

STADIA

by

SKEEETER ENTERPRISES

TM

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Overview

Stadia is a modular high accuracy above ground level (AGL) altimeter that is designed to be attached to the outside of an aircraft with a minimum of aircraft modifications or tools. Stadia works by using a LIDAR to take hundreds of measurements every second and deliver this information to the pilot via Bluetooth, giving them better spatial awareness when landing an aircraft. The Stadia app delivers the altimeter information to the pilot both visually and audibly so that the pilot can focus on their most important task – flying the airplane.

Stadia currently comes in two models: the strut mounted model, and the tie-down ring mounted model. While both models use identical electronics and application software, there are differences in the hardware and airplane installation which will be covered in this document.



Figure 1 Two models of the Stadia device

Parts (Strut Mounted)

The strut mounted version of Stadia comes preassembled to be mounted onto an aircraft. Stadia uses two main pieces: the mounting block and the LIDAR unit (Fig 2). The LIDAR in the LIDAR unit seen in Fig 2 emits an infrared laser that is invisible to the naked eye. **DO NOT LOOK AT THE LIDAR WHILE IN OPERATION!** While short exposures to the infrared laser will not damage the eye, longer exposures may, so it is best to avoid looking directly into the LIDAR while the device is powered on.

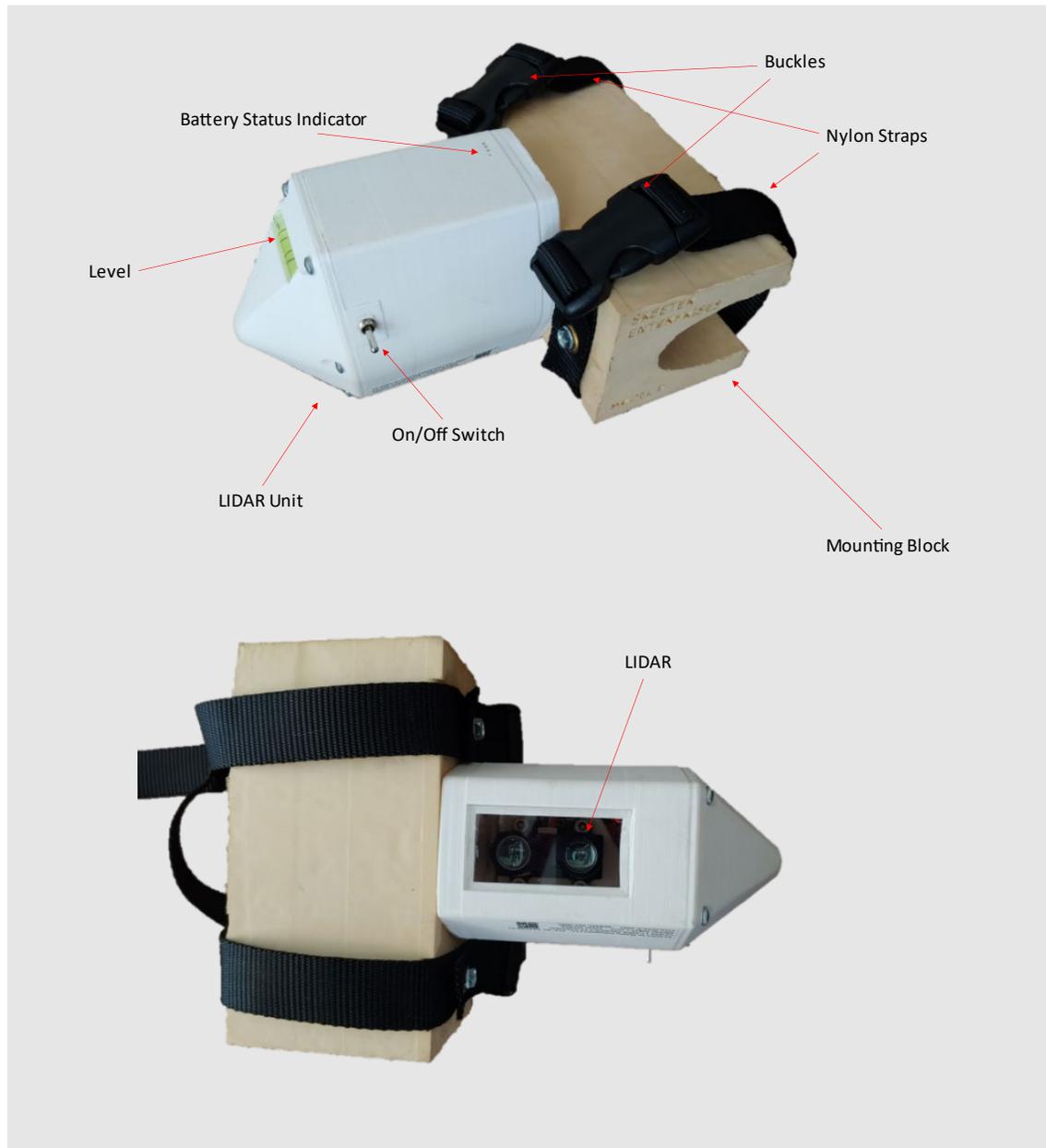


Figure 2 Stadia Top view and Bottom view



Figure 3 Strut mounted Stadia rear view

Parts (Tie-down Ring Mounted)

The tie-down ring mounted model of Stadia comes preassembled to be mounted onto an aircraft. Stadia uses two main pieces: the tie-down clamp assembly and the LIDAR unit (Fig XX). The LIDAR unit uses an identical LIDAR as seen in Fig. 2 previously, which emits an infrared laser that is invisible to the naked eye. **DO NOT LOOK AT THE LIDAR WHILE IN OPERATION!** While short exposures to the infrared laser will not damage the eye, longer exposures may, so it is best to avoid looking directly into the LIDAR while the device is powered on.

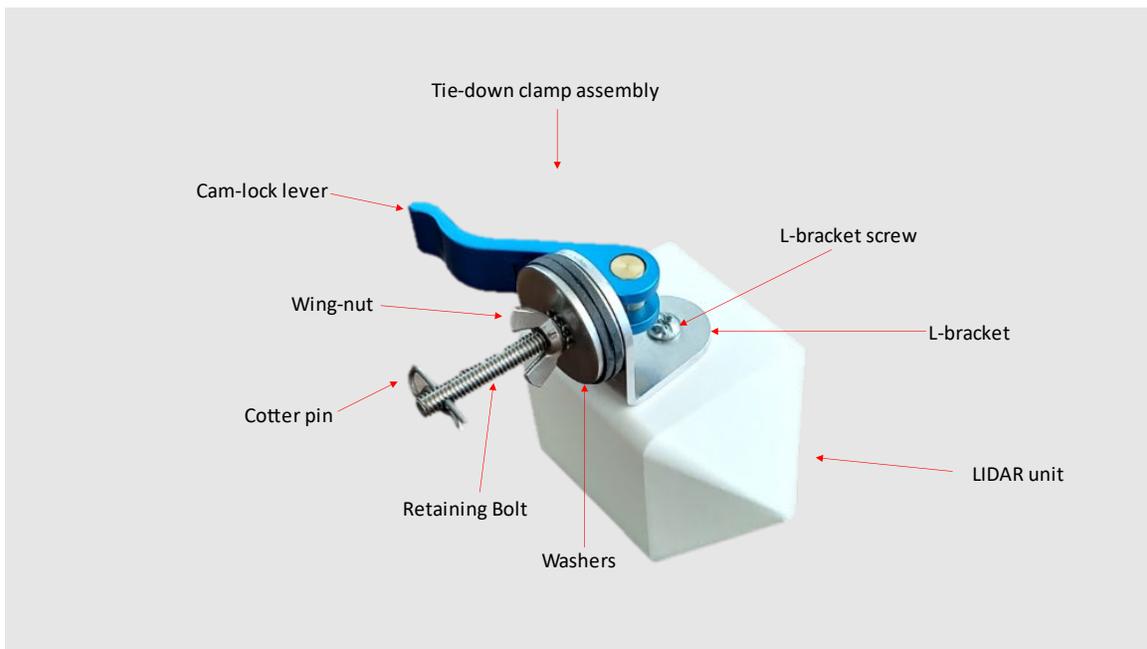


Figure 4 Tie-down ring mounted model of Stadia

Mounting (Strut Mounted)

The strut mounted model of Stadia is designed to be mounted to the wing strut (either side works equally well). Do not mount Stadia directly behind the propeller or above the wheels, as debris may damage the unit.

Release the buckles and fit the mounting block onto the leading edge of the wing strut. Attach the buckles and tighten down the straps as much as possible to ensure that the mounting block does not move on the strut. Make sure that no aircraft cables/wires are pinched between the Stadia straps and the strut.

Rotate the LIDAR unit until the bubble level indicates that the LIDAR unit is level.



Figure 5 Stadia showing rotation of the LIDAR unit



Figure 6 Previous Stadia model showing correct mounting on wing strut

Mounting (Tie-Down Ring Mounted)

The tie-down ring mounted model of Stadia is designed to be clamped to a tie down ring of an aircraft. If it is mounted to a tie down ring at the rear of the aircraft, care must be taken during takeoff and landing to ensure that Stadia is not damaged during rotation.

The tie-down ring mounted model of Stadia uses a modified version of the MyPilotPro GoPro airplane mount to secure Stadia to the aircraft. More details about MyPilotPro can be found on the website mypilotpro.com.

To install, remove the cotter pin and wing nut, along with the first metal washer and the first rubber neoprene washer. Insert the retaining bolt (attached to the rest of the Stadia hardware) through the eye of the tie-down ring. Replace the washers, wing nut and cotter pin in the order that they were taken off and tighten the wing nut so that is secure against the metal washer. Rotate the cam-lock lever to tighten the mechanism. Ensure that the top of the plastic Stadia housing is level with the bottom of the wing of the aircraft, and that the unit is fully facing forward (pointy end forward). If the unit is not facing fully forward, loosen the L-bracket screw one-quarter of a turn, rotate the Stadia unit appropriately, and then retighten the L-bracket screw. If the unit can rotate about the retaining bolt through the tie-down ring, unlock the cam-lock lever and tighten the wing nut further against the metal washer, then rotate the cam-lock lever to tighten the mechanism. Repeat this process as needed until Stadia is secure.



Figure 7 Stadia correctly mounted to a tie-down ring on a wing



Figure 8 Stadia correctly mounted to a tie-down ring at the tail

Operation

Once Stadia is securely mounted to the aircraft, flip the toggle switch up to On. A set of lights will illuminate on the Stadia device indicating the battery status. Once powered on, a connection can be made to the Stadia App. **DO NOT PAIR WITH STADIA THROUGH YOUR PHONES SETTINGS!** Only connect to Stadia through the Stadia app itself. Pairing through your phones settings may cause the device to malfunction. The Stadia Bluetooth name is “Stadia.”

When the Stadia App is opened, a short Splash Screen will show before taking the user to the Home Screen. Pressing the “Set Up Stadia” button that is located at the bottom will bring you to the Set-Up screen.

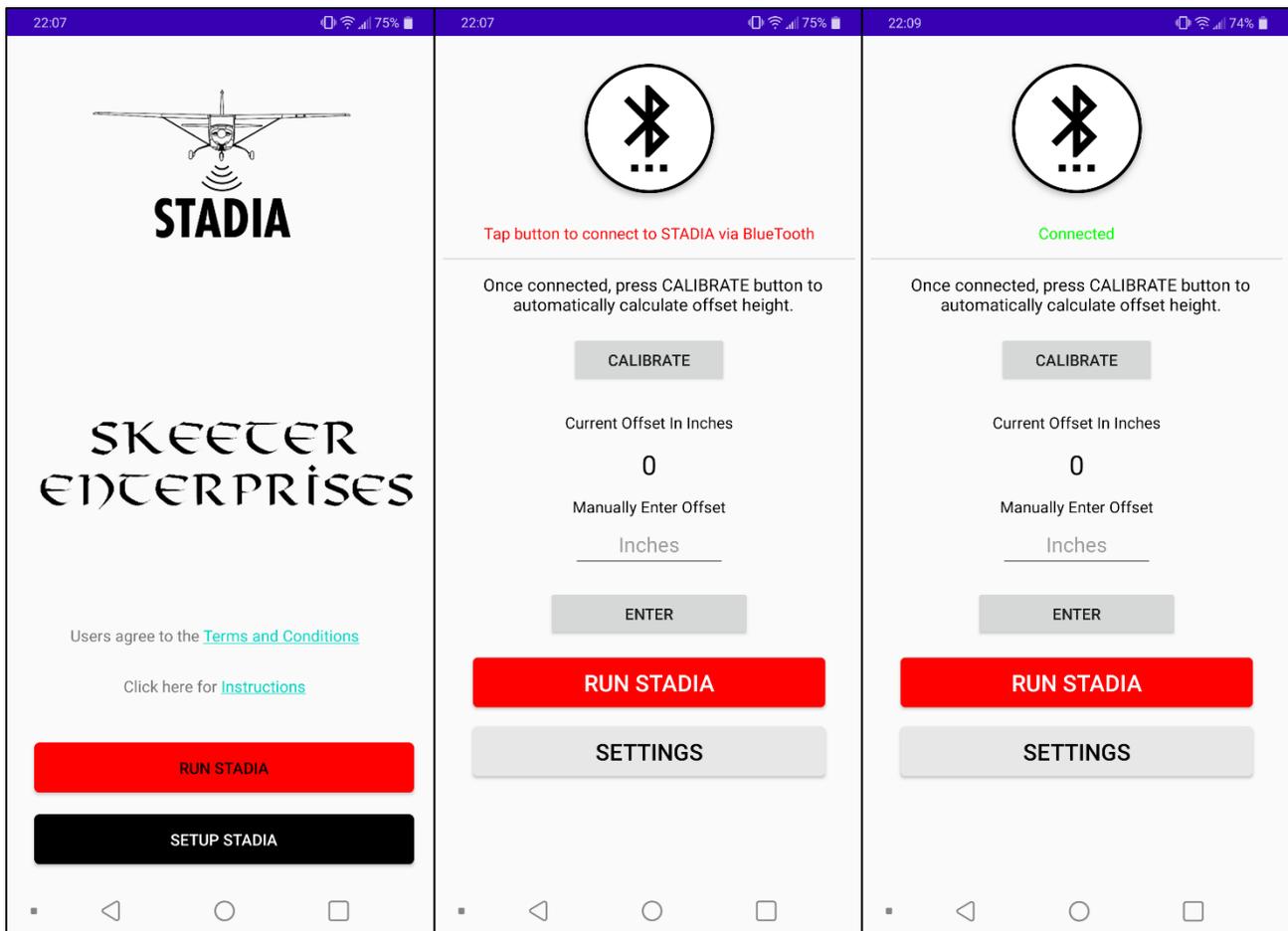


Figure 9 Home screen and Set-Up screens showing before and after a Bluetooth connection is made

Press the Bluetooth button at the top of the Set-Up screen. This will open a list of available paired Bluetooth devices. Press “Stadia” to connect to the device. On iPhones, after pressing “Stadia”, you will have to then press the red cancel button.

Back at the Set-Up screen the text below the Bluetooth button should be green and read “Connected”.

The next step is to calibrate the device for the aircraft. Calibration consists of measuring the distance from the Stadia unit to the ground while the aircraft is parked. This is done so that Stadia can factor this distance into its calculations and give you a true value of your aircraft's wheel height above the ground. Calibration can be done one of two ways: automated calibration, or manual input. If you choose the automated calibration, it is very important that Stadia is connected to the app, and that Stadia is in Active Mode, otherwise this process will not work.

For automated calibration, ensure that the aircraft is parked on level ground, and that the airplane is flight level. This means that tailwheel aircraft may need to be propped up in the rear. If this is not done, the automated calibration may be off as much as one foot. When the aircraft is flight level, and ensuring that Stadia is connected to the app, press the "CALIBRATE" button on the Set Up screen. A number should appear in the middle of your screen, giving you the offset distance in inches. This is the distance between the Stadia unit and the ground while the airplane is flight level.

For manual calibration, ensure that the aircraft is parked on level ground, and that the airplane is flight level. Measure the distance between the Stadia unit and the ground. Input this number into the text box labeled "INCHES" (or "Cm" in metric option) on the Set-Up screen, and then press the "Enter" button. The number you input should appear in the middle of your screen, giving you the offset distance.

The next step is to set up Stadia to your preferences. Press the “Settings” button in the Set Up screen.

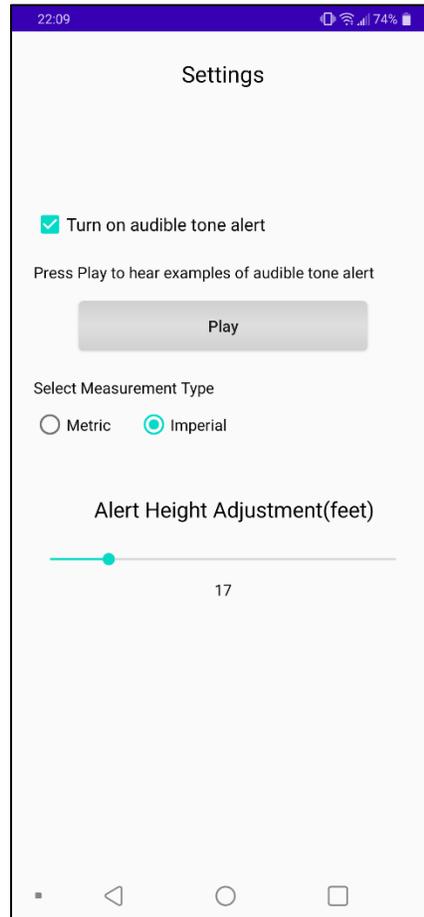


Figure 10 Stadia Settings

The 3 settings to control are: Altitude Tones, Measurement type (Imperial or Metric), and Alert Height adjustment:

-“Altitude Tones” – A series of audible beeping tones will play through your audio system. The frequency and pitch of the tones will increase as your above ground altitude decreases. This alert will only activate once you have descended below the Alert Height Altitude.

-“Measurement Type” – Allows the user to choose between Imperial or Metric units of measurement.

-“Alert Height Adjustment” slider – Changes the Alert Height Altitude at which the selected audio will begin warning you. The larger the Alert Height, the farther above the ground the warning systems will begin alerting you. No warnings/alerts will be given until you have descended below the selected Alert Height Altitude.

iPhones will have a fourth option:

-“Voice tone” – The aircraft height will be spoken to the pilot.

Once the settings are completed, press the back button to get to the Set-Up screen. At the Set-Up screen, press the red “RUN STADIA” button to begin using Stadia.

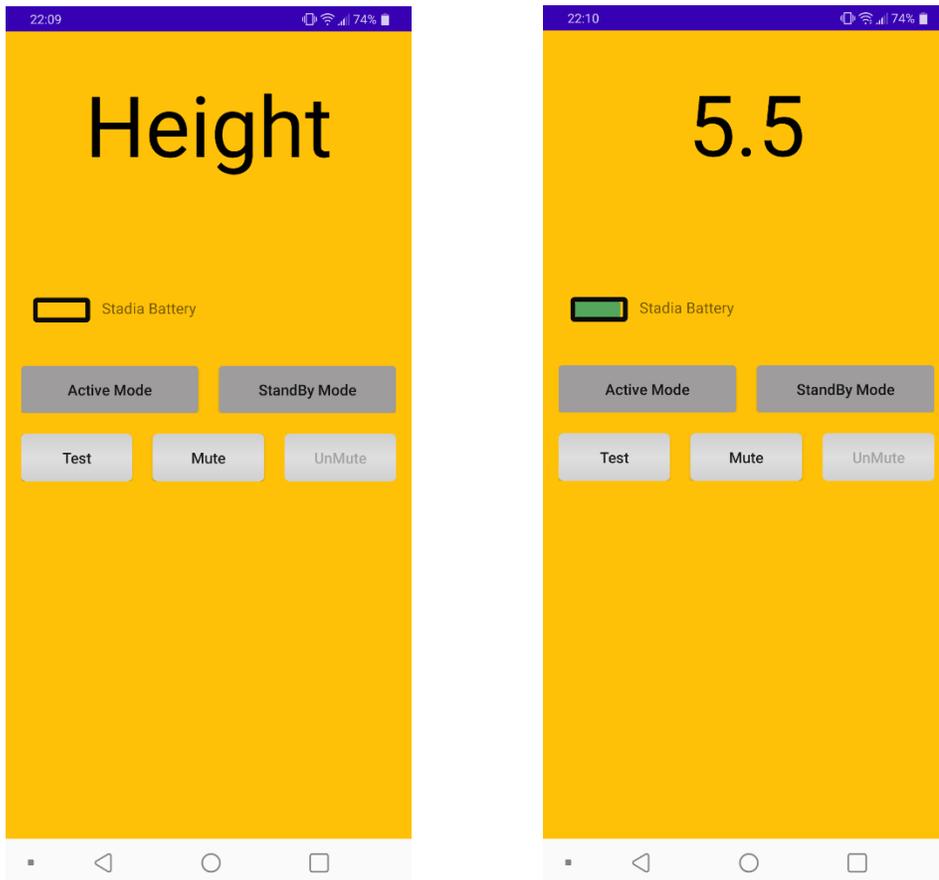


Figure 11 Stadia operation screen displaying "Height" indicating no Bluetooth connection. Screen displaying 5.5 indicates Stadia is 5.5 ft off of the ground

Fig 11 shows the Stadia Operation screen. Displayed at the top is the above ground altitude (AGL). This should be zero when you are on the ground if the calibration was done correctly. The AGL may vary slightly on the ground as Stadia tries to correct for errors. If your screen displays “Height”, this means that the phone/tablet is not correctly connected to the Stadia unit.

Below the height reading is “Stadia Battery” next to a battery symbol. This indicates the battery life available in the Stadia unit.

Below the battery indication are two gray buttons, “Active Mode” and “Standby Mode”. These buttons simply turn the LIDAR itself on or off, as running the LIDAR for an extended duration may damage it. Also, Standby mode decreases the power consumption of the Stadia unit. When in Active mode, the device will display the AGL. In Standby mode, the LIDAR is powered off and the AGL will instead read “Standby” as in Fig 12. Switching between these modes will take a few seconds. In both modes, the phone/tablet will remain connected to the Stadia unit via Bluetooth.

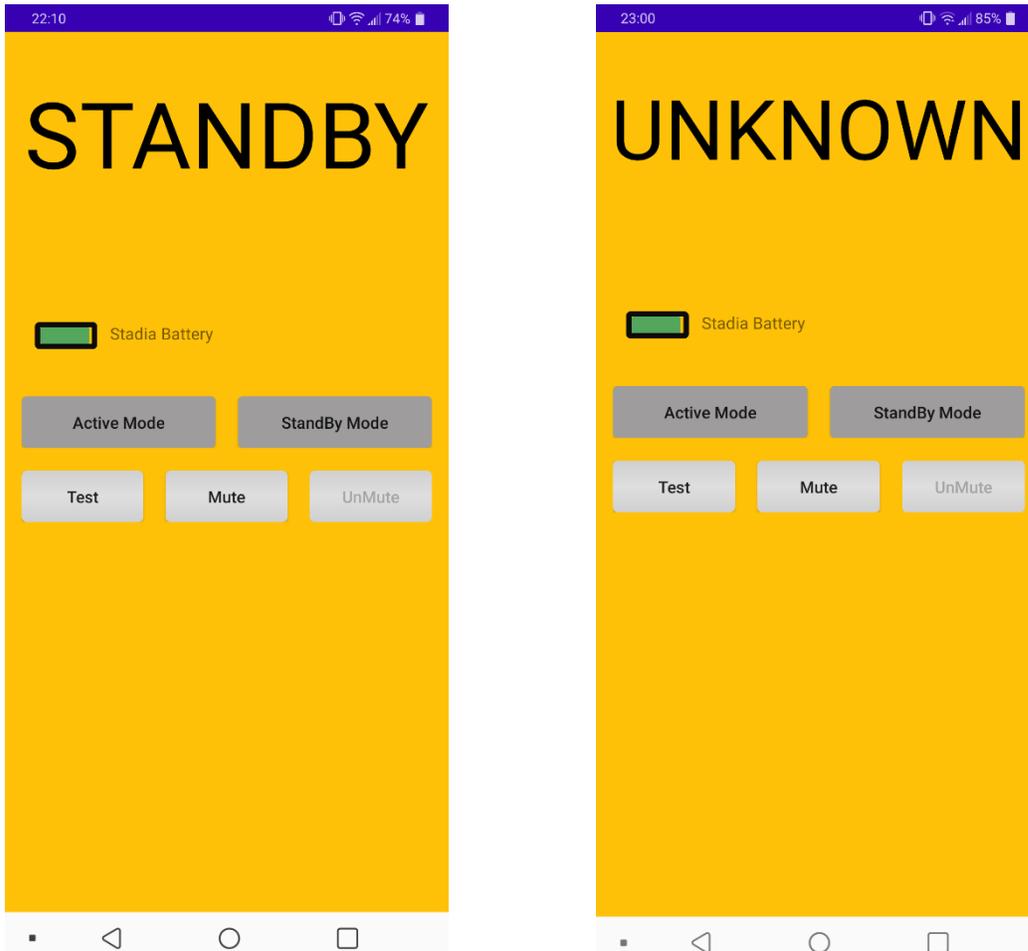


Figure 12 Stadia operation screen displaying "STANDBY" indicates that Stadia is in Standby Mode. "UNKNOWN" indicates that the LIDAR cannot receive clear return signal for measurement

Stadia has a maximum operational distance of 130ft in ideal conditions. If the LIDAR cannot receive a clear return signal for measurement (i.e., the ground is too far away), Stadia will display “UNKOWN” in the height display. See *Disclosures/Disclaimers* for more information.

If connection to the Stadia unit is lost, the app will automatically switch to the Settings screen and the green “Connected” message will instead display the red “Tap button to connect to STADIA via Bluetooth” to indicate that device connection has been lost. Some reasons for loss of connection could be depleted batteries, excessive distance between the Stadia unit and phone/tablet, metal objects interfering with the signal, or too many Bluetooth devices connected to the phone/tablet.

The three buttons below the Active Mode and Standby Mode buttons marked “Test”, “Mute”, and “UnMute” are straight forward. “Test” produces a short tone to indicate that audio is working properly. “Mute” & “UnMute” mute the phone/tablet’s audio.

Other

Charging

The Stadia unit runs on a rechargeable 21700 Li-Ion battery, with a built-in charge/discharge regulator. The system requires a 5V micro-USB cable to be recharged. The micro-USB cover protects the electronics from water and dust exposure. To charge, remove the micro-USB cover from the rear of the unit as seen in Fig 3 (this may need to be pried off with a flat tool or fingernail). Look inside to gauge the orientation of the micro-USB slot, and then insert the cable appropriately to charge. Looking at the top of the Stadia unit, you should see four LEDs. These LEDs indicate the battery charge. When the battery is full, all four LEDs will remain solidly illuminated. Remember to replace the micro-USB cover before use and ensure that it is fully inserted.

Automatic Reconnect

iPhones with the latest app version (2.6) have an automatic reconnect feature. Once the Stadia device is turned on and is close enough to the iPhone to receive Bluetooth signals, the Stadia device will automatically connect to the iPhone when the user is at the Set-Up screen. While in operation, if the Bluetooth signal disconnects the Stadia device will automatically reconnect with the iPhone once it is able to in the orange Operation screen.

Disclosures/Disclaimers

-Stadia produces an infrared laser that is invisible to the naked eye. When Stadia is powered on, this infrared laser may be emitted without the user being aware. It is incredibly important not to stare into the bottom of the enclosure (Fig 2) while the unit is turned on, as this could result in permanent eye damage.

-Stadia is not a substitute for instrument flight rules (IFR) guidelines, or proper flying procedures. Stadia is only meant to augment a pilot's sense of awareness, not replace it.

-Stadia works well in all light conditions, but not all weather conditions. Adverse weather conditions may include, but are not limited to, heavy fog, rain, snow, haze, or dust. These weather conditions will deteriorate Stadia's ability to give accurate AGL readings. It is ultimately the pilot's responsibility to ensure the aircraft's safe flight.

-Stadia does not compensate for the yaw, pitch, or roll of the aircraft. As such, these maneuvers will result in erroneous readings from Stadia. As an example, an aircraft flying at 100 ft AGL in a 20° bank using Stadia would read 106 ft AGL. It is important that the pilot recognizes this limitation of Stadia and appropriately compensates for it.

-The Stadia LIDAR has an effective range of no more than 130ft in ideal conditions. Ranges greater than 130ft will not return a signal. Less than ideal conditions may also not return a signal and may reduce the effective AGL range of Stadia. These conditions may include, but are not limited to; soft ground surface, surface water, leafy undergrowth etc. Particular attention must be paid to water landings, as the Stadia LIDAR is not meant to measure range over water. Very clear/still water may cause the LIDAR to range the bottom of the body of water instead of the top of the surface of the water.

-Stadia is an experimental avionics product and has not received FAA TSO approval. It is ultimately up to the user to determine the legality of using Stadia on their individual aircraft.

-Stadia has only been tested to a maximum airspeed of 120 mph (193 kph). The integrity of the Stadia attachment hardware is not guaranteed beyond this speed.

-Stadia is only approved for operation in temperatures between 0° F to 120° F (-18° C to 49°C). Charging Stadia should be done in temperatures between 32° F to 110° F (0° C to 43° C).