

**AIAD #10953**

**ORGANIZATION/PROJECT SPONSOR**

Organization: ARL/Vehicle Technology Directorate (VTD)

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Location of Sponsoring Directorate: Cleveland, OH

**PROJECT**

**Title:** Gear Efficiency Research for Drive System Improvements

**Description:**

It is generally accepted that improvements in efficiency and power density of drive systems and engine cycles are achievable through advanced materials and coating technology. An effort is underway to evaluate Nickel-Boron (NiB) coatings on geared and other propulsion components for their potential to reduce friction and increase fuel efficiency in army vehicles. Experiments and analysis will be conducted to evaluate the potential benefits in efficiency as well as secondary coating characteristics such as “loss-of-lube” performance, gear rolling contact fatigue, and tooth bending fatigue. Improvements in efficiency and/or fatigue characteristics benefit the warfighter by increasing the reliability, availability, and therefore the safety of ground and air vehicles. Improvements will also impact the Army’s logistical footprint through a reduction in the consumption of petroleum, oil, and lubricant products, as well as through a reduction in the consumption of expendable parts. Therefore, the results of this research provide the potential for a reduction in hazardous materials, environmental emissions, and cost. One major aspect of this project is determining the coating’s effects on fatigue properties of the gear.

During the cadet’s tenure at Army Research Lab – NASA Glenn, he/she will conduct both experimental and analytical research supporting this research project. The cadet will be responsible for operating test rigs such as a gear fatigue test rig capable of loading rates up to 1,000 Hz, setting up research hardware, performing experiments, and analyzing data. The student will also be responsible for comparing test rig results with results from other sources.

**ARL/Army Benefit:** Improvements in efficiency and/or fatigue characteristics benefit the warfighter by increasing the reliability, availability, and therefore the safety of ground and air vehicles. Improvements will also impact the Army’s logistical footprint through a reduction in the consumption of petroleum, oil, and lubricant products, as well as through a reduction in the consumption of expendable parts. Therefore, the results of this research provide the potential for a reduction in hazardous materials, environmental emissions, and cost.

**Background Required:** Introductory coursework in materials science, thermodynamics, fluids, heat transfer

**Security clearance required:** NONE

**Capacity: 1**