

US Navy's Superconductivity Programs: Scientific Curiosity to Fleet Utility

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Abstract - The US Navy's interest in superconductivity began shortly after World War II when programs at the Naval Research Laboratory (NRL) and the Office of Naval Research (ONR) began exploring the science of superconducting materials. Throughout the 1950's and 1960's these programs discovered new superconducting materials and added much to the basic understanding of the phenomena. Technology development programs began in the late 1960's with major efforts and ONR, NRL, and the Navy's Warfare Centers. Development of superconducting quantum interference devices (SQUIDS) used to detect underwater mines and submarines began at the Warfare Center in Panama City, FL in 1969. At the same time scientists and engineers at the Warfare Center in Annapolis, MD began their own technology efforts to develop quiet, high power density ship propulsion motors. ONR and NRL expanded their programs to include superconducting electronics as well as efforts to develop technologically useful materials (films and wires) for the Navy's technology programs.

The Navy's superconductivity efforts accelerated rapidly after the discovery of high temperature superconducting (HTS) materials. A major effort led by NRL developed and launched HTS electronic devices and subsystems into space. The Navy Warfare Center in San Diego and ONR/NRL began programs developing low loss filters for electronic communications as well as the development of fast, low power superconducting digital devices. Navy scientists led industrial programs for development of full scale HTS ship propulsion motors and HTS filters for communication systems. As the 21st century began, the Navy started to develop superconducting systems for fleet implementation. The first ship to use a superconducting system was the USS Higgins that uses superconducting cables in a degaussing system (2008).

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