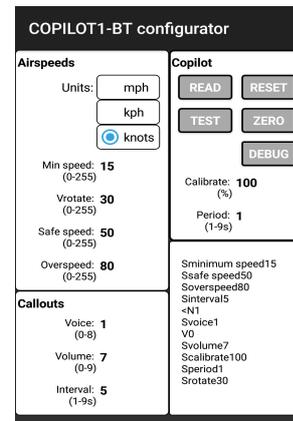
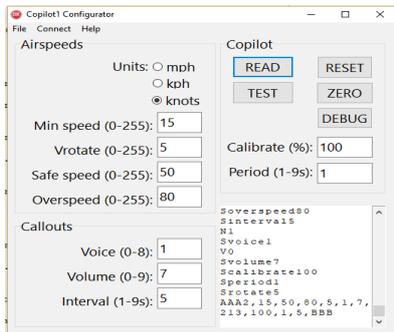


# COPILOT1 User Guide

Software version 1.2

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## What it is

- **Copilot** calls out your airspeed during critical phases of flight (takeoff, slow flight, landing, overspeed), so you can concentrate on flying your aircraft without having to scan your ASI.
- **Copilot** is available in two versions- USB or Bluetooth. The USB version can be configured from your PC using a Windows app; the Bluetooth version via your Android smartphone using an Android app.
- The standard **Copilot** will operate up to 150knots with +/-2.25knot accuracy. There is also a special high speed option for up to 190kts with +/-4.75knot accuracy.

## How it works

- **Copilot** taps into your airdata pitot/static system to monitor airspeed, with an audio output to your intercom/audio system.
- If airspeed is above a minimum level (to eliminate callouts during taxi) but below a 'safe' climbout/approach speed, or during an overspeed condition, it will call out your airspeed at regular intervals. (eg sixty....sixty... sixty-one...sixty...fifty-nine...)
- It also calls out 'Rotate' as you accelerate past Vr
- Any time you are flying below the 'safe' airspeed (eg takeoff, slow flight, landing) or exceeding VNE your **Copilot** will assist you to safely manage airspeed.
- The speeds (minimum, Vr, safe, VNE, units) and callouts (voice, volume, repetition rate) are all user programmable via the **Copilot Configurator** Windows or Android app.

## Hardware installation

***This equipment is primarily intended for installation in uncertified aircraft. Certified aircraft installations will require the appropriate modification approvals and documentation. In both cases, careful review of the installation by an experienced LAME or IA is highly recommended.***

- Connect power via the **POWER** jack. Centre pin to +12V (preferably via radio/intercom switched and fused supply, outer to ground).
- Connect the **PITOT** port to your pitot line. You will need to tee into the line, and preferably use flexible model aircraft silicone rubber fuel tube to the pressure port to avoid putting stress on the plastic port nipple. Best to put a small zip-tie around the tube at the nipple to ensure no leaks.
- Connect the **STATIC** port to your static line.. Again, 2.5mm silicone tubing with small cable tie at nipple. If no static system just leave unconnected
- Connect the 3mm **AUDIO** out jack tip to an auxiliary input on your intercom system. To help avoid interference, use shielded cable terminated at one end only.
- If you do not have an auxiliary input, connect to your system via an existing audio input via a 10K resistor.

### Cautions:

- The pressure transducer is a sensitive device- do not blow into the ports.
- The small bore transducer nipples and tube can be blocked by a small slug of moisture or a kink- ensure the tubing is clear and dry and routed with no kinks or pinches.
- **Test your airdata pitot and static lines for no leakage and correct ALT/ASI indication after installation.**

### Software installation- Windows/USB version

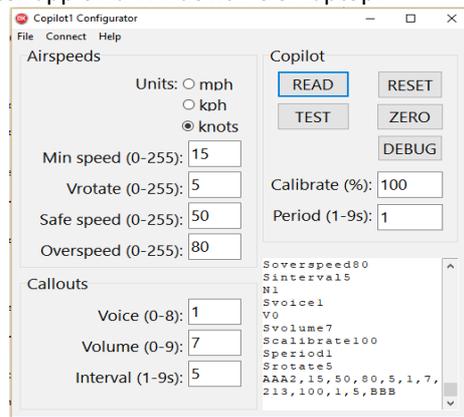
- Download the **COPILOT.EXE** file from the sparxfly website
- <http://www.sparxfly.co.nz/2014/documents/COPILOT1.exe>.
- Save the file to a suitable folder on your PC- (eg C:\Copilot)

### Software installation- Android/Bluetooth version

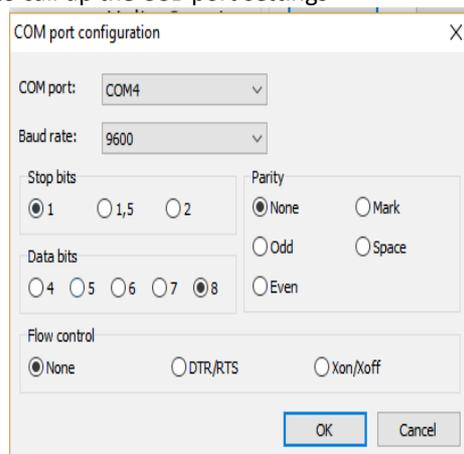
- Download and install the Copilot1 app from the Play Store
- <https://play.google.com/store/apps/details?id=nz.co.sparxfly.copilot1.bt>

### Connecting- Windows/USB version

- Easiest to do this on the bench prior to installation, but you may also need to tweak after installation.
- Ensure the **Copilot** unit is powered up, and connected to your computer via its USB port.
- You may need to identify the COM port connected to the **Copilot** unit by opening the Windows settings/devices and look for the device labelled COPILOT1.
- Open the **Copilot Configurator** app on a Windows PC or laptop.



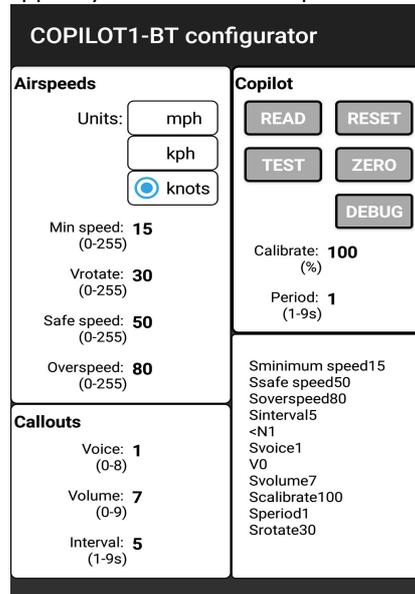
- Click on the **Connect** menu to call up the USB port settings



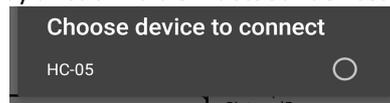
- Select the COM port connected to the **Copilot** unit.
- Check that Baud rate 9600, 1 stop bit, 8 data bits, no parity, no flow control are selected.
- Click **OK** to connect.
- Back in the main window, click **READ** to read the current settings from the **Copilot**. This will also confirm you have communications- if no luck then try another COM port in the **Connect** menu.

### Connecting- Android/Bluetooth version

- This can easily be done in-situ in the aircraft.
- Ensure the **Copilot** unit is powered up.
- Open the **Copilot Configurator** app on your Android smartphone.



- Tap on the 3 dot 'hamburger' icon on the top right of screen to call up the menu, then tap on 'Connect'.
- The app will search for and display a list of visible Bluetooth devices.



- Tap on **HC-05** to connect to the Copilot device.
- Back in the main window, tap **READ** to read the current settings from the **Copilot**. This will also confirm you have communications.

### Configuring- both versions

- The **READ** button loads and displays the current settings from the Copilot.
- The **TEST** button triggers a test callout with the software version.
- Edit the airspeed and callout settings to suit your aircraft.
- As each change is made the Copilot will read back the change (if connected to an audio system/intercom/headset/etc)- give it time to do so before keying the next entry.
- Settings-
  - **UNITS**- select mph, kph or knots
  - **MIN SPEED**- set the minimum airspeed for callouts, typically somewhere just above taxi speed to avoid unnecessary callouts on the ground
  - **Vrotate**- set the airspeed for 'Rotate' callout.
  - **SAFE SPEED**- set the airspeed below which callouts will occur, typically somewhere below cruise but above climbout and approach speed
  - **OVERSPEED**- set the airspeed above which overspeed callouts will occur, typically just below Vne.
  - **VOICE**- select the voice for callouts. Voice 1 sounds the most authoritative.
  - **VOLUME**- adjust the audio volume for good balance with intercom and radio.
  - **INTERVAL**- set the repetition interval for callouts (in seconds), typically 4 or 5 seconds
  - **CALIBRATE**- adjust the airspeed calibration for minor pitot installation/positioning errors.
  - **PERIOD**- set the averaging period (in seconds). A longer period smooths airspeed readings but slows response to speed changes.
- The **ZERO** and **DEBUG** buttons are for debug purposes.
- The log window in the lower right shows communications from the **Copilot**- also for debug purposes.
- Disconnect the Copilot from your computer- it is good to go!

Configuration settings	Default	Range	Yours
Units	Knots	kmh/mph/kts	
Minimum airspeed	15	0-255	
Vrotate	30	0-255	
Safe airspeed	50	0-255	
VNE/overspeed	80	0-255	
Repeat interval	4s	0-9s	
Voice	1	0-8	
Volume	7	0-9	
Calibrate %	100	0-255	
Period	1	0-9s	

## Specifications

### Physical

- Size 80x55x30 mm / 3x2x1 inch (approx)
- Weight 55 gm / 2 oz
- Mounting user choice- double sided foam tape recommended

### Environmental

- Temperature 10-60C / 50-140F
- Vibration not specified

### Power supply

- Physical standard DC power jack, 2mm/0.08" centre pin, centre pin positive
- Voltage 10-35 VDC
- Current 80mA

### Airdata input

- Physical 2.5mm barbed static and pitot ports, avoid fluids and mechanical stress
- Operating speed 0-150kts/170mph/280kph (standard version)  
0-190kts/220mph/350kph (high speed version)
- Accuracy +/-1.5% of full scale (+/-2.25kt/2.55mph/4.2kmh) (standard version)  
+/-2.5% of full scale (+/-4.75kt/5.5mph/8.75kmh) (high speed version)
- Resolution 2kt/2mph/3kmh

### Callouts

- Physical 3.5mm stereo jack
- Electrical -48 to +18dBm
- Power up "copilot 1 ready- your aircraft"
- Vr "Rotate"
- Slow flight eg "sixty...sixty...fifty-nine...fifty-nine...sixty..."
- Overspeed eg "one hundred and forty...one hundred and forty..."
- Test message "copilot 1 version x"

## Version notes

- 1.0 Initial development/prototype hardware version
- 1.1 Added Vr support
- 1.2 Added Bluetooth support

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**Disclaimer:**

***This product is intended as an aid to VFR piloting. It may be subject to inaccuracy or failure due to installation or operation. It should not be used as a primary indication of airspeed or for IFR flight.***

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