

## **(U) Cryptologic Almanac 50<sup>th</sup> Anniversary Series**

### **(U) The Widowmaker: SIGINT and Submarine K-19**

(U) The recent motion picture, *K-19, The Widowmaker*, makes some rather interesting claims about the importance of the early summer 1961 cruise by the eponymous Soviet Northern Fleet Hotel-class ballistic missile carrying submarine (SSBN). For one, the film boasts of a missile launch under or in the polar ice pack. The film also suggests that the nuclear accident that occurred while the sub was at sea might have gone critical and that the resulting explosion could have been interpreted as a nuclear strike. Are the film's claims true? To answer this we have to ask some questions about the K-19's voyage: Was there a missile launch by the sub? Did the United States or NATO detect the submarine's nuclear accident? Finally, was SIGINT able to determine anything about the submarine's activities through analysis of Soviet naval communications?

(U) The late 1950s were an important period for SIGINT and the Soviet strategic force problem. The Soviet leadership, under Premier Nikita Khrushchev, had opted for developing a strategic, intercontinental nuclear capability to counter the massive lead held by the United States. In the 1950s the American strategic force consisted of an impressive and growing force of B-52 and B-47 bombers, as well as a mix of an ICBM (Titan), an intermediate range ballistic missile (Thor), and long-range cruise missiles (Bomarc). On the other hand, the Soviets were behind in numbers and capabilities. Moscow had just begun to construct and field a strategic bomber force (TU-95 Bear). In 1957 the Russians also had successfully tested an ICBM (SS-6). On the naval front, the Soviets began design and development of a true ballistic-missile-carrying nuclear submarine (SSBN) to match the United States' Polaris missile submarine that went to sea in the early 1960s. The Soviets finally produced the equivalent Yankee-class SSBN in 1970.

(U) Before the Yankee became operational, the Soviets fielded a number of submarines to fill the role of a credible SSBN threat. However, these subs were hampered by two problems: the lack of a true long-range, submarine-launched ballistic missile, and a submarine that could fire the missiles from under water. At first, the Soviets modified a number of Zulu-class diesel attack submarines to carry a ballistic missile. They extended the Zulu's sail and installed two tubes for the SS-N-4 (SARK), a 300-nautical-mile range, nuclear-tipped missile. The Zulu had to surface in order to launch the missile; the launch sequence could take as much as thirty minutes, leaving the sub vulnerable to detection and attack. A second candidate was the Golf-class conventional-powered ballistic missile submarine. The Golf initially was armed with three SS-N-4 missiles, again with the tubes located in the sail. It, too, had to surface to launch the missile. Since both submarines were

diesel powered, their range was limited, and refueling at sea was necessary if any kind of extended patrol was desired. (A problem, by the way, that the Soviets had hoped to correct by building a submarine base in Cuba as part of Operation Anadyr'. The operation included the installation of nuclear-tipped medium-range ballistic missiles on that island, a move that set off the Cuban Missile Crisis.)

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~~(TS//SI)~~ The third candidate was the nuclear-powered ballistic missile Hotel-class submarine. This class, designated Project 658 by the Soviet naval construction administration, was part of a significant upgrade to the Soviet submarine fleet. Three nuclear-powered submarines were designed and built beginning in the late 1950s: the November attack sub (SSN), the Echo-class submarine cruise missile submarine (SSGN), and the Hotel SSBN. The first of the Hotel-class, the K-19, was laid down in the Severodvinsk shipyards on the White Sea on 17 October 1958. It was launched on 8 April 1959 and commissioned on 12 November 1960, possibly as the Leninskiy Komsomol (The Lenin Youth Communist Organization). The K-19 was about 350 feet long and 30 feet wide. It could sail at a speed of 26 knots submerged and was powered by two pressurized water nuclear reactors capable of generating 70 megawatts. The construction of the Hotel

~~(S//SI)~~ The K-19 underwent a period of acceptance trials before becoming operational. An omen of bad things occurred in February 1961 when an unexplained loss of pressure occurred in the first containment system of one of the reactors. Still, the sub appeared to be ready for its first big operation: participation in a Soviet multifleet exercise set to begin in late June 1961. This exercise included surface ships and submarines from the Soviet Northern, Baltic, and Black Sea Fleets. The exercise was a two-phase affair. The first, which began about 17 June, included the deployment of a number of Soviet Northern Fleet submarines to operational areas into the northeast Atlantic Ocean. Some of the submarines may have deployed as far south as the so-called Greenland-Iceland-United Kingdom Gap, the straits between these islands popularly known to NATO naval personnel at the GIUK Gap. At least three submarines, including the K-19, left at about this time. The submarines may have been setting up a barrier against NATO maritime strike forces, or deploying to battle stations during a notional crisis between the USSR and U.S.

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(U) Then, on the morning of 4 July, one of the pipes that regulated the pressure for the coolant system of one of K-19's reactors burst. An engineering oversight had put the pipe in an inaccessible spot. No one could reach it and repair the leak. (Other reports claim that the port-side pump that provided cooling for the heat exchanger broke down.) The crew had to jury-rig a system for cooling the reactor. The radiation that leaked out was estimated to be about 5 roentgens an hour - any crewmen working in the area would receive a dangerous dose after that time. A submarine in this situation would have to surface and vent the radiation-laden air if the crew were to survive. The K-19 surfaced and sailed to the exercise area where other Soviet submarines were operating. It signaled its distress to the other boats using its tactical communications system. Finally, one heard the signal and rendezvoused with K-19. It took off the crew, and later a salvage tug arrived and towed the

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K-19 back to base. Eight crewmen had died and another two dozen were injured because of the accidental leak.

~~(S//SI)~~ Despite the accident, the exercise continued, apparently without a hitch. On 7 July it went into its second phase. [redacted]



~~(S//SI)~~ There is no firm evidence that the K-19 launched a missile during this time, as portrayed in the movie. Soviet submarine missile launches took place at designated ranges, usually off the coast or in the nearby-enclosed White Sea. [redacted]



[redacted] Could it have been the damaged K-19? It is not certain. By this time perhaps as many as two more Hotels had become operational. So the launch could have been from another Hotel. The dramatic launch from the ice pack portrayed in the film appears to have been fictional. (The film also ignores the fact that the missile the K-19 carried had a range of 300 nautical miles.)

(U) The K-19 went on to have a mostly jinxed career. From 1962 to 1964, it was refitted with a new reactor system at a shipyard in the White Sea. The old reactor compartment was completely removed and dumped into the Kara Sea. In November 1969 the K-19 collided with the American attack submarine USS Gato (SSN-615) that probably had been shadowing it. The K-19's acoustic pod was destroyed, and diving planes were damaged from the collision. On 24 February 1972 the K-19 suffered another accident; this time a fire broke out and deadly gas spread through the submarine. The submarine surfaced about 700 miles east of Newfoundland. For forty days, in the midst of miserable North Atlantic storms, the rescue operation continued. More than thirty Soviet ships were involved. The K-19 slowly made its way back to its base, but another two dozen crewmen had died because of the fire on the sub.

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(U) In 1991 the Soviet Union decommissioned the K-19. The submarine, nicknamed "Hiroshima" by the sailors of the Northern Fleet, is now tied up in storage at the navy base at Polyarny. Unlike the film's portrayal, the K-19 never launched a missile from the ice pack. And its nuclear accident went undetected at the time and remained unknown for years.

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