

13th ANNUAL  
SAFETY ISSUE

MAY 2008

# SPORT *aerobatics*

OFFICIAL MAGAZINE OF THE INTERNATIONAL AEROBATIC CLUB

## 13th Annual Safety Issue

- Emergency Thinking
- Situational Awareness
- Heard of the Wobbles?

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# CONTENTS



8



12



20

## FEATURES

### 6 Safety Is Priority One

Meet our new Safety Committee chairman

—Stan Burks

### 8 Emergency Thinking

Have a plan before you need it

—Greg Koontz, MCFI-A

### 12 Fly What You See

The importance of maintaining situational awareness

—Rob Holland

### 20 Tumbled Gyros

The risk of vertigo and spatial disorientation

—Dr. Malcolm S. Pond

## COLUMNS

### 3 President's Page

—Vicki Cruse

### 26 Technical Advisor

—Budd Davisson

## DEPARTMENTS

### 2 Letter from the Editor

### 4 Newsbriefs

### 32 Calendar

## THE COVER

Rob Holland helps Scott Westover improve his situational awareness over AirVenture 2007 in Holland's MX2. (Photo by Bonnie Kratz)

# SPORT Aerobatics

OFFICIAL MAGAZINE OF THE INTERNATIONAL AEROBATIC CLUB

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Judson Bartlett

## LETTER from the EDITOR

by Scott Westover

## Safety is our business

The snow is finally melting in New Hampshire so it must be time for the annual safety issue of *Sport Aerobatics*. This yearly tradition helps to remind us that maintaining the impressive safety record earned by our members is central to preserving the aerobatic freedom we all enjoy. This year, the content for the safety issue was triggered by comments from our members ranging from requests for more information about emergency procedures to what to look for on a preflight to preventing an emergency from happening in the first place. We also had several members ask about human factors such as disorientation. I would like to thank Greg Koontz, Malcolm Pond, and Budd Davisson for tackling those areas of interest with their contributions.

When thinking about safety it is impossible to overstate the role of situational awareness. Understanding the environment we are flying in is critical. In aerobatics, that environment changes by the moment, and maintaining situational awareness is something that must be practiced with the same vigor as flying round loops or greasing landings. When pilots lose awareness, accidents happen—people get hurt and airplanes get bent. I had this conversation with Rob Holland (IAC board member, air show performer, and member of the U.S. Advanced Aerobatic Team) in Oshkosh last summer. Mastering situational awareness is a passion of his, and helping his students to develop this skill is something he works hard at. He showed me some tips during a flight in his MX2, and then he penned the article that appears in this issue. To say the least, that ride was incredible, and it helped me to understand that maintaining

situational awareness is the key to being comfortable flying any airplane.

In closing, I would like to thank the IAC for the opportunity to serve as editor of *Sport Aerobatics*. This is my last issue before I move on to other professional opportunities. Most of all I want to thank each member who has contributed to this magazine. Sharing your stories has allowed this publication to take significant steps forward. I have found motivation in working with every one of you. From building to flying, your stories are proof that airplanes have souls. I would also like to thank Lisa Popp and Vicki Cruse for their unwavering support of the editorial decisions that were made along the way. Their mutual desire to do the right thing for IAC members is a source of strength for our organization. As the IAC continues to grow, every member should feel comfortable that his or her interests are well represented to the EAA and other aviation organizations through these champions.

Finally, I (and everyone who enjoys this magazine) owe a tremendous thanks to the EAA publications department. Specifically, I want to thank Phil Norton for giving a piece of his heart to the design of every issue and Colleen Walsh for helping our members to find the voice they need to tell their stories without changing their tales. Sue Anderson has been a partner in making our magazine work hard for our advertisers and our readers, while Kathleen Witman and David Hipschman were always there when needed; I appreciate your guidance and insight.

I hope that you enjoy this issue of *Sport Aerobatics*. Please keep sharing your stories with the IAC and our members. Fly safely! ☺

***Sport Aerobatics* is your magazine. To submit news, comments, articles, or article ideas, please send them to: IAC, P.O. Box 3086, Oshkosh, WI 54903-3086; or email them to [lpopp@eaa.org](mailto:lpopp@eaa.org).**

## PRESIDENT'S PAGE

by Vicki Cruse • IAC 22968  
E-mail: vcruse@earthlink.net



Vicki Cruse

# The U.S. Air Force Academy Aerobatic/Demonstration Team

Competition with a purpose

The IAC contest year started off with a bang with Chapter 69's contest in Tucson in late March with 40 competitors, nine of whom were from the U.S. Air Force Academy (USAFA) in Colorado Springs. This was spring break week at the Academy, but instead of hanging out on a sunny beach in Florida, these guys made their way to Tucson to fly and be gofers for the contest staff.

The glider program at the USAFA has been in place since the late 1960s, but the IAC competition role began only in the early 1990s. Maj. Mark "Matty" Matticola has been attending IAC competitions since 2000. Of the 4,500 cadets at the Academy, most receive at least one glider flight, and half will proceed through a 10-flight program. Of those, 80 will be chosen as glider instructors, and only six will be chosen for the Cadet Aerobatic/Demonstration Team. Another six will be selected for the Cadet Cross-Country Soaring Competition Team. The glider program staff instructors have between five and 15 years in the Air Force (AF) and have flown almost every type of aircraft in the AF inventory.

Of the 22 gliders at the Academy, only five are fully aerobatic. Capt. Erich Kunrath said that within the next few years, the Air Force will have to choose new aerobatic gliders for the program, as the ones currently in operation will reach their intended life span. The cadets must currently fly the gliders below manufacturer-specified limits at the request of the Air Force.

The mission of the 94th Flying Training Squadron is to "*Inspire tomorrow's airmen through unrivaled soaring and leadership opportunities.*" The advanced cadets learn how to deploy assets, conduct briefings, set training schedules, inspect aircraft, transport aircraft, and a variety of other duties that will serve them well in the future and which cadets not involved in this program are not exposed to. In addition, the select cadets who compete gain invaluable aviation experience that they will bring to AF pilot training.



At the banquet, the cadets traditionally present a team picture and patch to the contest director, and this year was no exception. More than one attendee commented on how young these kids looked. These were young adults who will represent our country in one form or another, be it as an officer behind a desk or in the seat of a fighter or bomber. Most of these cadets will go on to pilot training.

Much like the stigma associated with power aerobatics by non-aerobic pilots (elitist pilots focused on themselves and no interest in shar-

ing their sport), there exists a similar glider stigma, probably because the glider and power operations are geographically separated on the airport resulting in misperceptions on both sides. The teamwork and camaraderie of the glider group can seem impenetrable by "outsiders," but it is no different than the view of aerobic pilots by GA pilots.

Cadet 2nd Class Ben Gardner asked me what my mother thought of my flying aerobatics and the risk involved. I told him that she loved every minute of it. Cadet Gardner's mother, who came from Texas with Ben's father to see him fly, said she too was frequently asked about the risks of having her son in the military, particularly with the current situation in Iraq. She replied that she understood the risks and was proud to have a son who wanted to serve his country.

The next time you have the opportunity to introduce yourself to one of the top Air Force cadets from the Academy, thank him (or her) for his (or her) future service to a country that allows you the freedom to fly. To the U.S. Air Force Academy Aerobatic Team, its staff, and its vision, we at the IAC salute you and thank you for being a part of the IAC.

*I would also like to thank Scott Westover for his outstanding work with this publication for the last one-and-a-half years. He has been a pleasure to work with, and the product of his vision has received rave reviews. On behalf of everyone at the IAC, we thank Scott for his outstanding work and we wish him all the best in the future. EA*

# NEWSBRIEFS

## Red Bull Aerobatic Helicopter to Visit AirVenture 2008

"You can't do that with a helicopter!" That's a typical reaction after seeing the Red Bull aerobatic helicopter, the only aerobatic helicopter performing in North America, which will fly at EAA AirVenture Oshkosh 2008. The 56th annual edition of EAA AirVenture, The World's Greatest Aviation Celebration, is coming July 28-August 3 at Wittman Regional Airport in Oshkosh.

"We are always looking for exciting and interesting performers to add to EAA AirVenture's daily air show, which is the greatest annual gathering of the world's best civilian air show performers," said Tom Poberezny, EAA president and AirVenture chairman. "The Red Bull helicopter is certainly one of the most innovative air show

acts to emerge in recent years, and we're very eager to welcome it to Oshkosh this summer." Red Bull's BO-105 CBS helicopter, a stock Eurocopter/Messerschmitt-Bölkow-



Chuck Aaron is the only person licensed in the U.S. to fly helicopter aerobatics.

Blohm, is flown by Chuck Aaron, who holds the distinction of being the only pilot certificated in the United States to fly aerobatics in a helicopter. His performances feature aerobatic maneuvers achieved previously only in fixed-wing aircraft, including loops and rolls, but also nearly the entire regimen of maneuvers reserved for fixed-wing aircraft. Among those are the split-S, Immelmann, half-Cuban-eight, and even the challenging lomcevak, slightly modified by Aaron for the helicopter. "I ended up having a maneuver named after me—the Chuckcevak," Aaron jokes.

Additional EAA AirVenture information, including advance ticket purchase, is available at [www.AirVenture.org](http://www.AirVenture.org).

## Sonex Aircraft Celebrates 10-Year Anniversary

2008 is a special year for Sonex Aircraft staff, owners, builders, pilots, and enthusiasts, as it marks the 10th anniversary of the Sonex design and Sonex Aircraft LLC. February 28 was the official start of the anniversary celebration, being the 10th anniversary of the first flight of the Sonex prototype in 1998. Sonex was established soon thereafter, and the sale of the first set of Sonex plans quickly followed in August of 1998. The rest, as they say, is history.

Sonex Aircraft LLC has enjoyed many milestones along the way,

including the evolution of complete airframe kits, kit upgrades, and options; the establishment of the AeroConversions product line in 2001 with AeroCarb and AeroVee engine flagship products; and the introduction of the Waiex sport plane and Xenos motorglider in 2003. To date, more than 200 Sonex aircraft have been completed and flown in the worldwide fleet.

1998 was not the beginning of the story of Sonex Aircraft, however, as Sonex Aircraft LLC Founder, President, and designer John Mon-

nett first entered the homebuilding marketplace with the Sonerai in 1971. Since the establishment of Sonex, John Monnett has enjoyed several distinct honors including induction into the EAA Homebuilders Hall of Fame. The entire team at Sonex Aircraft LLC would like to thank the incredible group of builders, friends, family, and supporters who have made the last 10 years such a pleasure. We can't wait to see what the next 10 years bring to the Sonex Aircraft and AeroConversions product lines.

## AWAC 2008 Matching Donor Fund Drive

AWAC 2008 Inc. has received and publicized a matching offer from a very generous IAC member. Since the drive has not yet reached its \$10,000 limit, AWAC 2008 Inc. has just secured agreement to extend the deadline for the match to May 30th: up until that point, every dollar will be matched up to a maximum of \$10,000 donated by individuals to support the AWAC 2008 in Pendleton, OR. In addition to his personal commitment, this individual

(who wishes to remain anonymous) has expressed a strong personal goal to encourage as many people as possible to show their support for this International event. He will match all donations from individuals up to a limit of \$1000 from any one individual. With your donation, your name will appear in the souvenir event program and be posted on the AWAC 2008 website with the following donation categories: Unlimited \$1000 or greater,

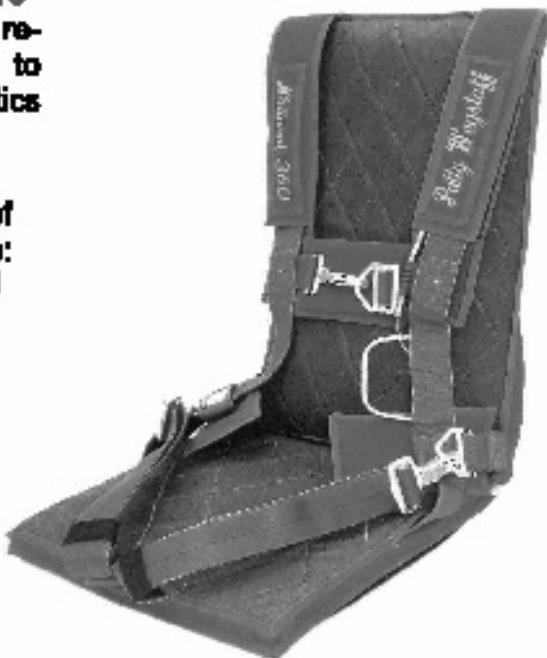
Advanced \$500 - \$999, Intermediate \$250 - \$499, Sportsman \$100 - \$249, and Primary \$50 - \$99. Donations may be made through the PayPal link at [www.awac2008.org](http://www.awac2008.org).





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SAFETY ISSUE



Courtesy Stan Burks

# Safety Is Priority One

by Stan Burks

## Meet your new Safety Committee chairman

I take this opportunity to thank the IAC for allowing me to serve as IAC Safety Committee chair. The IAC has a long history of advocating safety, and I intend to keep this focus. Safety is one of the key elements that will keep our sport free from additional regulation and scrutiny. I pledge to support safety as priority one.

Special thanks to Bruce Johnson for his efforts to move the safety program forward to its present level. Bruce has given untold hours of his free time to the cause of safety, and he deserves a rest. Thanks, Bruce, for a job well done. As an introduction, my name is Stan Burks, and I live in Hattiesburg, Mississippi. My aviation background is varied with the bulk being in flight instruction and aerial patrol. I have more than 15,000 hours of flight time with the majority of that time below 500 feet AGL.

Safety is a part of my daily life. I am presently the chief pilot for the Mississippi Forestry Commission where our daily mission is the detection of forest fires. I am in charge of the entire program, and safety is the prime goal. I am a graduate of the University of Southern Mississippi, and I received my masters of commercial aviation from Delta State University in Cleveland, Mississippi. I am also an FAA Safety Team (FAAST) representative for South Mississippi.

My fascination with aerobatics began when I received a poster of the 1972 U.S. Aerobatic Team with their Pitts

Specials. No airplane has ever grabbed my emotions like the Pitts. This fascination fueled my desire to learn to fly. My dad, who was a pilot, recognized my ambition and encouraged my interest in aviation. Without his support, I do not know where I would be today. I currently own an S-1C that is basically a flying project. I fly it periodically, then work on modifications and improvements as I have time. I hope to compete soon with the S-1C.

While working on my master's degree at Delta State University, I found my interest in safety was prompted by numerous required courses in the aviation curriculum. Before these classes, safety was a vague term for me. Through my study and research, I found that safety is actually "risk management." Our sport, by nature, has risks and hazards. If we are to continue our mind-set of safety, we must learn to assess the situation, minimize the risks, and manage the hazards.

So, where does the IAC Safety Committee go from here? First, I plan on continuing Bruce's work with a regular column in *Sport Aerobatics*. I feel this is the single most effective avenue we have to promote safety. I will not use this column to find fault with anyone or any incident, only to present different situations for exploring how we can learn from mistakes. Fortunately, there have been no accidents reported since January of 2008.

I am presently sorting all the information Bruce has

transferred to me. My most pressing goal is to get these data into a searchable database so we may easily review accidents, track trends, and compare yearly statistics. I will have the database available to the membership this summer. If you have any suggestions of what format we should use for the database, feel free to contact me.

Statistically, the major cause of accidents is flight while maneuvering. The second leading cause of accidents is spin related. This trend repeats itself year after year. If we understand the problem, surely we can take steps to minimize the risks. I am convinced that we can enhance our safety program with three simple actions: training, planning, and practice. These action elements will go a long way in minimizing the risks and hazards we face as aerobatic pilots.

I believe training could be the cheapest insurance available. While many of the maneuvers we aspire to perform can be broken down into simple movements of the controls, one can easily become disoriented during the first couple of attempts. A calm easy voice explaining what is happening and why is very reassuring and should decrease the amount of time spent learning new maneuvers. Planning, on the other hand, will go a long way toward keeping us out of trouble caused by spontaneous actions. Just as one plans a cross-country flight, I think our aerobatic flights should be planned

in the same way. Weather, aircraft performance, weight and balance, pilot currency, health, and mental attitude all play a part in the successful completion of an aerobatic flight. In addition, one should plan the maneuvers, sequences, and emergency actions for each flight. One cannot dismiss practice as a major safety factor in itself. Practice makes perfect and keeps us sharp. I plan to ask the current experts in these fields to write articles offering practical safety tips. Moreover,

I would like to see more safety seminars explaining actions. I need your help to gather these articles and information.

More articles concerning human factors while flying aerobatics are needed for the readership. There is evidence that suggests human factors may have played a role in some

accidents. Again, I think that if we know in advance what to expect, we will be able to make better decisions concerning our flights.

Your help in promoting our safety program is necessary as we strive toward excellence in our sport. If there is something you feel needs to be discussed, let me know. I will find someone to answer our questions or provide a solution to the problem. E-mail me at [N5ue@bellsouth.net](mailto:N5ue@bellsouth.net) and let me know your interests. Your support is greatly appreciated. I look forward to serving as your chair of the IAC Safety Committee. 

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# Emergency Thinking

***Have a plan before you need it***



Greg Koontz, MCFI-A

I've been a professional pilot since I was 18 when I started my career by instructing at a satellite airport near Birmingham, Alabama. That was back in 1972 when 100 octane was about 50 cents, a late model Cessna 150 trainer could be had for about four grand, and lots of people showed up at the airport on Saturdays. I could fly students all day and not get to them all.

In those days there weren't flight academies on every corner offering sidewalk-to-jet training packages. Most of us muddled through general aviation instructing, towing banners, giving rides, flying beat up Apaches on charters, and doing anything else that logged another hour. You flew in stormy weather without radar, airplanes were streaked with oil, and passengers were anyone willing to pay. It was a breeding ground for gremlins.

Like most pilots I've had my share of in-flight emergencies. Most are simple stories of putting gear handles down with no whirring sound to follow or a basic in-flight engine shutdown. Once in a great while something would come along that made my heart skip a few beats and challenged my serenity.

My first such incident happened at age 19 in the summer of 1973. Richard Cornelius, a fellow instructor then twice my age, was a part-timer who worked in real life at the power company (referred to by him as his "dam" job). One of his fellow workers owned a nice 7KCAB Citabria and needed some rental income to justify the payments. Richard struck a deal and had the pretty little Citabria brought to our airport for a trial weekend of rental. Wow, the door had opened to my first chance to fly a real aerobatic airplane! I simply couldn't wait to try this out.

You see, my thirst for aerobatics had so far been teased by what I could do with my J-3 Cub. That means loops, barrel rolls, and spins were about it. Now I was looking at the weekend as a chance to fly a Citabria for as many

hours as I could get in. This thing could actually roll, and it had an inverted system. From my first flight I was obsessed with learning how to fly that thing upside down. The first try was a disaster while I learned the required nose-up attitude for the Citabria, but it wasn't long before I could hold level inverted, and that meant taking up all my buddies to show it off. One such flight was with Steve Strickland, a young guy with a cautious approach to flying. On our inverted flight we got this strange cough out of the 150 hp Lycoming. Steve quickly decided he had enjoyed about all of this he could stand, and we quickly returned to the airport.

Of course, with my enthusiasm on high, I was quick to disregard the engine cough as just "one of those things" engines sometimes do. I had to take one more flight. I was about to accumulate my 1,000th flight hour that weekend, and I, in my usual flair for the dramatic, wanted to cross the 1,000 hour mark inverted.

So, up I went. By that late Sunday afternoon some clouds had rolled in, and a little over 1,000 feet AGL was about all I could get. I had this inverted stuff down pretty good, so as the ol' Hobbs clock was showing the last half of the number before getting me to my goal, I rolled over and settled into a decent level inverted flight path. It would be a matter of seconds before my glorious inverted ride through hour 1,000. A quick glance inside confirmed the sight of the whole next Hobbs clock number, and my mission seemed a complete success. As if to accentuate my achievement, the engine began to slowly bog down and lose power. I immediately rolled right side up, but during the roll the propeller stopped like it had hit concrete. This was not quite how I had planned to start my next 1,000 flight hours.

I was totally flabbergasted. I sat in that seat and stared at the propeller sitting there in the vertical position. A

long moment passed while somewhere deep inside I was trying to come to grips with the idea that I no longer had power at my disposal. I involuntarily moved the throttle forward to the full power position. In my stupor I reached over and pushed the starter button. It was like I really believed that a 12 volt starter could do what a 150 hp engine could not! Still, I trimmed for full cruise speed. I was quickly using up altitude as I continued trying to make sense of the situation. I looked outside for a landing spot. The group of fields I had selected to do my flying over had magically shrunk to postage stamp size. I did a hard 180 degree turn (still at 120 indicated airspeed) only to find myself lined up with a long rectangular stretch of flat cow pasture that had a magical sign at the threshold that read, "Land here, stupid." So I did.

There was no denying it. I had done absolutely nothing to make this picture perfect forced landing happen. I got out of the Citabria, and to complete my belief that the whole thing was surely a divine intervention, I looked behind me at the track of my landing rollout. The field was absolutely full of cows! I don't remember seeing a single cow as I landed. In fact, I don't really remember the landing at all.

Later I would learn that the poor little Citabria had turned the main engine bearing, which in turn closed its source of oil flow and caused the engine to seize. This wasn't caused by lack of proper oil levels or any particular abuse by the pilot. That was lucky for me, because I was a 19-year-old CFI with about half the income of a burger-flipper (I know because that was my previous job) who couldn't fork out enough money to pay for the spark plugs alone.

So, what had happened to my vast flight instructor knowledge of forced landing procedures? What happens to a seemingly competent pilot when an in-flight emergency hits him or her square in the nose? I think it's the difference between knowing how to handle an emergency

situation and actually being prepared for it to occur in the first place. Let's take an "aftermath" look at this fiasco.

(1) The pilot was young, enthusiastic, and driven by his desire to accomplish his ill-fated goals, absent of sound judgment. (2) Evidence of an engine problem was brushed off in favor of the desire to fly. (3) When the weather didn't cooperate, a "got-to-get-this-done" logic was substituted for knowledge of the regulations. (4) A decision was made to fly over possible forced-landing spots, but they were chosen carelessly with no intention of ever really using them. (5) Because the engine failure was never anticipated it came as a complete shock. (6) Said pilot never fell back to his training for help (no procedures, no checklist).

In the world of professional flying, be it military, airlines, corporate, or whatever, we approach emergencies with the idea of preparation. The professional learns the procedures. Not every little move, that's what a checklist is for. What we memorize is the first critical moves needed in a tight situation like an engine failure at takeoff or a fire. Then we go to the simulator and practice it until we have the moves down pat. On the line we include the most critical situations in a pre-landing or pre-takeoff briefing where we discuss the current situation and what

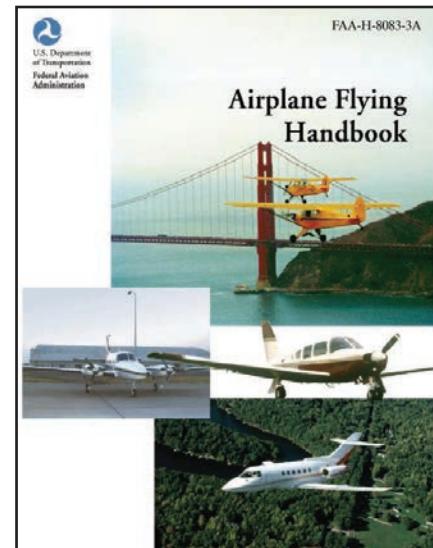
*I was about to accumulate my 1,000th flight hour that weekend, and I, in my usual flair for the dramatic, wanted to cross the 1,000 hour mark inverted.*



Logging his 1,000th hour while inverted, Greg rolled upright in time to make an emergency landing.



Greg Kortz



Courtesy/FAA

we plan to do if trouble happens. That is, we are always getting ready for that worst-case scenario. When the left engine comes apart just as we're lifting the nose gear off the pavement, a prepared pilot will begin a procedure that is right at the top of his thoughts instead of staring at the stopped prop with his chin in his lap.

The sport and typical general aviation flier goes to the airport to enjoy a day of a favorite activity. You just don't commonly hear the captain of a Skyhawk or a Decathlon doing a pre-takeoff briefing on emergency procedures.

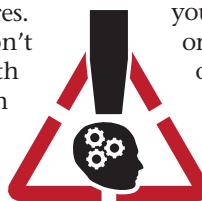
Your passengers and many students just don't want to hear this. Many have trouble dealing with the idea of sitting at the end of the runway on every takeoff talking about the worst that can happen. I have students tell me they never practice stalls, they never let an instructor pull the power on them to practice a forced landing, and they definitely don't sit around daydreaming about how they are going to handle a fire. But the truth is, that is exactly what we must do. I think a good pilot does a lot of daydreaming. We should be imagining ourselves handling a cabin fire, an engine failure, a gear collapse, a control malfunction, and an emergency egress. It is far better to think these things through while you're free of panic and have plenty of time. There is no time to make notes when the trees are getting bigger during a real emergency.

Cruising cross-country on a nice day is not exactly taxing work. I always spend some of that time running a few "what if" scenarios. What would I do if I smell the stench of an electrical fire? How could I restore some power to talk to tower after a complete electrical shutdown without restarting the fire? Should I pull the door release (or canopy latch) before I undo my seat belts in a structural failure? Could I find that fuel cut-off knob that I never use if I detect a massive engine fire? In what order would I do things after an engine failure? Would I remember to

establish best glide speed, find a landing site, turn toward that site, check fuel/mags/pump, and make an emergency call? It's like golf: you've got to do it regularly if you're going to be good at it.

Some emergency preparation warrants actual physical practice. Most of us are aware of the benefits of spin training and practicing unusual attitudes. But, as an example, how about that bailout? Is it getting the same attention?

I'm telling you now that you have to physically walk yourself through the procedure regularly. Have someone hold the canopy/door while you pull the pin or pull the knob and actually see what it takes to accomplish an emergency opening. Pop your belt buckles, move your body, and do what you would do if you were bailing out. Before you ever fly aerobatics with a student or passenger make sure you walk them through the entire procedure. They need to know the moves as well as the plan. Words alone will not do, and the risk of scaring them is outweighed by the passenger's understanding that you are ready to handle an emergency. Here's your assignment: Make a list of risks. Consider things that could happen (fire, engine failure, prop separation, etc.). Daydream your way through what you need to do about these things and check the pilot's operating handbook (POH) if your aircraft has one. If you



***Physically practice each procedure to perfection and always safety brief your passenger and yourself before each applicable phase of the flight. Once you have a plan, stick to it.***



Kate DeBaun

Keeping an eye on the weather prevents emergencies from happening.

do not have a POH, go to the FAA library and download a copy of the *Airplane Flying Handbook* ([www.FAA.gov/library/manuals/aircraft/airplane\\_handbook](http://www.FAA.gov/library/manuals/aircraft/airplane_handbook)) and refer to Chapter 16. Memorize the required "immediate actions" and make a checklist of the entire procedure. Physically practice each procedure to perfection and always safety brief your passenger and yourself before each applicable phase of the flight. Once you have a plan, stick to it.

I'm big on the idea of mentors, so if you have someone you respect and trust, use that person to help refine your

emergency plans. This sport has a wealth of knowledge sitting around at IAC meetings. Always take advantage of it. And never forget; be prepared (and look out for those cows!). ☺

*Greg Koontz is a full-time aerobatic professional and runs his aerobatic school at Sky Country Lodge in Alabama. He is sponsored in air shows by American Champion Aircraft, is an aerobatic competency evaluator (ACE), and sits on the International Council of Air Shows ACE Committee. Address any questions to greg@gkairshows.com.*



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13th ANNUAL  
SAFETY ISSUE





# Fly What You See

THE IMPORTANCE OF MAINTAINING SITUATIONAL AWARENESS

**Rob Holland**

The link between situational awareness and safety is stressed at every level of pilot training. In the FAA Office of Aerospace Medicine report *A Review of Situation Awareness Literature Relevant to Pilot Surveillance Functions* (report number DOT/FAA/AM-02/3), authors John Uhlark and Doreen Comerford write "...the most commonly cited definition of [situational awareness] is ... the perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future."

... In other words, situational awareness is knowing where you and the airplane are relative to your surroundings and understanding how things are changing in real time. Understanding their position relative to the ground is usually the first lesson in situational awareness for new student pilots. Gradually the concept is expanded so that pilots are constantly evaluating every aspect of the flight environment by combining information provided by instruments, their eyes, and their body. Decisions are made using that information, and when pilots have burned through enough fuel, an intuitive approach to controlling the airplane will develop.

When situational awareness is lost the result can be tragic. The vast majority of aviation accidents are caused by human error, and the error is usually rooted in a misunderstanding or misinterpretation of the flight environment. As aerobatic pilots we have a responsibility to constantly hone our situational awareness skills because our flight environment changes faster than that of any other type of flying. Our quest for control and thirst for excitement drew us to this sport, so we should not be surprised that our basic situational awareness skills may need to be polished beyond their straight and level state in order to maintain the level of proficiency required to safely fly aerobatic maneuvers.

#### FOCUS ON FLIGHT

Entire books have been written to stress the understanding that situ-

ational awareness applies to every aspect of activity related to each and every flight. That includes the preflight and continues through rolling out and securing the airplane. For the purposes of this article, the discussion is limited to flight. At EAA AirVenture 2007, *Sport Aerobatics* editor Scott Westover and I had been talking about the challenges related to transitioning from an entry-level aerobatic trainer like his Acro Sport II to a high-performance airplane such as an MX2. (It's actually easier than you may think. See Scott's sidebar on page 17.) I had made the point to Scott that the secret to safely flying different types of aircraft is developing good situational awareness habits and remembering to apply them in every airplane. Learn how the airplane flies and then fly what you see and feel. Like most people who first see the MX2, Scott thought it was a fire-breathing machine that is incapable of straight and level flight and only flies Advanced or Unlimited maneuvers. At the risk of bruising my own ego, I set him straight with a confession of sorts. The truth is that the MX2 and other stable high performers like the Extra 300L are relatively easy to fly. The skills learned in a bird like the Acro Sport will prepare a pilot well for a transition—with a little help from a qualified instructor. The secret is becoming a student of situational awareness. As I tell my students, make the decision to be a pilot instead of a passenger. That decision demands that you know exactly where you are relative to the ground and relative to space.



Aerobatics requires understanding situational awareness on a micro level.

#### AN APPLIED LESSON

To show Scott that I was serious about his Acro Sport time being applicable to the MX2 we took a flight over Oshkosh. Once we were in the air I gave him the controls so he could feel that the airplane, while more sensitive than his usual ride, flies more or less like every other airplane. In normal flight, when you pull back on the stick, it goes up; when you push the stick forward, it goes down. The airplane rolls normally—just a little faster—and admittedly that can take a little getting used to. When things happen faster it challenges the pilot's ability to understand where he is in relation to the space he is flying in. It also forces the pilot to use the information he is gathering, such as the horizon line. For example, when Scott rolled the MX2 for the first time, we rolled almost 180 degrees past the target wings-level position. Inverted, he pulled back slightly on the stick, and the nose lowered toward the ground. After an immediate correction and rolling upright, we did it again with better results.

Back on the ground I asked Scott about the pull at the end of the roll. He confessed that in his Acro Sport he often completes the roll slightly nose low and corrects with back pressure. In the MX2, with the faster roll rate, he overshot the end point and muscle memory took over so he added back stick—a classic symptom of having lost situational awareness. Even though the information outside the airplane told us we were upside down and that we had rolled beyond the intended point, he finished the maneuver with a bad habit (that I am sure he has since broken!). This story points out a couple of things. First, the importance of keeping your head on a swivel and knowing what is happening inside and outside of the airplane cannot be overstated. Knowing what your reference points are and using them (in this case the horizon) is not the same as memorizing the maneuver because the maneuver changes in different airplanes and can even vary during different flights in the same airplane. This simple roll lesson also points out the importance of getting your situational awareness bearings at a safe altitude with a qualified safety pilot on board. Perhaps the most important take-away from



**Safely flying different aircraft depends on exceptional situational awareness skills.**

this example is that the airplane did not do anything wrong. It did exactly what the pilot asked.

#### **IT'S ALL RELATIVE**

There is no doubt that investing in situational awareness skills is likely to be the best and least expensive investment a pilot can make in improving her personal margin of safety. Every practice flight presents the opportunity to sharpen awareness technique. When a student begins her aero-

batic training at Aerial Advantage, I encourage her to think about situational awareness in two parts. The first is where she is relative to the ground, and the second is her situation relative to space.

In aerobatic flight, the goal is to develop knowledge of where you are relative to the ground on a micro scale. In primary flight training students think about their position relative to the ground in terms of being on a Victor airway somewhere

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between Boston and Providence at 9,000 feet AGL. As aerobatic pilots, that understanding of space needs to become fine-tuned to the point of understanding where you are presenting every maneuver over a specific piece of ground. In competition, there is a box that has four sides and a midpoint. The pilot needs to know where the airplane is as a maneuver begins and also where the airplane will be during, and at the end of, that figure. It is the difference between knowing that you are flying over a forest and knowing that you are flying over a particular tree. As your situational awareness skills increase, you will know which branch you are flying over. Okay, this is an exaggeration, but it makes the point that it is impossible to be too aware of where you are placing the airplane relative to the ground.

Knowing where you are relative to space is also critical to successfully flying aerobatics. Some aerobatic pilots clearly do not know exactly where they are during a maneuver or a sequence. As an example, there are many pilots who can tumble an airplane after learning the proper control inputs. However, far fewer pilots can stay with the maneuver as the airplane tumbles and then stop the maneuver on heading in exactly the spot they want to occupy. The difference between the two is situational

awareness coupled with flying skill and experience, and it does not take a maneuver as dramatic as a tumble to make the point.

I once had a student who came to me for some advanced instruction in inverted flight. On our initial flight, I asked him to roll the airplane inverted and maintain our heading and altitude using a distant mountain as a reference point. Almost instantly the airplane began a gentle turn. I watched as the student turned his head and remained focused on the reference point even as it mysteriously drifted across the cowl and meandered toward the left wing. I asked the student to roll upright and then to turn the airplane toward the reference point. He was genuinely surprised at how much our heading had changed and in disbelief said, "But I was watching the mountain." He certainly was, but he did not use the visual clues to maintain situational awareness. He had fixated on airspeed and altitude, which were held constant, but had lost his position relative to the ground and also had lost awareness of the cockpit environment as the airplane was being allowed to turn. For him, the trick was to talk through the situation. By describing what he was seeing out the front and confirming the information from his instruments, we were able to dramatically improve

his awareness and remain on heading while holding altitude. Confirming aloud what you are seeing is a great way to convert information to control inputs.

Another example of lacking situational awareness can be seen when newer students are flying a loop. Too many aerobatic pilots fly loops facing forward with their eyes glued to the propeller. After the first portion of the maneuver, they are flying blind. When the horizon disappears under the cowl, the field of vision is all blue sky until the horizon rolls into view across the canopy. They have no idea if the figure is round or pinched, or if the airplane has rolled off track. In competition this is a sure way to lose points, but in a more practical sense the recreational pilot that has lost situational awareness has forfeited any margin of safety while flying the maneuver. While he is staring out the front he may miss references that would tell him to make a correction or that would reveal the maneuver should not be started in the first place. Those decisions are impossible without information, and information comes from being aware of the current situation and flying what you see.

#### WEARING YOUR AIRPLANE

Many aerobatic pilots have said, "You don't get into an aerobatic airplane; you put it on." Understanding this distinction is the key to mastering situational awareness. There is a noticeable breakthrough when an aerobatic student stops thinking about how to control *the airplane* and begins to think about how to move *herself* to accomplish some flying task. Instead of thinking, "How do I make the airplane turn in a circle while rolling?" the successful pilot thinks, "How do I roll through space in a circle?" Viewing the airplane as a physical extension of yourself makes piloting much more intuitive than memorizing every mechanical control input required when executing a complex maneuver. Getting to that point takes practice and requires developing a keen sense of how you are moving through the air relative to the ground and space.

On more than one occasion I have been asked if I can teach situational awareness. Like most instructors, I



Understanding location relative to space and ground is critical for air show pilots.

# Hey, Maybe I Can Fly That!

Scott Westover

The way an airplane flies at a contest or air show in the hands of an air show or Unlimited pilot tells you a lot about the full throttle capabilities of that airplane. However, it does not provide much information about the skills required to competently fly the aircraft. When watching Gary Ward tame the sky in his MX2 at AirVenture 2007 and having seen Rob Holland's high energy promotional air show videos, I believed that airplane was simply out of my league. After all, I fly a docile biplane; who am I to think about strapping on a few hundred extra horsepower and rolling at 500 degrees a second?

As it turns out, I am the guy that MXR Technologies has in mind when it is marketing MX2 airplanes. It just so happens that Gary, Rob, and other world-class pilots have discovered that a tweaked MX2 is capable of, well, just about anything. But that doesn't mean that the rest of us should be scared away (although it does mean

that we need to be realistic about the skill required to hang on the prop long enough to eat a sandwich as Gary does during his performance!).

After our MX2 flight in Oshkosh, Rob summed it up like this. "The beauty of the airplane is that you can tune it up like I have done and have a fire-breath-



airplane and have an airplane that you will never outgrow."

After my flight, I think he's onto something. Finances aside, I was very comfortable in the airplane. The only real difficulty was in my head. Sure it rolled fast (thanks, Rob, for ratting out my bad habits to an international audience in your article), but the lesson that I learned is that I have to tune into the airplane differently and actually see what is happening rather than assume that I have seen it before. Once I concentrated on maintaining situational awareness, the MX2 was downright comfortable and fun beyond words. While I understand that flying an MX2 would not magically turn me into an air show headliner or member of the U.S. Aerobatic Team, it is still very cool to watch those high energy performances and understand that those guys are taking an airplane that was actually built for the rest of us and making it do amazing things.

ing competition and air show machine, or you can take the exact same airplane, detune the ailerons slightly, and have a very easy airplane to fly...a pilot with solid tailwheel experience like you can get checked out in the



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answer that I can teach situational awareness to a certain point, and then it is up to the student to develop good habits and to keep his head on a swivel. The competence comes from using every minute of the flight to process what is happening moment-to-moment and into the future.

#### **IDENTIFYING COMPETENCE**

An excellent maneuver during which an instructor can evaluate situational awareness skill is the reverse half-Cuban. While this is considered a basic maneuver, it puts the student in an unusual attitude that requires a reliance on external reference points to be flown correctly. Most beginner students roll the airplane inverted and then become disoriented. They are not aware that the nose is too steep or too shallow or that the wings are not level. Since they are not aware of the situation, they do not fix the errors and attempt to fly the maneuver from memory. The role of the instructor is to bring the best available references to the attention of the student. Reminding them to keep their eyes outside of the cockpit is not enough—as instructors we need to tell them what they should be looking for. Students should not settle for holding a control input or for committing to an input that *would have* been correct if the situation had not changed. One drill that makes this point with dramatic impact is a two-part exercise that includes an inverted turn. This is

something that can be practiced solo after the student is comfortable, and it should be flown with an instructor until that time.

Begin during straight and level flight. Have the student look off the wing and find a highly visible reference point a safe distance away. Tell the student to focus on that point, and that she will need to turn toward that point when inverted. After a few moments instruct the student to roll the airplane onto its back and immediately turn toward the reference point. Nine times out of ten, the first few times the student attempts to flip and turn, she will pick the reference point, roll the airplane inverted, and then turn away from the reference point. The reason for the turn in the opposite direction is the student is concentrating on the reference point and the control inputs required to make the turn from an upright position. After rolling inverted, that “memorized” input is applied instead of rethinking the control inputs required to turn toward that point from a new position. The lesson teaches the student to observe the environment and to apply the control inputs that will place her in the correct position relative to the ground and space based on the current and future situation, not the previous situation that is no longer relevant. When the student learns to do this consistently, every aspect of her flying will become more precise.

The benefits of situational aware-

ness are not limited to competitors, air show pilots, or even aerobatic pilots. Every pilot will benefit from knowing where he is and how the flight environment is changing moment to moment. This helps to eliminate surprises and keeps the pilot from falling behind the airplane. It also helps when transitioning to a different airplane. If a pilot has truly invested the time and energy required to build situational awareness skills, it becomes more difficult to lose track of things during a flight. As soon as things look, feel, or sound wrong, the “tuned in” pilot is making a correction so that major recoveries are less likely to be needed. Disorientation is most likely to result from an unexpected change during a flight that exposes the pilot to a new view out of the windscreens. That’s why it makes sense for all pilots to participate in an upset and spin recovery course. That way they have “seen it before” and will be less likely to make bad decisions because they have been caught unaware.

#### **A CHALLENGE**

If you visit my website, [www.UltimateAirshows.com](http://www.UltimateAirshows.com), you can view a video that was recorded using a helmet-mounted camera. Try to follow along with the routine and see if you can maintain your situational awareness. You will see firsthand what I mean about understanding your position relative to the ground and relative to space. 

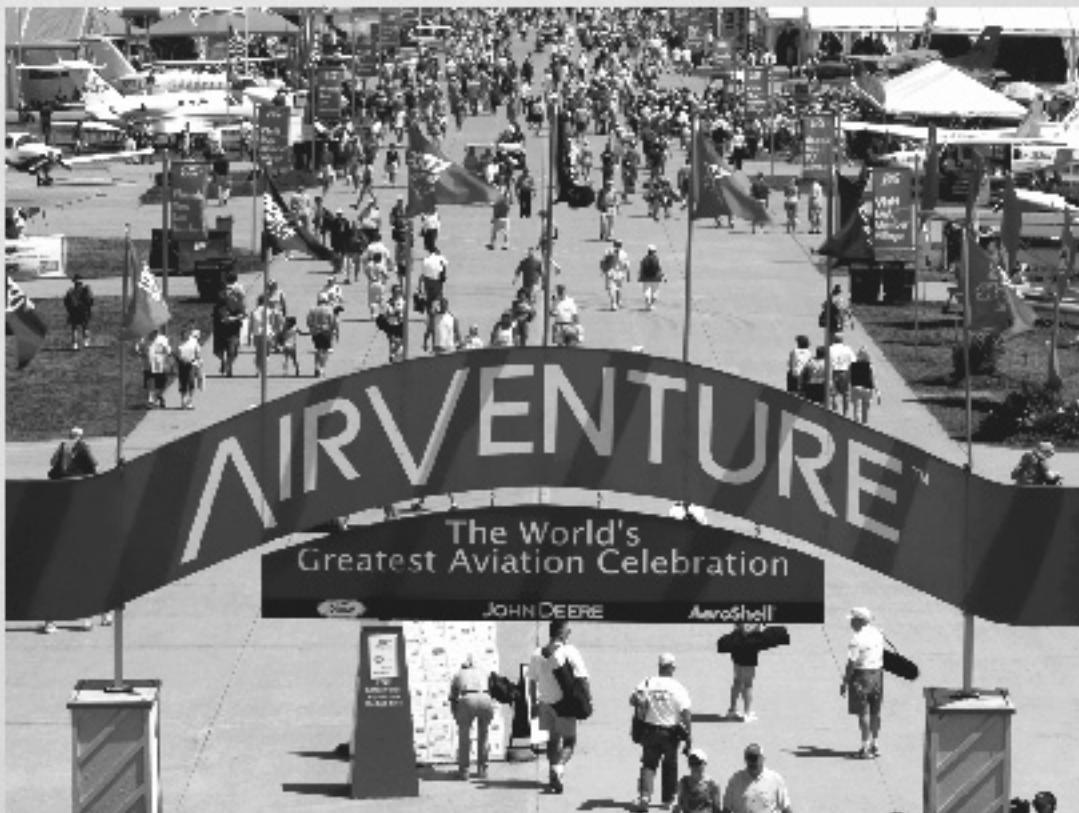


Brett Brock

*Rob Holland has received multiple first place and subsequent awards in aerobatic competitions in both the United States and Canada. He was the New England Competitor of the Year in 2002, 2003, and 2004 and won the “Pitts Trophy” twice. He is a three-time member of the U.S. Advanced Aerobatic Team and was the top-placing American at both the 2004 and 2006 Advanced World Aerobatic Championship (AWAC). Rob also placed second overall in the world at the 2006 AWAC held in Radom, Poland, and helped the U.S. Advanced Aerobatic Team secure second place in the team standings. He will be competing in the 2008 Advanced World Aerobatic Championship being held in Pendleton, Oregon, August 1-8, 2008.*

*Rob holds a level one unrestricted aerobatic waiver for air shows. He was voted to the board of directors of the International Aerobatic Club in 2006 and has been designated by the FAA to be an aviation safety counselor with a focus on aerobatic flight.*

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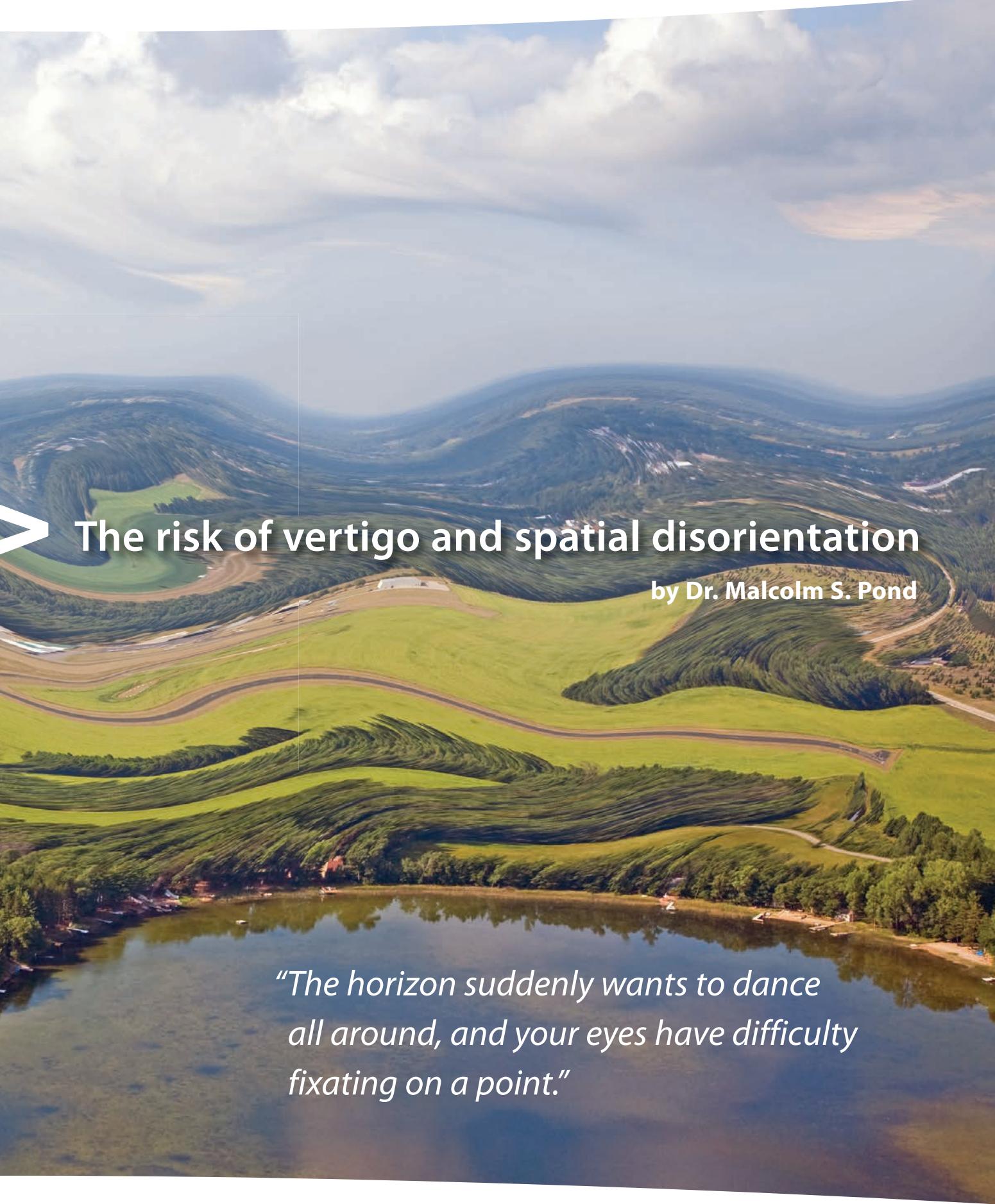
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# Tumbled Gyros >



## > The risk of vertigo and spatial disorientation

by Dr. Malcolm S. Pond

*"The horizon suddenly wants to dance all around, and your eyes have difficulty fixating on a point."*

**A**side from in-flight fire, airframe/engine failure, or unplanned ground proximity, there is probably nothing more upsetting than sudden spatial disorientation while flying. Spatial disorientation for most pilots usually is triggered by illusions that affect vision and orientation, and anyone who flies instruments in the dark or at night is familiar with these frightening events.

As aerobatic pilots, we are concerned about a different type of spatial disorientation. When flying aggressive maneuvers, pilots have reported sudden development of vertigo and the inability to steady themselves and safely pilot the airplane, even though the sky above, dirt below, and horizon are readily visible.

The horizon suddenly wants to dance all around, and our eyes have difficulty fixating on a point. We might develop nausea, headache, and other confounding symptoms that could be so incapacitating that we start thinking about bailing out of the airplane. When landing, we might not be able to stand upright, and we might stagger like a drunk when trying to walk. These symptoms usually resolve in several minutes,

but might last longer and recur later.

This condition is known as the "wobbles" or "g-induced vestibular dysfunction." A more accurate medical description of this condition is "benign paroxysmal positional vertigo," or BPPV.

#### WOBBLES = BPPV

Although BPPV has been known for a number of years, it had not been described well in the aerobatic community until 1998 when Dr. Tom Muller, an FAA medical examiner and physician for the U.S. Aerobic Team at the World Aerobatic Championships in Slovakia, described a case report in detail.

Scott Poehlmann, M.D., who is vice president of the IAC and a competitor in the Advanced category, reported results of an epidemiologic survey about the wobbles in the January 2004 issue of *Sport Aerobatics*. Although questionnaires were sent out to nearly 5,500 IAC members, only 2.6 percent responded. Even though the number of respondents was small (127 pilots), it represented nearly one-fifth of the 605 pilots active in competition aerobatics at the time of the survey.

Of these 127 pilots, one in four

had experienced the wobbles at some point in their aerobatic careers. Two-thirds of Unlimited pilots had felt the wobbles, while only 2.9 percent of Sportsman pilots had ever reported symptoms. Symptoms typically consisted of a sensation of spinning and loss of balance and lasted anywhere from 10 minutes to one hour, and the effects were rated from bothersome to incapacitating. Half of the pilots experienced symptoms during flight.

Onset of symptoms was usually associated with head movements, and symptoms occurred most frequently when pilots were exposed to high g-loads (positive or negative) and tumbling maneuvers. There was no association with migraine headaches, and the wobbles occurred less frequently in pilots who did regular strength training exercises. Aerobic exercise did not seem to confer any protection against the condition.

Unfortunately, pilots do not want to talk much about this condition because of repercussions that BPPV could have on their FAA medical certificate, their professional flying career, and their ability to continue aerobatics. FAR 61.205(c) addresses the fact that an aviator cannot pilot an aircraft if he has any disorder of equilibrium that makes him unable to meet the requirements of the medical certificate.

According to the Aircraft Owner and Pilots Association's medical certification department, an aviation medical examiner cannot issue a medical certificate to a pilot with vertigo. The FAA looks at each case carefully. It will only issue the certificate if the pilot submits a letter from his physician that indicates the severity, treatment, and prognosis of the condition and states that it has been treated successfully.

The largest percentage of pilots experiencing the wobbles is among pilots in the Advanced and Unlimited categories and air show pilots. Sportsman and Intermediate category pilots are probably less at risk. There is suspicion that hard positive and especially negative g-exposure and aggressive rotational maneuvers can cause the condition, although unfortunately there is a dearth of evidence. Advanced and Unlimited categories are known for



Robert Bismuth

Benign paroxysmal positional vertigo is more commonly known as the "wobbles."

*g* maneuvers that can exceed +10*g* and -6*g*. Unlimited competitors also perform gyroscopic maneuvers in their 4-Minute Free programs, and they experience acceleration in all three dimensions.

Many pilots have reported the first instance of wobbles when doing a zero *g*-maneuver such as a pull-push humpty or hammerhead after performing hard negative pushes. Rapid head movement, lateral acceleration of the body, and twisting of the head and neck away from the direction of flight might contribute to the problem. The risk of recurrence is higher once you have had an episode of BPPV.

#### YOUR INTERNAL GYROS

Our body's orientation in three-dimensional space depends upon visual references, position sensors in the skeletal muscles called proprioceptors, and receptors in the inner ear that register acceleration and rotation of the head. The overall structure of the ear is illustrated in Figure 1, and we are focusing on the inner ear.

*Many pilots have reported the first instance of wobbles when doing a zero g-maneuver such as a pull-push humpty or hammerhead after performing hard negative pushes.*

Figure 2 shows the structure of the inner ear in more detail. Three semicircular canals, which are oriented in a perpendicular fashion to each other, detect motion in the horizontal, vertical, and lateral planes. Each canal consists of a fluid-filled tube within a tube and has a special sensory organ called the "cupula" that detects fluid movement when the head is turned in one of these planes.

The innerear also has two additional

sensory organs, which detect linear acceleration. One is called the utricle, which senses gravitational acceleration in the horizontal plane, and the other sensory organ is called the saccule, which senses acceleration in the vertical plane.

The utricle is composed of fine hair-like nerve endings that are covered by a membrane and coated with small particles called "otoconia." More about this in a moment. The nerve endings in the utricle bend with

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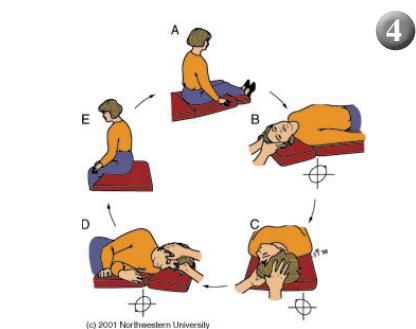
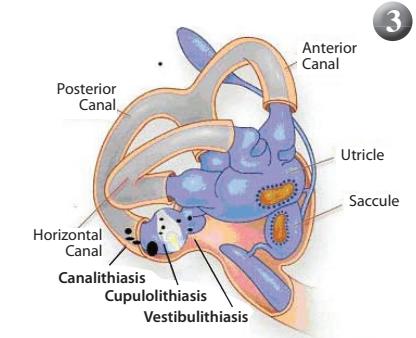
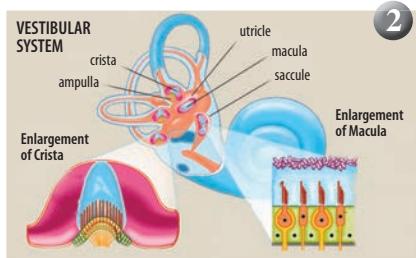
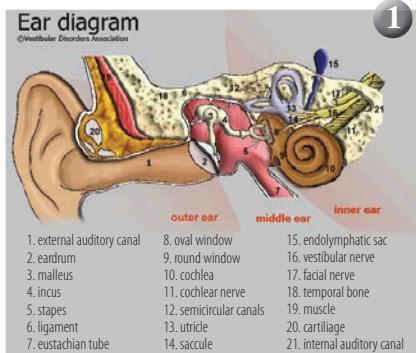
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acceleration. This stimulates the nerve and eventually registers acceleration with the brain. As an analogy of the function of the utricle, think of an aircraft inertial navigational system



**Figure 1** The structure of the human ear.  
[www.vestibular.org](http://www.vestibular.org)

**Figure 2** Detail of the inner ear and semicircular canals.  
[www.britannica.com](http://www.britannica.com)

**Figure 3** Particles in the canals.  
[www.dizziness-and-balance.com](http://www.dizziness-and-balance.com)

**Figure 4** The four step Epley maneuver.  
[www.dizziness-and-balance.com](http://www.dizziness-and-balance.com)

that senses acceleration in the horizontal plane. Another example would be a catapult launch off an aircraft carrier—certainly a maximum stimulation of the utricle!

The saccule is identical but senses vertical acceleration. It is responsible for the sinking feeling when you are on an elevator. Without getting lost in the medical jargon, just remember that each ear has five sensory organs—one each for head rotation left/right, up/down, head tilt, forward acceleration, and vertical acceleration.

### ROCKS IN YOUR EARS

As mentioned above, the membranes in the utricle and the saccule are covered by calcium carbonate crystals called otoconia, which is just another way of saying we have small rocks in our inner ear.

If these crystal particles become dislodged, they can start to float around. If they get into the semicircular canals, they will trigger an illusion of head movement. This is the most likely cause for BPPV or the “wobblies.” **Figure 3** shows examples of the calcium carbonate crystals in the posterior canal, or in the vestibule or cupola.

More than 80 percent of BPPV involves the posterior semicircular canal, while the horizontal and anterior canals are involved much less often. It makes sense that hard negative *g* maneuvers and tilting of the head could dislodge the particles and produce the condition.

We know that pulling *g*'s briefly can cut off blood supply to the brain. The blood supply to the inner ear is similarly affected. There is a possibility that these brief episodes when blood flow ceases might cause cumulative damage to the apparatus of the inner ear. Aging, prior head trauma, migraine headaches, sinus and ear infections, allergies, toxic drugs, and other conditions are known to increase the risk of developing BPPV.

### CORRECTING TILTED GYROS

The wobblies are accompanied by characteristic rapid oscillating eye movements, called “nystagmus.” You can easily re-create this by spinning around several times with your eyes closed, then opening your eyes when you stop. You will notice

that you have difficulty fixing your gaze on a point because your eyes keep moving. Ballet dancers avoid this by holding their heads still as they pirouette.

Under normal circumstances, when you turn your head one direction, the eyes move in the opposite direction to stabilize the image. This is the result of a brainstem reflex, the “vestibulo-ocular reflex.” When you turn your head, a semicircular canal senses the motion and sends a signal to the brainstem, which in turn triggers the contraction of certain eye muscles so that your gaze remains fixed.

The same phenomenon is observed when calcium carbonate “rocks” enter one of the canals and triggers BPPV—the eyes begin to oscillate. Each canal triggers specific patterns of nystagmus. A maneuver called the Dix-Hallpike test is performed to diagnose which semicircular canal is causing the problem.

The therapist positions your head back and to the side, while you rapidly lie down over the edge of an exam table. This maneuver evokes a pattern of rapid eye movements that identifies which semicircular canal is involved. When the maneuver is performed, the therapist might have you wear a set of opaque goggles, fitted with infrared lights and a video camera for each eye, so that the nystagmus patterns can be seen better and recorded.

There are three recognized ways to treat BPPV. First is the “wait and see” approach. Symptoms often subside spontaneously within several months. Drugs such as Valium, steroids, and various motion sickness medicines do not cure the problem. The second approach for treating BPPV is head-tilting maneuvers. In 1994 Dr. John Epley described a four step series of head-tilting maneuvers designed to clear the calcium particles in the affected semicircular canal and return them to their normal position in the inner ear. See **Figure 4**.

The objective of the Epley head-tilting maneuver is to allow gravity to move the particles in a slow stepwise fashion around and out of the affected semicircular canal. When successful, the canal no longer generates spurious motion signals. The Epley maneuver causes almost immediate relief from vertigo, although several treatments over the course of a week or two

might be necessary. The success rate is nearly 80 percent. You can observe a video of the maneuvers on YouTube at [www.YouTube.com/watch?v=pa6t-Bpg494&feature=related](http://www.YouTube.com/watch?v=pa6t-Bpg494&feature=related). One word of caution. Don't try to do the Epley maneuver by yourself without having a good understanding of the technique. You might make matters worse by inadvertently dispersing particles into healthy, unaffected areas of the inner ear.

The third approach to BPPV is surgical treatment to plug the posterior canal. Surgery is rarely performed and is reserved for cases refractory to other types of treatment. There is a small risk of hearing loss.

#### BEFORE YOU BAIL OUT

As your mother told you, an ounce of prevention is worth a pound of cure. If you have a head cold, sinus congestion, recent concussion, migraine headache, whiplash injury, or other similar problem, don't put yourself at risk for BPPV. If you are feeling even the slightest bit dizzy, don't fly. The key is to have an evaluation performed by a physician

or therapist who is specifically trained to diagnose and treat you.

If you get the wobbles, don't be in denial. Get it fixed and give your body and head a rest for at least a few weeks before you fly aerobatics again. Start cautiously, avoid high negative g-loads, and especially avoid movements of your head and neck while flying with any g-loads. Remember that the combination of g-loads and head movement increases your risk of developing the wobbles. You don't want to use your parachute unless you really have to.

#### RESOURCES

For more information, contact the Vestibular Disorders Association at [www.Vestibular.org](http://www.Vestibular.org) for a list of health professionals in your area who are certified to care for these conditions. This site has a wealth of information. Also check out the website of Dr. Timothy Hain at [www.Dizziness-And-Balance.com](http://www.Dizziness-And-Balance.com) for an in-depth discussion of BPPV treatment. DVDs and video clips are available illustrating the maneuvers. Figures 3 & 4 are courtesy of Dr. Hain. 



Courtesy Malcolm Pond

*Malcolm Pond is a cardiologist practicing in Southern California. He is a commercial pilot and has been flying aerobatics since 2001 in a Pitts S-2B and now in an Edge 540. He competes in the Advanced category and is a regional judge. He is on the board of IAC Chapter 36 and a member of Chapters 49 and 38.*

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SAFETY ISSUE

## TECHNICAL ADVISOR

by Budd Davisson



# Preflight Inspections: Our Best Insurance



**H**ow many times have you seen someone come down from a flight, leave for lunch, come back, and strap right back in the airplane for another flight? How many times have you done it yourself? It's common practice, but here's something worth thinking about: We all know things can go wrong with an airplane, so what makes us think it didn't happen on the flight we just came down from? We know things break...why not during the last hour?

The simple preflight represents probably the cheapest insurance we can buy. Actually, it's free, which makes it even better. Even if we don't find anything that will ground the airplane, if we get in a habit of doing a detailed preflight every single time we strap it on, we have a continued familiarity with every part of the airplane. And if something changes, we're more likely to notice it. Quite often before something serious breaks, it is preceded by a change.

So, since a preflight doesn't involve popping open any inspection panels or taking pieces off the airplane to look

at them, what are we looking for and what can we expect to find during a casual preflight?

Starting at the front and working our way back, what breaks and how do we find it? Most of this is pretty basic, and some items may be ignored on "normal" airplanes, but when it comes to aerobatic birds, we don't want to let anything slide because when something starts to go wrong, the way we treat our airplanes accelerates the growth of the problem. Also, although most of us don't do it, carrying a small flashlight to look in the nooks and crannies is a good idea.

## **Spinner**

Missing screws are obvious, as are cracks in the dome. What is not so obvious are cracks in the backing plate. On some spinners, the backing plate can't be seen easily, but on many of them, it can. The most common cracks are found at the intersection of the backing plate outer flange, where it bolts to the dome, and the backing plate itself. If you know where to look, they can be pretty obvious, and this is one area where the flashlight really helps. Also, look for cracks around the bolts that mount the backing plate to the propeller.

## **Propeller**

Fixed-pitch props and constant-speeds each have specific concerns, but there are also those that are shared simply because they are propellers. The never-ending search for nicks and dings in the leading edge

is a universal propeller problem. The same thing is true with grabbing a tip and tugging lightly fore and aft looking for looseness.

Constant-speed propellers have specific areas of inspection that exist simply because they are separate blades anchored in a two-piece, bolted-together hub. What we're looking for here is oil or grease leaks. For instance, it's common right after an inspection or prop servicing for excess grease to streak up the root of the blades. It's generally on the back sides of the blades, but this condition should exist for only a few hours after the servicing. Wipe it off during each preflight. If there is still grease at 15 to 20 hours, start getting nervous. It might be nothing more than a worn seal. However, this writer had this condition, and it was something new to the prop, so he had the prop disassembled: a crack was found in the blade shank groove that covered almost two-thirds of the hub half. It was allowing the blade to flex and let grease out. Changes never indicate anything good.

At the same time you're inspecting the prop, look at the back side of the backing plate and the crank flange for oil leaks that may indicate the nose seal is leaking. This is not immediately dangerous, but it is something to keep track of, and it's messy.

## **Engine**

The usual airplane engine stuff applies under the cowl, but aerobatic airplanes seem to crack exhaust systems more often than spam-cans. Make it a habit to eyeball the exhaust flanges where they bolt to the cylinders. It's not uncommon to find cracks in the flanges themselves or the weld attaching the exhaust tubing to the flange. Then, move down the pipes to where the exhaust stacks attach to the exhaust headers with some sort of flexible joint. Quite often there's a welded bushing or two there that mounts the retaining straps for the stack, and they like to crack. Ditto for the clamps (if you have them) at the bottom end that hold the extreme ends of two stacks together to keep them from vibrating.

## **Motor Mounts**

Every single time you pop the cowling open, visually scan each tube of the motor mount from one end to the other, staring closely at intersections and where gussets are welded. Hopefully, your motor mount is painted white or light gray so cracks will show up more readily. Mine "was" painted black, and it was only by accident that a flashlight caught a break (not a crack, an actual 1/16 inch break, offset about the same distance). It started right at the corner of gusset. The mount is now painted high gloss off-white for obvious reasons.

## **Wings**

As we age, we all hate the attendant wrinkles, but when it comes to aerobatic airplanes, wrinkles are trying to tell us something. Mainly, they are telling us something is moving within

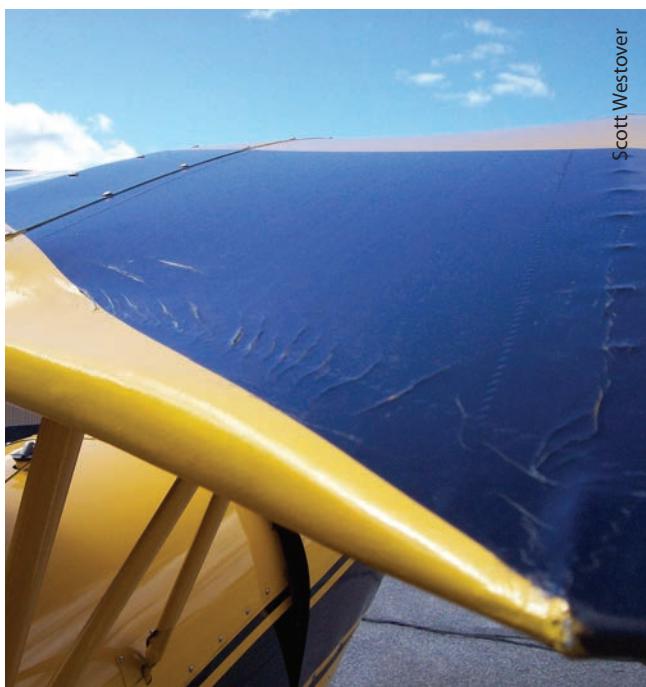
in the structure. Whether it's a rag and tube structure or aluminum, if the airplane has wrinkles while it's sitting on the ground, it's worth pulling a few inspection panels to see what's moving. It may be nothing more than drag/anti-drag wires that need tightening, or it may be something more serious. On wood-covered wings,



Inspect the prop for severe chips on the leading edge.



Scott Westover



Scott Westover

TOP: Relative motion in the tailwheel assembly is trouble.

ABOVE: Wrinkles may signal unwanted movement beneath the fabric.

wrinkles generally mean nothing more than the humidity is going up and the wood is expanding, but check it out to be sure.

### Fuel

Aerobatic airplanes are notoriously short on fuel, and some, like the Pitts, are best treated as if you have a fuel emergency the instant you're off the ground. For that reason, sticking the fuel tank each and every time you saddle up should become instinctive. The closest I've come to busting our own Pitts was when hopping passengers at a picnic. We hopped two, broke for lunch, didn't stick the tank, and forgot we had hopped two, which is the limit. On the way back from that hop, the fuel was so low that the engine quit cold in the middle of a slow roll. It restarted, and we landed without incident, but we put 23.6 gallons in a tank that supposedly only had 23 usable. Lesson learned.

And while we're talking about fuel, make sure your quick drains aren't dripping and grab the fuel cap and make sure it is plenty tight. It's amazing how much fuel will come out of a tank on the outside portion of a roller before you get positive *g* back on it (3 to 4 gallons—ask me how I know).

### Tail

The tail of an aerobatic airplane takes a terrific beating from the maneuvers, plus it's back there where rocks and debris can easily do damage to it. If there are flying wires holding it in position, look carefully to make sure there are no nicks in the wires. Streamlined wires on the bottom are especially easy to damage.

Grab the horizontal tail right at the wire attach point and try to flex it. Some aircraft have attachment methods, namely the bottom of the wires or the tail struts attach to a plate that is bolted, not welded, to the bottom of the fuselage, and it can work loose. When putting a little force (repeat, a *little* force) on the stabilizer, feel for movement and listen for "clicks" indicating something is not tight.

If it has trim tabs, move them with your fingers and see if there is any slop. If there is, determine whether it is in the hinges or the actuating linkage. Ideally, there should be zero slop, but some can be tolerated. You don't want a lot of extra movement as that can lead to elevator flutter, which is never a good thing.

### Tail Wheel/Rudder

Rock the tail back and forth and stare at the tail wheel spring right at the front where it goes under the fuselage. Then, while you're still rocking it, slowly bring your eyes back down the spring to the tail wheel attach bolt, then the actuating arms, and finally, the tail wheel itself. What you're looking for is any relative motion between the parts indicating that something isn't tight enough. At the same time, carefully inspect the tail wheel arms to see how much the rudder springs have worn into them.

With the rudder in neutral, sandwich the bolt that holds the rudder cable to the rudder horn between your thumb and forefinger. Try to move the bolt to see if it has wallowed out the hole or if there is excess wear on the bolt.

# During the Annual Inspection:



Aerobatic airplanes aren't just any airplane, so they shouldn't be annualized by just any mechanic. It's important that the mechanic knows the specifics of that exact airplane type and know it's not only flown harder than most, but also that this particular type has a reputation for such and such a problem over and above what shows up in the airworthiness directive and service bulletin lists.

In addition, there are specific items for each type that should just be replaced, no questions asked, at

each annual. Each Pitts, for instance, should automatically have the rudder cable bolts replaced. It's not unusual to find them worn halfway through. The same thing goes for the clips holding the tail wheel chains to the tail wheel arms. Your mechanic should be familiar enough with the airplane that he automatically knows what should be replaced. It's a question worth asking when you are deciding who you are going to trust with your safety—not to mention handing over a major portion of the family flying budget.



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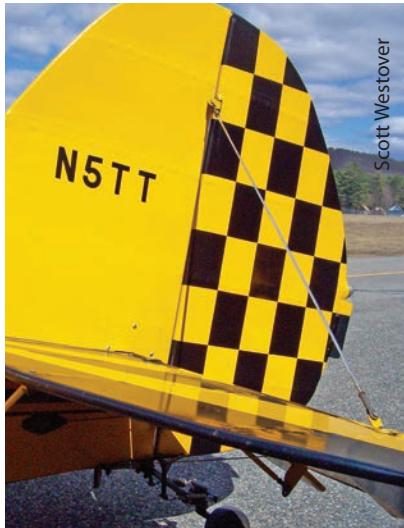


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LEFT: Aerobatic tails take a beating – be sure to check all surfaces. RIGHT: “Clicks” from the stabilizer merit a closer look.

### Screws and General Condition

Show me an aerobatic airplane that has all of its sheet metal screws, and I'll show you one that isn't flown very much. A missing screw here and there won't ground the airplane, but that's a good reason to have one of those screw kits available with all of the screws your airplane uses handy. Replace them as quickly as you can, and don't fly if you have adjacent screws in the same piece of sheet metal missing. That may be too much of a span and may let the metal vibrate and lead to a more serious problem.

Every airplane has areas of concern that are specific to that airplane, and it's important the pilot know what those are. Even more important is the necessity of viewing a detailed preflight as something that is a life-saving move and not a time-wasting one. Four or five minutes on the ramp makes a lot more sense than even a few seconds of panic in the air. Assume that just as you shut down after the last flight, something major, but unseen, fell off the airplane and it's your job to find it before your next takeoff. ☺

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# CALNDAR

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Power: Primary through Unlimited

Site: Sebring Regional Airport (SEF): Sebring, FL

Contest Directors: Hubie Tolson and Alan Bush

E-mail: [htolson@nccoxmail.com](mailto:htolson@nccoxmail.com)

## **LOS ANGELES GOLD CUP** (Southwest)

Friday, May 2 - Saturday, May 3, 2008

Practice/Registration: Thursday, May 1

Rain/Weather: Sunday, May 4

Power: Primary through Unlimited

Site: Apple Valley Airport (APV): Apple Valley, CA

Contest Director: Patrick Dugan

Phone: 805-612-0976; E-mail: [patrick.dugan@yahoo.com](mailto:patrick.dugan@yahoo.com)

Website: [www.Groups.Google.com/group/laac](http://www.Groups.Google.com/group/laac)

## **APPLE CUP** (Northwest)

Friday, May 23 - Saturday, May 24, 2008

Practice/Registration: Thursday, May 22

Power: Primary through Unlimited

Site: Ephrata Municipal Airport (EPH): Ephrata, WA

Contest Directors: Ann Marie Ward and Carol Burch

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## **SOUTHEASTERN AEROBATIC OPEN** (Southeast)

Friday, May 30 - Saturday, May 31, 2008

Practice/Registration: Thursday, May 29

Rain/Weather: Sunday, June 1

Power: Primary through Unlimited

Site: Clayton County Airport - Tara Field (4A7): Hampton, GA

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## **PENNSYLVANIA AEROBATIC CHAMPIONSHIPS** (Northeast)

Saturday, May 31 - Sunday, June 1, 2008

Practice/Registration: Friday, May 30

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Location: Donegal Springs Airpark (N71): Maytown, PA

Contest Director: Jeffrey D. Johnson

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## **HEUER CLASSIC** (Mid-America)

Thursday, June 5 - Sunday, June 8, 2008

Practice/Registration: Friday, June 6

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Site: Illinois Valley Reg. Airport - Walter A. Duncan Field (VYS): Peru, IL

Contest Director: Doug Bartlett

Phone: 847-875-3339; E-mail: [dbartlett@bartlettmfg.com](mailto:dbartlett@bartlettmfg.com)

Website: <http://IACChapter1.com>

For the most complete and up-to-date listings, visit [www.IAC.org](http://www.IAC.org).

If your chapter is hosting a contest, be sure to let the world know by posting it there.

## **LONESTAR AEROBATIC CONTEST** (South Central)

Friday, June 6 - Saturday, June 7, 2008

Practice/Registration: Thursday, June 5

Power: Primary through Unlimited

Site: Grayson County Airport (GYI): Denison, TX

Contest Director: Bud Judy Phone: 817-559-4522

E-mail: [judyranch@alltel.net](mailto:judyranch@alltel.net) Website: [www.IAC24.org](http://www.IAC24.org)

## **NORTHERN CALIFORNIA CONFERENCE ON INTENSE G-FORCE ADDICTION** (Southwest)

Friday, June 6 - Saturday, June 7, 2008

Practice/Registration: Thursday, June 5

Rain/Weather: Sunday, June 8

Power: Primary through Unlimited

Location: Paso Robles Municipal Airport (PRB): Paso Robles, CA

Contest Director: Tom Myers Phone: 650-328-2141

E-mail: [tom.myers@stanfordalumni.org](mailto:tom.myers@stanfordalumni.org) Website: [www.IAC38.org](http://www.IAC38.org)

## **BEAVER STATE REGIONAL CHAMPIONSHIP** (Northwest)

Friday, June 20 - Saturday, June 21, 2008

Practice/Registration: Thursday, June 19

Rain/Weather: Sunday, June 22

Power: Primary through Unlimited

Site: Eastern Oregon Reg. Airport at Pendleton (PDT): Pendleton, OR

Contest Director: Robert Toppel and Robert Harris

Phone: 503-292-6630; E-mail: [rboydt@comcast.net](mailto:rboydt@comcast.net)

Website: [www.IAC77.org](http://www.IAC77.org)

## **OHIO AEROBATIC OPEN** (Mid-America)

Friday, June 20 - Saturday, June 21, 2008

Practice/Registration: Thursday, June 19

Rain/Weather: Sunday, June 22

Power: Primary through Unlimited

Site: Union County Airport (MRT): Marysville, OH

Contest Director: Lorrie Penner

Phone: 513-284-5076; E-mail: [Penn.Lorr@yahoo.com](mailto:Penn.Lorr@yahoo.com)

Website: [www.IAC34.com](http://www.IAC34.com)

## **WILDWOODS ACROBLAST** (South Central)

Friday, June 27 - Sunday, June 29, 2008

Practice/Registration: Thursday, June 26 - Friday, June 27

Power: Primary through Unlimited

Site: Cape May County Airport (WWD): Cape May, NJ

Contest Director: Craig Wisman

Phone: 717-877-8933; E-mail: [cwisman@comcast.net](mailto:cwisman@comcast.net)

## **MIDWEST AEROBATIC CLUB CHALLENGE** (South Central)

Saturday, June 28 - Sunday, June 29, 2008

Practice/Registration: Friday, June 27

Power: Primary through Unlimited

Location: Seward Municipal Airport (SWT): Seward, NE

Contest Director: Chandy Clanton

Phone: 402-430-0219

E-mail: [cyclanton@hotmail.com](mailto:cyclanton@hotmail.com)

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