



USS THRESHER LOST APRIL 10, 1963

A 50TH YEAR
REMEMBRANCE



LEST WE FORGET

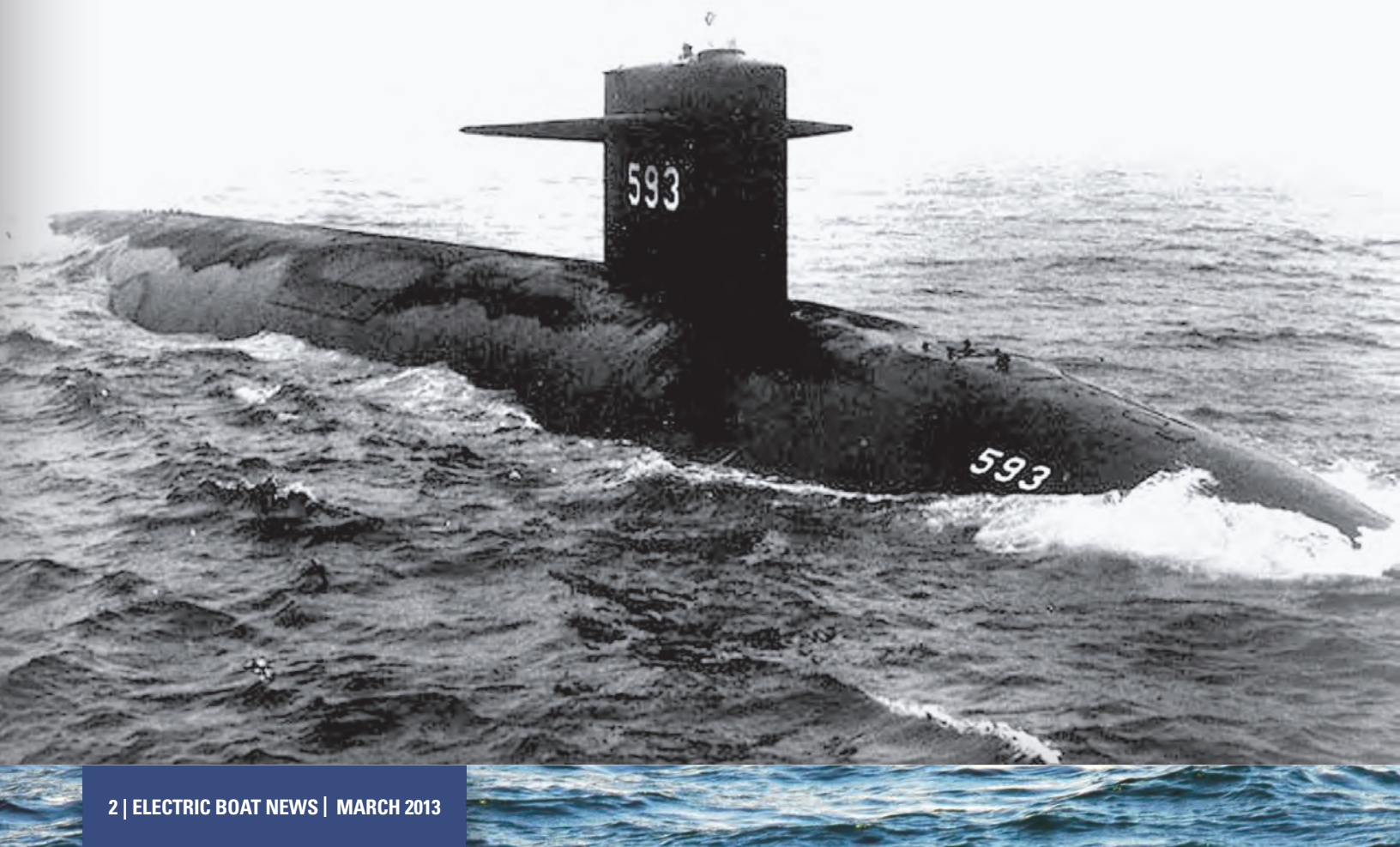
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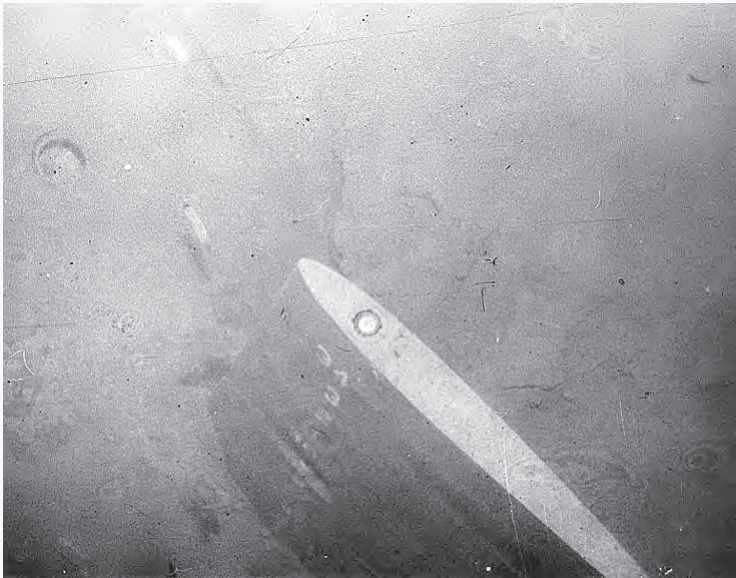
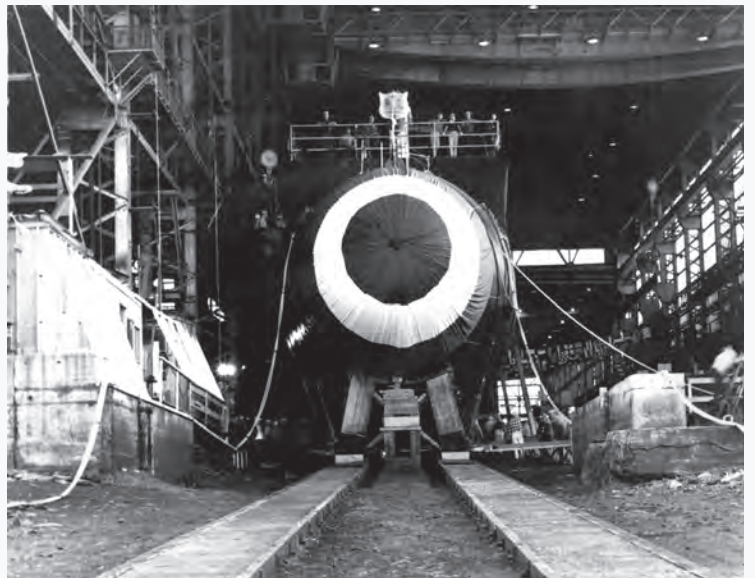
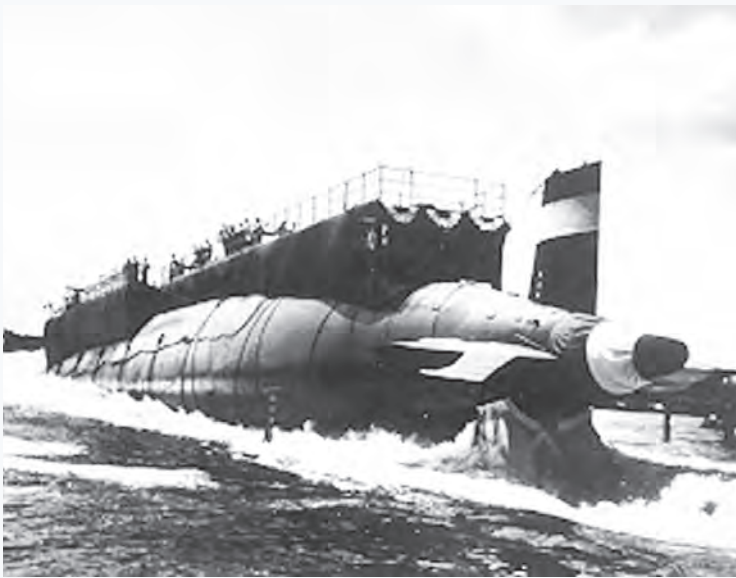
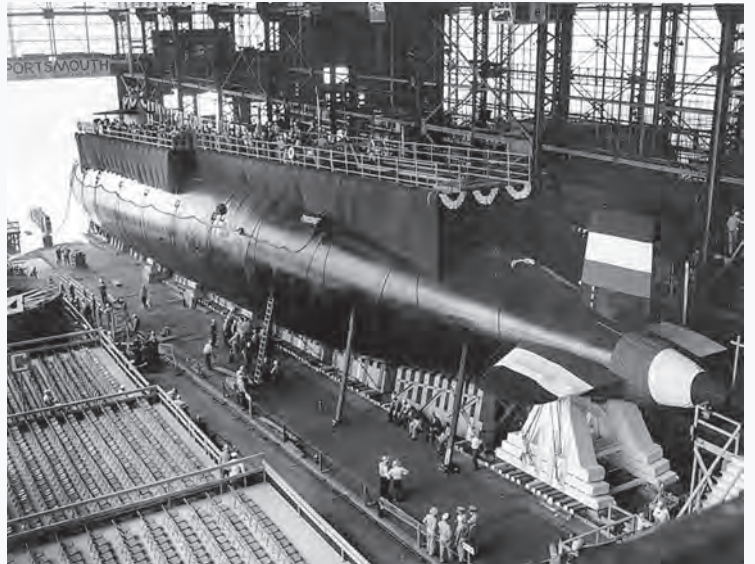
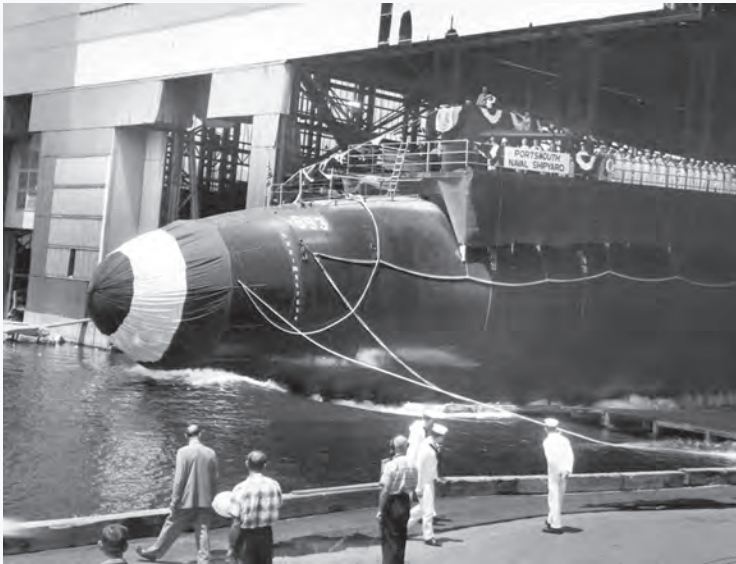


LEFT, THRESHER ON ITS
CHRISTENING DAY, JULY 9, 1960.

BELOW, USS THRESHER UNDER WAY.

PHOTOS FROM THE LIFE AND LOSS OF **USS THRESHER**





THE TOP FOUR PHOTOS SHOW THRESHER ON ITS CHRISTENING DAY, JULY 9, 1960. BOTTOM TWO PHOTOS TAKEN AFTER WRECKAGE FROM THRESHER WAS FOUND SHOW THE SONAR DOME, RIGHT, AND THE UPPER RUDDER, LEFT. U.S. NAVY PHOTOS

ELECTRIC BOAT TO HOLD COMMEMORATIVE EVENTS APRIL 10

Two Electric Boat events will be held Wednesday, April 10 to mark the 50th anniversary of the loss of USS Thresher (SSN-593).

There will be a flagpole ceremony on the main yard hill beginning at 9 a.m. with a Navy color guard and the Electric Boat singing group, the SubTones, participating.

JIM NOONAN, director of quality, will be the speaker. Following his remarks, a bell will be rung 129 times, once for each life lost on Thresher.

Later that day, the Electric Boat Management Association will sponsor a commemorative program open to all company employees.

The event will be held at the Port 'N Starboard at Ocean Beach Park in New London. Registration will be from 5:30 to 6 p.m.; the dinner and program will run from 6:30 to 9 p.m.

The program speaker will be **ALFRED H. FORD JR.**, whose 40-year career as a Navy civilian manager and leader included an assignment as the senior civilian responsible for safety and quality assurance for the Navy's submarine fleet and deep submergence systems. He is now director emeritus, Submarine Safety & Quality Assurance, serving as an advisor and mentor for Naval Sea Systems Command.

THE LOSS OF USS THRESHER – What It Means to Electric Boat Employees

BY JAMES NOONAN

On April 10, the nation's submarine community will mark the 50th anniversary of the loss of the submarine USS Thresher (SSN-593).

At Electric Boat, we are commemorating this somber event with a range of activities to remember the ship and its complement, and review the efforts we continue to make so such an event does not happen again.

Thresher was engaged in sea trials on April 10, 1963, following an extensive overhaul. During its initial dive to test depth, the submarine was lost with all 129 U.S. Navy sailors, Portsmouth Naval Shipyard and civilian company employees on board.

The central theme of this remembrance is "Lest We Forget." These were the words spoken by Sen. John O. Pastore, R.I., chairman of the Joint Committee on Atomic Energy, at the December 1964 hearings on the loss of Thresher.

The senator further stated "The committee hopes that these hearings will be carefully studied by all who are engaged in military technical development, for they contain many lessons learned for which we have already paid a high price."

With those words in mind, we remain committed to providing awareness and information on the lessons we have learned from the tragic loss of Thresher.

We also want to increase awareness for each Electric Boat team member as to "why we do what we do" at the company. This becomes more important as the memory of the loss of Thresher recedes in history and as our work force increasingly comprises men and women who have no personal recollection of the event.

Finally, we wish to honor each of the men who lost his life with the sinking of Thresher and to recognize the friends and family members who carry on the legacy of these amazing heroes.

We as Electric Boat team members are responsible for our Special Emphasis Program (SUBSAFE, Diver Safety and Fly-By-Wire) compliance. We all must adhere to the fundamentals of work discipline, material control, documentation and compliance with procedures on every task we do.

"Lest We Forget"

Noonan is director of Submarine Safety, Deep Submergence Systems, Fly-By-Wire Ship Control Systems, and Quality Assurance.



THE SHIP'S PATCH

The ship's patch for USS Thresher was adopted in 1960 and received in October of that year. It was accompanied with this description: "The fish depicted in the subject insignia is a Thresher shark, which is characterized by a tail that is approximately one-half of its total length. The Thresher shark reportedly attacks its prey by flailing the long tail. The horizontal lines signify the deep diving capability of Thresher. The circles represent its sonar capability. The motto, 'Vis Tacita,' describes the overall characteristics of the ship, 'Silent Strength.'"



Kittery Flagpole to Honor Lives Lost on Thresher

As a tribute to the sailors and civilians who died when USS Thresher (SSN-593) sank April 10, 1963, the Thresher Memorial Project Group will install a flagpole standing 129 feet – one foot for each life lost.

The flagpole will be located in Kittery, Maine, hometown to Portsmouth Naval Shipyard where Thresher was built.

Electric Boat employees contributed to the flagpole project through the sale of commemorative coffee cups, an effort coordinated by the Quality organization. These donations are expected to reach \$5,000.

Thresher / Permit-Class Submarines

The Thresher / Permit-class submarines resulted from a study commissioned in 1956 by Chief of Naval Operations Adm. Arleigh Burke.

Ships of this new class kept the proven S5W reactor plant from the immediately preceding Skipjack Class, but were a radical change in many other ways. The Thresher Class had the large bow-mounted sonar and angled, amidships torpedo tubes pioneered by the Barracuda Class. The use of a new alloy steel, HY-80, increased the boats' test depth.

Another innovation was the redesigned engineering spaces, with the turbines supported on "rafts" that were suspended from the hull on sound-dampening isolation mounts.

Thresher-class hulls were more effectively streamlined and had smaller sails, so while they used the same reactor plant as the Skipjack Class, their larger size did not reduce their speed.

The first submarine commissioned in this class was the ill-fated USS Thresher (SSN-593), and so the class was known by that ship's name. After Thresher was lost, the class was named for its second ship, USS Permit (SSN-594), in conformance with Navy custom.

USS THRESHER FACTS

USS Thresher was named for a type of shark that is harmless to man and easily recognizable by its tail, which is longer than the combined length of body and head.

Thresher was laid down May 28, 1958, at the Portsmouth Naval Shipyard and launched July 9, 1960. The ship sponsor was Mrs. Frederick B. Warder. The submarine was commissioned Aug. 3, 1961, with Cmdr. Dean W. Axene in command.

Displacement: 3,700 tons surfaced
4,300 tons submerged

Length: 278 feet 6 inches

Beam: 31 feet 8 inches

Speed: More than 20 knots

Complement: 100 officers and enlisted personnel

Armament: Four torpedo tubes

EB NEWS

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ELECTRIC BOAT NEWS is published by the Public Affairs Dept.
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Groton, CT 06340

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USS THRESHER — THE LOSS, THE INQUIRY AND THE LESSONS LEARNED

BY HARRY AINSCOUGH

On the morning of April 10, 1963, USS Thresher (SSN-593) began a series of sea trial exercises, accompanied by the submarine escort ship Skylark.

The exercises were conducted at the end of a major ship overhaul performed at Portsmouth Naval Shipyard during a Post Shakedown Availability (PSA), much like those completed at Electric Boat.

After a series of shallow dives to validate the ship's readiness for deep-dive testing, Thresher began a slow and methodical descent to the ship's maximum test depth. At periodic depth intervals, Thresher reported its status to Skylark through an underwater sound telephone.

At 9:13 a.m. Skylark received a "garbled message" from Thresher, though some words were recognizable:

"[We are] experiencing minor difficulty, have positive up-angle, attempting to blow."

Thresher's message was garbled because of the communication method used and the state of the communication technology at the time.

During dives, Skylark communicated with Thresher by means of an underwater sound telephone. Voice communication over this underwater telephone was difficult at best.

The underwater telephone functions similarly to a conventional telephone except that the energy is carried by sound waves in the water rather than by electrical signals through a wire.

As depth increases and the sound travels farther through the water, a variety of physical factors cause the quality of the sound transmission to degrade.

There was confusion on Skylark regarding the exact context of Thresher's messages during the four minutes between the initial garbled message and the submarine's final dive. To this day, there is

considerable disagreement over the exact communication.

However, the Skylark's log of those last four minutes contains the following:

► 9:13 a.m.: Thresher reported its status over the underwater telephone. Though the transmission is garbled, some words are recognizable: "[We are] experiencing minor difficulty, have positive up-angle, attempting to blow."

► 9:15 a.m.: Skylark picks up a second "garbled" transmission from Thresher, transcribed in the Skylark's log as "900 N." The meaning of this message is unclear; it may have indicated the submarine's depth and course, or it may have referred to a Navy "event number" (1000 indicating loss of submarine), with the "N" signifying a negative response to a previous query from Skylark, "Are you in control?"

► 9:17 a.m.: Skylark receives a third transmission from Thresher, with the partially recognizable phrase "exceeding test depth ..."

This was the last communication Skylark received from Thresher. Almost immediately after that, Skylark personnel detected a high-energy low-frequency noise with characteristics of an implosion.

During a subsequent interview, a Skylark crewman was asked why he thought the noise heard was "... a compartment collapsing, or something similar to that nature."

The crewman responded: "Both of us... heard a sound that registered with me as being familiar because of the fact that I had heard a lot of ships breaking up during World War II after having been torpedoed at depths."

This chilling observation made it plain — Thresher was most likely lost.

"Too Far, To Fast"

Immediately after the loss of the Thresher was confirmed, a Judge

Advocate General Court of Inquiry was convened to establish what happened on the ship when it was lost, and if possible why it happened.

After extensive investigation of the design, construction and short operational life, the court established a number of key facts. Based on these facts, the court recommended a number of corrective actions to improve the design, construction and maintenance of all newer, deeper diving ships, and to eliminate or mitigate risks associated with identified weaknesses.

Overall, the court concluded that design and construction activities were not keeping pace with the complexity of newer ship design and materials, and newer operational capabilities.

In short, submarine design, construction and operational capabilities had come "too far, too fast."

Weaknesses identified by the Court of Inquiry deliberations included:

Ship's Seawater Connected System Design and Construction

► Seawater connected systems were designed and constructed using silver brazing (silbraze) joint designs that were developed in the 1940s and 1950s. Welded joints were not used in seawater connected systems.

► Silbraze joint failure in sea connected systems was a common occurrence on ships in the fleet. Failures included significant flooding casualties, but the condition was commonly accepted in the submarine community as a part of submarine design.

► There was no effective nondestructive testing (NDT) capabilities developed for silbrazed joints in sea water connected systems. Visual inspection and successful system testing were the only criteria used.

► On Thresher, a new technology called ultrasonic testing was tried as an

WHAT MAY HAVE HAPPENED

Despite the Navy's rigorous investigation, no conclusive cause for the loss of Thresher was established. There is, however, a widely accepted scenario.

- ▶ One or more silver-braze piping joints failed, resulting in engine-room flooding.
- ▶ The crew was unable to access vital equipment to stop the flooding.
- ▶ Saltwater spray on electrical components caused short circuits, reactor-plant shutdown and loss of propulsion power.
- ▶ The main ballast-tank blow system failed to operate properly at test depth. Restrictions in the air system coupled with excessive moisture in the system led to ice formation in the piping. This in turn caused an inadequate blow rate. Consequently, the submarine was unable to overcome the increasing weight of water rushing into the engine room.

experimental NDT process for silbrazed joints. When the NDT was applied, there was a 14 percent rejection rate of silbrazed joints, including joints in critical systems. Because this newer NDT technology was not well understood, it was not mandated. Thresher went on sea trials without further corrective actions.

Ship Ballasting During an Emergency

- ▶ There was no emergency blow system on Thresher-class ships (named Permit Class after the loss of Thresher).
- ▶ The ship had a high pressure air system but it had never been tested under simulated full blow conditions at test depths.
- ▶ Testing after the loss of Thresher found the high-pressure air system would ice up during full ballast-tank blows, effectively disabling the system needed to bring the ship to the surface.
- ▶ The system was not required to be dehumidified to eliminate moisture that might form into ice.
- ▶ The high-pressure air system was designed to shut off air banks in the case of the loss of electrical power (key if the reactor was disabled).

Thresher's design did not incorporate an emergency flood-control system

- ▶ The submarine's design did not include

the capability to quickly and remotely secure all sea-connected systems during a flooding casualty.

Access to vital equipment during an emergency

- ▶ Equipment that required immediate access during an emergency was obstructed, in some case by bolted decking.

Lest We Forget — The Lessons Learned

The loss of Thresher was a watershed event in the submarine community and generated an immediate response. In June 1963 – less than two months after the sinking – the Submarine Safety (SUBSAFE) Program was created.

The program established and implemented clear requirements for the design, construction and maintenance of all Navy submarines.

Many of the Court of Inquiry's recommendations were incorporated into the SUBSAFE program.

Among these were:

- ▶ Redesign of sea-connected systems to use welded joints rather than silbrazing. Additionally, ultrasonic testing was mandated for all silbrazed joints used in other in critical systems.
- ▶ Implementation of emergency blow systems designed to function at all depths.

These systems are fully tested each time a submarine goes to sea.

- ▶ Implementation of an emergency flood-control system that enables quick hydraulic closure of all sea-connected systems from remote locations.
- ▶ Redesign of ship systems to ensure quick access to vital equipment in an emergency. Additionally, implementation of a formal test procedure that mandates access to vital equipment within specified times, in some cases, within seconds.

Sen. John O. Pastore, R.I., chairman of the Senate subcommittee that reviewed the Navy's Thresher investigation, provided this assessment:

"The committee hopes that these hearings will be carefully studied by all who are engaged in military technical development, for they contain many lessons for which we have already paid a high price. If the lesson is learned that excellence in design, fabrication, operation and training cannot be compromised in modern high performance military systems, the men of Thresher will not have died in vain." 🙏

Ainscough is deputy SUBSAFE program director in Dept. 320

HONORING THE MEN LOST ON USS THRESHER — AND THE NEXT GENERATION OF SUBMARINERS — BY RESPECTING THE LESSONS OF THE PAST



**FRED PHILIP
ABRAMS**
AGE 42



**PHILIP HARCOURT
ALLEN**
AGE 39



**TILMON "TILLY"
ARSENAULT**
AGE 36



**RONALD CLARE
BABCOCK**
AGE 25



**RONALD EUGENE
BAIN**
AGE 23



**STEVEN GEORGE
CAYEY**
AGE 23



ROBERT E. CHARRON
AGE UNKNOWN



**EDWARD "CHRIS"
CHRISTIENSEN**
AGE 20



**LARRY WILLIAM
CLAUSEN**
AGE 21



**THOMAS EDWARD
CLEMENTS**
AGE 25



**MERRILL FRANCIS
COLLIER**
AGE 31



**KENNETH RAY
CORCORAN**
AGE 46



**KENNETH JAMES
CRITCHLEY**
AGE 44



**FRANCIS MICHAEL
CUMMINGS**
AGE 26



TROY EARL DYER
AGE 30



**RICHARD KAYE
FISHER**
AGE UNKNOWN



**ELWOOD HENRY
FORNI**
AGE 34



**RAYMOND PETER
FOTI**
AGE 23



**LARRY WAYNE
FREEMAN**
AGE 23



**GREGORY JOSEPH
FUSCO**
AGE 26



**JOSEPH "DOC"
GALLANT JR.**
AGE 35



**NAPOLEON "NAPPY"
GARCIA**
AGE 35



**JOHN EDMOND
GARNER**
AGE 21



LAIRD GLENN HEISER
AGE 24



**MARVIN THEODORE
HELISIUS**
AGE 23



**JAMES JOHN
HENRY JR.**
AGE 24



**LEONARD
HOGENTOGLER
HEWITT**
AGE 31



**JOSEPH
HARTSHORNE
HOAGUE**
AGE 23



**JAMES PORTER
HODGE**
AGE 23



**JOHN "JACK"
HUDSON**
AGE 28



**JOHN PENFIELD
INGLIS**
AGE 21



**MAURICE FRANK
JAQUAY**
AGE 26



**GEORGE "PAPPY"
KIESECKER**
AGE 38



BILLY MAX KLIER
AGE 28



ROBERT LEE KRAG
AGE 35



**GEORGE RONALD
KRONER**
AGE 21



**DONALD WILLIAM
KUESTER**
AGE 41



**NORMAN GILBERT
LANOUE**
AGE 33



**WAYNE WILFRED
LAVOIE**
AGE 28



**JOHN SHELDON
LYMAN**
AGE 32



**TEMPLEMAN
NORWOOD MABRY
JR.**
AGE 26



**DONALD "BABY
DUCK" NAULT**
AGE 36



**WALTER "JACK"
NOONIS**
AGE 33



**JOHN DANIEL
NORRIS**
AGE 29



**CHESLEY CHARLES
OETTING**
AGE 22



**FRANKLIN JAMES
PALMER**
AGE 42



**GUY CARRINGTON
PARSONS JR.**
AGE 25



**ROScoe CLEVELAND
PENNINGTON**
AGE 38



**JAMES GLEN
PETERS**
AGE 38



**JAMES FRANK
PHILLIPPI**
AGE 22



JOHN DAVIS SHAFER
AGE 33



**JOSEPH THOMAS
SHIMKO**
AGE 26



**BURNETT MICHAEL
SHOTWELL**
AGE 20



**ALAN DENNISON
SINNETT**
AGE 29



JOHN SMARZ JR.
AGE 33



**WILLIAM HARRY
SMITH JR.**
AGE 28



**JAMES LEONARD
SNIDER**
AGE 23



**RONALD HAL
SOLOMON**
AGE 26



**DONALD T.
STADMULLER**
AGE 26



DANIEL W. BEAL JR.
AGE 31



JOHN EDWARD BELL
AGE 27



ROBERT DONALD BIEDERMAN
AGE 32



JOHN HILARY BILLINGS
AGE 35



EDGAR SOLON BOBBITT
AGE 23



GERALD CHARLES BOSTER
AGE 21



GEORGE BRACEY
AGE 43



RICHARD PAUL BRANN
AGE 24



RICHARD "SKI" CARKOSKI
AGE 24



PATRICK WAYNE CARMODY
AGE 24



PAUL CHEVALIER CURRIER
AGE 40



SAMUEL JOSEPH DABRUZZI
AGE 26



CLYDE ELCOTT DAVISON III
AGE 19



DONALD CLIFFORD DAY
AGE 20



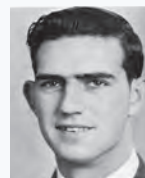
ROY OVERTON DENNY JR.
AGE 24



RICHARD ROY DES JARDINS
AGE 32



PETER JOSEPH DIBELLA
AGE 19



GEORGE J. DINEEN
AGE 42



MICHAEL JOHN DINOLA
AGE 33



DON ROY DUNDAS
AGE 22



PAT MEHAFFY GARNER
AGE 31



ROBERT "MITZI" GAYNOR
AGE 23



ROBERT HOWARD GOSNELL
AGE 20



JOHN GILBERT GRAFTON
AGE 25



WILLIAM EDWARD GRAHAM
AGE 32



PAUL ALFRED GUERETTE
AGE 24



AARON "GUNNER" GUNTER
AGE 29



RICHARD CHARLES HALL
AGE 23



JOHN WESLEY "CAPTAIN" HARVEY
AGE 35



NORMAN THEODORE HAYES
AGE 24



BRAWNER "BG" JOHNSON
AGE 32



EDWARD "DRIFTY" JOHNSON
AGE 33



RICHARD "RL" JOHNSON
AGE 19



ROBERT "COB" JOHNSON
AGE 37



THOMAS "TB" JOHNSON
AGE 25



RICHARD WILLIAMS JONES
AGE 21



EDMUND JOSEPH KALUZA
AGE 22



THOMAS CHARLES KANTZ
AGE 27



ROBERT DENNIS KEARNEY
AGE 21



RONALD DEAN KEILER
AGE 22



FRANK JOHN MALINSKI
AGE 32



RICHARD "DICKIE" MANN
AGE 23



JULIUS FRANIS MARULLO JR.
AGE 29



DOUGLAS RAY MCCLELLAND
AGE 22



DONALD JAMES MCCORD
AGE 32



KARL "MAC" MCDONOUGH
AGE 24



SIDNEY LYNN MIDDLETON
AGE 26



HENRY CHARLES MOREAU
AGE 55



RONALD ARTHUR MUISE
AGE 31



JAMES ALTON MUSSELWHITE
AGE 29



DANIEL ANDREW PHILPUT
AGE 23



RICHARD PODWELL
AGE 23



ROBERT DAN PRESCOTT
AGE 28



JOHN SAGE REGAN
AGE 24



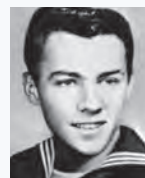
JAMES PATRICK RITCHIE
AGE 22



PERVIS ROBISON
AGE 21



GLENN ALVA ROUNTREE
AGE 24



ANTHONY "SKI" RUSNETSKI
AGE 23



JAMES MICHAEL SCHIEWE
AGE 23



BENJAMIN NATHAN SHAFER
AGE 36



ROBERT "ROCKY" STEINEL
AGE 24



ROGER EDWIN VAN PELT
AGE 28



JOSEPH "SKI" WALSKI
AGE 23



DAVID ALLAN WASEL
AGE 21



LAWRENCE EUGENE WHITTEN
AGE 33



CHARLES "CHUCK" WIGGINS
AGE 29



JOHN JOSEPH WILEY
AGE 23



DONALD EDWARD WISE
AGE 31



RONALD EUGENE WOLFE
AGE 20



JAY HENRY ZWEIFEL
AGE 22

BROTHERS PERISHED IN THRESHER SUBMARINE DISASTER

(Reprinted with permission by seacoastonline.com)

Scores of families were devastated when the nuclear submarine USS Thresher went down on April 10, 1963, but the blow to the Shafer clan of Connecticut was doubly brutal.

A total of 129 U.S. Navy sailors and civilian workers were lost aboard Thresher in the worst submarine disaster of all time. They were fathers, husbands, sons and brothers. In the case of Benjamin and John Shafer, they were brothers from the same bloodline.

Both were electrician's mates, and both were career sailors. Benjamin, the oldest of the two, had achieved the rank of master chief petty officer, the highest standard achieved by enlisted men; John was a senior chief, the next highest enlisted rank.

They were also both fathers. When Thresher (SSN 593) was lost during sea trials more than 200 miles off the New England coast, Benjamin left behind three sons and a daughter, while John was survived by four sons.

Michael Shafer, Benjamin's youngest boy, would grow up to devote 29½ years of his life to the Army, enlisting as a private and retiring as a major in 2005. As a military man, he understands the push to get the world's most advanced submarine of its day into action. It was, after all, the height of the Cold War with the Soviet Union. As hindsight suggests, however, Thresher may not have been ready for the deep-dive tests it was conducting when it sank.

"They gambled and lost," Michael said.

Both he and his sister Penny Shafer Craig take pride in the sacrifice their father and uncle made for their country, but acknowledge the heavy toll it took on the family.

According to a 1963 newspaper account that ran in the New London (Connecticut) Day in the wake of the Thresher tragedy, the Shafer brothers' parents were so distraught they had to be placed under heavy sedation by a physician. Family members gathered in the parents' home were in a



BENJAMIN NATHAN SHAFER



JOHN DAVIS SHAFER

state of shock that day, the report stated; Benjamin's wife Joyce wept as she disclosed the fatal cruise was to be his last before transferring to another command.

And the Shafers' mother, according to the newspaper, could be heard wailing repeatedly, "Both my sons! Both my sons!"

"Neither one of them lived long after that," Clara Main, their only surviving sibling, said of her parents this week. "You can truly die of a broken heart — I believe that."

Brothers and heroes

Benjamin Nathan Shafer was born in September 1926. He enlisted in the Navy in August 1944, after graduating from Robert E. Fitch High School in Groton, Conn. He then completed basic training in Sampson, N.Y., and served aboard the destroyer USS Doyle (DD 494), during World War II. Benjamin was awarded the Asiatic-Pacific Theater Service Medal, the World War II Victory Medal and other decorations earned prior to his discharge in May 1946.

He worked for a time as a welder at the Electric Boat Division of General Dynamics in Connecticut, then according to Michael, opened an electrical repair shop. After his partner took off with the money from their business, Michael said, Benjamin re-entered the Navy in February 1949. He attended the Navy's Electrician's Mate School, and ultimately volunteered for submarine duty.

He earned his coveted Silver Dolphins when he qualified as a submariner aboard USS Cobbler (SS 344), and attended the Nuclear Power Training Unit at West Milton, N.Y. He also served aboard the nuclear submarine USS Skipjack (SSN 585) before his assignment to Thresher in February 1961.

John Davis Shafer joined his older brother as a crewmember of Thresher in September of that same year.

"They asked to be on the same submarine," Clara recalled. "They loved each other; they were brothers. They just wanted to be together."

John was born in August 1929 in Fort Pierce, Fla. During his school years in Groton, Conn., he received awards in both spelling and history competition. Much of his free time was spent fishing, hunting and bowling.

After graduating from Robert E. Fitch High School in 1947, John enlisted in the Navy and entered basic training at the U.S. Naval Training Center in Great Lakes, Ill. He served aboard the aircraft carrier USS Franklin D. Roosevelt (CVA 42) and the heavy cruiser USS Salem (CA 139) before volunteering for submarines.

He followed his brother to Electrician's School and proceeded to serve aboard the subs USS Harder (SS 568), Kingfish (SS 234) and Trutta (SS 421), earning his Silver Dolphins aboard Entemedor (SS 340).

A third brother — the oldest, Joe — was also a Navy veteran of World War II, while their father had served in France with the Navy in the First World War.

Michael, the retired Army major, takes solace in knowing the Thresher tragedy directly resulted in the creation of SUBSAFE, the Navy's enhanced submarine safety program. No vessel has been lost after passing through SUBSAFE in the nearly half-century since Thresher's loss.

Asked about his thoughts regarding the family's legacy with the submarine, he cites "The Ballad of the Thresher," a song by the popular folk band the Kingston Trio. Famous for such 1950s and '60s hits as "Tom Dooley" and "Where Have All the Flowers Gone," the band paid tribute to the Thresher's crew in verse shortly after the disaster. In the ballad's chorus, the trio sings:

“Every man jack on board was a hero

Every man jack on board there was brave

Every man jack on board was a hero

Each man risked a watery grave”

“If you listen to that song, you’ll know,”
Michael explained. “It says it all to me.”

‘I was Daddy’s girl’

In 1969, the 116-man Bachelor Enlisted Quarters at the Atlantic Undersea Test and Evaluation Center on Andros Island in the Bahamas was named Shafer Brothers Hall in honor of Benjamin and John.

“I was very proud that the Navy named this building after my father and uncle,” Penny said. “Even though it’s only a barracks, it’s not very often that they name buildings after servicemen.”

However, the decade was otherwise unrelenting on the family. Penny notes both sets of grandparents died in the 1960s, and just days before Christmas 1969 her oldest brother Steve — a high school senior — died in an auto accident. Their mother was “out of it” for a while after that, Penny said. She would listen to the Glen Campbell tune “My Baby’s Gone” and cry as the country artist sang, “Dry all the raindrops/hold back the sun/the world has ended/my baby’s gone.”

“That one almost did her in,” Penny said of her brother’s death. “Eventually, she came back to us.”

Joyce Shafer went to work at the Navy exchange on the New London Submarine Base in Groton, Conn., and eventually retired as private secretary for the head of research and development there, Penny said. She described her mother as independent, strong and stubborn, but said she rarely talked about the loss of her husband. Joyce never remarried and died of cancer at age 55. Penny was only 5 when her father died, while Michael was 6. They remember very little of their dad.

Penny recalled that he loved the amorous animated skunk Pepe Le Pew, and

that a photo of herself at the age 2 or 3 wrapped around her father’s arm was inspired by her mother teasing that Benjamin was “MY daddy!”

“I was Daddy’s girl,” she said.

Michael said his father’s legacy as an honest, responsible family man provided him with a “measuring stick” that he applied as a standard while growing up.

“By all accounts he was a great guy,” Michael said, “but I never got a chance to know him.”

About a dozen members of the Shafer clan, including 79-year-old Clara, plan to attend 50th anniversary Thresher ceremonies in Kittery this April.

Impact on the American psyche

After its commissioning in August 1961, Thresher was considered the fastest, quietest, deepest-diving and most lethal submarine the world had ever known. Its loss was a stunning blow to the nation and the world.

It says something of the Thresher disaster’s impact on the American psyche at the time that in addition to the Kingston Trio’s tribute, legendary folk singer Phil Ochs also dedicated a song to the doomed submarine. “The Thresher” appears on Ochs’ first album, “All the News That’s Fit to Sing,” released in 1964. With haunting lyricism, Ochs captures the early enthusiasm surrounding the submarine’s construction “in Portsmouth town on the eastern shore/Where many a fine ship was born.”

“She was shaped like a tear/She was built like a shark/She was made to run fast and free,” he sings. But eventually a sense of impending doom creeps into his lyrics and the vessel becomes “a death ship all along.” He describes the sub’s final voyage, culminating in a stark final verse that conveys her fate:

“And she’ll never run silent

And she’ll never run deep

For the ocean had no pity

And the waves, they never weep

They never weep.” 🐼

USS SCORPION IS LOST FIVE YEARS AFTER THRESHER

Did you know? The sounds you hear during the PS-45 Special Emphasis Program training video of “air escaping” and “bulkheads collapsing” were not recorded when USS Thresher was lost. These sounds were recorded as USS Scorpion (SSN-589) was crushed as it sank below 10,000 feet of water. Scorpion was the second U.S. nuclear submarine to be lost.

► 99 men died on board Scorpion.

► On June 5, 1968, after a deployment of several months in the Mediterranean, Scorpion and its crew were declared lost approximately 400 nautical miles southwest of the Azores. On June 30, the submarine’s name was struck from the Naval Vessel Register.

► Scorpion was a Skipjack-class submarine built by Electric Boat and commissioned July 29, 1960. Specializing in the development of submarine warfare tactics, Scorpion was assigned various roles from being the “hunter” to the “hunted.” Scorpion was equipped with state-of-the-art “spy gear,” and had earned a reputation for its clandestine surveillance of Soviet Naval operations.

► On February 1, 1967, prior to its ill-fated voyage, Scorpion entered Norfolk Naval Shipyard for an extended overhaul. Instead of receiving the SUBSAFE program upgrades introduced after the loss of Thresher, the ship received only emergency repairs so it could return to sea as soon as possible.

► The results of the U.S. Navy’s investigations into the loss of Scorpion were inconclusive.

► No SUBSAFE-certified submarine has ever been lost. 🐼

FINDING USS THRESHER

BY SHEILA BLYDENBURGH

Moments after receiving the final communication from USS Thresher April 10, 1963, the Navy began an exhaustive search for the lost vessel. This search concluded more than four months later on Aug. 29, 1963 when the bathyscaphe Trieste came upon the Thresher's final resting place.

Since the initial discovery in 1963, the site has been visited by the Navy a number of times. One of the most notable visits occurred in 1985 when undersea explorer Dr. Robert Ballard surveyed the wreckage. Footage from Ballard's visit has recently been de-classified and can be viewed through a link on Electric Boat's Thresher home page.

Finding the final resting place of Thresher 8,400 feet below the surface was no easy task. The following highlights the series of events that led to the Thresher's eventual discovery.

April 10, 1963

► **0917 HOURS** – A garbled message was received from the USS Thresher stating the ship was “exceeding test depth.”

► The submarine escort ship Skylark hears a “muted, dull thud” over the radio that “sounded as though there was a compartment collapsing.”

► **0931** – Skylark requests a radio check from Thresher every 60 seconds.

► **1006** – Skylark requests Thresher to communicate its position by any means possible.

► **1058** – Skylark began dropping patterns of three hand grenades at intervals of 10 to 15 minutes. This was a pre-arranged signal telling Thresher to surface if possible.

► **1100** – Skylark radios Thresher to “Indicate your position or prepare to surface. Acknowledge within 10 minutes or I will initiate SUBMISS (submarine missing).”

► **1129** – Skylark sends the following

transmission “We have initiated SUBMISS. Indicate your position.”

► USS Recovery joins the search and discovers an oil slick about 7,000 yards from Thresher's original position.

► **1738** – Skylark rendezvous with USS Recovery and takes samples of the oil slick (1/2 mile wide by a mile and a quarter long). Also recovered were bits of cork, yellow plastic, and two rubber gloves.

► **2000** – The Department of Defense issues a news release stating “The next of kin of the crew of the nuclear submarine USS Thresher (SSN-593) are being notified that the ship is overdue and presumed missing.”

► **2130** – Chief of Naval Operations Adm. George Anderson states in a press conference “To those of us who have been brought up in the tradition of the sea, one of the saddest occasions is when we lose a ship. Such was the case today when it appears that the nuclear-powered submarine Thresher was lost with 129 officers, men and civilians.”

Over the next 13 days, dozens of vessels joined in the search, recovering charred plastic, red and yellow gloves, and parts of a life vest.

On April 23, the Navy announced that six ocean-bottom protuberances had been located and gave the code-name Point Delta to the one most likely to be Thresher. The research vessel Atlantis II tried to take pictures of Point Delta using a camera lowered on a line, with little success. Woods Hole Oceanographer Dr. J.B. Henry said that getting the camera in the right spot was “like lowering a ping-pong ball into a beer can from the top of a three-story building while blindfolded and during a northeaster.”

As the search pressed on, many ideas were considered. One involved sinking a submarine at the last known location of Thresher and tracking its descent. On May 31, the media inaccurately reported



BRASS PIPE RECOVERED FROM THE USS THRESHER DEBRIS FIELD.

that Thresher had been discovered and photographs had been taken of the ship, only to find out later that the machinery in the pictures was actually of the camera rigging equipment on Atlantis II. In the meantime, the research vessel Conrad had managed to scoop up packets of O-rings thought to be from Thresher. Other images taken by Atlantis II and Conrad showed various debris, including crumpled sheet metal, a book and a 10-ft bulkhead.

On June 24, the bathyscaphe Trieste made its first dive in search of Thresher. Trieste was a deep-diving research vessel that had recently returned from a trip to the bottom of the Challenger Deep in the Marianas Trench, the deepest point in any of the world's oceans.

On its first two dives, the Trieste was unable to locate the submarine. On its third dive June 27, Trieste discovered a yellow plastic shoe cover used by crewmen with stenciled lettering “SSN-5.”

Following a repair period, Trieste began its eighth dive Aug. 29, 141 days after Thresher went missing. As Trieste proceeded near the ocean floor, it found a torn cable, twisted pipes and scattered battery plates. Finally Trieste came upon large numbers of jagged metal plates roughly 20 square feet in size that were twisted, warped and spread over hundreds of yards.

Using a newly installed mechanical arm on Trieste, the crew grabbed a piece of brass pipe from the ocean floor and brought it back to the surface. This pipe had the number “593” printed on it as well as part and job order numbers. Thresher had been found. 🐞

Blydenburgh is a senior engineer in Dept. 322

THE LOSS OF THRESHER, 50 YEARS LATER

BY **BOB SCHEEL** • VICE PRESIDENT – QUALITY

Fifty years ago – on April 10, 1963 – the U.S. Navy nuclear submarine USS Thresher (SSN-593) was lost at sea along with the lives of the 129 men on board.

From that event, I want to impart to you one very important message – the hard lessons learned from that tragedy are as relevant today as they were 50 years ago.

Because of the Thresher tragedy, our predecessors in the nuclear submarine community embarked on a mission to provide “maximum reasonable assurance” that a similar event did not recur. They mandated that, among other things, improvements be made in critical submarine systems, test and quality programs, and accessibility to vital equipment.

The program further demands of us that everything be done to make sure a flooding casualty never occurs and if the unthinkable happens, that we provide the ability to isolate the failure and return the ship and its crew safely to the surface. This is the foundation of the SUBSAFE Program. Every construction and repair shipyard has worked to implement improvements in submarine safety since the loss of Thresher; no SUBSAFE certified submarine has been lost since.

Since I joined Electric Boat in 1979, there have been other incidents that serve to reinforce the lessons from Thresher and the necessity and wisdom of the SUBSAFE Program. In 1982, an incident on the USS Grayback cost five young navy divers their lives. Our nation has since lived through the loss of Space Shuttle Challenger in 1986, the loss of the Space Shuttle Columbia in 2003, a fire on the USS Bonefish while under way in 1988 that left three crewmen dead, and the BP oil spill in 2010.

These incidents and my background in Quality Assurance have made me very aware that technology failures remain real possibilities unless we are always diligent.

It is my job – and the job of each one of you – to make sure the submarines we design, build and maintain are as safe as they possibly can be. If there is one thing I have learned in my years with the company, it is this – to fulfill this obligation, we must have this commitment from everyone.

At Electric Boat, I believe we have this level of commitment. It is evident through four personal traits shared by virtually everyone in the company – honesty, integrity, thoroughness and alertness.

Honesty

Before a ship is certified, it must be verified as complete. This is no easy task for something as complex as a submarine. Every work order, weld joint, engineering report, test form and inspection record is first certified by a member of our workforce – an engineer, designer, tradesperson or inspector.

We have records to document that work has been accomplished and certified. But the real cornerstone of our SUBSAFE program is the honesty of our employees who certify that all work has been

completed in accordance with drawings and procedures. No matter how small, these individual certifications form the true basis of ship certification. They must be correct. We can tolerate nothing less.

Integrity

It's easy to sign your name when you know you have done something correctly. But when something goes awry, it takes real integrity to own up to the responsibility. At Electric Boat, the integrity of our employees is second to none.

This integrity is typified by our welders. They know that the use of correct filler materials is so important that no error can be tolerated. Mistakes are few – usually fewer than 20 occurrences per year – and they are almost always self-identified by the welder or welding department. I hate to see any “wrong weld-wire occurrence” or any mistake for that matter, but our employees know they have to do all work correctly. They know if an error occurs, they must identify the mistake to supervision and together determine how to correct it. The self-identification of problems makes Electric Boat what it is – and it's something we can all be proud of.

Thoroughness

Occasionally, there are misses in our work or in the documentation of our work. But when considered in the context of millions of opportunities, the number of errors is relatively small. It is evident that an overwhelming number of employees take ownership of their work and are thorough (double and triple checking) to ensure things are correct before they certify work as complete. We must always remember that our work can affect the safety of our country's submarines and crews.

Alertness

No matter how hard we try, mistakes or failures will occur in our quality system. Our workforce seems to have a natural sense of awareness of our environment, and frequently bring suspicions to the attention of their supervision or Quality Assurance. Over the course of my career, I couldn't tell you how many quality issues have been identified and rectified due the alertness of a tradesperson, engineer or planner. Our job is to catch these issues early when they are small and correct them before they become big problems.

To sum up, the SUBSAFE program is the cornerstone of our efforts to assure the safety of the Navy's submarines, as are other safety programs that have emulated the SUBSAFE approach, such as Diver Safety and certain aspects of Ship's Control (Fly by Wire).

The SUBSAFE program is effective because of the honesty, integrity, thoroughness and alertness of each employee. Electric Boat's culture, with its commitment to safety and quality, is incredibly important. Mistakes will happen. But when they do, we are responsible for ensuring that they are managed and contained.

We must do everything in our power to make sure an occurrence like the loss of USS Thresher never occurs again. I am confident you and your colleagues are working to fulfill this mission. 🙏

SUBSAFE MUST BE A WAY OF LIFE

BY CMDR. DANIEL ETTLICH, USN



On April 10, 1963, while conducting post-overhaul deep dive tests off the coast of the United States, the nuclear submarine USS Thresher

(SSN-593) was lost with all persons aboard. This event caused drastic changes in the conduct of U.S. Navy submarine design, construction and maintenance. In the years that followed the Silent Service worked tirelessly to build one of the most robust quality assurance organizations in the world. The U.S. Navy's Submarine Safety (SUBSAFE) and Quality Assurance Program is known globally for its thoroughness, rigor and record. Most importantly, the program serves as a lasting reminder of those we lost in 1963 and as a vow to do everything possible to prevent a similar catastrophe.

For those of us who work in the business of submarine design, construction and maintenance, the preceding paragraph acts as a background for the philosophy behind the SUBSAFE program. I am in the majority of the workforce who were not even alive when USS Thresher was lost. In an effort to ensure that the philosophy and requirements of the SUBSAFE program sit in the forefront of every worker's mind, special emphasis is placed on annual training and awareness. The goal is that the work discipline and principles associated with the program become a habit and thus a way of life. One cannot successfully "turn on and off" these principles depending on whether they are doing SUBSAFE work or not; it must be part of their culture.

Ignorance, arrogance, and complacency prove the three biggest threats facing the SUBSAFE Program. These threats continually attack and erode the long established safety culture. The keys to success

THE KEYS TO SUCCESS LIE IN PROPER RECOGNITION OF THE THREATS AND APPLICATION OF EFFECTIVE CORRECTIVE AND PREVENTATIVE ACTIONS.

lie in proper recognition of the threats and application of effective corrective and preventative actions. Ignorance is the state of not "knowing" the requirements. Arrogance is the façade of "knowing better" than the requirements. Complacency is the state of not "caring" about the requirements. One or more of these threats always present themselves for personnel errors (i.e., failure to follow the process). Continued vigilance at all levels, especially senior leadership, is required to combat these threats.

A significant contributor to the Deepwater Horizon disaster of April 2010 was a degraded safety culture. In his article titled, 'Errors in Judgment: Engineering's Great Teacher,' Bill Clayton states, "The environment throughout the chain of command was one in which those with the best information didn't act; those with little information didn't ask; and executives at the corporate level didn't care about safety as much as they cared about the bottom line."

2013 also marks the 10-year anniversary of the loss of the space shuttle Columbia. We can learn a lot from other disasters in an effort to continue to improve and strengthen the SUBSAFE program. Unfortunately, organizations can also forget lessons learned. The following quote is from an article by NBC News Space Analyst James Ober on the 10-year anniversary and NASA's apparent amnesia:

"Beyond the tragic loss of life, the greatest tragedy of the space shuttle Columbia was that NASA should have known better. As an organization and as a team, the agency learned nothing new

from the 2003 disaster. Rather, the disaster was a harsh reminder of what NASA had forgotten."

Ober provides a bold statement about NASA's safety culture at the time of the Columbia disaster, "These bad things happened mostly because attitudes toward safety got soft ... as complacent carelessness and time-saving shortcuts crept into the culture ..."

In further discussing the degradation in the safety culture at NASA, Ober notes:

"The fundamental safety rule had been to base no belief purely on hope. Safety was a quality that had to be explicitly verified. To assume that all was well unless there were visible hazards was imprudent and irresponsible. Convenient, unverified assumptions of goodness had led to the loss of Columbia and its crew."

As we learn from other disasters, we better understand why the SUBSAFE program places such a huge investment in compliance verification. The most important reason is that consequences of failure are unacceptable. Additionally, the pressures of cost and schedule are great, thus requiring us to ensure standards are upheld, even under the harshest of pressures. Lastly, an honest mistake can kill someone just as dead as malpractice.

I challenge all of those who work in the SUBSAFE enterprise to

- (1) heighten their sensitivity to the three threats facing our safety culture,
- (2) take time to reflect on why we do what we do,
- (3) consider what the consequences of failure would really mean, and
- (4) think about your personal standards – is it 100 percent compliance 100 percent of the time? It is a continual battle to maintain the rigorous standards of the SUBSAFE program, but the alternative is not an option – "Lest We Forget." 🚫

Ettlich is director, Submarine Safety and Quality Assurance Division, NAVSEA 07Q.

THRESHER'S LEGACY IS IN OUR HANDS



BY STEVE SCHULZE

April 10, 2013 marks a somber moment for the U.S. Navy. On that day 50 years earlier, USS Thresher (SSN-593) was lost 200 miles off the coast of Massachusetts taking with her 112 sailors and 17 civilians.

This tragedy shook the Submarine Force to its very core. On April 11, one day after the accident, the Navy convened a Court of Inquiry and a Design Appraisal Board to investigate the tragedy and issue findings that would be used to help prevent another similar loss.

Further, the Navy imposed depth limitations for all nuclear-powered submarines, restricted any test dives to areas where submarines would not exceed crush depth, revised submergence procedures, restricted speed at certain depths, required all submarines to maintain positive buoyancy and instituted new training.

While the Navy's investigations would result in 166 findings of facts, 55 opinions, and 19 recommendations, one thing was perfectly clear, a submarine as new as Thresher, recently out of a maintenance period, should never have been lost. The series of cascading events that led to the tragedy stemmed from a combination of an inadequate design and low quality standards for the operational environment.

On July 8, 1963, the chief, Bureau of Ships, established the Submarine Safety (SUBSAFE) Program. The program codified submarine design requirements, safety certification requirements and processes, and certification continuity requirements and processes while providing a framework for certifying certain critical systems for unrestricted submerged operations.

The SUBSAFE Program's mission is simple and concise: to provide maximum reasonable assurance of watertight integrity and operability and integrity of critical systems necessary to control and recover from a flooding casualty.

The accomplishment of this mission is borne by the civilian workforce, both private sector and government, as well as the Navy's Submarine Force and its fleet maintenance activities. We specify design requirements, we develop and approve the design products, we fabricate the components, assemble the systems and construct the ship, we test the systems to demonstrate compliance with technical requirements, and we specify the maintenance requirements and perform the complex depot level maintenance required to safely operate the ship for its 30-plus year design life.

Our SUBSAFE Program provides a thorough and systematic approach to quality assurance through four overarching means:

► **WORK DISCIPLINE:** Only highly trained select craftsmen work on systems within the SUBSAFE boundary.

► **MATERIAL CONTROL:** All material within the SUBSAFE boundary is made to exacting standards, and is inspected, stored

THE SUBSAFE PROGRAM'S MISSION IS SIMPLE AND CONCISE: TO PROVIDE MAXIMUM REASONABLE ASSURANCE OF WATERTIGHT INTEGRITY AND OPERABILITY AND INTEGRITY OF CRITICAL SYSTEMS NECESSARY TO CONTROL AND RECOVER FROM A FLOODING CASUALTY.

and handled according to strict protocols to ensure the correct material is installed.

► **DOCUMENTATION:** Design products such as system diagrams, SUBSAFE mapping drawings, ship systems manuals, SUBSAFE certification boundary books, and others meet the technical requirements of the ship's specification and are maintained for the submarine's life. Likewise, the work performed on SUBSAFE systems must have corresponding records documenting the type of work performed, who performed the work, material information, testing results, assembly records and waivers. These documents are signed by the people doing the work – making them directly and personally accountable for their work.

► **COMPLIANCE** Verification: inspections, surveillance, technical reviews, and audits of the work performed, including a careful review of the objective quality evidence serves to ensure the SUBSAFE work was performed by the proper personnel, using the correct material, in accordance with the proper design documentation, and validated by test.

Our challenge today is to remain vigilant 50 years after our “pinnacle event.” We cannot allow another Thresher. Much of our workforce was born after 1963, and the Thresher loss can easily become “ancient history.”

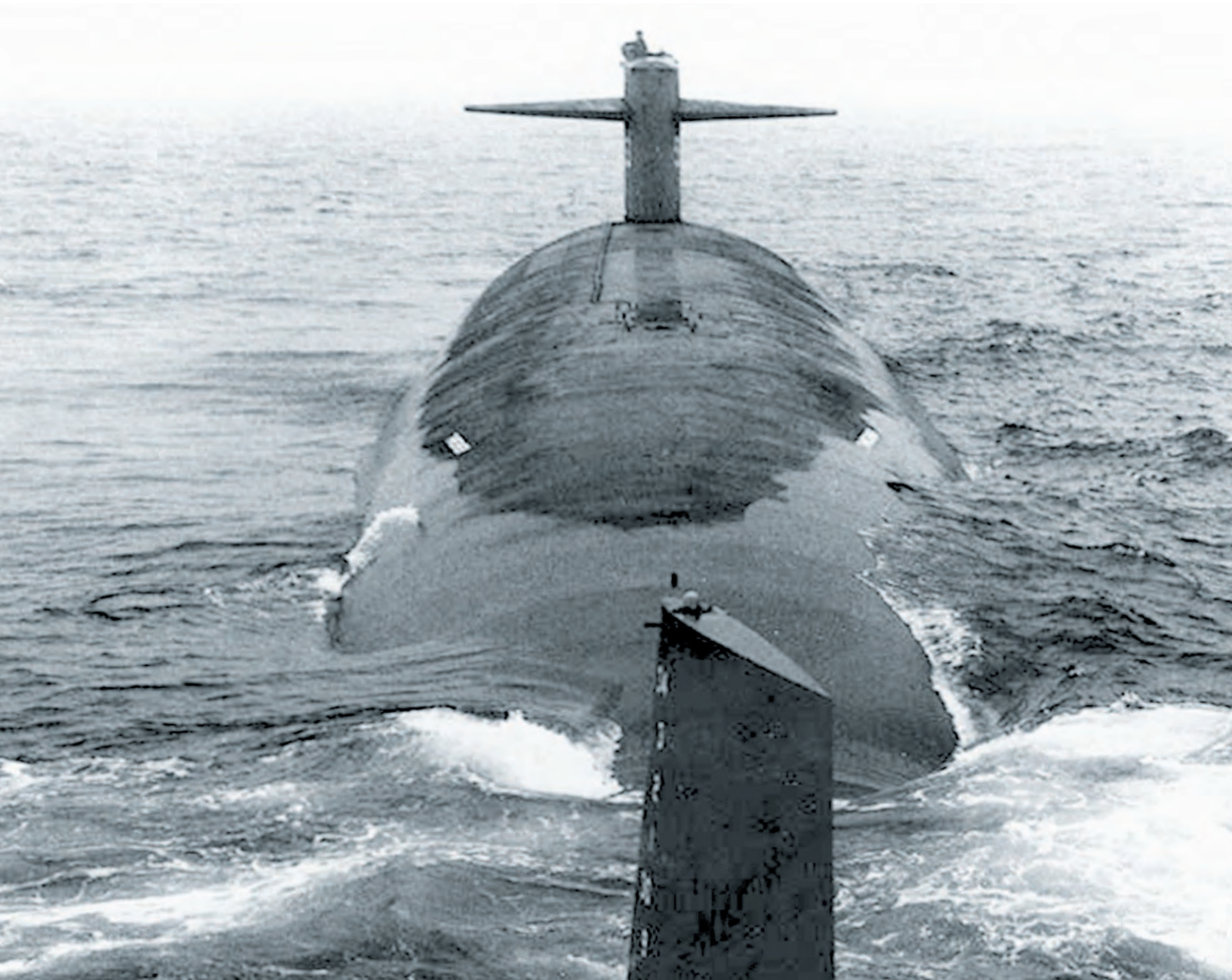
We are blessed with a workforce that is passionate about the product, dedicated and patriotic. We share a culture whose foundation is based on compliance with technical and programmatic requirements and supported by personal responsibility and accountability. We cannot be content with resting on our past success; we must continually seek to improve ourselves and the program.

We conduct internal audits to self-identify deficiencies and areas for improvement and welcome external audits of our policies, processes and procedures because we want to be better and recognize these actions are required to reach the next level of excellence. These behaviors are characteristic of a mature program and workforce. Please take time to reflect on the loss, discuss the lessons learned with your peers and co-workers, understand the SUBSAFE Program requirements as they pertain to your responsibilities and strive to avoid complacency. 🙏

Schulze is executive director, Undersea Warfare Directorate (SEA 07), Naval Sea Systems Command

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