

TALOS AVIONICS

FlySense AoA INSTALLATION MANUAL

ATTENTION: Installation of the FlySense AoA is supplemental only. It is not intended as a replacement for or modification to an existing, approved, or required system.

FlySense AoA is not a certified aviation instrument. Do not rely on FlySense AoA as your only navigation aid. Failure to comply to this warning may result in property damage, serious injury or death. You assume total responsibility and risk associated with using this device and associated app.

Congratulations on purchasing a FlySense AoA. This device provides rich flight information as detailed below. Proper installation and maintenance of the device facilitates accurate performance and uninterrupted operation.

Please read the current manual prior to using FlySense AoA and keep it for future reference.

Correct operation of the FlySense AoA requires that one or more mobile smart device(s) (iOS or Android) are connected to the device.

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1 FlySense AoA

The FlySense AoA is shown in Fig. 1. It is a portable device that comes together with a GPS antenna, an ADS-B antenna, and a USB adaptor for cable connection to a smart mobile device (tablet or smartphone). FlySense AoA includes a dual-band (978 MHz and 1090 MHz) ADS-B receiver for traffic and weather information.

1.1 Mounting the FlySense AoA

The FlySense AoA (Fig. 1) should be mounted in a convenient dry place, as far away as possible from heat sources. A suitable mounting location is the top of the instrument panel. You can mount the unit by means of double-sided adhesive tape or Velcro. Please ensure that the unit doesn't move during flight.

The FlySense AoA comes together with a GPS antenna and an ADS-B antenna. Both antennas should be connected as shown in Fig. 1 and mounted with double sided adhesive tape or Velcro, in a free-to-sky location for optimal signal reception.

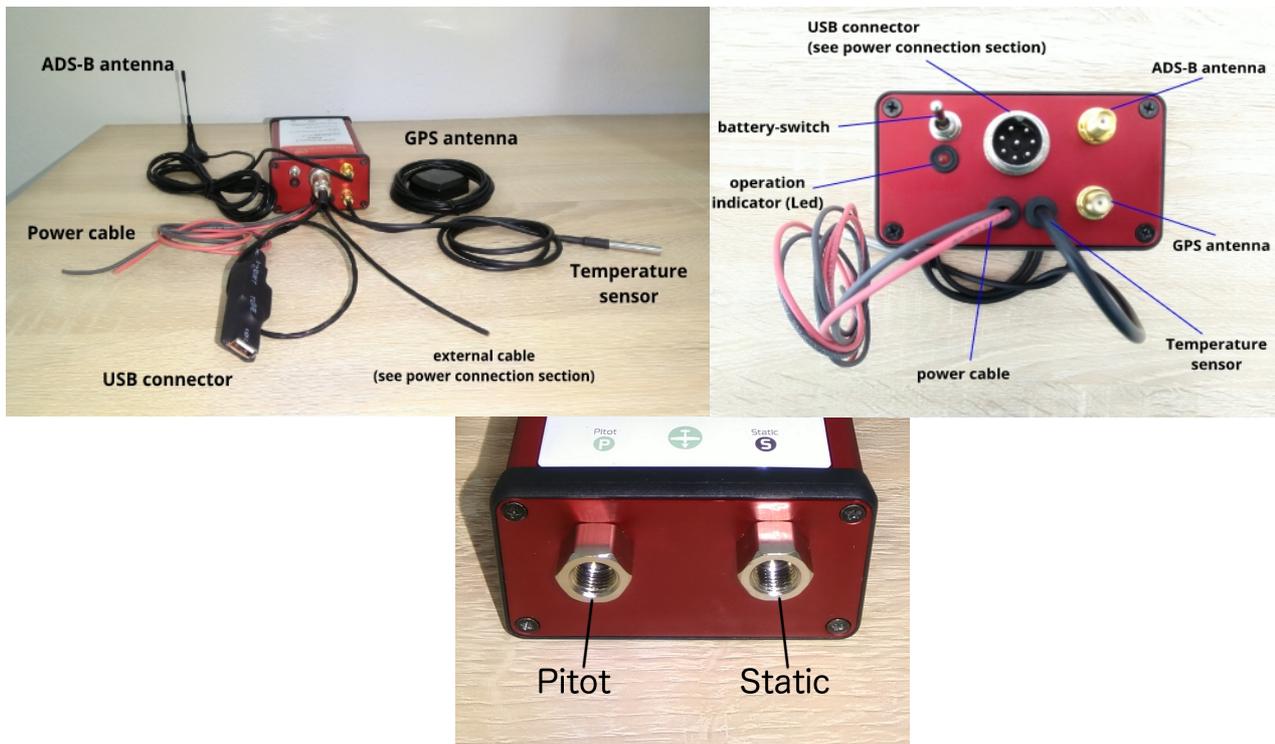


Fig. 1. FlySense AoA image.

It is important for the FlySense AoA to be mounted parallel and as close as possible to the symmetry axes of the airplane (see Fig. 2). The front side of the FlySense AoA is marked by a small airplane on the cover of the unit. After mounting the FlySense AoA, the “AHRS leveling” procedure described in Section 1.5 of the current manual should be performed, in order to adjust for small inaccuracies during placement.

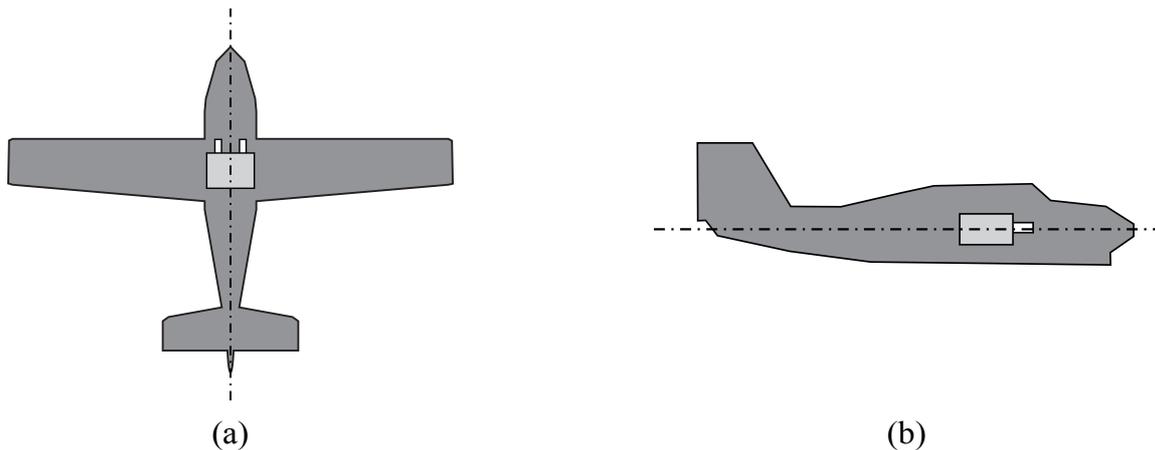


Fig. 2. FlySense AoA should be mounted parallel to the main axes of the airplane.

1.2 Power Connection

FlySense AoA is powered by two means:

- ! Its internal battery, offering approximately one and half (1.5) hours of operation. Please turn the battery-switch on for battery device operation.
- ! On the external cable USB adaptor, the free cable is for autopilot, and external buzzer.

The cabling reference is as follows:

Gray: Autopilot (serial NMEA-9600)

Yellow: External Buzzer -ve

Brown: External Buzzer +ve

Black: Ground

- ! The device also connects to a fused connection for continuous power supply and battery charging; such connection may be the cigarette lighter plug of the aircraft. Please note that battery charges in this case regardless of the battery-switch position (on or off). Always make sure to connect with the proper polarity:
 - The red cable connects to the positive pole (+)
 - The black cable connects to the negative pole (-)

It is suggested that FlySense AoA is always connected to a power source, and is operated with the battery-switch on. In case of power-failure, FlySense AoA will continue its operation after a short reboot (please make sure you reconnect to the FlySense WiFi network). Please note that, in the latter case, i.e. power failure and operation on the internal battery, the tethered connection (see below section 1.3, paragraph “USB Cable Connection”) to the smart mobile device (smartphone or tablet) will not work, and you must enable the wifi connection.

Important Note: Always make sure to turn the FlySense battery-switch off when FlySense AoA is not in operation and the mains aircraft switch is off. In the opposite case, the device will remain turned on, powered by its internal battery, until the battery is completely drained.

1.3 Software – EFIS TA app

FlySense AoA operates with the free EFIS TA app offered by TalosAvionics. EFIS TA app has been tested to comply with ASTM F3153 – 15 Standard Specification for Verification of Avionics Systems. EFIS TA app runs on smart mobile devices (tablets or smartphones) with iOS or Android operating systems.

EFIS TA app for Android can be downloaded from [Google Play Market](#).

EFIS TA app for iOS can be downloaded from [Apple’s App Store](#).

EFIS TA software instructions can be downloaded from <https://www.talosavionics.com/support/>

PLEASE DO READ THE EFIS TA APP SOFTWARE INSTRUCTIONS!

EFIS TA app may operate in standalone mode, when the smart mobile device is not connected to a FlySense AoA, or --preferably-- in connected mode, when the smart mobile device is connected to a FlySense AoA.

When EFIS TA app runs on a smart mobile device in standalone mode, it displays a relevant message informing the pilot about operation in standalone mode and runs by employing the internal sensors of the smart mobile device (assuming that the latter is equipped with the necessary sensors). When the smart mobile device is connected to a FlySense AoA via a cable-adaptor or via wifi, the EFIS TA app automatically recognizes FlySense AoA, and the above message disappears. If, for any reason, connection to the FlySense AoA is lost (e.g. FlySense AoA is turned off due to: power failure & battery-switch in off position), EFIS TA app switches automatically to standalone mode and the message reappears. Accordingly, the pilot may continue using EFIS TA app with the internal sensors of the smart mobile device as a backup, even in case of power failure!

From the main screen of the EFIS TA app interface, you can tap on “MENU” button and navigate to “sensor status window” and check the status of the sensors, as depicted in Fig. 3 below.

Sensor status		
Gyrosc.	Internal	15 msec
Accel.	Internal	20 msec
Magnet.	Internal	10 msec
Pressure	Internal	40 msec
GPS	Internal	1116 msec
Airspeed	no data	-
Air Temp	no data	-
Attitude	EFIS TA	20 msec
Compass	EFIS TA	107 msec

Aeolus	
Status	Disconnected
Model	
Firmware	
SSID	

(a)

Sensor status		
Gyrosc.	FlySense	7 msec
Accel.	FlySense	7 msec
Magnet.	FlySense	7 msec
Pressure	FlySense	5 msec
GPS	FlySense	92 msec
Airspeed	FlySense	5 msec
Air Temp	FlySense	829 msec
Attitude	FlySense	7 msec
Compass	FlySense	7 msec

Aeolus	
Status	Connected
Model	FlySense
Firmware	350
SSID	FlySense_XXXXXX

(b)

Figure 3: Sensor status window. (a) EFIS TA app working with internal sensors only, (b) EFIS TA app connected to a FlySense AoA.

To test the connection, start the EFIS TA app and tap on “MENU” button and then “Sensor Status”. A screen as in Fig. 3b verifies connection to FlySense AoA. If a screen as in Fig. 3a comes up, no connection with a FlySense AoA is established. Connection of the smart mobile device to a FlySense AoA is achieved by two means: (a) wired connection via a USB cable-adaptor, (b) wireless connection via wifi.

USB Cable Connection

The FlySense AoA comes with a USB cable-adaptor, which connects it to the smart mobile device that is used as display. USB cable connection confirms secure communication under any conditions and also facilitates charging of the smart mobile device.

Please note that in USB Cable connection, the smart mobile device is charged by the FlySense AoA; accordingly, battery-life of the latter will be reduced if not connected to an external power source (e.g. cigarette lighter).

After connection of FlySense AoA to the smart mobile device has been established, please follow the same steps as when connecting the latter device to a computer. You must permit the device to connect to unknown sources and press allow when asked, if you trust the connection to the FlySense AoA.

IMPORTANT: before connecting the smart mobile device with the cable-adaptor, you must turn off the WiFi connection to the FlySense AoA.

Wifi Connection

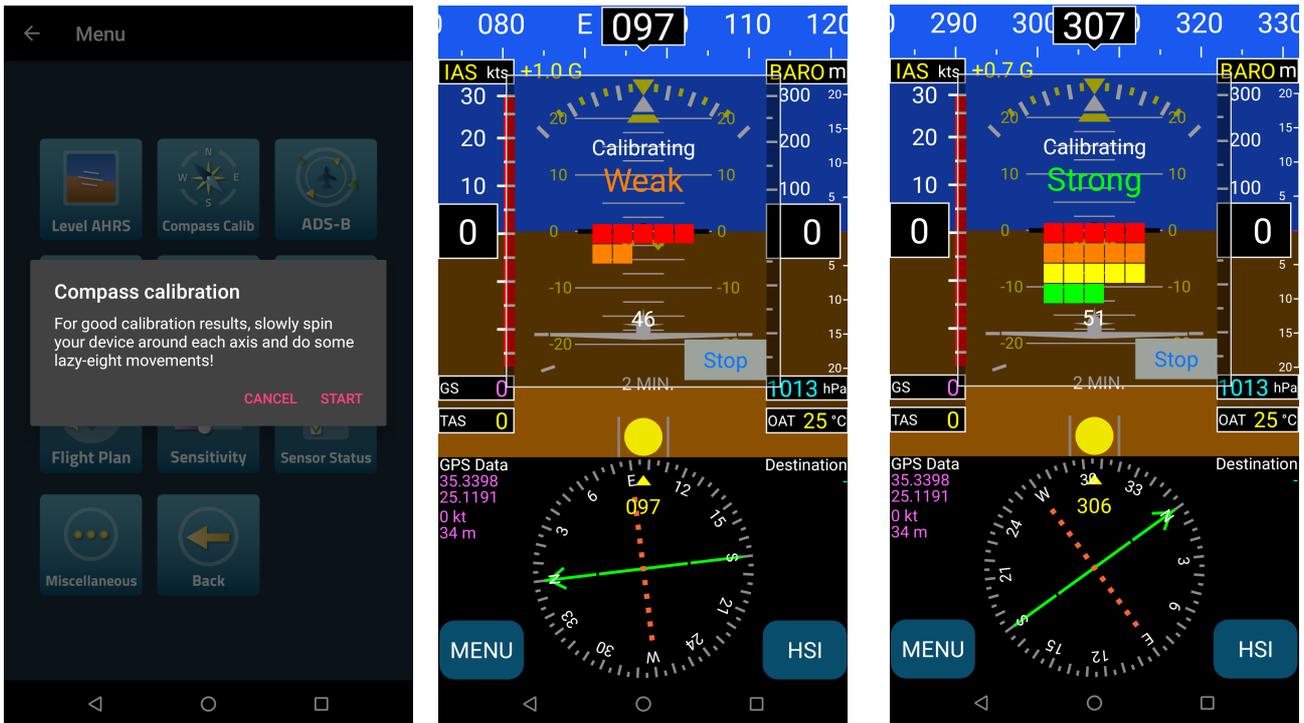
FlySense AoA creates a wifi network that is used to connect a smart mobile device. The SSID of FlySense AoA wifi network is “FLYSENSE XXXXXXXXXX” where X is a unique alphanumeric string. Up to ten (10) smart mobile devices can be simultaneously connected via wifi to an FlySense AoA.

1.4 Compass Calibration

Before start using your FlySense AoA, the device’s compass should be calibrated. This only needs to be done once. For that, the FlySense AoA has to be powered up and the EFIS TA app must be running on a connected (see above) smart mobile device. Please note that compass calibration must be performed with the aircraft in a parking position on the ground, and never during a flight. Moreover, this calibration procedure must be performed with the FlySense AoA as close as possible to the final installation position in order to compensate for parasitic magnetic fields. The exact steps for compass calibration are outlined below:

- Power up your device
- Connect your smart mobile device (iOS or Android) to the FlySense AoA wifi Network (no password needed).
- Start the EFIS TA app on the smart mobile device.
- Tap on “MENU” button and then “Compass Calib”.

- A notification window will pop up, informing you that the calibration procedure is about to start. Press “Start” to continue.
- EFIS TA app will return back to the main screen and the calibration window, indicating the calibration progress will appear (Fig. 4). Start rotating your device slowly, until the indication on the screen becomes “Good” or “Strong”. To easily achieve the desired calibration result, start by rotating your device three times around each axis and then perform a sequence of “lazy eight” maneuvers (Fig. 5).
- Press “Close” or wait a few seconds until the calibration window closes automatically.



(a)

(b)

(c)

Figure 4: (a) Press “Start” to start compass calibration. (b) Calibration in progress. The calibration results are indicated as “Weak”; you should continue rotating your device until you have a “Good” or “Strong” indication. (c) Indication as “Strong” calibration signifies that the device’s compass has been properly calibrated.

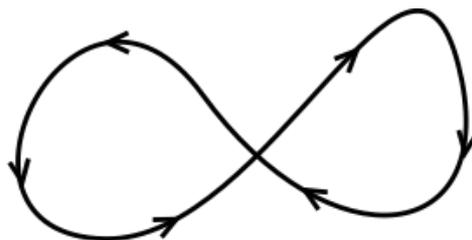


Fig. 5: To easily calibrate the Compass start by slowly rotating FlySense AoA three times around each axis and then perform a sequence of “lazy eight” maneuvers until you have a “Good” or a “Strong” indication on the EFIS TA app.

1.5 AHRS Leveling

As already stated above, the FlySense AoA should ideally be mounted parallel to the symmetry axes of the airplane. Since this cannot always be accurately performed, AHRS leveling is important in order to adjust for minor inaccuracies during placement.

The “AHRS leveling” procedure described below needs only to be done once, after you have mounted and fully connected FlySense AoA. Please note that AHRS leveling must be performed with the aircraft in a parking position on the ground, and never during a flight.

- Power up your device.
- Connect your smart mobile device (iOS or Android) to the FlySense AoA wifi Network.
- Start the EFIS TA app on your mobile device.
- Tap on “MENU” button and then “Level AHRS”.
- EFIS TA app will return back to the main screen and the “AHRS leveling” window (Fig. 6) will appear.
- Press the “Auto” button for automatic AHRS leveling, and/or use the arrows to manually adjust the AHRS. Manual adjustment may be unavoidable if, for example, you are installing FlySense AoA in an aircraft with a tailwheel-type landing gear (a taildragger).
- When you are done with leveling the AHRS, press “Close” to save the changes and return to the main screen.

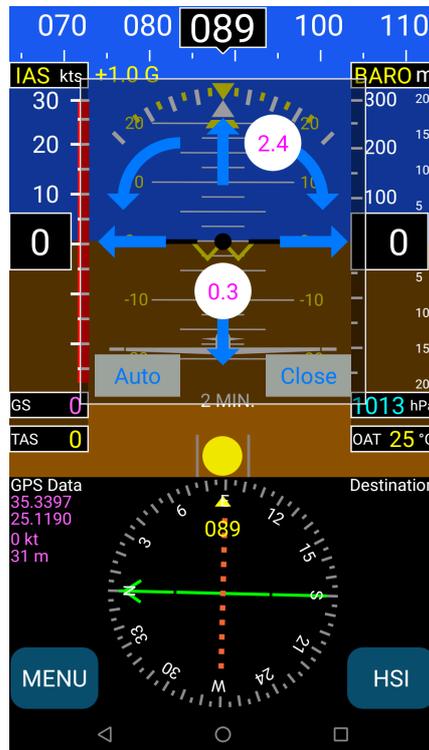


Fig. 6: AHRS leveling. Press “Auto” for automatic leveling, and/or use the arrows to manually adjust the AHRS and the compass.

1.6 Angle of Attack (AoA)

NOTE 1: Angle of Attack operation needs all installation and calibration instructions to be completed successfully (sections 1.1 – 1.5).

NOTE 2: The AoA indicator will not be visible until the AoA calibration is complete.

Angle of Attack calibration

SAFETY NOTE: It is highly recommended that, for safety reasons and in order to achieve proper calibration, a second person (e.g. co-pilot) performs the calibration procedure while the Pilot-in-Command flies the aircraft in a safe manner at altitude, while also maneuvering the aircraft.

AoA calibration procedure is performed according to the following 2 steps.

Step 1: Click on EFIS TA app “MENU” → “Miscellaneous” → “Calibrate AoA” option. This will bring up the window shown below in Figure 7(a); a value -1.0 in the mid-right part of the window signifies uncalibrated FlySense AoA.

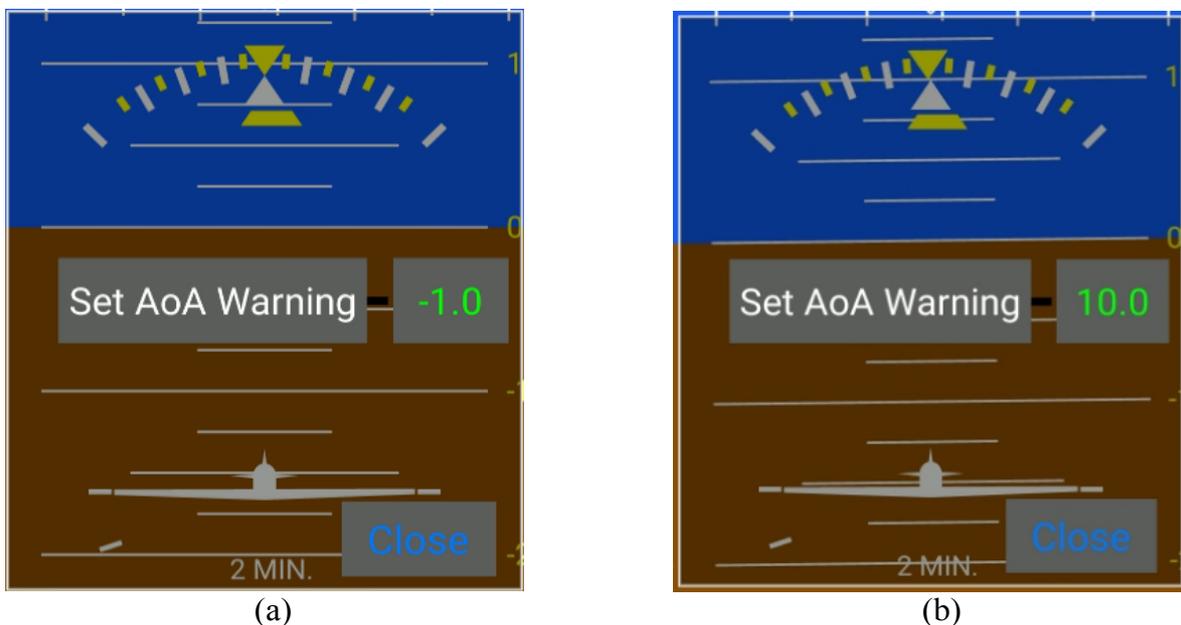


Figure 7: (a) Uncalibrated FlySense device. (b) Calibrated FlySense device (i.e. stall angle has been determined at 12° and accordingly warning angle has been set at 10°).

Step 2: While in flight mode, gradually reduce aircraft speed, until stall buffet is reached and press the “Set AoA Warning” button. This will automatically determine and store the aircraft's stall angle and will set the warning angle at a value of two degrees (2°) less. In the example case shown above in Fig 7(b), stall angle has been determined at 12° and accordingly warning angle has been set at 10°.

Angle of Attack operation

The Angle of Attack feature in FlySense AoA offers both visual AoA indication as well as aural warning signal. The visual indication is illustrated in Figure 8 and also detailed below.

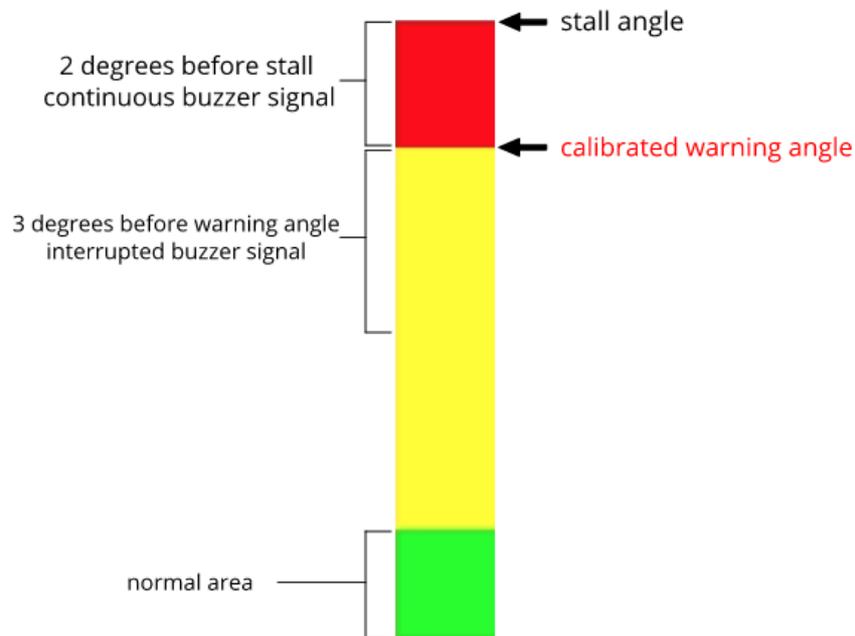
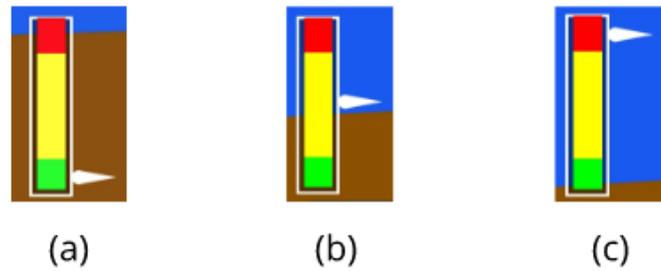


Figure 8: AoA visual indicator explanation.

AoA's visual indicator consists of a color-bar that is composed of three (3) areas as shown above:

- ! Green area, which signifies normal aircraft flight attitude.
- ! Yellow area, which signifies higher AoA; the higher in the yellow area, the closer to stall angle the aircraft is.
- ! Red area, which depicts critical angle that ranges from 2° before stall and the actual stall angle.

The upper side of the red area represents the stall angle as stored during calibration procedure. Accordingly, the border between the red and yellow represents the calibrated warning angle.



For visual indication purposes, FlySense AoA uses a moving white pointer on the color-bar that indicates the actual AoA. This is illustrated below in Figure 9 that shows three (3) example cases of AoA during flight. The case in Figure 9(c) is a critical case, where the aircraft is close to stall attitude. Figure 9: (a) AoA Normal area. (b) AoA warning area. (c) AoA critical area.

1.7 Other Considerations Regarding FlySense AoA

FlySense AoA complies fully with applicable Electronic Emissions and Flame Resistance standards. More specifically:

- **Electronic Emissions:** FlySense AoA deploys a WiFi network with transmitter power 9mW EIRP. Accordingly, it complies fully with the 10mW limit imposed by PS-ANM-25-13 and part 15 of FCC rules.
- **Flame Resistance:** Materials, design and construction of the FlySense AoA are flame resistant and in compliance with CAR regulation 3.

2 FlySense AoA Maintenance

FlySense AoA has been designed and manufactured for long and maintenance-free operation. Still, care must be applied for the following:

- **FlySense AoA Compass:** Any replacement and/or relocation of metallic items in the cockpit may require re-calibration of the Compass. Please follow the steps outlined in section 1.4 of the current document for Compass calibration.

3 Use Limitations and Abnormal Operation

The temperature and voltage operational ranges of FlySense AoA are as follows:

Temperature range: -20C to 65C or -4F to 149F

Operation Voltage: 10-32Vdc

Inflight power reset: in case of inflight power reset or if you turn on the unit during the flight after losing your main systems, please note that there is **no limitation or constraint** of attitude for correct operation of the FlySense AoA. This means that the FlySense AoA will recover in any flight

attitude, such as sharp turns, strong turbulence, etc. No constraint is imposed of straight and leveled flight for recovery, which sometimes, in IMC is impossible to know. In this case, if you don't have a visual reference, please wait for about 40 to 60 secs for full recovery of the Artificial Horizon.

Loss of GPS or Pitot/static: our system uses both GPS and pitot/static for correct attitude indication. In case of loss of one of them, correct operation relays on the other one. If you lose both, then operation is based on less accurate information provided by other inertial sensors and, depending on the kind of flight, there will be a slight drift after 15 to 30 mins.

Support

For support via email, please contact:

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