

COMPETITION AIRCRAFT PROPELLER PROTRACTOR

The Protector is a precision, highly accurate and simple to use device for checking, setting or changing propeller pitch. The Angle Cube resolution and repeatability is 0.05 degree and the accuracy is +/- 0.2 degree. It is powered with a rechargeable battery. A charging cable is supplied. An optional data connect kit is available to transfer measured data to a computer.

The Angle Cube can be used for other angle measuring applications such as checking and adjusting wing incidence, rotorcraft blade angles and tail-dragger ground angles. Aside from aircraft or airboat use, the gage can be used for measuring or setting table saw blade angles, machining or drilling angles or any other application requiring precision angle measurement. Magnets on three sides can be used to hold the unit to appropriate surfaces.

When the Angle Cube is magnetically attached to the protractor clip, the unit becomes a simple and accurate tool to measure blade angles.

Instructions

Angle Cube Operation

To power on and read absolute level, push the "LEVEL" button. LEVEL will show in the upper LH corner. Two small solid "triangles" will appear at each side of the digital readout of the absolute angle indicating which direction you are from level. Above 10 degrees from level, a small solid square will appear with the triangles.

To measure a relative angle, place the Angle Cube on the desired reference surface and press the "ZERO" button. Move the Angle Cube to the second surface and read the relative angle between the two surfaces. To switch back to absolute level measuring again, push and hold the "LEVEL" button for three seconds.

To hold a reading, push "HOLD" button. "HOLD" will be displayed at the upper-center of the display. To disable the HOLD function push "HOLD" button again.

If a "battery" symbol appears on the LCD display or the gauge does not power up, use the supplied screwdriver to remove the back and replace the battery.

To power off, push the "LEVEL" button. The unit will self power off within 3-5 minutes when not in use.

Propeller Protractor Operation

Propeller pitch can be measured and set with the propeller on or off the vehicle. We describe the more involved task of pitch adjustment with the propeller attached. It does not matter if the plane of propeller rotation is off from vertical as in a tail dragger. Tractor or pusher installations can be accommodated.

The process will be easier if there is no compression in the engine, making prop rotation easier and smoother. Remove one spark plug per cylinder. Also, carefully chock the wheels on both sides to prevent aircraft movement. For any other vehicle, such as an airboat, the unit must be locked in place.

Read and follow propeller manufacturer's instructions for loosening blades. Set all blades at approximately the same angle by "eyeball." Have the blades loose enough to twist, but not so loose as to be "floppy."

The protractor kit includes four small spirit levels. Each level has one surface with a Scotch brand (R100) reusable double sided tape. Be sure the blades are clean and dry to give long life to the reusable tape. Rotate one blade to roughly horizontal position with the leading edge up and using a tape measure or other straight "rod," record the vertical distance from a fixed spot on the floor to a fixed point on the blade lower (trailing) edge at or near the tip. Remove the adhesive liner from one spirit level and attach it to a convenient and readable place near the outer end of the blade. It must read level as close as possible. When you remove the spirit level to reposition, peel it off rather than pulling perpendicular to the tape. Repeat for the other blades, using the same distance and reference points (floor and blade) as before.

If you have a square tipped prop, the angle clip will attach nicely to the tip with easy repeatability from blade to blade. However, if the tip is any shape but square or you wish to measure the blade angle at a point other than near the tip, you must establish a reference line along a chord line. Measure and mark the desired distance in from the tip on all blades and use the protractor clip (level the spirit level attached to the clip) to establish a level line. Place a strip of masking tape next to the clip. Remember to have the spirit levels (previously attached to the blades) indicating level before you level the clip. The clip itself must have the flat surface of the blade against the flat surface of the clip and the top of the clip against the blade leading edge.

You must establish a reference surface on the propeller hub. The faceplate is ideal. Turn the Angle Cube "on" and with the clip/level attached; hold it against the reference surface. Cross level the Cube. Record the angle. Press "ZERO". Note that the display now reads zero. Go to the first blade, zero the spirit level and attach the propeller clip at the pre-marked location or tip and check its level. Attach the Cube to the clip. Very important note: **The Cube must maintain the same approximate orientation and view position as when the reference was established.** Twist the blade until the desired angle is indicated. Lightly clamp the blade at the hub if possible. Go to the succeeding blades and repeat. Recheck the blade angles and tighten blade clamps per manufacturer's specs.

Note: If you leave the Angle Cube unmoved for 3-5 minutes while doing the settings, it will power off automatically. To avoid this, move it occasionally. If it does shut off, just reset the unit at the reference point and proceed. Compare with the recorded original angle for repeatability.

We have described a typical propeller pitch setting operation. Your application may require some modification or refinement of the procedure to set the pitch. The method is not important; the results are. Properly done, the pitch should be well within 0.2 degrees which is far better than most other systems.

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