



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING

Senior Design Project Description for SPRING 2017

Project Title: NP2000 Sling Adapter (NAV_SLING)

Supporter: Navair

Supporter Technical Representative: ASSIGNED

Faculty Mentor: _____ ASSIGNED TBD (check one)

Single Team Dual Team _____ (check one)

Personnel (EN/ET): _____ E, _____ Cp, _____ Cv, 6 M, _____ SE

(Complete if the number of students required is known)

Expected person-hours: (250 per student)

Description of Project:

The NP2000 is an eight-bladed propeller used on C-2A, E-2C, and E-2D aircraft. It consists of a front and rear spinner to reduce aerodynamic drag, a variable pitch actuator (VPA) that establishes and maintains blade angle for the desired thrust level, a steel hub that houses eight composite blades, a bulkhead that supplies power to the blade heaters for de-icing, an integrated oil control consisting of an electronic valve housing and pump housing to control the oil sent to the VPA for pitch change, and an actuator valve module that incorporates the backup governor and secondary low pitch functions.

Each component can be installed individually using a customized sling that retains the component while providing an out of the way attachment point for an overhead hoist. The slings are designed to hold components on the horizontal axis which requires our maintainers to accommodate for any nacelle tilt manually during installation. The angle of the nacelle is between 1° and 5° above horizontal depending on the aircraft platform (E-2C, E-2D, or C-2A).

Because hoists are designed only to translate components in horizontal and vertical “steps”, installing components that are both heavy and delicate along the nacelle axis requires very skilled maneuvering from a guide and an experienced hoist operator to avoid damage or mis-installation. Hoisted components range in weight from 67 lb (blade) to 735 lb (hub and blades assembly).

Installation of the VPA (90 lb) in particular gives us the most trouble. It is configured with a cylindrical tube containing delicate seals that must be inserted into a tight tolerance bore. Damage incurred to these seals during installation occurs frequently and often goes undetected.



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Initial Project Requirements (e.g. weight, size, etc.):

The design should be a contraption that can be used as an adapter between a typical 3DOF overhead crane hoist hook and propeller component sling to facilitate component installation along the axis of nacelles angled between 1° and 5° above horizontal.

Design requirements include:

- Capable of translating components along nacelle axis at least 6"
- Capable of supporting minimum of 500 lb
- Operable by one person in addition to the crane operator

Expected Deliverables/Results:

The deliverables for this project include:

- A prototype of the system to interface with the Cherry Point valve test lab
- All related design/development notes and drawings

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

Students must be US Citizens only