

EAA 266

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Newsletter, April 29, 2021

Notice of ZOOM Meeting:

Thursday, April 29, 2021 at 7:30 PM:

Presenter: Jeff Seaborn

Topic:

EAA Canadian Council Chair Jeff Seaborn will present an update on the EAA Canadian Council, a little about himself, some of the aircraft that he has built, and his present restoration project: a Dalotel DM-165.

Location:

PLEASE NOTE, THIS IS AN ONLINE MEETING.

The sign-on link is provided within the e-mail that transmitted this newsletter.

Please be advised that any discussions or articles presented in this newsletter are for educational purposes **ONLY**. Only the reader can make the determination as to if the information provided is suitable for a particular application, and that this information is based on and/or contains sound, safe, generally accepted aircraft best practices.

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To contact any of our executive, send email to

contact@eaa266.org

and mention in the email the person to whom it is directed.

Librarian:

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Flight Advisor:

Graham Batty

Website Administrator :

Sandrine Gressard

Check out our website at: <http://eaa266.org>

A word from our Chapter President...**Mike Lustig**

Hello everyone!

I am pleased to announce Ms. Sandrine Gressard has accepted to serve as EAA Chapter 266 Director, Website Administrator. Thanks also to Dave Cyr for carrying this role for so many years and for bringing Sandrine on board.

There will be no Zoom Waiting Room that you may have experienced in other Zoom meetings; when you click on the meeting link, you will go straight into the meeting. Say *"Use Internet Audio"* if asked. Every aviation enthusiast in the world is welcome. If you are a newcomer to the EAA 266, it would be nice to say who you are and where you're from; don't be shy!

Best Regards to All and Stay Safe,

Mike Lustig
President, EAA 266

A word from our Editor**Richard Guevara**

Raspberry Pi's --- Oh my ...

There has been an explosion of DIY maker electronics everywhere. The things that can be done with these amazing devices is truly mind boggling. But (and there is always a but) the environmental and the physical challenges of heat, vibration, and moisture are always there, and clean electrical power a close second concern. EMI issues anyone? How well do these stock boards hold up in the field i.e., in someone's homebuilt aircraft? Hmmm ...

I would bet that car radios have very specific design and construction features that are very different from those for my home PC. It would be very interesting to look into this in more detail. If someone has experience in this area, they should put pen to paper and help us all understand this important topic.

Stay Safe,
-The Editor

What is an Angle of Attack Indicator? [AoA indicators](#) measure the angle between the chord line of the wing and the relative wind. Since an airplane's wing always stalls at the same “critical” angle, the AoA indicator warns pilots when they're approaching an aerodynamic stall.

Why an Angle of Attack Indicator is a “Must Have”? This is an excerpt from an [FAA report](#): “Although commercial airline accidents become relatively rare in the United States, crashes involving in-flight loss of Control (LOC-I) in General Aviation (GA), while trending downward, still occur at an unacceptable rate. About 48 percent of fatal fixed-wing GA crashes in the United States, between 2008 and 2014, resulted from pilots losing control of their aircraft in flight resulting in 1194 fatalities. The most common type of LOC is a stall, including a post-stall spin. occur when the pilot allows the aircraft to enter a flight regime outside its normal flight envelope. Stalls happen when a wing exceeds the critical angle of attack (AOA). Although LOC happens in all phases of flight, approach to landing, maneuvering, and initial climb is, statistically, the deadliest phase of flight for LOC crashes.”

In 2018, EAA offered [3 prizes](#) for the best ideas to reduce general aviation accidents. All 3 were AoA related!

An introduction to the first version of my AoA appeared in our [January 2017 Chapter newsletter](#).

Angle of Attack Indicator Operation:

We had designed a low-cost unit for Tony Molle's Lancair 360 that uses [pressure sensors](#) and math to drive a [10-segment LED](#) with an audio alarm. The initial prototype was rather crude with electronic components strung together in a “peg board”. Version 2 was built on a proper printed circuit board (PCB), using an Arduino microcontroller and through-hole components, which took considerable work to assemble.

It would have ended there, but the world changed, so with limited mobility, I decided to work on two “Covid-19 projects”; one for my son's [performance car parts](#) business, and the other is Version 3 of the AoA indicator. With the first project finished, I have been concentrating on the AoA upgrade project; still a work in progress.

An AoA indicator, once set up, will show the pilot how close to “the edge” the aircraft is flying; i.e. how close to a stall. As airspeed decreases, the AoA indicator shows an increasing number of bars on an LED display, until all LEDs are ON just before a stall. The important thing to realize as a pilot is that knowing the airspeed is not sufficient to prevent a stall. If the aircraft is pulling G's in a steep turn, pulling nose up, or is heavily loaded, the aircraft can stall at a significantly higher airspeed than the “published” stall airspeed. An AoA indicator will always alert the pilot of an impending stall, regardless of configuration and/or operating conditions.

Version 3 New Features:

The panel-mounted 10-segment LED will be framed in a proper bezel to make it easier and neater to mount in the instrument panel. The button switch on the bezel is used for calibration, so the AoA logic processor can be installed permanently behind the panel; cable-connected to the LED on the panel. The bezel



is only 15 x 67 mm, so can be mounted between other instruments, preferably just below the pilot's line of sight.

The Version 2 processor enclosure had to be hand held during calibration (while stalling the A/C), so the panel-mounted single push button arrangement makes calibration much easier.

Rather than manually mounting the components in a through-hole PCB, Version 3 is a surface-mount PCB, fabricated in a professional manufacturing facility. This makes final assembly faster with much less manual wiring.

Another new feature is flashing all 10 LEDs when the 10th red LED turns on in order to highlight the fact that stall is imminent unless rapid action is taken.

With the calibration push button available on the panel, when not being used for calibration, pressing it will cycle through varying brightness levels, so if flying at night, the display can be dimmed.

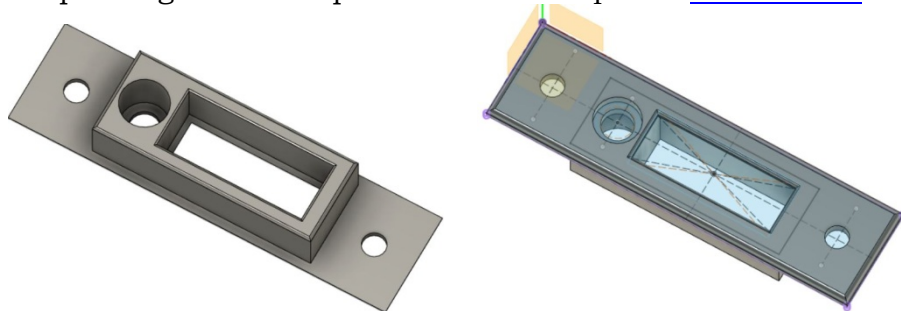
Given it already provides an audio stall warning via the auxiliary radio audio input (or intercom), we will be adding a voice saying "check gear down" for retractable-gear A/C when the speed drops below a set speed.

There will also be voice instructions to assist in calibration:

- 1) Start flaps down and press button
- 2) At end of flaps down and press button
- 3) Press button at midpoint speed
- 4) Flaps up stall then press button
- 5) Flaps down stall then press button
- 6) Landing gear speed and press button
- 7) Calibration complete

The processor used in Version 3 is an [ESP32](#) controller that has Wi-Fi and BlueTooth capability built in, which means that the AoA and/or attitude information could be sent to an iOS, Android or other operating system device without the need for a wired connection. Building an app to display the AoA is an alternative to the LED, but that's a future possible development.

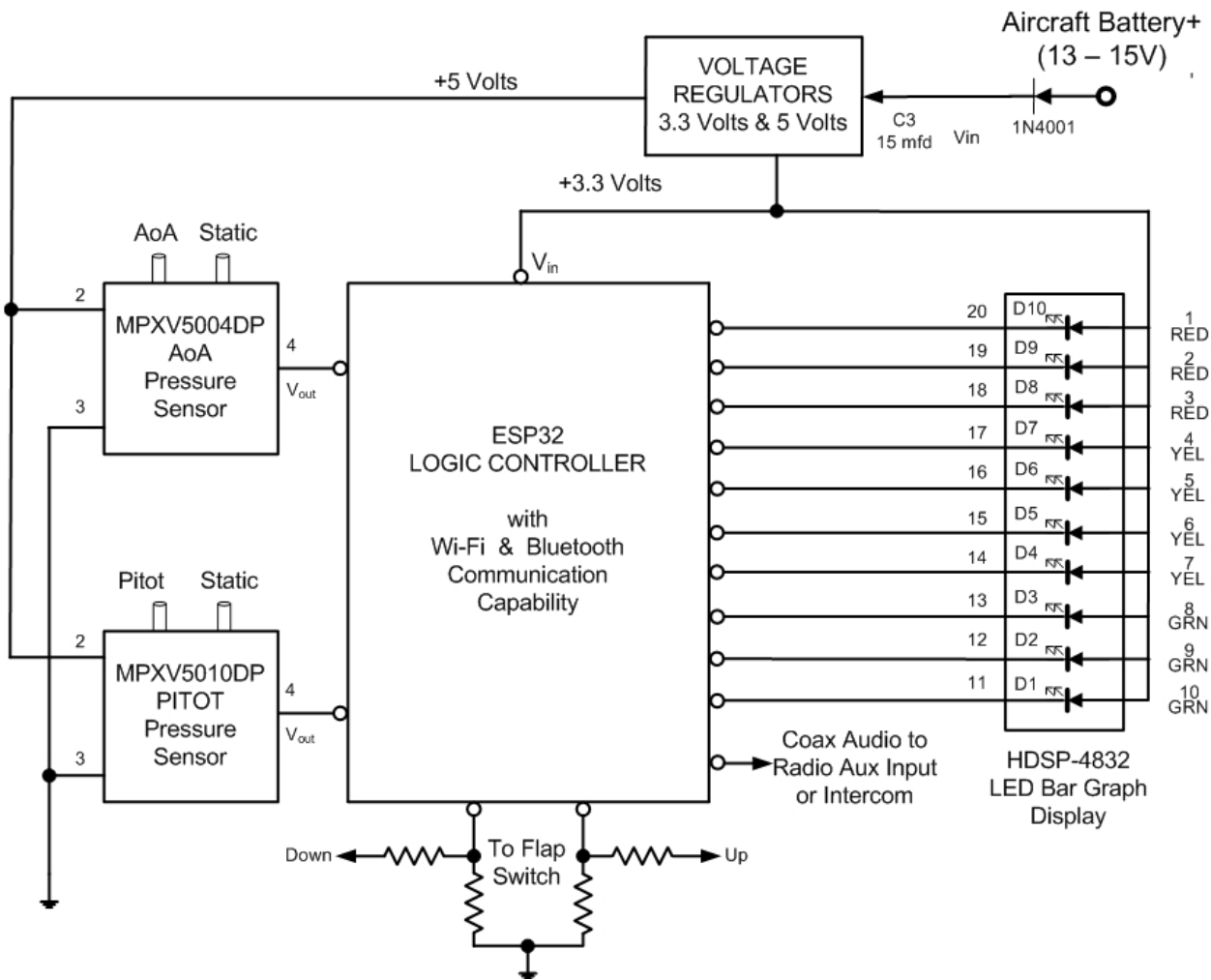
It has been an interesting project that required learning a CAD package to design the bezel for 3D printing. This is a picture of the completed [Fusion 360](#) CAD model of the bezel.

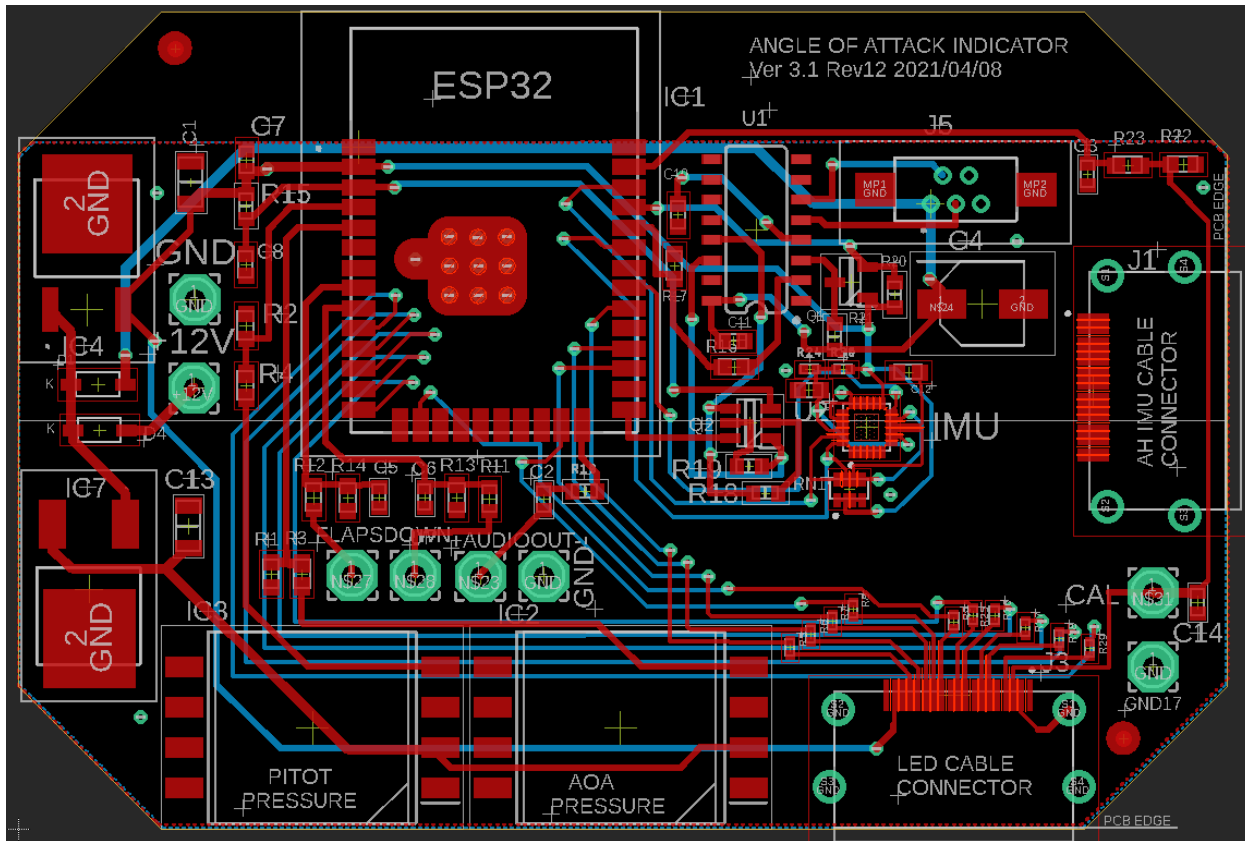


The 3D printing of the bezel was outsourced, however, 3D printer might be a future acquisition to bring that process in house.

The PCB design was done with [Eagle](#). The CAD drawing of the PCB shows the ESP32 logic controller, the pressure sensors, voltage regulators and an inertial measurement unit (IMU) module that could drive an artificial horizon (AH) display. The [ICM-20948](#) IMU (the replacement for the [MPU-9250](#)) is included on the PCB. However, even though there is plenty of board space for an AH IMU, the display would take up considerable instrument panel real estate, and given there are dozens of EFIS systems available today with full 6-pack functionality on a single display, the decision was made not to include the AH with the AoA indicator, at least not with the initial release of the device. If there is sufficient interest, this could be added later since the PCB was designed to accommodate the IMU and an HDMI port to drive a display monitor.

A block diagram shows the electrical connections, followed by the physical PCB parts layout:





The PCB fits into a small aluminum enclosure 3.3"W x 2.2"D x 1.2"H.



The Next step: Given the confidence of having built a successful Version 2 AoA indicator, it's time to send off the latest logic processor design to the PCB fabrication company to build the first 5 units. Then we will need a "launch customer" who will benefit from having the new and improved Version 3 AoA indicator on board!

References:

Hardware [comparison](#), MPU-9250/55 and its replacement ICM-20948

Contact Us!

<http://eaa266.org>

Of General Interest

various contributors

Some useful Zoom links:

- <https://zoom.us/signup>
- <https://zoom.us/signin>
- <https://zoom.us/join>

Of General Interest

various contributors

1. If anyone is aware or comes across any event that may be of interest to our members, please email myself or someone in the list on the front of this newsletter and let us know so that we can broadcast it to all concerned.

EAA 266 Library

by Ed Hannaford

The EAA 266 library contains a collection of books and DVDs that cover aircraft in general, homebuilding construction techniques, local events, history and Technical Manuals. Due to the Covid-19 pandemic, we have suspended the library operations. We will keep you informed of any changes in library operations in future Newsletters. Details of the library may be found on the EAA 266 website: www.eaa266.org . Contact Ed Hannaford for additional information.

The Unclassified Classified

Free Ads for Paid-Up Members

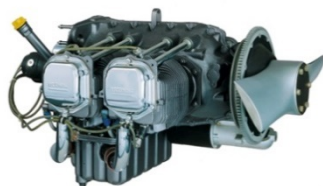
Plans (drawings) to give away, Still Available! : Plans for the Super Cavalier SA 105 all-wood aircraft. Donation thanks to John Duckmanton. For information, call Michel 514-694-2129.

FREE Plans (drawings, photo below) Karatoo J6C (Australian version of Karatoo). Larger, longer, 80hp to 100hp, steel tube fuselage, metal OR wood wing, folding wing option, removable rear cockpit tubing for use as camper vehicle. High wing and large windows for exceptional outside view. Luc Robillard Tel: 514-366-7500, cell: 514-298-3459 email lucrobes@hotmail.fr



For Sale: Lycoming 0235-C1 with logs 2160 SMO, 1427 STO (PenYann) with starter and generator. \$2900.00 John 514-428-1233

Picture below FOR REFERENCE ONLY:



Seeking: Looking for partner (or partners) to purchase a small (2-4 place) airplane. Would consider factory or home-built, tricycle or tail wheel. Robert Hope, roberthope530@gmail.com

Seeking: Active aircraft builder looking for old projects or materials. Specialized in old wood aircraft and restoration. Ron Gosselin (514) 808-1808 - ronny@total.net

For Sale: Landing lights, 50W, 24V, 20\$ each, Frank Grayer (613) 874-2837.
