



## **TOWLINE IMPROVEMENT TECHNOLOGIES**

The Naval Research Laboratory (NRL) seeks white papers and proposals related to improving the performance of towlines used by airborne towed decoys. These decoys are towed behind tactical aircraft and are required to be launched and utilized throughout the full flight envelope of the towing aircraft. Advanced testing has indicated several areas where material improvements in the towline would allow greater operational use.

Towline designs in current use consist of a Kevlar or Zylon strength member, with a fiber-optic signal line and 3-6 copper conductors. Designs range from a single line design (with the strength member woven around the conductors and fiber) to dual line designs, with the fiber and wires woven into a signal cable, which is wrapped around a larger strength member. Towline diameters range from .050 - .100 inches, and must meet requirements of tensile strength and the ability to spool up in a relatively small canister before launch.

NRL seeks proposals that further the state-of-the-art in several key areas:

- a) High Temperature Tolerance: Decoy towlines must operate in the vicinity of a jet engine exhaust. In afterburner, efflux temperatures can rise to 1000C. Current materials in use experience severe strength reduction above 500C, and fail completely above 550C.
- b) Higher Strength: Stronger towline materials will allow a smaller diameter towline, which will improve aerodynamic performance and simplify packaging.

Current towline Improvement areas of research at NRL include:

### High-Temperature Coatings for Strength Members:

NRL has developed a polymer material which improves the temperature performance of woven lines. This treatment may improve the performance of current towline materials by ~100C. NRL seeks partners to develop this process and produce samples for engineering and flight testing.

### High-Temperature Strength Materials:

Current towline materials do not survive temperatures above 550C. Of all the surveyed materials, carbon fiber alone has at least the possibility of surviving temperatures near the goal of 1000C. Its strength also allows a smaller diameter for the same tensile strength. However, carbon's stiffness presents difficulties in both the manufacture of the towline and its deployment in operational use. NRL seeks partners expert in the manufacture of carbon (or other materials considered suitable) towlines.

### High-Temperature Wire Insulation:

Previous testing has indicated that the insulation on the copper conductors can melt, causing arcing and the loss of the decoy. Voltages on these wires range from 2-5kV. NRL solicits partners with expertise in small-diameter, high voltage wire manufacture to develop improved high-temperature insulation materials and methods.

Address White Papers (WP) to Code 5713, or via [e-mail](#), telephone (202) 767-6191. Allow one month before requesting confirmation of receipt of WP, if confirmation is desired. Substantive contact should not take place prior to evaluation of a WP by NRL. If necessary, NRL will initiate substantive contact.