What sank the Thresher

All 129 men died aboard the submarine 50 years ago

By Bruce Rule and Norman Polmar

Beginning with the pioneer nuclear-propelled submarine Nautilus, which went to sea in January 1955, the Navy has built 200 nuclear submarines of all types. These undersea craft have been manned by several hundred thousand sailors and have traveled more than a hundred million miles.

They have demonstrated that nuclear propulsion is safe, efficient and of tremendous value for undersea craft. However, there have been several accidents and collisions, none involving nuclear issues, and two U.S. nuclear submarines have been lost — the attack submarines Thresher in 1963 and Scorpion in 1968.

[ANALYSIS]

The Thresher, which sank 50 years ago, on April 10, 1963, with the loss of all 129 men on board, remains the world's worst submarine disaster in terms of lives lost. And, her loss remains controversial, a half-century later.

The Thresher had departed Portsmouth Naval Shipyard in Maine, where she was constructed from 1958 to 1961, for post-overhaul trials April 9, 1963. On board under Lt. Cmdr. John Harvey was a ship's company of 108 men and, for the sea trials, four additional Navy officers and 17 civilians. The submarine was accompanied by the submarine rescue ship Skylark, which carried a McCann submarine rescue chamber. That device — with divers assisting — could rescue a submarine's crew down to a depth of 850 feet in the event of a disaster. It was the Navy's only submarine rescue system.

The Thresher's test depth was some 1,300 feet with a predicted "collapse" depth of about 1,950 feet.

After diving trials April 9, which were accomplished without significant problems, the Thresher and Skylark moved into deep water for the submarine to dive to her test depth. According to her first commanding officer, Rear Adm. Dean Axene, the Thresher had been to her test depth about 40 times before entering the Portsmouth shipyard. The submarine and surface escort could communicate via the UQC, a kind of underwater radio. Its clarity and reliability were poor.

As the Thresher approached her test depth early April 10, the Skylark received several messages from the submarine: Garbled, they were remembered by Skylark's commanding officer, Lt. Cmdr. Stanley Hecker. They included these words: "Experiencing minor difficulty. ... Have positive angle. ... Attempting to blow. ... Will keep you informed." At some point the number "900" appears to also have been transmitted. Then nothing. The Navy's most advanced submarine was gone — the world's first nuclear submarine to be lost.

With the submarine's loss established, and the knowledge that there were no survivors, the Navy set up a court of inquiry in Kittery, Maine, where the Thresher had been constructed. After lengthy and exacting hearings of witnesses, and examination of documents and exhibits, the court of inquiry concluded that a flooding casualty in the engineroom was the most probable cause of the Thresher's sinking and that it was most likely that a piping system failure had occurred in one of the saltwater systems, probably in the engine room. It was also concluded that in all probability water affected electrical circuits and caused a loss of power.

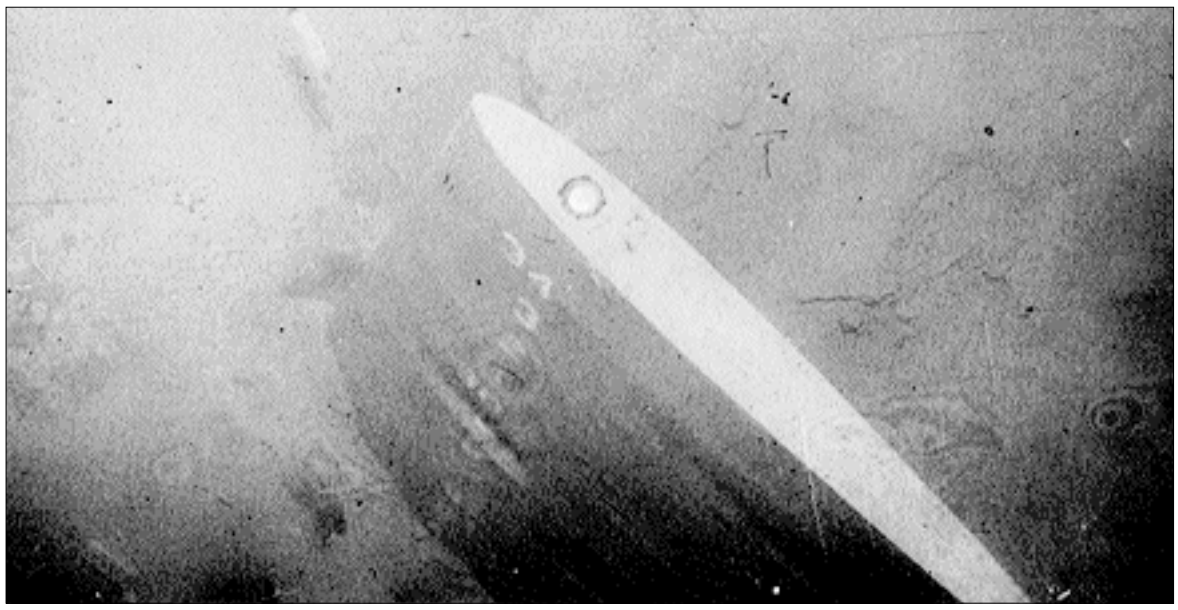
Obviously, the use of such terms as "most probable," "most likely," and "all probability" indicated that the exact cause of the disaster was unknown.

Perpetuating a theory

Still, almost a half-century later, the head of the Navy's nuclear propulsion program, Adm. Kirkland Donald, in discussing lessons from "unique and tragic events to remind all of us how our program's fundamental principles keep us successful," perpetuated this theory of a piping failure. The now-retired admiral stated:

"The most likely cause of the [Thresher] accident was the failure of a silver-braze joint in a seawater piping while operating at or near test depth which allowed high pressure seawater spray to short out the electrical equipment and led to a reactor scram [shutdown]."

Yet, back in 1963, none other than Vice Adm. H.G. Rickover, at



NAVY PHOTOS

The Thresher, top right, sank on April 10, 1963. All 129 men on board were killed, and it remains the world's worst submarine disaster. Top left, a view of the sonar dome wreckage and above, a view of the sub's upper rudder.

ABOUT THE WRITERS

■ Bruce Rule in April 1963 was the analysis officer at the Navy's seafloor sound surveillance system evaluation center in the Atlantic Fleet compound in Norfolk, Va., where he analyzed the acoustic events related to the loss of the Thresher. He subsequently testified before the Thresher court of inquiry. Rule then served as the lead acoustic analyst in the Office of Naval Intelligence for 42 years, retiring in 1992, and was a scientific and technical consultant to ONI from 1996 to 2007.

■ Norman Polmar, a columnist for Naval History and Proceedings magazines, has written several books related to submarines and has directed or participated in submarine-related studies for various U.S. government agencies and foreign firms and governments, as well as for senior members of Congress. He was a member of the Navy secretary's Research Advisory Committee for almost 11 years. Polmar worked as a Navy Times associate editor and overseas correspondent from 1960 to 1963.

the time head of the Navy's nuclear propulsion program, told Congress, "When fact, supposition and speculation, which have been used interchangeably, are properly separated, you will find that the known facts are so meager it is almost impossible to tell what was happening aboard Thresher."

Report's 'conclusion' unlikely

Thus, the "conclusion" that a silver-braze joint failure had caused the loss of the Thresher is highly unlikely and — at best — tenuous. In retrospect, three facts provide a more reasonable if not conclusive account of the cause of the disaster:

First, almost immediately after losing Thresher, Rickover at once sought to reduce the time lag after a scram to restart the reactor, according to Rear Adm. Ralph James, chief of the Bureau of Ships, in a 1963 interview. Reportedly, this effort included Rickover convening a meeting in Washington of his staff and available nuclear submarine engineers to work on this matter.

Second, according to then-Cmdr. Axene, the first CO of the Thresher, he would have reported a reactor scram as a "minor difficulty." He would not have used that term for a flooding casualty, "even through a small-diameter pipe."

Third, and in several respects most significant, the Navy's seafloor sound surveillance system had acoustically detected several sources from the Thresher in the submarine's final moments. At the time SOSUS was highly classified and was not discussed in open session of the court of inquiry or in the congressional hearings.

The submarine's main coolant pumps were initially detected by SOSUS on April 10 at 8:45 a.m., as the submarine was approaching a depth of 1,000 feet. SOSUS data indicated that at 9:11 a.m., after two minutes of line frequency instability, the nonvital electrical bus failed while the reactor MCPs were operating in "fast" mode, the normal full-power lineup for the propulsion plant.

The failure of that electrical bus caused the main coolant pumps to stop, which resulted in an immediate reactor scram — shutdown.

At 9:13 a.m. the Skylark received the message containing the words "minor difficulty." The other, garbled messages followed, indicating that the Thresher was attempting to blow ballast to reach the surface; a definite indication that she had lost propulsion.

Unable to effectively blow to the surface because of subsequently confirmed ice formation in the ballast system, the Thresher sank to her collapse depth without any prior flooding. At 9:17 a.m., the Skylark's bridge personnel heard what would be the final message, the one containing the number "900." This is accepted to have been a reference to test depth, indicating that it was being exceeded by 900 feet — the submarine had reached 2,200 feet.

'Sound of ship breaking up'

Moments later Lt. j.g. James Watson on the Skylark's bridge heard over the UQC a sound that he recalled from his World War II service: "the sound of a ship breaking up ... like a compartment collapsing." Continued calls via UQC to the Thresher brought no response. A short time later the Skylark began dropping small signal grenades, a pre-arrangement with the Thresher to immediately surface in the event that communications were lost. Hecker and his crew aboard the submarine rescue ship could do nothing more.

The Thresher collapse event signal was detected by multiple SOSUS arrays as an extremely high-amplitude event at ranges as great as 1,300 nautical miles. The characteristics of that acoustic event confirmed that the Thresher's pressure hull collapsed or "imploded" at 09:18:24 at a depth of about 2,400 feet (i.e., more than 400 feet below her predicted collapse depth).

The Thresher's pressure hull and all sea-connected piping systems had survived well beyond their design specifications. The analysis of the SOSUS detection of the collapse event — the bubble-pulse frequency — also indicated that the pressure hull and all internal compartments were destroyed in about one-tenth of a second, significantly less than the minimum time required for perception of the event by the men on board.

Measurements made during the instrumented sinking of the discarded diesel-electric submarine Sterlet in 1969 are consistent with the conclusion that the water-ram produced by the initial breaching of the Thresher's pressure hull at 2,400 feet entered the pressure hull with a velocity of about 2,600 mph. That force would have ripped asunder the pressure hull longitudinally and vertically, as verified by photographs of the Thresher wreckage.

Beyond reasonable doubt

Thus, beyond reasonable doubt, the available evidence defines the initial Thresher casualty as an electrical bus failure, which shut down the submarine's main coolant pumps causing the instant reactor scram. Unable to rapidly restart the reactor to regain propulsion, and unable to blow ballast, the Thresher slowly sank toward the ocean floor — a depth of 8,400 feet — with 129 men on board.

The loss of the Thresher was a reminder that the seas are deep, cold and dark, and while man has mastered them with his submarines, those who go down to the sea in undersea craft must be ever vigilant. But when tragedy occurs, it is vital to determine and understand the truth. □