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TRIDENT SUBMARINES:
AMERICAN AND BRITISH

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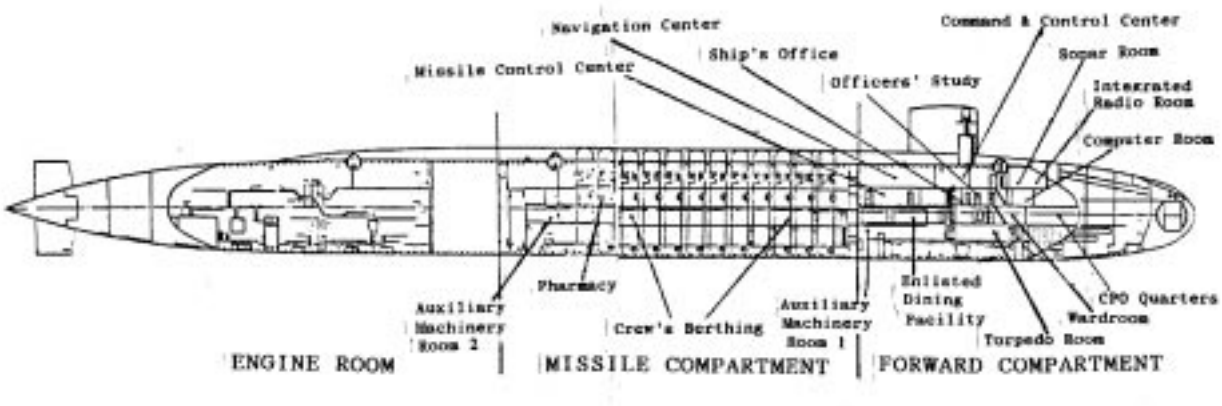
In 1967 the US Department of Defense engaged the Institute for Defense Analysis to study all options for modernizing the strategic triad of nuclear forces -- silo-based intercontinental ballistic missiles, bombers and bomber-launched nuclear weapons, and the submarine-launched ballistic missiles (SLBMs). In 1968 the Underwater Long-range Missile System (ULMS) emerged as the modification for the sea leg of the triad. ULMS was later called Trident.

AMERICA'S TRIDENT SUBMARINE.

Construction was started in 1976 on the *USS Ohio*, lead ship in the new Trident fleet. These submarines carry 24 missiles each and normally operate on a 100-day cycle -- 70 on patrol and 30 in port for resupply and refit. Appendix-A lists the 18 US Trident submarines and Appendix-C presents the US Trident submarine specifications.

By mid-1997 the final total of 18 US Trident submarines became operational -- eight out of Sub-Base Bangor on the west coast and ten from Sub-Base Kings Bay on the east coast. The ones at Bangor carry Trident-1 (C-4) missiles and the Kings Bay subs are loaded with Trident-2 (D-5)



US TRIDENT SUBMARINE LAYOUT
Source: US Navy

missiles. It was originally planned that the first eight Trident ships, which operate out of Bangor, would be refitted with Trident-2 missiles during their first ten-year overhaul. That was postponed but not canceled: "Backfitting of the C-4 capable SSBNs with the D-5 weapons system has been deferred to 2003."[1] That is the beginning of the second round of ten-year overhauls. Furthermore, the service life of each US Trident submarine has now been increased from 30 years to 42 years.[2] This allows for an additional two-year-long overhaul and another ten years of operation for each submarine.

A follow-on nuclear-powered ballistic missile launching submarine (SLBM) to Trident may be under way without public awareness. The US Navy is contemplating a replacement for its nuclear-powered attack submarines (SSNs). One option being investigated is for this new SSN to have a missile module that can be inserted in the middle.[3] The first Polaris submarines were made in this fashion, by inserting a missile section between two halves of an attack sub.

In September 1994 it was announced that the Pentagon's "Nuclear Posture Review" will cut the Trident force from 18 to 14 submarines when START-2 goes into effect. Under that treaty, each sub will still carry the full compliment of 24 missiles but each missile will be loaded with five warheads. The submarines to be retired will be the oldest four of the eight at Sub-Base Bangor, which carry the Trident-1 (C-4) missiles. The four remaining subs are scheduled to be refitted with Trident-2 (D-5) missiles.[4] Seven submarines could then be based on each coast, but that is not for sure.

Russia, however, has still not ratified START-2 and Pentagon officials are becoming impatient with spending money to keep scheduled-for-retirement forces active when they would rather use the money for other things. The Pentagon now wishes to reduce the US nuclear arsenal unilaterally before the START-2 Treaty takes effect. A *New York Times* article states: "Driven by budget constraints as much as diminished security threats, Pentagon officials are quietly recommending that the Clinton administration consider unilateral reductions in the nation's nuclear arsenal."[5] The article continues: "Since the United States has already committed itself to drastic cuts in its nuclear arsenal, the Pentagon believes that the unilateral reductions would have no effect on America's ability to deter a nuclear adversary.... The Pentagon has spent $95 million more over the past two years than it would have if START-2 had taken effect. Next year it would cost $100 million more, and the year after that, $1 billion.... With this budget crunch looming, the Pentagon submitted to Congress a highly classified report last April that outlined nine proposals for reducing the strategic nuclear arsenal."[6]

A San Jose, California *Mercury News* article stated: "The Chief of Naval Operations has told Congress for the first time that he would like to reduce the number of operational Trident ballistic

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[1]*ACIS-93*, p. 8.

[2]*The Day*, 20 February 1998.

[3]*The Day*, 17 June 1995, p. 1D.

[4]According to the *The Day*, 21 March 1998, the submarines to be converted will be the *USS Alaska, USS Nevada, USS Henry M. Jackson*, and *USS Alabama* in that order. Other reports, however, indicate that the four oldest will be retired.

[5]Myers.

[6]Myers.

missile submarines from 18 to 14, opening the way for Congress to repeal its ban against cutting US strategic nuclear force levels until the Russian Parliament ratifies the START-2 Treaty."[7] This insistence by the Pentagon that it is safe to further reduce strategic warheads, as opposed to Congressional legislation prohibiting such reductions, makes the maintaining of current force levels a political decision, not one based on national security. Nevertheless, there are hints that the Clinton administration's fiscal year 2000 budget request only supports 14 Trident submarines.[8] Whether that request is approved by Congress remains to be seen.

TRIDENT AS A STEALTH BATTLESHIP

It is unlikely that the four subs to be retired from strategic service will be decommissioned or mothballed. The Navy has contemplated using them to carry Tomahawk cruise missiles or troops in the role of a stealth battleship since at least 1994. Proposals to replace the missile tubes show that each submarine could carry up to 162 Tomahawks. Other possibilities are a mixture of 132 Tomahawks and 100 Special Operations Troops for covert missions. If used only as a troop carrier each sub could transport 400 troops.[9]

Again, as recently as January 1999, Pentagon advisors recommended that the four Trident subs removed from strategic service be converted to conventional missile platforms or covert troop ships.[10]

BRITAIN'S TRIDENT SUBMARINE.

In 1962 Britain decided to de-emphasize its strategic aircraft force and adopt submarine-launched missiles for the Royal Navy. Four submarines were built of British design but they carried Polaris A-3 missiles purchased from the US. The warheads were made in Britain but tested at the US Nevada Test Site. This force was assigned to NATO with two restrictions which nullify any real control by NATO: (a) only the British Prime Minister can order launch of the missiles and (b) Britain retains the right to launch the missiles without consulting with NATO officials. These Polaris submarines have now been retired.

In 1977 the British government set up a secret committee to determine a replacement for the Polaris fleet. That led to building a new fleet of four submarines which can carry fourteen missiles each. These are Trident-2 missiles purchased from the US. The submarines were designed by the British but the center sections, where the missiles are carried, are based on the design of US Trident subs. In fact, the missile launch tubes for the first boat were made by Westinghouse Marine Division in Sunnyvale, California. The submarines' pressurized water powerplants are designed to operate for seven years without overhaul. The four submarines are listed in Appendix-B. Their specifications are shown in Appendix-D.

The first British Trident submarine, *HMS Vanguard*, went on its first patrol in international waters on 13 December 1994. *HMS Victorious*, the second sub, started its first patrol on 7 January,

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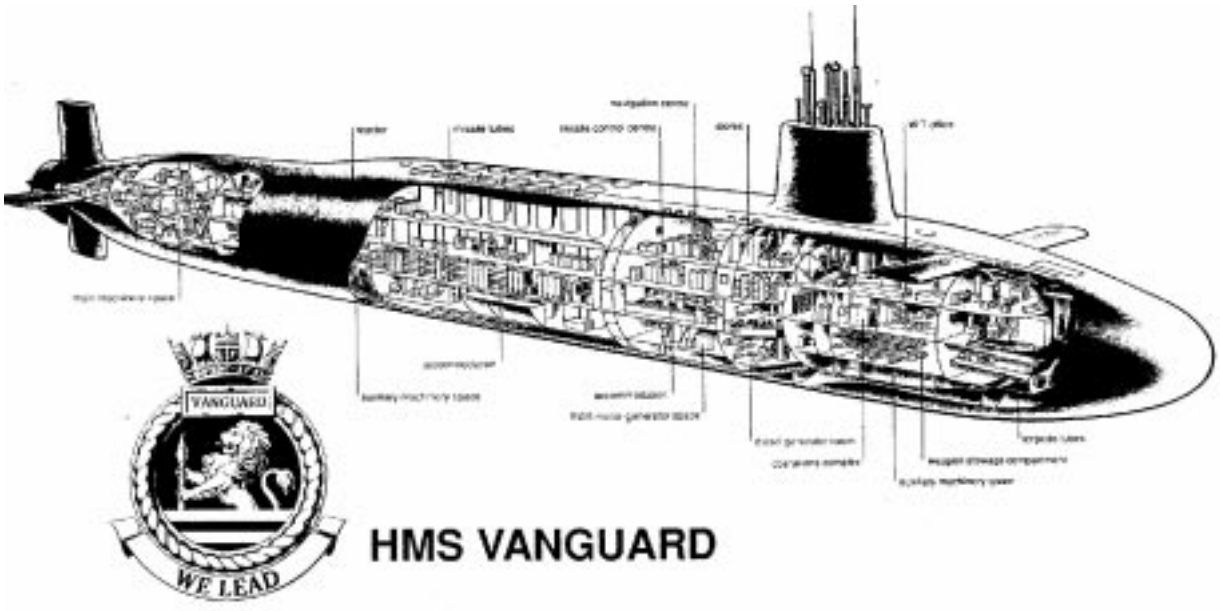
[7]San Jose, California *Mercury News*, 8 January 1999, page 18A of home edition.

[8]San Jose, California *Mercury News*, 7 February 1999, page 20A of home edition.

[9]*The Times-Union*, 8 November 1996. Also see *Defense News*, 12 December 1994, page 3.

[10]San Jose, California *Mercury News*, 30January 1999, page 16A of home edition.



BRITISH TRIDENT SUBMARINE LAYOUT
Source: British Ministry of Defence

1996. The British Campaign for Nuclear Disarmament (CND) speculates that *HMS Victorious* has assumed a tactical role -- that is, some missiles armed with one warhead aimed at a regional target such as in the Persian Gulf.[11] The third submarine, *HMS Vigilant*, commenced its first patrol on 3 December 1997. The fourth boat, *HMS Vengeance*, should start its first patrol in 2000.

HOME PORTS.

US Trident submarines are based at two locations -- Sub-Base Bangor in Washington state on the west coast, and Sub-Base Kings Bay in southern Georgia on the east coast.

Sub-Base Bangor on the Hood Canal was the first Trident home port established. It is located in Kitsap County across Puget Sound from Seattle. Submarine access to the base is from the Pacific Ocean through the Strait of Juan de Fuca and up the Hood Canal. The first Trident submarine, *USS Ohio*, arrived at Sub-Base Bangor on 12 August 1982. A full compliment of eight Trident submarines, armed with Trident-1 (C-4) missiles, now operates out of that port. Appendix-E provides a map of Sub-Base Bangor.

Sub-Base Kings Bay, the east-coast home port for US Tridents, is on the Cumberland Sound -- in Camden County of Georgia, a short distance from the town of St. Marys. Submarine access to the base is from the Atlantic Ocean through Cumberland Sound. The first submarine at this base was the *USS Tennessee* which arrived on 15 January 1989. In late 1997 the full compliment of ten submarines, all carrying Trident-2 (D-5) missiles, was operating out of this port. Appendix-F provides a map of Sub-Base Kings Bay.

[11]CND Press Release, 25 July 1995.

British Clyde Sub Base Faslane and Royal Navy Armament Depot (RNAD) Coulport are located along inlets, or lochs, off the Firth of Clyde. The former is on Gare Loch and the latter on Long Loch. Sub-Base Faslane handles the submarine refitting and routine maintenance between patrols.

RNAD Coulport is basically a weapons depot. That is where the British Trident warheads are stored, and where they are installed and removed from the submarine. It is also the storage and loading/unloading depot for torpedoes. The Trident missiles, themselves, are loaded and unloaded from British submarines at US Sub-Base Kings Bay, although they can be removed and installed at RNAD Coulport in an emergency. Appendix-G is a map of these two British submarine bases.

US FORWARD DEPLOYMENT.

Trident's presence has or will spread to the southwest Pacific and Indian Oceans. The additional ocean area in which the submarine can operate has always been the paramount justification for the Trident system. Covering more of the globe has become even more compelling with the strategic policy now leaning toward regional wars and nuclear expeditionary forces. But when patrolling off the Bay of Bengal or the Arabian Sea in crisis times, for instance, the Navy certainly wouldn't want to send the submarine all the way back to Bangor, Washington for periodic resupply and refit. There would have to be means of forward servicing.

Other than changing missiles, resupplying a Trident submarine can be done at any naval shipyard. Even the relief crew could be flown there for a change of command. The only time the submarine would have to return to its home port would be if a missile needed changing. Even then, that would not be necessary if a SSBN tender ship is used.

The US Navy has had five SSBN tender ships:

USS Proteus	AS19
USS Hunley	AS31
USS Holland	AS32
USS Simon Lake	AS33
USS Canopus	AS34

All were built from scratch except *USS Proteus*, which was converted from another ship to meet the early needs of Polaris submarines. According to US Navy documents, *USS Proteus* was retired in 1981 and scheduled to be decommissioned in late 1992. But as we shall see below, this ship has continued to support forward refits. The other four SSBN tenders were converted to handle Poseidon missiles. Later the *USS Simon Lake* and *USS Canopus* were again refitted for Trident-1 missiles, and probably Trident-2s. All of these tenders are now decommissioned according to information released to the media. But submarine tenders have a habit of turning up again, as we shall soon see.

1. SCOOP in the Pacific.

As mentioned above, the original argument for Trident was that the longer-range missiles give the submarine ten times the ocean area in which to patrol. But when discussion turns to forward bases to support use of that greater ocean area, the argument shifts to the other foot -- longer-range missiles allow Trident subs to patrol close to home port and still be able to attack their targets.

Longer-range missiles do allow the sub to be on-station as soon as it leaves port, but full flexibility is not achieved if the submarine is always at arms reach. So common sense tells us that the sub isn't going to hang around its own doorstep. We don't even have to rely on common sense because naval exercises point to the same conclusion. In a program called SSBN Continuity Of Operation Program (SCOOP), various Trident subs have been refitted at remote locations. In May 1986 the *USS Georgia* went through a nine-day full refit at Guam. Guess which SSBN tender ship was involved -- the *USS Proteus*. Although the exercise was described as a full refit, missiles were obviously not exchanged because the *USS Proteus* cannot handle Trident-1s. But the *USS Simon Lake* and *USS Canopus* can, and they have now been freed from service at Holy Loch and Kings Bay.

Another refit of the *USS Georgia* took place at Guam in February 1987, to work out some problems encountered during the previous exercise. Following that, the *USS Nevada* was turned around at Sitka, Alaska. In July 1989 the *USS Alabama* went through refit at Astoria, Oregon. Rear Admiral George W. Davis, former commander of Sub-Base Bangor, said that changing crews, replenishing supplies, and performing needed repairs could be done in Mexico. Trident subs underway in the open ocean have reloaded torpedoes from tender ships and taken on supplies from helicopters and supply ships.

Trident submarines have visited other ports. TV news on 7 August 1995 showed the *USS Michigan* in San Francisco Bay . The *USS Henry M. Jackson* also visited San Francisco Bay during Fleet Week in October 1995. SCOOP operations can take place alongside any ship or at any wharf if missiles are not exchanged. When missile handling enters the picture, the appropriate SSBN tender must be available. Two are now at large somewhere. Now let us look at the real thing.

2. Forward Bases in the Pacific and Indian Oceans.

Numerous places could be used as an anchorage for an SSBN tender ship. One prime spot is Palau's Malakal Harbor. Geographically centered in the Southwest Pacific, Palau has the only harbor in the Pacific which would give Trident submarines two quick exits to the open ocean, and the only harbor deep enough for submarines to dive while they are still in port. Located seven degrees above the equator and 500 miles east of the Philippines, Palau is aligned with the deep-water Sundra and Lombok Straits through which submarines must travel to reach the Indian Ocean. Palau is an ideal location for Pacific forward basing and a jumping off point for the Indian Ocean.[12]

Singapore is another option since a 1990 accord allows US resupply ships to operate from that port. Repairs are also allowed in Singapore's commercial shipyards. However, although Singapore's location at the head of the wide Strait of Malacca appears to be a perfect location for access to both the Pacific and Indian Oceans, that is not the case. That strait is wide but shallow. Trident submarines would have to forego stealth and travel on the surface in order to pass through it.

In the Indian Ocean itself, the island of Diego Garcia is a logical refit site. It is, arguably, a British island, and it is under US control with all the needed facilities. Possibly a tender ship wouldn't be necessary for servicing the sub but it would still be needed to transport extra missiles.

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[12]See *Resisting The Serpent* to discover US military interests in Palau.

Finding a suitable berth at Diego Garcia would be no problem.

These are not the only potential sites for servicing forward-deployed submarines. Any sheltered cove would suffice. When Rear Admiral J. Guy Reynolds commanded submarine forces in the Pacific, he remarked: "There may come a time when we won't have the luxury of returning to Bangor for a crew change or to refit the ship. So we practice in places far off the beaten track."[13] But there is no place far off the beaten track for Trident.

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REFERENCES.

ACIS-93 -- Fiscal Year 1993 Arms Control Impact Statements, US Government Printing Office.

Aldridge, Bob and Myers, Ched, *Resisting The Serpent: Palau s Struggle For Self-Determination* (Baltimore, Fortkamp Publishing, 1990).

Campaign, publication of Campaign for Nuclear Disarmament(CND) 162 Holloway Road, London N7 8DQ, England), various issues.

CND Press Release dated 25 July 1995 (Campaign for Nuclear Disarmament, London).

Day, The (New London, CT.), various issues.

Defense News, (6883 Commercial Street, Springfield, VA), various issues.

GAO/NSIAD-92-134 -- *Nuclear Submarines: Navy Efforts to Reduce Inactivation Costs*, US General Accounting Office Report, July 1992.

Guardian, The (London, England), various issues.

HAC-93 -- *Energy and Water Development Appropriations for 1993*, transcript of hearings before a subcommittee of the House Appropriations Committee, Part 6, 1992.

HASC No. 102-8 -- *Department of Defense Authorization for Appropriations for Fiscal Years 1992 and 1993*, transcript of hearings before the House Armed services Committee (1991).

HC-286 0f Session 1990-91 -- *Progress of the Trident Programme, The*, Eighth Report from the Defence Committee, House of Commons, June 1991.

HC-337 0f Session 1991-92 -- *Progress of the Trident Programme, The*, Fifth Report from the Defence Committee, House of Commons, 11 March 1992.

HC-356 0f Session 1986-87 -- *Progress of the Trident Programme, The*, Fifth Report from the Defence Committee, House of Commons, 6 May 1987.

Heddwch Action News, periodical of CND Cymru (Wales) (c/o Peace Shop, 56 Mackintosh Place, Roath, Cardiff CF2 4RQ, Wales), various issues.

Independent, The (London, England), various issues.

Mercury News (San Jose, CA), various issues.

[13]*The Sun*, 31 July 1989.

Myers, Steven Lee; "Pentagon Proposes Reductions in Nuclear Arsenal," *New York Times*, posted at http://www.mercurycenter.com/premium/codes/N/docs/N900.htm at 10:30 p.m. PST, 22 November 1998.

Nuclear Free Scotland, periodical of Scottish CND (15 Barrland Street, Glasgow G41 1HQ, Scotland), various issues.

Observer, The (London, England), various issues.

Problems of the Trident Programme, The, Nuclear-Free Seas report, Greenpeace-UK (Cannonberry Villas, London N1 2PN, England), April 1992.

Rising Cost of Trident, The, Nuclear-Free Seas report, Greenpeace-UK (Cannonberry Villas, London N1 2PN, England), July 1991.

San Francisco Chronicle (San Francisco, CA), various issues.

Seattle Post Intelligencer (Seattle, WA), various issues.

Statement on the Defense Estimates 1992, Presented to Parliament by the Secretary of State for Defence by Command of Her Majesty, July 1992.

Sun, The (Bremerton, WA), various issues.

Times Union, The (Jacksonville, FL), various issues.

UK Nuclear Weapons Policy: Deterrence, Arms Control and Non-Proliferation (Policies of the main political parties), A briefing by the International Security Information Service, 1992.

United Kingdom Trident Programme, The, Defence Open Government Document B2/1, 1982.

GLOSSARY.

C-4	US Navy designation for the Trident-1 missile.
CND	Campaign for Nuclear Disarmament (Britain)
D-5	US Navy designation for the Trident-2 missile.
ESGN	Electrostatically Supported Gyro Navigator.
GPS	Global Positioning System
knot	One nautical mile per hour.
MIRV	Multiple Independently-targeted Reentry Vehicle.
NAVSTAR	NAVigation System Targeting And Ranging.
SLBM	Submarine-Launched Ballistic Missile.
RNAD	Royal Navy Armament Depot (Britain).
SCOOP	SSBN Continuity Of Operation Program.
SINS	Ship Inertial Navigation System
SSBN	Nuclear-powered ballistic missile launching submarine.
SSN	Nuclear-powered attack submarine.
ULMS	Underwater Long-range Missile System.

APPENDIX-A
US TRIDENT SUBMARINES

SSBN	USS	COMMISSION DATE	HOME PORT	MISSILE
726	*Ohio*	11 Nov 81	Bangor	C-4
727	*Michigan*	11 Sep 82	Bangor	C-4
728	*Florida*	18 Jun 83	Bangor	C-4
729	*Georgia*	11 Feb 84	Bangor	C-4
730	*Henry M.Jackson*	6 Oct 84	Bangor	C-4
731	*Alabama*	25 May 85	Bangor	C-4
732	*Alaska*	25 Jan 86	Bangor	C-4
733	*Nevada*	16 Aug 86	Bangor	C-4
734	*Tennessee*	17 Dec 88	Kings Bay	D-5
735	*Pennsylvania*	9 Sep 89	Kings Bay	D-5
736	*West Virginia*	20 Oct 90	Kings Bay	D-5
737	*Kentucky*	13 Jul 91	Kings Bay	D-5
738	*Maryland*	13 Jun 92	Kings Bay	D-5
739	*Nebraska*	10 Jul 93	Kings Bay	D-5
740	*Rhode Island*	9 Jul 94	Kings Bay	D-5
741	*Maine*	29 Jul 95	Kings Bay	D-5
742	*Wyoming*	13 Jul 96	Kings Bay	D-5
743	*Louisiana*	6 Sep 97	Kings Bay	D-5

APPENDIX-B
BRITISH TRIDENT SUBMARINES

SSBN	HMS	FIRST PATROL	HOME PORT	MISSILE
05	*Vanguard*	13 Dec 94	Faslane	D-5
06	*Victorious*	7 Jan 96	Faslane	D-5
07	*Vigilant*	3 Dec 97	Faslane	D-5
08	*Vengeance*	2000*	Faslane	D-5

* Estimated

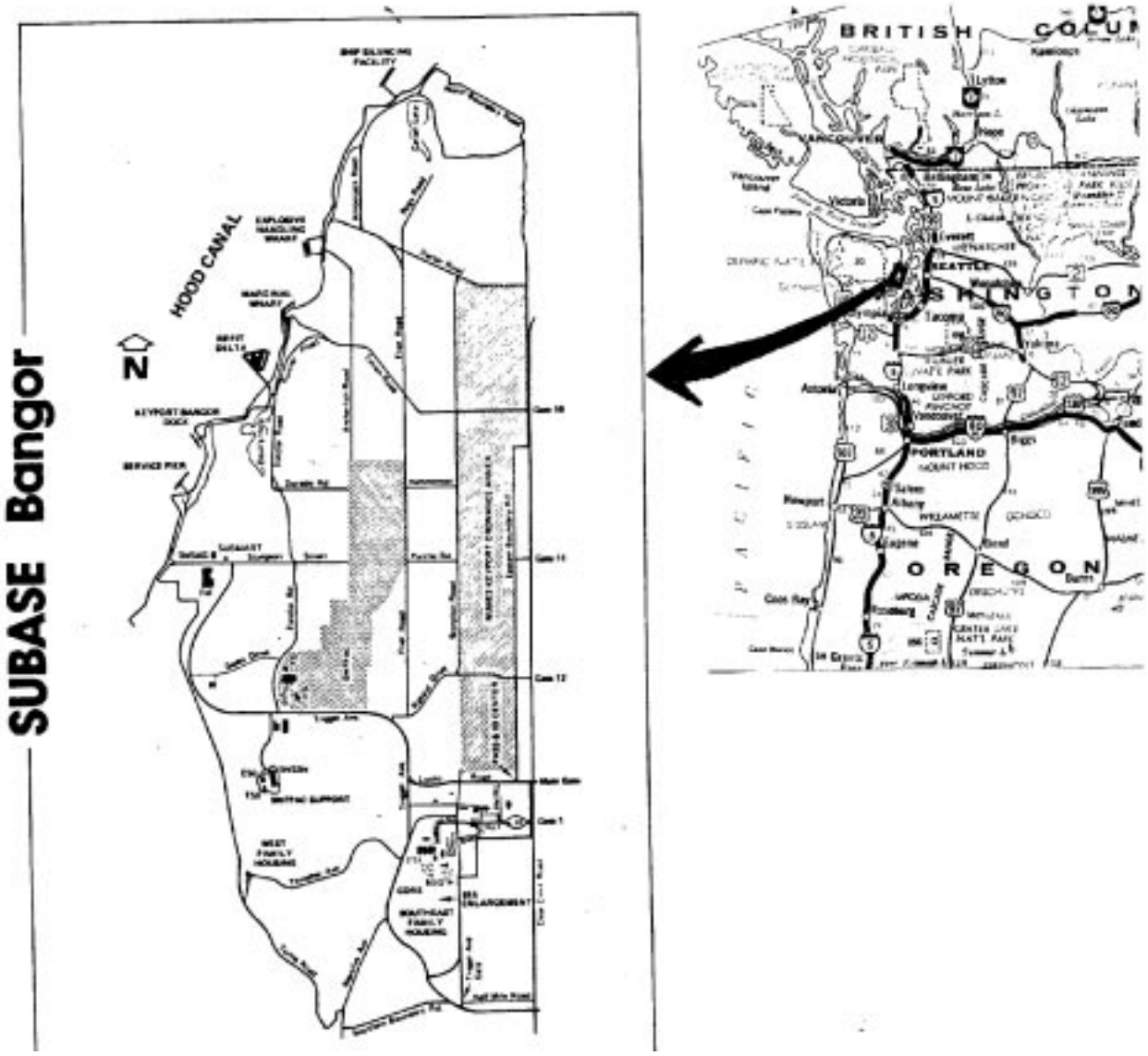
APPENDIX-C
US TRIDENT SUBMARINE SPECIFICATIONS

Length	560 feet (170.7 meters)
Hull Diameter	42 feet (12.8 meters)
Height	4 stories
Displacement	16,764 tons surfaced 18,750 tons submerged
Speed	20 plus knots (US Navy) 30 knots (non-governmental organizations)
Power Plant	1 pressurized water nuclear reactor 2 geared turbines, 1 shaft 90,000 horsepower
Navigation System	2 Mark-2, Mod-7 Ship Inertial Navigation System (SINS) Electrostatically Supported Gyro Navigator (ESGN) NAVSTAR GPS satellite receiver
Crew	157 with Trident-1 missiles (15 officers/142 enlisted) 165 with Trident-2 missiles (15 officers/150 enlisted)
Armaments	4 torpedo tubes 24 Trident SLBMs carrying up to 192 Mark-4/W76 or Mark-5/W88 MIRVs

APPENDIX-D
BRITISH TRIDENT SUBMARINE SPECIFICATIONS

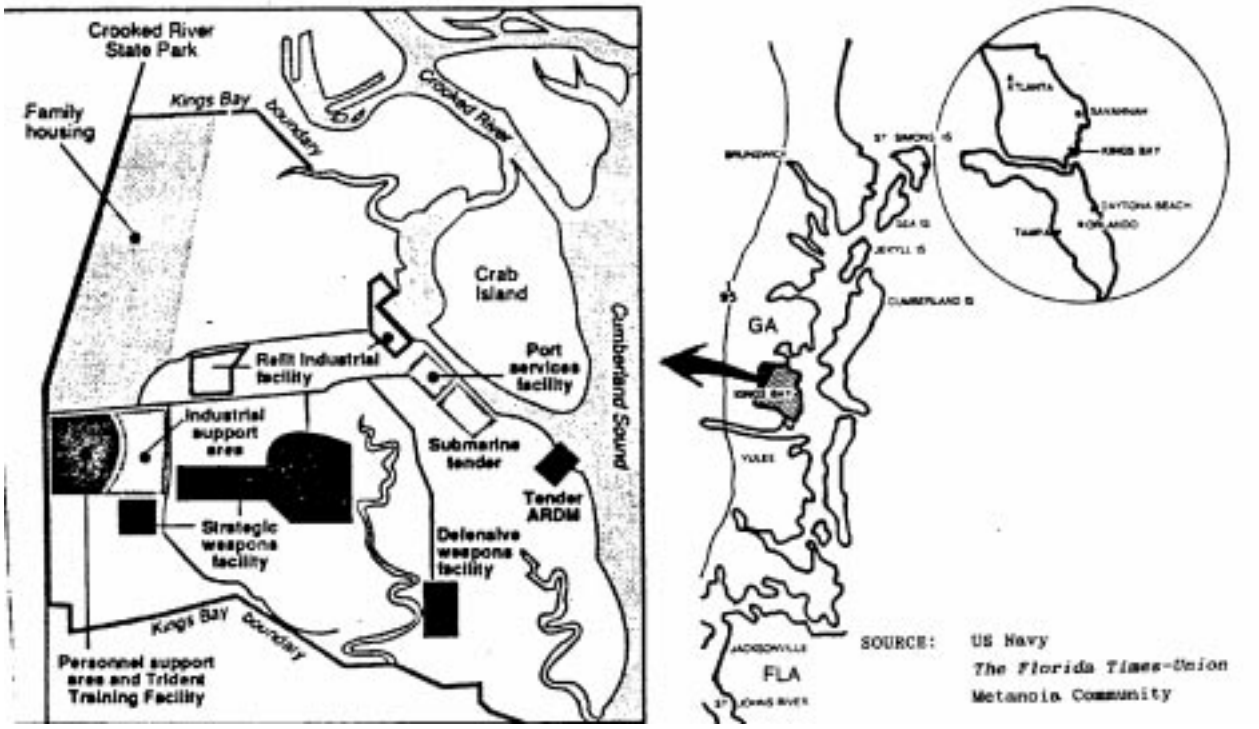
Length	491 feet (149.6 meters)
Hull Diameter	43.3 feet (13.2 meters)
Height	4 stories
Displacement	16,000 tons submerged
Speed	25 knots submerged
Power Plant	1 pressurized water PWR-2 nuclear reactor Geared steam turbines, 1 shaft
Navigation System	
Crew	132
Armaments	4 torpedo tubes for Spearfish torpedoes 16 Trident-2 SLBMs carrying up to 128 Mark-4, 100 kiloton MIRVs

APPENDIX-E
MAP OF US WEST-COAST SUB-BASE BANGOR

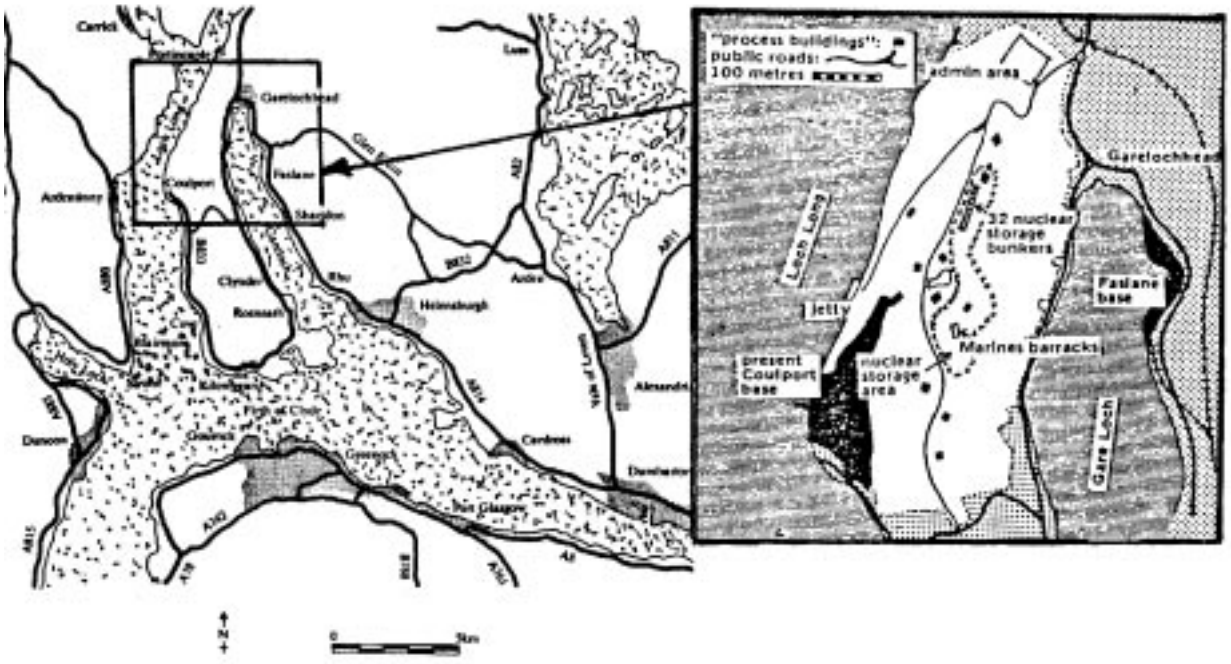


Source: US Navy
Ground Zero Center for Nonviolent Action

APPENDIX-F
MAP OF US EAST-COAST SUB-BASE KINGS BAY



APPENDIX-G
MAP OF BRITISH CLYDE SUB-BASE FASLANE AND RNAD COULPORT



SOURCE: *Peace News* (Britain), September 1983, p. 3.
Third Report of the Defence Committee, House of Commons, Session 1986-87, p. xi.