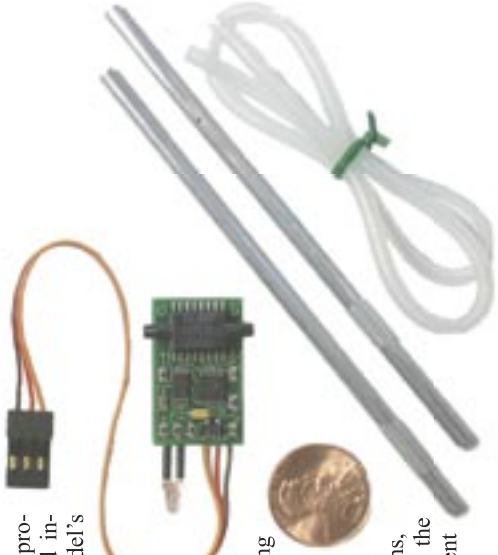
How Fast™

Model Aircraft Airspeed Instrument

Version 2



The *How Fast* Airspeed Instrument provides you with a simple, easy, and inexpensive way to measure your model's airspeed. It provides at-the-field readings right after your flight – without the need for a computer or any additional equipment.

INSTALLATION

The *How Fast* measures airspeed using the same technique that is used in full-scale aircraft – differential pressure sensing. The included Pitot and static probes mount in the leading edge of the wing. In some applications (gliders, pushers, twins, and jets) the probes can be mounted in the nose of the aircraft. The same alignment and spacing guidelines apply.

Mounting the Probes

- Choose a location far enough out on the wing to be clear of direct air from the propeller (propwash).
- The probes should point directly into the direction of flight (see Fig. 1).
- The tip of the Pitot probe (the straight-through tube) should extend at least ½ inch (12 mm) beyond the leading edge of the wing.
- The static probe has one end sealed and a series of small side holes. The plugged end faces forward. The small holes should be at least ½ inch (12 mm) from the leading edge of the wing.
- Position the two probes at least ½ inch (12 mm) apart (see Fig. 2).

For a removable mount, you can put the probes on the top or bottom wing surface – just be sure the probe tips extend the recommended distance beyond the leading edge. The tubes can be shortened, if needed, to fit your application. Clean the tubes with alcohol (or other solvent) and glue in position with epoxy, hot-melt, or other glue.

Mounting the Circuit Board

Mount the circuit board anywhere convenient. It is so small and light (2.7 grams) that it is usually easiest to mount it in the wing close to the probes. You will need to access the Light-Emitting Diode (LED) to read the airspeed. We recommend drilling a 1/8 inch (3mm) hole in the top surface of the wing so that the LED can point toward the sky for easy activation and reading. Figure 3 shows

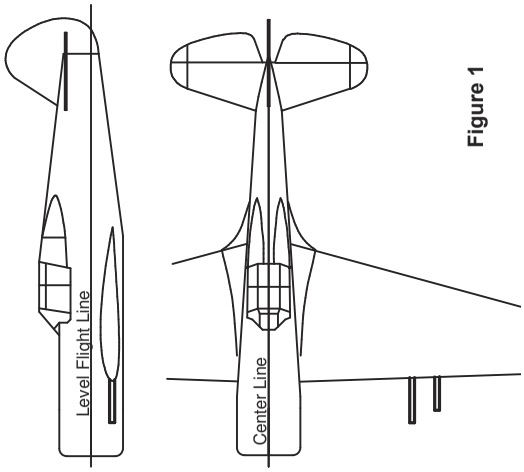


Figure 1

WARRANTY

We want you to be happy with your purchase. If you are not satisfied with any product purchased directly from us, return it within 30 days for a full refund of your purchase price. We also provide a one-year replacement warranty on any device that stops working properly - regardless of cause (even crash damage).

Add convenience and capability to your *How Fast* instrument:

See How™

Display Unit for the *How High*™ Altimeter and the *How Fast*™ Airspeed Instrument

- Eliminates Flash Counting
  - Ten-flight memory
  - No added airborne weight
  - High-speed data transfer
- Enables In-Flight Capturing of Altitudes or Airspeeds
  - Capture up to 9 points per flight – triggered by your R/C transmitter
  - Easy post-flight viewing

www.WingedShadow.com

Winged Shadow Systems • PO Box 432 • Streamwood, IL 60107 • (630)837-6553 • wingedshadow.com • Made in USA •

• Made in the USA •
www.WingedShadow.com

How Fast™

Airspeed Instrument

SPECIFICATIONS

Output Method:
Grouped light flashes

Output Activation:
Power cycle or finger wave

Airspeed Range:
15 to 500 MPH (24 to 800 km/h)

Report Resolution:
1 MPH (1 km/h)
0.1 with optional *See How* display

Voltage Input:
3.2V min., 12.0V max.

Current Input:
1.3 mA (average)

Size (Circuit Board):
1.05 x 0.65 in. (26.7 x 16.5 mm)

Weight:
2.7 grams (Circuit Board & Wires)

www.WingedShadow.com

Winged Shadow Systems
P.O. Box 432 • Streamwood, IL 60107
support@wingedshadow.com
(630) 837-6553
Made in USA

How Fast™

Airspeed Instrument

VERSION 2
- Now Easier to Use -
- English/Metric Selectable -

- **Reports Max Airspeed**
- **1 MPH (1 km/h) Resolution**
- **No Computer Needed**
- **Sensor Probes Included**
- **Works on its own or with the *See How*™ display unit.**

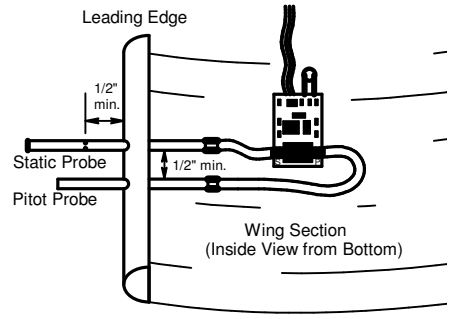


Figure 2

an example installation. Simply bend the LED lead wires as needed. Mount the circuit board with a small square of double-sided foam tape or Velcro.

Use the supplied flexible tubing to connect the probes to the sensor on the circuit board. Connect the straight-through Pitot tube to the side of the sensor marked "P", and the static tube to the side marked "S". The length of the flexible tubing is not critical. For long runs substitute model fuel line for the supplied light-weight tubing to reduce the chance of pinching or kinking.

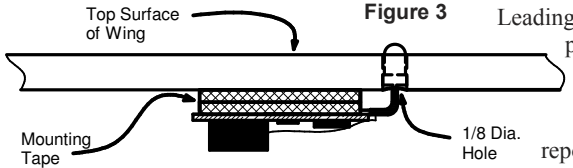


Figure 3

Electrical Connection

For R/C aircraft, simply plug the *How Fast* into any unused servo channel on your receiver. The supplied with connector is compatible with most brands of R/C equipment. If all channels are in use, you can use a "Y" adapter and share a channel with a servo. If you need longer wires, use a standard aileron extension. On DSC-compatible receivers, do not use the "DSC" or "DSC/battery" slot.

For free-flight (and other stand-alone applications) you will need to provide a voltage source between 3.2V and 12V. You can use a mating connector (or cut off the existing connector) and add a battery holder and a power switch. Connect the RED wire to the POSITIVE (+) battery terminal. Connect the BROWN and ORANGE wires to the NEGATIVE (-) battery terminal.

OPERATION

Using the *How Fast* is easy. Simply turn the unit on, make your flight as usual, and read your maximum airspeed after you land.

Power Up

Apply power to the *How Fast*. The LED will light up for about 3 seconds indicating the MPH or km/h setting. A flickering LED indicates 'km/h' mode; a steady LED indicates 'MPH' mode. The unit will then report the maximum airspeed of your last flight using a series of flashes. For example, an airspeed of 123 MPH (or km/h) will report as 1 flash followed by a pause, 2 flashes, another pause, then 3 flashes.

flash
flash-flash
flash-flash-flash

Each group of flashes represents one digit. Leading zeros are suppressed, so 89 will report as 8 flashes, pause, 9 flashes. A zero is represented by a quick double flash (you will know it when you see it). After the last flash of the airspeed report, the LED will remain off for 4 to 6 seconds so you will know the report is complete. New units will initially display a factory test value between 160 and 180.

After the airspeed report, the *How Fast* will enter measurement mode and the LED will output a brief flash every 2 seconds. This "heartbeat" lets you know the unit is on and all is well.

Reporting Max Airspeed

After landing, you can view the maximum airspeed of your flight using any of three different methods: **A**, **B**, or **C**.

Selecting MPH or km/h

To change the units used when displaying airspeeds:

1. Turn the power on. The LED will come on steady (MPH) or flicker (km/h) for about three seconds.
2. As soon as the LED turns off, switch off the power (within 1/2 second).
3. Repeat steps 1 & 2 **four** times in a row. The mode will switch from MPH to km/h (or vise versa).

The change will take effect on your next flight. The last flight in memory will not change.

Finger Wave Technique

- Make sure the LED is pointed directly at the sun, the brightest area of a cloudy sky, or other light source – and not blocked by your shadow.
- Briskly wave your finger back and forth in front of the LED.
- Come very close to the LED as your finger passes over.
- Move your finger completely past the LED on each side by two or three inches (50-75 mm).
- Don't go too slow. About two "round trip" cycles per second is good.
- Flexing your hand at the wrist works better than just moving your finger.
- Usually, only 2 or 3 passes are needed. If it is not working, try re-aiming the LED toward the light.

A. Cycle the power. Simply turn the unit off, and then turn it back on. It will perform the power-up sequence described previously; blinking the LED to report max airspeed. It does not matter how long you have the power off (one second or one year).

B. Wave your finger. With the LED pointing toward the sun, or the brightest part of the sky if its cloudy, wave your finger back and forth across the LED. (See the "Finger Wave Technique" box above.) When the unit recognizes your wave, the LED will come on for 3 seconds. At this point, stop waving and start counting! The unit will report the max airspeed by flashing the LED just like in the power-up case. You do not have to cycle the power. After the airspeed report, the *How Fast* is ready for your next flight.

C. Use the *See How* Display. Hold the *See How* Display (sold separately) up to the LED and your flight data is quickly transferred and displayed digitally. This optional accessory displays speed with 1/10 MPH (km/h) resolution, features a 10-flight memory, and adds the ability to view up to 9 additional airspeeds captured during your flight.

Notes on Operation

The airspeed information is saved in non-volatile memory, so you can view it as often as you like. Simply cycle the power or wave your finger over the LED.

When your next flight reaches a speed of about 15 MPH (24 km/h) the *How Fast* will replace the old flight data with new data. Your plane must fly at least this fast for the speed to be recorded.

The *How Fast* makes reference measurements at power-up and when you activate the display. On windy days, avoid pointing the probes into the wind at these times.

ALTITUDE CORRECTION

Like the airspeed instrument in full-scale aircraft, the *How Fast* reports indicated airspeed (IAS). IAS is extremely useful since it consistently aligns with aerodynamic parameters such as stall speed. However, IAS only equals true airspeed (TAS) at sea level on a "standard day". True air speed is affected by air density, which varies with altitude, and to a lesser extent with temperature and humidity.

Multiply the correction factor from the table below by the *How Fast* reading to get true airspeed. For example, if your field is 2000ft above sea level – use the 2000ft value of 1.03. If the *How Fast* indicates 75 MPH then:

TAS = 75 x 1.03 = 77.25 MPH

Using your approximate field elevation (above sea level) for altitude will provide good results. Note that a 1000ft change in altitude makes only a 1.5% change in airspeed.

For further improved accuracy, you can use a density altitude calculator to adjust your altitude for barometric pressure, temperature, and humidity. Online density altitude calculators are available at sites such as: *http://www.pilotfriend.com/calcs/calculators/density.htm*

Altitude in Feet	Correction Factor
0	1.000
1,000	1.015
2,000	1.030
3,000	1.045
4,000	1.061
5,000	1.077
6,000	1.093
8,000	1.127
10,000	1.163

Altitude in Meters	Correction Factor
0	1,000
250	1,011
500	1,022
750	1,034
1.000	1,046
1.250	1,058
1.500	1,070
2.000	1,095
3.000	1,147