SECTION XIV

U.S.S. DRAGONET (SS293)

Grounding While Submerged

Off Matsuwa To, Kurile Islands
15 December 1944

Class.....SS285

Builder..... Cramp Shipbuilding Co., Philadelphia, Pa.

Commissioned..... 6 March 1944

Length (Overall)..... 311 ft. 8 in.

Beam (Extreme)..... 27 ft. 3-1/4 in.

Submergence Depth (Designed Maximum) (Axis)..... 400 ft.

Displacements

Standard.....1525 tons

Emergency Diving Trim.....2050 tons

Submerged.....2414 tons

Draft (Mean, Emergency Diving Trim)..... 16 ft. 10 in.

Type of Propulsion.....Diesel Electric Reduction Drive

Main Engines (4)..... Fairbanks-Morse 38-D-8-1/8

Main Motors (4)..... Elliott Co.

Main Generators (4)..... General Electric Co.

References:

(a) C.O. DRAGONET conf. ltr. SS293/A16 of 20 December 1944 (Report of War Patrol Number One).
(b) C.O. DRAGONET secret ltr. SS293/A2-11/L11-1, Serial No.1 of 26 December 1944 (Report of Damage Due to Grounding).
(c) Comdt.Navy Yard Mare Island conf. ltr. SS293/S11-1(360-718391) of 19 March 1945 (Supplementary Report on DRAGONET Grounding Damage).

Photographs Nos. 14-1 through 14-8 (furnished by Navy Yard, Mare Island).

PLATE XIV

14-1. On 15 December 1944, during her first war patrol, DRAGONET holed and flooded her forward torpedo room as a result of striking an uncharted reef while running submerged off the Kurile Islands, and sank to the bottom in about 90 feet of water. DRAGONET was able to surface only after expelling the water from the torpedo room with salvage air, and she made the run back to base, through heavy weather, by continuing to maintain an air bubble in the damaged compartment. Although this case cannot be said to have resulted directly from enemy action, it has been included in this collection of war damage experiences to illustrate the problem of a submarine having one end compartment flooded while submerged. It is considered quite possible that other and less fortunate U.S. submarines during World War II may have received damage from enemy action, mines, ramming or grounding, which resulted in the flooding of an end compartment, and that the loss of these vessels may have been caused thereby. This report is based on the information contained in the references and on an informal interview with the then Commanding Officer. The Photographs were furnished by Navy Yard, Mare Island. The PLATE was prepared by this Bureau from data contained in the enclosures to reference (c).

14-2. On 9 November 1944, DRAGONET departed Midway for her first war patrol and on 17 November reached her assigned patrol area in the Sea of Okhotsk and along the Kurile Islands chain. For the next 28 days, until the grounding on 15 December, DRAGONET searched her area thoroughly but no enemy ship contacts worthy of torpedo fire were made. Weather conditions were extremely adverse during this period and strong currents and tide rips were experienced when operating close offshore or between islands.

14-3. During the early morning hours of 15 December, DRAGONET was conducting a surface patrol in an area slightly to eastward of the Kuriles chain. It was planned to submerge at daylight at a point about five miles south of the town of Yamato Wan on the east coast of the Island of Matsuwa To and to patrol across the southern approaches to this anchorage. Study of available hydrographic information indicated that navigational hazards in this area existed only close inshore. At 0515 DRAGONET submerged in Rashowa Strait to a depth of 100 feet in order to trim the boat. Although the sea was flat calm there were pronounced tide rips which rendered depth control difficult.

14-4. At 0717, in a position six miles south of Matsuwa To, DRAGONET was returning to a depth of 100 feet after a periscope observation at 63 feet, and had reached a depth of 70 feet, when a slight jar forward was felt. At this time the boat was running counter to the current in Rashowa Strait on course 090°(T) and had just rung up a change from one-third speed (1-1/2 knots) to two-thirds speed (4 knots). When the jar occurred, the ship had probably reached a speed of only about 3 knots and since observations had indicated that the current was about 2 knots, DRAGONET was probably making only about 1 knot over the ground. A dive angle of about two degrees was being carried. Immediately after receiving the jar forward, the boat assumed a three degree up angle and started to rise.

14-5. The first reaction on DRAGONET was that a plane or small patrol craft, not seen by periscope, had located the boat and was dropping depth bombs or charges. Reference (b) states that "the feeling was much the same as experienced during depth charging when explosions are not very close". Enemy aircraft bombing was entirely possible, for visibility was unlimited, flying conditions were excellent and DRAGONET was only about 12,000 yards distant from a known seaplane base on Matsuwa To. Available information also indicated that there might be a military air base on the southeast side of the Island.

14-6. Following this reasoning, it was decided to seek safety in depth as quickly as possible and by the time the boat had risen to 58 feet, the negative tank was flooded, a two degree dive angle was ordered and emergency speed was rung up. These actions enabled the boat to gain depth rapidly but when 90 feet was reached, only 10 or 15 seconds after receiving the first slight jar forward, a series of heavy jolts accompanied by loud noises shook the entire boat and caused it to lurch violently. DRAGONET's speed at this time is estimated to have been about 6 or 7 knots by shaft turns, or about 4 or 5 knots relative to the bottom. This second and violent jolting was also at first interpreted as another depth charge or bombing attack and orders were issued to proceed to 150 feet and rig the ship for depth charge. Almost immediately afterwards, however, it was noticed that the boat was hanging at a depth of 92 feet with a dive angle of 20 degrees, the log recorded zero speed, and further jars occurred forward accompanied by loud grinding sounds. It was then realized that the boat had gone aground on a submerged reef or pinnacle and both shafts were stopped at once. The ship had no appreciable list at this time.

14-7. At about 0718, directly after the second grounding had occurred, word was received in the control room that the forward torpedo room was flooding rapidly (PLATE XIV). The collision alarm was sounded and the forward torpedo room was ordered abandoned. Only four members of the crew were present in that space and they promptly retired to the forward battery compartment. A watertight boundary was immediately established at the after bulkhead of the forward torpedo room by closing the bulkhead door and the bulkhead supply and exhaust ventilation flapper valves. Salvage air (225-pound) was then bled into the torpedo room through the bulkhead connection in an effort to halt the flooding, but was secured when the pressure within the compartment had reached about 55 pounds per square inch. Shortly afterwards, word was received in the control room that the torpedo room was "completely flooded". Complete flooding could not have occurred, however, since the rupture in the compartment was just above the watertight deck flat, allowing air to be entrapped in the overhead, and it is presumed that this report was made after the water passed over the top of the sight glass in the bulkhead watertight door. Later inspection disclosed that the water level in the compartment reached a height of about 1 foot above the upper bunks, or about 1-1/2 feet below the overhead of the torpedo room. Since a clock located just below the maximum flood line in the torpedo room stopped at 0720, it appears reasonable to assume that flooding of that space took place in approximately two minutes or less.

14-8. As DRAGONET was pounding violently and lurching with the surge of the current at this time, it was feared that further serious damage would be sustained and that the hull might possibly break up unless the ship were quickly taken off the rocks. Word was passed to all hands to obtain objects that would float in case the boat might have to be abandoned. At about 0721, 3 minutes after the grounding occurred, the first attempt was made to get off the bottom. All main ballast tanks were blown plus bow buoyancy, negative and safety tanks. Nos. 3, 4 and 5 fuel ballast tanks were empty of oil but due to unfavorable sea conditions had not yet been converted to main ballast tanks by removing the riser blanks, and therefore were not blown since subsequent rapid venting, if the boat were required to again submerge, would have been impossible.

14-9. The increase in buoyancy resulting from the blowing of the main ballast tanks caused the stern of the boat to rise to the surface but the bow remained either on or near the bottom, due to the flooded compartment forward.[1] When the stern rose, it acquired sufficient momentum to considerably overshoot its point of static buoyancy and surged out of the water far enough to project the extended No. 2 periscope above the surface for a second or two. The Commanding Officer had time only to make a partial sweep to port, but this brief observation disclosed that all was clear in the direction of Matsuwa To. The stern then settled back in the water until it reached its equilibrium point for the static buoyancy condition, the boat assuming a down angle of about 30 degrees. Since both periscopes went under the surface, no further observations could be taken.

14-10. As the stern was protruding out of water and therefore might be sighted by the enemy, and the bow could still not be raised due to the loss of buoyancy forward, all tanks were again flooded to submerge the ship. This action was taken at about 0730. DRAGONET once more settled to the bottom, in a depth of about 92 feet and with a 16 degree down angle. The ship's heading had now swung from 090°(T) to 110°(T) and the action of the current once again caused DRAGONET to pound heavily on the reef. It was thought at this time that perhaps the bow had been prevented from rising by being wedged in the rocks, so a brief attempt was made to back clear of the reef using emergency power. This proved unsuccessful, however, and the plan was abandoned.

14-11. At 0732 a report was received that the 55-pound per square inch air pressure which had originally been built up in the forward torpedo room had now diminished to 40 pounds and that the water in that compartment was below the eyeport in the bulkhead door and continuing to recede. A few minutes later, air could be heard blowing outside the torpedo room hull, indicating that the water level in the compartment had been lowered to the point of rupture and the down angle on the boat began to decrease slowly. The order was then given to blow the forward main ballast tank group, bow buoyancy, safety and negative tanks. As this caused the ship to trim by the stern, the after group of main ballast tanks was then blown. The ship rose slowly and surfaced at 0738, in clear sight of the shore establishments on Matsuwa To. When 26 feet was reached, the upper conning tower hatch was opened and the tanks were then blown with the low pressure (10-pound) air system as in any normal surfacing.

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[1] For further discussion see paragraph 17-16.

14-12. All four main engines were started immediately and the area was cleared as rapidly as possible by proceeding south at emergency speed. All automatic weapons were manned and ammunition was broken out. Fortunately, no enemy interference was experienced as DRAGONET retired. Course was then set for Midway, the nearest Allied base.

14-13. The boat was only slightly down by the head on surfacing but was reported to have assumed about 15 degrees port list, for ruptures in the outer plating of port MBT Nos. 6B and 6D prevented those tanks from being blown below a few feet from the tank tops. Steps were taken immediately to increase freeboard, to reduce trim by the head and to correct the excessive list. Flood valves on Nos. 3, 4 and 5 fuel ballast tanks, both port and starboard, were opened and these tanks were blown in order to increase freeboard. MBT No. 6A and FBT No. 3A on the starboard side were then made free-flooding to compensate for the 15 degree port list. All variable tanks were pumped dry with the exception of No. 3 auxiliary, which was flooded as an additional list correction, and after trim tank, which was left about 3/4 full in order to add weight aft. No. 6 normal fuel oil tank was put on service to add weight aft by displacing fuel oil with heavier sea water. Air pressure was maintained on the forward torpedo room through the salvage air system and this kept the water within the damaged compartment at a low level. The after bulkhead of the torpedo room held tight with the exception of a few minor electrical cable stuffing gland leaks.

14-14. Heavy seas and high winds built up on 16 December. The bow planes were still rigged out and pounded so heavily that the entire ship vibrated and it was feared that further serious hull damage forward might result. A slight air leak developed around the top of the bulkhead door to the forward torpedo room but did not become serious. One of the bulkhead cable packing gland leaks increased somewhat, allowing water to enter the pantry. The gland nut was located in such a position that it was inaccessible and could not be tightened. When the grounding occurred and the forward torpedo room flooded, the Mk. 18 electric torpedoes in tubes Nos. 1 and 4 were in a partially withdrawn position for charging. Consequently, the inner doors of these tubes were open and the outer doors were closed but not locked. As the water level in the torpedo room was noted to be rising during this period of heavy weather, and salvage air had to be used in increasing quantities to maintain the air bubble in the torpedo room, it was believed that air must be leaking through one or both of the torpedo tube outer doors. Both high pressure air compressors had to be run continuously to provide sufficient salvage air. The three air banks on service were never allowed to drop below 2500 pounds pressure while the two emergency banks were kept at full pressure.

14-15. By 1800, the storm had increased in intensity. In order to decrease the draft forward and, therefore, the water level in the torpedo room, the contents of NFO tank No. 1 were blown aft into FBT Nos. 5A and 5B. During this transfer, DRAGONET developed a 20 degree port list, indicating that most of the water and oil in NFO No. 1 had ended up in FBT No. 5B, the port tank. The list shortly

decreased to about 10 degrees but the ship commenced to roll heavily, reaching a maximum of 40 degrees to port. Compensation was accomplished by opening the floods of FBT No. 5B and blowing its contents to sea but this apparently over-corrected the list, for No. 3 auxiliary tank was then pumped dry.

14-16. By morning of 17 December the seas had abated somewhat, the bow was riding higher and the water in the forward torpedo room was down to about 12 inches above the floor plates and appeared to be maintaining this level. However, the bow planes were still pounding heavily. It was therefore decided to attempt to enter the forward torpedo room to rig in the planes, tighten up the torpedo tube outer doors and to determine the extent of damage.

14-17. A party of three officers and two men entered and secured the forward battery compartment. Rescue breathing equipment and "lungs" were carried in case chlorine gas might be generated should sea water inadvertently enter the battery cells from the forward torpedo room. Air pressure was built up in the battery compartment by the salvage air system and the control room bulkhead was then inspected and found tight. The small line to the salvage air gauge for the torpedo room was then disconnected in order to equalize the pressure between the two forward compartments. Bulkhead flapper valves in the hull ventilation system were not opened to accomplish this for fear they could not be securely closed again. When the pressure between the compartments had equalized, the bulkhead door was opened and the party entered the forward torpedo room. As the water level in that compartment was well below the bulkhead door, no water entered the battery compartment and the rescue breathers and "lungs" were discarded. By working in relays, the bow planes were rigged in by hand and the torpedo tubes were secured. The air in the torpedo room was foul with oil fumes so oxygen was bled into the compartment to improve working conditions.[1] When the bow rose in the seaway, daylight could be seen through a ruptured area in the pressure hull plating, centered at frame 23, port side, just above the top of the forward trim tank. This was the first positive information that any of ship's company had as to the nature of the damage causing the flooding. Upon completion of the work, the torpedo room was again abandoned and sealed, and the air in the forward battery compartment was bled into the control room. The success of this well-executed and potentially hazardous operation for the safety of the ship removed many of DRAGONET's difficulties. The bow planes were subsequently further secured by running chains through the rigging gear quadrants in the superstructure.

14-18. Heavy seas and winds of gale force were again encountered late in the evening of 17 December and continued until the afternoon of the next day. At 0245 on 18 December, with the seas approaching from the starboard quarter, DRAGONET took a very large roll to port and "hung"

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[1] The introduction of pure oxygen into a compartment containing strong petroleum vapors is a potentially dangerous expedient, for it may result in an explosive mixture which will ignite upon the introduction of a spark or open flame. The safest procedure in a case of this nature is to don rescue breathers or "lungs" when oil fumes become objectionable.

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at an extreme angle for an appreciable period of time. This roll was measured on the clinometer in the control room as 63 degrees.[1] Men were thrown from bunks and mercury spilled from the flotation chamber of the master gyrocompass, completely disabling it. Seas filled the port side of the bridge, but fortunately did not reach the upper conning tower hatch. The rudder was put at full left and the ship's heading was swung through 105 degrees before the ship slowly came back to about 20 degrees port list. When MBT No. 6A and FBT No. 3A were vented, the ship came upright again, indicating that the flood openings of these tanks may have become exposed by the coincidence of a deep wave trough at the extreme roll, allowing the water within to escape and causing air pockets to form. Both MBT No. 6A and FBT No. 3A had been previously flooded to compensate for the port list which DRAGONET had assumed on surfacing.

14-19. DRAGONET arrived at Midway on 20 December 1944 and was docked the same day in ARD 8 for inspection and emergency repairs. Temporary patches were installed over the holes in the forward torpedo room pressure hull and the outer plating of MBT Nos. 2B, 6B and 6D. The ship departed Midway on 23 December for Navy Yard, Mare Island, and arrived on 4 January 1945. Complete repairs together with many outstanding alterations were accomplished there and DRAGONET was returned to service on 26 March 1945.

14-20. Structural damage due to grounding was found to have occurred in five different areas along the hull, these being designated hereinafter as damages "A", "B", "C", "D", and "E". The location and nature of each damage is shown in PLATE XIV and Photos 14-1 through 14-8. PLATE XIV also indicates the extent of structural replacements in way of the damaged areas which were accomplished by Navy Yard, Mare Island, to effect permanent repairs. It should be noted that all of the structural damage areas, with the exception of damage "A" and "B" at the bow, occurred along the port side of the ship at about maximum beam of the ship at each point and that no damage was sustained by the keel or adjacent structure. This indicates that the ocean floor itself was soft and that the damage was caused by DRAGONET striking the horizontal promontories of an outcropping of rock.

14-21. In connection with damage at "B" (Photos 14-1, 14-2, and 14-3). it was at first believed that the lower torpedo tubes, and possibly the entire nest of tubes, were out of line. However, when the ship was docked at Mare Island, bore gaging and a careful inspection disclosed that no damage or misalignment of the tubes had occurred. The damage at "C" to the single (pressure) hull plating (37.5-pound HTS) caused the flooding of the forward torpedo room (Photos 14-1, 14-4, and 14-5). Since that compartment was flooded for several days, most of the electrical equipment within had to be replaced and all of the ordnance gear had to be overhauled. Damage at "D" (Photo 14-6) was extensive to outer shell plating but no deformation occurred in the inner hull. The outer hull was breached in only one place in this area, a 12-inch crack at frame 49 below the bilge keel (Photo 14-7) in way of MBT No. 2B. The damage at "E" (Photo 14-8) ruptured the outer shell plating of MBT Nos. 6B and 6D at about the mid-height of each tank. Since these tanks could be blown down only

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[1] For further discussion see paragraph 17-7.

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to the point of rupture, the resulting off-center water loading caused the ship to assume a port list upon surfacing.

14-22. The 37.5-pound HTS shell plating of the forward torpedo room, which was ruptured over a wide area as a result of the grounding, (damage "C"), was cut out of the ship in one section (Photo 14-4) and sent to the Industrial Laboratory of the Navy Yard, Mare Island, for examination and testing. The mode of fracture (Photo 14-5) had suggested that possibly this plating on DRAGONET possessed insufficient ductility or other undesirable qualities. Physical tests and chemical analysis on seven HTS samples from the damaged area, however, indicated that all complied with the requirements of Navy Department Specifications 48-S5-(INT). Although the granular appearance of the torn edges suggested that the crystalline structure of the HTS plating might have been large, a comparison with another specimen of known quality demonstrated that the damaged HTS was similar to that in general use. It appears, therefore, that the material was sound and failed as a result of heavy concentrated loading when that area of the hull struck a rocky promontory, although the low temperature of the water, 29°F., may have been a contributing factor.[1]

14-23. DRAGONET's experience illustrates several pertinent matters. First, the great value of the internal salvage air system as fitted in U.S. submarines was once again demonstrated. Second, the damage which occurred to DRAGONET represents the best available example of what should be expected when a modern heavy-hulled submarine grounds forward on a hard reef while running submerged at low speed. With the trend in submarine design now tending toward increased operating depths and higher submerged speeds, it is considered likely that more instances of this nature will occur in the future. Third, this case clearly demonstrates the fact that a submarine on the bottom, with an end compartment flooded, can be brought to the surface in a horizontal attitude only if the longitudinal center of buoyancy resulting from tank blowing is very close to the longitudinal center of gravity. If this condition is not satisfied, only the light end will rise and the ship will assume a spar buoy position, as was the case with DRAGONET on her first attempt to surface. The most obvious method of longitudinally balancing a submarine in such cases is to eject that water which is responsible for the off-balance condition by any means available, usually the salvage air system. This was the method used by DRAGONET which permitted her to surface on her second attempt. If dewatering is found impossible, then longitudinal moment balance may be achieved by flooding the compartment at the opposite end of the ship and/or by flooding and blowing only such a combination of internal and external tanks as will offset the moment of the originally flooded compartment and yet provide the maximum reserve buoyancy possible. On DRAGONET,

[1] For further discussion see paragraph 16-25.

for example, if all external tanks aft of and including the No. 6 MBT groups had been left flooded and the after trim tank and after WRT were completely filled, the ship could then have been surfaced, even though the torpedo room was completely flooded, by blowing the amidships and forward MBT, FBT and variable tanks. This loading would have resulted in a reserve buoyancy after surfacing of about 300 tons, or only about 50 tons less than the emergency diving trim condition. It should be noted that normal fuel oil tanks are also available for blowing should such be considered desirable or necessary to achieve longitudinal moment balance.