More on the Telemark Nuclear Sabotage Efforts

As one can imagine, it's difficult to tell such a complex story as the Norwegian WWII nuclear sabotage operations in a short video without leaving many of the details out. The following discussion should help clarify several issues and fill in some of the blanks.

Why were the Norwegians making Heavy Water at Vemork before the war?

The Norsk Hydroelectric Plant at Vemork not only produced electricity for Norway, but it also manufactured liquid ammonia for fertilizer through the process of electrolysis, which required huge amounts of electricity. The transportation system that Norsk Hydro built in the 1930s, including the railcar-carrying ferry "Hydro" and her sister ships, were constructed to support this lucrative commercial operation. Norwegian engineers also realized that they could produce deuterium oxide (Heavy Water) through the same process of electrolysis, and that they could generate additional revenues by exporting that liquid to the labs of Europe for experimental purposes. All of this, of course, took place well before the Germans discovered and developed the theory of "fission" in 1938-39 and conceived of using Heavy Water as the moderator for controlled nuclear fission in building a plutonium bomb.

Act I of the video mentioned "Operation Gunnerside." Didn't the other sabotage efforts also have code names?

The video accurately calls the main commando attack on Vemork in February 1943 "Operation Gunnerside." However, several other phases also had code names.

The first event in the overall operation was the British insertion by parachute of Norwegian commando Skinnarland, an engineer and radio operator, who made initial contact with plant insiders and assessed the overall German security around Vemork. The British inserted four more Norwegian commandos to link up with Skinnarland, and this became "Operation Grouse." The mission of the Grouse team, led by Poulsson, was to lay out a landing strip on top of the plateau for gliders carrying the British assault force under "Operation Freshman," and then to guide the British team to the plant. (Interestingly, the British intended to use bicycles instead of skis during their descent off the plateau.) When the Freshman operation collapsed with the aircraft accidents, the British regrouped and trained a smaller Norwegian force under the command of Ronneberg; and the SOE then inserted these additional commandos onto the Hardangervidda Plateau to complete the destruction of the electrolysis room at the plant under "Operation Gunnerside."

A few other points of clarification:

The fatal glider and tow-plane crashes that killed the 47 British commandos and aircrew during Operation Freshman in November 1942 occurred many miles to the west of the intended landing zone, and the Norwegian pathfinders making up the Grouse team did

not actually witness the aircraft crash as suggested by the film clip from the movie "The Heroes of Telemark." The Grouse team found out about the tragedy subsequently.

In addition, the sinking of the Hydro in February 1943, led by Haukelid, apparently did *not* have a code name assigned to it.

Why hadn't the Germans developed an atomic bomb before war's end?

It turned out to be a matter of national priorities and differences in how program managers respond to political leaders' expectations in democracies versus totalitarian regimes.

Oddly enough, military planners in both the U.S. and Germany, at about the same time in 1942, asked their scientists the same basic questions about their atomic bomb programs: First, how long it would take to develop an atomic bomb once it became a priority military program? Second, could the bomb be made operational prior to war's end?

As to the first question, scientists in both countries amazingly came up with the same answer: it would take a minimum of two years to design and develop an atomic bomb.

However, scientists in the two countries differed on how they answered the second question – and this is because the U.S and the Germans held different expectations as to how long the war might last.

For the U.S. military, having just entered the war several months before, the conflict was expected to be a long one – not ending before 1946 or 1947. Scientists and engineers in the U.S., believing that they could get the job done in that amount of time, said yes, they *could* probably deploy an operational bomb before war's end. So the top brass, with Roosevelt's approval, transferred the nascent atomic scientific research effort to the War Department and made it a full-blown national-priority program, calling for billions of dollars to be spent on creating facilities, such as Oak Ridge, Los Alamos, and Hanford, which would become the size of small American cities.

By contrast, the German military – its "Barbarossa" invasion of the Soviet Union having stalled at the gates of Moscow and Leningrad, and in the Ukraine – and now having to deal with America's entry into the conflict – believed that the war would be over, in one way or another, within two years. For the strangest of reasons, Germany's factories, until very late in the war, kept on a near peacetime schedule, while its armies waged total war. *Blitzkrieg* warfare, while spectacular in the effectiveness of its initial shock effect, was never designed for the long haul. While the Germans, until the last several years of the conflict, kept factory output going at the rate of only one to one-and-a-half eight-hour shifts per day, Britain had long gone to two shifts, and the U.S. fairly quickly went to three shifts upon entering the war.

Keeping with its minimalist approach toward wartime industrial production, the Germans were not prepared in 1942 to spend billions of marks on new facilities in order to conduct

simultaneous research on the various methodologies that *might* prove fruitful in creating an atomic bomb. Moreover, they did not want to create for the German landscape the large, vulnerable physical footprint resulting from having to build huge factories for uranium enrichment. Recognizing this, German scientists argued for the development of plutonium weapons, the fissile material of which could theoretically be produced with uranium using deuterium oxide as the neutron moderator, and without having to build large enrichment facilities.

However, fearing above all Hitler's retribution should they offer an overly optimistic picture and then fail to deliver, German scientists decided to present a pessimistic view of the timetable required to successfully pursue this short-cut plutonium bomb option.

At the same time, German rocket scientists and engineers did play up their ballistic missile program. They effectively sold it to the German military by stating that missiles capable of striking London or Moscow could indeed be developed within two years. Realizing that the battle for the Soviet heartland was the main game, the German military of course wanted to invest in weapons that could turn the tide – and not waste limited resources on programs that would not bear fruit in time to make a difference.

Therefore, the German leadership elevated the V-1 and V-2 rocket projects to the status of high-priority military programs – but the development of atomic weapons was relegated to the civilian side as an important but lower priority experimental effort.

The question remains: Would the sabotage efforts in Norway have had any impact on the Germans developing the bomb? To this day, opinions vary. Those wanting to place the blame for starting a dangerous arms race on the U.S. believe that Germany would never have created an atomic bomb; and due to either a colossal intelligence failure or American designs to dominate the post-war world, the U.S. decided to press ahead with its gargantuan effort anyway. So, according to those taking this point of view, the sabotage efforts were meaningless.

Others, including myself, believe the opposite. The arguments are straight-forward, and they revolve around several decisive battles in the Pacific and European Theaters.

The naval Battle of Midway in June 1942 was a close-run thing in and of itself. Had Japanese pilots discovered our carriers first, they would have delivered a more devastating blow against the U.S. Navy than at Pearl Harbor, and this would have put us one or two years further behind in our fight against Japan. On Midway's heals came the first major engagement of U.S. ground forces in the Pacific at Guadalcanal, during the latter half of 1942 and into 1943. Had this amphibious operation, subsequent combat, and attempted relief efforts by the Japanese not gone in the U.S. favor, it would probably have taken the U.S. another six months to a year to mount another assault on the Japanese defensive island chain in the South Pacific. Moreover, the U.S. would have been compelled by public sentiment to abandon its "Europe-first" strategy and divert precious resources away from Britain and the Soviet Union towards operations in the Pacific. Had that occurred, Soviet forces might have collapsed latter in 1943.

In Europe, Hitler could have won the Battle for Russia had he listened to his generals and made an all-out assault on Moscow in the summer of 1942. Instead, he ripped off a number of divisions from the most important sectors, and sent them toward the oil fields of the Caucasus and on a mainly symbolic adventure to capture Stalin's namesake city on the Volga, which ended in the debacle at Stalingrad in early 1943.

Lastly, everyone who has studied WWII realizes what a risk the Normandy invasion was for the Allies in June 1944. Again, had it gone badly, the Allies would not have been able to mount another assault on Fortress Europe for another year or two. Worst case, Stalin might have sought a truce with Hitler, buying the Germans even more time to regroup and develop an atomic bomb.

Well, why does this litany of WWII history matter?

The answer is that, despite the fact the German atomic bomb program had been relegated to the civilians as an underfunded experimental program, a small team of German scientists and engineers still managed to get 75 percent of the way toward achieving a controlled nuclear reaction with limited amounts of uranium and Heavy Water that would have produced plutonium. Moreover, the Germans were just putting the final touches on creating a "dirty bomb" when the war ended.

Therefore, had the conflict been extended by another year or two – enough time for the German scientists to have finalized the reactor engineering for conducting a controlled nuclear event with Heavy Water as the moderator – there is little doubt that the program would have been elevated to the status of a national military priority, just like the missile program, with huge resources dedicated to supporting that effort. The lack of a reliable source of Heavy Water was the only thing that would have then stood in the Nazis' way. Therefore, the Norwegian sabotage efforts were *not* carried out in vain.

<u>Would the amount of Heavy Water being transported on the "Hydro" the day the ferry was sunk have made any difference</u>?

Norsk Hydro still possesses in its archives the manifest for the shipment of Heavy Water that was sunk to the bottom of Lake Tinnsjo in February 1944. However, historians differ widely as to the impact that the sabotage of the ferry "Hydro" actually had on the German atomic bomb program. One historian, arguing that the sinking was unnecessary, claims that the amount of *pure* Heavy Water in the barrels (excluding the light water along with it) totaled no more than one-half a ton – whereas the Germans might have needed as much as 5 tons to produce enough plutonium for one bomb.

The problem with this argument, however, is that we don't really know how much Heavy Water the Germans had stockpiled in Germany before the Hydro was sunk. Moreover, keeping with the previous discussion about how long each side thought the war might last, German scientists probably required a significantly less amount of Heavy Water to demonstrate to the Nazi leadership a controlled fission in their experimental reactor in

Hagerloch, Bavaria. Having then caught Hitler's attention, the program would have been transformed into a top priority national effort; and the shortage of Heavy Water resulting from the sabotage efforts would have come into play even more significantly by affecting the German rate of plutonium production for even a small arsenal of nuclear weapons. Author Ray Mears, in his 2003 BBC television special "The Real Heroes of Telemark," asserts that the amount of heavy water the Germans needed to conclude their experiments was roughly equivalent to that which ended up at the bottom of the lake.

Why should we be concerned about Iran's Heavy Water reactor at Arak?

One of the reasons that I raise the issue of the Arak Heavy Water Reactor in the "documentary" is that current diplomatic efforts by the P5+1 (permanent member-states of the UN security council plus Germany) to prevent Iran from developing nuclear weapons have focused on curtailing Iran's uranium enrichment capability; whereas Heavy Water reactors, such as the one the Iranians are building at Arak, can use un-enriched or much lower enriched forms of uranium to produce plutonium.

Just days before posting the videos and this entry, it was announced that the P5+1 and the Iranians have agreed to place the status of the Arak facility on the negotiating table. Whether the Iranians can be induced into abandoning their goal of producing plutonium and convert Arak into a light-water reactor is too soon to tell.

- *Bruce Slawter*
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