## Check Out Your Instruments

There are easy ways to determine the accuracy of your panel indicators; by doing so, you may know them intimately for the first time



by ROBERT L. SQUIBB . AOPA 152762

forget to reduce airspeed slowly while recording the indicated airspeed at time of stall so that actual indicated readings are as steady as possible.

The turn and bank indicator is a solid member of the primary panel. I have had little experience with the venturi-operated turn and bank; however, I have had an electrical one short out, thus inactivating the needle. Best you can do with the turn and bank indicator is to roll the plane slowly and estimate needle deflection. Equal banks should give equal deflection. If you have a gyro horizon, check right and left needle deflection against the bank indicated on the gyro. If they don't agree, then one or the other is out. The timed turn should indicate which is out. Next try timing some turns to the right and left at different needle widths.

Most indicators are calibrated to give a 3° per second rate of turn per needle width. Kick the rudder around and the skidding and slipping of the plane will demonstrate whether or not the ball rolls free and easy.

Sensitive altimeters very often are inaccurate. How many times have you adjusted your instrument to the barometric pressure reading given by the tower prior to landing or takeoff only to find 50 to 150 feet difference between the actual field elevation and the altitude reading given by your "adjusted" instrument. Professional pilots, especially those who fly IFR, keep a constant check on their altimeters. While my altimeter has always behaved fairly well, I keep it calibrated by setting my altimeter to the actual field elevation before take-(Continued on page 51)

A ave you ever questioned whether or not the various instruments on your plane's panel tell the truth? Or do you, like many pilots, accept the registered data as gospel? It has been stated many times that a pilot usually doesn't get to know his instruments until he begins to study instrument flight. I have found there's another way of becoming intimately acquainted with airplane instruments, and that is by calibration. Webster defines calibration as the act of checking the accuracy of graduations

Let's start with the airspeed indicator. This instrument is notorious for appearing to lag behind in its readings. This is a normal phenomenon due to the momentum or inertia of the airplane; however, many indicators will overdo it within certain speed ranges. One plane I flew had such an indicator; it didn't estimate airspeed below 50 m.p.h., while above 50 m.p.h. the instrument seemed to work satisfactorily. If you are flying by the seat of your pants, such an indicator may be okay; personally, I like mine to register smoothly from 10 m.p.h. and up.

You can check your airspeed indicator a number of ways. Pick a calm day and fly both ways over a measured course. You might build up enough enthusiasm while doing this to try several throttle settings and perhaps one or more altitudes. Try checking your airspeed readings on takeoff and again during stalls. Make a record of the indicated airspeed together with notes on gross weight and environmental conditions. Don't

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off and recording the corresponding barometric pressure reading given by the instrument; this I compare with the official pressure reading for the field. This may also be done in reverse; before landing. set the altimeter to the official pressure reading for the field as given by the tower, and after landing compare the altimeter reading with the actual altitude of the field. All these data may be easily kept in tabular form.

How often do you have your compass swung? Radio navigation has been so simplified that many pilots are actually losing their ability to fly by dead reckoning. Accurate compass headings don't bother the Sunday flyer since those who do not have radio navigation equipment in their planes depend on the "iron, concrete or water" compasses.

Regardless of what the deviation card says, I still think every pilot should make a routine check of his compass. If you have a directional gyro you can do both at the same time. The procedure I use is to cage the gyro to the magnetic direction of the runway prior to takeoff. It isn't always easy to do this since many private fields don't know the exact magnetic bearings of their runways. You may have to take along a hand compass of known accuracy and determine runway magnetic directions before takeoffs. After leaving the ground, I uncage the gyro and then check the difference between the readings of the gyro and magnetic compasses during (1) the straight-away and (2) the 90° turn. By staying in the pattern you can catch the 180° reading on the downwind leg. The gyro should indicate the 90° and 180° turns accurately; compasses will need to be corrected for deviations. Compasses and gyros can also be checked while in cross-country flight by flying parallel to marked runways or along roads of a known direction.

Don't forget that innumerable things may cause a magnetic compass to deviate. I can recall one routine check I made following a takeoff prior to flying over a jungle area. On comparing the compass reading to what it should have been on the downwind leg I found a 30° deviation—my passenger had placed his pistol in the adjacent glove compartment!

If you find that your oil temperature gauge indicates that your engine heats up too rapidly and runs unusually hot or vice versa, have a competent mechanic pull and test the gauge. Thermocouples are not infallible; replacement of a defective gauge can not only go a long way toward relieving the anxiety of a conscientious pilot but it may save wear and tear on a good engine. Even your air temperature gauge should be checked now and then. These usually can be calibrated with water of known temperatures.

Most pilots watch their gas gauges rather closely. Many types are calibrated rather broadly as: full, <sup>3</sup>/<sub>4</sub>, <sup>1</sup>/<sub>2</sub>, 1/4 and empty. If you would like to know something more about the idiosyncrasies of your gas gauge, wait until a general check which requires complete draining of the tanks. Then jack up the

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## THE AUTHOR

Robert L. Squibb, author of "Check Out Your Instruments," is chairman of the poultry department of Rutgers University at New Brunswick, N.J. The AOPA'er took up flying over 15 years ago in order to carry his research farther afield. Farther afield for Squibb has been largely Central America where he has gained most of his flying experience. In the tropics, where there is no radio navigation, Squibb says, compasses must tell the truth. "Starting out by calibrating my compass, I ended up by calibrating everything, no doubt because working in research, I am scientifically inclined to question everything."

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tail until the fuselage is in flying attitude. Add gas a gallon at a time and mark the corresponding amounts on the gauges. This procedure is especially adaptable to Cessnas. Of course, within a short period you'll have to calibrate the calibrations—that's part of the fun. Calibrated gas tanks are of most benefit to the cross-country flyer. Knowing approximately the gas consumption of your engine for the power settings selected, calibrated gauges serve to crosscheck these data. Calibrated gas gauges should not be used by the pilot to extend the range of his aircraft.

How about your radio's dial? Steady use and age may have thrown it out of alignment. Check the indicated frequencies on the dial in flight by tuning in and identifying the tower while still some 20 miles out. This not only saves time later but acts as a check on the radio's dial markings. Discrepancies can be indicated on the dial.

Having included the radio as an instrument, let's not forget the trim tab. Roll it to its indicated neutral position and get out of the plane and check to see if it really is neutral. If not, adjust the trim tab control until the tab is in its neutral position and then re-mark the indicator.

Sure—none of these suggestions are necessary if you fly by the seat of your pants and your engine operates correctly in spite of the indications of its instruments. There are all kinds of instruments and pilot procedures for checking them; many are far superior to those suggested herein. It is not the purpose of this article to promote calibration procedures as a cure for ailing instruments. If the foregoing arouses a pilot's curiosity to the extent that he may ask himself "Is my altimeter accurate?" then it has served its purpose. END



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