INDUSTRIAL SOLUTIONS LABORATORY

Company Information

Company Name	*NAVAIR Fleet Readiness Center - East*	**Date Submitted**	*4/5/2022*
Project Title	MQ-8C Weight On Skids Redesign **(NAV_MQ8C)**	**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	3
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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NAVAIR provides In-Service Support to a wide range of Navy and Marine Corps aircraft. These platforms are supported by Fleet Support Teams (FSTs). FSTs provide engineering expertise regarding operational sustainment, aircraft modifications, and fleet technical assistance. FSTs oversee technical publications, technical directives, and engineering investigations. The FST for this senior design project is for the MQ-8C Fire Scout (pictures provided below). The MQ-8C Fire Scout, developed by Northrup Grumman, is a Multi-Mission Tactical Intelligence/Surveillance/Reconnaissance (TACISR) Unmanned Air System (UAS). The MQ-8C Fire Scout's mission is to provide TACISR support to naval vessels using its various payloads. Given the Fire Scout is autonomous, its wide range of sensors are vital in allowing it to perform its mission. Recently, the landing sensors (Weight-On-Skids (WOS) sensors) have been failing. This prevents the air vehicle (AV) from determining it's on the ground.

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The WOS sensors have been failing at an elevated rate. These failures can lead to mishaps which can result in damage to the AV. The current WOS sensors used are 2 Double-Pole/Double-Throw (DPDT) switches that actuate upon lifting off deck through deflection from channel plungers. This configuration is not accurately nor precisely rigged in the aircraft and are subject to defect via vibrations and improper installation. The non-robust design allows for sensor error to occur without easily being detected prior to flight. The FST wants the team to design and fabricate a dual-redundant WOS sensor system that can be readily integrated into the AV. The new WOS sensor package must inform the AV of an 'In-Air' or 'On-Deck' state without fail. The sensor package shall receive an input voltage of +28VDC and output a discrete voltage of +28VDC ('On Deck') or 0VDC ('In Air'). The sensor package may not exceed 5lbs however the aim should be to minimize size. The sensor package must be environmentally sealed (prevent rain/water intrusion, be resistant to salt spray, and mitigate Electro-Magnetic Interference (EMI)), and must be able to withstand AV vibrations. Sensor package placement may not disrupt currently installed components. The team must also design and fabricate a testing setup to showcase sensor package capabilities. Any aircraft information needed to the complete the project will be vetted for security then provided to the team.

Expected Deliverables/Results:

- -2 (LH & RH) Fabricated, functional WOS sensor packages containing all components required for operation.
- Sensor package test setup
- Sensor package test data showing WOS sensor is functioning.
- Bill of materials containing parts, part numbers, quantities, and manufacturers of all components used.
- Removal, installation, and maintenance procedures for the sensor package.

- Documented code, if applicable, containing comments explaining functions and variables.
- Environmental and vibration test data showing sensor can withstand AV operational conditions.
- System and component-level engineering drawings.

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):

- Sensor design
- Fabrication skills
- **ALL Capstone participants STUDENT or FACULTY must have US Citizenship**