



SkyEcho

Installation and Pilot's Guide



UAV-1001130-001

ECCN 7A994



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1 Revision History

Revision	Date	Comments
A	4/24/17	Initial release
B	5/25/17	Export Control
C	6/5/17	Mobile app changes
D	7/4/17	Inclusion of UAT / Geofence

2 Warnings / Disclaimers

All device operational procedures must be learned on the ground.

Received traffic information is to be used as an aid to situational awareness and is merely supplemental and advisory in nature.

uAvionix is not liable for damages arising from the use or misuse of this product.

This equipment is classified by the United States Department of Commerce's Bureau of Industry and Security (BIS) as Export Control Classification Number (ECCN) 7A994.

These items are controlled by the U.S. Government and authorized for export only to the country of ultimate destination for use by the ultimate consignee or end-user(s) herein identified. They may not be resold, transferred, or otherwise disposed of, to any other country or to any person other than the authorized ultimate consignee or end-user(s), either in their original form or after being incorporated into other items, without first obtaining approval from the U.S. government or as otherwise authorized by U.S. law and regulations.

3 Limited Warranty

uAvionix products are warranted to be free from defects in material and workmanship for one year from purchase. For the duration of the warranty period, uAvionix, at its sole option, will repair or replace any product which fails in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor, provided that the customer shall be responsible for any transportation cost.

This warranty does not apply to cosmetic damage, consumable parts, damage caused by accident, abuse, misuse, water, fire or flood, damage caused by unauthorized servicing, or product that has been modified or altered.

IN NO EVENT SHALL UAVIONIX BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE OR INABILITY TO USE THE PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

Warranty Service

Warranty repair service shall be provided directly by uAvionix.

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5 Introduction

The SkyEcho is a portable ADS-B transceiver. It incorporates dual ADS-B band 1090 MHz and 978 MHz UAT receivers and 1090 MHz Class A0 transmitter limited to 20W. The SkyEcho includes a precision WAAS GPS, barometer, and Wi-Fi support for interface to EFB applications.

SkyEcho is designed to meet the performance requirements of United Kingdom (UK) Civil Aviation Authority (CAA) Electronic Conspicuity (EC) CAP 1931.



EC devices are intended for voluntary carriage on registered and non-registered UK Annex II aircraft, non-complex EASA aircraft of <5700kg MTOM and for gliders and balloons (including those covered under ELA 1 and ELA 2) within uncontrolled UK airspace.



An EC device cannot be used at the same time as a transponder and it doesn't replace the need for a transponder when required by airspace/flight rules. If your aircraft is fitted with a working transponder, you must switch off the transmitter function of your EC device.



An internal geofence prevents SkyEcho from transmission within North America. Within North America, receive functionality is supported.

5.1 Features

The SkyEcho performs the following functions:

- 1090ES reception (1090 MHz)
 - Receives ADS-B In data from aircraft equipped with 1090 MHz Extended Squitter transmitters.
- 978 UAT reception (978 MHz)
 - Receives ADS-B In data from aircraft equipped with 978 MHz UAT transmitters. Receives Flight Information Services (FIS) and Traffic Information Services (TIS) compliant with UAT where available.

- 1090ES transmission (1090 MHz)
 - Transmits ADS-B Out data on the 1090 MHz frequency.
- WAAS GPS reception
 - High precision SBAS (WAAS) and RAIM enabled GPS provides position data for ADS-B Out transmissions.
- Barometric Altimeter for pressure altitude
- Traffic correlation
 - Traffic information is correlated to provide a coherent view of nearby aircraft.
- GDL 90 output
 - Traffic, ownship, and FIS/TIS data are translated to standard GDL 90 format for WiFi transmission to compatible situational display applications.
- Wi-Fi EFB connection

The GDL 90 data is transmitted over the built-in Wi-Fi interface for reception by standards compliant with Electronic Flight Bag (EFB) applications.
- Integrated rechargeable battery

The integrated rechargeable battery provides 5 hours of continuous use. The battery is recharged through micro-USB connection, which can also provide power to SkyEcho directly.

5.2 Regulatory Compliance

The SkyEcho meets the Minimum Operational Performance Standards of DO-260B Class A0 with the output power limited to 20W and meets the performance requirements of TSO-C166b

5.2.1 CAA CAP 1391 Declaration

An EC device that operates using ADS-B at 1090MHz must have a Declaration of Capability and Conformance from the manufacturer before you can legally use it on board an aircraft. The pilot in command of the aircraft is responsible for ensuring that the EC device has a valid declaration.

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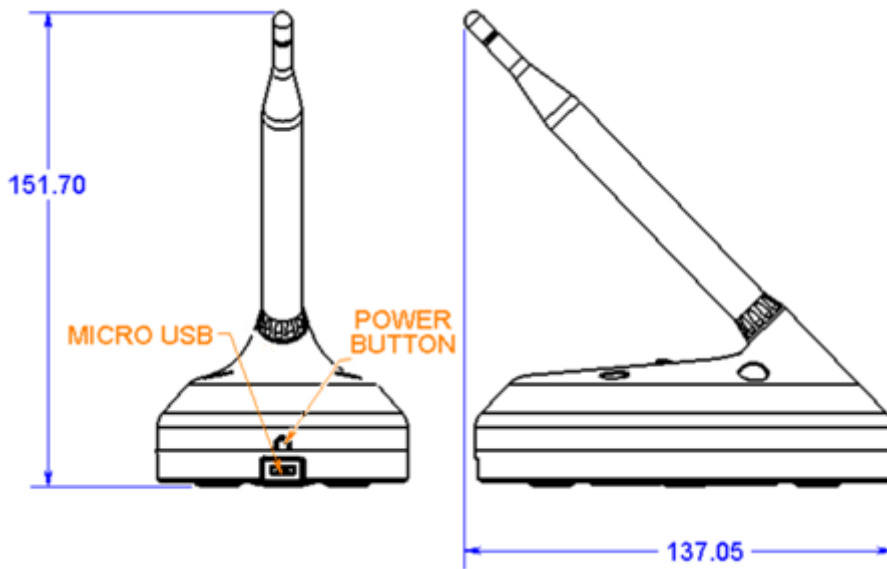


Please refer to the CAA EC Web page for more information:

<https://www.caa.co.uk/General-aviation/Aircraft-ownership-and-maintenance/Electronic-Conspicuity-devices/>

Reference number	Issue number	Manufacturer	Type number	Category
UK.CAA.DoCC.000004	Issue 0	uAvionix Inc	SkyEcho	Intermediate

6 Specifications



Specification	Value
Input Power	5V USB 500mW
Size	45x80x135mm
Weight	200grams
SIL/SDA	0/0
Operating Temp	-45 to 80°C
Transmitter	
Frequency	1090MHz ±1MHz
Transmit Power	20W Nominal
Spectral Performance	DO-260B
Receiver	
MTL 1090MHz	-88dBm
1090 Dynamic Range	-87 to 0dBm
MTL 978MHz	-99dBm
978 Dynamic Range	-99 to 10dBm
WAAS GPS	
Augmentation	SBAS
Sensitivity	-167dBm
Altimeter	
Range	-1000 to 60,000ft
Interfaces	
WIFI	
Control	GDL 90
Configuration	GDL 90
Ownship	GDL 90
Battery	
Internal 1200mAHr 5 hour operating life	

7 Limitations

7.1 Installation

SkyEcho is a completely self contained portable device with no required installation for external antenna, power source, or physical installation into the aircraft.

Modifications and use outside of intended scope

This device has been designed and tested to conform to all applicable standards in the original form and when configured with the components

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shipped with the device. It is not permissible to modify the device, use the device for any use outside of the intended scope, or use the device with any antenna other than the one shipped with the device.

Important Pilot Advisory Note Regarding Safety of Radio Frequency Energy

Safe use of this device requires care as to the placement of the antenna. Place the antenna at least 4cm away from any part of your body or that of other cabin occupants. To stop all RF emissions, remove power from the equipment. Only handle the antenna when power is disconnected. Advise your passenger(s) to avoid contact with the antenna while power is applied to the equipment. Retain these instructions with your maintenance logs/files and for future reference.

FCC RF Radiation Exposure Statement

This equipment complies with FCC RF radiation exposure limits (Table 1 of 47Pt1 (i) 1.1310) set forth for a Public/Uncontrolled environment.

Mode-S or ATCRBS

If the aircraft has an operating Mode-S transponder or ATCRBS beacon, the Transceiver must be deactivated. Deactivation of the device is accomplished by removing device power or disabling the transmit capability via the control setting in the uAvionix Echo mobile application.

Proximity to other equipment

Mount the SkyEcho so that it does not compromise the operation of any other proximate communication or navigation antenna or system.

Altimeter Cross Check

The reported altitude must be cross-checked against the aircraft's altimeter during pre-flight.

Harmful Interference

It is the responsibility of the pilot to ensure that the Transceiver causes no harmful interference to other onboard equipment and systems.

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Configurable Options

Accessing or altering configurable options not intended to be operated may cause pilot distraction.

See and Avoid

The SkyEcho is intended to be an aid to 'see and avoid'. Maneuvers to regain adequate separation should not be based on alerts issued by this device alone.

Approvals

Approvals do not cover adaptations to the aircraft necessary to accommodate ancillary equipment such as power provisions, mounting devices or external antennas, such items must still be approved under existing minor modification/change processes applicable to the aircraft.

Warning: This transceiver is to be used to improve pilot situational awareness only and as a navigational aid. It is not intended for use in IFR flight conditions. uAvionix is not responsible for the transceiver's end use and will not be held liable for any events occurring from its use.

Usage Within North America

Usage within North America is limited to receive functionality only. An internal geofence prohibits transmission within North America.

8 Equipment Installation

This section describes the installation of the SkyEcho and related accessories in the aircraft, including mounting, wiring, and connections.

8.1 Mounting

SkyEcho is approved as a portable ECD. SkyEcho should be placed on the aircraft glare shield with antenna forward line of sight and visibility to the sky for the internal GPS.

8.2 Connections

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1. Connect the provided antenna to the SMA connector on the top of the unit.
2. Connect a micro-USB cable to the micro-USB port in order to provide direct power or to charge the battery.
3. Care should be taken to make sure all devices are secure and will not interfere with pilot visibility or aircraft operation.

8.3 Installation Setup

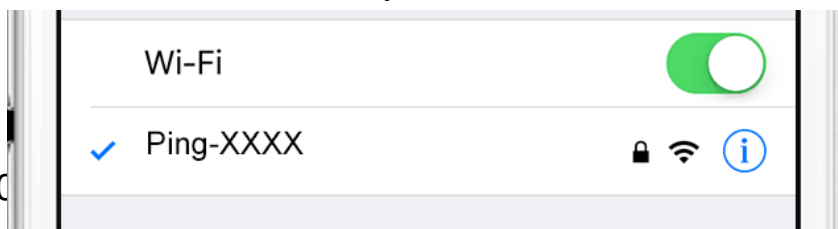
Download the “uAvionix Echo Installer” app from the IOS App store or Google Play.



8.3.1 Connecting to the SkyEcho via WiFi

To connect to the SkyEcho join a device to the wireless network named Ping-XXXX using the procedure for your device. iOS is shown below:

1. Go to **Settings > Wi-Fi**, and make sure that Wi-Fi is turned on.
2. Tap the SSID **Ping-XXXX** where XXXX is a random string. i.e. Ping-6A8E
3. If required enter **uavionix** as the WPA password for the secure Wi-Fi network, then tap join. Note: **The No Internet Connection** message is normal when iOS is connected to SkyEcho.



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4. Launch the Echo App.

For proper operation the following parameters must be configured:

- Device Type
- Control
- ICAO (Aircraft Registration)
- Call Sign
- Emitter Category
- Air/Ground Threshold Speed (V_{S0})
- Aircraft Length
- Aircraft Width
- GPS Antenna Offset from Roll Axis
- GPS Antenna Offset from Nose

The screenshot shows the 'Configuration' screen of the Echo app. At the top, it says 'echo' with a signal icon and 'CONNECTED TO DEVICE'. Below that are two tabs: 'Configuration' (selected) and 'Monitor'. The settings are as follows:

- Selected Device Type:** ATT-20B SkyEcho
- Control:** 1090ES TX enabled
- ICAO Number (hex):** A00001
- Call Sign:** ECHO20B
- Emitter Category:** Light Airplane
- V_{S0} (knots):** 1
- Aircraft Length (meters):** L ≤ 15
- Aircraft Width (meters):** W ≤ 23
- GPS Antenna Offset, Lateral from roll axis (meters):** 0
- GPS Antenna Offset, Longitudinal aft from aircraft nose (meters):** 0

An 'Update' button is located at the bottom of the configuration screen.

8.3.2 Device Type

The echo application should detect SkyEcho automatically.

8.3.3 Control

Select a control type. This setting configures SkyEcho for transmit, receive or standby.

- 1090ES TX Enabled: enables transmit and receive functions.

- Receive Only: disables transmissions but continues to provide received ADS-B data to a GDL90 compatible application.
- Standby: Disables the transmit and receive functions. GDL90 position data is still available from the device.

8.3.4 Aircraft Address Programming

The ICAO address is a 24-bit number issued to the aircraft by the registration authority of the aircraft. These addresses are usually written as a 6-digit hexadecimal number, although you may also encounter one written as an 8-digit octal number. The SkyEcho understands the hexadecimal format, so you must first convert an octal number to hexadecimal before entering.

8.3.5 Emitter Category

To assist ATC tracking of aircraft, an aircraft category can be transmitted. Select the aircraft category that most closely matches the aircraft. Emitter Category can be set as follows:

Light Airplane	Rotorcraft
Small Airplane	Glider / Sailplane
Large Airplane	Lighter Than Air
Large Airplane with High Vortex	Parachute
Heavy Airplane	Ultralight
Highly Maneuverable Airplane	UAV
	Space Craft

8.3.6 Call Sign

CALL SIGN is an 8 digit code that corresponds to the tail number of the aircraft. (0-9, A-F).

8.3.7 Aircraft Length and Width in Meters

On the ground, ADS-B transmits encoded aircraft size information which is used by ATC to identify taxiing routes and potential conflicts. Enter the

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length and width (wingspan) fields and the appropriate size codes will be calculated for transmission.

Enter the Aircraft Length in Meters

$L \leq 15$	$55 < L \leq 65$
$15 < L \leq 25$	$65 < L \leq 75$
$25 < L \leq 35$	$75 < L \leq 85$
$35 < L \leq 45$	$L > 85$
$45 < L \leq 55$	

Enter the Aircraft Width (wing span) in Meters

$W \leq 72.5$
$72.5 < W \leq 80$

8.3.8 GPS Antenna Offset

The GPS antenna offset is used in conjunction with the length and width to manage taxiway conflicts. A typical GPS does not report the geographic position of the center of the aircraft, or even the tip of the nose of the aircraft; instead, it usually reports the location of the actual GPS antenna (not the GPS receiver). In normal flight operation this distinction is of no importance at all, but if ADS-B is used to manage taxiway conflicts, a significant offset in antenna position could mean that the aircraft footprint is not in the same place as the ADS-B reported position. Although the GPS Antenna Offset is primarily intended for position correction on large transport aircraft, General Aviation aircraft can also have a significant offset. For example, if the aircraft has a long tail boom and the GPS antenna is on top of the tail, the GPS position could be 4 meters or more from the nose of the aircraft.

Enter the GPS Antenna Offset Lateral from Roll axis (Meters)

0	Left 4
Left 2	Left 6

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Right 2

Right 6

Right 4

Enter the GPS Antenna Offset Longitudinal from Aircraft nose (Meters)

0 to 60 Meters in 2 Meter increments

8.3.9 VSO (knots)

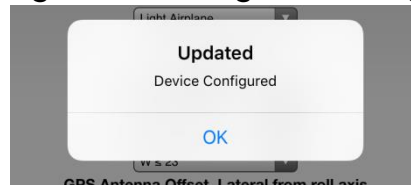
This parameter allows the SkyEcho to automatically switch between airborne and ground modes.

Enter the airspeed (in kts) that the aircraft typically flies after take-off.

0-999 knots

8.4 Update and Confirm Configuration

1. After entering the correct information for all fields press Update. You should receive a message confirming the configuration. Tap OK.



2. Tap Monitor just below the Echo logo. Confirm the ICAO, Callsign and Emitter shown are correct values for your aircraft.
3. Programming of the SkyEcho is complete.

9 Normal Operation

9.1 Battery Pack / Charging

The integrated battery pack needs to be fully charged before use.

Connect the micro-USB cable to the connector in the rear of the SkyEcho in order to charge the battery. The BLUE LED will remain lit during charging, and will extinguish when the battery is fully charged.

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9.2 Power On/Off

Press and hold the momentary power switch for approximately 3 seconds to power the SkyEcho on.

Press and hold the momentary power switch for approximately 3 seconds to power the SkyEcho off.

9.3 Indicators

There are a 3 LEDs visible through the top cover of SkyEcho.

LED	Flashing	On
BLUE (above micro-USB connector)	N/A	Battery Charging
Green (above micro-USB connector)	Power button pressed	Power On
RED (above power button)	N/A	GPS Lock

9.4 Electronic Flightbag Application

Launch your GDL 90 compatible Electronic Flight Bag (EFB) application.

Configure your EFB as necessary to access the device. In most applications, it will be automatically detected.

ADS-B traffic and flight information should begin streaming to the application when in range.

SkyDemon displaying ADS-B traffic from SkyEcho is shown below.



Altitude must be pre-flight cross-checked by comparing the aircraft's altimeter with the GPS altitude displayed on the EFB application.

9.5 Transmit Control

Transmit must be deactivated when used on an aircraft with an air traffic control radar beacon system (ATCRBS) or Mode-S transponder. Transmit can be disabled using the Echo application and selecting Receive Only or Standby. The device can also be disabled by powering the unit down using the power button.

For additional questions or support please visit <http://uavionix.com/support>