



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING

Senior Design Project Description

Company Name	NAVAL AIR SYSTEMS COMMAND FRC-E (NAVAIR)	Date Submitted	4/16/2018
Project Title	GPS Building Distribution and Prototype for CASS (NAVAIR_GPS)	Planned Starting Semester	FALL 2018

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	3	Electrical	1
Computer		Systems	
Other ()			

Company and Project Overview:

Naval Air Systems or “NAVAIR” is part of the Navy’s Fleet Readiness Center East. During its more than seven decades of operation, 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 employer for UNC Charlotte grad’s and has many COE Alum’s on their staff.

FRC East artisans perform phased depot maintenance, planned maintenance intervals, integrated maintenance concepts, modernizations, conversions, overhaul or in-service repair on the AV- and TAV-8B Harriers, the V-22 Osprey, the AH-1W Super Cobra, the AH-1Z Viper, the UH-1N Huey, the UH-1Y Venom, the CH-53E Super Stallion, and MH-53E Sea Dragon, the F/A-18 Hornet, the F-35B Lightning II, the H-3 Sea King; the H-60 Seahawk; the EA-6B Prowler; and the C-130 Hercules. The depot is also the depot repair point for the drive and rotary systems of the MQ-8B Fire Scout.

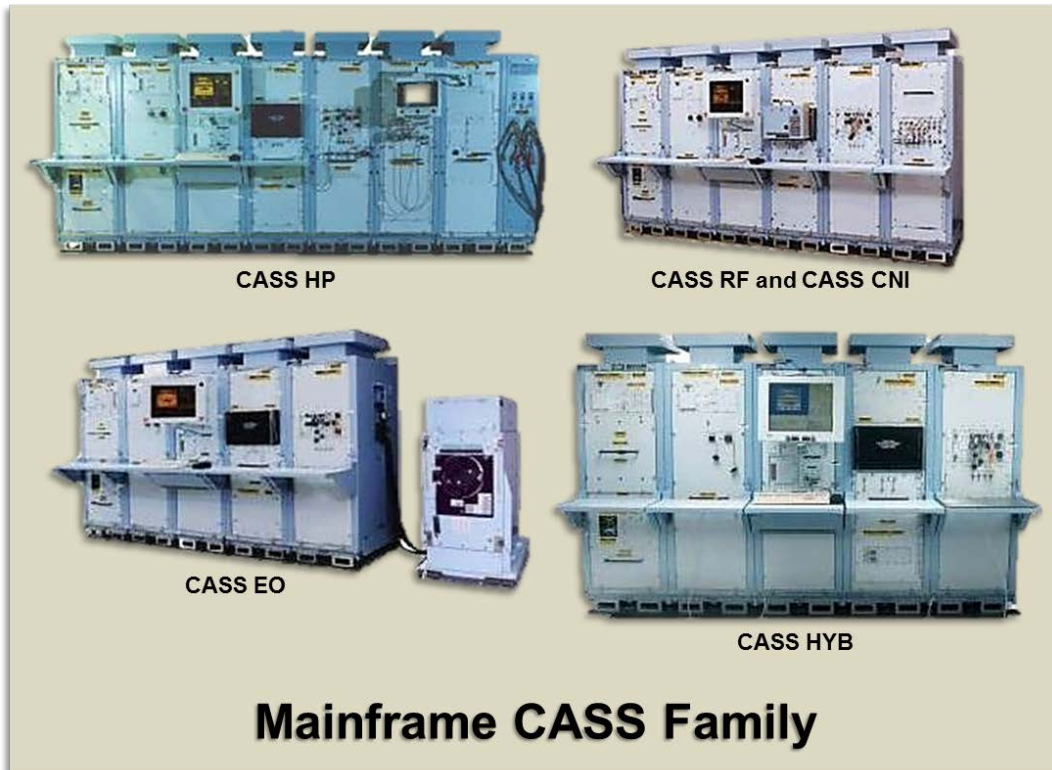


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The Consolidated Automated Support System (CASS) is the Navy's standard for automated testing of avionics components to ensure airworthiness and safety of flight. During calibration of the CASS stations and while using specialized ancillary equipment, a GPS signal is required. The CASS stations are operated in a controlled lab environment that does not allow for a GPS antenna mounted directly to the station. In order for the GPS antenna to be effective, it must have a clear line of sight of the satellite constellation with no obstructions. At FRC-East, CASS stations are located in six separate laboratories within one building.





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Currently, when the GPS signal is needed, a temporary set-up must be constructed. This is time consuming and delays the calibration process. The project objective is to design and prototype a permanently mounted and installed system to distribute a GPS signal from outside the building to the 6 different CASS labs. The external area for the GPS receive antenna will be on the roof of the building, this will be done on a tower and the mechanical design will need to take into account environmental survivability as well as building loading constraints. The link budget and signal distribution design will need to take into account what is needed from a distribution design to provide a proper signal to each CASS unit. Team will need to design the most optimal solution to get the signal from the roof to the labs. Both wired and wireless solutions can be considered. Wireless solutions must take into account the shielding environment of the building. The scope includes the electrical design and all mechanical aspects of the physical hardware from the rooftop reception to each individual port on the CASS units.

Project Requirements:

Design Objectives:

- Mount the GPS antenna to an existing tower adjacent to the building. Design should include mounting requirements, structural/strength considerations, wind, environmental, 25 year life and line-of-sight.
- Signal must be transmitted from the antenna to the building. Design needs to account for signal loss and distribution to 6 labs
- Connect (wire or wireless) all six labs in the building to connect to the GPS signal. Design should consider splitter requirements, signal loss/amplification, and a method to connect each CASS station within the labs.
- Provide a wireless solution within the labs to transmit the GPS signal to each CASS station. Design should consider wireless transmitters and receivers, range/signal strength, and interference.

Expected Deliverables/Results:

1. Full system schematic
2. Parts list
3. Analysis of solution to prove all components will be sufficient
4. Solid models of physical design components. Should include detailed mounting and attachment information
5. Proof of concept prototype – at least one station (end to end) is desired. More if budget allows. If budget is insufficient to do a full connection, then agree with the supporter what subset will be done.

Disposition of Deliverables at the End of the Project:

NAVAIR will take possession of all deliverables and research at the completion of the project.

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



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- Must be US Citizens (Students and Faculty Mentors)
- Must be willing (entire team, no exceptions) to travel to Cherry Point NC to gather data for project. Note mileage for travel will be reimbursed according to ISL procedures.