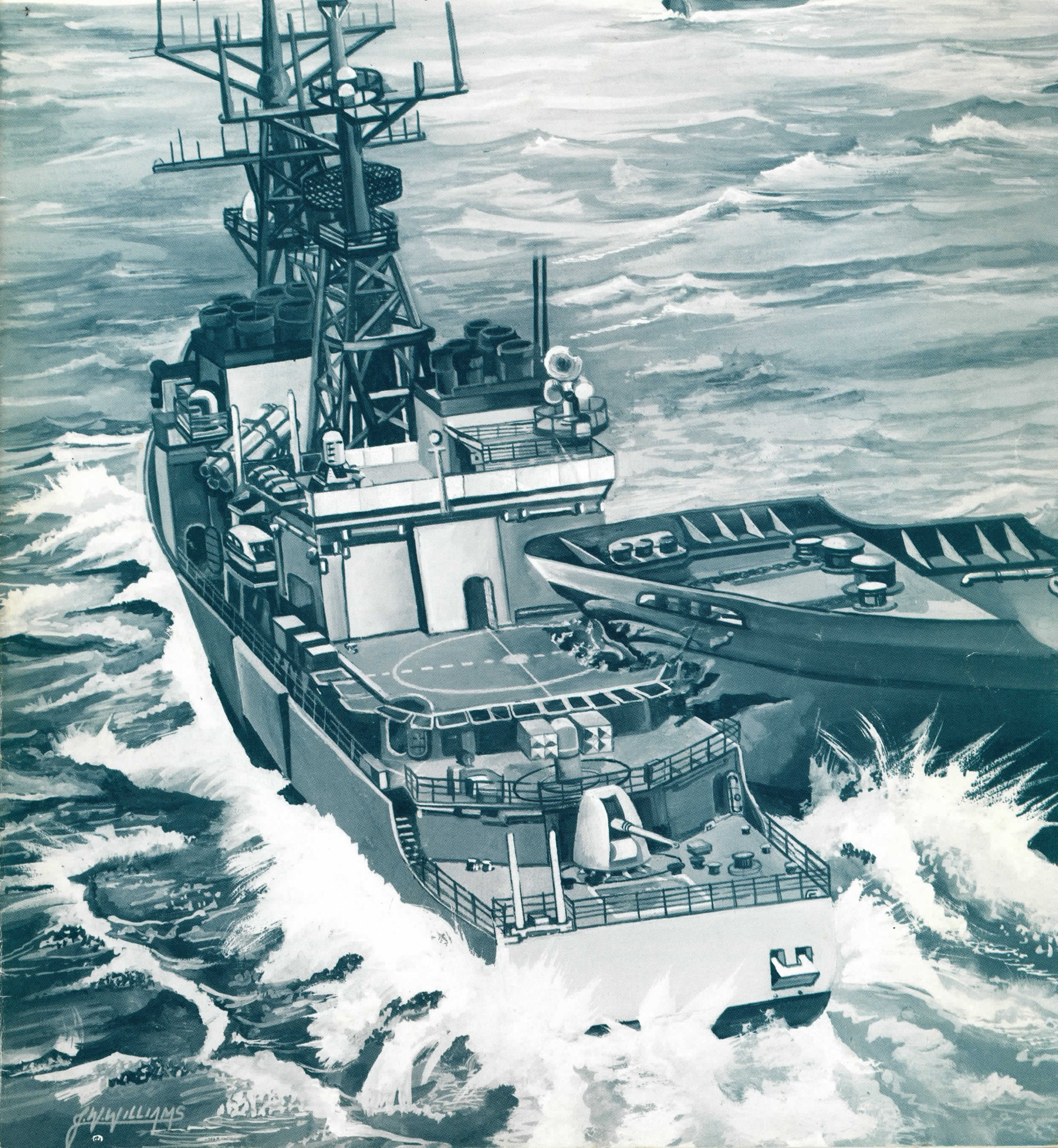
June/July 1990

fathom

Surface Ship and Submarine Safety Review

UNITED STATES NAVY



Editorial

Catching the Fever

I must down to the seas again, to the lonely sea and the sky
And all I ask is a tall ship and a star to steer her by.

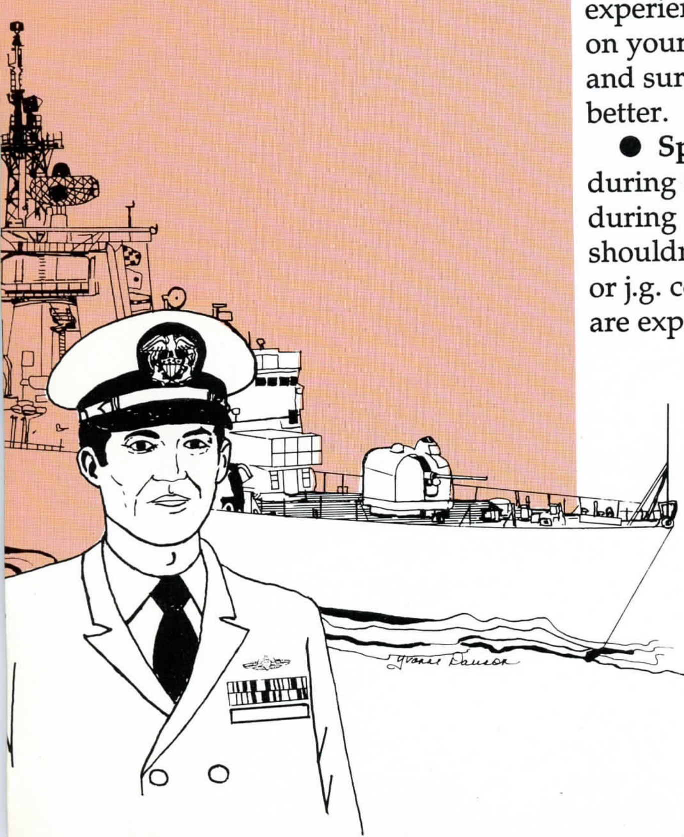
No one has captured the sailor's "lust for the sea" better than John Masefield in his poem, "Sea Fever." As naval officers, the sea is our lifeblood. The thrill of sailing the world's oceans is an experience unique to our profession.

As the Navy relies more on technology, however, we sometimes forget to nurture that healthy lust for the sea. Junior officers often spend more time learning electronic systems than perfecting their seamanship skills. That unfamiliarity can lead to mishaps which cost lives as well as dollars.

Budget cutbacks in the 1990s will force the Navy to reduce its operational tempo and decommission older ships. These cutbacks must not undermine our commitment to seamanship training. We must seize opportunities to emphasize the importance of shiphandling to our junior officers.

There is no secret formula to make time for this training. It's a matter of commitment. My last two commanding officers used an informal driver's education syllabus to accomplish this goal:

- **Ensign Hour.** Conduct regular training for officers covering principles of seamanship and shiphandling. Cover topics such as rules of the road, math for the OOD, and the maneuvering board. You must understand principles of seamanship, such as the radian rule or three-minute rule, before you can use them practically.
- **Shiphandling Drills.** Officers of the deck must actively train their conning officers. The "seaman's eye" can only be gained by experience. Ask the CO for permission to conduct a maneuvering drill on your watch, so your conning officer can learn how your ship turns and surges. Practice doesn't always make perfect, but it does make better.
- **Special Evolutions.** "Baby SWOs" need the opportunity to conn during special evolutions. I'm not suggesting a boot ensign conn during a night UNREP in heavy seas, but a second-tour lieutenant shouldn't always conn during an evolution that an experienced ensign or j.g. could handle. Boot ensigns eventually become lieutenants, who are expected to know a thing or two about shiphandling.



These procedures allow junior officers to build confidence in their shiphandling abilities. That confidence forms the basis of a CO's trust in his bridge watch standers. The OOD's primary job is safety. He must be able to recognize when a dangerous situation is developing, take appropriate action, and keep the CO informed. In turn, the OOD's confidence in his shiphandling will become an enthusiasm which can spread through the wardroom – sea fever.

Lt. Parham is editor of Fathom magazine.

Thom Parham

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SURFACE SHIP AND SUBMARINE SAFETY REVIEW

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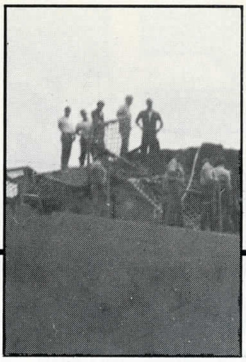
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Features:

Articles:

Departments

In "Fires Hit Budget Hard" (April/May 1990, p. 14) we printed a file photo of USS *Truett*. The *Truett* was not involved in any of the mishaps covered in the article.

METAL to

By LCdr. M.A. Hess and Ken Testorff

One morning before dawn in the Western Pacific, a collision at sea cost a naval officer his life, injured eight others and did 20 million dollars worth of damage to their ship.

At 0415 that morning, a new officer of the deck (OOD) assumed the watch. He studied the navigator's chart and proceeded to follow the normal watch routine. Ten minutes later, a new CIC watch officer (CICWO) took control in combat. He also studied the chart and realized the proposed track would lead the ship into possible danger.

The proposed track was on the edge of the traffic separation scheme at the beginning of the strait. It passed directly over a charted sunken wreck and was in the vicinity of shallow water (11.6 meters).

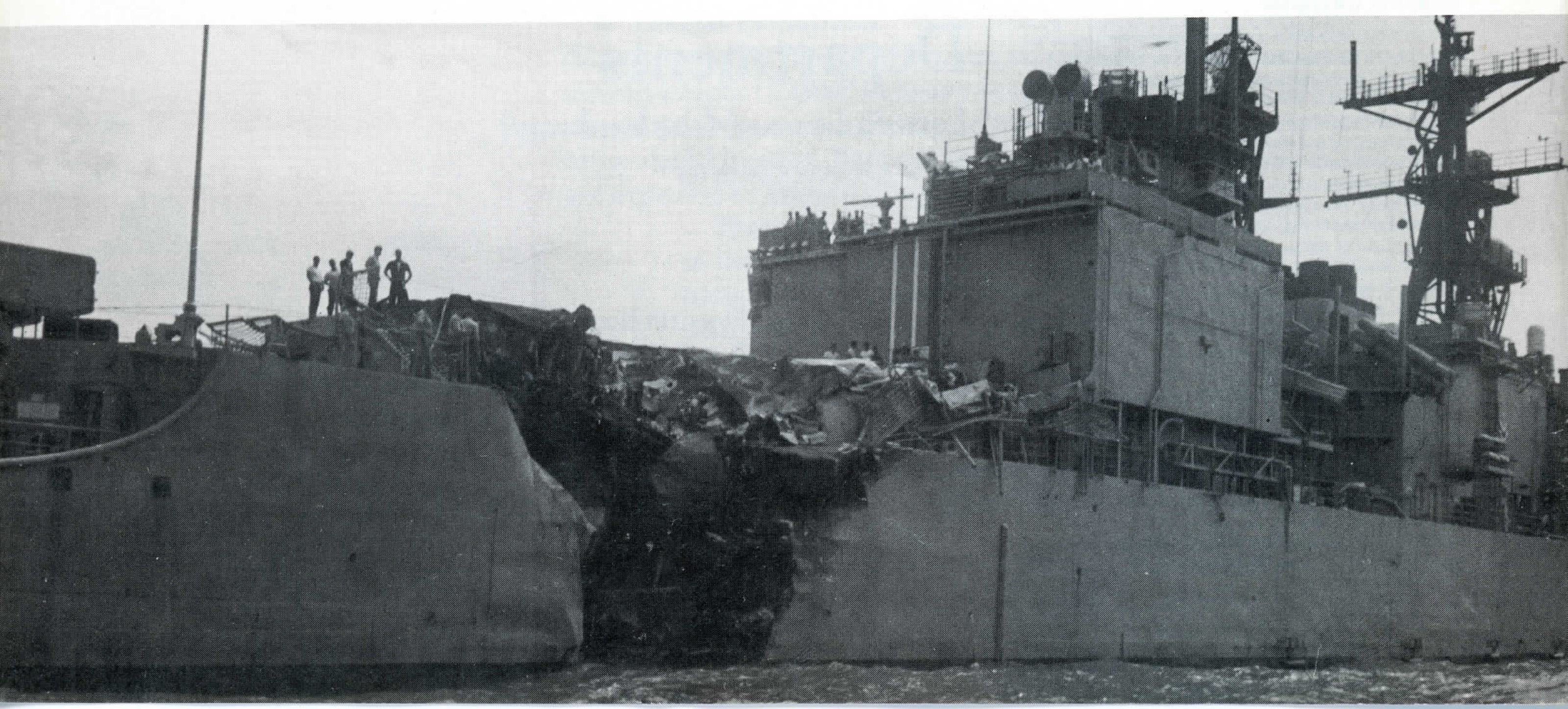
The CICWO pointed out the navigational problem to the OOD. Together, they decided to avoid the wreck by changing course. Later they would change course again to intercept the original track as quickly as possible. The OOD didn't call the CO or navigator.

The navigator had charted the ship entering the strait at 0440. As recommended by the navigator, however, the CO and XO agreed not to set the navigation detail until 0745. They felt the area to be transited during the early morning hours was wide enough to preclude setting the detail any sooner.

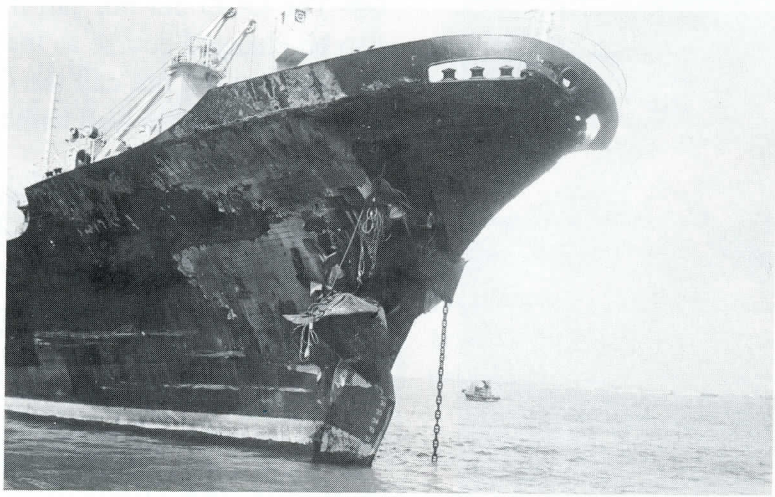
At 0440, the junior officer of the deck (JOOD) turned the ship. At 0448, the OOD spotted what he assumed was a navigation light and decided the ship was on the correct side of the traffic separation scheme. He passed a new heading to the JOOD, who gave the order to turn the ship to intercept the navigational track.

The CICWO felt the ship was turning too early, so he headed for the bridge to find out what the OOD's intentions were. As the CICWO left combat, he told the watch supervisor to get an estimated position.

During this time, the JOOD concentrated on three contacts off the starboard bow. He enlisted the help of the starboard lookout, the signal bridge watch, the bridge Naval Tactical Data System (NTDS) operator and the surface tracker in combat. Together, they tried to figure out the tracks of the contacts and their intentions. The surface tracker reported that none of the contacts had closest points of approach (CPAs) greater



METAL In the Straits



(Bottom, left) Destroyer crewmen survey the $20 million worth of damage to their ship. (Left) The crippled tanker rests at anchorage.

than 2,000 yards.

The CICWO arrived on the bridge at 0449. He stayed for the 0458 fix, which showed the ship on the correct side of the traffic separation scheme and well south of the submerged wreck.

The JOOD checked on the contacts to starboard and saw port running lights on all three. He asked the bridge NTDS operator for CPAs on them. The first contact's CPA was 2,000 yards; the second, 700 yards; and the third, close aboard to starboard. The JOOD passed this information to the OOD who replied, "It's not a problem."

The CICWO returned to combat at 0500. Using the two navigational buoys he had seen from the bridge, he cut an estimated position (EP). This EP showed the destroyer on the wrong side of the separation scheme.

The CICWO, watch supervisor and surface tracker then felt the ship turn again. They knew this turn would aggravate the navigation error even more. The CICWO asked both assistants if they could tell him why the ship was turning, but neither one had an answer.

No one was passing information over the JL phone circuit. The starboard lookout was talking directly to the JOOD, who was on the starboard bridge wing.

One contact, a merchant carrying paint and other flammables, was flashing the destroyer. The signal bridge watch and the JOOD saw the flashing light and told the OOD the contact might be a problem. The OOD replied, "I'm more concerned with running aground than (hitting) that ship."

Confident that combat's navigation plot was correct, the CICWO sent his watch supervisor to correlate the tracks with the QMs on the bridge. Meanwhile, the surface tracker continued watching the merchant ship track toward the destroyer. He assumed the OOD was maneuvering the ship visually to avoid the surface contacts.

As the merchant vessel became a bigger threat to the ship, the JOOD became more worried. He asked the OOD to take a look from the starboard bridge wing. The OOD looked at the merchant ship and mistakenly identified it as a parallel contact he was overtaking.

The JOOD said, "She's going to hit us!" The OOD looked again and ordered the ship left and increased speed to flank. When collision was imminent, the JOOD sounded the collision alarm and passed the word to "brace for shock." The merchant vessel hit the destroyer aft of amidships on the starboard side.

The collision damaged an officers' overflow berthing compartment, injuring five personnel. Two CPOs asleep in the compartment were sucked into the sea, followed by two who jumped. All four were picked up within 20 minutes by the destroyer's motor whaleboat. A corpsman treated them for inhalation of JP-5 fuel and other injuries that occurred while in the water. The fifth chief evacuated the space by climbing onto the main deck through the hole.

Fire immediately broke out at the No. 3 fueling station. Fueled by JP-5 in the standpipe, the class B fire spread to the torpedo magazine, Sea Sparrow magazine and the HT shop. Personnel extinguished all fires in one hour and 15 minutes, but not before some were injured from falls. A corpsman treated all of them.

The mishap's only fatality was resting in his stateroom before navigation detail. The merchant vessel struck the destroyer just one frame away from his bunk. He died instantly.

Damage to the destroyer included six spaces destroyed, two magazines destroyed and five spaces flooded. In addition, the ship lost 25 percent of its onboard supplies. The collision also resulted in major damage to the helo deck and its RAST recovery system.

Lessons Learned:

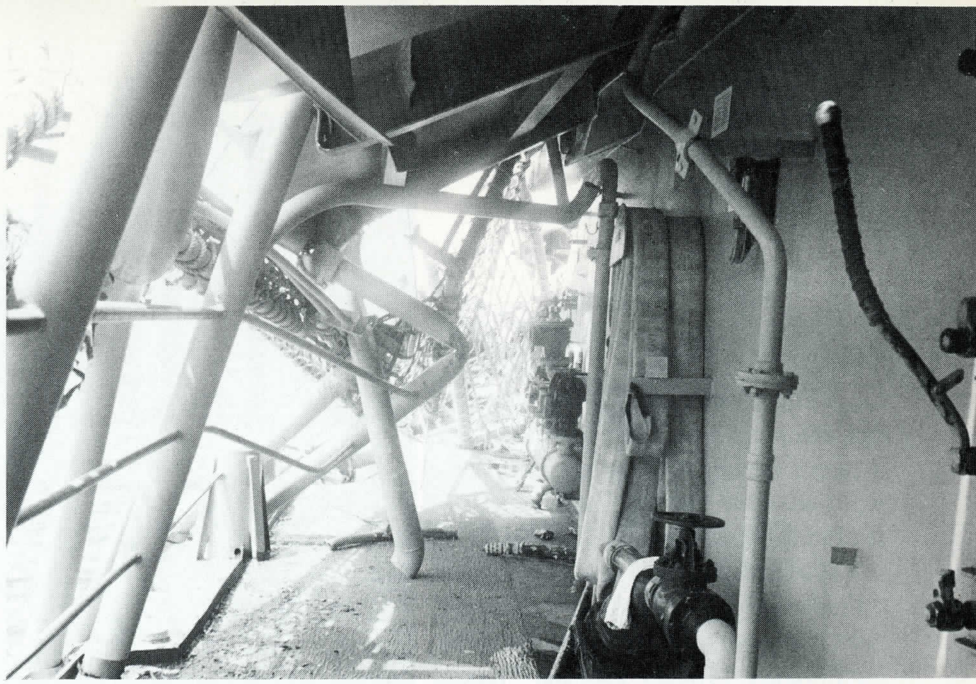
- The OOD did not call the CO or the navigator when he changed course as the standing orders specified. He also did not call the CO on the CPAs of the contacts, which were well within the limits specified in the standing orders.
- The OOD was more concerned with the navigation picture than with the surface contact picture. The fact he knew he was looking for a yellow flashing light caused him to mis-identify the navigation light. When he saw what he wanted, he then misplotted the ship in the traffic separation scheme. The JOOD, under questioning, said he saw a white flashing light.
- Neither the QMOW nor the OOD timed the light in question. If they had, they would have realized it wasn't the navigation point they were looking for.
- The OOD didn't allow the JOOD to make course and speed changes without permission. This rendered the JOOD almost useless and stopped him from maneuvering the ship early.
- The CICWO was more concerned with assisting the bridge in resolving the navigation picture than with managing the contacts. The watch team in combat wasn't computing scope-head or maneuvering-board CPAs. They also didn't recommend courses to avoid contacts, nor update the contact picture when the ship changed course.
- CIC was half-manned, with only five enlisted watch standers. No one manned the DRT, AN/SPA-25 or the maneuvering boards. The NTDS console operator was the only person monitoring all contacts. The surface tracker passed initial CPA, course and speed on the contacts directly to the bridge's phone talker, but never updated the CPAs after that. He made this report without telling the CICWO or watch supervisor.

● The combined experience of the OOD, JOOD and CICWO in their watch stations was less than three months.

● The ship neither held a navigation brief before leaving port, nor prior to entering the strait.

● The navigator did not brief the quartermasters or give them a list of lights and NAVAIDS in the night orders. He also wasn't on the bridge when the ship entered the strait.

● The OOD and JOOD did not take visual bearings on any of the surface contacts to determine the risk of collision.



The collision resulted in both external and internal damage to the destroyer, as evidenced in the photos at the top and bottom of this page.

● The operations officer had approved the plan to man CIC with only half the people listed on the watchbill. He was concerned about crew rest.

● The watchbill rotation on the ship contributed to the collision. While the OODs were in four sections, the JOODs were in six sections and the CICWOs were in four. Of the 14 officer watch stations, commissioned officers filled only six. The JOOD was ASWS- and ESWS-qualified, but neither the OOD nor the CICWO was SWO-qualified. Of the men on the bridge and in CIC, only half were PQS-qualified. The ship had no interim qualification program.

● Damage control teams responded correctly. Their prompt actions and the heroic work of the DC organization onboard prevented the fire from spreading beyond the Sea Sparrow and torpedo magazines to the rest of the ship.

The JOOD said, "She's going to hit us!" The OOD looked again and ordered the ship left to 100 degrees and increased speed to flank.

● The lookouts weren't trained properly. In many cases, their binoculars and sound-powered phones also were in bad condition. Some lookouts didn't have all the equipment they needed.

● The navigation team had completed REFTRA in March 1989 with outstanding scores. However, the team had changed completely by the time of the collision. The leading QM was TAD from another ship and the QMOW, who wasn't PQS-qualified, was supervising another QM under instruction.

● The investigating team also cited inadequate logkeeping onboard which hampered an accurate reconstruction of the events.

● The ship's firefighting equipment and EEBDs worked properly. There were some problems with the DC WIFCOM system, but the Repair III locker leader still was able to use it to pass resupply needs to an assist ship. ■

LCdr. Hess is assigned to the Surface Ship Safety Programs Directorate at the Naval Safety Center. Ken Testorff is associate editor of Fathom Magazine.

Think Before You "N/A"

By Lt. E. Martinuzzi

A tagout sheet is a piece of paper that can separate a safe dive from an accident waiting to happen. This concept may seem simple, but it's one we need to give more attention to.

The section marked "clearance authorized" on the back of the tagout sheet has room for two signatures – the "authorizing officer" and the "repair activity." It also has a note saying if you need two authorizing signatures to hang the tag, then you need two signatures to clear it. Official guidance is found in OPNAVINST 3120.32B.

The crew is permitted to mark "N/A" in the space under "repair activity" when no one from an IMA or shipyard is involved in the job. However, you must obtain the signature of someone from the repair activity when its personnel assist on the job.

All kinds of exciting, but dangerous, things can happen if you decide you don't need the second signature. Consider the following examples of events that occurred with divers in the water when duty officers simply marked "N/A" in the repair activity block:

- A ship cycled its rudder.
- Another ship cleared tags to sonar equipment to conduct pre-underway tests.
- A submarine cleared tags on its emergency main-ballast-tank blow system for testing.

Why did the duty officers make these mistakes? They were probably all having hectic days: onloading stores, answering urgent messages and receiving visits from the commodore.

DANGER/CAUTION TAG-OUT RECORD SHEET
NAVSEA 9210/9 (REV 3-86) (BACK)

TAG NO	LOCATION	TAGGED POSITION/ CONDITION	POSTED BY (INITIAL)	POSTING CHECKED BY (INITIAL)	CLEARANCE/ POSITION/ CONDITION	CLEARANCE AUTHORIZED (SIGNATURE)		DATE/ TIME CLEARED	CLEARED BY (INITIAL)
						AUTHORIZING OFFICER	REPAIR ACTIVITY		

SIGNATURE OF WATCH OFFICER/DUTY OFFICER	DATE/TIME	☐ CONTINUED AS ADDT'L SHEET (CHECK BOX IF APPLICABLE)

Here's a real life scenario. You're duty A-gang on Sunday. The ship will get underway on Monday at 0800. Your lucky day, right? You get to do all the pre-underway checks.

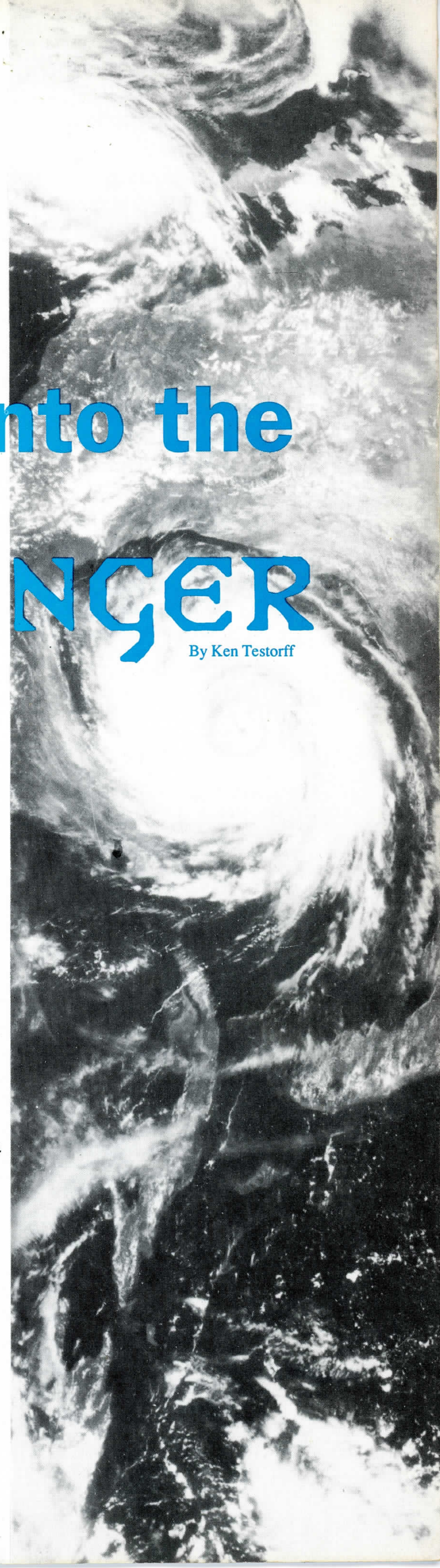
The repair-locker divers finish their security swim before lunch. It's 1330 and you're behind on your checklist. Should you go to the duty officer and ask him to clear tags on the No. 2 auxiliary sea water inlet so you can test the emergency generator? After all, it's the weekend, the security swim is done and you probably won't hurt anyone. But those tags require the repair activity's concurrence before removal. The right thing to do is call the dive locker, division officer, repair duty officer – anyone who can authorize tag clearance.

Get the repair activity's signature before you give the tag-out form to the duty officer. By doing so, the duty officer only has to evaluate whether the tag clearance will affect his own ship. This action does not violate CNO policy, and you haven't put your duty officer on the spot. Remember, he has as much interest in completing the pre-underway checks on time as you have.

No job is worth risking someone's life. Always get that second signature on the tag-out sheet, no matter how hard and time-consuming it is. ■

Lt. Martinuzzi is assigned to the Naval Safety Center as a diving and salvage assistant.

Hurricanes Allen and Iris
August 1980 – satellite photo.



Sailing into the Eye of Danger

By Ken Testorff

The special sea and anchor detail stood by their stations, while everyone else manned the CG's rail for leaving port. We waited anxiously for the bridge to pass the word, "Underway, shift colors."

A heavy, morning mist, coupled with the wintry, Japanese air, heightened our eagerness to feel the ship begin moving from the pier. We snuggled deep within our fully-buttoned peacoats and shifted slightly from one foot to the other just to keep our blood circulating. *How can our numb bodies stand this cold much longer?* I wondered, knowing the bridge wouldn't secure us from quarters until we cleared the harbor.

At long last, we felt the familiar, faint shudder under our feet, a sure sign the power plant of our mighty warship had sprung to life. Many miles lay ahead as we began this final leg of another long, Western Pacific deployment. What we didn't know at the time was we would face the biggest challenge of the cruise on this return transit. For some of us, the encounter would be a once-in-a-lifetime experience. For others, it would add just one more colorful episode to our collection of sea stories.

Only a few days out of Japan, we began noticing a big change in life aboard our ship. Worsening seas made working, eating and sleeping very difficult – *like my earlier days aboard a Fletcher-class DD,* I thought. And so it came as no surprise when the CO announced we needed to rig for extra heavy weather. "We're heading into a typhoon," he said in a somber voice.

Shortly after crew members completed making added preparations, the CO told all hands to secure from any unnecessary work. He also advised us to stand clear of all weather decks and to limit our movement throughout the ship as much as possible. With these instructions, we knew we were in for rough times.

Many of us began to wonder if our ship could survive the typhoon's onslaught. After all, we were riding in a ship some Navy officials considered top-heavy because of the macks *(combined masts and exhaust stacks),* which rose more than 104 feet above the main deck. At this point, the best we could do was hope all the skeptics were wrong.

Once the storm hit us with its full fury, many anxious moments came and passed when the ship seemingly rolled forever before righting herself. Each time, crew chatter died until the danger was over. A loud crash often shattered our silence, as the roll dislodged another piece of equipment somewhere on the ship.

A nearly-full trash can in our berthing compartment worked loose one night, slid across the deck and became airborne after hitting a deck fitting. It landed on a shipmate's chest, causing minor injuries. The victim never had a chance to move out of the way because, like everyone else, he had strapped himself into his bunk to prevent being tossed out of it.

At long last, our ship sailed into calmer waters, where an investigating team of crewmen started surveying damages. They found our biggest loss was a number of liferafts the typhoon had ripped from storage racks topside.

We also began hearing reports of damage to other ships in our task force. A CV escaped with only minor problems, but some DDs weren't so lucky. The storm battered a few so badly they had to return to Japan for repairs. Others managed to clean up the aftermath and steam home with us to enjoy the reunion with families and friends. ■

Ken Testorff is associate editor of Fathom magazine. In this story, he relates facts as he remembers them from a 1964-65 WestPac cruise he took aboard the guided missile cruiser USS *Columbus* (CG-12). He was a JO3 at the time.

By Any Name, A Big Storm

Meteorologists call them lots of things: hurricane, typhoon, baguio, willy-willy, or simply a cyclone. Collectively, the analysts refer to them as tropical cyclones. They occur everywhere, except in the Arctic and Antarctic Oceans, as well as south of the equator, in the Atlantic Ocean.

The different names indicate locations where the storms happen. For example, in the Atlantic, Gulf of Mexico and Eastern Pacific, meteorologists call them hurricanes. In the western North Pacific, the correct name is typhoon; in the Philippines, baguio; in Western Australia, willy-willy; and in the Indian Ocean, a cyclone.

Whatever the name, ships at sea must make every effort to avoid tropical cyclones of hurricane- or typhoon-intensity (64 knots or more). Even well-equipped ships, in some cases, may founder, because of the extreme violence of wind and sea on their masts and superstructures.

While many sailors never experience a tropical cyclone at sea, the prudent seaman nevertheless takes time to study such storm systems. He learns the long-period, heavy swells arrive well before the first clouds (dense cirrus and cirrostratus) announcing a hurricane. Active bands of cumulonimbus clouds move along lines up to a few hundred miles ahead of the storm, the distance varying with size of the storm.

Following the clouds (on the day before the storm), the tropical pattern is out of phase. Air mass thunderstorms of the day before are missing. The usual cumulus clouds are suppressed. The skies are bright and the temperatures are above normal. Then the barometer starts to drop slowly and the wind may shift to an unusual direction. In the trades, a north wind is most unusual and generally signals danger. Also, any wind veering south through west to north usually spells trouble.

As the storm center gets closer, the barometer falls more rapidly, the wind increases, the seas grow mountainous, and finally, an ominous black wall of clouds, called the bar of the storm, approaches.

Sailors may encounter tropical cyclones in the eastern North Pacific from June through October. Storms in this region normally are as violent as those in the North Atlantic, but not as large. Meanwhile, tropical cyclones may occur any month of the year in the western North Pacific, but the vast majority take place in July, August, September and October. More than twice as many tropical cyclones happen each year in the Western Pacific, compared to the Atlantic.

Tropical cyclones in the Bay of Bengal and the Arabian Sea are most likely to occur from October through May. The period from September to May marks the storm season in the South Pacific and South Indian Ocean, with January, February and March the worst months.

Despite many years of study, meteorologists have trouble predicting movement of tropical cyclones. In the early stages, the storms develop along an ESE-WNW axis and they tend to move toward higher latitudes, but similarities in movement end there. They show no longitudinal regularity in any turn to the north. Sometimes they accelerate (as much as 1500 percent in 24 hours), then suddenly decelerate. Other times, they stop and stay within a 50-mile circle for as long as three days.

Tropical cyclones south of 30 degrees North latitude are the most predictable. They usually travel at speeds between 12 and 16 knots, but may reach 20-25 knots when subtropical highs are exceptionally strong. Meanwhile, storms north of 30 degrees North latitude may vary in speed between 0 and 60 knots, with rapid accelerations up to 70 knots possible.

Hurricane-force winds (64 knots and higher) in the average tropical cyclone cover an area slightly more than 100 miles in diameter. Gale-force winds (34 to 64 knots) extend over an area 400 miles in diameter. In large storms, hurricane-force winds may stretch for 200 miles, compared to 400 miles for gale-force winds. Records show a few Pacific typhoons have carried hurricane-force winds in an area exceeding 300 miles, with gale-force winds covering an area of 600 miles in some quadrants.

No one really knows the strongest winds of hurricanes and typhoons, because most measuring devices can't stand speeds much higher than 125 knots. However, reconnaissance planes have reported winds in the 130- to 150-knot range. Some land stations also have made actual measurements as high as 150 knots. In a Florida Keys hurricane, engineers estimated the winds must have hit 170 to 215 knots. They based their guess on the extent of damages.

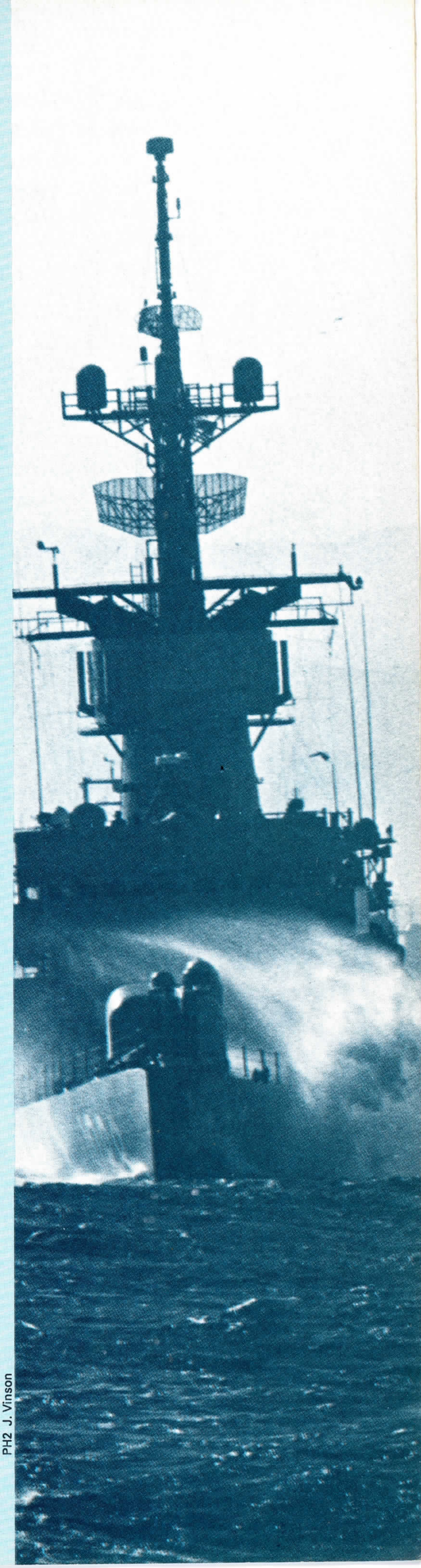
At the edge of the eye, winds reach their strongest point. Then, within a distance of as little as a few hundred feet, they may fall off from 100 knots to 10. The average eye measures about 14 miles in diameter, but it can be as small as 4 miles or as large as 100.

Winds of tropical cyclones generate some of the highest ocean waves. The average height is 35-40 feet, but giant storms have created some measuring 45-50 feet. A few have gone as high as 60-90 feet. These larger waves occur on the right side of the storm, along the direction of movement.

Waves move more slowly than the winds which create them, but still move faster than the tropical cyclone itself. As they move out, at perhaps 45 to 50 knots, they become swells and continue ahead of the storm for hundreds or thousands of miles. Hurricanes and typhoons produce swells at a rate of 2 to 4 per minute, contrasted with the normal 10 to 15 per minute.

During hurricane season, the Navy, National Hurricane Center (NHC), and the Air Force work together to provide U.S. coastal areas and shipping interests with timely storm warnings. NHC handles civil interests and merchant shipping, while the Navy takes care of coastal activities and ships at sea. The Air Force is responsible for Air Force and Army installations in the critical area.

The Department of Defense is in charge of reconnaissance. In this capacity, they frequently investigate areas of possible hurricane formation. Once they locate a tropical



PH2 J. Vinson

storm, hurricane-hunter planes check it almost 24 hours a day. Their fact-finding mission provides information on surface and upper winds, state of the sea, pressure, the eye, and storm location. *(Budget constraints may result in cancellation of this service in the near future. – Ed)*

A similar arrangement is in effect in the Pacific, where the Joint Typhoon Warning Center (Navy and Air Force) advises all civil and military interests in the area. This center is based at the Navy's Fleet Weather Central in Guam.

Weather satellites play an important role in discovering tropical cyclones as they begin, then tracking them in their later, more destructive stages. Satellite information, combined with reconnaissance data, helps save many lives and prevent much damage.

Radio reports warn mariners about approaching storms, while a system of flags and lights *(see Fig. 1)* at many U.S. coastal points alert them to dangerous winds. Explanations of the various warnings follow:

Small Craft Warning. One red pennant displayed by day and a red light over a white light at night indicate winds up to 38 miles an hour (33 knots) and/or sea conditions dangerous to small craft are forecast for the area.

Gale warning. Two red pennants displayed by day and a white light above a red light at night indicate winds ranging from 39 to 54 miles an hour (34 to 48 knots) are forecast for the area.

Whole Gale Warning. A single, square, red flag with a black center displayed during daytime and two red lights at night indicate winds ranging from 55 to 73 miles an hour (48 to 63 knots) are forecast for the area.

Hurricane Warning. Two square red flags with black centers displayed by day and a white light between two red lights at night indicate winds 74 miles an hour (64 knots) and above are forecast for the area.

Rarely does the mariner who has experienced a fully-developed tropical cyclone at sea wish to encounter a second one. He has learned the wisdom of avoiding them if possible.

On his second voyage to the New World, Columbus met a tropical storm, but suffered no damage to his vessels. This experience proved valuable during his fourth voyage when a fully-developed hurricane threatened his ships. He recognized a southeasterly swell, the direction of high cirrus clouds and hazy appearance of the atmosphere as signs of an approaching storm. He directed his vessels to shelter, while another commander, who ignored the signs, lost most of his ships and more than 500 crewmen.

References used for this article was Knight's Modern Seamanship, 16th Edition, and American Practical Navigator, Bowditch, Pub. No. 9, Vol. 1, 1977. Personnel assigned to the Naval Eastern Oceanography Center verified all information.

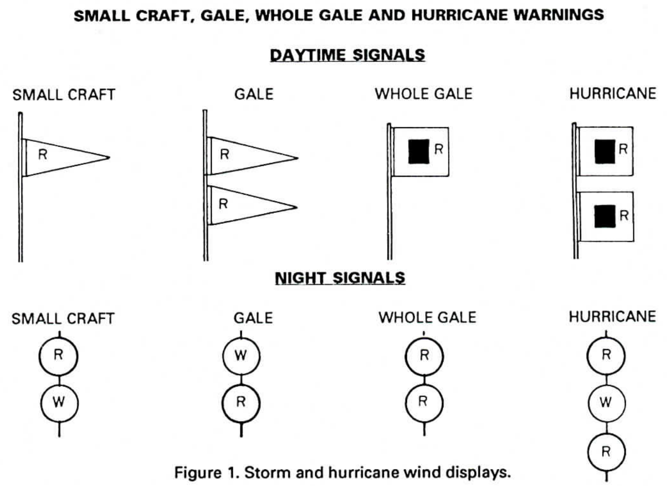


Figure 1. Storm and hurricane wind displays.

Rules for Handling Ships in Tropical Cyclones

1. Determine the bearing, distance and track of the cyclone from the official warnings, or from your own calculations if there are no warnings. Use this information to plan how to avoid the dangerous semicircle on the right side of the cyclone, looking downstream in the direction of movement. Consider the relationship to shoal water in your planning.

2. According to Buys Ballot's Law, an observer who faces into the wind has the center of low pressure on his right in the Northern Hemisphere, on his left in the Southern Hemisphere and, in each case, somewhat behind him. Since wind direction usually shifts temporarily during a squall, don't try to determine the storm center's position during this time. As the center comes closer, you may be able to locate it by using the radar. Do so if possible because a continuous knowledge of the center position is helpful in maneuvering. This method can be deceptive , however, because the rain creates most of the radar return. If the eye is out of range, the spiral bands may indicate its direction from the vessel. Tracking the eye or upwind portion of the spiral bands helps determine direction and speed of movement. You should do this tracking for at least an hour because the eye tends to oscillate. Tracking individual cells for 15 minutes or more, either at the end of a band or between bands, will indicate wind speed in that area of the storm. Distance from the storm center is more difficult to find than direction. Radar is perhaps the best guide; however, the rate of fall of the barometer also gives some indication.

3. If near a cyclone and you have no warnings, determine its bearing by (a) the direction from which the swells are arriving and (b) by adding 115 degrees to the direction from which your true wind is blowing.

4. If the wind gradually hauls to the right (clockwise), the ship is in the dangerous semicircle. If it hauls to the left, you are in the safe or navigable semicircle. *(see Fig. 2)*

5. If the wind remains steady in direction, increases in speed, and the barometer continues to fall, you are directly in the path of the storm.

6. Don't try to outrun or cross the "T" of a mature tropical cyclone; it usually means trouble. The front-running swells, which build rapidly in size with the approaching storm's center, cause most of the problems. These swells can slow ship speed by several knots, while the storm keeps roaring along, or speeds up.

7. If sea surface-temperature charts are available, use them to avoid the areas of warmest waters. When tropical cyclones move slowly, at 10 knots or less, they tend to use such warm areas as a path.

8. If the storm catches the ship in its circulation, even on the fringes, take the following steps:

a. If you are dead ahead of the storm's center, bring the wind on the starboard quarter (160 degrees R) and make best speed on this course. This action will quickly take the ship away from the center into the safe semicircle. When well within the semicircle, bring the wind 130 degrees R and continue best speed.

b. If the ship is in the safe or navigable semicircle, bring the wind on the starboard quarter (130 degrees R) and make the best speed.

c. If in the dangerous semicircle, bring the wind on the starboard bow (45 degrees R) and make as much headway as possible. ■

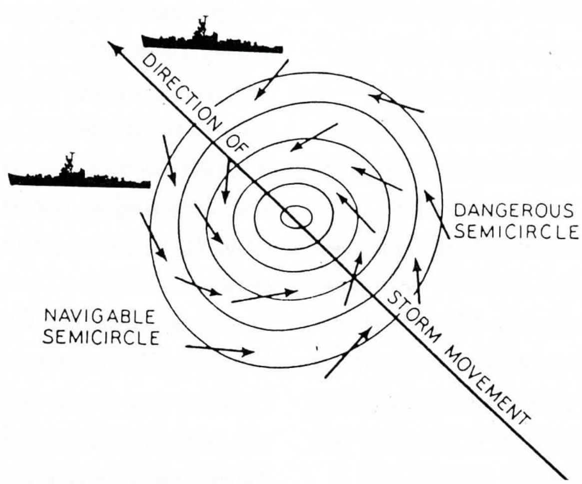
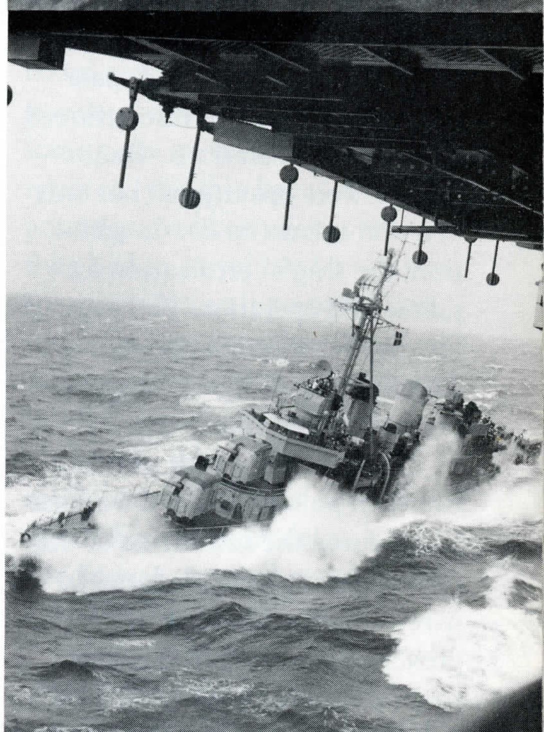
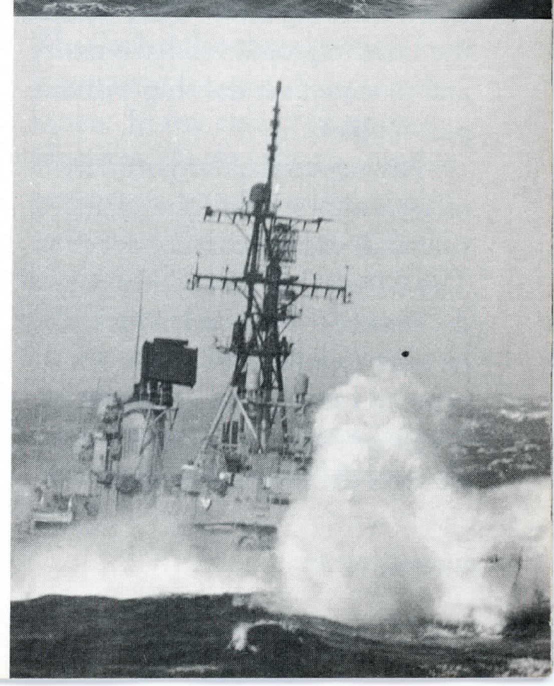


Figure 2. A ship hove-to in the dangerous semicircle will note the wind to shift to the right (clockwise); the wind will shift to the left (counterclockwise) if the ship is in the navigable semicircle.





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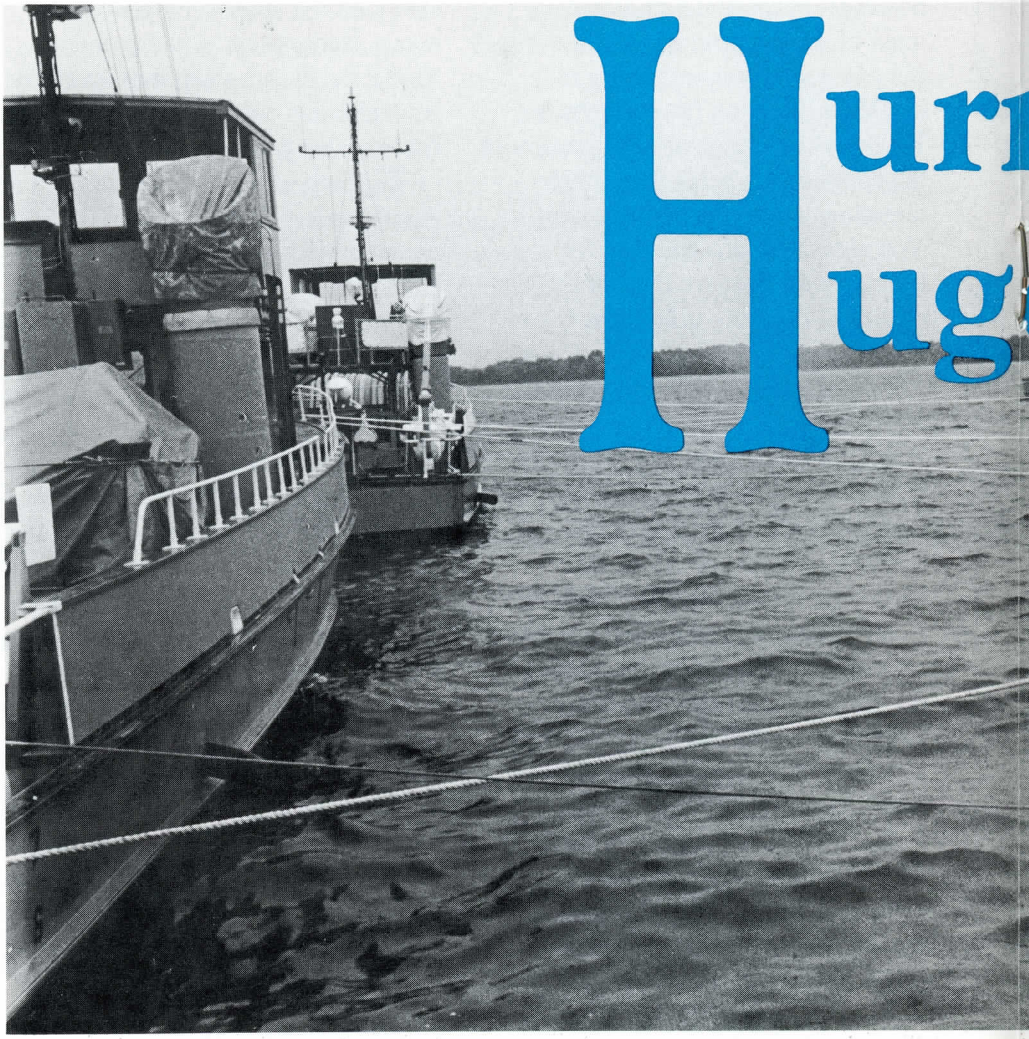

When Hurricane Hugo roared into Charleston, SC, late last year, its 137-mph winds ripped apart nearly everything in its path. One exception was an SSN moored to a shipyard pier. Despite some anxious moments, the submarine and her crew came through the ordeal with no damage or injuries.

Many ships went to sea before the hurricane arrived; however, this SSN had no choice but to stay at the pier. In preparation for overhaul, ship's personnel had removed all weapons and spare parts. They also had discontinued food service operations. Radio circuits were operational but only in a non-secure mode. In addition, the ship's certification for submerged operations had expired. Finally, the ship was about 100,000 pounds lighter than normal surface trim.

In accordance with standard overhaul policy, shipyard workers had secured the submarine to the pier using nine, doubled, steel wires. As the hurricane approached Charleston, however, ship's personnel added two 5-inch, nylon mooring lines. They slacked the lines to provide added security and to maneuver the ship without pier support.

An augmented, in-port duty section was on board the submarine with extra watches posted. The CO shifted all watches below decks except for a bridge lookout he kept topside until winds became too strong and visibility dropped to zero. Electrical loads were on the diesel generator with enough fuel to last two days. The ship was rigged for dive, with the exception of the bridge, lower weapon shipping hatch and miscellaneous equipment and rigging topside. Crew members had removed vent covers from the main ballast tank (MBT) to allow venting if necessary. Communications included one telephone line (the only pier service left intact), a hand-held radio (for talking to the emergency control center) and a VHF marine radio patched to the UHF/IFF mast. This latter device allowed contact with the control room and harbor common net. The hand-held radio failed, and the ship had to use the telephone to talk to the emergency control center.

Five minutes after Hurricane Hugo hit Charleston, the SSN broke away from the pier. One mooring line attached to an after cleat held the ship's head steadied

Back At
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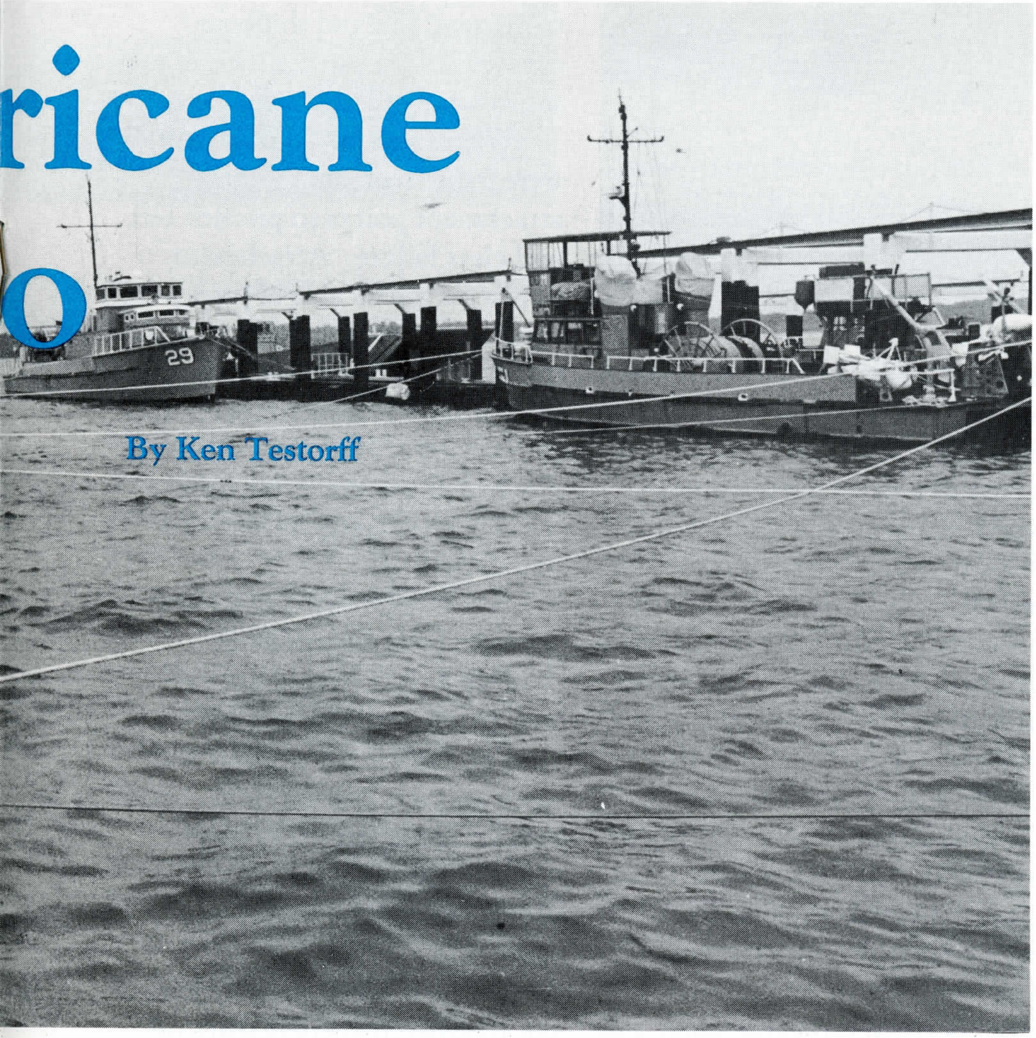
By Ken Testorff

Photos by PH3 Tom Petry



on 354 degrees T between two piers while the harbor control net guardship dispatched tugs. Crew members went topside to assess conditions and to make up lines to the tugs. However, wind speed rose rapidly as the hurricane's eye passed and forced personnel back below. At the same time, the ship abandoned efforts to bring tugs alongside because of concern for personnel and tug safety.

To minimize the ship's motion and prevent the SSN from becoming adrift in the Cooper River, the CO bottomed the ship. He maintained this position for three hours until the ship's head started swinging right. The submarine then began drifting toward the pier where it was berthed. Forty-five minutes later, the ship stopped on a heading parallel to the pier. The stern line remained in place throughout this movement.

Ten hours after bottoming, the submarine blew ballast and returned to normal surface trim. It then berthed at the pier without further incident.

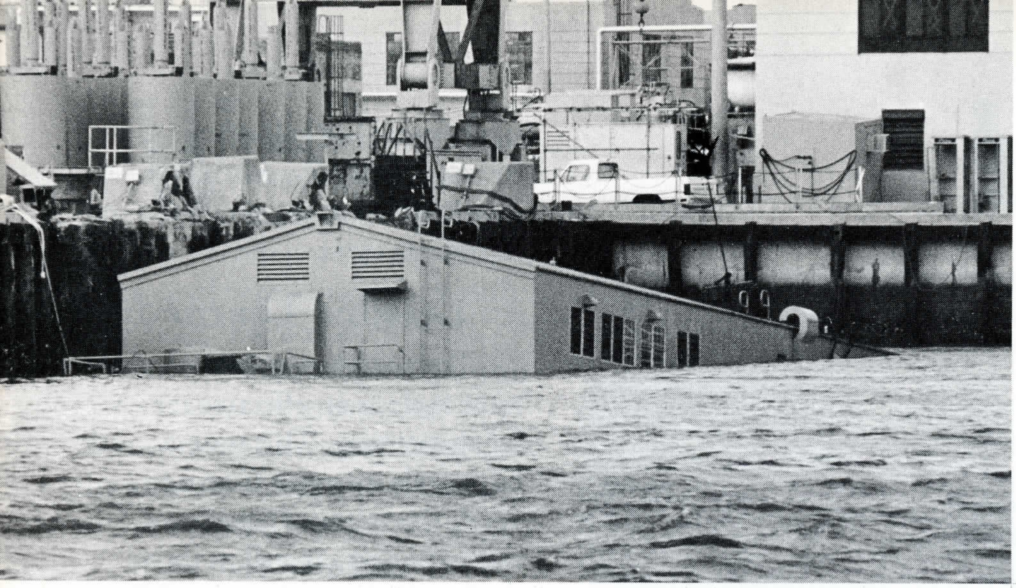
Lessons Learned:

Command preparedness plans must include an effective family locator system. This system needs to provide a way to assist and verify the safety of families of sailors in port, as well as those deployed. As civil preparedness changed and Hugo grew, evacuation orders became a significant factor in figuring out which onboard personnel and relief watch standers would be available. In some cases, personnel couldn't return to the ship because transportation had been disrupted and they had to travel too far to avoid the storm. A well-prepared contingency plan considers areas subject to flooding and families in need of post-storm assistance.

Loss of telephone services made communication difficult and unreliable for many days. You need a way to recall people other than by telephone.

Ships must review and upgrade habitability and sustainability requirements before a disaster. They must also stage special equipment for post-disaster assistance. In the case of Hurricane Hugo, trucks, food, fuel, portable generators, potable water, chainsaws, portable radios, protective clothing and gloves, lanterns, flashlights and electrical safety equipment were critical to recovery efforts.

During intense storms, handheld radios are useless because of



high background noise and wetting. Waterproof covers and batteries not dependent on AC-powered recharges are required.

VHF radio was a key circuit the SSN used to communicate with local authorities, tugs, the Coast Guard and emergency personnel. If your ship doesn't have a VHF radio, consider installing one temporarily or using a portable unit. Develop and practice a communications plan before an imminent disaster arrives.

Key factors in dealing with unexpected contingencies include training, material management practices and effective watch-section damage control.

Bottoming a submarine on purpose during a storm is obviously not a desired or preferred option. However, if conditions indicate the ship is likely to ground in an uncontrolled manner, bottoming may minimize damage to the ship.

Crew briefings, training and contingency plans need to extend beyond immediate ship-survival requirements. During Hurricane Hugo, recovery plans quickly emerged along established chain-of-command lines. As unit-level needs were satisfied, commands diverted manpower and equipment to support requirements of higher echelons. You must consider this aspect of disaster preparedness when making contingency plans, to assure smooth transition of resources during recovery efforts. Specifically, plans should include a description of unit responsibilities to support ISIC (immediate superior in command) needs during recovery from widespread disasters.

Post-storm inspections should include detailed examination and operational checks of facilities prior to use. A ship must anticipate long periods without shore services (power, potable water and CHT facilities).

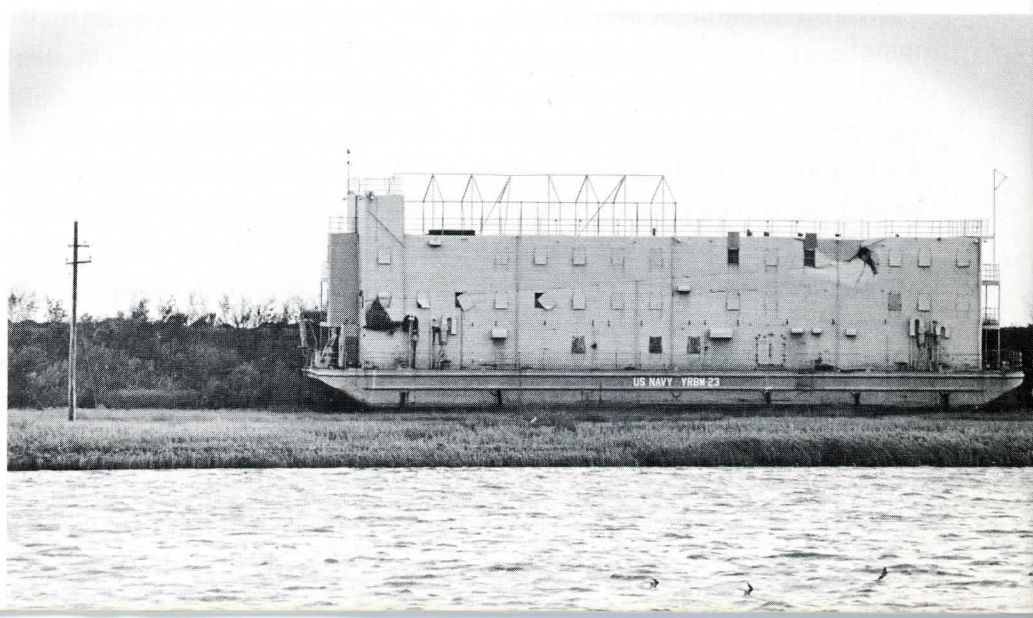
While Hurricane Hugo posed special problems for the SSN, it also highlighted a need to define and practice a mooring plan for all ships remaining in port during hazardous weather. Actions taken to prevent pier and shipboard damage during the high winds and storm surge of Hugo follow:

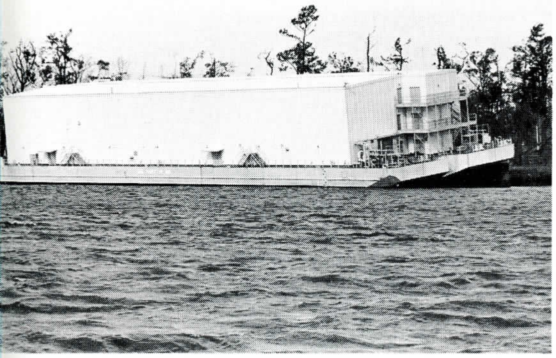
Where possible, mooring lines were led to separate mooring attachment points to prevent bitt and cleat failure. Attachment points on the far side of piers were used, with lines slacked (laying on the pier) to allow for storm surge. Eyes of lines to attachment points on the near side of piers were cinched at the eye to prevent them from slipping off the bitts and cleats.

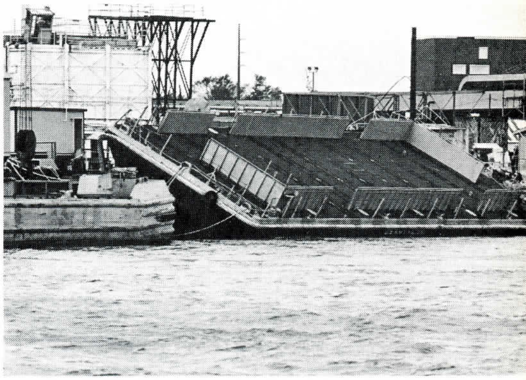
Personnel evened strain and slack on both parts of each doubled line. Getting lines set well in advance allowed sufficient time to analyze the tension and slack on each line and to compensate for predicted storm surge. Once Hugo hit, the high winds prevented anyone from working lines.

Outboard anchors were kedged out to assist in keeping ships off the pier. As a minimum, ships placed both anchors underfoot.

Crewmen used fenders to







prevent damage to both ships and piers. As the hurricane approached and after the eye passed, wind direction, storm surge and river currents affected each pier and ship differently, depending on heading and geographical location. Personnel learned they should consider securing fenders along top edges of cement utility encasements and pier pilings as well as in the normal positions. Ships can ride over piers during high tides and storm surges.

Shallow water camels were removed because of their susceptibility to flipping and damaging the ship. One Charleston-based AE reported severe damage to pier pilings by a camel and fenders while the ship suffered only cosmetic damage. The camel was destroyed while the fenders weren't hurt.

An MSO had some problems with her cross-pier mooring when a forward anchor chain parted because of increased tension during the storm. The increased tension also caused the aft sweep wire to part. If the ship had left sufficient slack in the anchor chain, this problem would have been prevented. A minesweeper squadron commander pointed out that wire should only be used for initial positioning of the ship's stern relative to the pier. Once nylon lines are run, personnel should lay wires slack so they don't encounter dynamic shock. Generally, ships and barges made up with steel cables broke free during Hugo.

The aftermath of Hurricane Hugo also indicated that ships need to take a closer look at topside stowage of equipment and fixtures during heavy weather. Here are some examples that illustrate this point:

A tornado passed close astern of an AE, damaging the helo hangar doors. Personnel could have better protected the doors by raising them a few feet off the deck and securing them with wire straps. This action would have reduced the pressure differential and allowed the bottom edge of the doors more flexibility to resist wind action.

A DDG reported they locked down the SPS-49 radar antenna, placed the AN/SLQ-32(V)3 antennas in the stowed position and let the SPS-10 and LN-66 radar antennas "wind vane." Crew members also removed or dropped all small antennas to a 90-degree angle and tied them off. These efforts worked well because no antennas were damaged.

Another DDG removed wind screens and installed stow pins in all directors as well as the gun mount. Personnel also turned all directors toward the ship's superstructure and pointed them down before tying them in that position.

Prior to each hurricane season, Charleston conducts a hurricane response and sortie exercise. This exercise covers attainment reports, flexing of watch bills and recall procedures. However, Hurricane Hugo pointed out the exercise shouldn't end at sortie. Charleston faced many problems with clearing and repairing harbor facilities before sortied ships could return. As a result, officials have added one more day of training to ensure everyone is capable of handling disaster response. ■

Ken Testorff is associate editor of Fathom magazine.

Planning Oversights Lead to Marine's Death

By LCdr. M. A. Hess
and
S. V. Scudder

The fleet commander scheduled the amphibious operation many months before. All the participants knew their parts. The only event remaining was to launch the Marines toward the beach. No one knew the day would end with one Marine dead, 10 injured and thousands of dollars of equipment lost.

The operation was a standard exercise, an amphibious assault to seize an airfield and defend it. A Marine company would also go ashore to secure a beachhead to land supporting artillery. The Marines would use rigid raiding craft (RRCs) to make the night assault, take the beach and hold it until an artillery company relieved them. The host nation provided liaison officers to each amphibious ship and the Marine battalion. These officers would answer questions about the beach area and coordinate services in the area.

According to the exercise's OPORDER, the Marine company would enter their RRCs from the LPD and transit 10 nautical miles to the bay's entrance. From there, troops would assault a beach five nautical miles inside the bay, which was shallow and had several sandbars near the entrance. Sailing directions for the area reported that wind action and wave movement over the sandbars could cause swells and create extremely rough surf. The Marine company commander laid out a navigational track that took his company directly over two sandbars en route to the assault point.

The operation started near midnight, with 96 Marines, four Navy corpsmen and one host-nation army officer embarked. Earlier that morning, the Marine company commander and the CO of the LPD canceled the original plan to use RRCs because of rough seas in the OPAREA. Instead, the company embarked in combat rubber raiding craft (CRRCs), which are 10-man, Zodiac-style, rubber rafts designed for amphibious raids.

The amphibious squadron staff calculated a safety factor from the Joint Surf Manual (COMNAVSURFPAC/LANTINST 3840.1B), a planning guide to determine if they could conduct the assault safely. The factor met acceptable criteria in the manual, so the squadron staff directed the company to proceed. The LPD safely launched all boats by 0030 and they proceeded toward the entrance to the bay. The Marine navigator and the company commander, who were in the lead boat, checked their position against visible reference points, using night-vision goggles.

At 0200, the group of 17 CRRCs approached the entrance to the bay, where waves up to 20-feet high greeted them. This high surf surprised the Marine company commander and navigator because an aerial, visual reconnaissance the previous morning showed the area to be calm.

Eight CRRCs capsized in the surf; some capsized three or four times. A ninth CRRC capsized two hours later near *Rescue Beach* (the beach where the wind and seas washed personnel from the capsized CRRCs). *Rescue Beach* became the center of the Amphibious Ready Group's (ARG's) search and rescue (SAR) efforts to recover 53 people that the rough seas had thrown overboard.

A lance corporal tossed from his boat by the seas was rescued by two more boats, which both capsized. Equipment-securing lines creating a spider-web effect, trapped the lance corporal beneath the third boat and caused him to drown. A sergeant, the senior NCO in the boat, recovered the lance corporal and unsuccessfully tried to revive him with cardiopulmonary resuscitation.

A Marine aircrew from a UH-1N SAR helicopter was waiting when the upside-down boat with the lance corporal arrived at *Rescue Beach*. They loaded him into the helo and transferred him to the ARG's medical-guard ship, but the lance corporal never regained consciousness. By staying calm, Marine Corps and Navy people in the exercise prevented more deaths.

Lessons Learned:

Amphibious warfare doctrine involves detailed planning at every level throughout the organizations of the Commander, Amphibious Task Force (CATF), and the Commander, Landing Force (CLF). This planning ensures the safety and success of an operation. In this exercise, planners left out several parts:

- Commands did not provide or discuss the information required to plan navigation. The company commander laid out his navigational track without consulting the force navigator. The force navigator neither attended the final planning conference nor reviewed the track to the beach that the Marine navigator proposed.

Both the ship and Marine navigator used charts with a scale of 1:300,000. This scale wasn't sufficient to show the sandbar at the bay's entrance. A member of an LCAC crew went to a local marine supply store and bought a chart with a scale of 1:24,000, showing the detail of the bay's entrance. The LPD had that chart. However, neither the ship's navigator nor the Marine navigator used it to plan the exercise. The LPD navigator and the Marine company commander discussed the Sailing Directions and looked over the large area chart, but the company commander did not show the LPD's navigator any of his proposed tracks for the assault.

- Exercise planners considered *Blue Beach* protected because it was inside the estuary. The Navy SEALs' surf observation team went to *Green Beach,* the main assault beach two and one-half miles away, rather than evaluating the conditions at *Blue Beach*. They should have surveyed the entrance to the bay.

- None of the pre-exercise briefs included information about navigation hazards. Because of limited space in the briefing room, the company commander missed the final planning conference. The host-country liaison officers said little or nothing about navigation hazards or surf conditions expected in the operational area. The primary control ship, the LPD, didn't hold an operations and safety briefing before the launch.

That morning, the Marine company commander and the ship's navigator discussed the weather conditions and the switch from RRCs to CRRCs with the CO. That discussion, however, centered on the management of the company's mission. They didn't talk about safety or a specific navigation track for the CRRCs.

Amphibious raids in CRRCs are normally conducted using lighter armament than that used in amphibious assaults. Using less equipment during an amphibious raid and withdrawing from an area allows you to use CRRCs instead of RRCs. But in this case, the CO of the LPD and the Marine company commmander decided to use CRRCs on this assault even though they had more equipment than they would need for a raid. The CATF approved their decision.

Although no specific operating doctrine exists for CRRCs, Marines have used them in moderate seas (up to sea state 3) and to penetrate surf zones where waves can reach 20 feet. However, the training manual for the CRRCs states that waves as small as two feet can capsize a craft if people don't maneuver it properly. After consulting with the company commander, the CO of the LPD recommended the launch proceed, and the CATF gave permission for it to begin.

● The U.S. personnel who planned this operation believed the host country's liaison officers would serve as *pathfinders* for the assault teams, giving advice and warnings of navigation hazards in the area. Meanwhile, the host country personnel believed they were to act solely as observers and liaisons for support services while ashore.

● The OPAREA manual given to the PHIBRON staff by the host country mentioned that the entrance to the assault bay might have heavy surf. However, the staff never relayed this information to the Marine Corps or Navy chain of command.

● Lack of communication between the Marine company commander and his support on the LPD contributed to this mishap. If the company commander had asked anyone in the Navy chain of command about his navigation track, they could have told him about the sandbars in the area.

● No one consulted the force meteorologist about weather conditions and the potential for heavy surf in the area. He was unaware of the planned assault on *Blue Beach*.

● The LPD's navigator didn't check the Marine navigator's track. He didn't feel responsible for confirming its safety. The general consensus among the LPD's crew and the PHIBRON staff was that the CRRC operations were strictly a Marine Corps exercise, rather than a joint effort.

● The LPD failed in its duties as primary control ship. It didn't provide any control to the CRRCs, except to give them an initial vector to the beach. No one even considered the danger to the CRRCs until the LPD monitored a radio call about people in the water.

● SAR efforts of the helicopters were extraordinary. However, the ARG didn't have a helicopter capable of doppler hover and night SAR. The Marine Corps helo's crew wore night-vision goggles, which helped them rescue seven Marines.

The Marines used Combat Rubber Raiding (CRRCs) pictured left when the situation called for them to use Rigid Raiding Craft (RRCs) bottom.

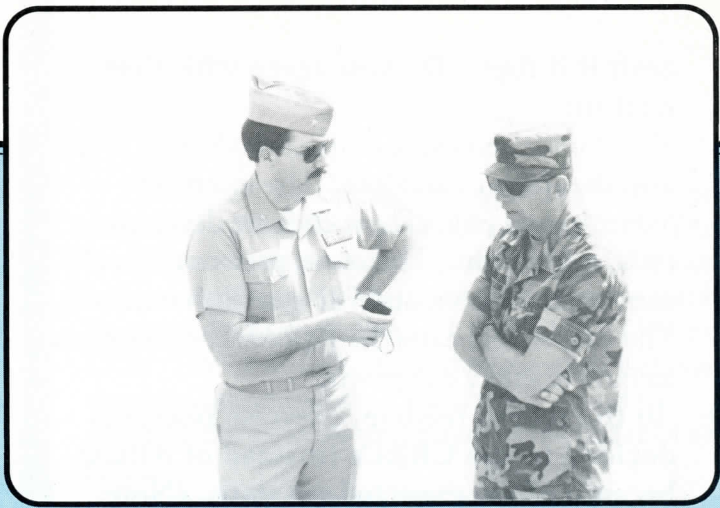
Conclusion:

The results of errors in this mishap are tragic. A Marine died because the *Green* and *Blue* sides didn't coordinate. This mishap could have been avoided if organizers had followed sound principles of amphibious operational planning. Lack of planning jeopardizes more operations and causes more mishaps than any other element. The *"It's not my job"* attitude generally leads to disaster. Talk to your counterparts and review the plan as often as possible. ■

LCdr. Hess and Mr. Scudder are assigned to the Surface Ship Safety Programs Directorate at Naval Safety Center.

RRCs & CRRCs:

How Safe Are They?



Photos by Rae Magill

Following the amphibious exercise mishap just described, a Naval Safety Center analyst and a Fathom writer contacted the Landing Force Training Command (LFTC) at Little Creek. Talking to an instructor who had 20 years of service, they discussed safety features of rigid raiding craft (RRCs) and combat rubber raiding craft (CRRCs). A synopsis of their interview follows:

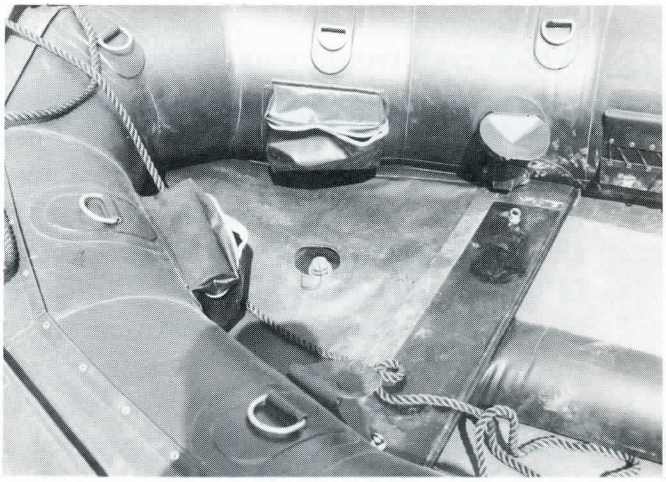
Q: What are the normal complements of RRCs and CRRCs?

A: Rigid raiders can carry 10-12 combat-loaded troops including a Marine coxswain and assistant coxswain, while CRRCs are designed to carry 8-10 people, including a Marine coxswain.

Q: Say I'm doing an amphibious assault (instead of an amphibious raid that entails a recon platoon or boat company securing a beach head, with a support team coming in behind). I put 10 Marines with rucksacks in a CRRC because we're going to leave them on the beach. In your opinion, is this a good or bad plan?

A: Bad, because you're taking too many people. A CRRC wouldn't perform like it's supposed to with 10 people and their rucksacks. You can only take six people with full combat gear *(including weapons, ammunition, support equipment, radios, etc.)*.

Q: People tell me that crewmen aboard CRRCs snap their gear onto D-rings in the craft. I also understand you use lattice-work lines to hold stuff down. According to one person I spoke to, these lines only create hazards to everyone in a



craft if it flips. Do you agree with that notion?

A: No. If crewmen use the lattice-work lines properly, they aren't hazardous. The secret is to reduce excess gear. These craft are designed for raids, not assaults. Therefore, personnel should carry their weapons and 782-gear with buttpack. The boat should carry SL-3 gear and a minimum amount of safety equipment.

Q: In the recent mishap, exercise planners decided to use CRRCs (instead of RRCs) because of the expected sea state. (Note: An aerial, visual reconnaissance the morning before the exercise showed the area to be calm. – Ed.) They said good coxswains could handle CRRCs in waves up to 20 feet (sea state four). What can you tell me about the capabilities of both types of craft?

A: According to doctrine, we don't launch an RRC in a sea state above three (*15 feet*). However, I feel you can handle one in a sea state of four if the waves are far enough apart. I don't know if CRRCs can handle a higher sea state; perhaps they can because of the rubber hull. I think RRCs handle easier though because they have steering columns *(combined with twin 70-hp motors)*, which give the coxswains more control. Meanwhile, CRRCs *(equipped with a 55-hp motor)* only have a throttle control. Also, RRCs have an in-house fuel tank that holds 56 gallons *(good for 124 miles)*, compared to an 18-gallon fuel bladder *(good for only 50-60 miles)* in CRRCs.

Q: Which craft would you rather use in an operation?

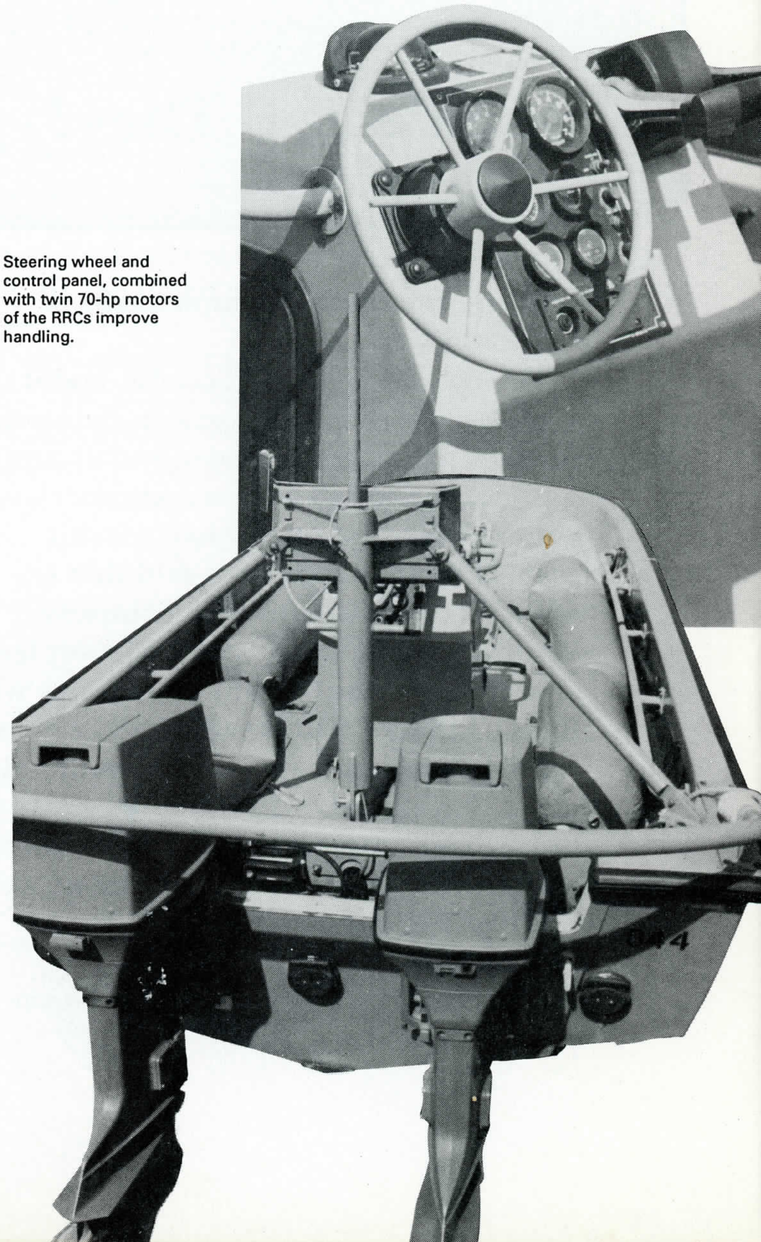
A: I'd pick the rigid raider because it's stronger and more reliable; however, the CRRC is an improved craft. Earlier models had only one air chamber, where new versions like we use at LFTC now have eight chambers. The floor plates are also heavier and the transom is stronger to accommodate 55 hp motors *(instead of 35 hp motors used on older CRRCs)*. The motors were upgraded because some planners envisioned using RRCs and CRRCs together in the same assault. With the 55-hp motors, CRRCs can reach speeds of 25 knots, compared to 35 knots for the twin 70s on RRCs.

Q: What does your training program for navigators consist of?

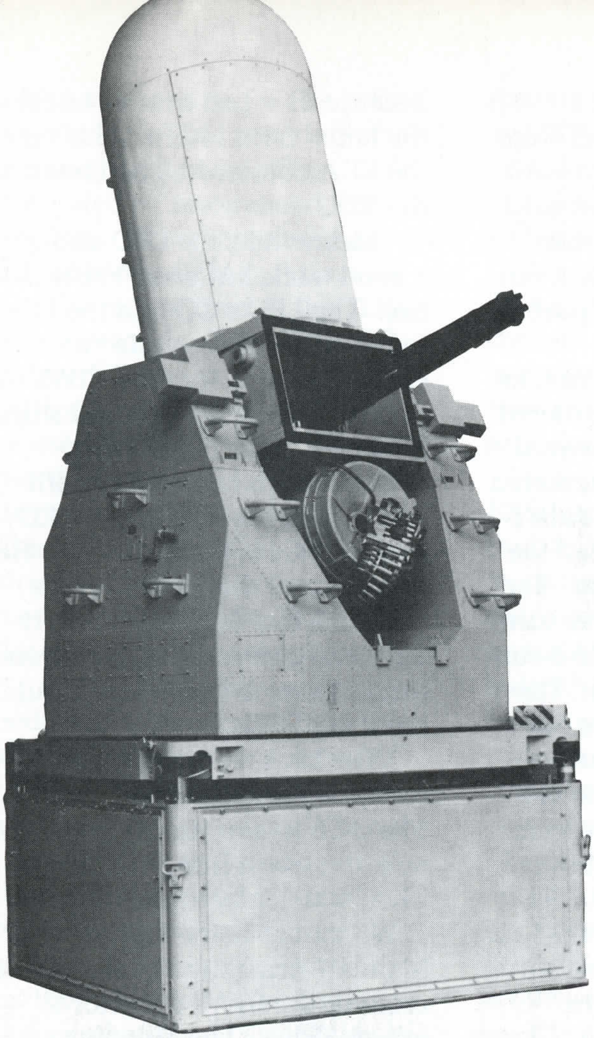
A: We teach a three-week course on over-the-horizon navigation using a plotting board, binoculars and a nautical slide rule. We use the navigation short-form formulas to get their objectives and then we go out more than 50 miles for an over-the-horizon exercise insertion.

Q: What kind of training do coxswains get?

A: They attend a 6-7-week course at Camp Lejeune, then spend a lot of time on the water getting comfortable in the boats and operating them. *(Beginning in September, the Marine Corps will convene a coxswain's course at Naval Amphibious Base, Little Creek. – Ed.)* ■



Steering wheel and control panel, combined with twin 70-hp motors of the RRCs improve handling.



A routine close-in weapons system (CIWS) exercise for five amphibious ships preparing for deployment turned to tragedy. Rounds fired by one of the ships struck and killed an officer and wounded a petty officer.

The event was an anti-air warfare (AAW) exercise from a Fleet Exercise Publication (FXP). The type commander required completion of the exercise before certifying the ships ready for deployment. Participants included an LST, LPD, LSD, LPH and LKA. The OCE (officer conducting exercise) was the amphibious squadron commander. His staff planned the exercise and directed the order of ships firing.

Exercise day dawned bright and clear. The jet towing the CIWS target launched on time and checked in on-station. The LPH, with the commodore and his staff embarked, had the best air-search radar of all five ships and controlled the aircraft. Staff members observed performance of the ships as they formed a column, with 4,000 yards separating them. The lead ship was the LST, followed by the LPH, LPD, LKA and LSD. All were steaming on course 130 degrees T at 10 knots.

The PHIBRON staff planned to have the jet deploy the target drone unit (TDU) with 13,000 feet of cable. It would fly a race-track pattern down the column, allowing each ship to fire when ordered. While the FXP described the exercise in detail, changes were necessary because of close-detection tolerances of the CIWS system. CIWS is designed to detect and destroy missile threats close to the ship. To simulate this , the aircraft had to tow the target drone close to the firing ship's superstructure. This move gave the CIWS a chance to acquire and track the drone.

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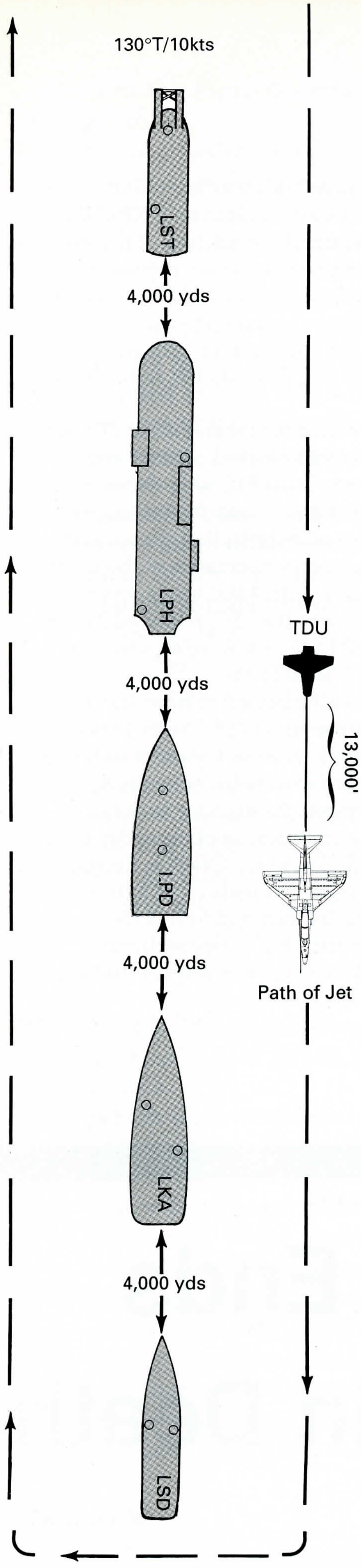
By LCdr. M. A. Hess

CIWS Firing Ends in Death



After checking in, the aircraft made a tracking run for all ships. The jet pulled the TDU forward to aft on the column's starboard side during the first run, then reversed course and made a run from astern on the ships' port side.

On the aircraft's next run, its first firing run, the OCE ordered the LST to fire from its forward CIWS mount. The pilot reported the ship hit the TDU but didn't destroy it. The OCE named the LSD as the next firing ship. The pilot executed a 180-degree turn and began an aft-to-forward-run on the column's port side. The LSD's CO directed his fire controlmen (FCs) to input "no engagement" sectors into the system. This order would prevent the CIWS from shooting toward ships forward of the LSD. The aircraft marked "on top" the LSD and the port-side CIWS mount engaged the TDU, this time destroying it.

The pilot then climbed to stream a second TDU. When he reported "on station," the OCE directed him to make his next run forward to aft on the starboard side. This time it was the LPH's turn to fire, but the target was outside the engagement envelope, so the ship didn't fire.

The pilot turned the aircraft and made a firing run from aft-to-forward on the LPD's port side, but the ship's CIWS didn't acquire the target.

The OCE ordered another firing run for the LPH. This run was on the port side from astern. The ship engaged the target with its port-side CIWS mount, but didn't destroy it. After this run, the aircraft controller (on the LPH) directed the jet to return down the column's port side, forward to aft. The LKA requested this run forward-to-aft because they had trouble tracking the target from astern. This time, the LKA obtained a good track on the TDU.

Meanwhile, the LPD also got a good track, but wasn't able to fire. The LPD's CO told the FCs to input 20-degree-wide "no engage" sectors into the CIWS to prevent hitting the forward ships. However, since the CIWS couldn't acquire the TDU with "no engage" sectors set, the CO told the FCs to remove them. He also ordered them to insert the holdback tool (a physical safety device to prevent the CIWS from firing) to see if the system would track the TDU.

The LKA reported it was ready to conduct a firing run. The OCE let the aircraft know the next run was a firing run for the LKA, which placed the port CIWS mount in the "AAW Manual" firing mode. This mode requires the CIWS operator to initiate firing. The aircraft began its run. The LKA was out of position in the column, so the OOD adjusted course left to 125 degrees to regain station. Lead ships in the formation were 005 degrees R (Relative) from the LKA.

When the aircraft's pilot reported inbound, the remote control panel (RCP) operator asked the on-station safety observer for an all-clear. The safety observer gave it to him. The aircraft marked on the LKA's beam and called "clear to fire." The OCE gave "batteries released" over the tactical communications net. The LKA's CO gave the "clear to fire" over the 21MC and his TAO ordered batteries released.

The RCP operator armed the gun and placed the mount in the "AAW Auto" mode (the CIWS mount didn't need operator action to start firing). The mount detected the TDU and started tracking right away. The CIWS generated a "recommend fire" solution. Observers saw the mount move right as it tracked.

The mount fired at the TDU for six seconds. The LKA's CO ordered "cease fire" when he realized the CIWS mount had crossed the bow. The CIWS crew put the mount on safety and returned it to the "air ready" mode. The XO and the OOD (under instruction), a lieutenant commander, reported the TDU had flown very close to the ship.

On the LPH, the navigator (a lieutenant commander) and the leading aerographer's mate (AG) observed the exercise from the starboard bridge wing. When the LKA fired, several rounds hit the starboard wing and bounced between the superstructure and wing lateral support. One round hit the navigator in the abdomen and another round struck the AG in his arm. The ship had to medevac the AG to a nearby naval hospital. Despite quick response from medical personnel aboard the LPH, the navigator died shortly after being wounded.

Lessons Learned

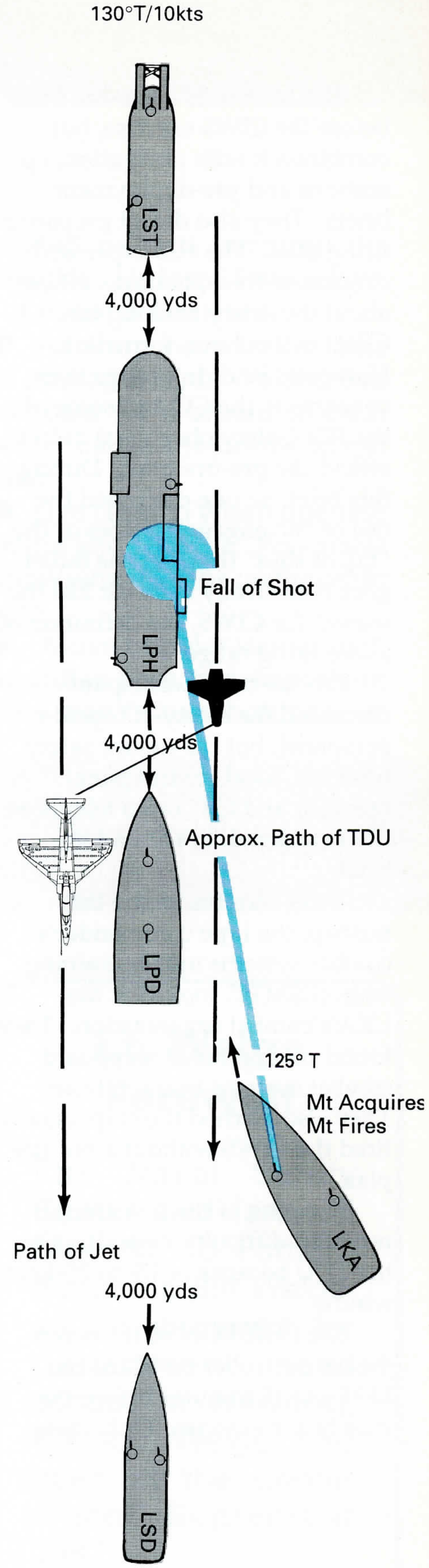
A senior enlisted man on the PHIBRON staff drafted the pre-exercise (Pre-EX) message, the operations officer approved it and the commodore released it. Although the Pre-EX referenced the FXP, neither the drafter nor the operations officer reviewed it before sending the message.

Ships in this exercise had participated in the same type of exercise during TCAT (type commander's amphibious training). The ships had problems firing at the TDU on the beam. The OCE used an old Pre-EX message to set up for this CIWS exercise. Unfortunately, all but one of the ships' COs reported on board after the TCAT, and those COs weren't familiar with the CIWS exercise. During the TCAT, the LSD's CO expressed concern the exercise was unsafe as written. He had had to maneuver his ship to get a safe firing area during TCAT.

The original draft of the Pre-EX directed the ships to fire when the TDU was on the beam, but the actual Pre-EX dropped this requirement. Investigators determined the PHIBRON staff felt the individual ships were responsible for the safe-firing arcs. In any case, no one in the staff's chain of command consulted the FXP or any other ordnance publication. They expected the exercise to be a normal, surface gunnery exercise.

The staff's chain of command presumed the CIWS would acquire the target and they could see the mount's position before actual firing began. In the "AAW Auto" mode, the CIWS reacts to the "threat" and opens fire automatically. Because of this feature, it is almost impossible for the CIWS to react to a crossing target – the profile shown by the target as it passed down the column. For the CIWS to react as designed, the target needs to be approaching the gun mount at a speed greater than the threat parameters in the computer. Because of the speed of the gun system, humans can't visually provide a margin of safety with respect to the gun mount.

The LKA's CO had no previous experience with the CIWS. He relied on his TAO, operations officer and weapons officer to explain what the system could and couldn't do. Because of his unfamiliarity with CIWS, he didn't specify "no engage" zones.



The LKA held a pre-fire brief before the CIWS exercise, but combined it with navigation, operations and pre-deployment briefs. They also didn't prepare a firing plan. The FCs expressed concern to the operations officer about the safety of firing the CIWS in a column formation. However, he didn't relate their concerns to the CO and some of the FCs (safety observers) didn't attend the pre-fire brief. During this brief, no one discussed the use of "no engage" sectors or the "fall of shot" (how far the bullet goes ballistically before it hits the water) for CIWS, the definition of a safe firing range.

Pre-fire brief participants discussed the safety of topside personnel, but the mount safety observer, local control panel operator and CIC radio telephone (R/T) talker didn't attend the brief.

Three months before this mishap, the type commander's combat systems mobile training team (CSMTT) looked at the LKA's combat organization. They found no organized shipboard combat systems training team. They also learned the ship usually fired the CIWS without a pre-fire plan.

The pilot of the tow aircraft reported difficulty in positioning the TDU because of 15- to 20-knot winds.

The PHIBRON staff briefed the air controller on board the LPH just 15 minutes before the start of the exercise. Only then did he learn of his duties and the plan for the jet and TDU. He then briefed the pilot over the R/T net about the OCE's intentions.

Design of the exercise as written in the FXP is for a single-ship firing, not a multi-ship exercise. The FXP gives specific flight profiles for aircraft to fly for the exercise. The profiles depend on the types of ships involved. As set up, the column formation was incorrect for the exercise, using the profiles shown in the FXP, since the FXP is not designed for multi-ship exercises.

For ships in a column formation, the type commander recommends a minimum distance of 12,000 yards between ships. This distance takes into account the range of fall of shot. However, it does not reflect consideration of the gun mount's location on the ship, which determines the safety factor. If the gun's target line falls onto another ship in company, you have a dangerous situation.

By placing the LKA at the end of the column, the PHIBRON staff created such a situation. The LKA's port mount is located forward of the pilothouse and is designed to cover the entire bow. One solution is to rotate firing ships to the head of the column (if the mount is located forward) or to the tail of the column (if located aft). This plan eliminates the possibility of shooting over other ships; while it takes more time for maneuvering, it's the only safe way to go. ■

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Lessons Learned (the hard way)

Coffee Run Ends in Fractured Knuckle

An RM on an MSO went to get a cup of coffee from the coffee pot located in the main galley passageway. This passageway serves as the main interior route to the forward part of the ship.

Three other people were waiting for coffee when the RM arrived. This is a big crowd on an MSO. As other people were trying to make their way forward, he turned to clear a path and stumbled.

While attempting to catch himself, the RM grabbed the actuating bar of the quick-acting, watertight door on the mess deck with his left hand. His right hand landed on the door's face at the same time someone was entering from the other side. This chain of events trapped the RM's fingers between the actuating bar and the bulkhead.

The RM felt a small pop in his third knuckle as he pulled his hand out. Examination revealed he had fractured the knuckle. He lost 21 workdays.

Lessons Learned:

- All ships have traffic jams in passageways. Waiting five minutes for a crowd to clear won't cause the coffee to get cold.
- Use caution when opening doors and hatches. You never know what may be on the other side.
- Move popular items, such as coffee pots, to areas where they won't cause bottlenecks.

New Developments

Surface Ship and Submarine

Disposable Respirator Available

The Navy has added a new, disposable, paint-spray respirator to the supply system. Available in small, medium and large sizes, the organic vapor respirator comes with a dust and mist prefilter. You can use it while painting with brushes and rollers or spray painting in small vapor concentrations. The new respirator also is effective for use in solvent degreasing. The pre-filter makes this mask more versatile for shipboard use than previous respirators.

National stock numbers for the disposable, paint-spray respirator are: small – NSN 4240-01-300-9416, medium – NSN 4240-01-300-9417, large – NSN 4240-01-300-9418.

The new respirator looks like a dual-cartridge-type mask. However, the entire unit is disposable. As with any other respirator, you need to be fit-tested before using it. Each one costs about $8, which is far less than the $18-$25 per mask and $9 per set of cartridges you had to pay before.

You can issue a disposable respirator to someone, along with a zip-lock plastic bag, to use for the life of the respirator. One respirator normally lasts for eight hours of continuous use or until breakthrough occurs in the filter. There is no maintenance needed.

Lt. Welge Farewell

The Naval Safety Center said farewell May 31, to Fathom editor, Lt. Bill Welge, as he departed for department head school in Newport, R.I. Lt. Welge had been at the Center since September 1987.

Of course you can't

SLEEP . . .

knowing you put

HAZARDOUS MATERIALS

into the dumpster.

Poster idea contributed by Frederick M. Church, Naval Aviation Depot, Jacksonville, Fla.