Naval Safety Center

LESSONS LEARNED

LL 21-27

SHIPBOARD MISSILE FIRING MISHAP

"What do you mean, Birds Away?!"

Note: This lesson learned product is derived solely from non-privileged, publicly available sources. It does not contain information from any safety investigation report.

Many of our procedures and rules result from actions and decisions that ended in catastrophe. Knowing ***WHY*** the rules and processes exist – not just ***WHAT*** they are – helps ensure those catastrophes aren't repeated. It's a common saying that "a picture is worth a thousand words." Having a mental picture of what went wrong that resulted in the training, procedures, and rules we have today can burn the importance of those processes into our memories. With that emphasis in mind, please read on.

NARRATIVE

Just after 2330 on a ship underway in the Mediterranean, a supervisor received a phone call from the Tactical Action Officer (TAO) and awakened two Fire Controlmen (FC) Petty Officers 3rd Class (FC3 #1 and #2) to man their missile stations. Due to a berthing shortage, their designated sleeping area was in their workspace in the aft missile mount. It was isolated, but they didn't have to travel far to work. The FC's were understandably a bit groggy, but one of them initially thought the event was an exercise based on what their supervisor said when he woke them up. They'd never had an unplanned missile drill in the middle of the night, though.

At about 2338, the work center FC1 received a second call from the TAO urging him to hurry to get FC stations manned or that he, the TAO, would call Air Defense over the 1MC announcing system. The FC1 hurriedly awakened two Target Acquisition System (TAS) operators (FC3 #3 and FC2) sleeping in the actual berthing compartment to man their stations in the Combat Direction Center (CDC or "combat"). He urged them to hurry and that Air Defense Stations might be called away.

Seven minutes later, at 2345, FC3 #3 manned the TAS console in combat, where the TAO was located. FC3 #3's headphones were missing, so he had no way to communicate outside of the CDC. At the same time, a Lieutenant from CDC called the aft mount FC3s via phone to direct them to acquire surface contacts with local search mode. FC3 #1 manned the firing officer console (FOC) operator station in the aft mount and FC3 #2 manned the radar set console (RSC) operator station alongside him. From the Lieutenant's urgent tone, they got the sense that this was "real-world."

FC2 arrived in CDC just after FC3 #3 (the TAS). Since FC3 #3 was already at the TAS console, FC2 worked with a Lieutenant and others to find a headset for him. About five minutes later, they found one for him. The communication network setup only permitted the FOC/RSC to communicate with the TAS.

At 2352, now with a headset, the TAS operator designated three surface tracks to the FOC operator in the aft missile mount. The FOC and RSC operators didn't know the identity of the ships they were tracking and engaging. They just knew the LT (via phone) and TAS (via the comm system) told them to.

A minute later, the TAS operator requested permission from the Ship's Weapons Coordinator (SWC; also located in CDC) to "arm and tune" the missiles. The SWC relayed the request to the TAO, the TAO granted permission, and the SWC passed permission to the TAS operator.

At 2354, the TAS operator ordered the aft missile station to "arm and tune." The FOC and RSC understood the meaning of those words. It meant the actual arming of the missile systems for a real-world engagement. Realizing the gravity of the situation, the RSC asked the TAS, "Is this the real thing?" The TAS replied, "Yes, this is real world." He did not seek confirmation from the TAO or SWC.

About a minute later, as one of the FC3s went to the launcher to put the arm/inhibit switches to "arm" and turn the safe/operate plugs to "operate," he could hear jets turning on deck for launch (two aircraft were launched at 2350 and 2356). It definitely sounded "real-world." At 2400, the FOC operator assigned ("tuned") seven missiles.

At 0002, the TAO asked the TAS operator, "How soon before you are ready?" TAS relayed that the mount response was 45 seconds. One minute later, the TAO gave the "free and take" order to the TAS. TAS relayed the TAO's order to the FOC operator.

At about 0004, the FOC operator engaged the "firing authorized button," selected the salvo, assigned the launcher, and told TAS he was preparing to fire. Upon the TAS operator's acknowledgment, the FOC operator pushed the fire button for a two-missile salvo. At 0004:41 and 0004:43, two missiles fired.

As the TAS reported the firing to the SWC and TAO, the chilling response was, "*What do you mean, birds away?! … I never said that this was real world, it's an exercise, it's all an exercise!*"

Seventeen seconds after launch, it got worse.

THE REST OF THE STORY

On 2 October 1992, USS SARATOGA and numerous other U.S. and allied ships were participating in the annual NATO exercise Display Determination (DD-92), which had begun seven days earlier. The second phase of DD-92 had ended 1 October at 1000 local time, and all participating units were repositioning for the start of phase three (the enhanced tactical phase), which started at 0000 on 2 October.

The enhanced tactical phase included the simulated "opposed" transit of the "Brown" forces to the amphibious operating area and a subsequent amphibious landing. SARATOGA, with Commander, Cruiser Destroyer Group EIGHT (COMCRUDESGRU EIGHT) embarked as the officer in tactical command (OTC), was a member of the "Brown" forces; and a handful of other NATO vessels were assigned as units in the exercise's opposing "Green" forces. At the time of the mishap, three "Green" force ships were approximately three miles away, just abaft SARATOGA's port beam.

Shortly after midnight on 2 October, SARATOGA mistakenly launched two NATO Seasparrow missiles at one of those three allied vessels, the Turkish naval ship, TCG MUAVENET. Seventeen seconds later, the missiles impacted the MUAVENET's bridge and exploded, killing five Turkish naval members, including the commanding officer, and seriously injuring 13 others.

The MUAVENET suffered extensive damage to the superstructure and two decks below the bridge due to the explosion, the resultant fire, and extensive secondary water damage. One American sailor, a search and rescue swimmer, was also injured while trying to rescue an injured, adrift Turkish sailor.

This tragic accident resulted from a series of independent actions and events that created an inconceivable situation. The ship's officers and enlisted personnel involved were good, experienced Sailors with good records who made mistakes, which together, contributed to this act. Insufficient training for certain key personnel and a collective failure to properly establish and follow procedures allowed the "swiss cheese" holes to line up into this epic incident.

TCG MUAVENET burning after being hit by missiles from USS SARATOGA.

BACKGROUND

It is noteworthy that SARATOGA's CDC and Operations (OPS) department were high performers. They received above-average grades during pre-deployment workups by the training Carrier Group, Commander, Second Fleet, and Commander, Naval Air Force Atlantic (CNAL). The OPS department was awarded the CNAL Battle E during the last competitive cycle as the best carrier OPS department on the east coast. A CDC inspector had evaluated the SARATOGA as number one of the carriers he'd inspected and well above average.[1]

The enhanced tactical phase of DD-92 commenced for participating ships at midnight on 2 October. The MUAVENET, along with several other U.S. and allied warships, played the role of a "hostile" "Green" force combatant; SARATOGA and its embarked battle group staff, with others, played the part of a "friendly" "Brown" force combatant. At the time of the accident, the ships were in international waters, with MUAVENET approximately three miles from SARATOGA. The real-world tactical situation was "white and safe" (completely benign) for all exercise participants.

HOW DID THIS HAPPEN? (*derived from the U.S. Navy Court of Inquiry (COI) into the accident*)

1. The CDC officer initiated an exercise, but did not ensure all participants were briefed. The CDC officer started the chain of events at approximately 2030 by initiating a short-notice simulated surface -mode NATO Seasparrow missile system (NSSMS) attack, in conjunction with the start of DD92's Phase 3, against three "Green-force" ships in a column three miles away. He failed to ensure all participants, including the TAS operator and NSSMS personnel, were properly briefed before the exercise.

2. The TAS operator console in CDC was not manned during Condition III. The TAS operator console wasn't manned until the CDC officer decided to use the NSSMS for a simulated engagement. COMCRUDESGRU EIGHT's "battle orders" and "cruising instructions" both required all ships to be in watch Condition III ("normal wartime cruising watch") during normal operations throughout the deployment. However, SARATOGA's "CDC doctrine" did not require the TAS console to be operated during Condition III, and the doctrine conflicted with the SARATOGA's own "battle orders" and other higher-level instructions. Twenty-four-hour manning of the TAS would have encouraged continuity in the thinking between TAS and the rest of CDC. If the ship had observed the requirement for Condition III manning of the TAS position in CDC, the TAS operator would have been fully aware of the exercise context in which the simulated attack was ordered.

[1] *Note: Perhaps surprisingly, above average performance is one of the six common traits of a mishap ship. These traits are discussed in LL 19-23 "Six Traits of a Mishap Ship." For a copy of that LL, email us at NAVSAFECEN_CODE522_LESSONS_LEARNED@navy.mil or download it from the lessons learned page of the NAVSAFECEN CAC-enabled website at https://intelshare.intelink.gov/sites/nsc/.*

3. The SWC and TAO failed to brief the oncoming TAS operator properly. When the TAS operator manned his position in CDC, he was not briefed of the situation. The TAO only told him to "take" the tracks (a "real-world" term) of the three surface contacts off SARATOGA's port beam. He was not informed of the exercise, nor were any terms of "exercise" or "simulated" used in instructions to him. Under his mistaken belief of a "real-world" threat, the TAS operator perpetuated the mistake by informing the NSSMS personnel manning the launcher that it was a "real-world" engagement.

4. The SWC and TAO did not understand the term "arm and tune." The request for "arm and tune" was passed from the FOC operator to the TAS operator to the SWC and TAO. The TAO's reply with permission to "arm and tune" solidified the TAS operator's mistaken belief that this was an actual engagement since he, the FOC and RSC had been trained that this command is only given when actual firing is contemplated. Neither the TAO nor the SWC understood the significance of the term "arm and tune."

5. The TAS operator failed to question the SWC or TAO. The TAS operator did not ask the SWC or TAO about the situation and threat status during the approximately 15 minutes of the firing sequence. Despite being questioned by the RSC operator, "Is this for real?" the TAS operator did not ask the same question to the SWC or TAO.

6. The CDC team lacked standard terminology and checklists (lack of formal communication).[2] Contradicting procedures and a lack of standard terminology and checklists contributed to this catastrophic event. The ship had no set process to verify weapons systems configuration before a simulated, non-firing training exercise. The ship also did not have a non-firing exercise checklist or script. Neither CDC nor NSSMS personnel grasped the importance of standardized terminology for actual or simulated weapons employment. Ship's personnel used inconsistent targeting and tracking terminology. The TAO and SWC never used the term "exercise" in their instructions to the TAS. Neither the CO nor CDCO were directly involved in the firing sequence, but each should have been, precisely for the reason of negating an erroneous command which would lead to inadvertently firing a weapon.

7. No Navy schoolhouse had the responsibility to teach a uniform doctrine for weapons employment. The COI found that no single Navy schoolhouse appeared to accept responsibility for teaching the operational aspects of aircraft carrier point defense weapons systems. School commands seemed unable or unwilling to teach a uniform Navy doctrine for the operational employment of defensive weapons systems. Responsibility for such a task was left to individual ships. Two specific examples were the absence of standardized terminology for a combat missile targeting sequence and the lack of an accepted Navy non-firing targeting and tracking missile exercise (safety) checklist. If this standardized terminology existed and the ship's personnel had been indoctrinated with it, the incident would likely not have happened. If a standardized and required non-firing exercise safety checklist existed and had been followed, even the officers' lack of knowledge about triggering commands would most likely not have resulted in the actual firing.

8. The officers directly involved in the incident lacked qualifications and prior training. While not specifically causal to this incident, all of the officers involved (OPSO, CDCO, TAO, and SWC) were serving in first-time ship's company tours, but only one (the SWC) had attended a formal school (TAO school) as part of his assignment to ship's company. It is evident that even that school did not train the officer in vital weapons system employment processes.

[2] *Note: A lack of watch team coordination is another of the six common traits of a mishap ship. See note 1 (on page 3) for how to obtain a copy of LL 19-23 "Six Traits of a Mishap Ship."*

WERE THE FOC AND RSC OPERATORS AT FAULT? (*derived from the COI*)

The two Fire Controlmen in the NSSMS turret performed their duties in the launcher control room as ordered by CDC. The FOC operator launched the missiles because he firmly believed he was executing the orders of the ship's CDC to fire at a designated actual hostile surface contact. The firing was not the result of any FOC operator error. The FOC's act in pushing the launch button was the logical culmination of a sequence of events over which he had no control. He was the "trigger" directed by others and little else.

The FOC and RSC had no independent means by which to determine, and could not know, whether any track designated to them by the TAS as a potential target was a real-world "friend" or "foe." The FOC had to rely on the TAS's description of a designated track as "hostile." The restrictive nature of the communication circuits did not permit the FOC or RSC to communicate directly with anyone in CDC other than the TAS. Orders inside CDC (from TAO, SWC, etc.) were relayed to the TAS operator via the "NET-8" circuit. The TAS then passed those orders to the NSSMS mounts via a different circuit, the "10JP." Transmissions on the 10JP were heard by the FOC/RSC on a speaker box located inside the mounts. NET-8 comms could not be heard over the 10JP, and vice versa, so the TAS was the only link between the mounts and CDC.

The FOC's belief that he was authorized to arm and release live missiles was the direct result of the use of extremely specific "triggering" terminology by the TAO, SWC, and TAS to "arm and tune," "free to take," and "fire." As used and understood by the FOC, RSC, and TAS, these words exclusively denoted a real-world, live-fire, hostile tactical situation. When communicated from the TAS to the FOC, they cued the FOC to act precisely as he was trained.

COI REPORT RECOMMENDATIONS (abbreviated)

1. SARATOGA should normally man TAS, NSSMS, and CIWS watches during Condition III.

2. SARATOGA's CDC and self-defense weapon system personnel should use the "repeat back" sound-powered phone communication protocol as standard practice to preclude miscommunications.

3. SARATOGA's Fire Control supervisory personnel and those that stand controlling station watches should be given a secret clearance (they only had confidential at the time of the mishap and thus lacked access to relevant classified information).

4. Type Commanders (TYCOMs) and Naval Sea Systems Command (NAVSEA) should install updated control equipment to ensure interconnectivity and "command by negation" capability for the SWC/TAO on self-defense weapons systems.

5. NAVSEA should provide a tactical firing sequence and non-firing training sequence checklist with standard terminology in the operator manual for firing the NSSMS. The terminology should be taught at TAO, TAS, and NSSMS operator/maintenance schools for each ship class.

6. TAO and SWC personnel qualification standards (PQS) books should include a requirement for actual tactical weapon release terminology and a requirement to differentiate between non-firing exercises and actual tactical firing procedures.

7. Officer training pipelines for aviation officers ordered to ship's company should be reviewed to ensure proper and specific CDC and shipboard weapons system indoctrination in the ship type to which they are being assigned.

8. TYCOMs, with NAVSEA support, should convene a standardization board to develop a standardized system employment phraseology and formulate standardized system settings for various tactical and training situations. The standardization board's procedures should be included in training standards. Board results should be issued as a directive to all aircraft carriers.

COI REPORT RECOMMENDATIONS (continued)

9. The TAO school should train firing and non-firing exercise procedures and standardized terminology.

10. This tragic event should be used for shipboard and school training to illustrate the need to train as a fully integrated unit and the absolute necessity to use standard weapons systems terminology which all watchstanders understand.

Key Takeaways / Lessons Learned

The learning points aren't just for firing evolutions. The same ideas apply to many things we do aboard ships, including UNREPs, launching amphibious craft, etc. Our teams are large, dispersed, and not in direct comms, so each node's report and action is vital. If there is one broken or informal link, it can go badly for all.

In the years since this epic accident, hardware has been upgraded and standardized checklists and terminology have been put into place. But, hardware isn't foolproof, and checklists are only as good as the professionals who use them. Today, humans still act as many of the same "cross-over" circuits that link orders and situational awareness between different nets in our gun and missile systems and between the mounts and combat. We continue to see near misses related to the same problems. Crews must still work through the challenges of poorly integrated system designs to be consistently effective.

Please remember this event as ***WHY*** formal communication is essential, ***WHY*** standardized terminology is required, and ***WHY*** teaching and following checklists matters. Proper application of one or two of the Sound Shipboard Operating Principles and Procedures – procedural compliance, questioning attitude, forceful backup, formality, level of knowledge, and integrity – could have avoided this mishap.

1. Train like we fight. Yet again**,** the original report notes this incident sadly points out the importance of "to train as we would fight," which requires exercising as a fully manned and integrated unit. That means to brief and train with all involved personnel. Anything less invites mistakes. Today, Strike Groups and Amphibious Readiness Groups all go through the Warfare Commander's Course (WCC) at the Tactical Training Groups, where they refine their OPTASKS in each warfare area and exercise their pre-planned responses (PPRs) for these types of situations. This training is absolutely invaluable! While the WCC occurs in a very hectic part of the training cycle, it is paramount that ships find a way to send all of their relevant team to these events. And the standard Plan, Brief, Execute, Debrief process isn't just for the CO.

2. Know the "biggest reason why." That advice goes beyond missile drills. It applies to much of what we do in the Navy and Marine Corps. Why does a limiting rule exist in the first place? Why do we need to use a checklist for things we could just do from memory? Why is that caution or warning in the manual? Take the time to find out. Leaders, teach your subordinates. Rules or procedures that seem arbitrary are easy to dismiss; knowing the blood that wrote those procedures makes them far harder to disregard. For our shipboard warriors, the 2018 Surface Warfare Watchstander Proficiency instruction, CNSFINST 3500.5A, should be a staple in all warfare watchstanders' reference kits and they should train to it.

3. Use formal communication. It's essential. Whether you are conning the ship, working in the engine room, line handling, or firing weapon systems, use standardized terminology and repeat backs. Formal comms prevents miscommunications and mistakes, and it ensures we complete the mission.

4. Never assume. The TAO, SWC, and TAS all *assumed* everyone shared their individual picture of the situation, but their pictures were totally opposite. Those assumptions led to disaster. When in doubt, confirm. The FOC and RSC did the right thing – they asked for confirmation. Do likewise.[3]

This product is posted on the NAVSAFECEN CAC-enabled website at https://intelshare.intelink.gov/sites/nsc/
Send any feedback to: NAVSAFECEN_CODE522_LESSONS_LEARNED@navy.mil

Note: The information in this LL is derived primarily from the 1992 U.S. Navy Court of Inquiry report into the SARATOGA accident. The original, 100-page COI report is publicly available on the Navy Judge Advocate General Corps' website https://www.jag.navy.mil/library/jagman_investigations.htm. To obtain an abridged, 27-page summary of that report contact the NAVSAFECEN lessons learned division at the email address above.

[3] *Note: During exercise DD-87 (just five years earlier), a SARATOGA jet accidentally shot down a U.S. Air Force "opposing" aircraft. Assumptions and a lack of formal comms were primary factors in that mishap as well. But that's a story for another day.*

And remember … Let's be careful out there.