Getting The Most Out Of Your Autopilot (Feb 2007)

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Whether you are flying hard IFR or just out in search of the best $100 hamburger, there's one piece of equipment that's right in your panel that can cut the workload on any flight you make – your autopilot. That is if you use it.

Truth be told, the majority of pilots rarely take the time to get to know the capabilities of their airplane's autopilot. Operationally speaking, they're a lot like airborne weather radars – many airplanes have them, but very few pilots ever take the time to learn how to use it. Sure you could read the Owner's Manual, but what self-respecting pilot will do that?

But you have a lot of money invested in your airplane and the Pilot's Operating Handbook (POH) that came with your particular autopilot is the best place to start to get the most out of that investment.

"Pilots need to spend time reading their autopilot's POH. It won't take long and it will greatly increase their understanding and confidence in using their autopilot on every flight," Greg Plantz, Director of Sales, S-TEC Corporation said. One of the first things it will tell you is whether yours is a rate-based or an attitude-based autopilot.

Is your autopilot rate-based or attitude-based?

As Plantz explained it, an attitude-based system it is going to get its input from your vacuum-driven attitude gyro, while a rate-based autopilot gets its primary information from a specially designed electric turn-coordinator that comes with the autopilot system.

Why is that important? Well, on the average flight it's not. But it can be critical when things start to go wrong and you need to know whether or not you can get help from your autopilot.

"What happens if you're in IMC and your vacuum system fails and you have an attitude-based autopilot?" Plantz said. "If you don't do anything, your autopilot is going to follow that gyro down to its [the autopilot's] design limits before disengaging. In other words, if that autopilot is designed to disengage at a 40-degree bank angle, it will follow that gyro until it reaches that limit. That's too late."

"Vacuum failure is a subtle thing," he continued. "If the vacuum failed and that gyro slowly spools down you can find yourself in an unusual attitude before you realize it. So if you have an attitude-based autopilot, you know that if you have a vacuum failure, you can't use it. A lot of pilots don't understand that."

"What else do you have in your airplane to back up that gyro?" he asked. "Do you have a standby vacuum pump? The point is, if your primary vacuum or gyro fails is there a backup data source for your autopilot? If not, it's not going to work."

"An advantage of a rate-based autopilot is it doesn't care about the vacuum system," Plantz said. "If you have an electrical failure, you'll at least have enough power in the battery to let the autopilot fly while you get things sorted out. Then you can turn it off and hand fly."

Plantz stressed that knowing these operational differences are critical to helping you get the most capabilities and safety out of whatever autopilot you have. The better you know your autopilot and how it interacts with the other systems on your airplane, the better prepared you are to handle an emergency.

Preflight your autopilot.

Another thing you'll find in your POH is the large section it dedicates to preflighting your autopilot. Did you even know there are preflight procedures? Sure you did.

"It's a step that most pilots have forgotten about, but it's very important. Especially if you're launching off into IMC. In the clouds is not the place to discover that your autopilot isn't working – especially if it's part of your get-home plan,"

Plantz said. "What you really want to do is go through all the preflight procedures in your POH. Companies go through a lot to get these [POHs] approved and this is one of the things it stresses. Some pilots just get too lazy." Plantz said that his preflight autopilot check not only confirms that the systems are working but he also uses it as an opportunity to 'exercise' the various servos. "The muscle of the system is the servo and it needs to be used," he said. "Carbon and corrosion can build up on the brushes so the motor won't work as well – they won't respond as quickly to small directions from the autopilot's controller. So the controller ends up sending more voltage and then the servomotor overreacts to the signal. That's one of the things we look at when someone complains about pitch-oscillation or wing-rock."

While how to do an approved autopilot exercise plan is part of the autopilot's preflight procedures in the POH, Plantz said that he kicks his up a notch. "What I do is throw my heading bug 30-degrees to the left. My servo starts turning the yoke to the left. But before it hits the stop, I grab the yoke and hold it until the clutch engages," he said. "I hold it for five or 10 seconds. It makes the motor work longer and I also verify that the clutch is working properly."

"I do that again for a right turn. Then I do it the same way for the pitch servo," Plantz said. "I use the maximum commands to get the maximum voltage requirements to the servo from the flight computer so I have the best chance of having the highest RPMs on the servos."

Since the S-TEC model Fifty Five X autopilot Plantz has in his Cherokee Six 300 has an auto-trim servo, he also turns the autopilot off and runs the electric trim all the way to its stops in both directions. "By doing this I've run all three servos," he explained. "Even if you only have a wing-leveler and one servo, the procedure is still the same."

Autopilot operational tips.

Now that you know that your autopilot is functioning as designed, it's time to launch off into that 500-foot ceiling, right? Not so fast. Knowing that your autopilot works is not the same as knowing how you're going to work with your autopilot. Take a tip from the professionals and have a game plan for autopilot usage.

"It's a comfort thing with every pilot," Plantz said. "Everyone wants to use their autopilot at a different phase of flight and that's fine. The key is to have the decision made before you leave the ramp."

"Personally, I engage my autopilot at 500 feet AGL. Other guys will hand fly to 1,000 feet, then turn it on. It's a matter or your procedure and comfort," he continued. "Have your departure profile decided upon early. Say it's 200 overcast and a half-mile. I'm going to use my flight director for the first 500 feet and then engage my autopilot. I've also decided which modes I'm going to use while on the ground – am I using my Heading or NAV modes? It's all pre-decided on the ground so I can concentrate on safely flying the airplane."

Plantz also said that he has his approach procedures decided before he even begins his decent. "Have a game plan for when you are going to disconnect during the approach," he added. "On a non-precision approach are you going to use the autopilot to maintain the inbound course? If your autopilot doesn't have vertical speed capability, are you going to keep it engaged to fly the

inbound course while you manually control the vertical decent? What are you going to do when you reach MDA?"

"I keep the autopilot on from the MDA to the missed approach," Plantz said. "Or until I visually acquire the airport – then the autopilot comes off. Pilots who don't trust their autopilots to track the inbound course, turn it off and hand fly. But let's say the autopilot has been holding a 30-degree crab into a crosswind. You turn off the autopilot and turn the aircraft into the runway heading and guess what? By the time you get down to the decision height, you're off course. If you have a capable autopilot, why wouldn't you fly it down to minimums to help you out?"

Another helpful tip on approach is to use the throttle to help the autopilot stay on the glide slope. "Pilots can anticipate the autopilot's pitch change and use power to help it out," he said. "I'm not making huge power changes, just small increments to smooth the approach out." Another tip Plantz shared is to use the heading bug to slowly start turning the aircraft in towards the final approach heading to smooth the intercept angle out during a localizer approach.

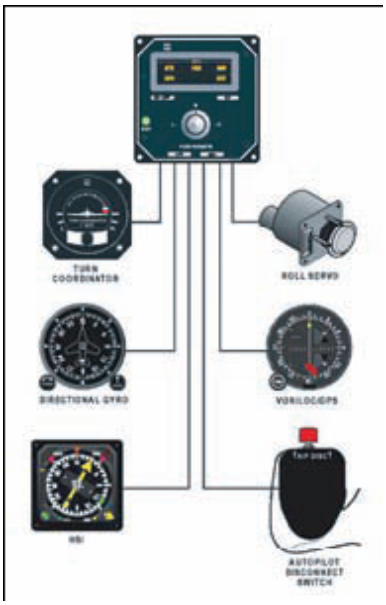
"If you're flying a 30-degree intercept your needle will be fully deflected. When you see that needle come off the peg, there's nothing wrong with using the heading bug to slowly start turning the aircraft inbound," he said. "This will help the autopilot fly a tighter localizer approach."

Practice makes perfect.

Like honing any skill, it takes practice to get comfortable with your autopilot. That's why it's a good idea to fly as much as you can with it on. Pick a VFR day and fly simulated IFR flight with a safety pilot. How does your autopilot track the localizer? What is your personal disconnect altitude? Get a feel for helping it fly the approach with throttle inputs. The extra practice is good for you and great for your autopilot.

Even if you are a VFR-only pilot. There may come a day when you encounter IMC weather and your ability to use your autopilot to keep your wings level and execute a 180 may be a real difference maker.

If you're not comfortable doing it yourself, find an experienced instructor who knows autopilots and can give you a few hours of dual. When it gets down to "crunch time" it may be the best investment you've ever made.



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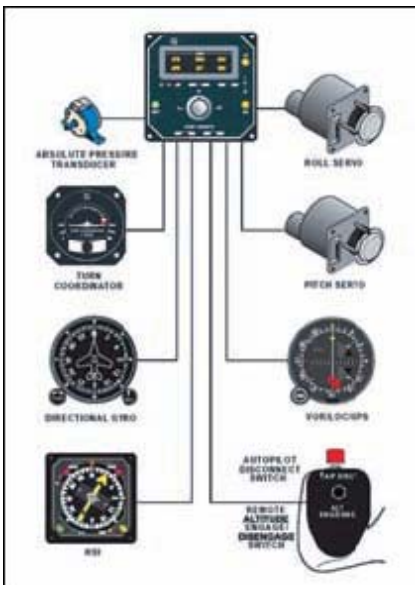

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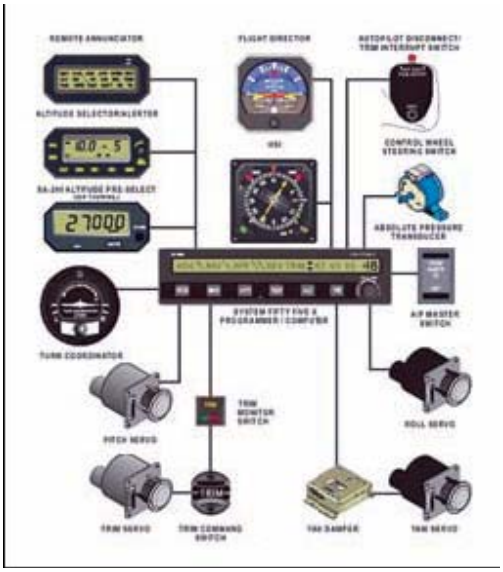

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