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Pilot Perspectives on Avoiding CFIT

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According to Flight Safety Foundation, Controlled Flight Into Terrain (CFIT) accidents are a leading cause of commercial aviation fatalities. CFIT is not selective; it is prevalent in corporate aviation and, all too alarmingly, in other segments of general aviation. This paper is a pilot-to-pilot conversation specifically about avoiding CFIT and, in the process, about airmanship. All are invited to listen in.

The Conversation

I know the CFIT statistics and the devastating consequence of this type of accident but, as a pilot interested in an aviation career, what can I do to avoid CFIT?
That's a difficult question to answer simply. The body of research is large, much is of the information is based on actual events and accidents, and good ideas result. But, the end product doesn't always produce specific guidance—that task is often left for the training departments, instructors and individual pilots to accomplish.

Let me draw upon the experiences and beliefs of other pilots, inject my own biases, and examine some of the thought processes that have proven to be useful. However, in the end you will need to establish your own guiding principles and personal standards on this issue and others that will define you as an airman.

How does avoiding CFIT fit into this concept of airmanship?
First, let's set the parameters. What is CFIT? Flight Safety Foundation defines a CFIT accident as, "one in which an otherwise serviceable aircraft, under the control of the flight crew, is flown unintentionally into terrain, obstacles or water, usually with no prior awareness on the part of the crew of the impending collision." In short, CFIT is loss of near-ground position awareness; the airplane is controllable; the results are fatal.

Position awareness is not a momentary, static geographic plan view. It's a three-dimensional understanding of where you've been, where you are and where you're going to be. But, we can't simply narrow our focus to positional status to grasp and deal with this CFIT problem. There are many factors involved, and we need to broaden our outlook to the more encompassing concept of situation awareness (SA), of which near-ground awareness is a specific case.

And the complexity of this broader view demands a high degree of professionalism—airmanship—from pilots. Airmanship requires confident piloting skills, sound judgment and a strong sense of personal accomplishment and well-being. Even with the finest technical flying skills, poor judgment leads to faulty decisions and, very likely, to loss of SA.

I'd been thinking of awareness in terms of location and position. What else is involved?
The varied aspects of flying are widespread and interrelated. Physically they include the aircraft, its flight, operating, navigation and communication systems; the aviation system, its traffic control, its navigation/communications network and navaids; its airports, runways and taxiways. Environmentally they include weather and its uncertainties; severe weather with its icing, storm cells and microbursts conditions; restrictions to flight from low ceilings and limited visibility; turbulence, winds, night conditions, sun position, etc. In the cockpit our concerns are all the flight parameters (altitude, airspeed, angle of attack, G-forces, flight progress, fuel status, etc.). Personally we deal with aeromedical issues such as spatial disorientation and illusions, vertigo, hypoxia, stress and fatigue, and ergonomic factors resulting from equipment design, control and switch locations, etc. Plus, personal interactions are many and varied.

These factors influence how well we fly and, separately and in combination, determine the situations we need to be aware of.

Situations change, and maintaining awareness in flight is a dynamic process. In fact, it is an integral part of what you know as "aeronautical decision making (ADM)."

OK, so it's a bit complex. But I'd really like to focus on my original question. Can't we get back to CFIT?
Actually, no. Managing risk requires understanding human fallibility and loss of SA, and understanding requires effort and patience. We all want to climb in the cockpit and demonstrate our piloting ability, but the truth is we may not be as good as we think. There

are a number of good and experienced pilots who have been victims of CFIT—it only takes one mistake, and every pilot I know admits to mistakes.

Let's continue. ADM is the process of judgment and decision making. We exercise judgment based on our experiences, our biases and pressures we place on ourselves. Any change that's perceived requires a decision. That decision may be to take any number of different actions, or may be not to act at all. The quality of your judgment—the option you choose—is measured by the resulting decision you made. But that's not the end. Decisions require action, actions induce change, and change necessitates judgment. It's a continuing feed-forward, feedback process.

I'll stay with you and try to be patient. Judgment is selecting options, decision making requires action. Where does SA fit in?
Remember I said that in terms of SA, pilot's think of where they've been, where they are and where there're going to be? Looking ahead requires anticipation and some degree of expectation.

At this point let me say that I've talked with a number of pilots and conducted informal surveys on issues related to SA, and feel I can speak with some confidence. You should make an effort to do the same because there's so much that can be learned from peer interaction.

Another pointer. The first thing I read in a magazine is letters to the editor—here you get the real-world opinions. Recently, Professional Pilot conducted a pilot survey on SA and published the responses.[1] If you carefully read comments like these you'll get a good sense of how other pilots think. You won't always agree but, again, you'll need to form your own opinions over time.

Back to your question on where SA fits in. We need to get beyond the words and put them in the context of how you might think and act.

On looking ahead. Anticipating. We prepare for each flight. We flight plan and consider any number of factors including weather, winds, fuel consumption, alternates, approaches, airport characteristics—our situation list. We brief ourselves and, perhaps, others. And, we brief in explicit terms, not abstract thoughts. We develop expectations of what lies ahead.

In flight we alter our expectations to actual events. How we prepare for and adapt to change varies with each individual, but I'd like to suggest that a structured thinking process that can be relied upon is

desirable, particularly under conditions of high workload. Stress is relieved when we're confident in our ability to anticipate problems and deal with them when they arise. Let's look at how some pilots think as they manage their cockpits. They play "what if?".

Only it's not a game. It's a serious management method that looks at an uncertain future and postulates alternative versions of that future. It works in business and works in the cockpit.

"What if?" Scenario building. Let's see how "what if?" could work in developing in-flight strategies.
1. Select an issue that you may be confronted with. A few possibilities: fuel (reserves or consumption); weather (enroute, at destination, at alternate); winds aloft; clearance; equipment.
2. Think of two or three possible outcomes ("what if" scenarios).
3. Think through the implications and work out a game plan (strategy) for each scenario ("what if—then…").
4. Establish a time or place (fix) to review your issue.
5. Revisit and revise, as necessary, your scenarios and game plans.

The "what if—then…" process is simple and straightforward, more difficult to describe than utilize. Through these steps you have put certain issues in perspective. You've gained greater awareness of the issues facing your flight. You haven't played your hand, but this disciplined form of thinking better prepares to make choices when you need to. You won't have "covered all the bases," but you will be able to deal more fully with new issues that pop-up since you've got a few others covered.

These scenarios can be developed by the single pilot, of course. They will tend to be more thorough in a cooperative two-pilot team cockpit. That's at least an introduction to options and SA. Are you with me?

Yes. I can see that working out in-flight strategies promotes increased awareness. It also lays out a few options that might be considered at an appropriate time. What about decision making and SA?
Other pilots will respect you for your flying ability, but they will judge you more critically by the decisions you make. We'll discuss and emphasize a few of the finer points, but I'd like to emphasize what I consider to be key elements. Know your airplane. Know your mission, visualize it and prepare for it. Then you'll be ready for in-flight changes when they occur. There's seldom need to rush, so approach your tasks systematically. Define and set your goals in

precise terms. Understand that if your expectations are not clear and your targets vague, then the quality of your resulting decisions and actions will suffer.

On maintaining control. Making corrections. We want to keep control of our activities and decisions as smoothly as we control our aircraft. The familiar feedback loop is at work—input, output, feedback, correction. It's exactly what you do or your autopilot does for you. Your cockpit management input is what you want to achieve, your objective, goal or target. Your output is what you're actually accomplishing, your result. The difference between what you want and what you get is the information feedback you need to act to get back on target. Clearly, the smaller the deviation the smoother the correction.

Before we move on, I'd like to emphasize two important points. One, be committed to your objective. If you waver in this commitment, then you've given up a measure of control. Your autopilot is tireless in its commitment to your input. You need to "stay the course" on your cockpit management activities as well. Two, set boundaries or tolerances with respect to your objective. These may be rules set by your organization or guideposts that you've established for yourself. How much variation are you willing to accept? For example, we know that unstabilized approaches lead to CFIT accidents. Define clearly and set in your own mind what a stable approach is. Perfect entries are not always possible, but know at what point you must be stable (within your predefined tolerances) or break it off. Stay in charge—control your destiny.

On ADM. Judgment and decision making. Flight conditions change, and change requires judgment be exercised. Almost all judgment is intuitive, based on experience, training, personal beliefs, professional standards, and the ability to determine right from wrong. If it weren't intuitive we'd be bogged down and unable to function.

The balance of judgment is cognitive. We make a conscious choice of what to do. It follows, then, that we want to elevate the more crucial situations to this more thoughtful level and base our choices on conscious evaluation. To do this, we look ahead, determine viable options, anticipate outcomes and select courses of action. We're interested in exercising sound judgment, not necessarily the very best, since it's impossible to evaluate and rate all possible options.

Decision making is judgment's product. The decision's objective (target) is defined, progress towards that objective is monitored (feedback), and corrective action is taken when necessary to keep the target in sight. At any one time there might be multiple decisions in play, so feedback is apt to be intermittent rather than continuous. The better pilots are able to keep them all in perspective, checking the flow of information for each sufficiently to maintain a state of management control.

It is this information flow—feedback of progress towards the goal—that establishes and maintains awareness. That's why I say that SA is an integral part of a quality decision process, not a separate, stand alone characteristic. Good decision making enhances awareness.

We've pretty well summarized the general topic of situation awareness. Now let's look at the more specific nature of near-ground awareness.

Good. I've been waiting for this!
Awareness of your surroundings is all the more crucial at lower altitudes. This is a good time to cover one other aspect of SA, self awareness. Add it to your situation awareness list—it's probably your list's most important item.

Self awareness. Self knowledge. We've all been taught aviation's cardinal rule: "Keep Flying the Airplane." We accept its premise. We understand its logic. Yet, it's surprising how often this simple rule is violated and an accident results. We also know we should act immediately and climb above minimum safe altitude (MSA) when near-ground position awareness is lost. But, as you know from your statistics, too often pilots don't take this action.

Knowledge of these fundamental behavioral rules is not enough. It's not an intellectual exercise. Are you committed to acting? Will you really do what you know is right at that crucial moment in time?

Dig deep! Imbed rules such as these in your personal belief system. Commit yourself to act. "Know Thyself" as the ancient axiom dictates. Know that you will act appropriately and decisively when the time comes. Acquitting the pilot in command's responsibility and authority and knowing "the consequences of your actions"[2] requires this type of individual dedication.

Thanks for the advice. I hadn't thought of myself as a pilot in quite those terms.
You're welcome. It's easy to fall into the trap of thinking, "Let's see what develops—I can handle it." On the subject of CFIT, there's another truth: "In the battle with Mother Earth, the lady always wins."

Let's move on and cover some CFIT topics. You know the other contraction, CFTT (for controlled flight towards terrain). No accident results, but an accident might have occurred if evasive action had not been taken. These are real learning experiences that unquestionably have changed the subsequent behaviors of those involved. One pilot told me:
"I realized it just in time. It was scary, but there's been instant improvement of SA from then on."

They can be learning experiences for you as well. A search of the ASRS database using "CFTT or CFIT" will produce well over 100 incidents. If you selectively read a few, get a real sense of the circumstances and mentally place yourself in the cockpit, you'll be able to learn a great deal and benefit from the mistakes of others.

And talk to other pilots. As I said, there's a huge database of aviation knowledge in the minds of others who do what you do. In my informal survey I found that, on a pilot-to-pilot basis, pilots are willing to share their experiences openly and honestly. We don't have this type of conversation often enough.

I agree. I've learned a great deal from my colleagues, and it's a great feeling to know I can call on more experienced pilots for advice. So many are willing to be informal mentors.
That's one rewarding aspect of our industry. As I said earlier, pilots are usually forthright in acknowledging mistakes: "Be aware that everyone makes mistakes and cannot operate at their best on all occasions."
Now, to a few specific CFIT/CFTT topics:

CFIT themes. Crew behavior patterns. One pilot who is concerned with the CFIT issue sent me his observations, as follows:[3] "From my experiences of investigating CFIT accidents I have seen the following common themes involving situation awareness and crew monitoring.
A. The crews saw something—the ground or non-aeronautical lights were misinterpreted. In most of these accidents, the crews were not adhering to the definitions of MDA/IMC, or not aware of the precise visual requirements for a land decision.
B. Both crew members were comfortable with their navigation position and/or their actions, they both made the same assessment and/or the same mistake, thus the cross monitoring function failed.
C. The circumstances did not enable any monitoring; the monitoring pilot remained head down and could not see what the captain was describing (ground contact). The flying pilot had made an error, but the monitoring pilot did not/could not/would not detect it.

D. There are covert peer pressures due to the expectations of the industry. I.e., a go-around carries a professional stigma—ATC sees it, other pilots comment, management wants to know why. In these accidents the crew formed an opinion of the airfield/flight conditions and briefed for that plan; they were unable/unwilling to change their plan as the real conditions unfolded—situation awareness/decision-making."

To be effective, CFIT prevention needs to take into account these and other identifiable themes and derive appropriate countermeasures. It's advisable to keep in mind that many CFIT accidents occur near airports over relatively flat ground, not necessarily rugged terrain.

Another good introduction to CFIT is the Flight Safety Foundation's video, complete with accident recreations.[4] It reports that fatalities are greatest in the transport category with air taxis providing the highest rate, and that frequent accidents occur in the approach phase with multiple step-down approaches being prominent.

When you view the video it you will see the effects of scud running (by two very experienced pilots), an accident due to black hole illusion on a straight-in approach, and the result of confusing ATC clearances with communications conducted by parties who had different primary languages. The concluding message: acknowledge vulnerability and be vigilant.

You seem to have given me homework assignments!
Strictly voluntary, but passive classroom attendance isn't enough to understanding the problem and developing your own behavioral guidelines. Now, let's be more specific.

Personal standards. Integrity. We started this conversation during the self awareness discussion. Here are a few of the specific commitments pilots make to themselves when regard to terrain avoidance:
"You really have to stick to your standards and not cave in to pressure from others in the cabin."
"I never do circling approaches at night in low visibility if there are any obstructions in the area."
"Go-around or climb if you're ever in doubt."[5]
"A landing is an approach without a go-around, mentally preparing the GA as the escape maneuver."
"A go-around is present in my mind throughout the approach. In fact, go-around is my aim until the situation is suitable for landing."

The concept that landing is a go-around interrupted by a decision to land is a valuable insight that appears to be gaining acceptance.

Preparation. Flight planning. The need for mental preparation is obvious, but a quick review doesn't hurt. Plus, there are a few good pointers in pilot comments and thoughts to keep in mind:

"Even when solo I give myself a detailed briefing, particularly on airport characteristics and obstacles."
"Gather information, as much as you can, about the flight to improve situation awareness."
"I study the VFR sectional, even though most of my flying is on IFR flight plans."
"I look for certain clues to the presence of obstacles—displaced thresholds, circling minima that vary with the category of the aircraft, circling restrictions, departure procedures."
"Non-precision approaches need special briefing attention."
"Being an east coast pilot, I think any airport above sea level deserves my full attention."

Pilots understand the need to be aware of hazard potential. However, many don't think of CFIT as distinct and separate issue since, with proper preparation, terrain and obstacles are part of the normal flight environment:

"My concept is that CFIT/terrain awareness must be embedded in everyday activities and is not a 'special' or bolt-on activity."
"Most of my routes are into areas of high ground and prone to heavy rain and poor visibility, so terrain separation is an every day exercise."

Options. Judgment's choices. Here are a few additional pilot thoughts that complement our earlier scenario development topic:

"Think "what if" and apply everything you've learned."[6]
"I always ask myself what I would do if a situation happened right now."[7]
"My basic principle is always have a solid gold plan B, maybe a plan C as well, and not to let risks compound with each other."
"Review all aspects of descent and approach during cruise and be sure to discuss all options."[8]
"Good SA involves being both physically and mentally aware … and what options are available should something go awry."[9]

Well, I seem to be getting good points to think about.
Yes, I think you are from your fellow pilots. Next, you'll get their view of a really critical issue, stable approaches, and setting specific targets during the approach to maintain cockpit management control.

Stabilized approach. Crucial to terrain avoidance. Inviolable rules and clear thinking are the hallmarks for maintaining control during approaches.

We won't get into great detail here, but pilots do establish defined tolerances for approach entries, the point the aircraft must be properly configured, the point at which they are stable within their boundaries (speed, rate of descent, +/- GS/LOC dots, etc.). A few related thoughts, but we're barely touching this important subject:

"A stabilized approach is my safety net."
"On a typical ILS approach, I get it fully configured and stabilized by 800 AGL or earlier. On non-precision approaches I try to be fully stabilized beginning at the FAF."
"I adhere to the stabilized approach philosophy and approach gate concept."

When flying alone, many pilots brief themselves and make altitude callouts through the intercom. It's not loneliness—it comes from the knowledge that speaking out loud makes each thought more concrete and specific, less abstract.
"During an approach I try to verbalize what is happening, even to myself if I am alone in the plane."

And, as with "what if?", asking and answering questions is a proven method of defining the situation more clearly than observing events taking place. Here is how one general aviation pilot maintains a stable approach and position awareness:

"I think about each segment of the approach using three questions: (i) 'how low?'; (ii) 'how far?'; (iii) 'what's next?'." By answering these questions he's establishing specific targets that he'll be able to measure his performance by.

We can all learn from this pilot's thoughtful and thorough technique. Few pilots I know have developed as comprehensive method for asking and answering questions that give confidence they're in control of their flight.

I do see the value of Q & A for position awareness as well as the earlier development of scenarios. I'll give techniques like these a great deal more thought.
Good. Let's briefly mention a few more topics related to CFIT/CFTT and perhaps expand on them later.

Sterile cockpit. Minimizing distracts. It's said that regulations are "written with blood" as an after-the-fact response to dramatic events. That's probably how this concept became a requirement for Part 121 cockpits. The idea is to aid SA by minimizing distractions and interruptions during crucial phases of

flight and, although not required, others have adopted versions of the sterile cockpit concept.

Here's a summary of the regulation: No flight crewmember may perform any duties during a critical phase of flight except those required for the safe operation of the aircraft. Critical phases of flight include all flight operations conducted below 10,000 feet, except cruise flight.[10]

And, here are ways that sterile cockpit is interpreted:
Transport category: Sterile cockpit below 10,000 feet (per regulation).
Corporate training program: "A sterile cockpit will be maintained during dynamic (non-cruise) flight."[11]
GA pilot: "I observe sterile cockpit rules within 40 miles of the destination."
Helicopter pilot: "Keeping good SA involves disregarding distractions such as passenger chatter and staying connected with what's going on inside the cockpit."[12]

Sterile cockpit is an important rule for all near-ground operations—it's certainly advisable for general aviation pilots to conduct this briefing with their passengers.

Minimum Safe Altitude (MSA). A primary SA threshold. It's the altitude that's established to provide at least 1,000 feet of clearance above the highest obstacle in a near-airport sector. Pilots develop rules and have definite thoughts about how to use this information, a few of which follow:
"The MSA is the tip of the iceberg on being aware of what hazards lie around the airport."
"Do not fly below MSA unless under radar control or established on a charted approach, or visual–VMC."
"Situational awareness is knowing … your MSAs and having all cockpit instrumentation set up for what's going to happen over the next 5 to 10 minutes."[13]
"If you are vectored or directed by ATC out of the routine, MSA is a good guide to use to be at a safe and clear altitude from the terrain."
"MSAs should be included in approach and departure briefings with the intensions of how to use them."

I'm with you on MSA. What about terrain warning systems?
That's a good question since MSA factors into automated CFIT avoidance. For now, let's just talk about EGPWS, enhanced ground proximity warning systems. First, a word of caution:
"In today's high tech world it's really easy to become complacent."[14]
There's no question that pilots need to find ways to stay mentally active and involved in automated flight.

EGPWS. Terrain/obstacle warning. Briefly:
"With a Red 'pull up' warning, pull up immediately and climb to MSA (not when the warning stops)."
"Practice the pull up maneuver in the simulator; know the aircraft's capabilities and remember the feel of the aircraft."
"We practice CFIT scenarios in the simulator besides the classroom discussions."

Terrain warning systems have proven effective in reducing CFIT but, regarding the pull up maneuver:
"The evidence from incidents is that the aircraft is only maneuvered sufficient to stop the warning."
We discussed the need for personal standards earlier—the commitment to performing escape maneuvers is the same as that for go-arounds.

Situation awareness seems to have many facets.
Yes, there's much to appreciate. Now, before leaving the avionics topic, let me mention two other equipment applications. First, as you're aware, the non-precision approach is the ultimate challenge in a hazard-filled environment. One pilot recommends use of the radio altimeter (if one is installed) during non-precision approaches, and has established specific operating and readout guidelines. Although the box is far less sophisticated, the same pull up and escape commitment applies. Second, a helicopter pilot uses radar at low level "as a means of establishing a clear path ahead" and, in addition, "demands precision in maintaining radar altimeter heights." Just a reminder of an earlier point—know your systems and how to operate them effectively.

I can see that technology is a complex topic that requires more intensive discussion. Have we covered the CFIT spectrum?
Pretty much. But there is one other subject I'd like to close with that's not so procedurally oriented. After you've flow for a while you get a real feel for the airplane. It's as though you and your airplane have come together as a single unit functioning effortlessly. I'm sure you know the feeling, and there's a confident awareness associated with it. Many pilots also develop a feel for the flight ahead as they gather information and brief for it. They actually form mental pictures of what lies ahead—they visualize situations, places, events—and, in flight, use all their senses to "see" what's happening.

"Vision." Using all your senses. Pilots develop a heightened awareness by experiencing their environment, and express it this way:
"Situational awareness means referring to your surroundings to get the big picture."[15]

"For me, SA is knowing what your mission is and staying focused on it."[16]

"We need to use all of our senses to evaluate what's happening in the environment around us."[17]

"Situational awareness mandates you use your total senses to monitor flight parameters at all times."[18]

"I use all my senses to keep aware … you'll find your backside works great for identifying unusual vibrations or aircraft movements."[19]

"Situational awareness means being aware of your surroundings. [Clues] can be anything from avionics inputs to engine sounds, air noise, vibrations or lack thereof, and even aircraft smells"[20]

"An important part of SA is maintaining a good listening watch on the radio, especially in the terminal areas."[21]

And, as for taking action, trust your gut instincts. "The nagging feeling that something is not quite right is often unfailing in its precision. … If you get a gut feeling, respond to it, don't ignore it."[22] Good advice that wraps it up.

Thank you. You've helped me to gain a deeper understanding of—perhaps even a feel for—situation awareness and avoiding CFIT.

Postscript

The primary goal of this paper is to stress the value of pilot-to-pilot interaction and communication, particularly on the issue of near-ground operations.

Knowing that individual pilots have learned much from their training and experiences and developed personal rules of conduct that serve them, I conducted an informal CFIT avoidance survey with subscribers to Aviation.Org. Respondents are from many countries (including Turkey, Malaysia and The Netherlands) and have different experience levels and backgrounds. The results from a Professional Pilot survey added still another dimension.

Regulations, company policies, standardized procedures, etc. are necessary and desirable but, if we listen, those in the operating arena can fill in the gaps and provide added insight, not only to other pilots but to all in aviation.

Footnotes

[1] Pilot viewpoints on situation awareness are published in the Jan. and Feb. 2005 issues of Professional Pilot (abbr. Pro Pilot), 30 S. Quaker Lane, Suite 300, Alexandria VA 22314, in its letters section, Squawk Ident. Quotes from these letters receive attribution since they have appeared in print. Unless otherwise noted, other direct pilot quotes are the result of an informal survey of subscribers to the website aviation.org. Subscribers were promised anonymity and, therefore, these quotes are not attributed.

[2] John Taylor, Jr., NV. Pro Pilot, Jan. 2005, p14.

[3] Dan Gurney, UK. Aviation consultant. Private correspondence, Jan. 2005. Mr. Gurney made other important contributions to this paper.

[4] Flight Safety Foundation. CFIT Awareness and Prevention, 1995

[5] Jimmy Farris, MI. Pro Pilot, Feb. 2005, p22.

[6] Bill Howley, NJ. Professional Pilot, Jan. 2005, p16.

[7] Duane Tedesco, CT. Pro Pilot, Jan. 2005, p15.

[8] Robert Read, TX. Pro Pilot, Feb. 2005, p14.

[9] Christofer Dawson, NC. Pro Pilot, Feb. 2005, p18.

[10] CFR 14 Part 121.542.

[11] Bob and Skip Mudge, Stow, MA. Quantum-Pro cockpit management system.

[12] Steve Powell, TX. Pro Pilot, Feb. 2005, p18.

[13] Jeff Milam, AL. Pro Pilot, Feb. 2005, p18.

[14] Mike Miller, CA. Pro Pilot, Jan. 2005, p16.

[15] Jeffrey Miller, TX. Prof Pilot, Jan. 2005, p16.

[16] Greg van Liew, GA. Pro Pilot, Feb. 2005, p18.

[17] Laurence Wightman, TX. Pro Pilot, Feb. 2005, p18.

[18] Alan Rybarchyk, AZ. Pro Pilot, Jan. 2005, p14.

[19] Phillip Chastain, MO. Pro Pilot, Feb. 2005, p20.

[20] Bruce Haugsdal, MN. Pro Pilot, Feb. 2005, p22.

[21] Don Watkins, NM. Pro Pilot, Feb. 2005, p14.

[22] Eric Wickfield, MA. Situation Awareness | Losing the "Big Picture. Aviation Org website, March 1998.