 turbofan engines.

Bear H16 (Tu-95 MS16) Strategic Bomber.

RANGE:	3,720 nautical miles
NO. DEPLOYED:	31
WEAPONS LOAD:	16 AS-15A ALCMs or 16 AS-16 SRAMs or bombs
IOC:	1984
SPEED:	Mach 0.8
COMMENTS:	4 turbofan engines.

3. Submarines and SLBMs.

This section will be a more detailed description of each SLBM based in Russia. As of December 1997, Russia had 17 operational strategic submarines loaded with 348 SLBMs carrying a total of some 1,384 nuclear warheads. Specifications for each type follow.

SS-N-18, Mod-1 Stingray (RSM-50) SLBM

RANGE:	3,500 naut. miles
NO. DEPLOYED:	96
RVs/MISSILE:	3 MIRVs
YIELD/RV:	200 kilotons
CEP:	0.75 naut. miles
FUEL:	2 stage liquid
IOC:	1978
DEPLOYMENT:	On 6 Delta-3 submarines
COMMENT:	16 missiles per Delta-3.

SS-N-20, Mods 1/2 Sturgeon (RSM-52) SLBM

RANGE:	4,500 nautical miles
NO. DEPLOYED:	40
RVs/MISSILE:	10 MIRVs
YIELD/RV:	100 kilotons
CEP:	0.25 nautical miles
FUEL:	Three stage solid
IOC:	1981
DEPLOYMENT:	On 2 Typhoon submarines
COMMENT:	20 missiles per Typhoon. Stellar Inertial guidance (SIG) for midcourse and terminal updates.

SS-N-23 Skiff (RSM-54) SLBM

RANGE:	4,500 nautical miles
NO. DEPLOYED:	96
RVs/MISSILE:	4 MIRVs
YIELD/RV:	100 kilotons
CEP:	0.5 nautical miles
FUEL:	Three stage liquid
IOC:	1985
DEPLOYMENT:	On 6 Delta-4 submarines.
COMMENT:	16 missiles per Delta-4.

B. RUSSIA'S TACTICAL NUCLEAR WEAPONS.

Following is a listing of Russia's operationally deployed tactical nuclear weapons as best they can be determined.

1. Attack Aircraft.

Backfire (Tu-26) Bomber.

RANGE:	4,300 nautical miles
NO. DEPLOYED:	150
WEAPONS LOAD:	AS-16 SRAM Bombs
IOC:	1974
SPEED:	Mach 1.92 maximum
COMMENTS:	120 Land-based. 70 Naval

Fencer (SU-24 Fighter

RANGE:	
NO. DEPLOYED:	330
WEAPONS LOAD:	AS-16 SRAM Bombs
IOC:	
SPEED:	
COMMENTS:	280 Land-based. 70 Naval

2. Air-to-Surface Missiles (ASMs).

AS-15 Kent ALCM

NO. DEPLOYED:	718 estimated total manufactured
IOC:	1984
YIELD:	250 kilotons
RANGE:	900 nautical miles
SPEED:	Mach 0.6
CARRIERS:	Tu-95 Bear H, Tu-160 Blackjack
PROPULSION:	Turbojet

AS-16 Kickback SRAM

NO. DEPLOYED:	2,180 estimated total manufactured
IOC:	1989
YIELD:	350 kilotons
RANGE:	110 nautical miles
SPEED:	Unknown
DEPLOYMENT:	Tu-160 Blackjack, SU-24 Fencer Tu-26 Backfire, Tu-95 Bear H
PROPULSION:	Unknown

3. Sea-launched Cruise Missiles (SLCMs).

SS-N-19 Shipwreck SLCM

RANGE:	300 nautical miles
NO. DEPLOYED:	240 total all SLCMs
YIELD:	500 kilotons
IOC:	1980
DEPLOYMENT:	Submarines & surface ships
SPEED	Supersonic
COMMENTS:	Anti-ship missile.

SS-N-21 Sampson SLCM

RANGE:	1,620 nautical miles
NO. DEPLOYED:	240 total all SLCMs
YIELD:	200 kiloton
CEP	0.1 nautical mile
IOC:	1987
DEPLOYMENT:	Submarines
Speed	Supersonic
COMMENTS:	Long-range, land-attack. Can be fired from submarine torpedo tubes.

SS-N-22 Sunburn SLCM

RANGE:	215 nautical miles
NO. DEPLOYED:	240 total all SLCMs
YIELD:	200 kilotons
IOC:	1981
DEPLOYMENT:	Surface ships.
PROPULSION:	--
SPEED	--
COMMENTS:	Possibly an SS-N-9 improvement.

III. NUCLEAR WEAPONS OF BRITAIN.

Trident missiles in submarines are now Britain's only nuclear weapons.

A. BRITAIN'S STRATEGIC TRIDENT.

Britain's four Trident submarines -- *HMS Vanguard*, *HMS Victorious*, *HMS Vigilant*, and *HMS Vengeance* are all operational. British Tridents carry 16 missiles each (not 24 as do US Trident ships) so the maximum possible number of SLBMs that can be deployed is 64. Currently only one submarine is on patrol at any given time, and it carries no more than 48 warheads. It also has reduced readiness in which it takes days to fire a missile, not minutes. The total number of warheads available for deployment is less than 200.

The British Trident submarines will carry US Trident-2 (D-5) missiles, each capable of carrying up to eight 100-kiloton warheads. These warheads will be MIRVs, which means they can be sent to separate targets. Each Trident boat could strike up to 128 targets with a full load of warheads. Although current policy is to have only 48 warheads on each submarine, that policy could be changed under a new administration or because of changed world conditions.

Britain now plans to purchase only 58 Trident missiles from the United States, rather than 65. It is not clear if that includes missiles fired in demonstration and shakedown tests as each of the submarines entered service, or expended in operational tests after they are in service.

The accuracy of Trident-2 SLBMs makes them "hard target killers." Hard targets are heavily fortified with concrete and steel and usually buried deep in the ground. The ability to threaten another country's hardened command bunkers will significantly destabilize international relations.

Furthermore, Trident will threaten these targets over a larger geographic area. Trident-2 missiles are designed to travel slightly over 4,000 nautical miles with eight 475-kiloton bombs. But the British Trident, carrying smaller and lighter 100-kiloton bombs, should have a range close to 6,000 nautical miles. Even though only one submarine is on patrol at a time, those in their home port on the Clyde can still threaten almost half the globe. Its missiles will reach all of Africa north of the equator except Kenya, Somalia, and part of Ethiopia. The missiles would also reach all of the Mid-East including Afghanistan and Pakistan, and all of the former Soviet Union except the very easternmost part.

B. BRITAIN'S TACTICAL TRIDENT.

When *HMS Victorious* left its base at Faslane, Scotland on 7 January 1996 for its first patrol, it was carrying the first tactical Trident missiles as part of its missile load. Presumably the submarine currently on patrol will be loaded with two, four. Or six missiles that have a single nuclear warhead which can be used against any country threatening to use weapons of mass destruction. Weapons of mass destruction includes chemical and biological weapons as well as nuclear. In November 1993, then British Defence Secretary Malcolm Rifkind said the tactical Trident would be used to give "an unmistakable message of our willingness to defend our vital interests to the utmost."[6] Those vital interests that the tactical Trident is to protect were spelled out in Britain's 1995 Defence White Paper: "We have global interests and responsibilities ... As a nation we live by trade and investment ... Our manufacturing industry is dependent on raw materials from overseas. Our global investments are estimated to be worth about $300 million."[7]

Indication that Britain has a reduced yield warhead for a tactical Trident surfaced on 19 March 1998 when Ms. Roseanna Cunningham, Member of Parliament, asked the secretary of State for Defence to comment on the development and deployment of a lower-yield Trident warhead for its sub-strategic role. Mr. George Robertson replied: "The UK has some flexibility in the choice of yield for the warheads of its Trident missiles."[8]

IV. NUCLEAR WEAPONS OF FRANCE.

Next to the United States and Russia, France's nuclear arsenal has had the widest spectrum of weapons for both strategic and tactical use. Modernizations taking place are reducing variety and increasing aggressiveness.

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[6] *Heddwch*, Spring 1996, p. 7.

[7] *Heddwch*, Spring 1996, p. 7.

[8] Source: E-mail message from Scottish CND.

A. FRANCE'S STRATEGIC WEAPONS.

France, until 1996, operated a strategic triad but in 1996 the land-based missiles were deactivated. After the turn of the century it is expected that France's strategic nuclear force will be four ballistic missile submarines and about 45 Mirage-2000N strike fighters armed with ASMP cruise missiles. Following is a description of the current French nuclear arsenal.

1. Mirage-2000N Bombers with ASMP Missiles.

France has 60 of these aircraft configured for the nuclear role. Using drop tanks the Mirage-2000N can fly 970 nautical miles (1,800 kilometers) with terrain following sensors for low-altitude penetration. At higher altitudes it has a range of about 1,500 nautical miles (2,780 kilometers). Their top speed is Mach-2.2. Each aircraft can carry one Air-Sol Moyenne Portee (ASMP) missile.

2. Air-Sol Moyenne Portee (ASMP) Missile.

The ASMP, an air-to-surface medium-range cruise missile, delivers a TN-81, 300-kiloton bomb over a standoff range of up to 160 nautical miles (300 kilometers). It uses a liquid-fuel ramjet engine with an integrated solid propellant booster rocket to reach speeds of Mach-2 to Mach-3. It is estimated that almost 100 of these missiles were built with about 80 warheads available for them.

3. Submarines and Their Missiles.

France has four SSBNs -- *Le-Foudroyant (Le-Redoubtable* class*), L' Inflexible* (lead ship of its class), *Le Triomphant* and *Le Temeraire* (both of *Le Triomphant* class). Each holds 16 missiles.

The SSBN fleet is based at Brest with its communication infrastructure in Rosnay. The subs patrol in the Atlantic Ocean and the Norwegian and Mediterranean Seas. But they can also fire from their home port and hit targets in Russia. One or two are believed to be on station.

a. M-4 SLBMs. M-4A/B SLBMs are carried on *Le-Foudroyant* and *L' Inflexible*. Each M-4 carries six 150-kiloton MIRVed TN-70/71 warheads for a range of 2,370-3,240 nautical miles (4,400-6,000 kilometers). The Natural resources Defense Council places the number of M-4 SLBMs at 16, which is less than full loading for three submarines.

b. M-45 SLBMs. The M-45 is installed on the two *Le Triomphant* class subs. It uses the first and second stage from M-4 but has new electronics and reentry vehicles. It carries six 100-kiloton TN-75 MIRVed warheads for a range of 3,240 nautical miles (6,000 kilometers).

B. FRANCE'S TACTICAL NUCLEAR WEAPONS.

French tactical nuclear forces are composed of 24 Super Etendard Strike Aircraft equipped with one ASMP Missile each (ASMP missiles were described under strategic weapons above). They are based on the aircraft carrier *Foch,* home-ported at Toulon. When the aircraft carrier *Charles de Gaulle* becomes operational, it will assume the *Foch*'s role and the *Foch* will be laid up. Super Entendards have an unrefueled range of 324 nautical miles (600 kilometers) and fly at subsonic speeds.

The strategic Mirage 2000N bombers also perform the "pre-strategic," or tactical, role.

C. FRANCE'S NUCLEAR MODERNIZATION PLANS.

France's nuclear modernization plans address two types of missiles -- one launched from submarines and the other from airplanes.

1. M-51 SLBM.

The M-51 SLBM is expected to enter service in 2008, replacing the M-45. It will be able to carry up to six MIRVed warheads of updated existing design. Its range could be as great as 5,400 nautical miles (10,000 kilometers).

2. Le-Triomphant *Class SSBNs.*

The second ship of the *Le-Triomphant* class -- *Le Vigilant* -- is to be operational in 2004. The fourth is scheduled for 2008. They will displace 14,000 metric tons and will carry 16 missiles each. Initially they will be loaded with M-45 missiles fitted with improved penetration aids and lighter warheads. Starting around 2010 the submarines will be backfitted with the new M-51 SLBM. All ballistic missile submarines except the four new ones of the *Le-Triomphant* class will be retired .

3. ASMP-Ameliore (ASMP-A).

Sometimes referred to as ASMP-Plus, this is an improvement and eventual replacement for the ASMP. It will have better stealth characteristics and 500 kilometers range (rather than 300 for the existing ASMP) with the same weight and size. Initial deployment is projected for 2010 on the Mirage 2000N strike aircraft, and later on the Rafale navy strike fighters. On 29 December 2000 the French Defense Ministry awarded as US$215 million contract to Aerospatiale Matra Missiles, a subsidiary of the European aerospace group EADS, for initial development of ASMP-A.

4. Rafale Strike Fighter.

When these become available, the Rafale-D carrier version will first replace the Navy's Super Entendards starting in 2002. Deliveries of the Air Force nuclear-strike versions will start replacing Mirage-2000Ns in 2005.

5. Palen Nuclear Test Simulation.

France is developing a computer simulation of nuclear testing (as is the US) which will make it unnecessary to conduct actual nuclear explosions to develop a new warhead. The name of this program is Palen.

V. NUCLEAR WEAPONS OF CHINA.

The Peoples Republic of China does not have a large number of nuclear delivery vehicles. But they can deliver about 400 nuclear bombs.

A. CHINA'S STRATEGIC NUCLEAR WEAPONS.

China operates strategic nuclear forces delivered from land and sea. Dong Feng means "East Wind" and Julang means "Giant Wave."

1. Land-Based Missiles.

The land-based leg of the Chinese strategic forces is composed of CSS-3 and CSS-4 ICBMs.

a. CSS-3 (Dong Feng-4) ICBMs. The liquid-fueled CSS-3 (DF-4) ICBMs are four-stage missiles with inertial guidance. Their range is 2,970 nautical miles (5,500 kilometers) with a single 3-megaton warhead. They are based in caves and rolled out prior to launching. Twenty have been deployed since 1980.

b. CSS-4 (Dong Feng-5A) ICBMs. The liquid-fueled CSS-4 (DF-5) ICBMs are four-stage missiles with inertial guidance. They are silo-based. Their range is 7,000+ nautical miles (13,000 kilometers) with a single 5-megaton warhead. Twenty have been deployed since 1981..

2. Sea-Based Missiles.

China's sea-based strategic missiles are carried on one Xia-class, nuclear-powered submarine commissioned in 1988, which carries twelve CSS-N-3 missiles.

a. CSS-N-3 (Julang-1) SLBMs. Twelve solid-fueled CSS-N-3 SLBMs are submarine-launched and have a range of about 920 nautical miles (1,700 kilometers) with a single 250-kiloton warhead.

B. CHINA'S TACTICAL NUCLEAR WEAPONS.

Tactical missiles of China are launched from land and air. It is possible that some could be launched from a submarine.

1. Land-Based Weapons.

China's land-based tactical missiles are the CSS-2 and CSS-5. There is also a Dong Feng 31 in development which could start deployment in 2000 and will pose a particular threat to Taiwan. A new mobile, solid-propellant ICBM is also in development and could be operational by 2010.

a. CSS-2 (Dong Feng-3A) IRBMs. The liquid-fueled CSS-2 IRBMs have an inertial guidance system and a range of 1,500+ nautical miles (2,800 kilometers) with a single 3-megaton warhead. Forty are still operational. Deployment started in1971. They are gradually being retired.

b. CSS-5 (Dong Feng-21A) IRBMs. The solid-fueled, mobile CSS-5 IRBMs have a range of 970 nautical miles (1,800 kilometers) with a single 250-kiloton warhead. They are mobile. At least 48 have been deployed since 1985.

c. Artillery, Atomic Demolition Munitions, and short range missiles (CSS-6/DF-15 and CSS-7/DF-11). There are probably about 120 of these warheads in the low kiloton role.

2. Sea-Based Weapons.

There is one Soviet-built Golf submarine which the Chinese Navy acquired in the 1960s. It can carry three missiles but the type is not known. This vessel is probably only used for ICBM sea trials, if that.

3. Air-Launched Weapons.

China has two bombers capable of delivering nuclear weapons.

a. Hong-6 (B-6) Bombers. About 100 medium-range (1,670 nautical miles or 3,100 kilometers) Hong-6 bombers are deployed. They could carry two or three nuclear bombs. They are 1968 vintage based on the old Soviet Tu-16 Badger.

b. Qian-5 (A-5) Bombers. Some 30 of these are deployed in a nuclear role to deliver one bomb each. They have a range of about 215 nautical miles (400 kilometers). They are based on the Mig-19 design.

C. CHINA'S NUCLEAR MODERNIZATION EFFORT.

China has three ballistic missiles in development or nearing deployment.

1. Land-Based Missiles.

A new land-based ICBMs is in the Chinese pipeline. It is nearing deployment. Another new mobile, solid propellant ICBM is thought to be in development.

a. CSS-X-9 (Dong Feng-31). This is a mobile, 3-stage, solid fuel ICBM with a range of about 4,300 nautical miles (8,000 kilometers). It has a single-warhead payload of about 200 kilotons and its development has been ongoing since the 1980s. Deployment could take place by about 2005. At least three flight tests have been conducted so far -- the first in August 1999, the second earlier in 2000, and the third on 4 November 2000. This could also possibly be a silo-based replacement for the CSS-3.

2. Sea-Based Missiles.

One new SLBM is still believed to be several years away from deployment. China recently released photos of the upgraded version of "XIA" SSBN. According to Kanwa News, there are signs that one XIA Type 092A took part in military exercises during 2001.[9]

a. CSS-N-4 (Julang-2). This SLBM will have a longer range than the SS-N-3 -- about 4,300 nautical miles (8,000 kilometers). It could replace the SS-N-3 and/or be placed in a new submarine -- SSBN Project 094. This could be deployed by 2010 in a new class of nuclear-powered ballistic missile submarines. This missile is a variant of the Dong Feng-31.

VI NUCLEAR WEAPONS OF INDIA.

During border clashes with China in 1962, India fared poorly. When China conducted its first nuclear test in 1964, the balance of military force shifted unmistakenly in China's favor. India decided that an accelerated nuclear program was justified. Although Pakistan was a hostile threat at that time, it was China that first motivated India's nuclear program.

1. India's Bomb Program.

India purchased a nuclear reactor from Canada, and thus provided a case example of how a civilian nuclear power program can divert spent reactor fuel to a chemical reprocessing plant to make a nuclear weapon. The first Indian nuclear test was ordered in 1973, and that country exploded a

[9] *Kanwa News*, 30 November 2001.

12-kiloton atom bomb underground at Pokaran in the Rajasthan Desert on 18 May 1974. It was advertised as a peaceful use for nuclear explosives -- a futile attempt to stimulate water resources -- but it served notice to both China and Pakistan that India had the bomb. India than ostensibly abandoned its nuclear weapons program but threatened to restart it if Pakistan appears near to developing such weapons.

Nevertheless, India's nuclear technology reached the point in 1985 where it could produce plutonium at domestic sites free from outside inspection. By 1985 it had tons of plutonium stored without IAEA safeguards. India has not signed the NPT because it exempts from controls those countries already possessing the bomb. This plutonium storage caused international concern regarding illicit sales or acquisition by terrorists.

Pressure continued to mount in parliament for India to resume its nuclear bomb program. Then in 1985 the New Delhi government announced that its new reactor near Bombay could produce weapons-grade plutonium -- possibly enough for ten bombs. "This is a landmark in the country's atomic energy program," said then Chairman Raja Ramanna of India's Atomic Energy Commission.[10] India's current nuclear capability is as follows:

-- **The Cirus and Dhruva reactors** can theoretically produce more than 30 kilograms of weapons-grade plutonium per year; enough for four fission bombs. Other civilian reactors also produce plutonium.

-- **It was estimated in mid-1992** that India's stockpile of weapons-grade plutonium exceeded 300 kilograms; enough for forty or fifty atom bombs.

-- **Uranium enrichment** has also begun at two gas centrifuge plants but the capacity is still very low.

-- **Research work** at Bhabha Atomic Research Centre appears to be addressing fission for thermonuclear (hydrogen) bombs.

2. India Becomes A Nuclear Power.

Regional events caused concern for India. China embarked on an ambitious military modernization program, including the purchase of modern fighter planes from Russia. Military cooperation between Pakistan and China was signaled when China allegedly sold Pakistan road-mobile M-11 missiles capable of carrying a nuclear warhead for 156 nautical miles (290 kilometers), and M-9 missiles with a range of 432 nautical miles (800 kilometers). A 23 March 1994 report from India's defense ministry called for a complete reassessment of the regional threat because the quantity and sophistication of arms being acquired by Pakistan are beyond legitimate defense needs. The report also warned against the sale of F-16 fighter planes to Pakistan by the US.

Over the past decades the Indian government has maintained the position that it will keep the options open on nuclear weapons. But in March 1998 the newly-elected right-wing Bharatiya Janata Party said it would review the country's nuclear weapons policy and might "induct nuclear weapons" into the military arsenal.[11]

Then this new nationalist government, under the leadership of Prime Minister Atal Behari Vajpayee, announced that on 11 May 1998 it had detonated three nuclear bombs in the desert state

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[10]*Mercury News*, 9 August 1992, p. 18A.

[11]Cited in *Mercury News*, 19 March 1998, p. 4A.

of Rajasthan, close to the border of Pakistan. They were reported as low yield thermonuclear (fission) blasts. Two days later, on 13 May 1998, India detonated two more nuclear devices at the same location. It claimed that these were sub-kiloton explosions and were the last of the series.

3. India's Delivery Systems.

To compliment its nuclear program, India has also amassed the means of delivering weapons of mass destruction. The Agni-1 medium-range ballistic missile has a range of 648 to 971 nautical miles (1,200 to 1,800 kilometers). Agni-2 intermediate-range missile has a range of 1,080-1,350 nautical miles (2,000-2,500 kilometers). It can reach targets in China, Saudi Arabia, and Iran, as well as Pakistan. Both variants of Agni can deliver a 2,200-pound (1,000-kilogram) warhead and are nuclear capable. India says both missiles are now fully ready for operation and serial production will begin in 2001. That country could produce 18 Agni's a year but will not disclose how many are planned. There are currently 10 Agni-1s and two prototype Agni-2s in inventory.

India may also be working on an Agni-3 missile with a 1,890 nautical mile (3,500 kilometer) range and an Agni-4 with intercontinental range. The later is based on India's Surya-1 space launch vehicle which was successfully demonstrated in April 2001. The first test launch of Agni-4 could take place in 2004.

India also has a tactical, road-mobile, short-range ballistic missile called Prithvi which is nuclear-capable. It has a single liquid-fueled stage but with two engines. The Air Force version can reach out for 135 nautical miles (250 kilometers) with a 1,100 pound (500 kilogram) warhead. An 81-nautical-mile (150-kilometer) version has been developed for the Army and Navy. It has several options for warheads and has an accuracy of 820 feet (250 meters). In 2001 the Prithvi went into production to provide 300 missiles -- 150 for the Army, 100 for the Navy, and 50 for the Air Force.

An improved Prithvi-2 was tested on 31 March 2001. It is designed for a range of 135 nautical miles (250 kilometers).

Besides missiles, the Indian Air Force also has 131 French/British Jaguar-IS/IB strike-aircraft capable of delivering nuclear bombs. There are also some 165 MiG aircraft of the Soviet design. Both types are nuclear capable. There are also Mirage-2000 French bombers and Soviet-design SU-30K aircraft in the Indian inventory.

VII NUCLEAR WEAPONS OF PAKISTAN.

India and Pakistan have had strained relations since the 1948 partitioning of India which established Pakistan. Disputes have had ethnic-religious overtones but the bottom line is borders and territory -- especially in the Kashmir region. Wars were fought in 1948 and 1965. Enmity was heightened in 1971 when India stepped in with military force to help the liberation of Bangladesh (formerly East Pakistan). Then the competition turned to a nuclear standoff. In May of 1990 India and Pakistan faced off on the verge of a nuclear exchange. The crisis was defused by the Bush administration but kept from Congress and the American public because of high-tech sales to Pakistan.[12] The next time they go to war over the Kashmir, it might very well be nuclear.

Pakistan is another country with civilian nuclear reactors that has pursued a nuclear bomb program. Zulfikar Ali Bhutto launched Pakistan's nuclear weapons program in 1972, thereby creating another action-reaction cycle with India. After India exploded its bomb in 1974, the Pakistani leader

[12]See Hersh, "On The Nuclear Edge."

said his people would eat grass before they let the Indians get ahead. Pakistan is not a signatory to the NPT.

1. Pakistan's Bomb Program.

The 1973 oil "crisis" sparked a flow in cash in the Mid-East and countries such as Libya were willing to finance Pakistan's endeavor. Rising oil prices also created a boom in nuclear power stations, and enterprising countries started a uranium shortage scare to promote plutonium reprocessing plants. The extracted plutonium could be used for power plant fuel or for bombs. Pakistan ordered such a plant from France in 1975. In 1977 the US confronted France with evidence of Pakistan's intent and the sale was quietly canceled.

Meanwhile, Pakistani scientists working at the Netherlands' Urenco plant -- a British-Dutch-German consortium -- stole plans for the gas-centrifuge enrichment of uranium. Pakistan then built a similar facility at Kahuta, about 12 miles southeast of Islamabad. Pakistan then engaged in a clandestine program of obtaining critical equipment from abroad. By 1984 the Kahuta plant was operating.

A leaked US Defense Intelligence Agency report said Pakistan detonated its second high-explosive test during September 1986 as part of its continuing effort to develop an implosion trigger for a fission bomb. Intelligence reports also showed that Pakistan had enriched plutonium above the 90 percent needed for a bomb.

Although Pakistan's main effort so far appears to be on the simpler uranium bombs, it apparently has not given up on graduating to the higher technology of plutonium devices. On 31 December 1991, China announced that it was selling Pakistan a 300-megawatt nuclear reactor but that it would be subject to safeguards and inspection by the IAEA. But Pakistani Foreign Secretary Shahryar Khan said on 6 February 1992 that his country has the components and expertise to assemble a nuclear bomb -- the first time an official had publicly revealed the status of Pakistan's nuclear program. The “NRDC Nuclear Notebook” refers to a 40-50 megawatt thermal Khushab reactor at Joharabad in the Khushab district of Punjab which can produce either plutonium or tritium.[13]

Retired Pakistani Army Chief of Staff Mirza Aslam Beg revealed in July 1993 that his country's first successful nuclear test was conducted in 1987. Pakistan's industrial enriching plant now has the capacity to produce enough highly-enriched uranium to make 12 nuclear bombs a year. With the Iranian threat from the west as well as friction with India over the Kashmir to the east, there is no motivation for Pakistan's to slow its bomb-making effort.

2. Pakistan Joins The Nuclear Club.

After India’s five tests in May 1998, Pakistan leader fulminated about matching India’s accomplishment. International pleas for restraint and threat of sanctions were not successful. Prime Minister Nawaz Sharif announced that on 28 May 1998 that Pakistan had detonated five nuclear devices in the desolate Chagai (sometimes spelled Chaghi) region barely 30 miles from India. The number of actual tests has been disputed, and variously estimated from one to five. However, a Pakistani government spokesman said: “The long-range Ghauri missile is already being capped with

[13] *Bulletin of the Atomic Scientists*, January/February 2002, p. 70.

the nuclear warheads to give a befitting reply to any misadventure by the enemy."[14] The 1,080 nautical mile (2,000 kilometer) range Ghauri had been tested the previous April 6th.

On 30 May 1998 Pakistan conducted two more nuclear tests. Again there was dispute as to whether there were really two bombs or only one. Pakistan then announced that it had completed its planned series of seven tests.

3. Pakistan's Delivery Systems.

Pakistan first tested a ballistic missile on 25 April 1988 in its southern Thar Desert. The missile had the range to reach Bombay or New Delhi in India. Hatf-1 and Hatf-2 missiles are designed by Pakistan but with help from the Chinese. They are nothing more than the 156 nautical mile (290 kilometer) range Chinese M-11 missile.

In October 1990, US President Bush could not certify that Pakistan does not have an atomic bomb. Some $564 million in new military and economic aid was canceled along with $2.7 billion in previously-authorized military aid and sales, including 71 F-16 fighter jets. But that cancellation did not occur before the US provided its staunch ally during the Afghanistan war with $4 billion in aid, including delivery of 40 F-16 fighters which make excellent nuclear delivery vehicles -- 32 of which are reported still in service. Pakistan also has French-supplied Mirage-2000 aircraft.

In early May 1993, US officials alluded to reports and other indications that China might be shipping road-mobile M-11 SRBMs with spare parts to Pakistan. China rebutted that it was not violating its promise to stop selling delivery systems for mass destruction.

In August 1996, US intelligence officials concluded that construction work in the suburbs of the northern Pakistani city of Rawalpindi (near Islamabad), that it had been watching for a year, is a missile factory. It could be ready in a year or two to produce major missile components. On 2 July 1997 Pakistan test fired a 810 nautical mile (1,500 kilometer) range missile known as the Hatf-3. Experts in India argue that the Hatf-3 is really a Chinese M-9 with a new paint job. Pakistan first test fired its 377 nautical mile (700-kilometer) range Shaheen-1 missile on 15 April 1999 -- the day after the Ghauri-2 test described below. The Shaheen-1 is also believed to be a M-9 derivative. A two-stage, road-mobile Shaheen-2 has a 1,350 nautical mile (2,500 kilometer) range. Some say the Shaheen-2 is reverse engineered from North Korea's No Dong missile. Others say it is based on Chinese design.

On 6 April 1998, the month before exploding nuclear bombs, Pakistan tested its 810 nautical mile (1,500 kilometer) range Ghauri-1 (Hatf-5) missile which is capable of reaching a large portion of India. It is also said to be of the North Korean No Dong design. A year later -- on 14 April 1999, just days after India's Agni-2 test -- Pakistan tested its 1,080 nautical mile (2,000 kilometer) range Ghauri-2 (Hatf-6) missile. Any of the missiles described above could deliver a nuclear bomb.

VIII NUCLEAR WEAPONS OF ISRAEL.

Israel has not declared its nuclear capabilities but there is compelling evidence that it has at least 200 nuclear warheads. However, Israel has not signed the NPT so there are no legal restrictions on that country's nuclear activities. Its nuclear program dates back to the late 1940s -- from as long

[14]Associated Press dispatch, 28 May 1998.

as Israel has existed. As early as 1947 it was discovered that recoverable traces of uranium existed in the Negev Desert.

Much of the information below is paraphrased from Seymour Hersh's *The Samson Option*, an excellent history of how the Israelis developed their nuclear arsenal and how the US was bribed and blackmailed to look the other way.

1. Israel's Nuclear Beginning.

Israel's Atomic Energy Commission was established in 1952, under the military and unknown to the public. In 1955, under the Eisenhower's "Atoms for Peace" program, the Israelis obtained a small research reactor. It was installed at Nahal Soreq, south of Tel Aviv. But it was too small to produce enough plutonium for a bomb and too closely monitored for bomb-making activities to take place.

France and Israel agreed in 1953 to help each other in nuclear research. France, itself, was then striving to become a nuclear power. Israeli scientists worked closely with the French in designing the French bomb. They helped France build its elaborate reprocessing plant for plutonium. They also showed France a means they developed to make heavy water and better ways to mine uranium.

In return the French, starting in early 1958, helped Israel build its Dimona complex in the Negev Desert. France supplied a reactor and helped construct a reprocessing facility buried 40 meters (130 feet) below the surface. U-2 spy planes monitored this activity but the US did nothing to stop it.

Israeli scientists were trained at French plants and observed the first French nuclear explosion in February 1960. Later, Israel constructed a nuclear weapons assembly plant at Haifa, to the north, and heavily-fortified nuclear storage bunkers at its Tel Nof fighter base near Rehovot. Since there was so much internal opposition to an Israeli bomb, most of the work was accomplished by private funding from Jews living abroad.

2. The Yom Kippur War.

By 1973 Israel had at least 20 nuclear weapons. Three or more missile launchers had been operationalized at Hirbat Zachariah and there were some mobile Jericho-1 missiles. A squadron of nuclear-capable F-4 fighter aircraft was in underground bunkers at Tel Nof Air Force Base near Rehovot. Data from US KH-11 spy satellites was shared with the Israelis and helped them to target their weapons. According to Seymour Hersh, US policy toward this amassing of Israeli nuclear weapons was "a conscious policy of ignoring reality."[15]

Egypt and Syria launched a surprise attack against Israel on 6 October 1973 -- on Yom Kippur, the most sacred day on the Jewish calendar. It took Israel three days to fully mobilize. On October 8th Israel called its first nuclear alert. All completed nuclear missile launchers at Hirbat Zachariah were armed. Eight of the special F-4s at Tel Nof Air Force Base were put on 24-hour alert. Initial targets included the Syrian and Egyptian military headquarters. Israel blackmailed the US for conventional arms replacement or the Israelis would escalate to nuclear.

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[15]Hersh, *The Samson Option*, p. 319.

At this time Dimona had mastered the miniaturization of nuclear bombs to fit into 175-mm and 203-mm artillery shells. After the Yom Kippur war, Israel formed at least three battalions of nuclear-capable artillery. Each battalion eventually contained a dozen 175-mm artillery pieces with three nuclear shells apiece. The 203-mm pieces were later introduced.

3. The South African Connection.

On Saturday, 22 September 1979, a US Vela satellite passing over the southern Indian Ocean picked up the double-flash of a nuclear explosion. At least two Israeli naval ships had sailed to that area previously. Israeli experts as well as South African scientists observed what is believed to be the third test of a low-yield nuclear artillery shell for the Israeli Defense Force. According to Seymour Hersh, Israel "signed an agreement before the 1979 test calling for the sale to South Africa of technology and equipment needed for the manufacture of low-yield 175-mm and 203-mm nuclear artillery shells."[16]

4. The Exposed Nuclear Power.

Mordechai Vanunu exposed the Israeli nuclear program in a 5 October 1986 London *Sunday Times* article, complete with photographs. Vanunu, a nuclear technician for nine years at the Dimona plant, indicated that Israel was producing about ten nuclear weapons a year, and had already stockpiled possibly 200.

Vanunu was kidnaped in Rome and taken back to Israel to stand trial for "collection and delivery of secret information, with the intent to impair the security of the state, and acts calculated to assist an enemy in war against Israel."[17] He was convicted and sentenced to 18 years in prison. Vanunu stated before his abduction that, although he broke Israeli law, his was an act of conscience intended to serve the interests of Israeli democracy and world peace by bringing public knowledge and debate to bear on Israel's entry into the nuclear weapons club. Israel has never attempted to impeach Vanunu's integrity.

5. Israel's Present Nuclear Arsenal.

Israel has steadily progressed as a nuclear-weapons state. Israel may have planned to place nuclear land mines in the Golan heights during the early 1980s. By the mid-1980s Dimona had made hundreds of low-yield neutron bombs. In September 1988 Israel put its first satellite into orbit as a step toward gathering its own intelligence, and developing an intercontinental ballistic missile. Israel can also produce lithium deuteride for thermonuclear hydrogen weapons and is negotiating for a waiver from US laws and international agreements so it can obtain extremely powerful computer technology. Israeli scientists are working at the cutting edge of nuclear technology and are involved with intensive research into the next generation of weaponry.

Jane's Intelligence Review reported in late 1994 that the Israeli nuclear arsenal consisted of the following:[18]

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[16]Hersh, *The Samson Option*, p. 276.

[17]Farinella.

[18]Cited in *Chicago Tribune*, 19 November 1994, p. 14.

-- Weapons grade plutonium is being produced at the Dimona plant.

-- The Soreq Research Center, south of Tel Aviv, designs Israel's nuclear weapons.

-- The Palmikim Missile Test Range south of Tel Aviv on the Mediterranean Sea tests nuclear capable missiles.

-- A factory at Ba'er Yakov, west of Jerusalem, builds the nuclear capable Jericho-2 missiles.

-- A missile base at Kefar Zekharya, west of Jerusalem in the Judean hills, has 50 underground bunkers housing at least 50 nuclear-tipped Jericho-2 missiles.

-- Israel's nuclear weapons assembly and disassembly plant is at Yodefat, east of Haifa in the Galilee.

Jane's Intelligence Review also reported in 1994 that Israel has nearly 200 nuclear weapons in its arsenal.[19] Most observers agree that Israel's present nuclear arsenal is still around that number.

A Russian intelligence report asserts that Israel also has a store of chemical weapons. "At the present time Israel is capable of producing toxic substances of all types, including nerve-paralyzing, blister-producing and temporarily-incapacitating substances," said the report.[20]

6. Israel's Delivery Systems.

Israel is also improving the delivery systems for nuclear warheads. Air delivery could be made by a number of aircraft, including US-furnished fighters -- 75 F-4E, 62 F-15, and 205 F-16 aircraft.

Missiles for nuclear delivery are some 50 Jericho-1 SRBMs with a 270 nautical mile (500 kilometer) range, and about 50 Jericho-2 IRBMs with a range of 970 nautical miles (1,800 kilometers). During the 1991 war against Iraq, Israel moved mobile nuclear missile launchers into positions to target Iraq. A full-scale nuclear alert lasted for weeks.

Israel may also be developing a 2,590-3,780 nautical mile (4,800-7,000 kilometer) range Jericho-3 missile based on its Shavit space launch vehicle.

The Israeli Navy also has nuclear aspirations. In October 2000 the last of three state-of the-art, Dolphin-class, diesel-electric submarines was delivered from Germany. General assumptions and unofficial reports predict that these subs will be outfitted with modified Harpoon cruise missiles which could be nuclear tipped. Other reports have it that in June 2000 the Israeli Navy was testing land-attack cruise missiles from submarines off the coast of Sri Lanka. These missiles had a range of 1,500 miles according to the *Jerusalem Post*.[21]

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[19]Cited in *Mercury News*, 19 November 1994, p. 4A.

[20]AW&ST, 8 November 1993, p 29.

[21]Reported in WorldNetDaily.com, 27 October 2000.

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GLOSSARY.

ABM	Anti-Ballistic Missile.
ACM	Advanced Cruise Missile.
ALCM	Air-Launched Cruise Missile.
AS	Air-to-Surface.
ASCI White	Accelerated Strategic Computing Initiative White (a new supercomputer).
ASM	Air-to-Surface Missile.
ASMP	Air-Sol Moyenne Portee.
ASMP-A	Air-Sol Moyenne Portee-Ameliore.
CEP	Circular Error Probable -- the radius at which half the warheads are expected to hit.
CND	Campaign for Nuclear Disarmament.
ENDS	Enhanced Nuclear Detonation Safety.
FRP	Fire Resistant Pits.
ICBM	Inter Continental Ballistic Missile.
IHE	Insensitive High Explosives (in a nuclear warhead).
INF	Intermediate-range Nuclear Forces.
IOC	Initial Operational Capability.
LANL	Los Alamos National Laboratory.
LLNL	Lawrence Livermore National Laboratory.
MIRV	Multiple Independently-targeted Reentry Vehicle.
MX	Missile-X -- a US ICBM.

NATO	North Atlantic Treaty Organization.
OPS	One Point Safety (in a nuclear warhead).
RV	Reentry Vehicle.
SAM	Surface-to-Air Missile.
SLBM	Submarine-Launched Ballistic Missile.
SLCM	Sea-Launched Cruise Missile.
SRAM	Short-Range Attack Missile.
START	STrategic Arms Reduction Talks.
TASM	Tactical Air-to-Surface Missile.
US	United States.
USSR	Union of Soviet Socialist Republics.
Yield	The explosive power of a nuclear warhead measured in kilotons or megatons of conventional explosives.