

Alaska Marine Field Service

CAUSE STATEMENT SUBMISSION NTSB INVESTIGATION OF THE QUALIFIER 105 FIRE

GENERAL REMARKS ON THE FIRE SCENE:

1. Alaska Marine Field Service (AMFS) personnel discovered a small fire on a bunk in Stateroom J.
2. No welding activities, including placement or storage of hot welding equipment, were performed in Stateroom J at any time, including on the day of the fire. No portable grinding wheel was placed on the Stateroom J bunks by Alaska Marine Field Service (AMFS) personnel.
3. AMFS welding tools were not damaged by the fire. The head/bathroom where AMFS was welding was only burned from the ceiling down to about shoulder high. The floor of the head/bathroom, where welding was being done, had no visible fire damage. At the time of the fire, AMFS was welding small clips to hold the head floor up at normal level.
4. The AMFS welding machine and power feed to it were not damaged within Stateroom J. The power extension cord to the welder was damaged by fire as it came through the escape hatch in the aft of the boat, and fire damage was present on the cord in the passageway adjacent to Stateroom J.
5. The Qualifier 105 was stored in the Northern Enterprise Boat Yard when the fire occurred. AMFS was hired by the owner of the Qualifier 105 to conduct maintenance work on the vessel. *The vessel's owner was responsible for all applicable hot work permits, including 1) confined space entry and hot work requirements; 2) tank-cleaning operation and gas-free inspections; 3) Shipyard Competent Person's (SCP) daily re-inspections and atmospheric testing of the hot work areas and/or confined spaces (fuel tank, compartment); 4) the daily updating and posting of confined space entry and hot work permits; 5) the record-keeping of all SCP's entry and hot work permits; 6) the posting of a Fire Watch, 7) the posting of approved fire protection equipment, charged water hose and/or approved fire extinguishers; 8) the posting of required forced-air ventilation during hot work operations; 9) supplying electrical connections for power tools, lights and welding machine; 10) Fire Safety Plan; 11) Emergency Evacuation Plan; and 12) the maintenance of general vessel safety as required by Federal, State and local regulations. The safety requirements for the vessel owner relating to confined space entry and hot work operations are specified in the Federal OSHA 29 CFR 1915 "Shipyard Industry Standards".*

VESSEL ELECTRICAL PROBLEMS:

1. As stated in the Factual Information portion of this report, the Qualifier 105 was over 50 years old at the time of the fire. During maintenance work on the vessel, AMFS observed areas of the electric power wiring of the Qualifier. The wiring system appeared to be original equipment with exception of a few upgrades.
2. Each day when AMFS began work on the Qualifier 105, the Port Engineer or another designated owner's representative would precede the AMFS work team to the work area in the vessel. For several weeks prior to the fire, the work area was in the aft crew quarters, where Stateroom J was located. The Port Engineer would then energize circuit breakers the 110v power outlets and

lights in the quarters. These circuit breakers were in the power panel at the bottom of the portside stairs adjacent to Stateroom J.

On the day of the fire, the Port Engineer preceded the AMFS work team to the rear crew quarters and, as usual, energized the circuit breakers providing power to aft compartment work area. The Port Engineer then departed the vessel to attend to other matters, leaving the fire watch personnel as the owner's representative on the boat.

When preparing for work, the AMFS work team noted that an outlet in the starboard stateroom adjacent to Stateroom J was not operational; the welders tried the outlet in stateroom j, it did not work. The outlets would not power a small vacuum cleaner used for routine cleanup following welding. The AMFS employee identified as Welder A in the Technical Section of this report requested that Welder B check the circuit breakers near the port stairway to see if a circuit breaker had tripped. The circuit breakers were still in their operational "on" position. Welder A then told Welder B to turn the circuit breakers to "off" position and turn it back on. Welder B did so, but this did not restore power to the outlets in either the port stateroom or Stateroom J. The overhead compartment lights and all other outlets still provided power all systems remained operational except the two outlets in the fwd staterooms.

This was the first time while working on the Qualifier 105 that the outlets in these two staterooms had **not** functioned properly. The AMFS work team plugged their hand tools and the vacuum in outlets in or near the head/bathroom, which had working electric power, and continued cleaning up and restoring the floor.

3. The weld work and repairs AMFS was asked to make on the boat were largely due to marine electrolysis, which is the result of potential current existing between two different objects. It is normally caused by stray electrical current within a boat's structure. (Electrolysis is much more destructive than galvanic corrosion. To prevent electrolysis, the vessel must be wired properly.) This was evident by heavy pitting in the aluminum replating (replacement of aluminum hull and structure) which AMFS performed on the vessel. The visible corrosion in the electric power breaker boxes, was another indicator of wide-spread corrosion. In the marine industry experienced maintenance personnel would call this a "hot boat", meaning electrical power from the shipboard wiring system was leaking into the hull. AMFS personnel were aware of these conditions from their experience and training in the marine industry.

Electrolysis generally is much more damaging when a liquid is involved. AMFS noted the pitting was concentrated on the interior of the fuel oil tanks where the plating was wet, not external as one might expect from salt air or water. This indicated that electric power leak-caused electrolysis was a general condition throughout the vessel. The damage to the aluminum plating this party was hired to renew was caused by electrolysis; the majority of the repairs, including the port forward fuel tank, and the starboard aft fuel tank are both within a 10-foot radius of Stateroom J.

4. After the fire AMFS examined the circuit breaker boxes, especially the box near the stairwell on the port side of Stateroom J and found them heavily corroded. This was another indication of electrolysis; the corrosion on electrical system components can be part of the source of stray current creating potential electrical system failures.



Photograph 1. Circuit breaker box at bottom of rear quarters stairs, port side. Circuit breaker/s and wires associated with the two failed outlets along some other wires were removed by owner's insurance company representatives.

- 5. After the fire the owner's insurance company sent two representatives to the Qualifier 105. They removed the circuit breaker/s from the breaker box shown above. AMFS did not have representatives present during that visit. Based on inspection following departure of the owner's insurance company personnel, owner's insurance company also removed much of the ceiling and bulkheads with tools including a reciprocating saw to access and remove the wiring providing power to Stateroom J. There is a picture on page 8 of the technical document of the removals area.



Photograph 2. Portside circuit breaker box, breakers removed. Upper left mounting position had melted plastic from the breakers at the box/breaker contact points.

6. On May 12 2023, AMFS checked every circuit breaker on the vessel, numbering over one hundred. All circuit breaker boxes had visible corrosion on connecting terminals with the exception of one of the several in the engine room which appeared to have been replaced at some point. Electrolysis corrosion was evident in varying degrees in all the old breaker boxes.
7. Due to the owner's insurance company's removal of the circuit breaker/s and associated wiring, AMFS could not determine which outlets, lights or equipment were being fed by the at-issue breakers but the wiring that came from this breaker box went into the athwartship passage way to other areas of the aft stateroom compartment, including the overhead of Stateroom J.
8. On the day of the fire, AMFS was not at any time in stateroom j, or adjacent stateroom with anything hot, nor were they near enough for anything hot to migrate from their area into those rooms. Moreover, AMFS was moving a large amount of air (approx. 3,000 ci ft per min) **the opposite** way, i.e., down through the stairwell with an opening of approximately 28 sq ft, then to the middle of the vessel where stateroom j is located and

from there aft past our work area out of the aft escape hatch directly to open air; that provided an approximate complete air change in the aft compartment every 2 to 3 minutes.

Smoke/Firing & Timing:

1. The firewatch first saw smoke in the salon then, running below to alert the welders, saw a small fire on the bunk; he then yelled "fire!" The welders stopped their work and saw the small fire on the bunk. One welder ran over to the bunk. From the welder's observation, it appears that the fire may have been caused by overheated materials dripping down *onto* the bunk *from* the overhead.
2. In the 3 or 4 seconds it took the welder to reach the little fire on the bunk, it had become just a small pile of smoldering, goo, it was **way too small** to have caused the smoke that had earlier filled the salon and alerted the firewatch. But, seconds later, **after** the small fire on the bunk had turned into only smoldering goo, flames began filling the salon. The small fire on the bunk, that had quickly subsided and had turned to smoldering goo? It did not cause the salon smoke nor the flames that within seconds had filled the salon and aft compartment.
3. The overhead in the aft compartment filled with smoke and flames at the same time the salon burst into flames with heavy black smoke and flames in both places, in the aft compartment the smoke was trapped above the plastic that had been attached to the ceiling to keep it clean during welding processes, it was now melted and forming a bubble below the smoke.
4. All of this occurred within a matter of seconds, i.e., the welders saw a small fire/goo pile on the bunk and within seconds of the firewatch's alert so that by now the salon filled with smoke and flames as was the aft compartment.
5. **AMFS did not do any welding, or place hot materials, in Stateroom J on the day of the fire. The welding was performed in the head/bathroom, separated from Stateroom J by walls and a hallway. The welder and associated cables had no damage following the fire. Strong air flow was continually moving away from stateroom j and adjacent stbd stateroom. AMFS employees were not aware of the fire and were not in Stateroom J until the firewatch notified them of the fire.**

Conclusions

It appears that the fire was most likely caused by a failure in the shipboard electric power system, causing heating and fire within the ceiling and/or bulkheads of Stateroom J of the Qualifier 105.