3

SECTION 3
SUPPORTING SYSTEMS

3.1 COMMUNICATION: NO GAPS ALLOWED

Communications is perhaps one of the most critical aspect of military activities. Submarines provide unique communications challenges. They are usually so far beneath the ocean's surface that ordinary radios cannot reach them. Messages sent in the low frequency (LF) band only penetrate the ocean to a depth of 9-12 feet. Very low frequency (VLF) transmissions can go about 30-40 feet deep. A submarine patrols much deeper than that. True, submarines can send antenna buoys close to the ocean's surface, or even on the surface, but that introduces the risk of being detected. To provide continuous, one-way communication with all the nation's submarines, and those belonging to Britain, the Pentagon has developed an extreme low frequency (ELF) capability.

A. ELF

Since ELF sends very slow signals in only one direction, it could more properly be called a "bell ringer" to call the submarine to attention. As John LaForge of the Lakes and Prairies Life community states it, ELF "can only shout, never listen." So we might keep that in mind when referring to ELF as a communications system.

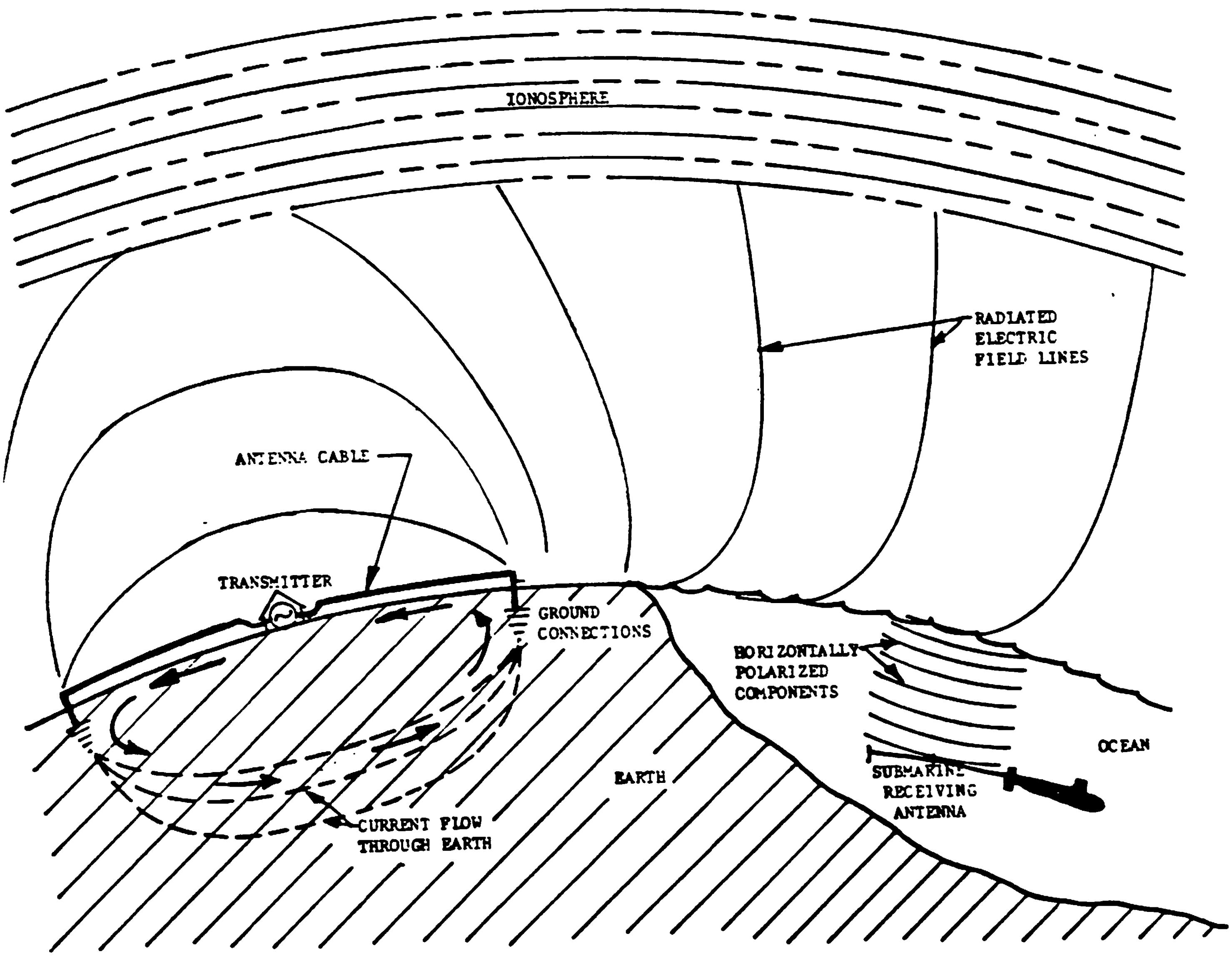
Nevertheless, ELF radio signals do provide continuous one-way contact with submarines because they penetrate seawater to depths of several hundred feet. It is reported that submarines as deep as 400 feet have been contacted in the Mediterranean. [Lucas, p. 52] Navy officials claim ELF is the only available means of continuous contact with submarines at patrol depth and cruising speed.

In 1969 the Navy constructed its ELF Test Facility in the Chequamegon National Forest south of Clam Lake, Wisconsin. This consisted of 28 miles of antenna cable strung above ground on poles -- two 14-mile segments laid out as a cross to provide bi-directional transmission.

After many false starts on ELF expansion, the Reagan Administration on 8 October 1981 directed the Pentagon to plan the present concept of ELF, called Project ELF, which upgraded the Wisconsin facility and installed a second transmitter with antenna at K.I. Sawyer Air Force Base in upper Michigan. The Michigan facility in Escanaba State Forest has 56 miles of above-ground antenna cable -- exactly double that of the Wisconsin facility. ELF became fully operational in 1991 with receivers in all submarines.

The underlying layers of hard, low-electrical-conductivity pre-Cambrian granite of Northern Wisconsin and Upper Michigan -- called the Laurentian Shield -- provide optimum substructure for ELF transmission. When current passes through the rock between the two grounded ends of the antenna it electrically forms the lower half of the antenna loop. In high conductivity rock the current will complete the loop in a shorter path and only penetrate a few hundred feet deep. In the Laurentian Shield it forms a loop some

FIGURE 3.1-1
ELF WAVE PROPAGATION



10,000 feet deep which radiates a much stronger signal for a given antenna current. (See Figure 3.1-1)

As the signal completes the loop deep in the earth, it resonates ELF signals between the earth and the ionosphere, which is a band of electrically charged particles in the upper atmosphere. This Schuman wave resonance, as it is called, reinforces and strengthens the transmitted signals, resulting in waves trapped between the earth and the ionosphere. The propagation loss is very low and relatively small signals can travel essentially all the way around the world. Whether they actually do or not depends on propagation conditions, the location of the transmitter, and the antenna layout.

When the ELF wave passes across the earth in this earth-ionosphere waveguide, it is dragged, or bent, along the earth's surface. The wave actually develops a horizontally polarized component and a vertically polarized component. (See Figure 3.1-1) The horizontal electric field can penetrate several hundreds of feet down into the earth or ocean.

US ELF transmitters operate at 76 cycles per second (Hertz, or Hz) and send messages by shifting down to 72 Hz or up to 80 Hz. A 76-Hz ELF wave has a length of approximately 2,500 miles (4,000 kilometers) which is difficult to jam and resistant to nuclear radiation blackout. It will form ten complete waves around the earth which is about 25,000 miles in circumference. These waves meet each other in phase and continue to reinforce one another as they rebound and resonate.

ELF waves travel at the speed of light but they are slow for communication because it takes time to build up resonance, or strength. Messages are sent in binary form by the shifting downward or upward. An ELF transmitter can shift 16 times per second. Each shift is called a "bit" of information. It takes 5 bits arranged in various combinations to make one letter of the alphabet.

Since the ELF transmitter can send 16 bits of information a second, it would seem that it could send slightly over 3 letters per second. This does not happen because the signal would be too weak to penetrate the ocean. Each signal has to be repeated many times to build up sufficient resonant strength. How many times, or how long it takes, depends chiefly on the size of the antenna grid. The present US ELF will barely transmit one bit per minute -- about five minutes to send one letter.

A system of 3-letter codes provides 17,576 pre-designated messages. (With 26 letters in the alphabet: 26 x 26 x 26 = 17,576) Project ELF takes about 15 minutes to send such a message. Two letter codes provide 676 messages (26 x 26 = 676) which take ten minutes to send.

ELF communication coverage to the required ocean depth is somewhat governed by strength of the signals, but propagation factors play a more dominant role. Speed of transmission, however, could be traded off for depth under given conditions. During a crisis, submarines could be brought closer to the surface and ELF messages could be sent faster.

ELF transmitters operate continuously whether there are messages to send or not. This serves two purposes. One is that continuous transmission won't tip the Navy's hand by an increase of activity when a real message is sent. The other is known as "fail dead" -- that is, if transmissions should cease for any reason it would be a signal for the submarines to send an antenna to or near the surface to determine what is happening. It would put the entire submarine force on high alert. The first Trident submarine, *USS Ohio*, went on its first patrol in 1982 with an ELF receiver and "performance was better than expected." [See Nagler] Neither is ELF exclusively for instructing ballistic missile submarines. In early 1983 Admiral Nagler stated: "ELF is for both the ballistic missile submarines and the attack submarines. It will free those submarines from staying close to the surface in order to receive communications." [HASC-84, Part 3, p. 858.]

Since the transmitter-antenna complex is modular, it can be expanded to increase speed. One means of quick expansion is with a mobile system using trucks and trailers -- variously referred to as "Mobile ELF", "Elusive Voice" and "Transportable ELF." As of early 1982, five million dollars had been appropriated to investigate this possibility [Stop Project ELF newsletter, p. 6.] which could eventually consist of a fleet of trucks and trailers carrying thirty miles of ELF cable, transmitters, generators, security equipment, and radiation protection equipment. Deployment would probably take place in Wisconsin and Michigan. [Stop Project ELF newsletter, p. 6.] During time of emergency these trucks would unravel the cable in segments and connect them to form a 30-mile antenna element.

Another form of rapidly deployable ELF is the so-called "Balloon ELF." In early 1978 Pentagon officials referred to a proposal to use balloons for lifting an array of vertical antennas. [HAC-79, Part 4, p. 507.] The Navy in 1981 contracted with Pacific-Sierra Research Corporation of Santa Monica, California to study Balloon ELF's feasibility. [*Defense Daily*, 25 Jun 81, p. 306. Also see *AW&ST*, 6 Jul 81, p. 63.] In his fiscal year 1985 Defense Advanced Research Projects Agency (DARPA) report, director Dr. Robert S. Cooper referred to a VLF/ELF transportable communication system using a balloon-supported vertical dipole antenna. [DARPA-85, p. III-16.] Field tests were completed by October 1987 when an aerostat lifted more than 12,500 feet of antenna. [*AW&ST*, 19 Oct 87, p. 129.]

ELF will not survive a nuclear attack. [HAC-79, Part 4, p. 491.] It is even vulnerable to conventional sabotage. There would simply be no ELF left to call up submarines for second-strike retaliation under the public policy of deterrence. For striking first, however, ELF would play a vital role -- or if the submarine were part of a nuclear expeditionary force under the New World Order. Congressional transcripts are replete with testimony saying ELF is a "bell ringer" to bring submarines to the surface where targeting and launch instructions can be sent by other means. [HAC-79, Part 4, p. 501; HASC-84, p. 991; HASC-85, Part 2, p. 666 and Part 5, p. 178; SASC-85, Part 2, p. 936; HASC-86, Part 7, p. 386; and HAC-87, Part 3, p. 496.]

Communication with the submarines of US allies could also be enhanced. The British once considered an ELF transmitter in Northern Scotland where the Caledonian Granites meet transmission requirements. [See Spaven] From this location ELF messages could better reach submarines in the Arabian Sea. However, the Scotland ELF has not been pursued. Britain will have to rely on the US transmitter to call up its submarines.

Project ELF is a dangerous system which will significantly contribute to the destabilizing offensive capability of the United States and its allies. Global security would be enhanced if ELF were cancelled and existing facilities dismantled.

B. TACAMO

The US has a network of land-based VLF transmitting stations around the world to provide one-way communication with submarines. These are known as the Fleet Broadcasting System. But since ground-based communications are probably the most vulnerable of military targets, TACAMO (an acronym for "Take Charge And Move Out") was developed as a nuclear-survivable alternative. The submarine would put an antenna close to the surface at prescribed times to receive messages.

The TACAMO aircraft is a flying broadcasting station. The older models have been replaced with the E-6A aircraft, a Boeing 707 derivative. As of mid-1991, ten of the sixteen airplanes planned had become operational. They are based at Tinker Air Force Base in Oklahoma. When transmitting, the plane reels out a five-mile-long, 0.16-inch-diameter antenna while flying the so-called orbit maneuver -- a tight circle at low speed (30-50 degree bank angle at approximately 150 knots). This allows the antenna to fall almost vertical. The emitted VLF waves travel vertically in the atmosphere. They also have horizontal components, as described for ELF waves above, that penetrate sea water some forty feet to be picked up by a long antenna trailed by the submarine.

Since ELF has been fully deployed, and especially since the cold war ended, TACAMO gave way to budget pressure and was taken off airborne alert. There used to be two aircraft flying continuously, one over the Pacific Ocean and the other over the Atlantic. TACAMO aircraft are now on 24-hour strip alert, ready to take off immediately in a crisis. As MILSTAR satellites become operational, the ELF-MILSTAR combination could well relegate VLF communications to routine message delivery.

C. MILSTAR

Just prior to launching missiles there would be no danger in putting an antenna on the surface to pick up more rapid satellite transmissions -- both for communication and to determine the submarine's true position from NAVSTAR navigation satellites. In April 1983, then DARPA Director Robert Cooper revealed that submarines are also being equipped with extreme high frequency (EHF) receivers. "That combination of ELF bell-ringer and the EHF capability," he said "should provide appropriate communication to our submarines in the latter part of (censored). [HASC-84, Part 5, p. 991] It is now known that the censored date is the latter part of the 1990s. In May 1986, Assistant Navy Secretary Melvyn R. Paisley confirmed that missile-launching submarines will be able to receive MILSTAR satellite EHF messages. [SAC-87, Part 2, p. 230.]

It is no great risk to use rapid EHF communication to send missile launch instructions to the submarine because avoiding detection is a moot point at the time of launch. The submarine must approach the surface anyway to get a position fix from navigation satellites. Also, missiles cannot be launched from great depths or while the submarine is moving (unless it has surfaced). The hovering system required to stabilize the submarine at essentially zero speed prior to launching missiles would be far more detectable than an

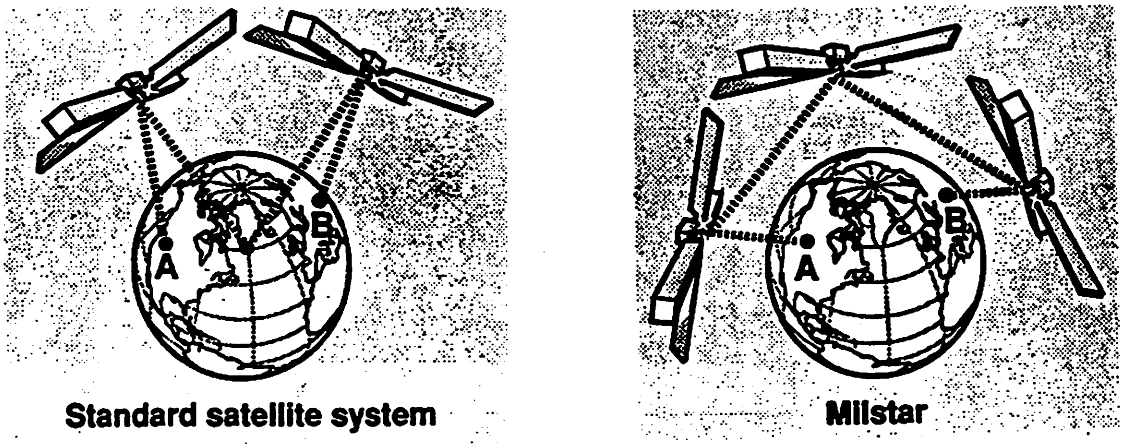


FIGURE 3.1-2
COMMUNICATIONS SATELLITE CAPABILITIES
Source: San Jose *Mercury News*
To send between "A" and "B" the standard system must relay through a ground station. MILSTAR does not.

antenna on the surface.

Before proceeding with MILSTAR, I should mention other satellite communications systems. There are two constellations of military communications satellites presently in geosynchronous orbits -- the Fleet Satellite Communications System (FLTSATCOM) and its follow-on, and the Defense Satellite Communication System (DSCS). In addition, the Air Force Satellite Communications (AFSATCOM) system has communication transponders riding piggy back on other satellites. There is also the Arctic Satellite communications system (ARCTICSATCOM) which has a highly-elliptical orbit. It swoops low to within a couple hundred miles of the earth around the south pole and then climbs to a very high apogee over the arctic. ARCTICSATCOM spends most of its time over the northern hemisphere and provides better communication at the northern latitudes than do FLTSATCOM and DSCS which are in earth-synchronous orbit over the equator. Several ARCTICSATCOMs equally spaced would provide continuous communication coverage in the arctic.

Later models of FLTSATCOM and DSCS may have some EHF capability but that seems to be mainly for development testing and to eventually tie in with MILSTAR. Nevertheless, these satellites could, and probably do, communicate with submarines having an antenna on the ocean's surface.

Design of the Military Strategic and Tactical Relay (MILSTAR) satellite started early in the 1980s at Lockheed Missiles & Space Company. There have been technical problems, design changes, cost increases, and schedule delays. Over the 12 years leading up to 1994 the Pentagon had invested about $8 billion in the MILSTAR program. Each MILSTAR put in orbit is expected to cost about $1.3 billion -- $1 billion for the satellite and $285 million for the Titan-4 rocket that launches it. $648 million was requested for MILSTAR during fiscal year 1995, down from $918 million in 1994. The entire program was originally estimated to cost $17 billion.

Originally MILSTAR was designed to operate at a low data rate (75-2,400 bits/second) for sending launch instructions to strategic nuclear forces. Those are the best rates for sending teletype and compressed-voice communications. But for tactical operations, such as in regional wars, this is not adequate. A medium data rate of between 4,800 and 1.5-million bits/second is required for regular voice communications and imagery. Therefore, with the end of the cold war, Congress directed in the fiscal year 1991 military budget that MILSTAR be restructured or an alternative advanced communications satellite program be commenced.

The Pentagon chose to restructure MILSTAR. To reduce cost it cut the planned eight-satellite constellation to six, reduced the amount of ground-based equipment, and eliminated several systems survivability features (such as nuclear electromagnetic-pulse shielding). To support tactical operations it scheduled the medium-data-rate capability for satellite number 4 and after.

In October 1992, again based on pressure from Congress, the Pentagon further reduced the planned constellation of satellites to four. The plan at that time was to launch the first two with the original low-data-rate design and then pick up the medium data rate on satellite number 3.

A year late, after the October 1993 bottom-up review of major weapons programs, the Pentagon held the constellation size at four but limited total production to six. The first two, known as MILSTAR Block-1, would be low data rate only. The next four, known as MILSTAR Block-2, would have both low and medium data rate. Presumably the last two Block-2s would replace the two Block-1s. Block-2 will have 100 times the tactical communications capacity of Block-1. Starting in 2006, to reduce long-term costs, the Pentagon plans to start replacing MILSTAR Block-2 satellites with an enhanced MILSTAR -- an advanced-capability, smaller satellite which can be boosted into space with a smaller rocket.

The first MILSTAR satellite was put into orbit on 7 February 1994 -- about seven years behind original schedules. The second satellite is slated to be launched in May 1995. Satellites numbers 3 and 4 are in development and scheduled for launches in 1999 and 2000.

Contracts have not been awarded for the 5th and 6th MILSTAR satellites which are scheduled for launch in 2001 and 2002 respectively. The GAO has pointed out that these last two could be cancelled and existing technology would support advancing the schedule for enhanced MILSTAR, which could be deployed in 2003 rather than 2006. The money saved by doing so would exceed $2 billion. [GAO/T-NSIAD-94-164, pp. 1 & 6-7]

Present plans call for four MILSTAR satellites in geosynchronous orbit -- an orbit about 22,300 miles above the equator which is synchronized with the earth's rotation so the satellites appear to be stationary in the sky -- and some capability for communication in the northern latitudes. The latter could be accomplished by putting MILSTAR payloads piggyback on existing satellites. MILSTAR will provide secret and jam-resistant EHF communication between any two places on earth. It will be the first system to provide such communication 24 hours a day. It will also be the first space constellation capable of relaying messages between satellites to eliminate dependence on ground stations.

When three MILSTAR satellites are in orbit the system will be considered fully operational. Transmission from a ground command post, ship, or aircraft will be received by the nearest satellite, relayed to the satellite closest to the message's destination, and then transmitted back down to the recipient. With on-board data processing, each of these 5-ton spacecraft will be relatively autonomous.

MILSTAR is a dangerous addition which will make America's war machine more aggressive. It should be cancelled to lessen world tensions. FLTSATCOM, DSCS and AFSATCOM provide all the communication necessary for defensive operations.

Lockheed Missiles and Space Company is the prime contractor and has about 1,000 people working on MILSTAR. TRW Space and Electronics Group provides the low-data-rate payload, Hughes Aircraft Company will supply the medium-data-rate payload for the Block-2, and Martin Marietta Corporation makes the Titan-4 launch vehicle with the wide-body Centaur upper stage.

* * * * *

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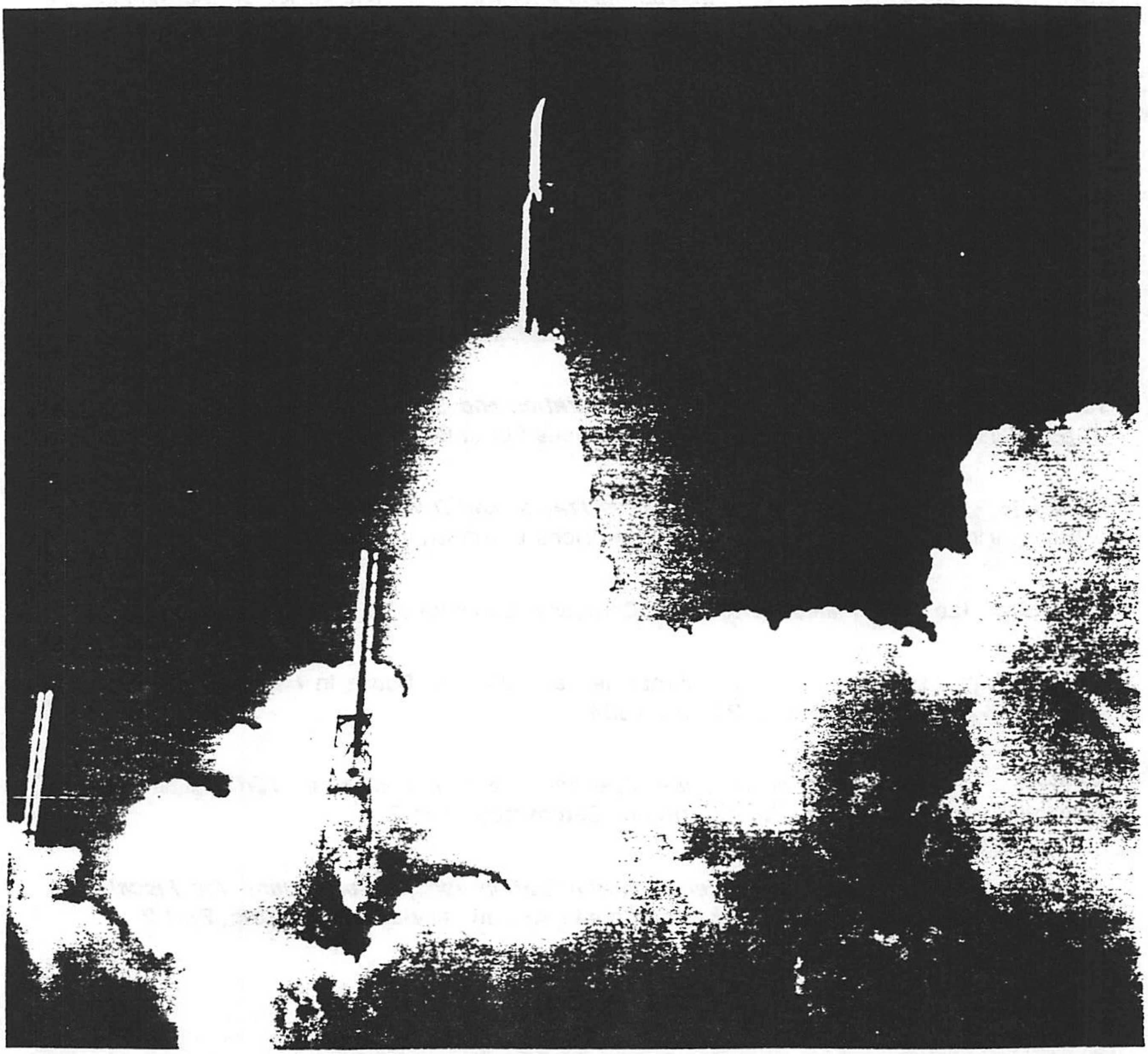

MILSTAR satellite in a shroud atop a Titan-4 booster blasts off from Cape Canaveral
Source: *LMSC Star*

3.2 NAVIGATION: STRAIGHT AND TRUE

Submarines, like missiles, have an inertial navigation system comprised of instruments which sense every movement of the vessel as well as tides and currents. By keeping track of all this relative motion the navigation system provides a pretty fair location of the submarine over a given period of time. But the margin of error increases with time and the sub needs a navigation *fix* to update its exact location. Then the corrected inertial system continues for another increment of time. Prior to the 1990s, submarines relied on land-based Omega and Loran-C signals, and Transit navigation satellites for these periodic positional fixes. Now the NAVSTAR global positioning system is taking over.

A. OMEGA, LORAN-C, AND TRANSIT

Omega is a very-low-frequency (VLF) system with eight transmitting stations spread throughout the world to provide global coverage. Every ten seconds each of these stations emit a unique beep, but they are not emitted simultaneously or haphazardly. Through the use of very accurate and precisely synchronized atomic clocks, these beeps are emitted in a prearranged sequence at a specific time. A submarine can raise an antenna to within 30-40 feet of the surface to receive at least three of these stations at any time. By knowing when the beep is emitted and recording, by means of an on-board atomic clock, the time it is received, the submarine's navigator can calculate how far the boat is from each station. Then it is merely a matter of trigonometry to determine the sub's position. Of course this is all done automatically by computer. Omega is accurate to within 3,000 feet. An improvement called Differential Omega can improve the accuracy to several hundred feet. In this system a nearby land station of known location determines the error accumulated during the travel of the radio signal, and then broadcasts local correction factors. But such stations are limited and even Differential Omega is not accurate enough for destroying hard targets.

Loran-C uses land-based transmitters to send out signals in the low-frequency (LF) band. Most areas of the world are covered but to receive these fixes a submarine has to put an antenna within 9-12 feet of the ocean's surface. Loran-C fixes are accurate to within 250-500 feet -- still not good enough for hard-target missiles.

Finally, there are Transit navigation satellites which can also transmit in the LF band but are only in view of a specific submarine's location every hour or so. Then a submarine must leave its antenna within 9-12 feet of the surface for three to four minutes in order to get a fix from different positions of the single satellite in view. Transit accuracy is anywhere from 150 to 600 feet, which is still not good enough.

It was because of this lack of precision in navigation aids that submarine-launched missiles never had the accuracy of land-based ICBMs. A faster and more accurate system was needed to make Trident a first strike weapon. The answer was the NAVSTAR Global Positioning System (GPS).

NAVSTAR GPS

In *First Strike* (Aldridge, 1983), the history and function of the Navigation System Timing And Ranging (NAVSTAR) is outlined. NAVSTAR is now available at any time, in any weather, and at any place on or above the earth. A 30-second fix gives the receiver's position within 10 meters (33 feet) in all three dimensions, and velocity (speed and direction) within a fraction of a mile per hour. Navstar also provides precise time within a millionth of a second to synchronize the submarine's atomic clock.

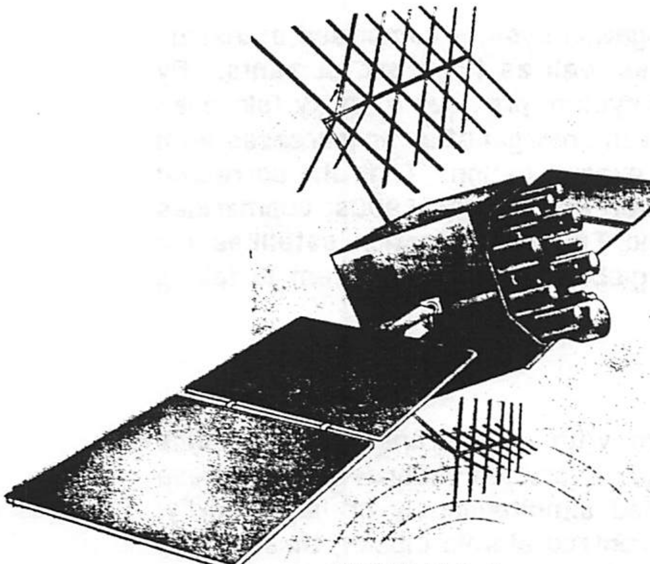

FIGURE 3.2-1
NAVSTAR SATELLITE
Source: San Jose *Mercury News*

A more accurate application of NAVSTAR is available at certain critical locations. Called Differential NAVSTAR, it provides 3-dimensional accuracy within 2 meters (6.6 feet). To accomplish this a receiver of precisely known location receives the NAVSTAR signals, calculates the error, and then broadcasts a correction factor for that locality. For civilian use, however, the Pentagon will only provide navigation fixes with an accuracy of 100 meters (330 feet) in all three dimensions.

The full NAVSTAR constellation consists of 24 operational satellites. They are divided equally in six polar orbital planes inclined 55 degrees to the equator. The orbits are approximately half-geosynchronous (10,898 nautical miles above the earth), which means each satellite completes about two trips per day around the globe. With this full constellation there will always be five satellites in view. The satellites have about a 7-year service life. NAVSTAR satellites are now being put into orbit by Delta-2 rockets launched from Cape Canaveral. Falcon Air Force Base in Colorado is the master control station for NAVSTAR, which was used extensively during the war with Iraq. The first Block-2 operational satellite was launched into orbit on 14 February 1989. All Block-2 and Block-2A satellites, built by Rockwell Space Systems Division (Downey, California), have now been launched into orbit.

In 1989 the US Air Force awarded a contract for 21 replacement satellites designated Block-2R. Lockheed Martin Missiles & Space Company (LMMS -- Sunnyvale, California) will deliver the first of these in 1996. They are also expected to last about 7 years in space.

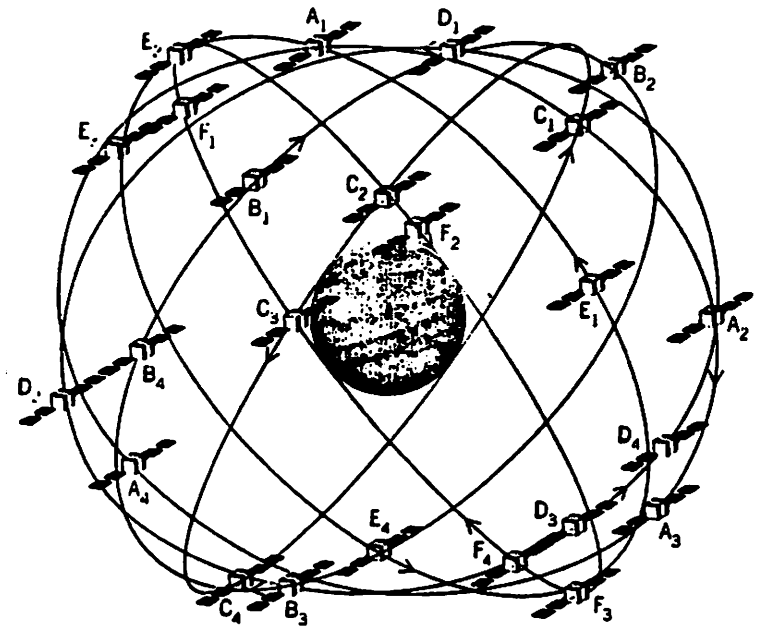

FIGURE 3.2-2
FULL NAVSTAR CONSTELLATION
Source: Unknown

LMMS is preparing a proposal for a third generation NAVSTAR called Block-2F. They will have more auxilliary payload space and last about 10 years. Originally the Air Force wanted 51 of the Block-2Fs but in mid-1995 that was scaled back to 33. Besides LMMS, Rockwell Space Systems Division and Hughes Space & Communications Company (Los Angeles, California) are competing for the contract.

Obtaining the navigation fixes from NAVSTAR is, again, a sophisticated exercise in triangulation. Extremely precise atomic clocks time the intervals between transmission and receiving of radio signals from each of the satellites in view. A computer then solves four or five simultaneous equations to obtain the receiver's position. Subsequent readings provide speed and direction.

NAVSTAR, by giving the exact position of launch, is the answer to submarine-launched missile accuracy. NAVSTAR receivers could also be in the missiles, themselves, to provide in-flight missile guidance updates for even greater precision. Both Trident-1 and Trident-2 missiles have received NAVSTAR signals during test flights, purportedly to calibrate the on-board navigation system. But millions of dollars have been spent to integrate NAVSTAR fixes with inertial navigation packages and it would be no great effort to do that for Trident. NAVSTAR has already been incorporated on cruise missiles (21 inches in diameter) and receivers have been designed for use in 155-millimeter artillery shells (six inches diameter. Some NAVSTAR receivers are as small as cigarette packages, so space and weight are not problems. NAVSTAR updates would only be necessary for Trident-2 missiles carrying the smaller and lighter 100-kiloton warheads, so weight is definitely not a problem. Regarding space, the receiver is so small it could be installed almost anywhere on the reentry vehicle deployment platform (bus) to aim each warhead directly at its target.

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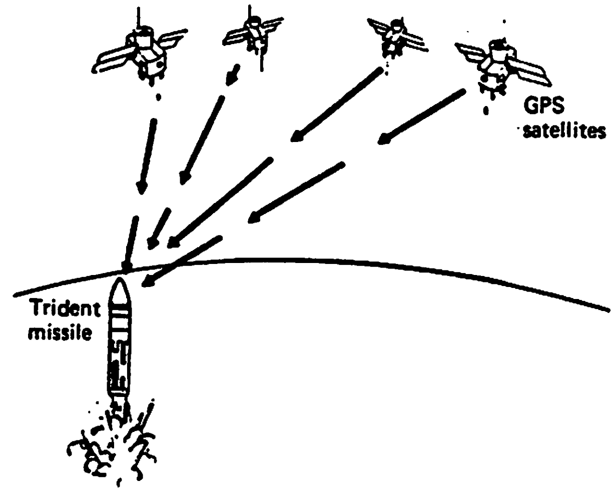

FIGURE 3.2-3
TRIDENT MISSILE RECEIVING NAVSTAR SIGNALS
Source: Thompson

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4

SECTION 4
TRIDENT
DEPLOYMENT

4.1 US BASES:
BANGOR AND KINGS BAY

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 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 now operate out of that port. All are armed with Trident-1 missiles.

Sub-Base Kings Bay, the east-coast home port for US Tridents, is on the Cumberland Sound -- in Camden County 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. As of the end of 1992 five Trident submarines were operating out of Sub-Base Kings Bay. The full compliment of ten is scheduled to be achieved by the end of the 1990s.

Sub-Base Kings Bay is also the forward base for US Poseidon submarines carrying Trident-1 missiles. (Their home port is Charleston, South Carolina.) They are serviced by a tender ship and floating dry dock anchored in the water, not by the land facility which is only for Trident submarines.

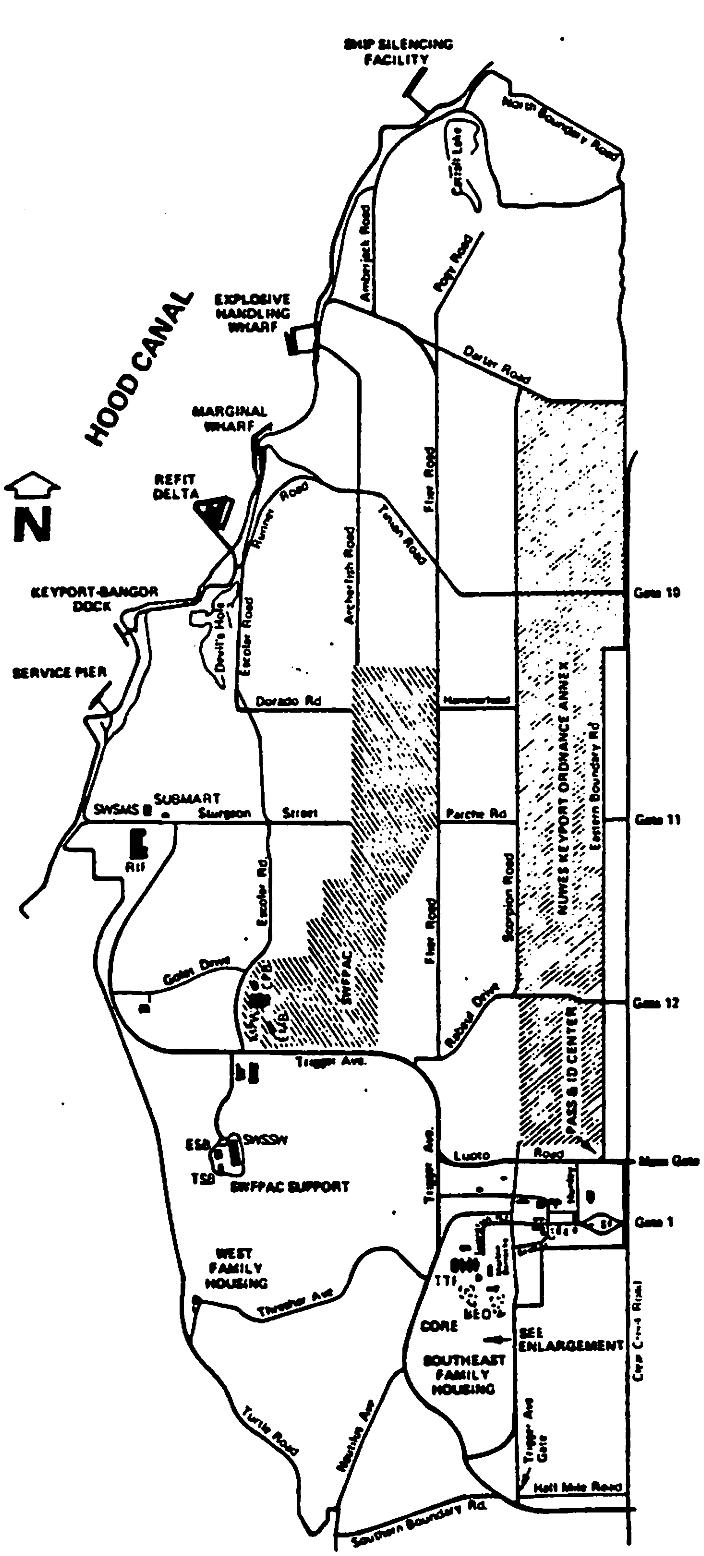
Figures 4.1-1 and 4.1-2 are maps of the two home ports for Trident submarines.

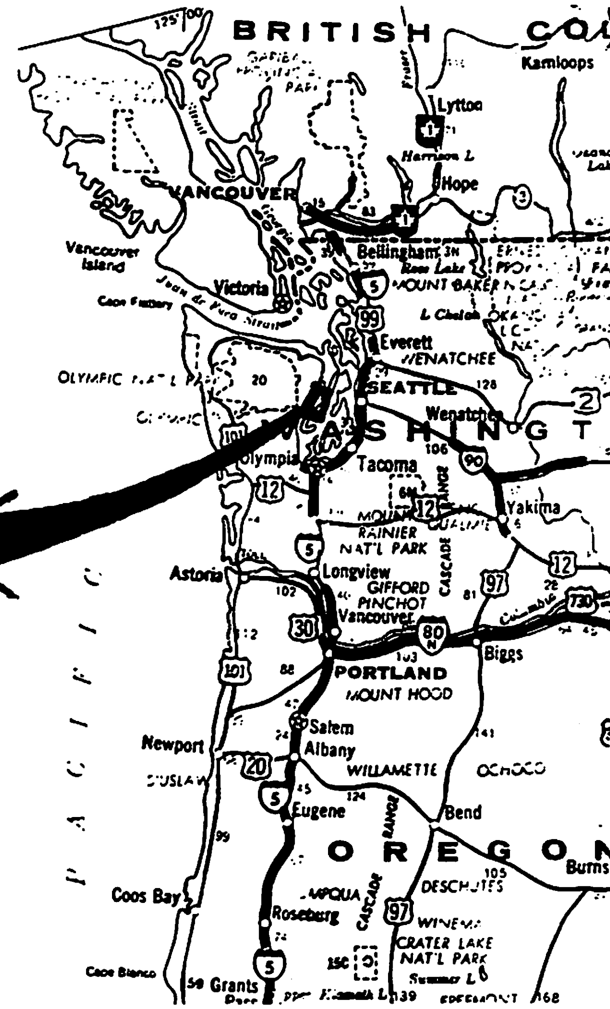
* * * * *

[MORE INFORMATION ON THIS SUBJECT WOULD BE WELCOME]

FIGURE 4.1-1

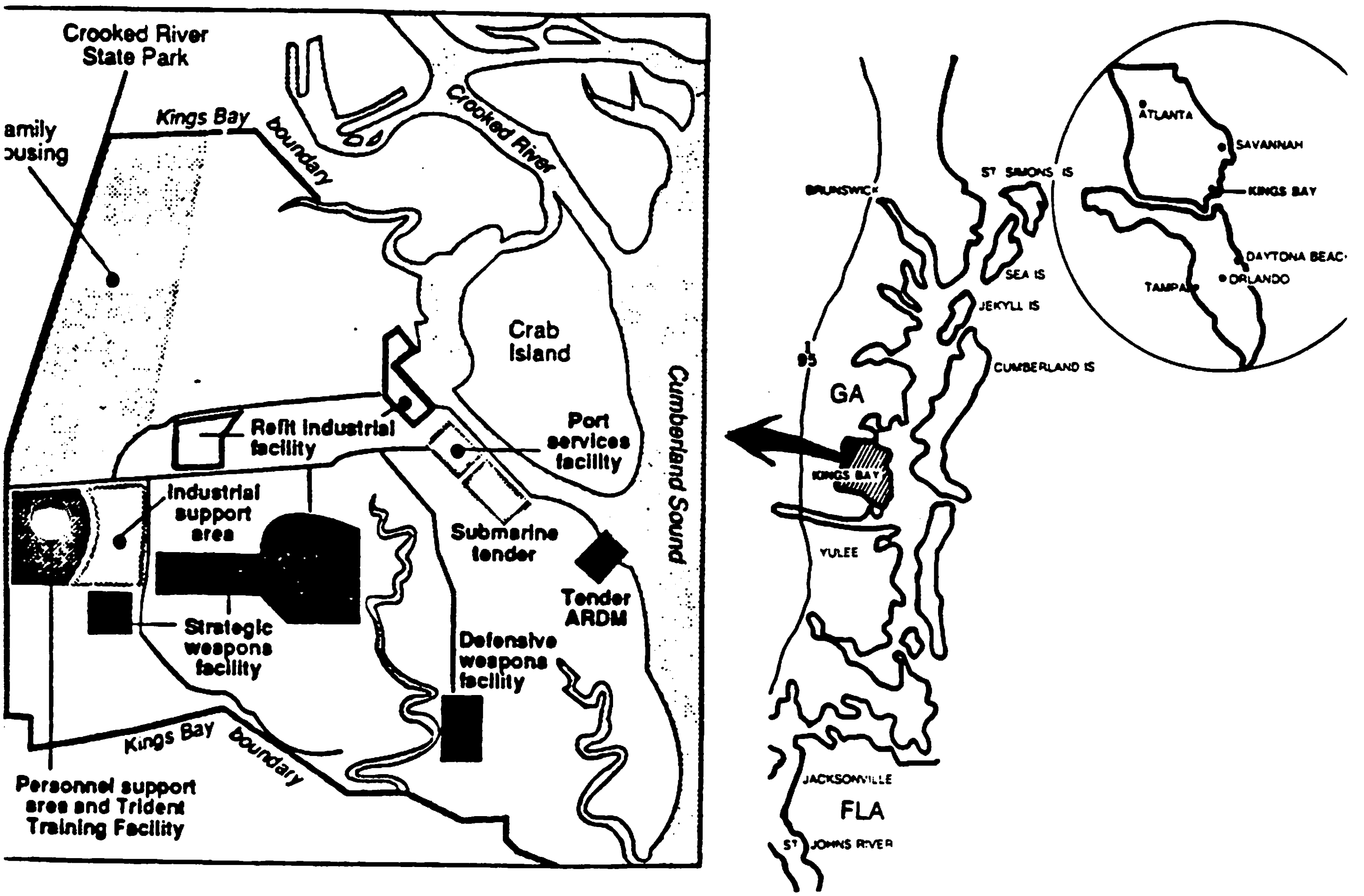
MAP OF US WEST-COAST SUB-BASE BANGOR



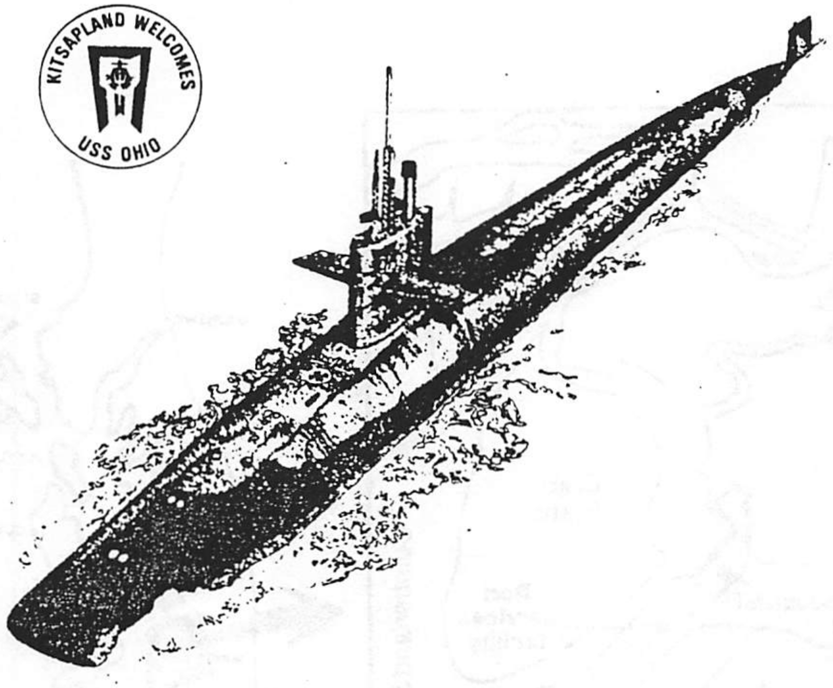


SOURCE: US Navy
Ground Zero Center for
Nonviolent Action

FIGURE 4.1-2
MAP OF US EAST-COAST SUB-BASE KINGS BAY



SOURCE: US Navy
The Florida Times-Union
Metanoia Community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Employment Opportunities
U.S. NAVAL
TRIDENT COMPLEX
KINGS BAY, GEORGIA
6

4.2 BRITISH BASES: FASLANE AND COULPORT

British Clyde Sub-Base Faslane and 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. The next inlet toward the mouth of the firth is Holy Loch where US missile launching submarines were once forward based. (See Figure 4.2-1) The US forward base at Holy Loch was closed in November 1991.

RNAD Coulport is basically a weapons depot. That is where the warheads are stored, and where they are installed and removed from the submarine. It is also the storage and loading/unloading port for torpedoes. For Polaris submarines, the missiles are also loaded, unloaded and stored at RNAD Coulport. For Trident missiles this would normally be done at Sub-Base Kings Bay in the US, but RNAD Coulport will have the facilities if needed.

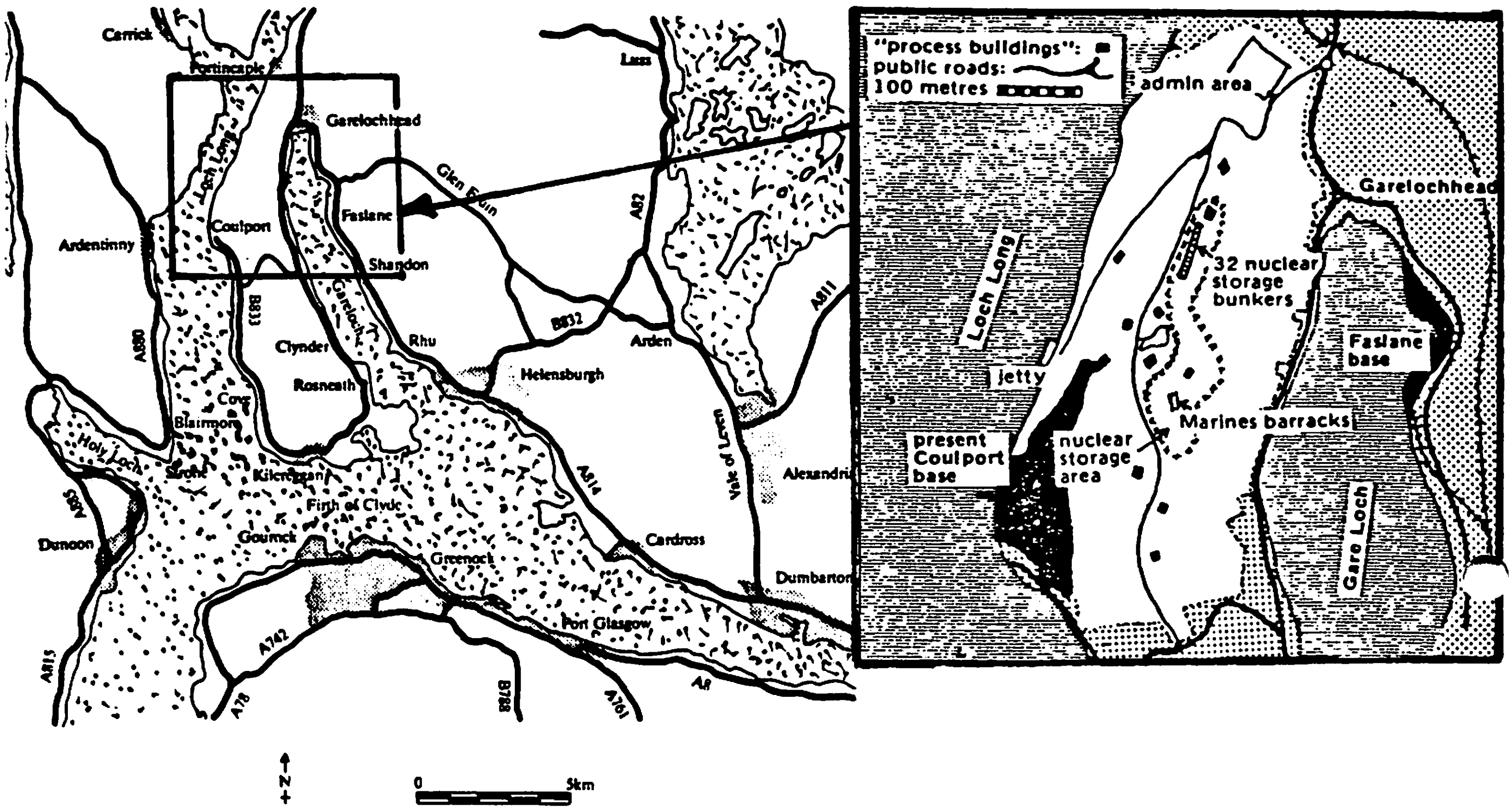
Sub-Base Faslane handles the submarine refitting and routine maintenance between patrols.

* * * * *

[MORE INFORMATION ON THIS SUBJECT WOULD BE WELCOME]

FIGURE 4.2-1

MAP OF BRITISH CLYDE SUB-BASE FASLANE AND RNAD COULPORT



SOURCE: *Peace News* (Britain), September 1982, p. 3.
Third Report of the Defence Committee, House of Commons, Session 1986-87, p. xi.

4.3 FORWARD DEPLOYMENT: POISED FOR THE KILL

Trident's presence has or will spread to the southwestern 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 shift toward regional conflicts. But when patrolling off the Bay of Bengal or the Arabian Sea in crisis times, the Navy certainly wouldn't want to send the sub all the way back to Bangor for periodic resupply and refit. There would have to be means of forward basing or servicing.

Although plans for a Trident base in Micronesia are hotly denied by Navy officials, the obvious advantages coupled with official statements and actual naval exercises indicate secret ambitions for such bases. Likewise for Diego Garcia in the Indian Ocean. All that is necessary to establish a forward base is for a submarine tender ship to steam in and drop anchor. The US Navy's inventory of SSBN tender ships is shown in Figure 4.3-1.

FIGURE 4.3-1
US SSBN TENDER SHIPS

NAME	DESIGNATION	COMMISSIONED
USS Proteus	AS 19	8 Jul 1960
USS Hunley	AS 31	16 Jun 1962
USS Holland	AS 32	7 Sep 1963
USS Simon Lake	AS 33	7 Nov 1964
USS Canopus	AS 34	4 Nov 1965

All were built from scratch except *USS Proteus*, which was converted from another ship to meet the early needs of Polaris submarines. According to a US Navy document, *USS Proteus* was retired in 1981 when Polaris missiles were taken out of service, and it is scheduled to be decommissioned at Puget Sound Naval Shipyard in Washington state -- starting in September or October 1992 and taking about one year. But as we shall see below, this ship has continued to support forward refits. The USS Hunley (AS 31) is scheduled for decommissioning in 1994. [*New London (CT) Day*, 19 February 1993]

A. FORWARD DEPLOYMENT IN THE ATLANTIC

The other four FBM tenders were converted to handle Poseidon C-3 missiles. Later the *USS Simon Lake* and *USS Canopus* were again refitted to also have a Trident-1 (C-4) capability (and possibly a Trident-2 D-5 capability). They have been stationed at Holy Loch (Scotland) and Kings Bay (Georgia), respectively, to service Poseidon subs. According to the US Navy, Holy Loch is the forward base for Poseidon subs carrying Poseidon missiles, and Kings Bay is the forward base for Poseidon subs carrying Trident-1 missiles. The home port for both classes of submarines is Charleston, South Carolina. However, the *USS Simon Lake* at Holy Loch gave that forward base a Trident capability. Since the subs carry no markings, observers could not determine their identity and what missiles were inside.

In November 1991 the Holy Loch base was closed. The *USS Simon Lake* is now free to transfer to the Pacific where Trident submarines carry Trident-1 missiles. When the remaining Poseidon subs are retired, which we are told will be soon, *USS Canopus* will also be able to operate in the Pacific or Indian Oceans.

B. SCOOP IN THE PACIFIC

As mentioned above, the original argument for the Trident program is that the longer range missiles will allow the submarine ten times the ocean area in which to patrol. When the discussion comes to forward bases to support the use of greater ocean area, the argument then shifts to the other foot -- the longer range missiles allow Trident subs to patrol close to home port and still be able to attack their targets. The Navy can't have it both ways.

Longer range missiles do allow the sub to be on-station as soon as it leaves home port. In early 1989 the *USS Alaska* went through a drill to the point of firing missiles right in the Hood Canal where Sub Base Bangor is situated. [*Seattle Post-Intelligencer*, 9 Feb 89, pp. A1 & A12] But full flexibility is never realized if the submarine stays at arms reach all the time. To achieve the short-flight-time advantage of SLBMs the submarine must be closer to its target. In addition, shorter (lofted) trajectories have a steeper reentry angle which minimizes the time to get back down through the atmosphere. That translates into less atmospheric disturbance and better accuracy. Better accuracy would be particularly true for a maneuvering warhead because it would be coming straighter down on its target and have more time to zero in.

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 lead us to the same conclusion. In a program called SSBN Continuity Of Operation Program (SCOOP) various Trident subs in the Pacific have been refitted at remote locations. In May 1986 the *USS Georgia* went through a nine-day full refit at Guam. Guess which FBM tender was involved -- the *USS Proteus*. It may have been deactivated from supporting the Polaris fleet but it apparently remained at Guam. Although that exercise was described as a full refit, missiles were obviously not exchanged because the *USS Proteus* can't handle Trident-1s. (Perhaps it is because the *USS Simon Lake* has been freed from Holy Loch that the *USS Proteus* was finally scheduled to be decommissioned.)

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 submarine *USS Nevada* was turned around at Sitka, Alaska. In July 1989 the *USS Alabama* went through refit at Astoria, Oregon, which created a local furor because it violated the county's nuclear-free-zone ordinance. Rear Admiral George W. Davis, former commander of Sub Base Bangor, said that changing crews, replenishing supplies, and performing needed repairs could also be done in Mexico. Trident subs under way in the open ocean have reloaded torpedoes from tender ships and taken on supplies from helicopters and supply ships.

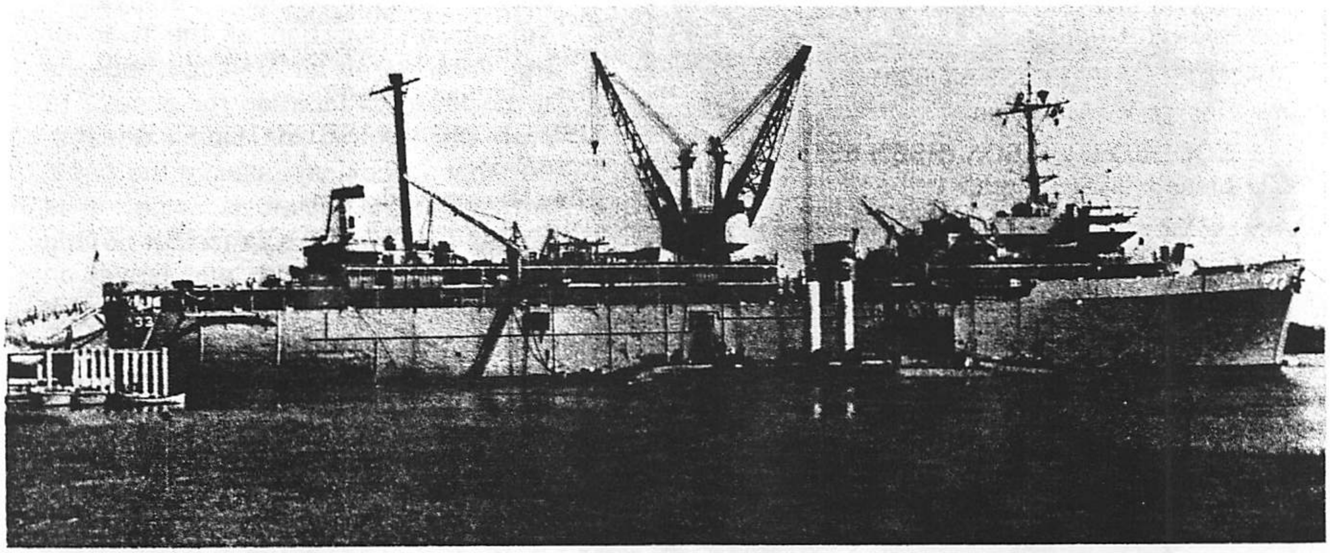


FIGURE 4.3-2
USS SIMON LAKE -- AS-33
Source: US Navy

SCOOP exercises can take place alongside any ship or at any wharf if missiles are not exchanged or reloaded. When missile handling enters the picture, the appropriate FBM tender must be available. I have seen nothing to indicate that the *USS Simon Lake* has been transferred to the Pacific, nor do I expect to see it announced, but I'll give good odds that is happening. Now let us look at a few possible sites for the real thing.

C. FORWARD BASES FOR THE PACIFIC AND INDIAN OCEANS

Numerous locations could be used as an anchorage for an FBM tender ship. One which I have suspected for some time is Palau's Malakal Harbor. Geographically centered in the Southwest Pacific, Palau (indigenously Belau) 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 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 submerged submarines must travel to reach the Indian Ocean. Palau would be an optimum location for Pacific forward basing and a jumping off point for the Indian Ocean. [See *Resisting The Serpent* as an example of how the US tries to influence, control, and if necessary destroy people in order to enforce cor-

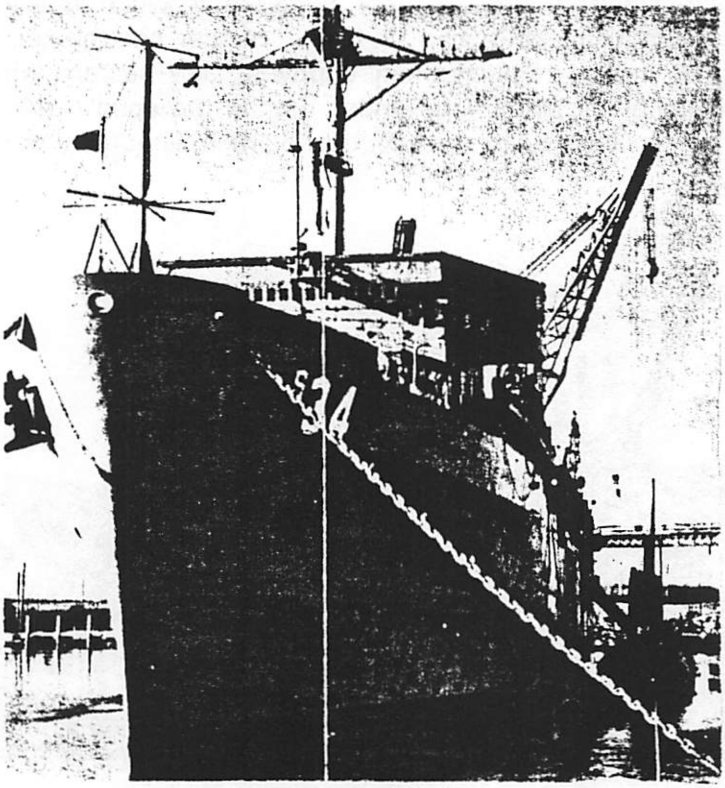


FIGURE 4.3-3
USS CANOPUS -- AS-34
Source: US Navy

porate and military plans.]

Singapore is another option since a 1990 accord allows US resupply ships to operate from that port. Repairs are also allowed at Singapore's commercial shipyards. Singapore's location at the head of the wide Strait of Malacca appears to be an ideal location for access to both the Pacific and Indian Oceans, but that is not necessarily the case. Although that strait is wide, it is shallow. Trident submarines would have to forgo stealth and travel on the surface. To remain submerged they would have to detour south and go through the Indonesian chain via the Sunda Strait.

In the Indian Ocean, itself, Diego Garcia is a logical refit site. It is, arguably, a British island under US control and has all the needed equipment. Possibly a tender ship wouldn't be needed, but it would still be desired for transporting extra missiles. Finding a berth at Diego Garcia would be no problem.

These are not the only potential sites to service forward-deployed Trident submarines. Any sheltered cove would suffice. As Rear Admiral J. Guy Reynolds, commander of submarine forces in the Pacific, 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." [*The Sun*, 31 Jul 89] But there is no place "far off the beaten track" for Trident.

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