



NAVAL SAFETY COMMAND

SAFETY AWARENESS DISPATCH



SA 24-14

A Tale of Two Sonar Domes

Sonar technology, which the Navy began developing during WWI, advanced significantly throughout WWII and the Cold War era, leading to sophisticated systems that enhance anti-submarine warfare capabilities today — *but that's not what this dispatch is about*. While the examples here are sonar-related, this Safety Awareness Dispatch (SAD) is about the right and wrong ways to respond to an equipment casualty and conduct maintenance. In a review of ships' sonar-related mishaps, Naval Safety Command staff noted inadequate casualty response to low air pressure in the sonar dome was a common issue. And by inadequate, we mean not following procedures. That issue isn't limited to sonar domes or ships. As we highlighted in SAD 24-06, "Why Don't We Follow Procedures", this dispatch again illustrates (*again*) why we should and the consequences when we don't. Join us as we examine the rights and wrongs of shipboard sonar casualty response and maintenance procedures.



- **Procedural Compliance 101.** In our first tale, the crew of an underway ship felt the ship shuddering. About one minute after the shudder (presumably from striking an unknown submerged object), the Combat Systems Officer of the Watch (CSOOW) and his relief received a "29SD Sonar Dome Rubber Window (SDRW)¹ High/Low-Pressure Alarm." The CSOOW immediately notified the sonar supervisor of the alarm, who dispatched a technician to investigate the Sonar Dome Pressurization System (SDPS). The technician arrived on scene within 90 seconds of the incident and saw the SDRW digital electronic depth indicator gauge was reading approximately 11.5 pounds per square inch (psi) of pressure, when it should have been at least 24 psi while the ship was underway. The technician immediately reported the status to the Sonar supervisor and commenced immediate actions following the Combat Systems Operational Sequencing System Loss of Dome Pressurization System Water procedures. The CSOOW coordinated with the bridge and combat information center to slow the ship, verified adequate water depth beneath the keel and verified proper valve alignment of the SDPS. After completing the low-pressure alarm procedures, the crew capped the sonar dome (also per the written procedures). —*The quick actions by watchstanders likely prevented further damage and enabled the ship to return to home port. The officer of the deck, tactical action officer and CSOOW promptly and correctly used training and experience to make time-critical risk management decisions. And they followed the procedures.*

- **"Aligned" for failure.** In our second (*and true*) tale, things went less smoothly. While pierside, a ship completed a water-to-air interchange to prepare for a radiographic inspection of the sonar dome. This process involves pumping out water from the SDRW to allow technicians to enter the dome for inspection. Of note, the crew conducted the procedure during a post-deployment leave period on the day of crew turnover (*hmm...is this the best time to schedule a complex evolution?*). The water-to-air interchange was completed following the procedures outlined in the technical manual. Great work so far, but...they didn't reference the associated maintenance inspection page (*which, it turned out, was important*). After the sonar dome was on air and the pressure stabilized between 14-15 psi, the ship's force decided to align an eductor to remove water from the sonar dome access passageway. After educting the water, the watchstander did not close the overboard discharge valves (*not following the procedure [because they didn't reference it] and in direct contradiction to a Chief's direct verbal order to the watch team NOT to use the eductor while the dome was on air*). Adding to the error chain (*soon to prove disastrous*), two sonar

¹ The SDRW is made of reinforced rubber, which must be pressurized to keep it from collapsing.

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dome suction valves were also not fully closed, unknown to the ship's force, allowing air to escape from the sonar dome to the outside via the eductor piping and the open overboard discharge valves. With the air escape route established, the sonar dome lost air faster than the ship's low-pressure air system could supply, even with three compressors online.

There's more. The audible alarm bell on the sonar dome pressurization system was disabled because it became a nuisance during the water-to-air interchange. The alarm was never enabled after the interchange was complete.

And more. While on air, the sonar dome pressure must be continuously monitored by a qualified Sailor, which includes momentary coverage during head calls and smoke breaks. A single Sailor was assigned to both monitor the system and operate the eductor, although one Sailor cannot do both simultaneously. In the eight minutes it took the Sailor to make a head call, the dome pressure dropped from 14 to 9 psi. And, of course, there was no audible alarm because they had disabled it. After they noticed the problem, during troubleshooting, the pressure dropped further to 2.5 psi even with the dome air supply gauge reading 40 psi! (*All that air had to be going somewhere, right?*).

Cue the hero. While returning to the ship from liberty, a Sailor saw the overboard discharges were open and realized they were supposed to be closed per the Chief's direct order. So he closed them, and voila! The dome pressure returned to 14 psi... but the damage had already been done. Divers discovered visible damage to the dome totaling over \$1M. —*Why did the team make so many missteps leading to a million-dollar mishap? The report offers some clues: 1) The ship's posted placard procedure for operating the eductor was incomplete; 2) The required SDRW refresher course was out of date for the entire ship's team; 3) The Sailor in charge of monitoring the dome pressure was not adequately trained in the system and was not supervised; and 4) The watchstanders doing the steps didn't reference all the procedures. Leaders, if you want to have the "A" team, build a culture of excellence through proper training, supervision and emphasis on following the technical manuals and maintenance procedures.*

Key Takeaways

With this dispatch being mostly about procedural compliance, pardon us if we "echo" an applicable takeaway (#1) from SA 24-06: Why Don't We Follow Procedures? (*See what we did there?*). It's worth repeating as often as necessary to reach our naval warriors.

1. There is no culture of excellence without safety. Sailors, Marines and civilian employees don't likely show up at work thinking, "I'm just gonna wing it today." That is unless the unit maintains a culture allowing deviation from following published procedures as routine. A culture of procedural non-compliance can reside in one division, one department or an entire organization. It may lie undetected for days, weeks or even years before manifesting as a mishap. That's where an effective Safety Management System (SMS) that self-assesses, self-corrects, and identifies and fixes problems when they are small can break the cycle of bad habits. See our Safety Awareness Dispatch, SA 23-17, "What is the SMS and Why Should You Care," for more information on how the SMS works for you. It's simpler than you might think.

2. Invest in training. Be committed to training others. Training must be diverse to reach every crew member's or team member's full potential, e.g., hands-on, classroom and on-the-job. Take advantage of all training opportunities and allow adequate repetition to increase proficiency. Ensure each team member is fully trained and qualified **before** you let them perform unsupervised.

3. Read All the Instructions. Hey, we've been there while constructing that gadget we've ordered online or the new playset for the kids. It's tempting to press forth with "I know how to do this." But, like we've experienced first-hand, reading **some** of the instructions tends to have the same bad results as reading **none** of them. Leaders: It's your job to set the example and supervise your team in doing so.

And remember, "Let's be careful out there"