Pictured from left to right: Christian Corwel, George Zoghbi, Stevan Webb

ELECTRICAL AND COMPUTER ENGINEERING

TEAM: 1915

SPONSOR: Naval Undersea Warfare Center

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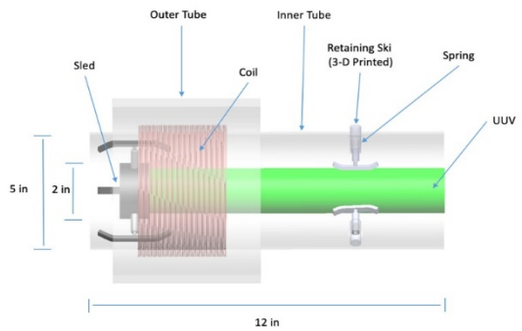
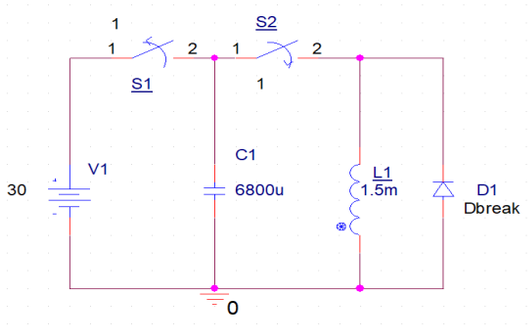
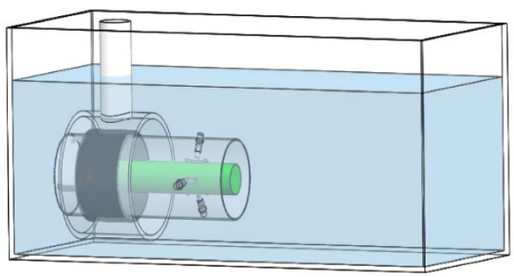
NAVSEA WARFARE CENTERS NEWPORT

Electromagnetic Expulsion from an Outer Tube in an Undersea Environment







The ability to launch, or otherwise deploy, an object such as an unmanned vehicle, from an outer tube in an underwater environment continues to be of interest to the marine community. Applications of such technologies include the use of small unmanned underwater vehicles (UUV's) deployed from deep ocean craft to support oil exploration efforts or inspection of damaged infrastructure. Historically, these payloads are deployed from their containment tube through the use of a water slug generated from a pump which pushes the vehicle into the open ocean environment. The objectives of this project are to identify and demonstrate a method to launch a cylindrical body from the launch tube utilizing an Electromagnetic scheme.

The system will consist of an outer launch tube driven by an electromagnetic scheme, as well as a circuit to facilitate the launch. The goal is to create a new launch system which utilizes electromagnetic principles to propel a cylindrical object out of a tube, which will be energy efficient and require no mechanical movement to create the force. The system will be able to operate under water and deliver the payload without being damaged by the open ocean environment. The development of this system will serve as proof of electromagnetic concepts to then be used by the Naval Undersea Warfare Center in designing electromagnetic launchers.

To accomplish this goal, several systems were considered, and after careful deliberation the "Coilgun" design was chosen. This system works by running a high pulse of current through a solenoid coil wrapped around a tube, this in turn produces a high magnetic field that will launch any ferromagnetic objects placed within the tube. To make this system compatible for any UUV, regardless of build material, a ferromagnetic armature was designed. This allows non-ferromagnetic projectiles to be fired from the coil gun, as the armature will push out the payload. To facilitate this magnetic field, a high pulse of current was also required. Thus a circuit comprised of a power source, capacitor bank, the coil itself, several switches and a rectifier diode was designed. This will provide the solenoid the current it needs to create a strong magnetic field and launch the projectile.