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FAA Safety BRIEFING

Weather Tech and Automation

The Dangers of Overreliance on Automation

Safety Concerns and Mitigation Strategies for Pilots

By Jason Blair

Automation has significantly transformed aviation — enhancing safety, efficiency, and workload management for pilots. However, the increasing reliance on automation tools in general aviation (GA) presents some safety risks. Unlike many commercial pilots, who undergo extensive and regular recurrent training, GA pilots may not get such training and are often left to their own devices to figure out new technology and how to incorporate it into their flight operations. As aviation technology advances, it is important for pilots to understand how it is utilized and get appropriate training before relying on it.

The Rise of Automation in General Aviation

Modern GA aircraft are increasingly equipped with sophisticated avionics, including glass cockpits, autopilots, and GPS-based navigation systems. These technologies have provided immense benefits, such as:

- Enhanced situational awareness through moving maps and terrain warnings;
- Reduced workload via autopilot capabilities;
- More precise navigation with GPS approaches;
- Increased efficiency and fuel savings.

While these advantages are clear, the growing dependence on these systems raises concerns about pilot proficiency and safety. Let's examine some of these concerns.

Overreliance on Automation: Safety Concerns

Degradation of Manual Flying Skills

One of the most significant risks of overreliance on automation is the erosion of manual flying proficiency. When pilots frequently engage autopilot systems, their hand-flying skills may deteriorate. This becomes critical in emergency situations where automation may fail, requiring immediate manual control. The crash of Air France Flight 447 in 2009 demonstrated how pilots who lacked hand-flying practice and relied on automation did not properly recover from a stall during an automation failure in a highly trained airline environment.

The interface of a general aviation autopilot system. (Garmin photo)

GA pilots are not exempt from the challenges of becoming over-dependent on automation systems. As our aircraft are equipped with more advanced and more capable systems, they allow us to disengage our flying skills more and more, relying on programming skills too often.

If manual flying skills are not also practiced, they decay.

Complacency and Reduced Situational Awareness

Automation can create a false sense of security, leading to complacency. Pilots may assume that automation systems can be relied upon to handle more aspects of flight than may be logical. This results in diminished vigilance during flight operations. Situational awareness may decrease as pilots become passive monitors rather than active participants in flight management. This can lead to delayed responses to system malfunctions, failure to cross-check automation inputs and flight path deviations, and even the inability to detect potential hazards, such as airspace violations or terrain conflicts.

Automation Dependency in Emergency Situations

Automation failures often require immediate pilot intervention. If a pilot is too dependent on automation, they may struggle to transition to manual control during an emergency. Some common automation failures include:

- Reliance on autopilot systems during flight operations and the inability to physically fly the aircraft without autopilot engagement;
- Inability to manage added workload while hand-flying the aircraft, especially during instrument conditions;
- Instrument failures that require operating in reversionary modes with which the pilot may not be familiar.

Inadequate training in handling such scenarios can have disastrous consequences.

Misinterpretation of Automation and Mode Confusion

Pilots must understand the operational logic of automation systems. Mode confusion occurs when pilots incorrectly assume the state of an automation system. This can lead to:

- Unexpected autopilot disengagement;
- Failure to recognize that automation is not following the intended flight path, whether lateral or vertical;
- Incorrect reliance on automation modes, such as altitude capture or vertical speed hold, without verifying actual aircraft behavior.

Lack of, or training deficiencies in automation logic can contribute to accidents where pilots fail to recognize or correct automation errors in time.

A general aviation autopilot system. (Garmin photo)

Mitigating the Risks of Automation Dependence

There are ways to mitigate these risks and minimize the potential for accidents and incidents that occur due to incorrect use of automation in modern aircraft.

The first is regular manual flight practice. Pilots should actively maintain their manual flying skills by regularly disengaging automation and hand-flying in different phases of flight. Don't give up those basic flying skills. Practice hand-flying en route segments, particularly in visual meteorological conditions (VMC). Also fly instrument approaches without autopilot engagement to maintain proficiency.

A second way to reduce automation overreliance risk involves the continued use of scenario-based training and emergency preparedness. Pilots, and their instructors, should include scenario-based training that emphasizes automation failures and manual flight recovery in their initial and ongoing training. Including this type of training during flight reviews and instrument proficiency checks (IPCs) is critical. Flight instructors and training programs can help make this happen by including things like simulations of autopilot failures, partial panel exercises, and presenting emergency scenarios that have a pilot transition from automation to manual flight.

Enhanced Understanding of Automation Logic and Systems

Pilots need to fully comprehend the systems in their aircraft. Navigation equipment, audio panels, communications radios, and especially autopilots must be fully understood if you are going to use and rely upon them. It is important that a pilot know the limitations of these systems also.

Many autopilots have operational limitations that their pilots have never seen. Know if or when an autopilot will disengage on its own, or how you would disengage the unit if it isn't doing what you want it to be doing. Be ready and able to verify any inputs and outputs of systems in your aircraft to ensure they are doing what you want them to, and think they are doing. We even now have some aircraft with automatically switching fuel tank feeds. If items such as these fail, the pilot needs to know how to identify those failures and how to remedy them.

Avoiding Overdependence on GPS Navigation

Following the magenta line can be easy but also misleading. Reliance on GPS can be dangerous in cases of improper programming, signal failure, or even equipment failure. While the latter of these two items is not that common, mis-programming the information in the GPS system with regard to how you want the aircraft to navigate or perform is very common.

It is critical to know how to program your GPS navigation system to include using flight plan sequencing and loading approaches. Another key tip is to know how to insert or remove a hold at waypoints in an approach or in the en route environment. Take your programming skills well beyond the "direct-to" button and simply loading and activating an approach in the "vector-to-final" option.

A healthy bit of professional skepticism goes a long way when using your GPS navigation systems. If it is taking you somewhere you don't think it should, be ready to disengage, hand-fly, ask for a vector, or set up the approach or flight plan path again. This may also mean transitioning to more traditional methods of navigation such as using a VOR or using some pilotage and dead reckoning. Charts and the ability to use them are still a critical part of pilot proficiency.

Staying Engaged as the Pilot-in-Command

Automation should serve as an aid rather than a replacement for active flight management. Pilots should be continually monitoring flight instruments and automation settings. It is important to cross-check system inputs and aircraft performance. Maintain a high level of engagement rather than passively relying on automation. There should never be a moment where the pilot lost awareness of what the aircraft is doing or where they are is lost just because they are on a long cross-country flight and "the autopilot has it" for now.

The Role of Flight Instructors

Flight instructors play a critical role in ensuring GA pilots develop balanced automation skills. There is much they can do in initial training and when they work with clients who are coming back to them for recurrent training or advanced training. Instructors should:

- Encourage students to practice manual flying during each lesson;
- Introduce controlled automation failures in training scenarios;
- Help students understand the full functions, capabilities, and limitations of automation systems in their aircraft;
- Reinforce the importance of situational awareness and active cockpit management.

By incorporating automation-related emergency procedures into checkrides, currency flying, and training syllabi, pilots will be better equipped to handle automation failures.

While automation has undoubtedly improved safety and efficiency in general aviation, excessive reliance on it can lead to skill degradation, complacency, and increased risk during failures. Pilots have a duty to find a way to strike a balance between leveraging automation and maintaining fundamental flying skills. Regular manual flight practice, scenario-based training, and a deep understanding of automation systems are essential to ensuring pilots remain proficient and prepared for any situation. By adopting a proactive approach to automation training, systems failures, and keeping your flying skills sharp, you can ensure your overall safety of flight is increased. Learn to monitor and mitigate failures related to potential overreliance on automation.

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FAA Fly Safe Topic, *CFIT and Overreliance on Automation*
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"No Surprises! Keeping Control of Avionics and Automation," *FAA Safety Briefing*, Jan/Feb 2020
adobe.ly/4hpaBiS

"Where the Heck Are We? Understanding the Lost Art of Aerial Navigation," *FAA Safety Briefing*, Jan/Feb 2018
adobe.ly/41Bg2oS

"Teaching Technology – Instilling the Right Aptitudes and Attitudes for Safety," *FAA Safety Briefing*, Sep/Oct 2017
adobe.ly/4hnHZ9x