

# Electron Wranglers

## Project Proposal

### Product Title:

“Cooling Fan Monitor Circuit Board”

### Product Description:

This device has two main parts to its operation. First, a circuit board that will monitor the tachometer output of a brushless DC cooling fan. Second, the control of a discrete output that will indicate the status of function of the fan.

### Primary Application Proposal:

This project is to develop a small circuit board for Textron Aviation that will monitor the tachometer output of a brushless DC cooling fan, and then control a discrete (ground/open) output to indicate if the cooling fan is functioning as intended. The intent is for the circuit board to be small enough that it can be installed in the aircraft wire bundle with zip ties to support aftermarket and late point definition installations with minimal impact to the aircraft and/or maintenance crew.

### Requirements:

1. The design must operate reliably with the power input ranging from 10 Vdc to 80 Vdc.
2. The design must utilize only one electrical ground.
3. The tachometer signal frequency and voltage range will vary from one application to another; however, this input should be easily configurable (e.g., resistor value changes) to accept either a 0-5 Vdc square wave or a 0-28 Vdc square wave. This input should be able to accept frequencies between 0 kHz and 1 kHz.
4. This output should be a discrete output that will provide a ground whenever the cooling fan's RPM is above the defined threshold; otherwise, this output should provide an open (high impedance) output. This output should be capable of sinking 1 A continuously when it is providing ground.
5. The design package envelope must be less than or equal to 0.5 inches x 0.5 inches x 1.5 inches.
6. The design must operate in a temperature environment ranging from -55°C to 85°C. The design must operate at altitudes ranging from -1000ft to 55000ft. The design must be able to pass the DO-160G section 8 Vibration category S curve L test. The design must be capable of operating in a humid environment as defined by DO-160 section 6 category B. The design must be capable of passing the Indirect Effects of Lighting DO-160G section 22 test to category A3J3L3.
7. The design should not contain any programmable devices (e.g., microcontrollers, FPGAs, PLDs, etc.).

### Goal:

The main goal of this project is to create a well-researched and designed product package that Textron Aviation can evaluate and design to run tests to ensure it's in compliance with FAA

regulations. If the product complies, they plan to install them on numerous airplanes in production to help with flight tests.

## Update:

By the end of fall semester, we had a prototype that had the first half of the circuit done. We now have the second half of the circuit, which effectively gives an output if the fan is spinning above a certain threshold. This project has been well defined, and the scope has not been altered so far.