INDUSTRIAL SOLUTIONS LABORATORY

Company Information

Company Name	*NAVAIR Fleet Readiness Center - East*	**Date Submitted**	*4/11/2022*
Project Title	T700 Engine Wire Harness Tester **(NAV_T700)**	**Planned Starting Semester**	*Fall 2022*

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical	3	Electrical	2
Computer		Systems	

Company and Project Overview:

For more than 60 years, Fleet Readiness Center East, at Marine Corps Air Station, Cherry Point, N.C., has played an integral role in our national defense. The facility's In-Service Support Center provides multi-disciplinary, engineering services in both design and maintenance. Our workforce has earned a reputation of excellence, providing worldwide support for Navy and Marine Corps aviation.

Fleet Readiness Center East has provided maintenance, repair, and overhaul support to virtually every weapons platform the Marine Corps has flown – from the inverted gull-winged F4U Corsair of World War II fame, to the Corps newest aircraft, the F-35B Lightning II. It is one of eight fleet readiness centers operated by the United States Navy. It is also the Department of Defense Vertical Lift Center of Excellence. FRC East has a workforce of about 3,800 civilian, military, and contractor personnel. It is North Carolina's largest industrial employer east of Interstate 95.

NAVAIR is an active participant in capstone projects for a variety of school and uses said projects as a means for recruiting high achieving engineers.

Project Requirements:

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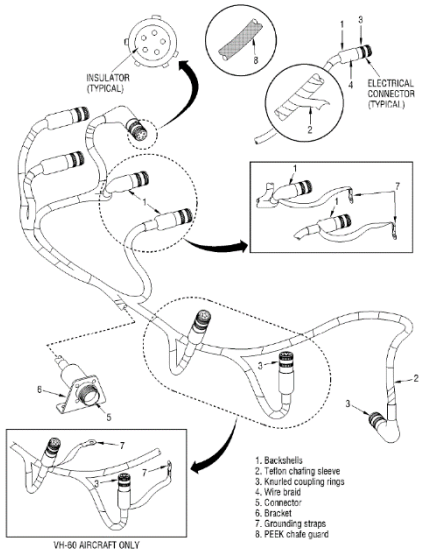
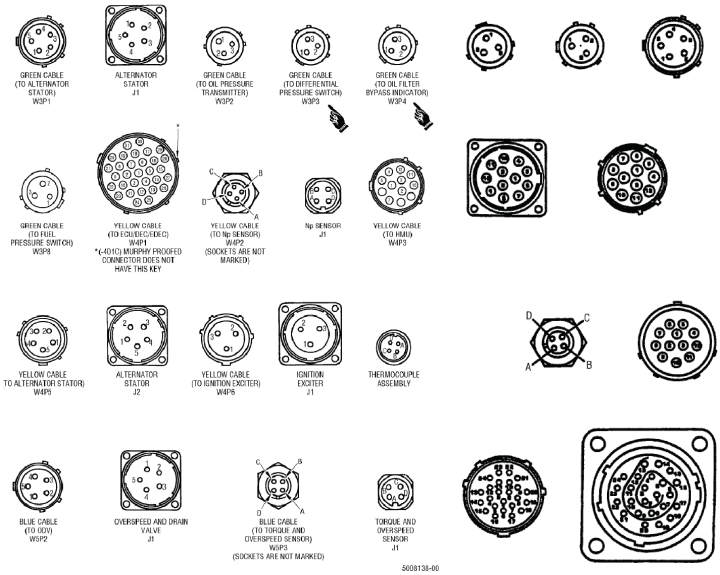
This purpose of this project is to design a new piece of equipment that will assist T700 turboshaft engine mechanics with testing engine wiring for continuity and shorts. Aircraft utilize wiring harnesses to power engine components and carry electrical signals from engine sensors to computers that monitor aircraft systems. Four different wiring harnesses of varying lengths connect to the T700 engine and each one has a different number of wires and connectors. An example of a T700 harness is shown below.



The connectors are different shapes and sizes, and can have between 2 and 32 pins.



Occasionally, a harness will develop a short or continuity issue. If a harness is suspected of being faulty, mechanics remove the harness from the aircraft and use a multi-meter to complete pin-to-

pin tests for continuity and shorts. Continuity checks are completed between the two pins at the ends of individual wires. Short checks are completed between all possible combinations of two pins. Additionally, the issue may be intermittent when the harness is installed on the aircraft due to aircraft vibrations shaking the harness, so mechanics need to physically flex the entire length of the cable while performing each pin-to-pin test. With potentially hundreds of pin-to-pin combinations, it is very time consuming to complete a check of a harness. It is also difficult to accurately hold a multi meter lead to a single specific pin while simultaneously flexing the harness.

The project team will develop a test bench that will flex a harness along its entire length while mechanics perform continuity and short tests using multimeters and/or an existing electrical test box. The test bench should allow one end of the cable to connect to a small electrical test box (box is approximately 13" x 6.5" x 5"). The ends of a cable not connected to the test box should be secured to allow mechanics to easily and accurately touch a test lead to individual pins. It would be preferred if the free ends of the cables could attach to an adapter that improves the interface between the test leads and individual pins. The test bench should be compatible with four different harnesses of varying lengths and connector types. The test bench should also be capable of heating the harness to its operating temperature as differences in results have been detected at Operating vs. Ambient temperatures.

Expected Deliverables/Results:

- Plans for the physical piece of support equipment,
- a working prototype, and
- instructions for its use.

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- **ALL Capstone participants STUDENT or FACULTY must have US Citizenship**
- Travel to NAVAIR may be required 1 time per semester. Students will be reimbursed for travel if they follow the procedures in the Purchasing lecture.