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What Is Sonar ?

Active sonar emits pulses of sound waves that travel through the water, reflect off objects, and return to the receiver on the ship. By knowing the speed of sound in water and the time for the sound wave to travel to the target and back, we can quickly calculate distance between the ship and the underwater object. For example, the picture on the right shows a helicopter (SH-60) towing a dipping sonar that is lowered with a cable into the water. This system utilizes active sonar to detect or maintain contact with underwater targets and can realign internal navigation systems by identifying known ocean floor features. Whales, dolphins and bats use the same technique, echolocation, for locating prey.



Active sonar is needed for precise location and targeting purposes because it gives **both** the direction and distance of the enemy. Without active sonar, the men and women serving aboard US ships and those of our allies are blind and vulnerable to attack from submarines.



Passive sonar is a listening device that uses hydrophones (underwater microphones) that receive, amplify, and process underwater sounds. It is primarily used to detect the presence of submarines. The advantage of passive sonar is that it places no sound in the water, and thus does not reveal the location of the listening vessel. The picture on the left is a passive sonobuoy called Directional Frequency Analysis and Recording (DIFAR) sonobuoy. These listening sonobuoys are deployed from helicopters or other maritime aircraft, and can detect and track submarine threats. Although passive sonar provides a general bearing to an object, it does not provide a precise distance. In addition, passive sonar is less effective in areas of high background noise, such as near commercial shipping areas. High background noise levels make it very difficult to detect quiet, diesel-electric submarines.

Sonar Frequencies Used During Atlantic Fleet Training Exercises

Mid-frequency active sonar, which operates between 1 and 10 kHz, has been in use since World War II (1939) and has evolved since then into the



version in use today. It is the primary tool for identifying and targeting submarines. Mid-frequency sonar has typical ranges of up to 10 nautical miles. Mid-frequency sonar is a key element of anti-submarine warfare (ASW) as employed by the United States, North Atlantic Treaty Organization (NATO), Russia and most other navies. It is used to detect submarines that may be operating within strike-range of U.S. Navy ships. Without it, men and women serving aboard ship are blind and vulnerable to attack from submarines.

Other active sonar systems utilized during mine warfare (MIW) training events typically operate at a frequency above 10 kHz and are considered to be high frequency active sonars. At higher acoustic frequencies, the sound energy is greatly attenuated in the ocean environment due to scattering and absorption, resulting in shorter ranges, typically less than 5 nautical miles.

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