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*The Bubble Effect: How Nozzle Induced Cavitation Affects Torpedo Operation*

The purpose of this investigation was to determine if pressurized bubbles injected forward of a torpedo will lower the water pressure and reduce the drag along the surface of the torpedo thus reducing travel time over a fixed distance. I hypothesized that a decrease in torpedo travel time (sec) would result as the level of pressure (kPa) induced bubbles increased.

This experiment involved a PVC-made torpedo with a pressurized tank and a shaped bubble stone nozzle to deliver pressurized bubbles. The torpedo was powered by a weight and pulley system sliding along a guide wire through a tank of water. The testing involves 10 non-pressurized runs and ten separate runs at 5 pressurized levels.

The data indicates plausible agreement of the hypothesis with a decrease of 12.8% in torpedo travel time with commensurate increase of pressure. A decrease of 9% occurred with the lowest pressure setting and additional incremental decreases for the next four increasing pressure settings. However, examination of the random error data ranges indicates an overlap significant enough to ensure travel time improvement is not unique and therefore prohibits a conclusive result.

Implementation of this concept at the leading edge of water vessels will improve fuel efficiency by reducing drag. The decreased fuel use will lessen emissions from the tar-based bunker fuel used by ships. Bunker fuel contains 4.5% sulfur versus .0015% found in diesel fuel. Sulfur is a major pollutant which creates the toxic yellow-colored smog detrimental to life and requires mitigation.