

Senior Design Project Description

Company Name	NAVAIR – Cherry Point, NC	Date Submitted	April 27, 2017
Project Title	H-53 Tail Drive Disconnect Coupling Locking Device (NAV_H53)	Planned Semester	Fall 2017

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	7	Electrical	2
Computer		Systems	
Other ()			

Project Overview:

This project addresses a current tail rotor drive system issue with the US Navy MH-53E and US Marine Corps CH-53E heavy lift helicopters. There is a disconnect coupling in the tail rotor drive train which allows the tail of the aircraft to be folded for storage. This tail rotor disconnect coupling (TRDC) has recently been exhibiting partial separation during flight resulting in heavy wear and damage. If the TRDC fully separates during flight the result can be catastrophic loss of the aircraft. The objective of this project is to design a positive locking feature to prevent TRDC separation in flight while still maintaining tail folding functionality on the ground. In addition to the design and analysis aspect, the scope will also include development of a test apparatus to test the prototype at a variety of rotational speeds.

Initial Project Requirements:

- Capable of holding/restraint of 750 lbs of separation force when tail rotor drive shaft is turning at 4271 rpm.
- Allow for dynamic airframe deflection at the output spline: up to 0.4 degrees angular misalignment and 0.075" axial movement
- Automatically unlock for tail fold sequence and a means to manually unlock if automatic unlock fails
- Utilize existing straight splined connections
- 400 hour minimum life
- Easy to maintain and inspect
- Minimize cost
- Minimize aircraft modification



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- Minimize new components
- Minimize weight
- Test station capable of testing device designed at a variety of rotational speeds in a safe manner

Expected Deliverables/Results:

- Strength analysis assessment – include FEA
- Prototype
- Cost analysis
- Test plan
- Test results produced using test station

Disposition of Deliverables at the End of the Project:

Make arrangement to ship prototype to sponsor after Expo unless a follow-on project is defined

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

Must be US Citizens (Students and Faculty Mentors)