An ASW helicopter will traditionally team with a surface ship to prosecute an underwater target. The helicopter will deploy multiple sonobuoys and then utilize tactical sensor systems installed on both the surface ship and the helicopter in order to localize the target. The helicopter's crew can track and, if necessary, attack a submarine with torpedoes.

The ASW mission requires a helicopter crew to track submarines using sonobuoys. Sonobuoys are passive or active sonars that can localize a sound source. Sonobuoys are placed in patterns and provide the direction from which a sound is emanating underwater. Typical sonobuoys used by the Navy include Low Frequency and Ranging (LOFAR) and Directional Frequency and Ranging (DIFAR). Bathythermograph sonobuoys create a profile of water temperature versus depth. ASW aircraft are predominantly equipped with sonobuoy launcher systems which utilize cartridge-activated devices, such as pyrotechnic squibs or high-pressure gas bottles, as the energy source for ejecting the sonobuoys. Gas is discharged at high pressure for high reactive loads at low volume entailing very sophisticated breech and firing mechanisms within separate metal, plastic or filament-wound fiberglass sonobuoy launch containers.

Dipping sonar allows the helicopter to listen for and transmit underwater electronic signals while in a "hover" or stationary mode. The aircraft typically hovers at an altitude of 50 to 300 feet above sea level and lowers the transducer into the water using a powered reel system similar to a fishing reel. The transducer can be lowered to depths ranging from the water's surface to 2,500 ft. Once lowered to the selected depth, the transducer is activated, generating sound signals and receiving echoes from submerged objects. These echoes can then be processed to identify and locate potential underwater threats.

During the early part of World War II, the Navy Department initially visualized the helicopter as an aid in combating German submarines which were seriously menacing United States and Allied shipping. Original plans called for the helicopters, piloted
by Coast Guard flyers, to accompany ocean convoys and operate as scout aircraft from platforms constructed on the merchant ships. The Navy accepted delivery of its first helicopter, the R-4 (HNX-1), on 16 October 1943 and assigned it to the United States Coast Guard, Coast Guard Air Station, Floyd Bennett Field, Brooklyn, New York. Testing of the helicopter's suitability as an antisubmarine weapon began the following month.

The helicopter could carry a MK IX 200-pound, fast-sinking-type depth charge and drop it after surface contact had been made. The helicopters could be based on destroyers and could be directed by radio to the subs. Then, by hovering until a sonar signature was obtained, they could drop a depth charge and be rearmed by the destroyer. The one thing that had not been considered was that if the helicopter was rushed into mass production, it would inevitably interfere to some degree with airplane production. Thus, the actual value of the helicopter had to be weighed before a production program could be approved. Production scheduling, however, was already a potential problem.

Despite the mounting threat to shipping, the development of helicopters slowed for a year, due to differences between the Army and Navy. The Army felt that it was not its function to develop the helicopter for anti-submarine warfare. The Navy, on the other hand, felt that the Army had been given the job of developing the helicopter and that until this was done, the Navy should not butt in. The Navy based its limited interest in rotary-wing aircraft on the thesis that a helicopter could never be built large enough to carry a sufficient load to be of any value.

To expedite the evaluation of the helicopter in antisubmarine operations, in May 1943 the Commander in Chief, U.S. Fleet directed that a "joint board" be formed with representatives of the Commander in Chief, U.S. Fleet; the Bureau of Aeronautics; the Coast Guard; the British Admiralty and the Royal Air Forces. The resulting Combined Board for the Evaluation of the Ship-Based Helicopter in Anti-Submarine Warfare was later expanded to include representatives of the Army Air Forces, the War Shipping Administration and the National Advisory Committee for Aeronautics. Navy representatives witnessed landing trials of the XR-4 helicopter aboard the merchant tanker Bunker Hill in a demonstration sponsored by the Maritime Commission and conducted in Long Island Sound. The pilot, Colonel R. F. Gregory, AAF, made about 15 flights, and in some of these flights he landed on the water before returning to the platform on the deck of the ship.

In an attempt to make helicopters more proficient in the role of a submarine hunter, a project began in April 1944 to equip them with a "dipping sonar" similar to what blimps carried. The major concern was the noise transmitted to the water by the wash from the helicopter's rotors. Working off the Cobb, it was found that the noise level was insignificant and did not interfere with equipment operation. During flight operations, it was discovered that the HNS-1 helicopter was extremely helpful when used as a target for the alignment of fire-control radar, anti-aircraft radar and loran testing. This use was so helpful, in fact, that it later became the chief operational function during the war.

Had the submarine menace increased rather than declined in 1942, more resources might have been poured by the United States into the development of the helicopter as an anti-submarine-warfare weapon. The allies eventually solved the problem of the air-gap in the Atlantic Ocean with long-range bombers and escort carriers. Planes from the escort carriers in particular played the role that had originally been envisioned for the helicopter. Rotary-winged aircraft appeared on the scene about two years before the helicopter could be adapted for any type of active anti-submarine warfare role.

As it was, helicopters remained largely untested and undeveloped and thus never played the role that many envisioned for them during the war. Given the declining submarine threat, those that wanted to develop the helicopter found it difficult to shift national policy. Perhaps more important was the fact that technology is evolutionary rather than revolutionary. The helicopter could not be developed fast enough to be effectively used and, so it sat out the war.

In 1946 the Anti-Submarine Helicopter Dipping Sonar program was run by the Naval Research Laboratory in Washington, DC. Helicopters were used during the successful testing of a special "dipping" sonar, a device that is still in use today by Navy ASW helicopter squadrons.

Beginning in the 1950s, the carrier-based air ASW community was one of the driving forces behind helicopter development, and within the HUK groups, HS squadrons deploying active, dipping sonars became a key new addition to the combined arms ASW team. HS squadrons gave the HUK group an active sonar platform with the speed and mobility of an aircraft. The original attraction of an airborne dipping sonar was in cooperative operations with radar-equipped aircraft in operations against snorkelers. The latter would often detect a snorkel, but the submarine would submerge and be lost when it went on battery because no destroyers were within range to hold the contact with active sonar. The ASW
helicopter with a dipping sonar filled this gap by holding the contact until destroyers with the endurance to hold the submarine down until its batteries were exhausted arrived.

As ASW against nuclear submarines became more important, HS squadrons also were useful because they could operate in noisy environments where passive acoustics were much less effective, but where screening forces were still necessary, as in the inner screen of a carrier battle group or within a convoy.

Lightweight torpedoes became the weapon of choice for the air ASW community, while heavyweight torpedoes were developed for submarines. Surface ships initially carried both, but came to rely mostly on "thrown" (ASROC) or air-delivered (DASH, LAMPS) lightweight torpedoes.

The culmination of this first phase of the helicopter's use as an ASW platform was the SH-3 Sea King. The Sea King was too big to be deployed on all but the largest surface combatants of its time, which limited the ASW helicopter to being a carrier-based platform. Smaller ships, such as destroyers, deployed with the the Drone Anti-Submarine Helicopter (DASH) system.

This would change in the early 1970s with the development of LAMPS (Light Airborne Multipurpose System) ASW helicopters. The Light Airborne Multipurpose System combines the SH-60B helicopter with a computer-integrated shipboard system to extend the range and overall capabilities of surface combatants for antisubmarine and antisurface warfare, surface surveillance, and over-the-horizon targeting missions. To enhance littoral warfighting capabilities, the Flight IIA design of the DDG-51 included the capability to support SH-60Bs.

By the late 1990s the F version of the SH-60 was replacing the obsolete carrier-based SH-3H as naval battle groups' inner-zone ASW helicopter system. The SH-60F employed a new, longer-range active dipping sonar to localize and track submarines, particularly in littoral areas. Future plans call for the conversion and reconfiguration of both the SH-60 B and F classes into a common SH-60R model. The SH-60R program includes a service life extension as well as avionics upgrades, such as the addition of an advanced low-frequency sonar and multimode radar. The aircraft also will be outfitted with gun and missile systems, to enhance performance in littoral regions.