

The Mature Market for ELECTRIC ATTITUDE INDICATORS

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The instrument panels in today's personal aircraft are truly marvelous. Compared with even 10 years ago, avionics in the typical piston single or twin leverages the revolutions in microprocessors and software to present more information with greater accuracy than ever before.

With the advent of avionics systems like the Garmin G1000, digital attitude and heading reference systems boast reliability figures exceeding the typical airframe's expected useful life.

Of course, new airplanes aren't the only ones flying: Thousands of older aircraft continue to give their operators excellent service — thank you — using radios and other equipment with roots going back to World War II. That these aircraft continue to provide safe, efficient transportation is a testament to their engineers and the professionals maintaining them. But, even the most well-maintained airplane can have an Achilles' heel: vacuum or air-driven flight instruments.

Any aircraft flown in weather conditions preventing flight by visual reference to the horizon is required to have a functioning set of flight instruments powered by independent sources. Usually, this means altimetry and airspeed instruments, using the aircraft's pitot-static system, electric turn coordinator, attitude indicator and directional gyro powered by an engine-driven vacuum or air pump.

While any device can fail, vacuum- and air-driven instruments and

the systems powering them have an unenviable record of failures. Even more troubling is the inability of many pilots flying in instrument conditions to recognize these failures and successfully control their airplane until a safe landing can be made.

In their defense, one of the reasons some pilots prove incapable of handling such a failure is its insidious nature: Over a few minutes, the instrument would slowly start to lose accuracy, adding to a pilot's workload and presenting bewildering information. Only recently were vacuum- and air-driven gyro instruments available with failure warning flags.

In addition to more and better training, pilots and owners concerned about failure of their vacuum- and air-driven flight instruments can install an electric backup. Typically, they choose an attitude indicator because it's more safety-critical than the directional gyro — and the magnetic compass, for all its errors, already is coming along for the ride.

Recognizing the value of an electric backup attitude indicator, the FAA, in 2003, published Advisory Circular 91-75, "Attitude Indicator," which provides guidance to non-commercial operators of Part 23-certificated airplanes (or airplanes certificated under earlier equivalent regulations) weighing less than 12,500 pounds on substituting an approved attitude indicator for the rate-of-turn indicator.

At first, the market for electric atti-

tude indicators in the typical piston airplane included only products that were heavy, expensive and rare — or a combination of all three. But demand from pilots who would rather fly their familiar aircraft than upgrade to one with the latest and greatest "glass" panels has resulted in today's mature market for electric attitude indicators.

Gone are the days when an owner — and his avionics shop — might be forced to adapt something from a jet to work in a piston airplane.

Today's offerings are lighter and more reliable than their predecessors and come with features making them easier to install and use in a wider variety of aircraft than ever before. This includes internal lighting, integrated inclinometers for slip/skid indications, selectable panel tilt for helicopters and even battery backup.

Here are some highlights of what's available:

Kelly Manufacturing Co. / R.C. Allen

The R.C. Allen line of gyro instruments, produced by the Kelly Manufacturing Co., includes the RCA26 electric attitude indicators in the traditional 3-1/8 inch form factor. The instruments are available with or without movable roll pointers, internal lighting and inclinometers.

On request, the company also can incorporate custom color schemes to replace the traditional blue-over-brown presentation. All models in the RCA26



Kelly Manufacturing produces the RCA26.

line include a “pull-to-cage” handle. The units are available in either 14v or 28v configurations.

For more information, contact Kelly Manufacturing Co. at 800-722-4976 or visit www.kellymfg.com.

Mid-Continent Instruments / The Lifesaver

Mid-Continent Instruments is known throughout the general aviation industry for its repair, overhaul and exchange services. Perhaps not so well known is its development and production of new products, including the 4200 (2 inch) and 4300 (3-1/8 inch) line of electric attitude indicators, all of which are lit internally and operate on 10v to 32v DC.

Definitely the pricier of the two, the 4200 series weighs only 1.5 lbs. and is designed for both fixed- and rotary-wing aircraft where panel space is at a premium. The instrument can



Mid-Continent Instruments' 4300 series is dubbed “The Lifesaver.”

Installing the Electric AI

As avionics installations go, the electric attitude indicator is almost foolproof. Of course, it should be on its own circuit breaker, tied to the avionics buss and wired according to the FAA and the manufacturer's recommendations. But that part of the installation is easy — the hard part can come when choosing a panel location for the new device.

While the primary market for an electric attitude indicator is the piston-powered single or twin depending on air- or vacuum-driven primary gyros, panel space can be at a premium. This is especially true with older aircraft sporting original panels built before the standard “T” arrangement of flight instruments became common.

In many instances, it may be tempting to mount the new addition out of the pilot's regular scan, perhaps on the panel's far side. Don't, even if the pilot/owner paying for it agrees.

Instead, installers should plan to place the electric attitude indicator close to the existing flight instruments. This may mean some additional work to relocate some non-essential devices, but the effort is well worth it and should be supported by the customer. Why? Two words: Spatial disorientation.

On Oct. 16, 2000, a Cessna 335 piston twin crashed near Hillsboro, Mo., killing all three aboard. Night instrument conditions prevailed for the flight. Shortly after take-off from the St. Louis Downtown Airport in Cahokia, Ill., the pilot reported to air traffic control the primary attitude indicator was not “reading properly” and that he had “his hands full.” Subsequently, the pilot said he was trying to use the attitude indicator on the co-pilot's side of the panel.

Despite being properly trained and certificated for the flight — and despite there being another certificated pilot aboard flying as a passenger in the cabin-class piston twin — the flying pilot lost control of the aircraft at 7,700 feet while attempting to execute a climbing left turn.

The National Transportation Safety Board determined the pilot's failure to control the airplane and the subsequent loss of control resulted from spatial disorientation. Although the airplane was equipped with a second attitude indicator, it was located on the far right side of the panel, a location the NTSB said required the pilot to make “frequent, rapid head movements to cross-check that instrument with the other instruments.”

The NTSB concluded the “pilot's head movements most likely caused him to experience spatial disorientation.”

Although the backup attitude indicator in this accident was vacuum-powered, the same principle applies when choosing a location for one powered by electricity. Installers should work with their customers before installation begins and take great care to place backup instruments, like electric attitude indicators, in locations where pilots can cross-check them easily and without significant head movement.

be ordered with up to a 20-degree panel tilt as well as in a configuration to match existing instruments or EFIS displays, minimizing a pilot's need to transition to them.

Dubbed “The Lifesaver,” Mid-Continent's 4300 series, on the other

hand, is more affordable and flexible. Needing the same voltage requirements as its smaller sibling, options available on the 4300s include a backup lead-acid battery providing up to one hour of operation as well as front

Continued on following page

ELECTRIC ATTITUDE INDICATORS

Continued from page 41

panel annunciators. Like many of the electric attitude indicators available today, the 4300 series is available with a panel tilt specified by the customer.

For more information, contact Mid-Continent Instruments at 800-624-6845 or visit www.mcico.com or www.lifesavergyro.com.

Sporty's Pilot Shop / Castleberry Instruments

Known for its charts and pilot supplies, Sporty's recently began offering an electric attitude indicator manufactured in the United States by Castleberry Instruments. Available in the 3-1/8 inch form factor, the Sporty's product includes an inclinometer, enabling operators to move their turn coordinator to a more convenient loca-



Castleberry Instruments' 2060 can be purchased through Sporty's.

tion. It is available in either 14v or 28v versions.

The units are backlit and feature a pull-to-cage knob. Sporty's offers a two-year warranty on its electric attitude indicators.

For more information, contact Sporty's Pilot Shop at 800-776-7897 or visit www.sportys.com.

The products listed here all are designed and marketed for certified aircraft; manufacturers, including Falcon and Trutrak Flight Systems, offer non-certified electric attitude indicators for experimental aircraft.

While redundancy in aviation often is thought to require two engines and two sets of aircraft systems, installing an electric attitude indicator can provide an active instrument-rated pilot with an extra margin of safety beyond what might have been the industry standard when his or her airplane was manufactured.

Supplying an electric alternative to the "old-tech" air- and vacuum-driven gyro instruments in a customer's airplane literally can be a lifesaver on that cold and rainy night when the primary gyro rolls over and dies. □