INSIDE SUBS

by Tom Buckley

Nuclear missiles may or may not be with us forever. But while they are, how would you like to live right next door to one?

The car followed a road that ran between a broad tidal river and thick woods. Cypress and swamp oak furred with Spanish moss. A sailor in whites drove. He steered with one hand and in the other he held a microphone, into which he murmured.

The admiral and I sat in back. He had a long nose and tight lips, cool blue eyes and a golf-course tan. His starched khakis were rich with admiral's gold. We said little in the misty morning, but the wheels thump-thump-thumped over the ridges of tar.

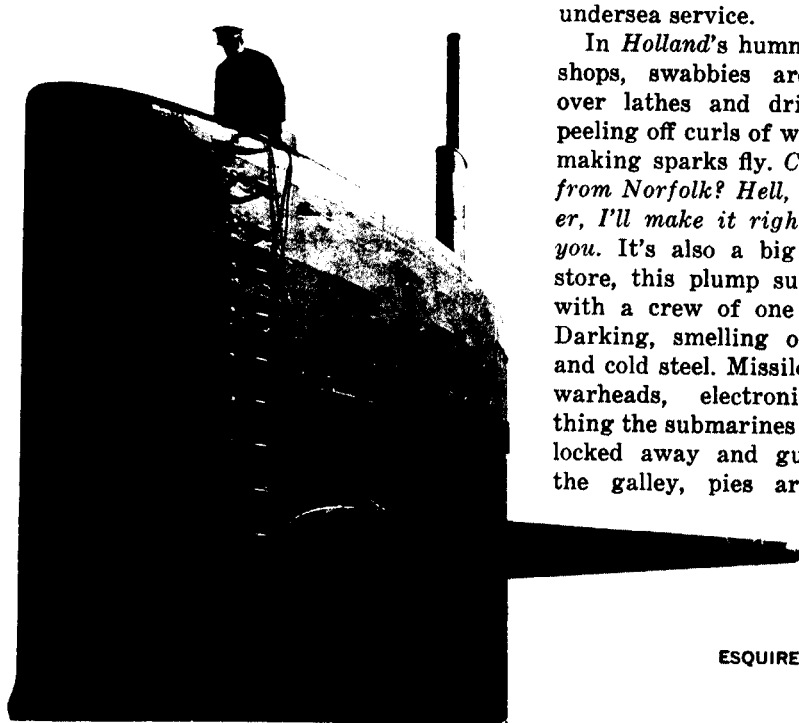
Barbed wire edged the road, and guard towers. In a clearing stood a long low building. I inclined my head questioningly. "Missile overhaul," the admiral replied.

A long curve in the road and there was Charleston harbor. Grey flat water washed against grey sky. Far off, a freighter made for the sea. A squadron of destroyers, moored side by side, loomed up, bow on. Motionless, they looked as swift and fierce as the great bronze horses of St. Mark's in Venice.

At the dockyard gate a sentry peered inside, saluted and waved us on. We rolled between rows of sheds. Yellow forklifts skittered around us. We drove onto a pier as wide as a highway and pulled up alongside the *Holland*. She is the mother ship of the ballistic-missile submarines based at Charleston—broad-beamed, wearing her blue-toned-grey paint like a rinse job.

Pipes screech the admiral aboard. On deck more salutes, smiles, handshakes. *They're always glad to see the admiral,* a captain whispers, *even though he bites their asses once in a while, hahr, hahr, hahr.* They're all submariners, wearing the handsome golden dolphin badge, but red-faced and full-gutted now, too senior for undersea service.

In *Holland*'s humming workshops, swabbies are bending over lathes and drill presses, peeling off curls of white metal, making sparks fly. *Can't get it from Norfolk? Hell, Commander, I'll make it right here for you.* It's also a big hardware store, this plump surface ship with a crew of one thousand. Darking, smelling of lube oil and cold steel. Missiles, nuclear warheads, electronics—everything the submarines need—are locked away and guarded. In the galley, pies are baking.



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Photographed by Robert Freson

Filipino stewards lay out crisp white cloths for lunch.

The mother ship's decks gleam. Her brass is bright. Lines are spliced as fussily as antimacassars. A white canvas awning stretches across her ample stern. We walk under it to the other side, away from the pier. Wallowing there, among the grapefruit halves, the beer cans and condoms, is the *Thomas Jefferson* (SSBN 618). She is a bloated cylinder, painted a tarry, cloacal black, absorbing light and sound. Her bow is bulbous. Her stern comes to a blunt point and a single four-blade screw. Her sail—conning tower in the old days—is set well forward. It looks like a section of an airplane wing set on end. Aft of it, *Jefferson*'s hull is raised and flattened to form a kind of shelf. On it are traced sixteen circles in two parallel rows of eight, each about five feet in diameter. These are the covers of her missile tubes.

In each of these tubes stands a Polaris A-3 missile. They are thirty-two feet long, weigh seventeen and a half tons. All sixteen can be fired in half that many minutes from two hundred feet beneath the sea. High-pressure steam pushes the missiles to the surface. Then their fuel ignites. It arches them a hundred miles into the stratosphere, then down, with an accuracy measured in tenths of a mile, onto a target as distant as twenty-eight hundred miles.

If the day ever comes when these missiles are to be fired, *Jefferson* will be lying motionless in the depths, perhaps somewhere west of the Orkneys. She will float her radio antenna up to within twenty feet of the surface. The spurt of radio transmissions, lasting only a few seconds, will go through the decoding machines, and the order to fire will emerge. It will be verified, and the submarine will go immediately to general quarters.

"Man battle stations, missile," the skipper will order. The words the crew has heard hundreds of times, "This is a drill," will not be spoken this time. Within minutes the preparations will be completed. The skipper and the executive officer will insert the duplicate keys they wear on chains around their necks—flat silvery keys like the ones that open safe-deposit boxes—into the grey-painted box that arms the nuclear warheads and opens the firing circuits.

They have done it too many times in practice not to do it now, but the keys will feel slippery and the red firing buttons will feel cold, will seem to resist. After the first missile has been fired, the rest will be easier. Only a *thump* down there. The one hundred ten men on board will wonder, Did we cream them or did they cream us?

Twenty minutes later, people in Minsk or Pinsk, Omsk or Tomsk, will look upward, see for a moment a golden line drawn against the sky. They will scarcely have time to think, This is it, before they are evaporated in the nuclear fire.

If that day never comes, it will be largely because *Jefferson* and the rest of the world's ballistic-missile submarines existed in the first place. Leaders of the governments of the United States and Russia have probably dreamed, will surely dream again, of a nuclear surprise attack. But the submarines, concealed, all but undetectable, and for that reason invulnerable, alone carry enough nuclear destructive power in their missiles to provide a retaliatory force that makes these dreams break up and drift away.

Since the two countries signed the first Strategic Arms Limitation Talks (S.A.L.T.) agreement in 1972, one thing at least has become unmistakably clear: Of the three methods for delivering nuclear warheads—by missiles launched from dry-land silos, by bombs dropped from planes and by missiles launched from submarines—only the last effectively deters the use of the other two.

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Some fear the accuracy and warhead size and efficiency of land-based intercontinental ballistic missiles—the American Minuteman and the Soviet SS series—have increased to the point that a surprise attack, or first strike, by one side will eventually be able to wipe out the other's missiles in their silos. This capability would catch a large proportion (perhaps as much as two thirds) of the other side's bomber fleet on the ground. Of those that survived to begin their own runs against the enemy's targets, too few, given the continuously improving efficiency of radar spotting, surface-to-air missiles and interceptor aircraft, would be left to retaliate effectively. With the attacker still possessing a reserve of missiles for a second strike against the other country's population centers, the only choice would be surrender or annihilation.

The assumption that a first strike would catch the other side's missiles in their silos had always puzzled me, especially since it was the rationale for the complex strategies of nuclear warfare. Why not, I asked Richard Garwin and Herbert Scoville Jr., simply fire your missiles as soon as your radar reported that the other side's had been launched, leaving them to strike empty silos?

Garwin, physicist, I.B.M. researcher and Defense Department consultant, and Scoville, former deputy director of research of the Central Intelligence Agency and former assistant director of the Arms Control and Disarmament Agency, are among the handful of scientists outside the government who have the technical knowledge and independent outlook to criticize policy in this highly complex area.

The answer to my question, Garwin and Scoville told me in separate conversations, was that neither the United States nor Russia wanted to fire "on warning," as they say, because there was always a chance that the radar, the computers or the spy satellites might be wrong. There is no way to recall a missile once it is launched, a point that the Air Force always makes in its arguments on behalf of the new B-1 bomber. Beyond that, the two men said, there probably wouldn't be time enough to confirm that an attack was taking place, to get word to the President (or his designee) who alone has the authority to order the firing of nuclear weap-

ons, and get the strike order back to the silos in the thirty minutes or less between first warning and impact.

So, by the middle of the 1960's, it had become clear to both sides that, as things stood, the game belonged to the aggressor. The United States and Russia began thinking about protecting their silos from a first strike. One way was to superharden them—that is, make them strong enough to withstand anything short of a direct hit. Another was to build antiballistic missiles (ABM's) that could shoot down incoming missiles.

The cost was daunting—tens of billions of dollars—and the effectiveness was questionable, but the two countries were getting ready to take that long, perhaps ruinous, step in the arms race when something else made it all quite pointless.

That was the development by American scientists of the multiple independently targeted reentry vehicle, or MIRV, which could overwhelm any conceivable ABM system. MIRV is a marvel. The first intercontinental ballistic missiles carried a single nuclear warhead. It was enormously destructive—the American Minuteman I had an explosive force of a megaton—equal to a million tons of TNT—and the Russian warheads were even bigger—but accurate only to perhaps one mile. A city-buster but not particularly effective against targets like silo fields.

The second generation, among them *Jefferson*'s A-3 Polaris missiles, carried three or four separate warheads, smaller in blasting power—about two hundred thousand tons of TNT—that could be "shotgunned" at the same target.

But MIRVing made it possible to load ten to fourteen warheads into a single missile and, with onboard computers, aim them at targets hundreds of miles apart. These warheads were more accurate, too. Tests showed that they regularly landed within a few hundred feet of their targets, and that, in the marksmanship of nuclear destruction, is the center of the bull's-eye. And as the missile zigged and zagged on its downward course, discharging warheads as it went, it could also fill the sky with electronic chaff and dummy warheads to confuse the defender's radar.

By the late 1960's, the United States was well along in MIRVing its Minuteman missiles and had begun modifying thirty-one of its forty-one ballistic-missile submarines to accept the MIRVed Poseidon. Both projects have now been completed. The ten oldest submarines, including the *Jefferson*, could not be adapted to the Poseidon, which has about the same dimensions as the Polaris but weighs twice as much. They have remained armed with the shotgunned Polaris A-3.

At one stroke, the United States had multiplied its nuclear striking force by a factor of at least ten and was once again far ahead of the Russians, who finally began deploying their own MIRVed warheads a couple of years ago. That set the stage for the S.A.L.T. talks. The two countries agreed to stop the deployment of antiballistic missiles and to limit the size of their ICBM arsenals. S.A.L.T. II, which was agreed to in principle at Vladivostok in November, 1974, but has not yet been signed, provided that the United States and Russia could each have twenty-four hundred "nuclear delivery vehicles," of which one thousand three hundred twenty can be MIRVed and nine hundred fifty can be submarine launched.

Those were Henry Kissinger's agreements, on the behalf first of Nixon and then of Ford, ushering in the years of détente; they were opposed, naturally enough, by the Pentagon. In the past year this opposition has become angrier and more open. Sure, there are enough nuclear warheads to destroy Russia ten times over, the argument runs, but the Russians are spending enormous sums on civil defense. In an hour or two, or a day or two before launching a first strike they will disperse their urban population. Their missiles will destroy three-fourths of our population, while ours will fall on deserted cities.

Arms-limitation treaties tend to make diplomats happy and military men unhappy. Down through history, the military men have

usually gotten their way. In such contests, they have big advantages. Armaments mean contracts, jobs, graft, all of which appeal to the legislators who pass the bills. Disarmament feathers few nests.

There's also the question of runaway technology. S.A.L.T. II, for example, is being held up by a dispute over the cruise missile. It's a refinement of the V-1's that the Germans were firing at London in the late stages of the Second World War. Advancements in microelectronics and jet-engine technology have turned it into a cheap and efficient means of delivering a nuclear warhead. The Russians say that since it has a fifteen-hundred-mile range it ought to be counted among the strategic weapons. The Americans say that if the cruise missile is counted, then the Russian Backfire bomber ought to be. The Russians say that the Backfire is a tactical weapon and that if it is counted, then the American F-111's based in Europe ought to be. And so on. Meanwhile, everything keeps being built, and the number of nuclear weapons at the disposal of the two powers rises from the apocalyptic to the absurd.

The decisions now are Jimmy Carter's to make. During his campaign, he gratified the liberals by seeming to favor a fairly big cut—five or seven billion dollars—in the defense budget. Then, after his election, it turned out not to be a cut, really, but a hoped for reduction of some sort in the future. Work will probably continue on the B-1 bomber and the cruise missile, but one thing seems certain: Jimmy Carter, Annapolis graduate, former nuclear-submarine officer—attack subs rather than ballistic-missile subs—and aide to Admiral Hyman Rickover, the father of the nuclear submarine and the man Carter has said he admires most in the world aside from his late father, will not be niggardly with the Navy and especially not with the submarine service.

Below decks, *Jefferson* is a black pot, bubbling with secrets. When she is in port, her instrument panels are covered with screens. The radio room is secured with two combination locks. The nuclear reactor is off limits.

There is something blurry about the crew, possibly because they are all, in a manner of speaking, doppelgängers. Like all ballistic-missile submarines, *Jefferson* has two complete crews: one hundred enlisted men and twelve officers each. The crews are named "blue" and "gold." They alternate in taking *Jefferson* out on her regular sixty-day patrols and doing the maintenance and repair jobs during the twenty-eight days she spends in port between patrols.

The gold crew is on duty when we step aboard, and everybody has an interchangeable look. The skipper, on deck to greet us, is slim, dark-haired, decisive. The executive officer looks a bit burlier, perhaps more humorous. The reactor and missile specialists wear slightly rumpled khakis. Some have beards and wear spectacles and look as though they might be on sabbaticals from college science departments.

The crew is mousing around, and conversations have a tendency to break off when we approach. Not that anything much seems to be going on, and you get the idea that, whatever it is, it's being done in the silence that comes with well-established routine and in a technological shorthand incomprehensible to outsiders.

Outsider is twice the right word. Even when *Jefferson* is tied up right next to fat old *Holland*, it's possible to catch something of the quality of being sealed off from the rest of the world for two months at a time, without even a porthole through which to watch, like Captain Nemo, the nameless creatures of the deep disport themselves. The members of the crews of ballistic-missile submarines are volunteers. The most junior spend a year or more in training, and they are very carefully examined, you may be sure, for their resistance to claustrophobia, to boredom—for there isn't, when you come down to it, much to do in an active way during those sixty-day patrols—and for their ability to get along with other men in close quarters for long periods of time.

These relationships aren't the boisterous camaraderie of destroyers, say. At least that's what a psychologist who once made a research cruise on a nuclear submarine told me. Rather, it's the essentially negative capacity to avoid close relationships and the hassles that may result from them. In a way, he said, it's like doing what old cons call easy time, as opposed to hard time.

Not that there isn't communal life of a sort aboard the *Jefferson*. Good chow, bingo, movies, Ping-Pong, music, correspondence courses, weight lifting and other exercises that don't take up much space, and practically no chicken shit. In fact, these slim, scholarly looking young fellows don't even look as if they know the term.

Anyhow, we walk around the public parts of the *Jefferson* and I look dopily at the missile tubes, painted light cream, that run from the keel up to the deck, and at the dark green torpedoes that are stacked up forward. Torpedoes have come a long way since World War II, a weapons officer tells me, when half of them didn't do anything worse than put an unsightly dent in whatever it was they hit, and every so often one would turn around malevolently and blast the submarine that fired it. Nowadays, most of them are electrically driven, leaving no telltale wake of compressed air; they can home in on their targets. For the *Jefferson*, though, these are defensive weapons. At sea she remains as quiet and unaggressive as a clam.

The *Nautilus*, the first nuclear-powered submarine, was commissioned in 1954. She was also the first nuclear-powered ship of any sort, and when she put to sea she rendered obsolete all of Russia's hundreds of diesel submarines, not to mention our own. The advance in technology was as absolute as sail was to steam or wooden ships to ironclads.

Nautilus would not have been built, at least not then, if it had not been for an obscure captain in the Bureau of Ships named Hyman Rickover. Rickover was an oddity—a Jewish Annapolis man, class of 1922. His only seagoing command was a humble minesweeper in the 1930's. He took an advanced degree in electrical engineering and spent most of World War II in the Pentagon. At the war's end, he was heading for unheralded retirement.

Rickover was quick to see that the atomic bombs that finished Japan could also be used to generate power, that this power could drive *(Continued on page 132)*

(Continued from page 84) ships, and that the best ships for it to drive would be submarines.

Before *Nautilus* there never was a true submarine in any navy in the world. What were called submarines were, essentially, surface ships that could spend short periods of time, a dozen hours, perhaps, submerged at no great depth, running slowly on batteries that were charged by her diesel engines during the hours of darkness, when she ran on the surface. The diesels could not be used when the submarine was submerged, because oxygen was required for the combustion of the oil.

When improved radar and sonar made surfaced submarines vulnerable to attack at night from 1943 onward, the Germans developed a makeshift. That was the snorkel—a breathing tube that permitted the submarine to cruise on its diesels while submerged at periscope depth. The hull and conning tower were concealed, but in a calm sea she would make phosphorescent double "V's" as she went, arrowheads pointing directly at her.

But Rickover knew that a nuclear reactor required no oxygen and that a plutonium core could provide the power for hundreds of thousands of miles. Such a submarine would not have to surface at all, would not have to rendezvous dangerously with tankers in mid-ocean, would not be crammed with batteries full of lethal acid. For two years, he studied the question with the specialists of the Atomic Energy Commission. At last, he and they decided that a reactor could be installed in a submarine. The A.E.C., anxious to do something besides fabricate bombs, put up the money for a prototype.

The problem was that Rickover's superiors in the Bureau of Ships couldn't

see any need for a nuclear-powered submarine. The Navy had a full inventory of excellent late-model diesels. The Russians had no surface fleet or ocean commerce worth mentioning and these were what submarines of any sort were meant to attack. The Russian submarine fleet, while large, comprised for the most part short-range coastal defense boats. Most importantly, Rickover's superiors told him, it was obvious that a nuclear-powered submarine would cost two or three times as much as a conventional sub, and in those days before the start of the Korean War, the defense budget had been cut back to bare subsistence levels.

Rickover had always been one of those officers who were barely tolerated because they were immensely hard-working, brilliant, almost always right. But he was also abrasive, intolerant of incompetence and therefore, as they say, hard to work with. On the subject of nuclear propulsion he had become obsessed, and now he did something very daring. In 1949, he sent his proposal directly to Admiral Chester Nimitz, who had commanded the Pacific Fleet during the war and was then the chief of naval operations. At the same time, with a measure of cunning, Rickover also mobilized support in the A.E.C. and in Congress.

Nimitz, although a surface-ship man, gave Rickover the go-ahead, causing rage and consternation in the Bureau of Ships. He also gave Rickover permission to raid the Navy for the officers he needed. One of these turned out to be a submarine lieutenant four years out of Annapolis named Jimmy Carter. In *Why Not the Best?*, Carter describes his first interview with Rickover. It ended with Rickover asking him about his standing at Annapolis. "Fifty-ninth in a class of eight hundred twenty," Carter proudly replied. "Did you do your best?" Rickover asked. Carter tells how he debated the answer in his mind, finally replying, "No, sir, I didn't *always* do my best."

"He looked at me for a long time," Carter goes on, "and then turned his chair around to end the interview. He asked one final question, which I have never been able to forget—or to answer. He said, 'Why not?' I sat there for a while, shaken, and then slowly left the room."

But Carter was accepted, and until he resigned from the Navy in 1953 after his father's death, he was assigned to the nuclear-submarine program, for the final year or so as an assistant to Rickover. Carter writes feelingly of his chief's perfectionism, his irascibility and of his refusal to praise a job well done. At the same time, somehow, Carter knew that his work was appreciated, that he had Rickover's support, and that they were involved in a great undertaking. And so it proved to be. *Nautilus* was commissioned on schedule, within budget and encountered amazingly few problems after she joined the fleet. And of the more than one hundred fifty nuclear-powered submarines of all types that have been built since, only two, *Thresher* and *Scorpion*, have been lost, and not, apparently, for reasons that Rickover had anything to do with.

By the time *Nautilus* went to sea, everyone in the Pentagon was talking about missiles. The Army and the Air Force had development teams, and the Navy didn't want to be left out. It was then that the notion of a submarine-launched missile was first discussed.

The Navy set up another special-development team, this one headed by Admiral William F. (Red) Raborn, who many years later was briefly to head the Central Intelligence Agency. It kept in close contact with the Rickover group. It soon became clear that there would be an operational missile, the Polaris A-1, long before there was a submarine to launch it from. It was decided to cut in half a nuclear attack submarine that was under construction, insert a missile compartment, and weld it back together again.

This first missile submarine, christened the *George Washington*, was commissioned in December, 1959. The following July, she successfully fired the Polaris on the South Atlantic testing range. The A-1 had a range of only twelve hundred miles and carried a single nuclear warhead, but work had already begun on the A-2 and the A-3, which had a range of twenty-eight hundred miles and four shotgunned warheads. Almost without a pause, work began on the Poseidon missile and on an advanced class of submarines to fire it. And then, before that deployment was completed, there was the Trident class, twice as big, and the Trident missile, with twice the range.

And always there was Rickover. Since the commissioning of *Nautilus*, he had transcended the military establishment. Secretaries of the Navy, chiefs of naval operations, came and went, but Rickover remained, gaining rank over the soon dead bodies of those who hated him, aggregating power and influence with Congress and the White House, where it counted. In 1959, Congress awarded him a gold medal. This Russian-born Jew was heaped with honors by small-town Southern Baptist mandarins. Each year he is respectfully invited to testify before the Defense subcommittee of the House Appropriations Committee, not only on his specialty but on whatever subjects he decides its members need to be instructed about, and they love it.

Now, at the age of seventy-seven, retired from the Navy but still the head of the naval reactors division, he is as irascible as ever, regularly damning his service as inefficient, careerist, forgetful of the fundamentals of leadership, seamanship and technical excellence. For years he has argued that all major surface warships as well as submarines should be nuclear-powered, a view that is strongly opposed by the Navy itself because the Navy gets fewer ships that way. Carter may or may not agree, but Rickover can be certain of having his views heard and seriously considered by his onetime protégé.

The salty old admiral does not talk to the press, however. He hasn't given an interview in years, so I considered that I did well, through the intercession of two powerful members of Congress, to get a telephone call from him. It came unexpectedly one day. The voice on the other end, so raspy it seemed as if it would cut the wire, wanted to know why the hell I was bothering him like that.

"I told you in that letter I sent you that I don't give interviews," he growled. "I don't owe you anything, do I?" he went on. "I'm not violating your constitutional rights, am I? Tell me, but I don't think I am. I've never raped your wife." Then he rang off with the briefest kind of good-bye.

Well, at least I got in to see several Navy officers involved in the ballistic-missile submarine program at the Pentagon. Among them was Rear Admiral Robert Y. Kaufman, known as Yogi, who was then in charge of the development of the Trident class, the third-generation missile submarine. The first two are already under construction.

"It's one helluva submarine," Yogi exclaimed, and then went into the inevitable dog-and-pony show with maps and charts. It will displace eighteen thousand tons, twice as much as the Lafayette class, which in turn was twice as big as the biggest diesels, will carry twenty-four missiles rather than sixteen, each with as many as seventeen MIRVed nuclear warheads or penetration aids. It will fire a new missile, also called the Trident, with a range of four thousand miles, when the first of the eleven or twelve that are to be built is scheduled to go into commission in 1978 or 1979. Within five years, these may be replaced by the Trident II, with a range of six thousand miles.

Sometime after this discussion, the Navy also disclosed that it was improving MIRV. It was going to become MARV, or maneuverable reentry vehicle, and would be fitted to the Trident missile. The warhead didn't just follow a ballistic trajectory after being ejected from the carrying missile, it also had an on-board computer radar and tiny guidance rockets that permitted it to find its own way to the target with something like zero error.

With missiles of that range and accuracy, Trident could strike at targets *anywhere* in the Soviet Union, the admiral went on, stocky, smiling, almost bouncing with enthusiasm, from concealment *anywhere* in millions of square miles of ocean—Atlantic, Pacific, Indian. The chance of detection, unlikely now, when the Polaris-Poseidon subs had to operate in the North Sea or the eastern Mediterranean, would become infinitesimally small.

Not only that, but Trident would have new natural-circulation reactors. The elimination of pumps would make them far quieter and they would be faster, too, than the missile subs now in service. Crews wouldn't be much larger, either, making the subs far more efficient in terms of use of manpower. This has always been a headache for recruiters, since there are com-

paratively few men with the qualifications and the desire to work those sixty-day missions.

Sure they would be expensive—original estimates were $1,200,000,000 per Trident, but the figure is now something like $1,800,000,000 and rising with inflation—but national security doesn't come cheap, Kaufman said.

A new base is being built for the Tridents at Bangor, Washington, on the Hood Canal, near Seattle. Opponents of the program, and I was to hear strong and important criticisms from Garwin and Scoville, said that it was more than coincidence that Washington was the state represented by the immensely powerful Senator Henry (Scoop) Jackson.

Jackson, who has been for years referred to, laughingly or not, as the Senator from Boeing, the aircraft corporation that is his state's largest enterprise, has been as successful in getting contracts and bases for his home state as the late Representative L. Mendel Rivers was. It was during Rivers' long service as chairman of the House Armed Services Committee that Charleston, which was in *his* district, got the Polaris-Poseidon base and much else besides.

"Faster and bigger is absolutely the wrong approach," Scoville told me one afternoon not long ago in his old house in McLean, Virginia, down the road from the headquarters of the C.I.A., where he worked for many years. "What you're doing is *concentrating* your retaliatory capacity instead of dispersing it. Maybe we should be thinking about submarines *smaller* than the present ones instead of bigger."

Although Yogi had argued strongly the other way, Scoville said he was convinced that the Tridents would eventually be far more vulnerable operating in the Pacific than they would be in the Atlantic. "Base them in Maine or anywhere on the East Coast and from two hundred miles at sea they've got complete coverage of Soviet targets," he said. "The other way doesn't make much sense to me."

Scoville also reminded me that the Navy is really of two minds about Trident. The top officers like the idea, of course, that their service has been entrusted with the most important strategic weapon. At the same time, they fear that the immense cost of both the submarine and antisubmarine programs is eating deeply into the budget of the surface fleet. Rickover has made the budget squeeze worse by convincing Congress that major surface ships as well as submarines ought to be nuclear-powered. This raises initial outlays by at least fifty percent, Scoville noted, and while a good deal of this cost is gained back over the life of the ship in fuel savings—a plutonium core can drive a submarine, for example, four hundred thousand miles without replacement—and lower maintenance costs, it also tends to reduce the number of ships the Navy can build.

"Rickover is a great man," Scoville said, "but I've seen it happen again and again. He's gotten so he won't listen to anyone else. He's always right; he can't be wrong. Even in his specialty, nuclear reactors, there haven't been any significant advances in years, and that's because he won't try anything new."

Ever since the ballistic-missile submarines went into service, there has been one nagging problem: Like cops, they may not be available when you want them.

From the time the *Jefferson* submerges off Charleston until she returns sixty days later, she, like all other ballistic-missile subs, maintains radio silence. Her security lies in the fact that the enemy does not know where she is. A radio signal would permit her location to be pinpointed within seconds. For the same reason she would surface only in the direst emergency.

Once she is on station, lying silently at a depth of about two hundred feet, *Jefferson* floats an antenna up to within ten or twenty feet of the surface each day at times scheduled before her departure to pick up whatever messages her operating headquarters in Norfolk, Virginia, may have for her.

She has to float the antenna because water muffles radio waves. That is why sonar, using sound waves, which travel for much greater distances through water, rather than radar, is used for underwater detection. Even this not entirely satisfactory method of communication—the submarine's safety is at least theoretically compromised—has required the construction of vast transmitting stations at places like Cutler, Maine, and Northwest Cape, Australia, broadcasting on the very low frequency (VLF) band, which is required for even minimal penetration of the ocean surface.

To eliminate this problem and to be able to maintain constant contact with both ballistic-missile and attack submarines, the Navy has been trying for nearly a decade now to build an extremely low frequency (ELF) transmitter, whose waves could penetrate down to where the subs are.

As things stand now, Kaufman said, looking grim, hours would pass after a nuclear attack before all the submarines on station could be ordered to retaliate. Then, too, suppose the VLF stations were destroyed. The only alternative, the use of the less powerful transmitters aboard "command post" aircraft, is chancy.

What the Navy originally wanted to build was a system of transmitters and antennas buried several feet underground and covering several hundred square miles in northern Wisconsin. The Precambrian granite that underlies the region, the hardest and oldest rock in the country, is ideal for propagating radio signals.

Project Sanguine, as the Navy rather ineptly dubbed it, immediately ran into strong opposition. It was obvious that the system would be a high-priority target in the event of nuclear war. The Navy had acknowledged as much by planning a segmented system big enough so that it could still function if large parts of it were destroyed, like an earthworm cut into sections and still wriggling.

However, not wishing to be thought of as pusillanimous or lacking in patriotic zeal, the hardy folk of the region and their elected representatives decided to base their objections to Sanguine on the possibility—the certainty, they argued, without much real scientific study—that the electricity coursing through the buried cables would stunt the growth of trees, cause milk to sour in the pail and generally play havoc with nature.

The Navy was discouraged but not defeated. West Texas seemed nearly as desirable, geologically speaking, and the love of country of its inhabitants, sons of the Alamo, was proverbial. Never mind that; Texans didn't want Sanguine, either. They saw it diminishing the libido of prize bulls and clouding television reception.

As of this writing, the Navy is attempting to find a location for a more modest project, with the less bloody name, Project Seafarer.

Unspoken in public, so far, though, is perhaps the most important reason for building the system, at least according to my information. That is that instant radio communication would make it possible to use a "permissive action link" to control the firing of the missiles aboard submarines.

There's no way the commander of a Minuteman silo or of a B-52 bomber can arm his missile or bomb without the receipt of a coded radio signal from his headquarters that goes directly to a "black box" that allows the first step to be taken.

No such safeguard exists aboard ballistic-missile submarines, and its absence makes some people nervous. The firing order would be received in the radio shack, decoded and transmitted to the skipper and the executive officer. Each wears a key around his neck. When the keys are used consecutively, the firing procedure begins. It is remotely possible that both of the officers might go berserk or convince each other that for some reason they had to act in the absence of the order, and thereby start a nuclear war.

Now let us visit in our imagination the office of Admiral Sergei Gorshkov, who has run the Soviet navy for the past twenty years. He is a man with many accomplishments, one of which is the building of a blue-water fleet that now ranges the globe; but he has many problems. Not the least of these is the fact that Russia is, by geography, history and tradition, a land power rather than a naval power.

In 1955, when *Nautilus* went to sea, Admiral Gorshkov found himself with an enormous inventory of instantly obsolete diesel submarines. It wasn't until at least 1960 that the Soviet navy was able to build its own slower and noisier version of *Nautilus*, and despite its best efforts it has remained five to ten years behind the United States in submarine and submarine-missile technology. Here it is, 1977, the Americans have finished

MIRVing their Poseidons and Minutemen, the first Trident missile has been successfully test-fired, and work is well along on MARV. The Russians, on the other hand, have scarcely begun deploying their MIRVs.

The American admirals seem to want to spare Gorshkov's feelings. They act as though the Russian submarine fleet frightens them. At least sixty ballistic-missile subs already and more on the way, they say, compared with our paltry forty-one. A new Delta class, whose missiles are similar to the Trident. A swarm of attack subs, far more than we have, and no end in sight.

But they know, and Gorshkov knows, that the numbers don't mean much in comparison to the technological superiority of the American submarines and their enormous strategic advantages. The operating characteristics of the two fleets are probably similar. That is, the attack subs can probably make at least thirty-five knots and operate at depths of at least a thousand feet, and the missile subs can cruise easily at twenty-five. But the American submarines do this far more quietly than the Russians'. And in the undersea war this is an absolute and enormous advantage. Radar doesn't work down there. You have to *hear* the enemy. If he is noisier than you, your sonars hear him before his hear you. And if your sonars are better, as the Americans' are generally acknowledged to be, the advantage is squared and cubed.

Not to mention that the American Navy is spending enormous sums, some say $5,000,000,000 a year, on antisubmarine warfare. Listening devices planted on the ocean floor, hanging from buoys, sending signals to vast computers, torpedo mines, electronic barriers, hovercraft, destroyer patrols, low-flying planes that bulge with detection devices.

When that submarine of the Golf class went down in the northern Pacific in 1968, the Russians could only guess at her location, based on her final radio transmissions, but the Americans had been following her across the Pacific from Vladivostok and knew precisely where to send the *Glomar* to raise her.

Building a nuclear power plant small enough to fit inside the hull of a submarine isn't easy, but what's really tough is to balance the power takeoffs, the reduction gears and the propeller shaft, so that all you can hear is the ticking of her clocks. That old Russian boat scarcely counted, since she was a diesel carrying three primitive short-range missiles, but even the new Russian models sound like cement mixers. Like a particular kind of cement mixer, too, and for years supersilent American submarines cruised off the Russian bases recording their individual sound characteristics—their voice autographs. That was Operation Holy Stone. It is finished now, apparently, but even if provocative, like the U-2 flights, it was also enormously valuable.

Not only are the American submarines far superior but they have the benefit of forward bases—Holy Loch in

Scotland, Rota in Spain and Guam. They hide in the lee of the friendly shores of Norway, of Turkey and of Japan and Korea. There's nothing there Russia can match. Soviet diplomats have secured basing and refueling rights here and there—Somalia, Guinea, India, something with Cuba, perhaps—but for the most part these are not very helpful. It is in the northern seas, not the southern, that the strategic issues will be decided.

A great many otherwise inexplicable issues in international diplomacy hinge on the basing question. Iceland, for example, knows just how hard it can push the dispute with Britain over fishing rights, because Iceland is indispensable in guarding the North Atlantic approaches to American shores from Russian submarines.

Without those forward bases, it's almost impossible for Russian submarines to reach the open ocean unobserved. From Murmansk, they must transit the coast of Norway, Spitsbergen, Bear Island, the Faeroes and the Orkneys, all of which bristle with detection gear. From Vladivostok, they must run either the Soya Strait, scarcely twenty-five miles wide, guarded on one side by the Japanese island of Hokkaido, the long and narrow Tartar Strait, whose entrance can be closely watched, or the Korea Strait, both sides of which are controlled by American allies. From the Black Sea, there is the Dardanelles, watched by the Turkish and American navies, and in the west Mediterranean, the Strait of Gibraltar, where the British flag still flies on the great rock.

Once past these choke points, as the strategists call them, Russian submarines still face days of steaming to get within range of American targets west of the Alleghenies, and a moving submarine is a submarine that is detectable by slow-flying planes and surface ships trailing their sensitive instruments in the sea, matching the impulses they pick up to those voice autographs that are already programmed into their computers.

In contrast, American submarines are in the open sea almost from the moment they leave their bases. Their escorts, if they are required, can confuse Russian sonars, and once on station they can remain, far longer than the Russians, safe and silent until it's time for them to return or to fire their missiles.

It's precisely this big American lead in submarine and antisubmarine technology, which will be bigger when Tridents begin to join the fleet, that worries Richard Garwin and Herb Scoville. It's another example of destabilization, of not, in other words, leaving well enough alone. If the Russians lose confidence in the ability of their ballistic-missile submarines to inflict assured destruction on the United States, they say, the S.A.L.T. treaties will go out the window and the arms race will resume at an even faster and more ruinously expensive rate than in the 1960's.

Garwin has proposed, indeed, that the two powers establish sanctuaries in the world's oceans in which their missile submarines could remain on station in range of their targets without fear of destruction. In the same way, trailing, by which a killer sub might follow a missile sub to its hiding place, would be forbidden. If the United States and Russia could agree to abandon their antimissile systems, Garwin doesn't see why they couldn't do that.

But it's a farfetched notion at best, Garwin agrees, particularly since the Pentagon has always viewed S.A.L.T. I and II, and any subsequent S.A.L.T. agreement, with deepest distrust. I spent an evening with Admiral Elmo Zumwalt, the retired chief of naval operations, not long ago. Kissinger was a Borgia, a Machiavelli; détente was a disaster; S.A.L.T. was a fraud, he exclaimed. Did I know, he asked, that the Russians were well along with plans to evacuate their cities within hours, rendering the whole theory of mutual assured destruction null and void. Our missiles would destroy empty buildings while theirs would kill three-fourths of our population. Not long afterward I heard a journalist who had recently completed a three-year tour in Russia say that he doubted that the Kremlin could manage such an evacuation in three months let alone in a matter of days or hours.

What would it be like, I often wondered, aboard the *Jefferson* if the order to fire her missiles were ever received. If the routine were broken after so many years. On the basis of conversations I had with two former missile-submarine officers, I suggest that it might go something like this.

Jefferson's orders would come, as usual, from Atlantic Fleet headquarters in Norfolk, Virginia, wrapped up in unbreakable one-time code, triple-sealed and locked in her safe until she was under way.

These orders would set her course, give her her lying-in-wait position, somewhere near the Orkneys perhaps, perhaps in the lee of the Danish peninsula, depending on the target settings of her missiles. These change, of course, from cruise to cruise, being based on intelligence on the dispositions of Soviet antisubmarine forces, on ocean conditions, since the layerings of the sea, temperatures, salinity and the like can help or hinder detection. Usually, a depth of three hundred feet or so is safest, rather than deeper or nearer the surface, and that is how she would make her transit and the depth at which she would remain, her reactors burning only hotly enough to supply her minimum requirements.

The submarine would stay on S.I.N.S.: ship's inertial navigation system. Like a 747 doing the Atlantic run, but no windows to look out of and no stewardesses to flirt with.

That's one reason they get out, finally. All those blank sixty-day periods in their lives. They see their wives and families in a kind of stop-motion photography. There are discontinuities and awkwardnesses, none of them disastrous in themselves, but ultimately, after ten or twenty patrols, they accumulate into estrangements.

There are drills all the time, of course. Fire drills, torpedo drills, evasion drills and firing drills. In the silence of the submarine, they walk around in felt slippers like inmates in a madhouse, and suddenly the hooter sounds, the bells. The nose of the submarine tilts upward. She slides up to one hundred feet beneath the surface. This time it is not a drill. The captain and the exec have the keys. Wearing them on chains around their necks.

"I go for a swim and I see someone wearing a locker key around his neck," one former officer said. "And I think of those drills. I see a locket or a cross around a neck and I think of those drills." ⊞