

Submarine Crash Shows Navy Had Gaps in Mapping System

By Christopher Drew, New York Times, January 15, 2004

Sailors on the San Francisco, a nuclear-powered attack submarine, had just finished cleaning the vessel last Saturday as it sped along 500 feet beneath the surface of the South Pacific. Submarines run blind, just listening for sounds of danger. And to the captain and other officers relying on undersea navigation charts, everything seemed clear.

Suddenly, there was a horrible screeching. And according to an e-mail message written by a crew member, the inside of the submarine quickly resembled a scene from the movie "The Matrix." He wrote, "Everything slowed down and levitated and then went flying forward faster than the brain can process."

The submarine had crashed head-on into an undersea mountain that was not on the charts. One sailor was killed, and about 60 others were injured. Now, Defense Department officials say they have found a satellite image taken in 1999 that indicates an undersea mountain rising to perhaps within 100 feet below the surface there.

But the older navigation charts provided to the Navy were never updated to show the obstruction, they acknowledge, in part because the agency that creates them has never had the resources to use the satellite data systematically.

The officials said the main chart on the submarine, prepared in 1989 and never revised, did not show any potential obstacles within three miles of the crash. They said the incident happened in such a desolate area - 360 miles southeast of Guam - that updating their depiction of the undersea terrain was never considered a priority.

The new information about the charting flaws also illustrates what many experts say is a broader danger not only to submarines but also to many surface ships. At the same time, it provides a glimpse into the arcane task of plotting an undersea world that in some areas is still more mysterious than the surfaces of Mars or Venus.

A variety of satellite data is now showing that many sea charts, including some that still rely on notations from the days when sailors navigated by the stars, are inaccurate. And some scientists are calling for greater use of satellite data to fix more precisely the location of undersea ridges, islands and even continental boundaries and to chart large, less studied areas of the oceans.

The latest disclosures support the account by the commanding officer of the San Francisco that the charts showed that his track was clear. But former submarine captains said Navy investigators were likely to examine whether it had been prudent to travel at such a high speed, 30 knots, given the age and spottiness of the information.

Officials said the main chart on the submarine was prepared by the Defense Mapping Agency in August 1989. That office was later absorbed into the National Geospatial-Intelligence Agency, a part of the Defense Department that provides maps, sea charts and other geographic intelligence to the nation's combat forces.

Chris Andreasen, the chief hydrographer for the Office of Global Navigation at the intelligence agency, acknowledged in an interview that on the chart, "there's nothing shown that would be a hazard" at the crash site.

But since the accident, Mr. Andreasen said, his office has examined commercially available images taken by a Landsat satellite in 1999, and at least one image indicates that an undersea mountain could rise to within 100 feet of the surface there. Analysts say variations in water color can sometimes indicate a land mass below.

Mr. Andreasen said his agency had not normally used satellite imagery to update sea charts, though it recently began using the images to help pinpoint the boundaries of islands and other land masses. He and other officials said that the charting office's staff had shrunk in recent years, and that the Navy never asked it to focus on the area south of Guam, where it began basing submarines in 2002.

Current and former Navy officials say the main focus during the cold war was charting areas in the Northern Pacific and in Arctic seas where missile and surveillance submarines guarded against a Soviet attack. Since then, the Navy has been trying to improve charts of shallower coastal waters in the Middle East and other areas where it might have to help battle terrorists.

Mr. Andreasen said that since global positioning satellites came into wide use in the 1980's, Navy and commercial ships had had a much more accurate way to fix the coordinates of islands, undersea volcanoes and other parts of the giant mountain ranges that jut up from the ocean floor.

"G.P.S. is changing the world," he said.

As ships have reported these coordinates, sea-charting offices around the world have found that many islands were "maybe a mile or two out of position" on widely used charts, he said. So over the past year, his agency has been using the Landsat images and other data to update many nations' boundaries.

But Mr. Andreasen and other scientists said that while commercial shipping interests had helped chart the most common transit routes, large areas of the ocean depths remained little charted.

Dr. David T. Sandwell, a geophysics professor at the Scripps Institution of Oceanography in San Diego, said that about 40 percent of the oceans were "very, very poorly charted, and those areas are mostly in the Southern Hemisphere."

While many sea charts include obstacles and features spotted by commercial vessels, World War II warships and even 19th-century explorers, the best charts are made by survey ships that use sound beams to create detailed pictures of the undersea terrain. The Navy has only seven such ships, however, and scientists say it could take decades to chart the rest of the seas thoroughly.

As a result, Dr. Sandwell and others have suggested that the government make rough chartings of more areas with another type of satellite - one that uses radar to measure variations in the height of the ocean that can signal if mountains are below.

Dr. Sandwell said readings by one such satellite in the mid-1980's also indicated there could be an undersea mountain at the San Francisco's crash site. But he said the margin of error was too large for the studies to be conclusive. And Mr. Andreasen said much of the satellite data was too vague for precise charting.

Mr. Andreasen said the main chart used on the submarine showed that the only concerns were a small area of discolored water that had been noted three miles from the crash site and some coral reefs about 10 miles away.

Notes on the chart indicated that the discolored water was mentioned on a British sea chart in 1963, and Mr. Andreasen said the notation might even go back to World War II. He said the discoloration might have been just a temporary disturbance, or it could have been a sign of the undersea ridge.

Other notes suggest that some ships had reported depths of 5,000 to 6,000 feet nearby. But Mr. Andreasen said few commercial ships used the area, and "it has never been systematically surveyed."

Navy officials declined to comment, saying they are investigating the accident.

The submarine left Guam on Jan. 7 for Brisbane, Australia. The Navy said 23 of the sailors were seriously injured, and at least five had broken bones.

The e-mail message by the sailor was sent to several people involved with submarines, and as it circulated within the submarine community, one person provided a copy to The New York Times.

The sailor wrote that many crew members were eating lunch at the time of the crash, which severely damaged the vessel's bow. He said several sailors suffered "bad head wounds," and men in the engine room smashed against "lots of metal and sharp edges."

Still, he said that the vessel's damage control party "did everything exactly right even though they were hurt as well."

The message also said that the submarine was lucky to have an extra medic on board, and that its main medic, known as a corpsman, did not sleep during the two-day trip back to port.

The Navy has said a machinist's mate second class, Joseph A. Ashley of Akron, Ohio, was knocked unconscious by the crash and died the next day from severe head injuries. The e-mail message said other sailors were surprised that the corpsman "got him to hold on as long as he did."

[back to top](#)

Team from 7th Fleet to investigate submarine accident

Associated Press

HONOLULU (AP) - A team from the Navy's 7th Fleet based in Japan has been sent to Guam to investigate an accident aboard the nuclear attack submarine USS San Francisco that left one sailor dead and 23 others injured, a spokesman said Thursday.

No timetable has been set for the investigation, said Jon Yoshishige, a Pacific Fleet spokesman at Pearl Harbor.

"In general, they will interview crew members, go over all the evidence and draw some conclusions," Yoshishige said.

He declined to identify the officer leading the investigation.

The San Francisco was performing underwater operations Saturday when it ran aground about 350 miles south of Guam.

Officials said a preliminary investigation indicated the submarine had to surface suddenly after it struck something hard such as an underwater mountain, large rock or other type of natural feature.

A sailor who was working in the submarine's engineering spaces suffered fatal head injuries. Injuries among the sub's 137 crew members included cuts, bruises and broken bones.

There was no damage to the submarine's nuclear plant, officials said.

Yoshishige said the investigation team also will determine the cost of the damage and how long it might take to repair the 360-foot vessel. "We will get all of that in one big lump at the end of the investigation," he said.

The San Francisco's home port is Apra Harbor, Guam.

Located west of the international date line, Guam is a U.S. territory about 3,700 miles southwest of Hawaii.

[back to top](#)

Shipmates mourn loss of brother

'99 Manchester High grad killed in sub wreck served Navy proudly, officer says

By Kymberli Hagelberg, Beacon Journal staff writer

Approximately 200 friends, loved ones and shipmates paid their respects on Saturday night to Navy Machinist's Mate Second Class Joseph Allen Ashley at Akron Baptist Temple.

At his funeral service, patriotic songs were sung. Two naval officers flanked Ashley's flag-draped, open casket.

The Rev. Dallas R. Billington's voice broke as he described the veteran "Cowboy Joe" had become.

"I want you to know what Joey has done for you," Billington said. "He gave his life so you can live in freedom."

To those who felt the pain of Ashley's loss, the minister offered the prayer, "At times like this, we look to the heavens as we have nowhere else to turn."

The 24-year-old, who graduated from Manchester High School in 1999, died last Sunday after suffering head injuries when the nuclear-powered submarine he was serving on, the USS San Francisco, crashed into an undersea mountain about 360 miles southeast of Guam in the Pacific Ocean.

Before Ashley joined the Navy in 2001, he was known for playing drums in the high school band and for the car horn on his green Jeep Wrangler that played Dixie, like the one on his favorite television show, The Dukes of Hazzard.

Rear Adm. Jay Deloach, deputy commander of the U.S. Atlantic Fleet submarine force, called Ashley "a very special shipmate."

"Joey, or 'Cooter,' wore the silver dolphins (of a Navy submariner) on his uniform with pride," Deloach said. Men who work in submarines are a brotherhood "formed beneath the waves," Deloach said.

The waves are often calm but also quickly changeable. "They are seas that know neither pity nor remorse," Deloach said. "Joey lived with those hazards every day with an upbeat attitude that made the work easier."

U.S. Defense Department officials told the New York Times that a chart used by the submarine prepared in 1989 did not show any potential obstacles within three miles of the crash, but a satellite image taken a decade later showed the obstruction that rose about 100 feet below the surface.

Ashley will be buried today in Spencer, W.Va.

Donations in his memory may be made to the Joseph Ashley Memorial Scholarship, c/o Manchester High School, 437 W. Nimisila Rd., Akron, OH 44319.

[back to top](#)

Crippled Sub Challenged Crew's Skills

Navy sources shed light on crash, return trip of USS San Francisco

By Robert A. Hamilton, New London Day, 15 Jan 05

New London -- The galley crew had started to serve lunch as the USS San Francisco checked its position against a global positioning system satellite, checked the water depth with its fathometer, and announced that the ship was going to dive, all routine operations aboard an attack submarine.

Four minutes after it submerged, that routine was shattered one week ago today as the San Francisco crashed into an undersea mountain at more than 35 mph, sending sailors crashing into equipment and bulkheads and destroying the bow dome and three of the main ballast tanks at the front of the sub.

The accident released kinetic, or nonradioactive, energy on the scale of the electrical output of the Millstone 2 nuclear reactor, which explains the extensive damage to the ship and the severity of the injuries - one man was killed and more than 60 others were injured, two dozen of them seriously.

But engineers are impressed that despite the violence of the underwater encounter, the ship's reactor, steam turbine generators, electrical distribution network and even its navigation system were unharmed, and the ship was able to limp back to port on its own.

Through dozens of interviews with submariners, active duty and retired, as well as a review of a variety of internal Navy documents, an account of the accident that nearly crippled the San Francisco is beginning to emerge.

Because the investigation is still under way, there are few official sources of information, however.

The captain of the San Francisco, Cmdr. Kevin Mooney, has not been relieved of duty, perhaps the most telling evidence that the initial inquiry has found that the sub was following all the correct procedures and had the misfortune to run into an uncharted seamount.

In fact, Rear Adm. Paul Sullivan, commander of the Pacific submarine force, said in an unclassified e-mail obtained by The Day that he was impressed with how the captain and crew dealt with the aftermath of the crash.

"The continuous operation of the propulsion plant, electrical systems and navigation demonstrates the reliability of our equipment and the operational readiness of our crews as a whole," Sullivan wrote.

"The impressive Joint and Navy team effort which resulted in SFO (San Francisco) returning to port safely says volumes about the ingenuity and resourcefulness of all our armed services. For all who participated in this effort, thank you and your people. We are all eternally grateful to each of you."

The San Francisco was built at what is now the Northrop Grumman Newport News (Va.) Shipyard, was commissioned in 1981, and was originally homeported at Pearl Harbor, Hawaii. After a refueling overhaul completed in 2002, it was assigned to the new submarine base in Guam.

The San Francisco had finished all the post-refueling sea trials and conducted its first two-month deployment last year, arriving back in Guam Dec. 1, 2004. On Friday, Jan. 7, it set sail for Brisbane, Australia, for a port visit. The sailors were probably excited - Australians still recall that the U.S. submarine force kept the Japanese at bay in the Pacific during World War II and generally treat American submariners well.

Saturday morning, soon after breakfast ended at 6 a.m., the ship conducted a "field day," during which the entire ship is cleaned, top to bottom. All 137 men on board would have been out of their bunks and taking part until just before lunch was served at 11 a.m. They would have removed deck plates to clean bilges and other hard-to-reach spaces.

The chief petty officers on board warned everyone as they finished to "stow for sea" - make sure everything is bolted down or locked up. In the event of a collision, loose objects tend to become unguided missiles. As a result, the ship was probably more tightly stowed than usual, which helped prevent more serious injuries, submariners said.

In late morning, the ship was at periscope depth, checking to make sure it was on course. Everything checked out; the ship was just over 400 miles southeast of Guam, near the Caroline Islands ridge, but the charts showed that there was no water less than about 6,000 feet deep for at least seven miles around the boat, more than enough of a safety margin for submariners, who are known to be cautious.

Some time about 11:30, after running through a safety checklist to make sure the boat was ready to submerge, the officer of the deck gave the order to dive. The San Francisco used the dive to pick up speed, and was soon running at flank speed, something in excess of 30 knots.

Although its destination was to the southwest, it was headed in an easterly direction, probably because it had "cleared its baffles," or changed direction to check to make sure there were no submarines trailing it in the spot directly behind the ship, where its normal sonar sensors cannot "hear."

At 11:42 a.m. Guam time, about four minutes after diving, the San Francisco crashed head-on into a nearly vertical wall of stone, a seamount that was not on the charts. In an instant, the submarine's speed dropped from almost 33 knots horizontal to 4 knots almost straight up as the bow whipped up and the ship tried to go over the obstacle - without success.

Crewmen told family and friends that the moment was surreal, so unexpected that it took a moment to realize what had happened: The sub had rammed into something and was out of control. One sailor told a friend it reminded him of the movie "The Matrix," in which everything slows down and a disaster unfolds in slow motion.

The diving officer of the watch, normally strapped into a chair in the control room, had just unbuckled his belt to update a status board. He struck the control panel so hard that he broke some of the gauges. Some crewmen were tossed 20 feet into bulkheads, several narrowly missing being dropped down through stairways.

A couple of men were smoking in the lower level of the engine room, and more were waiting their turn - it is the only area in the sub where smoking is allowed. The area includes much sharp-edged metal equipment that caused several of the lacerations and broken bones that had to be treated later.

Machinist Mate 2nd Class Joseph Allen Ashley, 24, of Akron, Ohio, who had just re-enlisted for a second four-year term, was in the main seawater bay at the back of the sub. He was thrown forward 20 feet into the propulsion lube oil bay, striking his forehead against a large metal pump. He was knocked out and died the next day without regaining consciousness.

Through the chaos, though, the crew followed the procedures they had drilled on day after day as submariners. Within seconds, one of the crewmen at the helm, his arm broken in the crash, pulled the "chicken switch," which forces high-pressure air into the main ballast tanks to force the submarine to the surface.

The executive officer suffered a serious back injury when he was thrown onto an emergency air supply pipe, but he was quickly directing damage-control efforts. Injured men were carried to the crew's mess and the wardroom, where the tables were pressed into service as gurneys. The ship's "doc," an independent duty corpsman trained in emergency medicine, began assessing and treating the injuries.

One of the ship's junior officers was a former enlisted man and was able to help out. Other crewmen were recruited to keep men with head injuries awake until they could be checked out, as the worst cuts were stitched and the worst breaks were set.

When a medical team arrived from Guam via helicopter the next morning, a surgeon, an undersea medical officer and another independent duty corpsman remarked that the care given to the injured crewmen was outstanding, particularly considering the circumstances.

The submarine force has a policy of "water space management" that would have required Mooney, the skipper, to file a plan showing his expected track and speed through the area to make sure he would not be in the same water as another submarine at the same time. Navy sources said there was nothing on that plan that would have raised any alarm.

In addition, given the charts that showed only deep water in the area, Mooney would not have been expected to do depth soundings more than every 30 minutes, certainly no more than every 15 minutes, which would not have given him enough time to react to the steep seamount. In fact, he might not have been able to avoid grounding even with nearly continuous soundings.

The undersea mountain was so steep that there was damage visible even on the top of the sonar dome, which indicates that the sub hit a virtual wall.

The San Francisco would have picked up the mountain if it was using active sonar, but submariners use that sparingly because it gives the boat's location away. Instead, it would have been using passive sonar - listening for the noises made by other ships and submarines. But seamounts don't make any noise, and even if there were currents swirling around it, the noise would have been lost in the noise the San Francisco was making as it sped through the water near top speed.

Jeff Schweitzer, a research professor in the Physics Department at the University of Connecticut, said the submarine's kinetic energy at 33 knots and 4 knots is easy to calculate - one-half its mass (6.3 million kilograms) times its velocity (16.98 meters per second before the accident, 2.06 meters per second afterward), or 902.4 megajoules before, and 13.3 megajoules afterward. So the accident released just over 889 megajoules of energy. The

Millstone 2 reactor in Waterford is rated at 870 megawatts, so if the ship slowed over a second, it released roughly the same energy in that time as Millstone 2 could generate.

"It would have lit quite a few light bulbs," Schweitzer said. "It is a lot of energy, which is why the collision cracked rock and dented such strong steel."

He said it would take much more complex calculations to determine where all that energy went - how much went into bending the steel of the ballast tanks, or even heating the water in the area around the wreck - but the release was enormous. Physics also explains the injuries, a fundamental principal being that a body in motion tends to stay in motion until something slows it down, whether air friction or a steel bulkhead. If the submarine instantly decelerated from 33 knots to 4 knots, in theory the men aboard would have kept moving forward at 29 knots relative to the rest of the ship until they encountered something hard.

Schweitzer noted, however, that even sitting in a chair or standing on the floor would bleed off part of that speed, and that the ship would have decelerated over a second or so, which would also yield a slight difference.

"So it might not be the same thing as being thrown forward at 29 knots," Schweitzer said. "But it would have been a lot more comfortable to have been in a seat and belted in."

At the time, however, no one on the San Francisco was doing the calculations. They were more worried about saving the ship. At almost 550 feet, the water pressure would have been almost 240 pounds per square inch, so even a small leak could have quickly put the ship in danger.

In addition, it quickly became apparent that three of the four forward ballast tanks had uncontrollable leaks, which caused the ship to take on a serious bow-down aspect. That was dangerous for two reasons: any forward movement could quickly drive the ship deeper; and any angle would allow more air to seep out of the ballast tanks, making the ship heavier, increasing the angle even more.

Through the quick use of variable ballast tanks located throughout the ship, the crew was able to get it to the surface, though the back end of the ship was riding about four feet higher than normal, and the bow was so deep the depth markings were out of sight.

The reactor plant, propulsion system and electric distribution gear were all operating normally, however, which allowed the crew to focus on the ballast system.

Immediately, Mooney dispatched a message to Guam, where the Commander of Naval Forces Marianas dispatched the 110-foot, Guam-based Coast Guard cutter Galveston Island and the 906-foot Maritime Sealift Command cargo ship Gy.

Sgt. Fred Stockham to intercept the submarine and escort it home, but it would be almost a day before they arrived.

By 4 p.m. Saturday, the commodore of Submarine Squadron 15 on Guam had called together family members to deliver the news and promise regular briefings on the situation.

The front of the ship was so badly deformed, its maneuverability was compromised. In addition, because the bow-down aspect of the sub would force it under at even moderate speeds, the San Francisco was limited to about eight knots on the surface.

Then, poor weather on Sunday forced the captain to bring all his crewmen down from the bridge out of fear that any additional water coming down the hatch would cut further into the sub's limited buoyancy. He had to run the ship from the control room, using radar and radio to make sure it stayed close to the escort ships, but not too close.

The crew continuously operated the low-pressure blower to keep air in the ballast tanks, despite the leaks. The air pump is rated for only intermittent use, but held out for more than 30 hours during the trip back.

In addition, the crew quickly implemented an emergency technique to use the exhaust from its massive auxiliary diesel engines to augment the low-pressure blower.

Back in Guam, the Navy was assembling flotation aids and welding gear to do emergency repairs when the San Francisco finally pulled into port. Divers and technical experts were on hand to assess the damage. A team was on its way within hours from Pearl Harbor Naval Shipyard, including a structural engineer, a ballast tank expert and an air systems expert, led by Capt. Charles Doty, who commanded the USS Cheyenne in the Pacific until last year.

During his time at the helm, the Cheyenne was the first ship to launch missiles in the Iraq war in 2003.

On Monday afternoon, family members lined Sierra Pier at the Guam submarine base, where they waited anxiously for their first sight of the submarine they were assured would be berthed at the pier before long. About 3 p.m., it

came into view, nose down, listing visibly to starboard, with a tumultuous bow wake testifying to the damage at the front of the boat.

Submariners from the USS City of Corpus Christi and USS Houston, and the tender USS Frank Cable, which comprise the rest of Squadron 15, waited on the pier as well, ready to help tie up the ship, shut down the nuclear plant, hook up the shore power supply and otherwise aid a crew that had been up for two days straight saving the San Francisco.

[back to top](#)

Letters To The Editor: Sailors And Others In Our Military Are Great

New London Day, 17 Jan 05

The crew of the submarine San Francisco saved their ship on Jan. 8. By the account I read in The Day, heroism was in no short supply. The situation was grave and the loss of the boat a real possibility.

The crew not only saved the boat by back-feeding the diesel exhaust into the low-pressure blower system, but also sailed the San Francisco back to Guam, not under tow, but on ship's power. These sailors, every one, trained at the Submarine School on the New London Submarine Base and performed duties with professionalism and courage.

The next time you see a young sailor walking down Route 12 listening to an Ipod; see her or him buying a bag of candy; or observe one watching cartoons on a Saturday morning, don't judge that person by what you see, but by what you know.

The sailors who serve today are as brave as, and smarter than, all sailors that have come before. They are the best ever. This goes for every soldier, sailor, airman and Marine serving anywhere in the world today.

Mack Kelly, Ledyard