

TALOS AVIONICS

FlySense AoA PRO INSTALLATION MANUAL

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

FlySense AoA PRO is not a certified avionic instrument. Do not rely on FlySense AoA PRO 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 PRO avionic instrument. FlySense AoA PRO is a rich flight information system, 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 PRO and keep it for future reference.

Correct operation of the FlySense AoA PRO requires that one or more smart device, phone or tablet (iOS or Android) are connected to the device. We propose to use a tablet instead of a phone as the tablet screens are larger and therefore easier to view.

ATTENTION

We perform updates to the EFIS TA application and the firmware of our units when necessary to ensure the best performance of our devices. This procedure is automatic. When you connect your smart device to the internet, an update of the EFIS TA application is automatically downloaded. This of course depends on smart device/user settings, so if you are asked to give your permission, please do so.

After downloading the EFIS TA application update, the first time you connect your smart device to our instrument, you might be asked to update the FlySense AoA PRO instrument firmware (if there is a latest firmware update for it), please press confirm.

ATTENTION, during this process, don't power off the device for at least 3mins. Then reconnect it to the tablet for normal operation. Please ensure that there is power available for the time required to complete the firmware update operation.

If the device is turned off intentionally or because of a poor power supply during this operation, the device could stop working and the only way to recover it is by sending back to the factory for complete reprogramming.

TABLE OF CONTENTS

1 FlySense AoA PRO.....	3
1.1 Mounting the FlySense AoA PRO.....	3
1.2 Power Connection.....	4
1.3 Software – EFIS TA app.....	5
1.4 Compass Calibration.....	6
1.5 AHRS Leveling.....	8
1.6 Angle of Attack (AoA).....	9
1.7 Electronic Emissions and Flame Resistance Compliance.....	12
2 FlySense AoA PRO Maintenance.....	12
3 Limitations and Abnormal Operation.....	12
4 Support.....	13

1 FlySense AoA PRO

The FlySense AoA PRO is a portable device that requires connections to a GPS and an ADS-B antenna (both antennae are included). The instrument has a USB socket for cable/tether connection to a smart device (tablet or smartphone). FlySense AoA PRO includes a dual-band (978 MHz and 1090 MHz) ADS-B receiver for traffic and weather information.

1.1 Mounting the FlySense AoA PRO

The FlySense AoA PRO should be mounted in a convenient dry place, as far away as possible from heat and magnetic 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 is stable during flight.

The instrument must be connected to the airplane native pitot/static tubes using two 1/8in. BSP to the airplane hoses/adaptors.

Both antennae (GPS & ADSB) should be connected at the back of the device and mounted with double sided adhesive tape or Velcro, in a free-to-view-sky location for optimal signal reception.

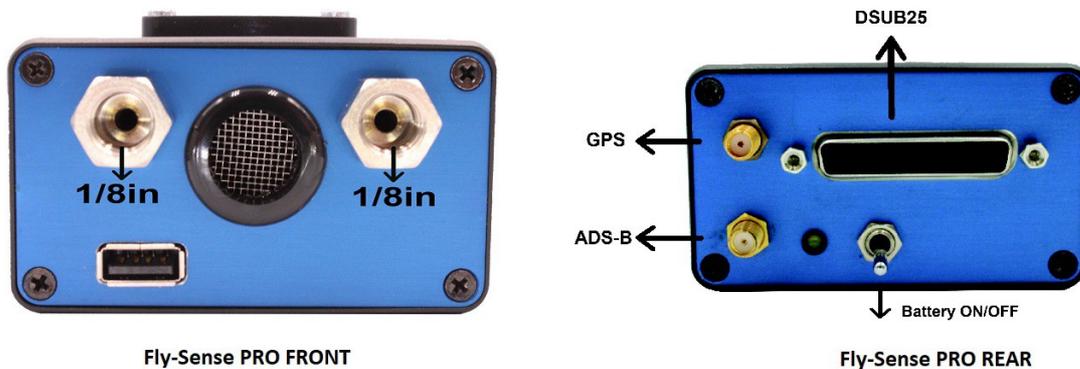


Fig. 1. FlySense AoA PRO Instrument.

It is important for the FlySense AoA PRO to be mounted parallel and as close as possible to the symmetry axes of the airplane. The front side of the FlySense AoA PRO is marked by a small airplane on the cover of the unit. After mounting the FlySense AoA PRO, 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.

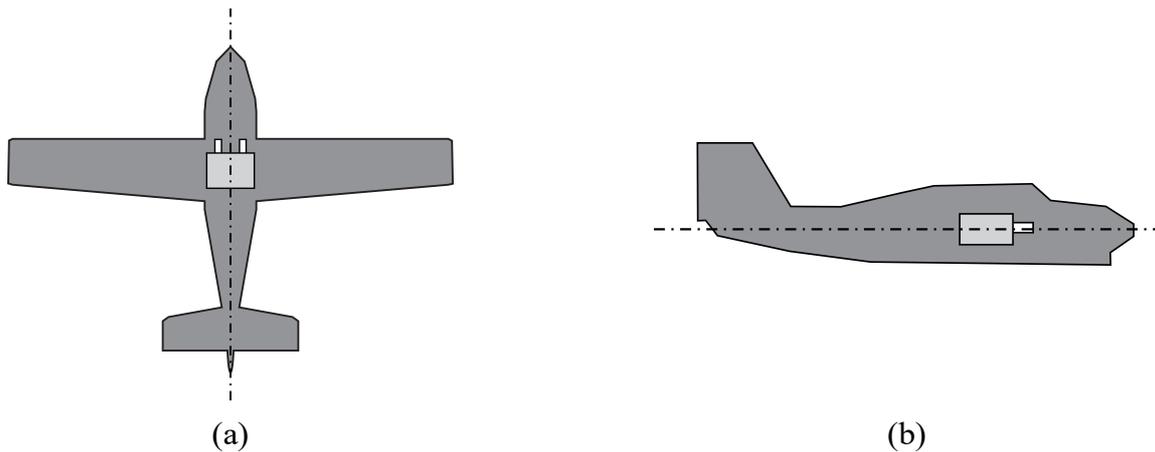


Fig. 2. FlySense AoA PRO should be mounted parallel to the main axes of the airplane.

1.2 Connection

FlySense AoA PRO is powered by two means:

- An internal battery, offering approximately one and half (1.5) hours of operation. Please turn the battery-switch on if a battery device operation is required.
- The external DSUB25 connector. The pin-out configuration is as follows:

PIN	CONNECTION
1	Main Power 12V to 30V (+ve) (white wire factory connected)
4	(reserved)
5	(reserved)
7	Horn red (+ve)
8	External LED (+ve)
9	temperature probe blue or yellow(factory connected)
10	GND
11	External Battery Switch (if used keep the device switch to the off position)
12	External Battery Switch (if used keep the device switch to the off position)
13	GND
15	Autopilot/Transponder extended squitter: RS232(9600,8/N/1)3.3V, NMEA 0183.
21	temperature probe black (factory connected)
22	temperature probe red (factory connected)
24	Horn Black (0V)
25	Main Power (0V) (black wire factory connected)

The instrument should be connected through a fused connector for power and battery charging; such connector may be the cigarette lighter plug of the aircraft. Please note that the battery charges regardless of the battery-switch position (on/off). The instrument has reverse polarity protection, however always make sure to connect with the proper polarity:

- The red/white cable connects to the positive (+ 12V to +30V)
- The black cable connects to the negative (0V)

It is suggested that FlySense AoA PRO is always connected to a power source, and is operated with the battery-switch on. In case of power-failure, FlySense AoA PRO 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 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 PRO 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 application

FlySense AoA PRO 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 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 PRO, or **--preferably--** in connected mode, when the smart device is connected to a FlySense AoA PRO.

When EFIS TA app runs on a smart 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 PRO via a cable-adaptor or via wifi, the EFIS TA app automatically recognizes FlySense AoA PRO, and the above message disappears. If, for any reason, connection to the FlySense AoA PRO is lost (e.g. FlySense AoA PRO is turned off due to: power failure & battery-switch in off position), EFIS TA app switches automatically to standalone mode and the message reappears, warning the pilot.

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		
Gyros.	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		
Gyros.	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_XXXXXXX

(b)

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

To test the connection, start the EFIS TA application and tap on “MENU” button, then “Sensor Status”. A screen as in Fig. 3b appears, verifying the connection to FlySense AoA PRO. If instead a screen as in Fig. 3a comes up, it indicates that no connection to the instrument has been established.

Connection of the smart device to a FlySense AoA PRO can be achieved by two means: (a) wired connection via a USB cable, (b) wireless connection via wifi.

USB Cable Connection

The FlySense AoA PRO instrument connects to the smart device through a USB connector situated at the front panel of the FlySense AoA PRO. USB cable connection confirms secure communication under any conditions and also facilitates charging of the smart device.

When FlySense AoA PRO is in USB cable/tethered connection with a smart device, the WiFi of that smart device must be turned off. However there is the option to connect other smart devices to the FlySense AoA PRO WiFi network, and provide the cockpit with multiple displays of the same instrument.

When connection of FlySense AoA PRO to the smart device has been established by USB cable, you will be asked to confirm the connection. On Android this appears as “Allow USB debugging”, and on iOS as “Trust” the connection. The user needs to confirm the connection.

Android Device Note: On Android devices the user needs to enable “Developer Options” and then “USB Debugging”. On most Android devices the Developer options menu is hidden by default. In addition, different android device manufacturers allow users to enable “Developer Options” in their own way, there is no standard procedure as of yet. Also, the list of developer options will depend on the version of Android that the device is using.

As an example on Samsung devices the procedure will be: Settings->About phone(or about device).

Then, depending on the device and operating system, you may need to tap "Software information", then tap "Build number" seven times **repeatedly**. The "Developer options" menu will now appear in the Settings menu. Again, depending on the device, it may appear under Settings->General->Developer options (you need to go back to the Settings screen and scroll down to the end).

When "Developer options" menu is enabled, the user goes inside, finds the option "USB Debugging" and enables it. Now you have access to your device USB.

As an unwritten rule, since we can't know the menu of every android device, the above procedure might be a bit different on your device. For example, in Xiaomi Redmi there is no option "Build Number", instead you tap "MIUI version" several times to enable the "Developer options". So if you can't find-out how to enable "Developer options" on your device, run a Google search: How do I turn on the Developer Options menu on <put your device name here>, or drop us an email and we'll perform the search for you.

Wifi Connection

FlySense AoA PRO instrument creates a wifi network that is used to connect to a smart device. The SSID of the wifi network is "FLYSENSE XXXXXXXXX" where X is a unique alphanumeric string. Up to ten (10) smart devices can be simultaneously connected via wifi to a FlySense AoA PRO instrument.

1.4 Compass Calibration

Before start using your FlySense AoA PRO, the device compass should be calibrated. This only needs to be done once. 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 PRO 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 FlySense AoA PRO instrument
- Connect a smart device (iOS or Android) to the FlySense AoA PRO wifi Network (no password needed).
- Start the EFIS TA application on the smart 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.
- The application returns back to the main screen with a superimposed calibration window, indicating the calibration progress (Fig. 4). Start rotating your device slowly, until the indication on the screen becomes "Good" or "Strong". To easily achieve the desired calibration results, 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) “Strong” calibration signifies that the device compass has been properly calibrated.



Fig. 5: To easily calibrate the Compass start by slowly rotating FlySense AoA PRO 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

FlySense AoA PRO should ideally be mounted parallel to the symmetrical axes of the airplane. Since this action can't always be performed with certainty, AHRS leveling makes adjustments 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 PRO. Please note that AHRS leveling must be performed with the aircraft in a parking position on the ground, and never during flight.

- Power up your device.
- Connect your smart device (iOS or Android) to the FlySense AoA PRO wifi Network.
- Start the EFIS TA application 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 PRO in an aircraft with a tailwheel-type landing gear (a taildragger).
- When you are satisfied with leveling the AHRS, press “Close” to save the changes and return to the main screen.

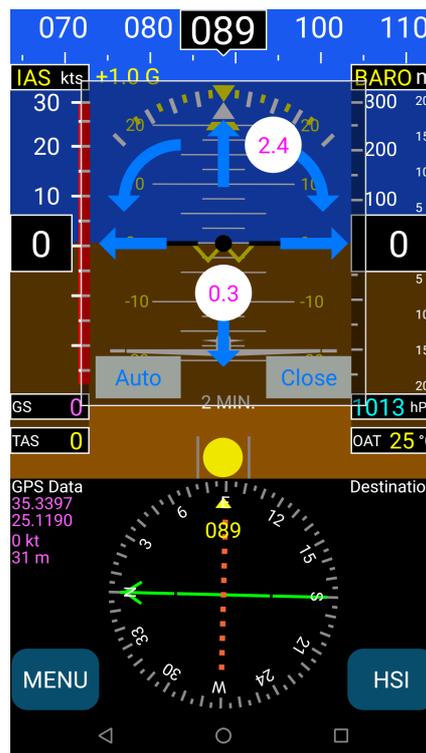


Fig. 6: AHRS leveling. Press “Auto” for automatic leveling, and/or use the arrows to manually adjust the AHRS and the compass.

1.6 Angle of Attack (AoA)

NOTE 1: Angle of Attack operation needs all previous installation and calibration instructions to be completed (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 a certain altitude.

To perform the AoA calibration procedure please follow the instructions below:

Step 1: Click on EFIS TA application “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 PRO.

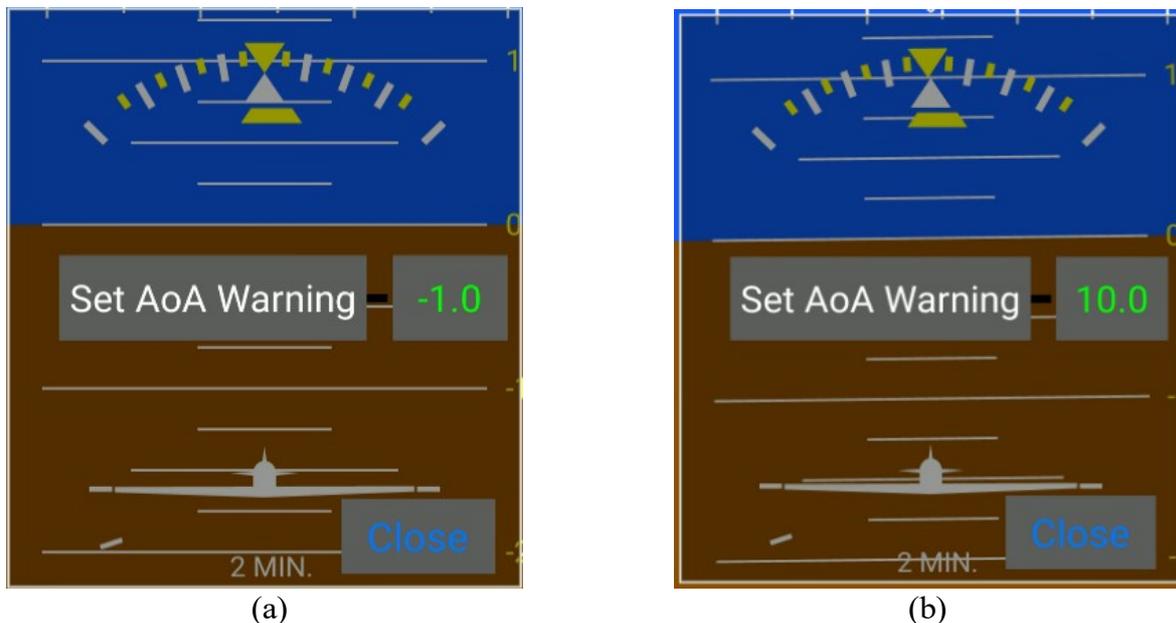


Figure 7: (a) Uncalibrated FlySense device. (b) Calibrated FlySense device (i.e. stall angle has been determined at 12° and warning angle has been set at 10°).

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 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 to be 12° and the warning angle has been set to 10°.

Angle of Attack operation

The Angle of Attack feature in FlySense AoA PRO offers both visual AoA indication as well as audio warning signals. The visual indication is illustrated in Figure 8 below.

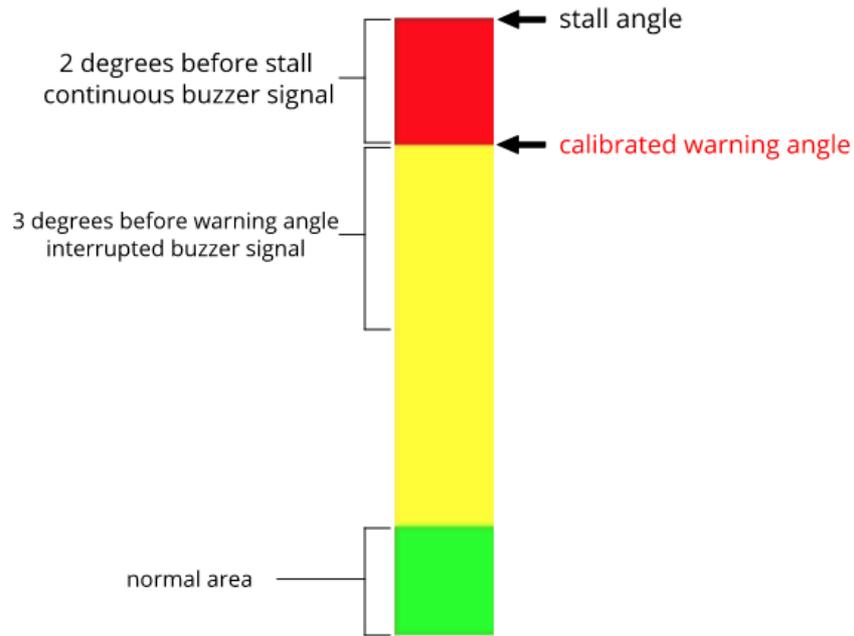


Figure 8: AoA visual indicator explanation.

AoA 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 to the actual stall angle.

The upper side (red area) represents the stall angle as stored during the calibration procedure. The border between red and yellow, represents the calibrated warning angle. As a visual indication, FlySense AoA PRO uses a vertically 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 a stall attitude.

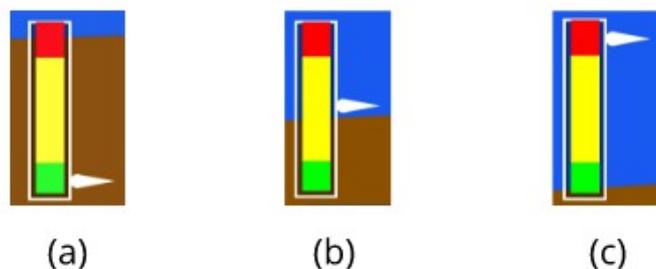


Figure 9: (a) AoA Normal area. (b) AoA warning area. (c) AoA critical area.

1.7 Electronic Emissions and Flame Resistance Compliance

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

- **Electronic Emissions:** FlySense AoA PRO deploys a WiFi network with transmitter power 9mW EIRP. 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 PRO are flame resistant and in compliance with CAR regulation 3.

2 FlySense AoA PRO Maintenance

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

- **FlySense AoA PRO 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 Limitations and Abnormal Operation

Temperature and voltage operational range:

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

Voltage: 10-32Vdc

Current: max 4A during smart device charging. Please use a 10A fuse.

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 PRO. This means that the FlySense AoA PRO will recover in any flight attitude, such as sharp turns, strong turbulence, etc. No constraint is imposed of straight and level 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 a loss of one of those subsystems, correct instrument operation depends on the live one. If you lose both, then operation is based on less "attitude" accurate information provided by other inertial sensors and, depending on the flight conditions, there will be a slight drift after 15 to 30 mins.

4 Support

For further information with respect to the present or any of our models please refer to our web: www.talosavionics.com

For support via email, please contact: support@talosavionics.com

For voice support, please call:

USA: +1-309-874 4227

Europe: +30 2815 304480

For general questions & feedback, please contact: info@talosavionics.com