

Senior Design Project Description

Company Name	<i>NAVAIR</i>	Date Submitted	<i>04/20/2020</i>
Project Title	<i>H-1 FST Drive Fluid Test Stand (NAV H1)</i>	Planned Starting Semester	Fall 2020

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	4	Electrical	1
Computer		Systems	
Other ()			

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 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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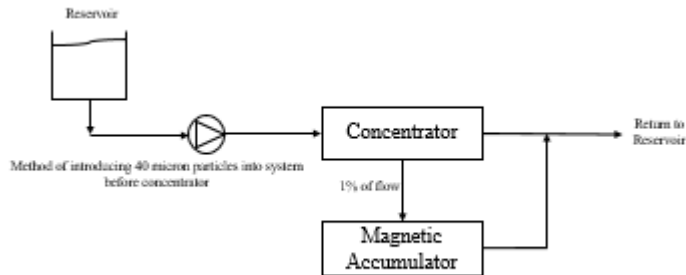
This project will involve the fluid quality on the H-1 drive system. H-1 pictured below:



Project Requirements:

The quality of the drive fluid is of utmost interest in terms of reliability and availability of the H-1 helicopter. NAVAIR is seeking improvements in the ways that they analyze debris content in the

drive fluid in order to find ways to measure this with less unit down time. A system is envisioned that would bleed off a portion of the flow of fluid to perform a particle evaluation using a magnetic accumulator. The start of this would be to develop a small scale proof of concept test stand to determine the feasibility of this concept for use in the fleet as a gearbox and engine diagnostic and maintenance tool. NAVAIR has started this work in their labs. This project would be to take that work and develop a larger scale (36”H x 72”W x 34” Deep) system in a two shelf work bench that can support the weight of the system. This is a simplified block diagram of the system:



The full scale test stand which will involve fluid dynamics and electrical considerations. Fluid dynamic design constraints include, but are not limited to, calculation of supply reservoir size, flow regulation and prevention of dead heading pump, pressure tracking before and after test assets, method of collecting working fluid after magnetic accumulator to calculate capture efficiency, and calculation of heat introduced into working fluid by pump and incorporation of heat exchangers. Electrical considerations include wiring of pump motor, converting single phase to three phase with motor control capability, and wiring of ancillary electrical equipment such as a flow meter or heat exchanger fans. Finally, physical mounting and supporting of fluid piping and test assets so as not to introduce a bending moment on the pump and create unnecessary fluid turbulence or premature wear.

Expected Deliverables/Results:

- Two shelf workbench which supports test equipment
- Test flow apparatus designed, built and integrated into workbench
- System instrumented and controlled to pump test fluid through system and according to project specs developed.
- Visual gauges, displays, etc. to monitor status of key variables

Disposition of Deliverables at the End of the Project:

Hardware developed is the property of the Industry Supporter. The work product will be displayed at the last Expo then immediately handed over to the supporter unless arrangements have been made to deliver at a future date.

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



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- Controls and Instrumentation
- Fluids