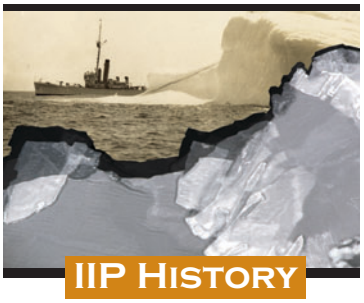

Seek and Destroy?

The history of iceberg demolition experiments.

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"All ice is brittle, especially that in bergs, and it is wonderful how little it takes to accomplish their destruction. A blow of an ax will at times split them, and the report of a gun, by concussion, will accomplish the same end." [1]
–Ensign H. Rodman

The shocking sinking of the *Titanic* made the menace icebergs pose to shipping horribly evident. Icebergs are a clear and present danger to mariners traversing the North Atlantic Ocean. They are the enemy. Why not just destroy them? In the early 20th century it was unlikely that very many people shared Ensign Rodman's optimism on how easy this would be, especially in the light of *Titanic*'s fateful collision, but destroying threatening icebergs seemed to be a reasonable thing to try. For nearly half a century the Coast Guard International Ice Patrol did just that. The following sections describe the attempts, sometimes spur-of-the-moment and sometimes with extensive planning.

Figure 1: *Seneca*'s crew conducts target practice with the type of gun used in iceberg demolition attempts in the early 1900s.

Gunfire

In April 1913, U.S. Revenue Cutters *Seneca* and *Miami*

Figure 2: Photo taken minutes after a strike by a 1,000-pound bomb during the 1960 tests.

began taking turns conducting iceberg-scouting patrols in the vicinity of the Grand Banks. On April 26, less than three weeks after beginning these regular patrols, *Miami* fired a shot from its 6-pounder gun against the vertical wall of an iceberg. The result was far less dramatic than Ensign Rodman would have predicted since the shot "… had no other effect than to shake down a barrelful of snow-like dust." While this was hardly a concerted or even mildly promising effort at iceberg demolition, it marks the beginning of the International Ice Patrol's experimentation with iceberg destruction.[2]

In the years that followed, *Miami* and *Seneca* fired their 6-pounder guns at icebergs sporadically, partly for diversion and partly for experimentation (Figure 1). *Miami*'s efforts on May 26, 1914, involved firing 12 6-pounder shots at an iceberg southeast of the Tail of the Grand Banks. The results were "…just as effective as if we had stormed the Rock of Gibraltar." It had become evident that the small guns on the early patrol vessels were no match for the icebergs they were charged with tracking.[3]

Mines

One of the little-known responsibilities of the Revenue Cutter Service in the early part of the 1900s was the destruction of derelict vessels drifting in the ocean. Abandoned wooden vessels could drift for many years, circumnavigating the North Atlantic Ocean several times and creating a great hazard to navigation.[4] Their destruction was usually accomplished using standard Navy-type wrecking mines, which had guncotton as the explosive agent and were detonated using an electrical charge from a battery. The Ice Patrol vessels conducted this important Coast Guard mission and carried the wrecking mines, so it was natural to see if they would fare any better than the gunshots against the icebergs.

In May 1923 USCG Cutter *Tampa* tracked a particularly fast-moving iceberg in the warm (>15° C) Gulf Stream waters south of the Tail of the Grand Banks. Since this iceberg was well into the busy steamer lanes and considered particularly menacing, they decided to use wrecking mines to hasten its demise. The effort was done mostly in the name of experimentation, but the iceberg's location imparted an operational urgency to the destruction of this iceberg.[5]

From May 20–24, *Tampa* exploded four charges alongside the underwater portion of the iceberg at depths ranging from six to 30 feet. Several of the attempts involved attaching the mines to the iceberg using lines with grapnels. This allowed the mines to explode right alongside the iceberg at various depths. Overall, the experiment was considered a success, with the belief that the life of the iceberg was shortened by one to two days, an important achievement, considering the dangerous location of the iceberg. It was clear that the effective use of wrecking mines, while successful in this case, could only be undertaken in calm conditions that permitted small boat operations and in warm water, so natural deterioration processes and the explosives could work in concert to destroy the iceberg.

The final effort at destroying icebergs using wrecking mines was undertaken by *Tampa* on May 28, 1926. It came upon a small to medium iceberg in the steamer lanes, again in the warm Gulf Stream waters. Although natural deterioration processes

were taking their toll on this dangerous iceberg, *Tampa* used its 6-pounder gun and 238-pound wrecking mines to speed the decay. The conclusion: "Considerable ice was shaken down, but it is questionable whether the expenditure would be justifiable in continuing the practice on a greater scale." That evening, *Tampa* remained close to the iceberg, warning all approaching ships of its location.[6]

Heat

Professor H.T. Barnes, a professor of physics at McGill University and one of the earliest proponents of using thermite, a mixture of aluminum and iron oxide, to destroy ice, was a self-described "ice fighter" who regarded ice as an enemy to mankind.[7] During *Modoc*'s patrol in June of 1924, he had seen Ice Patrol's use of wrecking mines and realized that it would be better to create an intense thermal shock by igniting thermite inside an iceberg. When ignited, thermite creates a violent reaction that burns at very high temperatures, as hot as 3,500° C, which is hot enough to melt steel.

Figure 3: Drilling a hole in the iceberg with a power auger was a 45-minute procedure during the 1960 tests.

In the summer of 1926 in Notre Dame Bay, Newfoundland, Barnes conducted several iceberg-destruction experiments using thermite and Bermite, a high explosive. In one of the tests, 500 pounds of thermite were placed about four feet into the iceberg and:

"…fired at sundown in order to allow the people of Twillingate an opportunity to see the spectacle of the burning and disrupting ice. The whole thing was a most wonderful sight when the mighty charge fired and roared, lighting up the iceberg and surrounding hills like Vesuvius in eruption. Flames and molten thermite and ice were shot upwards 100 feet or more by the explosion which followed. Much of this berg was disrupted but the full effect of the big charge was lost to into the air."[8]

He concluded that the charge would be much more effective if it could be placed 50 to 100 feet into the iceberg using a rock drill, a process, he declared, that could be accomplished from a boat without boarding the iceberg.

After the results of Barnes' 1926 experiments became widely known, the following optimistic assessment appeared in the March 1927 issue of *Nautical Magazine:*

"…it would appear that as soon as an iceberg is reported approaching the trans-Atlantic steamer routes all that is necessary is for a handful of men to approach the berg and with the judicious use of thermite completely destroy it in a few hours."[9]

Bombs, Thermite, and Carbon Black

While Ice Patrol recognized the promise of Barnes' thermite experiments, the prospect of taking explosive charges and boarding or even approaching an iceberg tossing in the sea conditions that are typical of the North Atlantic seemed foolhardy. Ice Patrol sought a better way to deliver the required thermal shock: bombing.

During and after World War II there were tremendous advances in the manufacture of "shaped" charges and special bomb and rocket designs. In 1959 Ice Patrol obtained 20 aircraft incendiary bomb clusters and conducted a series of bombing experiments against several icebergs near Newfoundland. Two types of incendiary bombs were tested, each consisting of many bomblets containing material, including thermite, that burned at very high temperatures. The airplane delivering the bombs was the USCG UF2G Albatross, a twin-engine amphibious airplane. While there was some modest evidence of success

against one of the icebergs that had been struck eight times, the bomb clusters were not able to deliver the concentrated heat source required by Barnes' thermal stress theory of ice demolition.[10]

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The following year, 1960, brought three separate demolition tests: bombing with explosive charges, igniting thermite inside an iceberg, and coating an iceberg with carbon black to accelerate natural, solar deterioration (Figures 2–5).

The bombing tests were a direct follow-on to those conducted in 1959, except that high-explosive bombs were used. Ice Patrol obtained 20 1,000-pound bombs from the U.S. Navy, 10 general-purpose bombs and 10 semi-armor-piercing bombs. Over an eight-day period (May 23–30), an Albatross dropped all 20 bombs on a single large iceberg using the same bombsight design from the previous year and with the same outstanding success. Of the 20 bombs dropped, 18 struck the iceberg, of which three were underwater bursts and three failed to detonate. Some of the bomb strikes resulted in a spray of ice fragments that rose to over 500 ft. Others caused minor changes to the iceberg's waterline orientation due to a loss of ice mass. At the conclusion of the bombing, Ice Patrol estimated that the iceberg's size had been reduced by a quarter to a third but could not say for certain how much of the disintegration was due to bombing and how much was due to natural deterioration processes.[11]

Figure 4: Shortly after the detonation of 560 pounds of thermite during the 1960 tests, a large plume of smoke and steam rose hundreds of feet into the air.

The second phase of the 1960 tests was essentially a repeat of Barnes' thermal shock experiments using thermite. Led by project officer Lt. Cmdr. Bob Dinsmore, an Ice Patrol field party conducted three thermite detonations on June 8 on two icebergs in the protected waters of Bonavista Bay. Because the test was conducted in Canadian territorial waters, Ice Patrol obtained the full support of Canadian authorities, including personal approval from Newfoundland's Premier.

For each detonation, a team boarded the iceberg from a rubber raft, drilled holes in the iceberg with a power auger, and planted the charges. Drilling each hole took about 45 minutes, during which time loud cracking noises could be heard from within the ice. After planting the charges, the party ran a detonation cable to USCG Cutter *Evergreen*, which ignited the thermite. The first detonation, consisting of 196 pounds of thermite, scattered a shower of molten iron over a radius of 100 yards but, other than producing a few growlers, had no significant impact on the size of the iceberg. The second detonation, on a different iceberg, used 364 pounds of thermite, with the same results as the first. A third detonation, a 560-pound thermite charge planted near the base of the iceberg's pinnacle, had the following result:

Figure 5: During the 1960 tests, it took three men using fiber brooms about 30 minutes to cover half the iceberg's surface with carbon black.

"…a magnificent display took place as smoke and molten iron was hurled hundreds of feet into the air, but the berg remained virtually unchanged. This concluded the thermite tests."[12]

These tests showed that thermite detonations would not necessarily cause the disintegration seen in Barnes' experiments in 1926.

The intent of the final phase of the 1960 tests was to cover an iceberg with carbon black and other dark substances to speed its solar-induced deterioration. Three persons boarded the iceberg and in 30 minutes spread 25 pounds of carbon black with fiber brooms. They covered 6,500 square feet, which was approximately half the iceberg's surface. Five hours after the carbon black was placed on the iceberg, it broke apart, and by the next day it was reduced to less than a third its previous size. As with the bombing and wrecking mine tests, it is not possible to say how much of the observed breakup was due to natural causes and how much to Ice Patrol's intervention.

The tests in 1959 and 1960 can be best be summarized as follows:

"Although some damage to the bergs resulted, it must be admitted that all of the means tried were unsuccessful in destroying the icebergs."[13]

Conclusion

The 1960 tests ended Ice Patrol's attempts at iceberg demolition. Rather than destroying icebergs, Ice Patrol adopted *Tampa*'s May 1926 approach, monitoring the dangerous icebergs and warning mariners of their location. There are several reasons why this practice makes good sense. The demolition process is expensive and dangerous. Even if an iceberg could be broken into smaller pieces, the result would be an increase in the number of icebergs. They would be smaller than the parent iceberg and, thus, harder for mariners to detect with their surface radars.

Endnotes

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