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THE (LOST) ART of PAYING ATTENTION

Managing the Attraction to Technological Distraction

Our inventions are wont to be pretty toys, which distract our attention from serious things. They are but improved means to an unimproved end.

— Henry David Thoreau

Several years ago, I had just finished an enjoyable GA glass cockpit flight with an FAA colleague. During the postflight discussion, he made the following observation. “When it comes to programming the avionics, you know these systems as well as anybody I’ve seen. But you probably don’t have any idea how much time you spent heads-down. There was a lot of traffic out there today.”

Gulp. He got my attention — attention that, during the flight, had admittedly been sucked into the vortex of the shiny multi-colored whiz-bang gadgetry at my disposal in the DA-40 *Diamond Star* we had been flying. Yes, TIS (Traffic Information Service) was available for most of the flight, but I know better than to regard it as a failsafe and foolproof method of colli-

sion avoidance. It was sobering to realize that, without even noticing, I had allowed all the pretty toys in the panel to distract my attention far too much from the serious business of see and avoid. Even more sobering was the knowledge that such failure could easily have resulted in some version of Mr. Thoreau’s “unimproved end.” I’ve never forgotten the lesson, nor have I ceased to mentally replay my colleague’s cautionary comment whenever I fly.

As I began to instruct more frequently in glass cockpit aircraft, I noticed that the eyeball and attention vacuum effect of the glass panel technology was not unique to me. My fellow pilots would similarly fixate not just on periodic programming requirements, but also on monitoring the myriad bits and bytes of flight information on the various glass cockpit displays. In an effort to offer them the kind of awareness my colleague gave me, I sometimes used a stopwatch to provide very specific feedback on how long they really spent in the technological time

warp. The attraction to technological distractions is even greater now that so many of us have acquired extremely capable tablets stocked with equally capable flight planning, managing, and monitoring apps.

It's painfully easy to succumb to the subtle tyranny of technology. The glorious gadgets tempt us to shirk not only our see-and-avoid responsibilities, but also a vast swath of the flight management work. They lull us away from the discipline of critical thinking and true situation awareness, a term that implies far more than a position check on the moving map. And, as several air carrier accidents in the past few years demonstrate, highly trained and experienced airline pilots are no less vulnerable to over-reliance on technology and the resulting errors in automation management.

So what's a safety-conscious pilot to do? Here are a few pitfalls to see and avoid.

Mistakes Magnified

The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency.

— Bill Gates

This observation clearly applies to aviation as well as to business. Technology and automation applied to an actively-managed flight can magnify its safety and efficiency, but when applied to a non-managed flight, they can very efficiently get you into very big trouble. That's because regardless of how good they are, today's avionics and handheld devices do not have sufficient intelligence to do more than exactly what we command them to do. If we issue the wrong commands because of inattention or incomplete understanding of the technology, the flight will potentially go off track in every possible way.

I learned this lesson several years ago when a GPS programming mistake was about to command the autopilot into a 180 degree course change and a 1,000 nm deviation from the intended flight path. It seems I had wrongly selected the identifier for my intended destination, Augusta, Georgia (AGS), by accepting the system's presentation of AUG. In fact, AUG is the identifier for Augusta, Maine. The GPS didn't know the difference. The autopilot would have obediently pointed the nose in the opposite direction. And I would have found myself confused and disoriented — "what's it doing?!" — while also doing some serious 'splainin' to an equally befuddled air traffic controller.

Improper understanding and/or poor management of technology has also contributed to major air carrier accidents. Remember the 1995 B-757 crash near Cali, Columbia?

More recently, how about Air France 447, lost over the South Atlantic on a flight from Brazil to Paris? Or Asiana 214, which crashed while attempting to land at SFO last July?

Knowledge is the key to avoiding this particular technology pitfall. You need to know the equipment cold. When I teach use of GPS moving map navigators, I stress the importance of knowing how to precisely navigate both the mechanical structure (aka the "knobology") and the library structure — that is, how to efficiently find and display the information you need for any given phase of flight. You need to know its normal and abnormal operations, so you can avoid those pesky and potentially dangerous "what's it doing" situations. You need to know its limitations — what the technology can do for you and, equally important, what functions are simply beyond its capability.

As Kenny Rogers sang in "The Gambler," you also need to "know when to hold 'em, and know when to fold 'em." If you find yourself baffled, confused, or in any way uncertain about what the technology is doing, it's time to turn it off and reorient yourself. That certainly applies to the autopilot, but it also includes panel-mount, hand-held, or tablet-based navigators if you don't understand where they are taking you — or if you have any doubts as to the safety of the suggested course. Never forget that the magenta line can guide you direct to anywhere ... including direct *through* regulatory obstacles (e.g., restricted/prohibited/controlled airspace), man-made obstacles, or natural ones such as terrain.

Role Reversal

There is a real danger that computers will develop intelligence and take over. We urgently need to develop direct connections to the brain so that computers can add to human intelligence rather than be in opposition.

— Stephen Hawking

Even if you've never watched *2001: A Space Odyssey*, the story of the spacecraft's domineering computer, HAL 9000, has long since passed into

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popular culture. HAL asserts that he is “foolproof and incapable of error.” At least initially, the crew is content to believe in HAL’s infallibility and let their computer run the show. And yes, that decision leads to a bad end.

How often are we aviators guilty of the same thing?

There is no dispute about the astonishing capability and reliability of today’s technology. Tablet flight

management apps and panel-mount GPS moving map navigators provide an enormous range of information. Even the most modest GA autopilots can often manage stick and

rudder duties far more smoothly than many human pilots. What’s not to like?

The problem is that we humans are so beguiled by our electronic tools that we expect them to compensate for functions that we cannot, or choose not, to perform. We expect the technology to do not just

the work, but also the thinking. We are too often content to completely relinquish command and control functions to our on-board technologies. In effect, we implicitly delegate our PIC authority, and entrust our very lives, to mere machines.

Because even our best technologies are thankfully not (yet) up to HAL-like intelligence that can actively decide to assume command, both safety and good airmanship demand that we retain the role of PIC, and that we keep the technology under firm control. Never let the airplane or any of the on-board technology do anything you don’t know about, and — as the cliché reminds — never let the airplane or any of its high-tech equipment take you to any place your brain hasn’t already passed through.

Out of the Loop

I think it’s very important to have a feedback loop, where you’re constantly thinking about what you’ve done and how you could be doing it better.

— Elon Musk

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Photo by Susan Parison

Delegating the PIC role to your on-board technology provides a very direct path to loss of situation awareness — more colloquially known as being out of the loop. When I was a student pilot, making my solo cross-country flights in a C152 with only a single nav/com radio, my fear of getting lost motivated a near maniacal focus on positional and situation awareness. In addition to double-, triple-, and quadruple-checking the VOR frequencies and courses, I used pilotage to ensure that I could constantly match features on the ground passing below me to the proper location on my well-worn paper sectional chart.

There is no doubt that GPS provides a much more precise position indication than anything I could have calculated in the pre-moving map Stone Age. Ironically, though, the advent of at-a-glance position awareness capability has sharply diminished the “where-am-I-now” discipline that was the hallmark of being in the loop. When you don’t have to put any mental effort into ascertaining positional awareness, it’s easy to stop paying attention.

If you are lucky enough to have a good autopilot, it’s great to have “George” tend to the basic flying chores while you — at least in theory — focus on more important things ... like positional awareness (*see above*) and, more broadly, overall situation awareness (e.g., status of weather, fuel, engine indications). The challenge, of course, is to actually direct that freed-up mental and physical capacity to those more important positional and situation awareness considerations. That means overcoming the very human tendency to lapse into “fat, dumb, and happy” complacency ... complacency that could cause you to miss something like an abnormal indication on an engine gauge.

Avoiding this potential technology pitfall means finding ways to keep yourself continuously in the loop. For example:

- Use callouts to maintain positional awareness (e.g., “crossing WITTO intersection, next waypoint is MITER intersection”).
- Annunciate changes to heading, altitude, and frequency.
- Record those changes in an abbreviated navigation log. The act of speaking and writing bolsters your awareness.



Photo by Susan Parson

- Annunciate any change to navigation source (e.g., “switching from GPS to VLOC”) and autopilot modes. I encourage pilots to read each item on the autopilot status display aloud every time there is a change, stating which modes are armed and which modes are engaged.

These practices can be the backbone of the feedback loop Mr. Musk recommends, but you can make it stronger still by peppering yourself with a steady stream of “howgozit” questions about the flight.

Today’s technology provides the foundation for an unprecedented level of situation awareness. We just have to use it for that purpose, and pay attention in order to repel the all-too-human attraction to technological distractions that could detract from flight safety. ✈️

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Learn More:

Safety Alert for Operators (SAFO) 13002 encourages operators to use manual flight operations whenever appropriate. You can read more about it at

<http://go.usa.gov/WmSe>.