MARCH/APRIL 2025

SPORT AEROBATICS

OFFICIAL MAGAZINE OF THE INTERNATIONAL AEROBATIC CLUB

ANNUAL SAFETY ISSUE

FREE YOUTH ADMISSION

Free youth admission ages 18 and under is supported in part by

BOEING

Vol. 53 No. 2 **MARCH/APRIL 2025** *A PUBLICATION OF THE INTERNATIONAL AEROBATIC CLUB*

CONTENTS

FEATURES

DEPARTMENTS

COVER

ON THE COVER:
Rick Volker in his Marchetti SF260C, Brooks Mershon in his Sukhoi SU-26M, Corben Meyer in his Extra 230, and Justin Spence in his father Anthony Spence's Yakovlev Yak-50 fly over EAA AirVenture Oshkosh 2024. Photo by Steve Koskella.

ABOVE:
Doug Jenkins's pretty little yellow Pitts S-1, fondly named *Daisy*, comes in for a landing at Llano, Texas. Photo by KJB photography.

SPORT AEROBATICS
OFFICIAL MAGAZINE OF THE INTERNATIONAL AEROBATIC CLUB

Publisher: Jim Bourke, president@iac.org
Executive Director: Tim Dahnke, execdir@iac.org, 920-426-6574
Editor: Taylor Mershon, editor@iac.org
Contributing Authors: Jim Bourke, Randy Brooks, Wayne Forbes, Barry Hancock, Doug Jenkins, Pike Kelly, Brian Lloyd, Taylor Mershon, Gordon Penner, Anthony Spence, Rick Volker
Senior Copy Editor: Colleen Walsh
Copy Editors: Jennifer Knaack, Bryant Shiu
Proofreader: Tara Bann
Print Production Team Lead: Marie Rayome-Gill

IAC CORRESPONDENCE
International Aerobatic Club, P.O. Box 3086
Oshkosh, WI 54903-3086
Tel: 920-426-6574 • Fax: 920-426-6579
Email: execdir@iac.org

ADVERTISING
Senior Sales and Advertising Executive:
Sue Anderson, sanderson@eaa.org

MAILING
Change of address, lost or damaged magazines, back issues.
EAA-IAC Membership Services
Tel: 800-843-3612 • Fax: 920-426-6761
Email: membership@eaa.org

SPORT AEROBATICS (USPS 953-560), copyright © 2025 by the International Aerobatic Club, Inc., is published bimonthly and owned exclusively by the International Aerobatic Club, Inc., EAA Editorial Department, 3000 Poberezny Road, Oshkosh, WI, 54902. Periodicals postage is paid at Oshkosh, WI, 54901, and additional mailing offices. U.S. membership rate for International Aerobatic Club, Inc., is $45 per 12-month period, of which $18.00 is for the subscription to *Sport Aerobatics*.
POSTMASTER: Send address changes to EAA MEMBERSHIP SERVICES, P.O. Box 3086, Oshkosh, WI 54903-3086. CPC 40612608

Welcome Spring and a New Editor

BY JIM BOURKE, IAC 434151

Spring Is Here

CONGRATS ON MAKING IT through another winter, whatever that means in your neck of the woods. Here in Scottsdale, Arizona, it means occasional forays into the low 50s. Brr.

Wherever you are, take a moment to crack open a copy of the 2025 IAC rule book and prepare for judge's school. This spring, if you aren't yet a judge, this is a great time to become one by attending judge's school. If you are already a judge, this is a great year to finally learn some corner case in the rule book that you know deep down you haven't really paid attention to. Let's strive to make 2025 the best-judged season of contest aerobatics yet!

Dues Increase

Last month I outlined the IAC's budget situation using a series of charts that showed:

1. **Dues in constant dollars.** This chart demonstrated how our membership rates have decreased dramatically in constant inflation-adjusted dollars.
2. **Membership level.** This chart showed the steady state of our membership over the last 20 years or so.
3. **Membership revenue in constant dollars.** This chart combined the data from the other two charts, showing how our membership revenue has declined in constant dollars.

Shad Coulson provided some great additional data to the board at a special meeting on the subject. That data compared IAC membership dues against several other air sports organizations.

DUES OF OTHER AIR SPORTS ORGANIZATIONS

Organization	*Annual Membership Fee*
Balloon Federation of America	$65
Soaring Society of America	$80
Academy of Model Aeronautics	$85
U.S. Parachute Association	$98
U.S. Hang Gliding & Paragliding Association	$150

As you can see from the above chart, other air sports organizations are priced at a higher level than the IAC, with only one group costing less than the proposed IAC membership rate of $75. This was a very persuasive report. Thank you, Shad!

Therefore, after considerable discussion and debate, **the IAC board decided to increase our membership fees to $75 per year.** This change will be enacted beginning in April 2025. This magazine goes out before then, so if you are just now reading this, chances are that there is still time to renew your membership at the $60/year rate! While you are renewing, how about taking advantage of a lifetime membership? This is a great deal at $1,295. If you buy a lifetime membership, you will never have to pay annually again, and you won't have to worry about any future rate increases, either!

Lorrie, you did a great job for the IAC every single day. We are all lucky we had the pleasure of working with you.

The Future of Our Dues Structure

While this step certainly helps us to catch up, I will be encouraging the board to adopt a policy to increase our rates more regularly. We should be in the habit of catching up on inflation every two or three years. I think if we make it a policy to review and consider an increase automatically every two years, we will sidestep the inevitable political considerations. It's just good stewardship to keep the dues adjusted for inflation, and that's all there is to it.

Sanction Fees

Along with this dues increase, the board agreed to a reduction in sanction fees. This decision supersedes the board's previous plan to raise these fees while keeping the dues the same. The exact timing of the sanction fee reduction isn't specified yet, but at some point, hopefully this year, you can expect to see contest sanction fees capped at $500 per contest. This is going to be a welcome change for everyone involved in financing regional contests. The per-pilot fee is also being reviewed and may be decreased as well.

While I don't see our membership as being particularly price-sensitive, high sanction fees create negative pressure on contests, possibly out of proportion to the benefit they offer to IAC HQ. I'm hoping that a reduction in sanction fees will allow contest directors to find more funds for banquets, marketing, and trophies. I do hear a lot of concerns from contest directors that their events are only possible because of donations from a small number of chapter members. Perhaps with this change, we will be making the lives of our CDs a bit easier. Maybe it will mean more successful contests.

Thank You, Lorrie Penner!

IAC Editor Extraordinaire Lorrie Penner left us at the end of January. Lorrie is a cornucopia of good ideas and bubbly energy. Truly one of a kind!

I'm really going to miss working with her. She was fun to work with, she got the job done, and she helped everyone around her find success. That's a great combo that we can only hope for in all our working relationships.

Lorrie, you did a great job for the IAC every single day. We are all lucky we had the pleasure of working with you. Thank you from the bottom of my heart for everything you did, both as IAC executive director and as editor. You deserve a nice, boring, comfortable retirement. Enjoy it!

Welcome, Taylor Mershon!

Our new editor is Taylor Mershon. Welcome, Taylor! She lives in Santa Paula, California, with her aerobatic enthusiast husband, Brooks; their 2-year old, Malcolm; and their Sukhoi. While we haven't worked together for long as I type this, I can already see she is enthusiastic, pleasant, and competent. She also has some amazing artistic talent that I'm sure she will find a use for on the IAC's behalf. I look forward to working with you, Taylor! IAC

The Extraordinary

BY TAYLOR MERSHON, IAC 442603

THE MARCH/APRIL EDITION OF *Sport Aerobatics* is a special one for a few reasons. It's my first issue as the new editor. Lorrie Penner passed the baton to me at the beginning of the year. You all have been so welcoming and helpful in offering up your ideas, writing, and support. I am excited to continue bringing you the best aerobatic content, and to continue evolving and improving the magazine as our sport and its pilots evolve and change as well.

Early in my husband's aerobatic pursuits, he told me one of his big goals was to someday appear on the cover of *Sport Aerobatics*. Coincidentally, this issue in which this goal was accomplished was also my first issue to plan out almost entirely independently from beginning to end. I had the privilege of selecting the cover image, featuring Rick Volker in the Marchetti up front and Brooks Mershon (my husband) right behind him in the big pink Sukhoi. It was a little bit of kismet, I think!

Rick Volker's article to accompany the cover photo is another reason this issue is special. Having flown the big pink Sukhoi for so many years before he sold it to Brooks, Rick has spent hours on the phone and in-person with Brooks, talking through every single corner of the airplane's handling characteristics and imparting technical wisdom. Many of those conversations happened within earshot of me making dinner or in the passenger seat of the car or under the wing passing up tools, so naturally it was Rick's voice I heard reading the "Yin and Yang" article as I did my edits on it before publication.

Additionally, Rick's article and the accompanying photos symbolize my own experience of one of the greatest things about aerobatics, and that is the extraordinary stories we get to live at a frequency of the ordinary. It boggles my mind to think about how truly grand a web of people, skills, events, and machines had to come together for that four-ship photo shoot to happen (producing this issue's cover shot and the photos in Rick's and Anthony's articles) at EAA AirVenture Oshkosh 2024. And this is just one of many examples in this magazine alone!

To me, the Sukhoi represents dozens of coast-to-coast ferry flights, over a thousand glider flights, four prior aerobatic airplanes, thousands of hours practicing, 30-some contests, dozens of training camps, an *ungodly* amount of money spent on fuel, and the equivalent amount of time, energy, and care on my end spent supporting the pilot who did all those things (Brooks). The airplane itself comes to us by way of an incredible amount of engineering and an unlimited Russian military budget, plus many years of flawless maintenance and regular flying without crashing (thank you, Rick).

Now, add to that the expert pilot skills of Rick and all the hours, flights, airplanes, and experiences it took him to get to where he is, plus the design feat that is his own unique and phenomenal airplane (the Marchetti), and you have the pieces of only two of the four-ship equation. Without the network of human connections that brought the Sukhoi and Marchetti pilots together and all of the flying and coaching that happened after that, the pieces would just remain separate pieces.

Finally, this brings us to the photo shoot at AirVenture, which brought two more pilots and airplanes into the equation, plus the photographer and photo ship, each with their own unbelievable adventure that got them there. Every one of these pieces is extraordinary, but in the aerobatic world, we often get to live lives that are bursting with so many extraordinary events that they almost become ordinary.

The aerobatic community commits ridiculous amounts of awesome stuff every day, and there's no shortage of incredible stories that are just waiting to be told.

Send me your stories of the extraordinary, even if they seem ordinary to you. The aerobatic community commits ridiculous amounts of awesome stuff every day, and there's no shortage of incredible stories that are just waiting to be told.

Lastly, I feel it's only fair to give you all a heads-up that you should have a tissue box nearby when you read Doug Jenkins' article about *Daisy*, "End of an Era." It will catch you by surprise because the first part of the piece is a fascinating recounting of an event that Doug uses as an opportunity for education. It's well worth the read. However, one moment your brain gears are turning in information mode, and the next moment the words on the page have gone blurry with tears that welled up from the raw emotion of a beautiful eulogy. Doug, your words for *Daisy* are so sweet and moving, and I felt them in the deepest parts of my heart. *Daisy* will always be remembered. IAC

SUBMISSIONS: Photos, articles, news, and letters to the editor intended for publication should be emailed to editor@iac.org. Please include your IAC number, city, and state/country. Emails should be concise, polite, and to the point. All letters are subject to editing for clarity and length.

PHOTOGRAPHY BY **DON GOLDEN**

LIFT AVIATION

STAY PROTECTED

PUSH YOUR LIMITS

AV2.1

AV-1 KOR

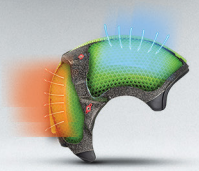
PROTECTED BY KOROYD

IMPACT PROTECTION

Koroyd helps protect your skull and brain from impacts, which may reduce the risk of suffering a life-changing injury.

EXTREMELY LIGHTWEIGHT

The AV2.1 weighs in at 2.5 lbs and the AV-1 KOR is as light as 3.5 lbs, without compromising exceptional strength and defense.



ADVANCED VENTILATION

Air flows interchangeably through the open cells and helmet vents while hot air from your head easily disperses.

The Torrington Tailslide AcroRodeo

FIRST-EVER AEROBATIC CONTEST OVER WYOMING'S HISTORIC PLAINS

BY HEIDI AND WAYNE FORBES, IAC 441269

LADIES AND GENTLEMEN, acro pilots of the world, buckle up! The inaugural Torrington Tailslide AcroRodeo is calling aerobatic pilots and IAC members to KTOR for an event that's set to redefine the thrill of competition.

Nestled on the eastern edge of Wyoming, Torrington is not just a dot on the map. It's a vibrant community echoing with the rich tapestry of the Wild West—a town where history is not just remembered, but lived. Experience it for yourself, from a historic park where you can walk through the past with exhibits of early 20th century life, to the charming downtown with its cowboy-themed boutiques and saloons. You can even enjoy a leisurely stroll by the North Platte River, where the tranquility of nature contrasts beautifully with the adrenaline of aerobatics.

This contest isn't just another notch in your belt; it's an opportunity to be part of history. The first-ever Torrington Tailslide AcroRodeo embraces a new approach to contests by blending the traditional with a Wild West flair. You're not just competing; you're partaking in an event where the community rallies around you. Local residents will cheer you on, turning each portion of the competition into a spectacle of community spirit and aviation prowess. Your skills will be celebrated not just in the air, but in the heart of the town, with music, laughter, and the roar of the airplane engines echoing through the skies.

POSTER COURTESY OF **WAYNE FORBES**

The excitement of this contest is palpable, with delicious food from local restaurants, unique club activities, cowboy cookouts under the stars, and storytelling nights near the campfire, where tales of the sky meet legends of the land.

Be a pioneering pilot of the inaugural Torrington Tailslide Acro-Rodeo. Take a journey back to the roots of adventure and courage, where the sky is your stage and the community is your audience. So gear up, polish your wings, and let's make history together in Torrington for the most exhilarating dance in the sky. Let's show the world what the spirit of the Wild West can do when it takes flight!

Receive updates and news about the contest by following on X at @The25Tailslide. And if you'd like to learn more about the sport of aerobatics, follow on X at @AvalancheAero.

Important Information:

Because of the generosity of the community of Torrington and the KTOR airport, a fuel discount and free hangar space is available for all competitors.
Location and coordinates: The airport is located 2 miles east of Torrington, Wyoming, with coordinates at N42°3.87' / W104°9.16'.
Elevation: The surveyed elevation of the airport is 4,206 feet MSL.
Crosswind runway:

- Runway 10/28: 5,703 feet long by 75 feet wide, asphalt surface.
- Runway 2/20: 3,401 feet long by 60 feet wide, also asphalt.

About IAC Chapter 12

IAC Chapter 12 is dedicated to promoting aerobatics as an art form, a sport, and a means of advancing piloting skills. We are committed to safety, education, and community engagement through the thrilling world of aerobatics. IAC

John Ostmeyer talking to pilot Tom Rhodes before his U.S. Nationals flight in Salina, Kansas.

IAC Member Dues Increase April 2025

BY LORRIE PENNER, IAC 431036, AND **TAYLOR MERSHON**, IAC 442603

During the last IAC board of directors meeting on October 16, 2024, the board reviewed the inflation rate over the last few years and determined that a dues increase is appropriate. It is important to us that we maintain the ability to continue providing our membership with high-quality services and valuable benefits. To ensure we can do this, beginning in April 2025, the membership fee will go from $60 to $75 annually.

Failing to increase the dues to keep pace with inflation slowly erodes our capability of offering the many advantages that come with the maintenance and growth of such a unique community. As part of our principles and core values, the IAC continues to educate and share our knowledge both inside and outside the aerobatic world, and is committed to safety and excellence in every aspect of our practice. We are grateful to our membership's support in promoting the incredible sport of aerobatics.

For questions about this topic or about anything else going on at the IAC, please reach out to president@iac.org. IAC

PHOTOGRAPHY BY **LEIGH HUBNER**

The Greatest Engine You've Never Seen

BY PIKE KELLY, IAC 438485

IF YOU WERE TO build an engine for aerobatic aircraft today, what would you do? Would you start by defining the basic characteristics of your engine? What would those characteristics be? Perhaps: lightweight, powerful, capable of delivering fuel in all attitudes, capable of delivering lubricating oil in all attitudes, and reliable.

Would you sacrifice cross-country performance and simplicity for an engine tailored to aerobatic flight? What about maintainability? How about acceleration? Aerobatic aircraft engines are unique in the aviation world because in their daily operation they are not steady-state. We punish them with rapid and frequent throttle changes and, worse yet, constantly changing cooling airflow.

In building your engine for aerobatic aircraft, would you borrow technology commonly found in performance automotive engines? You might choose crankcase vacuum, the practice of drawing a slightly lower pressure inside the crankcase because of its multiple benefits. Crankcase vacuum reduces the swirling air and suspended oil, called windage. Common in air-cooled engines, this windage, combined with blowby combustion gases slipping past the piston rings, pumps up the crankcase, the whirling crankshaft colliding with the aerated oil, increasing the oil and crankshaft surface temperature, increasing friction, and reducing power output. The vacuum creates a greater pressure differential across the rings, increasing ring to cylinder wall pressure, reducing blowby, resulting in less windage. Modern performance engines use externally mounted, multistage oil pumps to scavenge oil from different locations in the oil pan. These pumps also create vacuum, reducing windage. Let's not forget the most practical of benefits crankcase vacuum provides: fewer engine oil leaks.

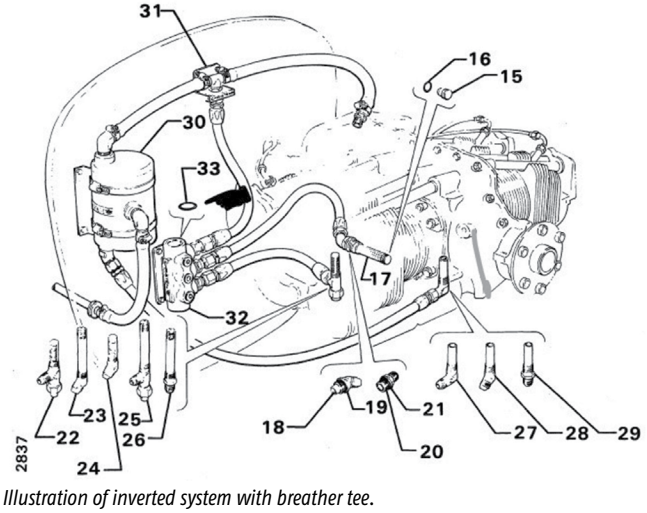


Illustration of inverted system with breather tee.

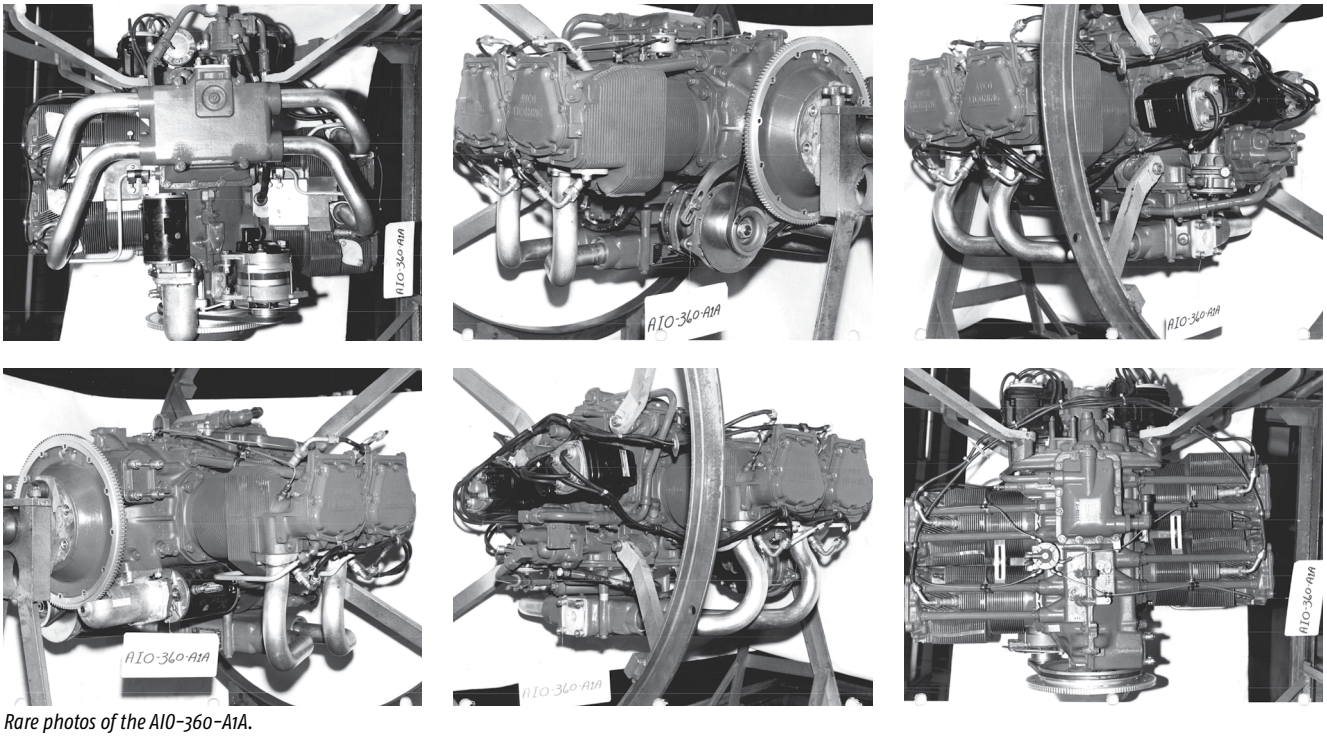
Armed with this basic understanding of windage, add the gyrations of aerobatic flight and its forces on the engine, along with extended unusual attitudes. Now, a cursory review of the inverted oil system operation. Take the engine oil in quantity, held in the sump beneath the engine, and roll inverted. The oil passes through slots in the case, in quantity, through the whirling crankshaft, now not in aeration, but en masse, where it collects at the top of the case, and must migrate to the back of the engine through the accessory case, through a fitting and hoses and a valve, where it is returned to the oil pump to continue the engine oiling, mostly uninterrupted. We say *mostly* uninterrupted because as you explore the limits of aerobatic flight, you realize some aircraft attitudes result in the modern inverted systems' inability to provide pressurized oil without momentary blips of lower than desired pressure. Knife-edge flight is a good example of this. The oil is neither at the top or bottom of the engine, where the oil pickups are located, so oil flow is interrupted. Inverted 45-degree downlines are also an invitation for interrupted oil flow. The oil migrates from the sump to the now upside-down forward portion of the case, yet our oil pickup is at the rear of the engine. Modifications have been made on some aircraft to mitigate these specific deficiencies, but in most aerobatic aircraft flight manuals, you'll find the caveat "extended knife-edge flight not recommended." What if the engine was not subject to these flight attitude limitations? And what if the oil didn't have to crash through the crankshaft every time the aircraft was inverted?

Lycoming did exactly these things with the AVCO-Lycoming AIO-320 and AIO-360 series engines.

Some basic facts about the AIO engines:

- They are dry-sump. Oil is not stored within the confines of the engine in a wet sump or "oil pan." The oil supply must be carried in a vessel mounted external to the engine.
- They have an externally rear-mounted and serviceable double-acting scavenging oil pump.

 ILLUSTRATION FROM **THE LYCOMING ENGINE ILLUSTRATED PARTS MANUAL** *PHOTOGRAPHY COURTESY OF* **PIKE KELLY**



Rare photos of the AIO-360-A1A.

- The case halves are cast and machined to accept a shallow sump on both the top and bottom of the engine.
- The AVCO-Lycoming AIO-320 and AIO-360 series engines are the world's first purpose-built and type-certified aerobatic engines.
- First penned in 1966, the AIO-360-A1A was submitted to the FAA on February 7, 1967, and issued Type Certification 1E10 on November 20, 1967.

As a student of internal combustion engines of all types, I was first drawn to the AIO series of engines while reading the *AVCO-Lycoming Direct Drive Engine Overhaul Manual.* The *Overhaul Manual* offers a schematic and description of an upright/inverted oiling system used on the AIO series of engines. The *Lycoming Engine Illustrated Parts Manual* includes illustrations of the case halves, oil pump, and upper/lower sumps. Scouring the internet for a glimpse of these engines in the wild revealed a big fat donut hole. I asked sage colleagues in the industry if they had heard of or seen this unicorn. Budd Davisson, Mr. Pitts, and all things aerobatic, no. Don Rivera, Airflow Performance, no.

So I did what anyone would do and called the manufacturer. It turns out these engines are so rare that, when I reached out to Brandon Dildine, senior field service technical representative at Lycoming Engines, he told me none of his fellow tech reps had ever seen one. Brandon took the time to research the AVCO records and was able to provide the black and white pictures of the AIO-360 on the build stand. Kudos to Brandon and the team at Lycoming, as this research was not an overnight project. I've now learned that photos of the engine are as rare as the engine itself.

At first glance, the AIO-360-A1A looks similar to any four-cylinder Lycoming angle valve engine you might find on a Pitts or Mooney. Four cylinders, check. Two magnetos, check. AC-style fuel pump, check. Big honkin' starter and ginormous alternator, check, check. But wait a minute—what is this "thing" on top of the engine? That thing is the

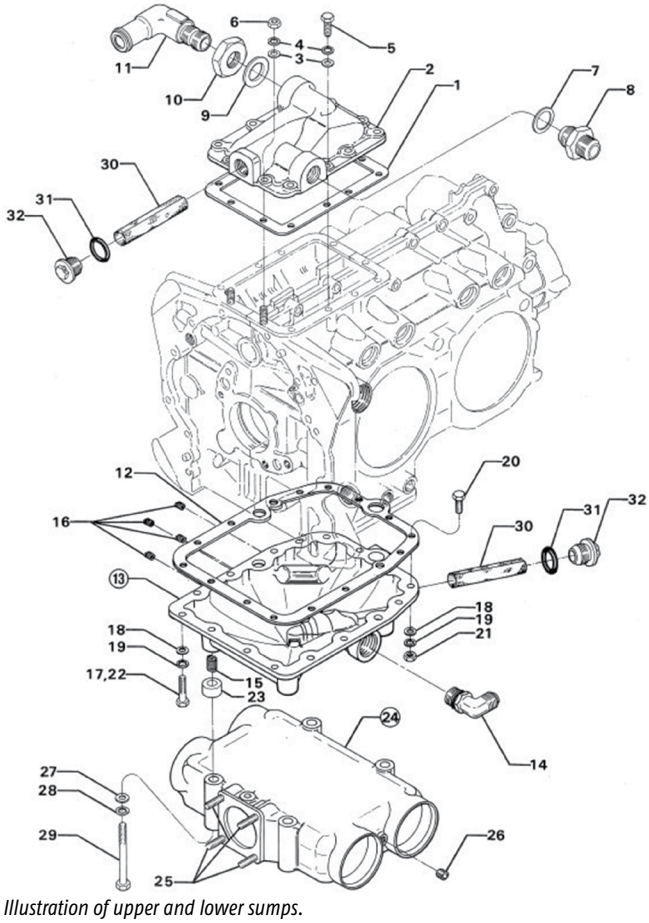


Illustration of upper and lower sumps.

first giveaway that you are not looking at a normal Lycoming engine.

Perched atop the engine is a mini sump, which includes provisions for an oil scavenge line, complete with a serviceable suction screen and an upright breather line. Removing the upper case cover does not reveal a clear view into the crankcase and rotating assembly below. The case halves continue providing a nice stiff spine to prevent case flex. For you budding engine scholars, the four-cylinder Lycoming 320 and 360 engines are a three main bearing engine, meaning the crankshaft is supported by three main bearings, at the rear, middle, and front of the crankshaft. The forward bearing, to handle the bending load the propeller places on the crankshaft, is longer to support the crank and transfer this load to the cases. The middle and rear main bearings, while smaller in width, still take quite a punishment as the crank and case flex torsionally. While not common, the center main bearing can become pinched, as the case and crank bend around this central support, the result being skyrocketing oil temperatures without an accompanying drop in oil pressure. This case cover adds some additional rigidity to the case, if only by accidental necessity. A side note to aircraft engines with upper case covers, the Lycoming O-145 had a three-piece case, with the upper portion of the case being removable to provide inspection access to the crankshaft and rods. Franklin engines shared this same trait.

The lower engine sump was again shallow and equipped with its own sump screen for scavenged oil, along with the supply suction line for engine oiling.

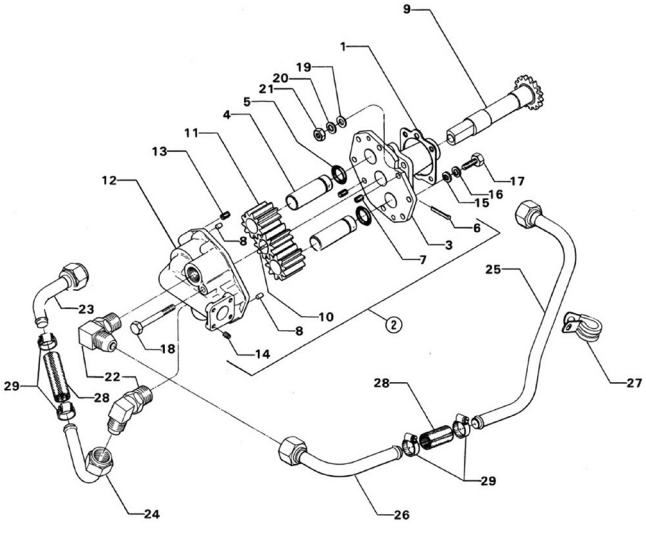
The magic of this engine, then, was its ability to maintain oil pressure in all attitudes. Windage was reduced because the case did not contain a large quantity of oil thrashing through a spinning crankshaft with every change from upright to inverted. The hot-rodder in me likes the idea of an external, serviceable scavenge pump where I could increase the vacuum on the case to increase ring seal and lower windage and potentially oil temperatures a bit more.

Moravan Zlin Z-526-L.

The dry sump lends itself to a smaller vertical profile, and the remote oil tank means I can place the oil where I want it to affect the CG of the aircraft. Beneath the lower sump cover is the tuned cold air induction, another feature that lends itself to performance.

According to Lycoming SSP-110-2, *Certificated Lycoming Engines*, two versions of AIO engines were produced. The AIO-360-B1B was installed in the Moravan Zlin Z-526-L "Master Trener" in place of the inline six-cylinder Walter Minor engine. The kid brother, the AIO-320-B1B, was installed in the MBB Bo-209-C Monsun. We do not know how many of these unique engines were installed in the Zlin. We do know that 100 of the Messerschmitt-Bolkow-Blohm Monsun were built, but this includes the non-aerobatic type, so exact numbers are unknown. I know that two of the AIO engines were installed in Decathlons here in the United States. The wings of these aircraft were clipped, and they were last known to be located in the Pacific Northwest.

So here we are today, a great engine, capable of so much more, relegated to the history books. More like "history *book*." Few people knew about this engine before, and



External rear-mounted double scavenge pump.

Model	Characteristics
IO-360 A1A	Basic Model. Four cylinder air-cooled, horizontally opposed, direct drive, fuel injected, tuned induction engine having oil jets for internal piston cooling. Provisions for single action controllable pitch propeller.

IO-360-A1A characteristics description.

AIO-360-A1A	Similar to IO-360-A1A except permits operation in an inverted position. Differences include a front mounted propeller governor, two dry oil sumps, dual external oil scavenge pumps, an oil tank, three options of position for fuel injector mounting and provides for a constant speed propeller.

AIO-360 characteristics description.

AEIO-360-A1A	Same as IO-360-A1A except equipped with an inverted oil system kit for aerobatic flight.

AEIO-360 characteristics description.

 ILLUSTRATION FROM **THE LYCOMING ENGINE ILLUSTRATED PARTS MANUAL** *PHOTOGRAPHY COURTESY OF* **PIKE KELLY AND KARSTEN PALT**

Lycoming had to be reminded it actually made the engine. Interest in this engine was limited to, well, me. So why did it go the way of the dodo? Frank Christensen.

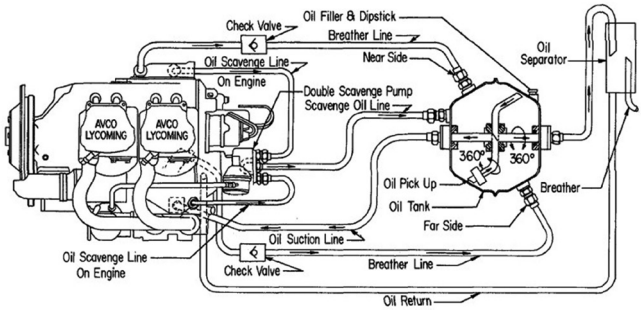
If you examine the oil schematic for the AIO-360, you see a complex remote oil reservoir with an internal shaft and some kind of weighted, spinning oil pickup, which seemed like a good idea at the time. Then there are the one-off castings for the AIO engines; two sumps and two case halves, all of which have to be manufactured and machined. Lastly, there is the external oil pump. We have a hard time preventing oil leaks on Lycoming engines when we fly them hard like we do. I can't imagine trying to seal a pump like that without the help of modern-day sealing products. So, this really smart guy looked at what is essentially a stock IO-320 and 360 and came up with a couple fittings: a weighted ball valve and an air-oil separator. Genius. It's light, it's simple, and there are no special castings for Lycoming to produce for such a small market.

Yearly maintenance to your inverted system is fairly simple, so long as you actually use the system. The ball valve requires actuation and oil to pass through it to keep the balls from corroding in the housing. The shuttle valve in the air-oil separator needs the shuttle to keep itself free and lubricated. Remember, the air-oil separator is its own little sauna and cesspool of oil decomposition. It is also a critical pathway to letting the crankcase pressure escape from the engine. Should it become blocked, you can expect oil leaks in places that normally don't leak along with perhaps a leaking crankshaft seal.

There are a couple of good Lycoming service documents that address issues in oiling of aerobatic engines. *Lycoming Mandatory Service Bulletin No. 399A* addresses loss of oil pressure in various attitudes. *Lycoming Service Instruction No. 1397A* addresses overflow oil coming from the breather, including a 300-hour service of the air-oil separator. If you observe your oil pressure fluctuating during aerobatic flight, or dropping to zero, get on the ground and investigate thoroughly with your trusted aircraft professional. Once you lose oil pressure, you have minutes (which can be counted on one hand) to get yourself safely on the ground. Don't mess around, get on the ground.

If you have an ejector in your exhaust system using the velocity of the exhaust gases to pull a vacuum on your air-oil separator, buy yourself a brass bore brush and gun cleaning rod. Clean that ejector tube yearly. They quickly coke up. If you own a Carbon Cub or have a neighbor that has one, they have ejectors in their exhaust systems, too. These are little tiny tubes that coke up really fast and definitely require yearly maintenance.

During the course of researching the AIO-360 series engine and several other topics for future articles, I asked Lycoming a couple statistical questions to get a feel for just how good 1930s Lycoming technology really is. Here are the questions and answers, verbatim:



AIO-320-360 oil schematic.

Q. How many hours does Lycoming estimate their engines have flown?

A. There are over 200,000 active Lycoming engines in the world, logging over 1 million flight hours every month as reported by the General Aviation Manufacturers Association (GAMA) in 2020 referencing a Federal Aviation Administration (FAA) survey from 2019.

Q. Can we say more students have learned to fly behind a Lycoming engine than any other brand?

A. Yes, we produce more piston aircraft engines than any other manufacturer and for approximately 69 percent of the primary flight training aircraft in the market.

So let that sink in: 1 million flight hours a month.

Most aerobatic airplanes today fly behind a Lycoming. You know these engines as AEIO-XXX. And now you know the AIO-360 graced the sky also, a true, purpose-built aerobatic engine, with the most forward innovation Lycoming could muster at the time. An engine tested and certified to FAA standards. A mythical, fantastical feat of engineering that just might be the rarest of Lycoming's works. The greatest engine you've never seen. ***IAC+***

Inspired by Leo Loudenslager's October 1987 *Popular Mechanics* "Laser" article, **Pike Kelly** knew he would learn to fly. At Purdue University, Pike earned his private pilot license, then took an aerobatic course in a de Havilland Chipmunk. At Cessna Aircraft, Pike designed and tested anti-ice and pressurization systems, and through his work has been on almost every aircraft production line in North America. Pike has built several aircraft, owned a Christen Eagle II, and currently runs, maintains, and flies a research and development aircraft fleet that includes a UH-1H Huey, some T34-As, an AT-6C, a Citation Encore, and a T-38 Talon. He has flown 3,800 hours in 70 types of aircraft and is a commercial pilot and A&P/IA mechanic. Pike is the IAC Chapter 62 president and part of the IAC Government Relations Committee. He lives outside of Phoenix with his wife, Caroline, and dog, Buddy.

Flying the 2025 Sportsman Sequence — Part 2

BY GORDON PENNER, IAC 429704

Overview

FOR 2025 WE HAVE an excellent Sportsman Known sequence that is high energy and that can be flown by a Citabria or 150-hp Decathlon.

Welcome to Part 2 of "Flying the 2025 Sportsman Sequence."

As covered in Part 1, Sportsman champion Giles Henderson and I have long wished for a sequence that rewarded finesse instead of horsepower. Giles had a saying I love that encapsulates that desire: *"Energy management is something one does with the right hand, not the left."*

In his earlier writings Giles stated that, above all, low-hp/high-drag aircraft need to have access to their energy by diving. This sequence meets most of Giles' wishes. My hope is that this sequence will be the model for those that come after. We must continue to leave room in Sportsman for Citabrias, RVs, and other experimentals of similar performance. For those who want more difficulty, I would suggest developing a Freestyle.

In addition to this article there are separate, stand-alone maneuver articles on the IAC website just like those below. Each article title starts with "Flying the ..." To get to any of these articles, go to IAC.org, hit the search function, and type in "Flying the Hammerhead," "Flying the Immelmann," "Flying the Loop," etc.

Safety

One of the best books ever written about flying is still *Stick and Rudder* by engineer and test pilot Wolfgang Langewiesche.

He said that a horse has "gaits," like the walk, trot, canter, and gallop, and each of the gaits has a different feel. So it is with the airplane.

Riders and pilots must be sensitive to the feel of their mounts in each gait.

Listen to the horse.

If the airplane doesn't feel right, if the tip of the nose is not responding to pitch commands, or if it begins to do something you did not expect, abandon the maneuver immediately. Aggressively centering the rudder pedals and the stick, as well as getting the power back once the nose is close to or below the horizon, will normally keep the airplane from departing.

In the movie *Top Gun*, Viper, the instructor, said when dogfighting, "...don't push a bad position... extend and escape."

We are not curing cancer. Come back and try again.

Sequence Analysis

The sequence analysis comes in two flavors, Citabria/Decathlon (150 hp) and Super Decathlon (180 hp).

Sequence analysis should start at the last maneuver and work backward. In both of the above cases, the bottom altitude on maneuver 10 should be 1,700 feet AGL. The Decathlon/Citabria body type is big enough that the judges will always call it low if flying at 1,500 feet AGL. Now we just work backward from there.

Maneuver		Start Altitude, Citabria 150-hp D/Super D	Altitude Change
1.	45° Upline	2,700/2,200 feet	+700/+900 feet
2.	One-Turn Spin	3,400/3,100 feet	-1,200/-1,200 feet
3.	Immelmann	2,200/1,900 feet	+500/+600 feet
4.	180° Aerobatic Turn	2,700/2,500 feet	0 feet
5.	Goldfish	2,700/2,500 feet	-300/-200 feet
6.	Wedge	2,400/2,300 feet	-400/-300 feet
7.	Loop	2,000/2,000 feet	0 feet
8.	Hammerhead	2,000/2,000 feet	-300/-300 feet
9.	Two-Point Roll	1,700/1,700 feet	0 feet
10.	270° Aerobatic Turn	1,700/1,700 feet	0 feet

These above numbers are just a shot in the dark and will be different due to temperature and altitude, but they are a place for new people to start. Adjust from there with practice.

Individual Maneuvers

The Two-Point Aileron Roll – I am doing the aileron roll, maneuver 9, out of order because its elements and techniques apply to the part rolls in the Immelmann (3), Goldfish (5), and Wedge (6).

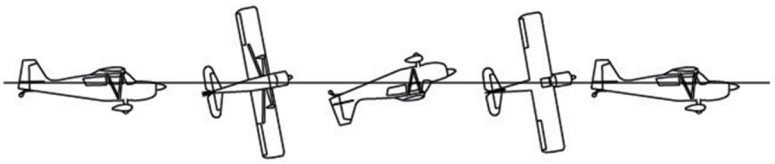
Competition aileron rolls are *really slow rolls in technique*. You must not pitch first before initiating the roll as you would in a pure, 1g, *Bob Hoover*-smooth, *coordinated* aileron roll. A slow roll is definitely *not* coordinated, as top rudder, or "sky" rudder, is applied in each knife-edge portion of the roll.

Aileron (slow) rolls are judged by CGT, or center of gravity track. Imagine reducing the aircraft to a dot at the center of gravity. In the roll, the track of that CG dot must make a straight track. See below. The circle made by either the nose or the tail in the roll is not important and not a judging criteria.

The main problem in this maneuver is that people do not maintain the straight and level path of the CGT before, during, and after the roll. Sinking during the roll is quite common, especially in the inverted and second knife-edge portions of the roll. Another problem is not maintaining a constant roll rate. Most pilots allow the roll rate to speed up in the second half of the roll.

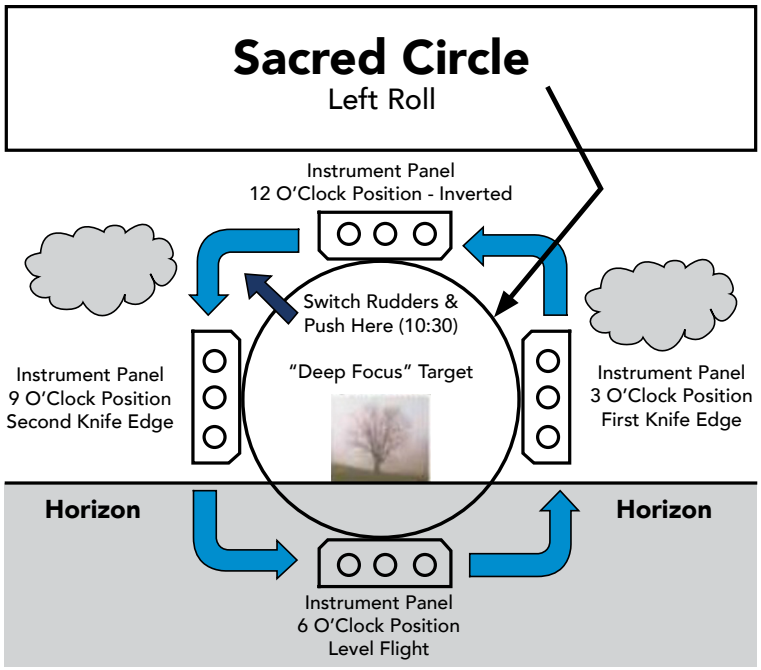
People also end up off-heading, usually to the right in a left roll.

The key to a good competition aileron (slow) roll is picking a spot on the horizon and then drawing Alan Cassidy's "sacred circle" with the tip of the nose around that spot. John Morrissey's "deep focus" must be maintained throughout the roll, which will be a challenge in



The aileron (slow) roll illustration.

ILLUSTRATIONS FROM **IAC ARCHIVES**



Sacred circle illustration.

and of itself as the controls are manipulated and the eyes try to go to infinity focus.

If we consider a left roll, the tip of the nose starts at 6 o'clock on the sacred circle, rotates counter-clockwise up to 3 o'clock for the first knife edge, continues up to 12 o'clock when inverted, down to 9 o'clock for the second knife edge, then back to 6 o'clock.

Remember, pitch is a "head-to-foot" motion of the nose of the aircraft, and this motion is in relation to the pilot, not the horizon.

To find the correct 12 o'clock attitude, the pilot must first fly inverted at different speeds and see how high the nose has to be above the horizon *while holding an altitude.*

When rolling past 3 o'clock on the sacred circle, on the way to 12 o'clock, there must be enough push added to get the nose up to the correct inverted attitude. Blend this push in between 3 o'clock and 12 o'clock.

Enough knife-edge practice must be flown to determine how much top rudder must be held to maintain altitude at the selected speeds.

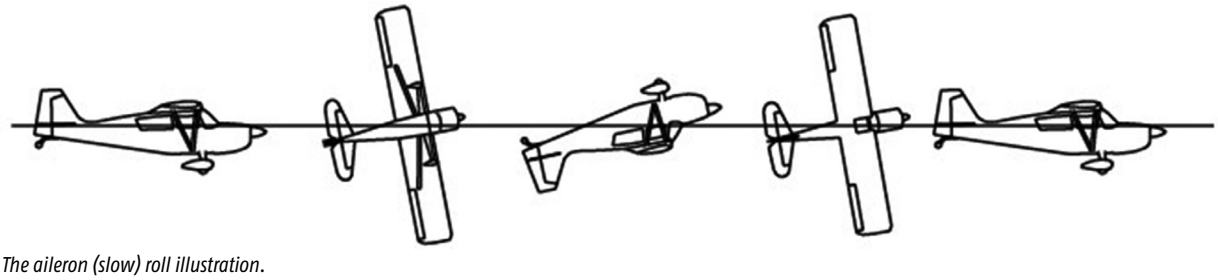
A good trick taught to me by Emerson Stewart here in Ohio was to not switch the rudders (when switching to the "other" top rudder) when passing through 12 o'clock, but to wait until about the 10:30 o'clock position instead.

Additionally, as it says in Alan Cassidy's book, *Better Aerobatics*, a little push with the elevator about the same time as the feet are switched (10:30) will also keep the nose pointed in the right direction as the rolling motion continues, rounding out the second half of the sacred circle. This push will fix the problem of ending off heading to the right all the time.

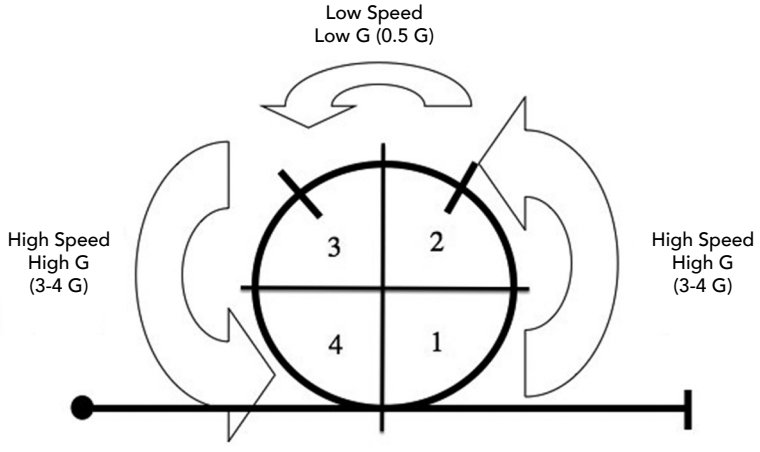
Once the rudder pedals are switched the roll rate will increase, which is a downgrade. Ease off the aileron deflection a bit when the rudder pedals are switched so the roll rate stays the same.

As to judging, the illustration below, of a low horsepower/high-drag aircraft should be scored as a "10." When looking at the nose and tail below, judges have sometimes called the roll "barreled." The nose and tail of the below aircraft will be drawing circles, but the *flight path of the center of gravity "dot" is not drawing a corkscrew line around a "barrel."*

The IAC judging training organization is working hard on correcting this common judging error, but the



The aileron (slow) roll illustration.

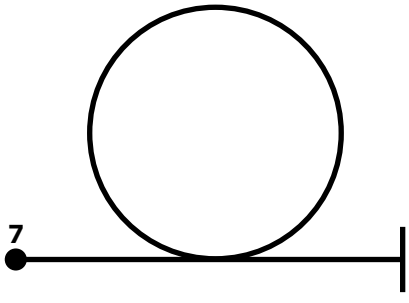


Fly the loop in thirds illustration.

pilot must do everything possible to perform for their flawed, human judges. When an aircraft is flown faster it will require less top rudder and a lesser inverted nose-up attitude to perform the roll.

<u>*The Loop*</u> – The loop is maneuver 7, but I'm also doing this discussion out of order as it also applies to the part loops in maneuvers 3 and 5.

We fly the loop in thirds, but we must analyze it, and judge it, in quarters. Quarter number 1 is free to the pilot and sets the standard. Whatever radius is drawn in quarter number 1 must be re-created in quarters 2, 3, and 4. Quarters 2 and 3 are the hardest to fly over the top as the airplane's energy state is at its lowest, with number 3 being "the downgrade zone."



The loop 2025 sportsman figure 7 illustration.

The first key, especially in a low-performance airplane, is to make quarter number 1 small. Keep quarter number 1 small enough that you can duplicate it three more times. It is important to pull enough *g*'s in the first quarter–at least 3.5*g*–or you won't have enough horsepower to make quarters 2 and 3 look good.

Also, enter the loop fast. Think of textbook looping speeds as minimums. This approach is good advice in general, but is even more important in this sequence.

As you finish the loop, pull just a little less *g* at the end of the 4th quarter. The aircraft is going a little slower in the 4th quarter than it was in the 1st , and most people tend to finish the loop "high." This means the exit altitude was higher than the entry altitude, which is a downgrade.

"Energy management is something one does with the right hand, not the left." -Giles

Loops, and parts of loops, must also be wind-corrected. When presented with a strong headwind or tailwind you can make an adjustment, widening out into the wind and tightening up with the tailwind. Just don't overdo it. A 5 percent to 10 percent adjustment should do it.

Loops are hard to do well and usually suffer under the judges' pens. *I highly recommend that every Sportsman pilot get a Freestyle*, even if they borrow it from someone else. And the first thing I do on my Freestyles is get rid of the loop! If you look in the *Rule Book*, the loop is not required on the Freestyle. Most airplanes like angles better. Why do the loop three times?

<u>*The Goldfish*</u> – This maneuver has three elements that must be conquered. First, make the 3/4ths of a loop a constant radius without pinching the top. The other two elements are those darn 45s and centering the roll.

Maneuver 5 is just like the regular loop. As in the full loop, pull enough *g*'s as you come off the first 45-degree downline and into quarter number 1 to make it small, enabling you to duplicate its size in quarter number 2 and through ½ of quarter number 3.

As for centering the roll, until ground coaching helps you make an adjustment, make the line before and the line after the roll equal in time. It is not perfect, but it is a place to start.

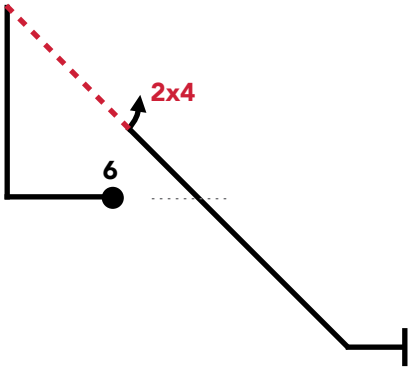
With coaching you will find that you'll need to spend slightly longer on the slower line (before the roll) than the faster line (after the roll) to make them equal in distance, but the timing difference is not a 2-to-1 ratio. This also applies in Maneuver 6.

Flying the 45s well depends on the pilot's eye position. See the 45 upline discussion.

You must maintain the same line before, during, and after the roll. See the aileron roll section about this.

Also, when it comes to 45-degree lines, most new people are shallow. Getting ground coaching would be best, but if you can't get it, being a little steep is better than being a little shallow. If half of the score sheets say "shallow" and half say "steep," steepen up your 45 lines. That will get rid of half of the demerits.

In this maneuver people usually pinch the top of the looping segment, which is a downgrade. The looping segment must be started with enough energy to fly that constant radius. Pulling the necessary beginning *g*'s will scrub off speed, so the first 45-degree downline must be held until the proper speed is attained before pulling up into the ¾ loop. Learn that entry speed for your airplane.



Wedge 2025 sportsman figure 6 illustration.

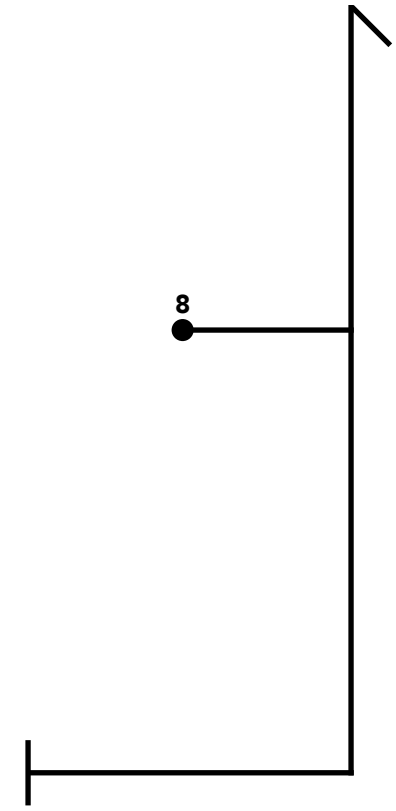
The Wedge or the Sawtooth – The Wedge is a Family 1 figure, which means that the 3 radii do not have to be the same size. With that being said, you must still have enough energy to draw a constant radius across the top, not flop, even though that radius can be a lot smaller than the other two.

Second, the lines within the figure do not have to be the same length. It will be hard for low-horsepower/high-drag aircraft to have enough energy to show the vertical line and to also draw a radius across the top. Start this maneuver fast—as fast as you can. The vertical line does not have to be any minimum length, but the judges have to see it. Coaching will help you with this.

As for centering the roll, see the Goldfish description on page 15.

Just like the level rolls, the aircraft center of gravity "dot" must track the same line throughout the roll on the 45-degree downlines. Again, the greatest problems maintaining a straight line through the roll are in the inverted and knife-edge portions of the roll. See the aileron roll section about this.

The pause needed to show the first point in the 2-by-4 roll must be long enough for the judges to see it. One recommendation is to pause for as long as it took you to roll to that point. The slower-rolling aircraft will have to pause longer, or the judges may not see it.



Hammerhead 2025 sportsman figure 8 illustration.

On the 45-degree downlines, pick that spot on the ground for your "deep focus" and do your "sacred circle" around that point.

The Hammerhead – The Hammerhead is fun to do. It is also a maneuver that can induce an inverted spin if mishandled. It is the upline and the rotation we must discuss.

In this discussion, we're in a left Hammerhead with a clockwise (from the pilot's perspective) turning, or American, engine.

First, the more vertical the upline, the better the rotation. I have found that once the vertical line has been set, the stick cannot be frozen in position. The Decathlon, for instance, will slowly creep on its back (negative) as it goes uphill and slows down. Don't let it.

The engine at full power will "torque" the aircraft as it slows. This

will cause the aircraft to roll left, which is a downgrade. Put in the right aileron as necessary to prevent any rolling on the upline.

The "kick," or pivot, is really a rapid and smooth push of the rudder to the stop, followed a split-second later by opposite aileron and then forward stick. These movements are not to be done simultaneously but sequentially. The aircraft type will determine the timing. The rudder and elevator are effective immediately because they are in the prop slipstream. The aileron only becomes effective once the wingtip is moving in yaw and it has some relative wind over it.

My hope is that this sequence will be the model for those that come after. We must continue to leave room in Sportsman for Citabrias, RVs, and other experimentals of similar performance.

The rudder begins the left yaw motion, giving the right wingtip more relative wind. This pulls the right wingtip into a left roll. The opposite aileron input, in this case right aileron, is added to prevent this roll. Enough aileron must be added so that the aircraft yaws "in plane" with no rolling motion present. Any roll is a downgrade.

Here is where we enter the possible inverted spin zone. The left yaw motion causes gyroscopic forces in the propeller to pitch the airplane on its back. Pushing the stick forward cancels out this pitching to keep the aircraft yawing "in plane."

Preventing the inverted spin entry *is all about not overdoing the forward stick input*.

Rich Stowell taught me a neat trick that helps the pilot use the correct amount of forward stick.

At the end of the vertical line, the pilot is usually looking at the sight gauge or part of the aircraft structure in relation to a spot on the left horizon, in the case of a left Hammerhead. It is natural for the eye to want to follow the wingtip down across the ground as the rotation begins, but you must resist it.

Instead, keep the eyes on that spot on the horizon and let the wingtip(s) drop away out of sight. Then apply just enough forward stick to put the tip of the nose through the same spot on the horizon the wingtip or sight gauge just vacated.

It is hard to keep the Pitts Specials from torquing around during the rotation. I was taught to pull power a little bit (maybe 10 percent to 15 percent) just before the rotation begins, which really helps. Don't pull power too much, though, or the second half of the rotation will stop working. It sure takes a lot more forward stick to counteract the gyroscopic pitching in the Pitts than it does in the Decathlon.

When the nose reaches straight down, just neutralizing the rudder pedals will bring about a "pendulum" effect, which is a downgrade. To avoid this problem, put in full opposite (right) rudder when roughly 30 degrees away from straight down, then quickly go to neutral. That will stop the nose quite smartly, with it pointing straight down. Once the pivot stops you don't need as much forward stick, so ease off. Avoid pushing negative on the downline.

Hold the downline long enough to have energy for maneuver 9.

Final Thoughts

If time and resources permit, I always *highly* recommend flying a Freestyle sequence. It is okay to use someone else's. First and foremost, in a Freestyle you can leave out the loop, that bane of the new pilot's existence!

The pilot can use the Sportsman category as a springboard to higher categories, or stay here for a lifetime. In either case, the Freestyle is a great place for education and self-challenge.

Back to the 2025 Sportsman Known sequence–whether a pilot is staying in this category forever or trying to move up, a Freestyle is challenging and fun. In this Known, there are many pieces, or strings of maneuvers, that would fit nicely in a Freestyle.

Watch your redlines, watch your altitudes, wear your parachute, and have fun!

Gordon Penner is a three-time Master CFI-Aerobatics, FAA Gold Seal flight instructor, and CFI for emergency maneuver training, aerobatics, tailwheel, and gliders. He has been flying for 35 years with a total of 14,000-plus hours. He is a professional airline pilot currently flying the Boeing 767, with experience in the Boeing 747, DC-8, and EMB 120. Gordon has been a member of the IAC since 2001. He is a Sportsman category competitor, a grading judge, and a past president of IAC Chapter 34 (Ohio).

YIN AND

Rick Volker flying his Marchetti SF260C and Brooks Mershon flying his Sukhoi SU-26M over EAA AirVenture Oshkosh 2024.

PHOTOGRAPHY BY **STEVE KOSKELLA**

YANG

Sukhoi versus Marchetti

BY RICK VOLKER, IAC 23297

I HAVE BEEN LUCKY to experience flight in wildly disparate aerobatic aircraft, from competing in the Unlimited category in the Pitts and Sukhoi to flying aerobatic air show routines in the AT-6, Sukhoi, Spitfire, and Messerschmitt. Whether you are flying a Decathlon, Extra, or Bücker, there is something they all share.

RICK VOLKER

Aerobatic aircraft evoke the passions of a world lived in the extreme. It is a joy to find oneself existing in the moment during challenging maneuvers. Such follies deny us the tyranny of everyday life until, soon enough, the challenge becomes habit. Pick the wrong airplane, and routine develops faster than we predict. There are those who recommend beginning with a forgiving aerobatic trainer and transitioning into incrementally more challenging models so one can progress safely up the ladder. This approach assumes a pilot possesses zero aptitude mixed with unlimited finances. The pilot tries to make a basic or marginal aircraft work but is forever wanting a higher-performance aircraft that is out of reach. It can be a killer of dreams for some. Surely, the pilots who are held in highest regard and have become household names did not start that way. Successful people start with a vision of themself and tune out the naysayers. They do their homework. They jump right into their dream.

The evolving flock of Unlimited-level monoplanes keeps pushing the limits of power-to-weight ratio, *g*-limits, and ease of flying to new levels each year. These designs have been striving to achieve many of the same performance characteristics and result in increasingly similar features, but designers appear to have stolen each other's plans! To see paint schemes as the only obvious difference in competing designs from 100 feet away suggests a trend toward homologation in today's aerobatic competition world.

A view of the Marchetti's cockpit.

Rick Volker's Marchetti SF260C at EAA AirVenture Oshkosh 2024.

PHOTOGRAPHY BY **PHIL HIGH**

Designs that differ from the "norm" can be equally competitive but may not be as successful due to financial or political factors. Some of them are charismatic masterpieces. They can be equally capable, stimulating passion in those of us who are ready for another extreme flavor. In a search for an aircraft to maximally satisfy aviation desire, I suggest two opposites. These two aircraft have similar stall and max level speed and are equipped with inverted systems. That is all they share. They are at opposite poles of the aerobatic aircraft spectrum and truly demonstrate the yin and yang of aircraft design.

In one corner is the Russian-built Sukhoi SU-26M, the first monoplane built with a majority of carbon fiber. The design philosophy: an aircraft with a speed range that would be easy to keep inside an aerobatic box; a design with speed and *g*-limits so high that the only limitation is the pilot's physiology; and a thick wing designed primarily for maintaining energy at the steepest angles of attack, combined with a geared giant propeller that can produce the static thrust of a John Deere tractor. The pilot body position is designed for the best *g*-tolerance and comfort. The Sukhoi SU-26M dominated the aerobatic competition world for almost 20 years and still competes with the best when flown by the likes of Castor Fantoba of Spain. The M14P engine has proven to be more reliable than any other design and is still in production.

What is it like to fly?

The high deck angle is striking as the Sukhoi SU-26M sits on the ramp. The 30-degree reclined seat is extremely comfortable but may require some neck muscle endurance while taxiing. All controls feel robust yet oddly free of friction. Rudder pedals are gliding parallelograms befitting a $30 million fighter. The throttle quadrant design makes competitors look like Tinkertoys. You are airborne in less time than the 4 seconds it takes to smoothly move the throttle to full power.

A view of the Sukhoi's cockpit.

Brooks Mershon's Sukhoi SU-26M at EAA AirVenture Oshkosh 2024.

Rick Volker flying the Sukhoi SU-26M in an air show.

Marchetti SF260C performing a high-speed pass.

The main wheels come off the ground before the tail wheel, and you can climb at a 40-degree angle for thousands of feet. Acceleration from 0-130 mph is blistering and faster than almost any sports car. Using only cruise power, you can compete in the Advanced category. Going to full power and pulling to vertical from max level speed will have you going straight up for over 20 seconds while you decide whether to do six rolls, a couple snaps, or even place a phone call before you torque roll out at the top, rolling either way—your choice.

The Russians seem to view V_{NE} as a mere suggestion. The late Nikolay Timofeev shared with me the entry speed he used in his SU-26M for an eight-sided loop with snap rolls on each side as "V_{NE}, plus!" When I questioned doing snaps on a downline over a certain speed, he responded, "No too fast! Airspeed indicator around once ... good; two times ... good; three times ... too fast!" However, the pilot needs to really work to get near the high V_{NE}, as the airplane tries to stay in its favorite speed range.

What about slow speed performance? Slow it way down. Think you are too slow? Nope. Run out of energy after a knife-edge spin going up and find yourself hovering at the top? Start rolling in place and gradually convert your vertical attitude into rolling horizontal flight. Power-on stall speed is close to zero, and maximum recommended snap roll speed is painfully close to max level speed. Controls? The rudder is godlike. Press it to full deflection anytime and exclaim, "My will be done!" The top 3/4 of a loop is easily done in knife edge using rudder alone. The elevator is on rails around looping sections. You can do a round +4*g* or -4*g* loop with trim alone. The ailerons are slightly heavier than most Unlimited-level monoplanes because of the mass of the wing. The oversized control stick pays dividends when trying to index your body with two hands during complex maneuvers. The SU-26M has a strong centering feel that makes cross-countries and point rolls feel equally effortless. The oversized propeller delivers huge gyroscopic effects that continually challenge the pilot who enjoys fully exploring the envelope to create new maneuvers. It also creates a great amount of drag during tumbles that slows them down until the force is no longer with you. This provides safe, consistent exits from anything you can create, such as a four-wingspan-wide cartwheel in pure yaw—an air show favorite.

PHOTOGRAPHY COURTESY OF **RICK VOLKER**

Rick Volker flying his Marchetti SF260C and Brooks Mershon flying his Sukhoi SU-26M over EAA AirVenture Oshkosh 2024.

Now the downsides: the Sukhoi optimally returns to the same 200-mph max level speed using 6.5*g* between successive maneuvers for best maintenance of energy. If you want to go really fast, you must start with it early in a sequence or buy an Edge that wants to go 250 mph and do 10*g* at every corner to stay in the box. The Sukhoi plays its own box-loving energy game. It rolls at 360 degrees per second, slower than the newest monoplanes. The fuel tank holds only 17 gallons, requiring the addition of a 35-gallon belly tank for long-distance travel. The only other downside is convincing your mechanic that it is simple to maintain. It *is*.

> Going to full power and pulling to vertical from max level speed will have you going straight up for over 20 seconds while you decide whether to do six rolls, a couple snaps, or even place a phone call before you torque roll out at the top, rolling either way—your choice.

In the other corner is the Italian-built, all-aluminum, certified Marchetti SF260C. It does almost everything. Imagine flying it with a student in side-by-side seating, with sticks and dual throttle controls, in IFR conditions at 200 mph for 500 nm nonstop, with a dog and 200 pounds of luggage in the back seat. The autopilot and Stormscope reduce your stress. The next day, you fly with the same student in the heated cockpit and demonstrate the Intermediate Known sequence on a 40-degree windy day, reassured that the 25-knot crosswind capability will keep you in one piece during landing. The following week, your Marchetti is stolen, and you watch it on CNN firing rockets to silence counterinsurgents in some developing country. Your insurance company decides to buy you a new one, but that's no problem as they are currently still in production. Yes, that is all possible in only one aircraft!

For pilots embarrassed to be seen in a nosewheel aircraft, the Marchetti gets a pass, as it is purpose-built to train future fighter jet pilots. In fact, the flight character of this aircraft is jet-like with a razor-thin laminar flow wing that demands speed to keep it happy. Fly in the top half of its speed range and you are rewarded with 2,000-foot verticals, multiple snaps, and precision point rolls. Fly it in the bottom half of its

PHOTOGRAPHY BY **STEVE KOSKELLA**

range and the stall horn will be like your in-laws complaining about your behavior the whole flight. Thankfully, the Marchetti has a good pre-stall buffet and great upright and inverted spin behavior.

There is almost zero adverse yaw with hard aileron use. With a three-blade MT prop, the gyroscopic effect is also almost zero. There is no proclivity to go on its back during a hammerhead pivot. The ailerons are light and provide roll control well below stall speed. While 195 mph may be recommended for loops, with strong right rudder compensating for slipstream, entry speed can be as low as 160 mph. At a power setting of 25 squared, the Marchetti will maintain 195 mph indicated between maneuvers. Never-exceed speed is quite far away at 272 mph. You can get a full roll up on a humpty with an entrance speed of 240 mph. Two-snap avalanches or a snap immediately after a hammerhead pivot feels natural. While the Marchetti is not designed to be a competition machine, you can fly most of the recent Intermediate Knowns if you have the Christen inverted system. The fuel-injected Lycoming AEIO-540-D4A5 is the same engine as in a Pitts S-2C. Hands-off spin recovery works. The cockpit visibility is better than anything short of the front seat of an Extra 300L. The high-wing loading smooths out turbulent practice days that would leave a Citabria in the barn.

Now the cons: gear and flap speed are annoyingly slow for such a fast mover. Only two of the four fuel tanks can be used for aerobatics. Roll rate is slow with about three seconds to get around; *g*-limits, when dual, drop from +6*g*/-3*g* to +4.4*g*/-2.2*g*. It is not approved for tailslides or tumbles. Flying at 4*g* and 195 mph, loop radiuses start to get large enough to make contest sequences difficult to keep in the box. Squander energy, and reacceleration will be slow. The pilot must work hard to make four-point slow rolls look good due to the asymmetric wing. The low-speed ability to fly directly from an Immelmann into a perfect four-point roll in the same aerobatic box is missing. An Immelmann with 1-1/2 rolls must be done with a penalty for rolling far before the horizontal line. Retractable gear, flaps, and the complex build typical of piston warbirds can add complexity to the learning and maintenance curves.

Look again at the familiar aerobatic aircraft types available. You will not see too many

Unlimited-level monoplanes that have much resale value after 2,000 hours of airframe life, as they are expected to have been beaten to within an inch of their life on the fatigue curve. High-performance biplanes often require re-covering with some internal wing repair in 2,000 hours. The Sukhoi is only likely to require replacement of a few lost trim screws in that same timeframe. A Marchetti that was used to teach aerobatics and dogfighting for over 10,000 hours was recently inspected

> For pilots embarrassed to be seen in a nose-wheel aircraft, the Marchetti gets a pass, as it is purpose-built to train future fighter jet pilots.

Brooks Mershon in his Sukhoi SU-26M, Rick Volker in his Marchetti SF260C, Justin Spence in his father Anthony Spence's Yakovlev Yak-50, and Corben Myer in his Extra 230—all flying over EAA AirVenture Oshkosh 2024.

and had no wrinkles, no hot rivets, and no history of airframe repairs. There was no apparent wear. The Marchetti and the Sukhoi are built to last and will remain exciting alternatives to the current direction of aerobatic aircraft design for many years.

Either one of these aircraft will guarantee enough challenge to last your whole aviation life. The Marchetti is a jet masquerading as a piston aircraft. It continually invites you to find challenge working within its aerobatic limits and in exploring how many different hats can be worn by one airplane. You will not find an aerobatic aircraft with more utility. The Sukhoi SU-26M is a beast of an aircraft that flies to its own beat while remaining competitive with other current designs in the Unlimited category. The Sukhoi's real challenge is in developing your imagination for 3D flight.

Look up the definition of yin and yang. Yin represents darkness, femininity, passivity, and the earth. Yang represents light, masculinity, activity, and the heavens. I know which aircraft each one represents. Do you? ***IAC+***

Backed by the advantage of physical fitness from athletic competition in multiple sports, **Rick Volker** began his aerobatic livelihood in competition where he won at the Unlimited level in both Pitts Special and Sukhoi aircraft. In air shows, some of Rick's highlights include an incredible surface-level sequence in a WWII Supermarine Spitfire Mk IX and beautiful aerobatic demonstrations in the Hawker Hurricane Mk XII and the Harvard Mk IV. He also performs close formation flying with the CF-18 fighter. Rick is an Aerobatic Competency Evaluator (ACE) and trains aerobatic pilots in the Extra 300-L, the Sukhoi SU-29, and the Pitts Special.

PHOTOGRAPHY BY **STEVE KOSKELLA**

EXPLORING THE YAK-50

BY ANTHONY SPENCE, IAC 435860

Front view of the Yak-50.

LEGEND HAS IT THAT in the early 1970s the Soviet government went to Yakovlev and said, "Build us an airplane to beat the Americans in aerobatic competition." Whether this is true or not, we do not know, but it sounds cool. And so the Yak-50 was born.

Alexander Yakovlev started the Yakovlev company in the 1930's and designed and built successful fighters throughout World War II—the Yak-1 to Yak-9. The first post-WWII aircraft was the Yak-18, designed and built in 1946. It was a two-seat tandem trainer made of tube and fabric with a tail wheel and retractable main undercarriage, with only a 160-hp engine. Over the years, the Yak-18 was developed into a single-seat tricycle-geared advanced trainer for the Air Force: the Yak-18PM, still fabric covered but with a much improved and higher-horsepower engine. But being a military trainer, it was heavy and not suited for aerobatic competition. It was later developed into a taildragger that much improved the performance but was still not the world-beater. The Soviets did win the World Aerobatic Championships (WAC) Aresti Cup in 1966 and 1970 in Yak-18PM aircraft. But by the early 1970s, the Pitts was dominating, and the Zlin 50 was a huge contender, which now brings me to the Yak-50.

The Yak-50 was developed in 1973 as a complete redesign. It is similar to the Yak-18PS single-seat tailwheel with a retractable main gear, but it differs in construction technique and materials. Designed by Alexander Yakovlev's son, Sergei Yakovlev, and Yuri Yankevich, it has all-metal construction with a semi-monocoque fuselage and smaller overall dimensions. It has a smaller, lighter airframe and a wing section that, while not fully symmetrical, enhances inverted flight. It is fitted with the Vedeneyev M-14P nine-cylinder air-cooled radial piston engine, nominally 360 hp with a big but somewhat inefficient two-bladed V-530 propeller. Now that the USSR had the aircraft it wanted, production was started in Arsenyev, Russia. Only 312 Yak-50s were built between 1975 and 1985.

The author's son, Justin Spence, pilot of the Yak-50 in this issue of Sport Aerobatics.

The 1976 WAC was dominated by the Yak-50, which took first and second in the men's—Victor Lestko taking first place—and the top five positions in the women's—Lidia Leonova taking first place. As well as overall men's and women's team prizes, the great Victor Smolin won with a Yak-50 again in 1982.

However, the Yak-50 did have its faults as it was only designed as a +9*g*/-6*g* airframe, and in order to win, these planes were often pushed well beyond the limit to 11*g*-12*g* loads. There were four wing failures in that period, and unfortunately Victor Lestko lost his life when his wing broke off during practice. Following these incidents, the Yakovlev factory brought out some modifications to strengthen the wing, but by now it was obvious that the Yak-55 was not going to be a contender anymore against the likes of Extra and other monoplanes such as Leo's Laser. So the decision was made to withdraw the Yak-50 from competition in 1984. This move led to the design and development of the Yak-55, but that is a whole different story.

Of the 312 Yak-50 airframes built, we are not sure how many are left. Some say 60, and others say 90. But what we do know for certain is that there are a number of them that made it to the West. Originally the Yak-50 only had 15 gallons of fuel onboard. Now, if you think about that, at aerobatic power settings you are burning at least 25-30

PHOTOGRAPHY BY **PHIL HIGH**

Side view of the Yak-50.

Flying in formation over EAA AirVenture Oshkosh 2024: Brooks Mershon in the Sukhoi SU-26M and Justin Spence in the Yakovlev Yak-50.

Yak-50 instrument panel.

gallons of fuel per hour, and in cruise you are burning 15 gallons per hour. You are not going far, so those airplanes imported to the West have all been modified with extra fuel storage, as far as I know. Mine, for example, has an extra 15-gallon fuel tank to bring it to 30 gallons, so it gives me a bit of cross-country time to go places. Another great modification that most westernized Yak-50s have is that the propellers have been changed to the more performant three-bladed MT prop.

So, these modifications and the strengthened wing spar make for a great safe flyer that is a lot of fun. I think in the right hands it could still compete at least in the Advanced category, and it also makes a great air show mount. I'm often asked, "How does it fly?" Well, it's an absolute delight to fly for a 1970s-era airplane. It's very light on the controls for its size and will do anything you ask of it. You take off in a three-point attitude (and remember the prop turns the wrong way, so it's left rudder), and it's off the ground before you can say Yakovlev. It climbs skyward at 3,000 fpm. I normally cruise at around 130 knots to save fuel. But as soon as I want to do aerobatics, I push that big fighter-like throttle forward, and then it's a point and shoot; the airplane will do anything from straight-and-level loops to vertical tumbles.

Now, it's obviously nothing like a modern monoplane, but will easily roll at 180 degrees per second. Landing is a lot of fun as it has a huge hose nose like the Corsair. I bring it in initially at about 100 knots, slowing to 90 over the fence and trying (note, I said *trying*) to "three-point" it at I-don't-know-the-speed as now I'm looking to either side of that huge nose to maintain directional control without seeing anything directly ahead of me. However, it is stable and tracks nice and straight on the ground. Interesting fact: It does not have a steerable tail wheel — it only locks straight with the stick back, so taxiing can be exciting as you must push the stick forward or at least to neutral to turn!

Unfortunately, I couldn't make it to EAA AirVenture Oshkosh 2024 due to work, so I would like to take this opportunity to thank my son Justin Spence for taking my Yak-50 there and flying it in the photos you see in this issue of *Sport Aerobatics*.

Here are the specs for my Yak-50:

Crew: 1 person
Length: 25 feet, 7 inches
Wingspan: 31 feet, 2 inches
Height: 10 feet, 6 inches
Wing area: 160 square feet
Empty weight: 1,653 pounds

PHOTOGRAPHY BY **STEVE KOSKELLA AND PHIL HIGH**

Tail view of the Yak-50.

Air intake and oil cooler.

Max takeoff weight: 2,006 pounds

Engine: Vedeneyev M-14P nine-cylinder air-cooled radial piston engine, 360 hp

Propeller type and diameter: Two-bladed V-530 (originally), now MTV-9, three-bladed. IAC

Anthony Spence grew up with EAA and *Sport Aerobatics*; his dad started the first international EAA chapter in 1964 in South Africa. Anthony served two years in the South African Air Force as a mechanic, got his private pilot license in a Chipmunk, did A&P after the Air Force, went on to get his certified pilot license, and then ATP. He immigrated to the United States in 2016. He lives in Memphis, Tennessee, flies corporate in a Citation X, owned a Pitts S-2A, and now owns a Yak-50 and a PZL-102B.

The End of an Era

***Daisy:* A special little airplane we'll always remember**

BY DOUG JENKINS, IAC 436255

SPOILER ALERT: THIS STORY ends with me standing, unharmed, looking at my airplane (aka *Daisy*) lying on her back along the edge of the runway at our home field. I wasn't wondering what happened; I knew what happened. The story of how we got there may, I hope, prevent a similar thing from happening to you.

There was no foreshadowing. I had decided to move to the Advanced category of competition, and practice had been going about like you would expect. My flying had gone from "painfully bad" to merely "bad." Progress was being made. The airplane had performed flawlessly throughout. On the day prior to the event for which there was no foreshadowing, we practiced Advanced for the first time in front of an audience and got some feedback from my wife and another pilot. No issues were noted with *Daisy*, none.

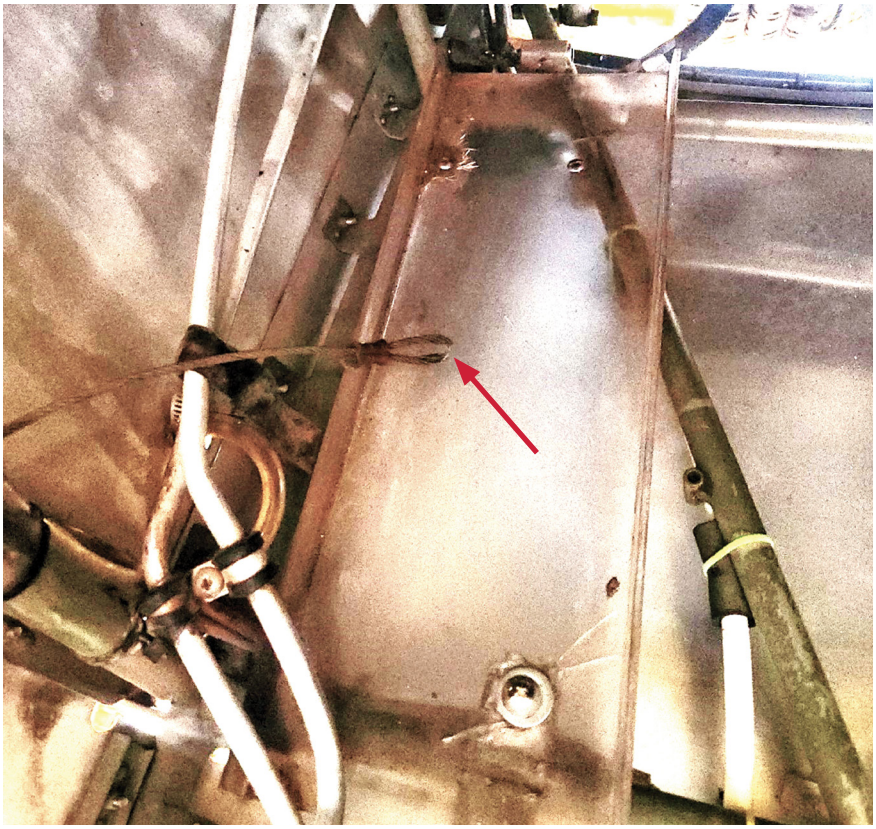
Our final flight together, on Sunday, November 17, 2024, started just like any other. Preflight inspection was normal. I rolled the airplane out of the hangar into a sunny South Texas winter day. The plan was to practice our Advanced Free once and then move to the Known for two or three iterations after that, depending on progress. Start, taxi out, run up, take off, and climb to the working airspace: 100 percent normal. The first eight figures of the Free (various Advanced figures to include a snap roll) were also uneventful. Figure nine was where it all went pear shaped.

Daisy *in flight*.

In upright flight, at 105 mph and approximately 2,700 feet AGL, I entered a left-hand snap roll, which was planned to be a snap and a half prior to a half-loop down. As I initiated the snap roll with full throttle, aggressive full left rudder, and near full aft stick, I felt the left rudder pedal suddenly lose tension and go to the firewall. Simultaneously, the airplane ceased the nascent snap roll and transitioned to a spiral to the left. Using elevator and aileron, I was able to level the aircraft. "Well, that was interesting," was my first thought. "I wonder what just happened?" was my second thought. I rapidly discovered that I could fly the airplane. The elevators and ailerons worked normally. But the left rudder pedal was pinned against the firewall, and I could not apply it. Right rudder was available, but with no left rudder control, it took roll to re-center the rudder. Interesting. Further experimenting at a safe altitude led me to believe that attempting a landing was preferable to jumping overboard. Part of this thought process was the fact that the grass strip I was heading to was less than a minute away and 200 feet wide by 3,000 feet long with 10-15 knots of wind pretty much aligned with the runway.

I flew a straight-in approach, initially aligning near the left edge of the runway, anticipating the inability to stop any right drift/veer after touchdown due to the left rudder/brake pedal being pinned against the firewall.

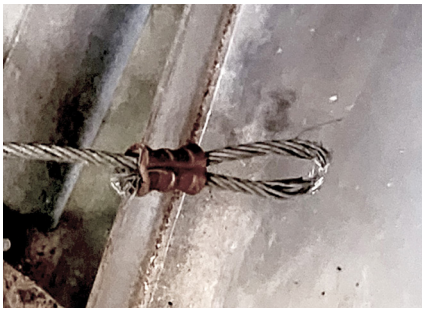
PHOTOGRAPHY COURTESY OF **DOUG JENKINS**



In the cockpit: left rudder cable completely worn through.

On final, the aircraft yawed significantly to the right as airspeed decreased, and left aileron alone was not enough to maintain runway alignment. I eventually went around from over the right edge of the runway at approximately 75 feet AGL while severely cross-controlled. During the subsequent pattern, again I thought about potentially abandoning the aircraft due to the inability to maintain fuselage alignment with the runway. Since I had the luxury of time and was not eager to take to the parachute while the airplane was capable of flight, I looked around the cockpit in more detail. When I did so, I noticed the left rudder cable lying on the floor by my left hip. "Ah-ha!" I grabbed the cable and pulled. The rudder responded, and I was able to get it to go to, and stay at, neutral. Lacking a lever to work with, I

Front view of Daisy *lying on her back after the incident.*



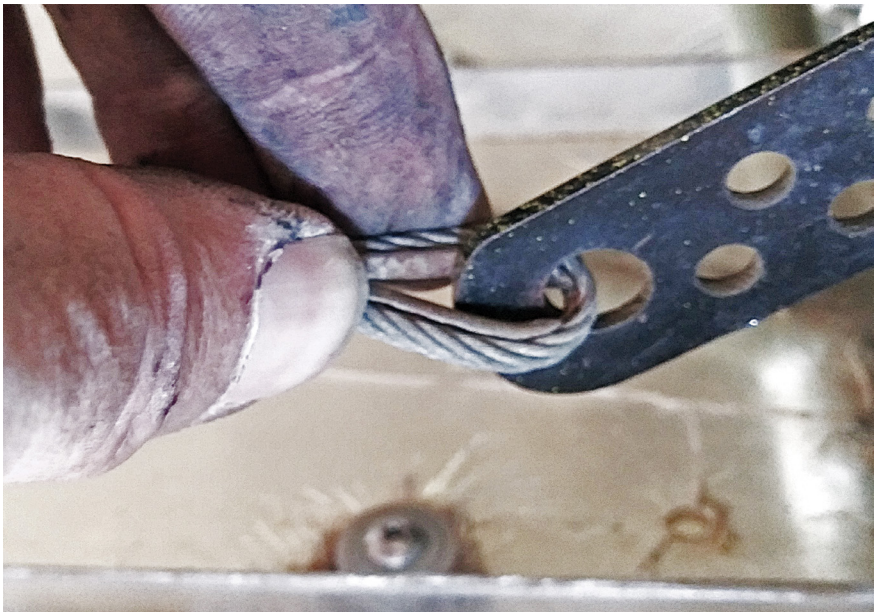
Close-up of the left rudder cable completely worn through.

couldn't overcome airflow and get any left deflection, but I could at least get neutral rudder.

Having discovered this new option, I positioned the aircraft for a second straight-in approach. The second final was much better. By pulling on the rudder cable, I was able to maintain runway alignment throughout final and up to touchdown. After touchdown, it got a little dicey. With no rudder control available, I was basically a passenger. I switched off the magnetos and kept the stick full aft and the ailerons neutral. The aircraft began to veer to the right and entered a right yaw and left roll ground loop. When the lower left wing contacted the runway, the mass of the aircraft pivoted around this new contact point, and unfortunately, there was just barely enough energy left for that pivot to put her on her back. The pivot from upright to inverted was excruciatingly slow (at least in my mind), and I remember thinking, "Don't do it, don't do it, don't do it ... oh, we're gonna do it."

Following the pivot to inverted, I was left hanging from the straps in my seat in a stationary aircraft. I turned off the master switch and released the secondary lap belt. After that, I placed my right arm on the ground and released the primary lap belt with my left hand. I then fell (slithered) out of the cockpit

Figure nine was where it all went pear shaped.



Close-up of the right rudder cable showing complete wear through the thimble and the beginnings of the cable itself being cut through.

and moved away from what had been, up until moments before, a magnificent airplane. I assessed myself for injuries and found none, other than a minor scratch on my right shin, which likely happened as I egressed the cockpit. At this point, several folks had arrived, and the post-accident assessment began. Using some patience and a few tools, we got the airplane back on her wheels and rolled her to my hangar. A prop blade fell off on the way, which provided a little comic relief.

Once I had the airplane in the hangar, I began to dig into the rudder cable connection, and the cause of the accident was immediately apparent. The left rudder cable had failed at its attach arm to the pedal. My rudder control system was set up with the cable looped around a thimble that was inside the rudder pedal arm. (See pictures for details.) The thimble was gone, and the cable was broken. Once the cable broke, the tension spring pulled the pedal forward and allowed the rudder to move at the whim of the relative wind.

When I looked at the right rudder cable, there was evidence of the same failure already in progress. (See pictures for details.) The thimble had worn through, and the arm was beginning to cut the cable. This condition was impossible to see on a normal preflight inspection. Removing the forward sheet metal was the only way to see the cables and their attachment points. I took the sheet metal off at each condition inspection. The cables were looked at seven months and 86 hours prior to the accident. No one noticed the wear. Why? To see the flaw, you need to pull the cable and thimble away from the arm and look at the inner surface of the thimble. I didn't do this. You can bet I will in the future! Review of the logbooks showed that the cables were likely the original ones installed in 1988 and had been flown for 1,750 hours.

The pivot from upright to inverted was excruciatingly slow (at least in my mind), and I remember thinking, 'Don't do it, don't do it, don't do it … oh, we're gonna do it.'

Once the cable failed, the outcome of the landing was already decided. The only way to prevent this accident (I believe) was for that cable to not have failed. The only way to make that happen would have been to find and fix the issue before it progressed before it progressed to the point of failure.

Post-failure, I like to think I handled the situation about as well as possible. As trite as it may sound, the tools I got in U.S. Air Force pilot training were what I fell back on. To summarize, the USAF approach to handling any emergency in an airplane is to:

1. Maintain aircraft control.
2. Analyze the situation and take appropriate action.
3. Land as soon as conditions permit.

So, here is what I did: Once the airplane exhibited an abnormal response to my control inputs, I ceased maneuvering and recovered to level flight. This was item 1. **Maintain aircraft control.**

Once I determined that it was possible to maintain aircraft control, I began to figure out what worked and what did not work. I flew the airplane and decided it was safe (and possible) to continue flying it given what I had available to me. I experimented with the flight controls while safely away from the ground and determined that a landing attempt was preferable to abandoning ship. This was the first part of item 2. **Analyze the situation.**

I flew to the best available landing site (considering runway length/width/condition and surface winds) and set up to land. This was the second part of item 2: **Take appropriate action.**

I was willing to change my course of action based on evolving inputs (go around from first approach and reconsider the preferability of bailing out). I updated my decisions as I gathered new information. ("What's this? A rudder cable! Let's give it a pull.") This was **analyze the situation and take appropriate action** continued.

And finally, given the totality of the circumstances and inputs, I decided to 3. **Land as soon as conditions permit**.

While the landing certainly could have gone better, I was uninjured, no other property was damaged, and my airplane, while deemed a total loss by the insurance company, was left in a potentially repairable state.

Monday-morning quarterbacking can always yield "coulda-woulda-shoulda," but, all things considered, it certainly could have been worse!

PHOTOGRAPHY BY **DOUG JENKINS**

Doug Jenkins taxiing Daisy.

Douglas plants a kiss on Daisy's *nose.*

To sum it up, here are my lessons learned from this event:

1. Control system components should not be "fly to fail" parts. Some sort of time/hour/logical replacement schedule might be wise.
2. When you think you have looked closely enough at a system during an inspection, you probably haven't, especially when looking at a part where the penalty for failure is severe.
3. The things the Air Force taught me work. I went through the steps that were drilled into my skull for years, and they enabled an outcome where no one was hurt; maintain aircraft control, analyze the situation/take appropriate action, and land as soon as conditions permit.

Please give your airplanes, especially your flight controls, a thorough evaluation. Consider replacing critical parts *before* they fail. When things go pear shaped, fly the airplane first and then sort out everything else after that.

Okay, that was the technical. Now it's time to get personal. As I write this, the outcome of the accident (in terms of *Daisy's* future) is still unknown. I am awaiting word from the insurance company on salvage value. It is possible I may buy her back and make her whole again, but that seems unlikely. As always, and even more so than in the past, it is a question of time and money.

If this is the end of our path together, then I feel compelled to deliver some sort of eulogy since I suffer from a condition that drives me to anthropomorphize things and to attribute to them a personality and a soul. And *Daisy* certainly had personality and soul in abundance. Please indulge me and forgive my verbosity as I present to you a career retrospective for *Daisy.*

For more on our aerobatic discoveries, journeys, trials, and tribulations, I recommend reading articles in the following issues of *Sport Aerobatics*, all of which are available on the IAC website: April 2013, pages 10-13; September 2015, pages 6-11; December 2015, pages 19-26; and January 2018, pages 7-15.

Over our 12 years together, we flew almost 820 hours. We visited Texas, Oklahoma, Kansas, Nebraska, and Colorado. We braved cold and heat, we persevered through headwinds and crosswinds, and we learned together. *Daisy* was a fantastic teacher. Not just about things aeronautical, but also about things real. Her personality and soul connected to and spoke to mine and we formed a solid team. Chrissy, my wife, loved her as much as I did. Douglas, my 6-year-old son, is still

A collection of Daisy's *stickers from many years of competitions – her 2024 stickers are still in the mail.*

quite shaken by the fact that we probably won't fix *Daisy*; they have known each other his whole life. She had that effect on people.

During our dozen years together, we participated in 10 seasons of aerobatic competition. All told, we flew in 43 aerobatic contests and she compiled an enviable record.

From 2013 to 2014 and again in 2017 (following a two-year rebuild) we flew Sportsman. Daisy brought home three second-place and five first-place trophies from regional contests. She placed second at Nationals in 2014. She finished third in the South Central Region in 2013, second in the Region in 2014, and first in the Region in 2017.

From 2018 to 2024 she flew Intermediate. During that six-year span she took home three third-place finishes, 10 second-place finishes, and 13 outright victories at regional contests. She dominated the Texas Championship Series, finishing second in 2018 and first in 2019, 2021, 2022, 2023, and 2024. She finished second in the South Central region in 2021 and first in the Region in 2019, 2020, 2022, 2023, and 2024.

This is a record of accomplishment that any 180-hp open-cockpit biplane can surely be proud of, and if this is the end of her story, I am glad I got to play a role in it. She was the best. ***IAC+***

Doug Jenkins has an Airline Transport Pilot (ATP) certification and his day job is working as a T-38C simulator instructor for the Introduction to Fighter Fundamentals program at Randolph Air Force Base. He has flown numerous aircraft types; however, the most interesting to him are the Pitts S-1, Taylorcraft BC-12D, Bellanca Decathlon, T-37, T-38, T-6 Texan II, and the F-15C. Total aerobatic hours flown are around 5,000, which includes military time in trainers and fighters.

PHOTOGRAPHY BY **KJB PHOTOGRAPHY AND DOUG JENKINS**

Perspectives on Acceptable Levels of Risk

BY RANDY BROOKS, IAC 436808

"HAVE YOU EVER HAD *any close calls?"* is a strange, but perhaps common, question many of us have been asked by our non-aviator friends, and even by some of our pilot friends who may not be involved in aerobatics. Many people who have no wish to participate in the flying we do get a voyeuristic fascination from hearing of our adventures. While this question might be frustrating to some of us, those who are curious often don't fully appreciate the level of precision required in aerobatics and may still view it through the outdated lens of "stunt flying." Answering such questions provides an important educational opportunity if done with patience.

In my air show days, I always thought it was an interesting question. For 10 years, I flew on four-ship aerobatic teams: 450 Stearmans with the Red Baron Squadron and Pitts S-2Bs and S-2Ss with the Holiday Inn Aerobatic Team. Standard performances involved four-ship aerobatic maneuvering within a wingspan of three other aircraft, upside down and close to the ground. For most people, my average day at work would have constituted a close call. For me, it was an average weekend. This subject brings to light the term "acceptable level of risk."

Individual Choice and Group Variability

As the only pilot in my aircraft, performing with three other well-trained and trusted pilots and with healthy concern and respect for energy directed toward the crowd, my acceptable level of risk was totally up to me and my teammates. Put a media person or air show organizer onboard with me and that calculation was significantly altered in terms of minimum altitudes, maneuver complexity, and other risk factors.

There are many definitions for "acceptable level of risk," but one that seems to fit well for this topic and audience might be: *risk that has been reduced to a level that can be tolerated by the organization or individual.* This distinction between individual and organizational considerations explains the variance described between a pilot in a formation air show demonstration and a standard press flight with passengers on board. In this example, the organization standards come from the FAA, the air show's air boss, or a particular air show team, with different teams accepting different levels of risk. We'll come back to the question of group, or organizational risk, in a moment.

For most people, my average day at work would have constituted a close call. For me, it was an average weekend.

Safety First?

Regarding safety, we sometimes hear the rallying cry, "Safety first," but brief deliberation puts an end to that. If safety were our *first* priority, wouldn't we just stay on the ground? What fun would that be? Even if we accept that we must fly, it is hard to argue that aerobatics is the safest form of flying with all those "abrupt changes in an aircraft's attitude, abnormal attitudes, or abnormal accelerations not necessary for normal flight" that regulations describe (FAR 91.303). Safety is, and must be, a high priority, but we must balance it with the concept of what is acceptable. In contest flying, these acceptable limits are well delineated by altitudes, inspections, parachutes, and procedures to reduce risk to acceptable levels for the organization.

The Holiday Inn Aerobatic Team, 1987.

A Safety Management System Viewpoint of Risk Management

This entire conversation is based on Safety Management System (SMS) concepts. A simplistic definition of an SMS might be *a proactive approach to identifying risks and finding ways to mitigate them*. If this sounds like something an experienced pilot does naturally over the course of a long flying career, it generally is, to one degree or another. The term "proactive" identifies a thoughtful, deliberate, premeditated, calculated approach rather than just picking up lessons here and there as they present themselves. This conscious and intentional approach can vastly accelerate the natural process of identifying and exposing less obvious or hidden risks.

Many readers with airline experience or higher-end corporate operators are aware of these SMS concepts and fly within such systems on a regular basis. For those who aren't yet familiar, there are FAA requirements for SMSs coming into effect in 2027 that will impact some air tour operators and Part 135 charter operators. For the rest of us, it may just be a good idea that we can use in our aerobatic flying.

Mitigating Risk

From an SMS standpoint, once risks are identified (hitting the ground, not recovering from a spin or autorotation, and structural failure are the most blatant and severe examples), there are generally four ways to mitigate them: avoidance, reduction, transference, and acceptance. Unfortunately, avoidance is what too many pilots are already doing. Many pilots simply don't fly aerobatics, perhaps because they think it is too risky for them—beyond *their* acceptable level of risk. Reduction can be as simple as wearing a parachute or flying at

Red Baron Squadron in the break.

higher altitudes, allowing greater time and opportunity for recovery. Transference might involve upgrading to a more capable aircraft with greater structural integrity. Finally, acceptance is just that—being comfortable with the remaining risk that cannot be cannot me mitigated, as I was when flying formation air shows at a surface level.

Considering Your Acceptable Level of Risk

With acceptance, we have brought things full circle to the original concept of the acceptable level of risk. Do you know what your acceptable level of risk is? Have you ever thought about it? If you do think about it, and something about your flying risk doesn't feel completely acceptable, have you thought about what you might do to mitigate it? Additional training and expertise are always beneficial.

The real point here isn't *what* your acceptable level of risk is. The real benefit is in simply *asking the question* and determining what is or isn't acceptable to you. This question alone would go far in preventing spontaneous flybys, impromptu displays, and maneuvering below safe altitudes. In all too many accidents and incidents, the calculation of risk was not sufficiently considered in advance of a bad outcome.

For the greater tribe of all aerobatic pilots, whether officially in the sense of the IAC or socially in terms of friends we practice or fly with, we must understand the important cultural implications of how we communicate our concepts or beliefs about acceptable levels of risk. This is especially true when around those new to the sport who may not understand where the appropriate boundaries between competitive zeal and caution lie.

We all share the consequences of our collective risk, perhaps most conspicuously through insurance rates. Unfortunately, all too many of us may have lost aviator friends, often due to the presence of unconsidered and unacceptable risk.

Regarding safety, we sometimes hear the rallying cry, "Safety first," but brief deliberation puts an end to that. If safety were our *first* priority, wouldn't we just stay on the ground?

What can we all do to foster an atmosphere that embraces safety and identifies risk? While it may seem simplistic, it can be as easy as being perpetually cognizant of risks, vigilant in their mitigation, and comfortable talking about the subject.

The Larger Unconsidered Risk

While my comments to this point have been based specifically on our aerobatic community, those of us who include ourselves in this group understand there is a greater, unconsidered risk that faces our non-aerobatic brothers and sisters in their flying. Those of us familiar with all-attitude flying know best about the incredible benefits in aerodynamic understanding, manual flight operations proficiency, and human-factors understanding that we gain from flying aerobatics. Our friends and fellow aviators who do not fly aerobatics are blind to the contributions that all-attitude flight provides us.

It is in our interests, whenever possible, to advocate for the risk reduction that aerobatic flying provides. Loss of Control In-flight (LOC-I) has led all causal factors in fatalities in every sector of aviation, everywhere in the world, for decades. While dedicated and focused forms of all-attitude maneuvering such as those involved in upset prevention and recovery training (UPRT) may be more transferable to Normal category or Transport

Holiday Inn aerobatic team in diamond formation.

category aircraft, good old-fashioned loops and rolls have much to teach any pilot about energy management, *g*-management, and what happens to your flight path in a rolling upset.

Current certification requirements only call for one full stall event in an aircraft during a pilot's entire career: on the private pilot checkride. Stalls for the commercial certificate can be recovered when a stall is imminent—the pre-stall buffet or other warning/indication. For the airline transport pilot or type ratings, a failure to recover at the first indication of the stall (typically a stall horn or stick shaker) is a failure. It should be no surprise that stalls are involved in approximately 50 percent of all LOC-I accidents. The aerobatic pilot encounters a stall with every snap roll or spin. Who is safer?

The more tools and ways we have available for communicating with our fellow aviators about the benefits of aerobatics, the greater our ability to increase our ranks and support. Other pilots may join us for the increased benefits of proficiency and confidence, and stick around for the fun flying and the camaraderie of all the entertaining people we have in our sport.

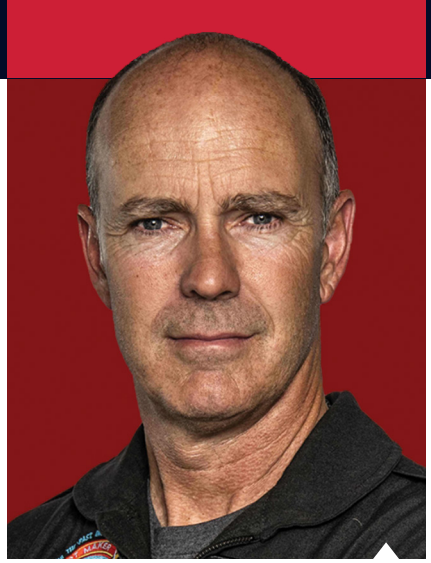
Safety Promotion

While safety may not be first, it must be constantly promoted. It is one of the four pillars of an SMS: safety promotion (along with safety policy, safety risk management, and safety assurance). It is the goal of this article and magazine issue and should be the intention of all of us to keep each other safe and to prevent losing a single friend.

My hope is that this discussion provides awareness of some basic SMS concepts and an invitation to identify and mitigate your risk in flying aerobatics. The objective is for all of us to work together in a manner that will make our flying more enjoyable and safer, and most importantly, will help all of us to avoid any of those "close calls" some may ask us about. ***IAC+***

Randy Brooks began flying aerobatics in sailplanes and competed briefly before flying air shows professionally for over 10 years. In 2015, Randy was inducted into the International Council of Air Shows Hall of Fame as a founding member of the Red Baron Squadron. He is currently the executive vice president of flight operations for Aviation Performance Solutions, serving as an advanced instructor and managing the operation of eight Extra 300L aircraft and two SIAI-Marchetti S.211 jet trainers used for the delivery of upset prevention and recovery training. He also serves as a support pilot for the Pitts Flying Museum.

PHOTOGRAPHY COURTESY OF **RANDY BROOKS**



Upset Prevention and Recovery Training

IT'S NOT AEROBATIC TRAINING, BUT IT SHOULD BE

BY BARRY HANCOCK, IAC 28007

AS AEROBATIC PILOTS WE spend hours and hours turning dead dinosaurs into more fun than most pilots ever experience. Recreational aerobatic pilots become proficient and safe in basic loop and roll-type figures and typically love to share the experience with others. Competition pilots spend hours and hours trying to eke out that extra Aresti tenth to move up to the next level, just so they can spend four times the money trying to eke out that extra tenth in their new mount. One aspect of aerobatic training that doesn't get enough attention is recovering from botched maneuvers. Typically, the better we get, the less time we spend in unexpected situations. Aerobatic training is a fantastic way to expand your flying skills and enjoyment. Often, however, it does not focus on recovering from loss of control situations. Upset prevention and recovery training (UPRT) is a relatively new concept and is something all aerobatic pilots should consider to enhance their safety, enjoyment, and confidence.

For aerobatic pilots, the distinction between upset training and aerobatic training is blurred by a lot of similarities, but let's take a closer look at why these two disciplines are perhaps more complementary than most people might think.

When I first started flying aerobatics nearly 30 years ago (yikes!), Controlled Flight Into Terrain (CFIT) was the number one cause of fatal GA accidents. GPS and display technology were quickly evolving at that time, and nearly as quickly, CFIT started seeing a dramatic decline. This increased reliance on technology made a huge improvement in flight safety due to increased situational awareness (SA). However, it also created a problem. As the benefits of the technology entered more and more cockpits—and ultimately more and more flight schools trained pilots with this equipment—the focus of both pilots and training shifted away from stick and rudder skills and toward a heavier reliance on tech, screens, and gadgets. Enter Loss of Control In-flight (LOC-I) as the number one killer in GA—by a factor of 3 to 1! Predictably, the majority of these accidents happen in the critical phases of flight (takeoff and landing) when the aircraft is slow and low to the ground and operating with smaller margins. As an aerobatic pilot, that last sentence should have your attention since low and slow is where we operate a significant amount of the time.

It is true that as aerobatic pilots we are more comfortable out of the normal flight regime than your average pilot. But how comfortable are we when an airplane goes out of control unintentionally? When we are neophyte aerobatic pilots, that scenario could be created by something like being too slow at the top of a loop

Barry Hancock flying an air show.

PHOTOGRAPHY BY **RED THUNDER AIRSHOWS**

Cockpit view of a spin.

and then applying just a little too much back-pressure, or having incorrect inputs on a hammerhead. As we get into snap rolls and gyroscopic maneuvers, all kinds of interesting yet unanticipated things happen that put us outside of not only our comfort zone but also into (for that pilot at that time, anyway) the unknown. At least in a contest you have a few hours to work out how you are going to successfully fly the Unknown sequence, but when the unknown happens as a result of unintended and improper inputs, it takes immediate action to correct going further into the unknown. That is the difference between normal aerobatic training and upset prevention and recovery training: something referred to as "the startle factor."

Traditional UPRT syllabi, like the one I developed when I started Pilot Makers Advanced Flight Academy or the ones developed by Rich Stowell or Patty Wagstaff, are geared toward training normal GA pilots to be able to comfortably recover from more typical LOC-I scenarios such as a wake turbulence upset or a base to final stall/spin. As a side note, if you haven't ever replicated that at altitude, it's closer to a snap roll. But the general flying public doesn't know what that is, so we call it a stall/spin, etc. The bottom line here is that everyone should see what this looks like at altitude, with a competent instructor, of course, as it is both a dissuasive and motivational moment for a pilot. So, there is one scenario in the case for even an aerobatic pilot getting UPRT under their belt. But there are more.

When I began flying aerobatics, my first experience actually came in my Private Pilot License (PPL) training at Sunrise Aviation in Southern California. Michael Church ran a really good program and encouraged all of his students to at least experience aerobatics. So, there was a spin flight in the PPL syllabus. From that point on, I was hooked. After I finished my PPL I went straight into aerobatic training. Before I was cleared to solo an aerobatic plane at the flight school, I had to demonstrate the ability to recover from a botched loop and a botched hammerhead. UPRT wasn't a thing then (I just dated myself again!), but I remember how that experience gave me far greater reverence for "normal" aerobatics and instilled a lot of confidence in my ability to recover when I ventured into an area of the flight regime that was unknown to me previously.

Upset prevention and recovery training "UPRT" is a relatively new concept and is something all aerobatic pilots should consider to enhance their safety, enjoyment, and confidence.

Fast-forward to today and I have flown multiple Unlimited aerobatic airplanes, botched just about every Advanced gyroscopic maneuver the airplanes are capable of (well, unless you are talking Rob Holland level stuff), and safely recovered without traumatizing myself or anyone else. How did I do this? Training. Getting in airplanes with Michael Church and Wayne Handley and Bill Stein and Sergei Boriak and Bill Finnigan and being forced to fix problems that I'd never seen before—or to have these highly

Inverted aerobatic aircraft.

skilled pros show me how it's done when I was overwhelmed—made all the difference.

None of that training was classified as UPRT at the time. Today, with how we normally think of UPRT, that training still doesn't fit the description, and that is my entire point. As aerobatic pilots I believe we often neglect this crucial part of our aerobatic instruction, training, and practice. Let's go back to where I mentioned that slow, low to the ground, and smaller margins should have our attention (like during critical phases of flight such as takeoff and landing). Of course, we should always practice any new maneuver up high until we gain proficiency, but even at the Sportsman level, or the FAR minimums for aerobatic flight (1,500 feet AGL), we are still in the danger zone for an unintentional departure that maybe we never encountered up high. And now the ground is a real threat.

You can argue that training with all these guys (over the course of years, mind you) costs money. Yes. Correct. It does cost money. But if you can afford to fly aerobatics, it is this author's opinion that you cannot afford to neglect this type of training and expect to respond correctly when the chips are down, low to the ground, with smaller margins and the highest of stakes.

When we have had the experience of unintentionally departing controlled flight in a protected environment (i.e., with an instructor), we build our competence and confidence, which allows us to more reliably overcome the startle factor and respond correctly in a timely manner. There simply is no substitute for the physiological and psychological stresses experienced in a real-world environment. And the only responsible way to do this is by training with a pro who can safely open your eyes to the wild rides of unintentional departures during aerobatic flight.

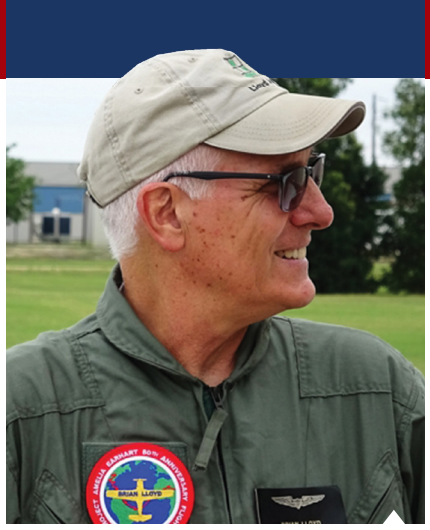
…if you can afford to fly aerobatics, it is this author's opinion that you cannot afford to neglect this type of training and expect to respond correctly when the chips are down, low to the ground, with smaller margins and the highest of stakes.

PHOTOGRAPHY COURTESY OF **BARRY HANCOCK**

If we do this long enough, we all will eventually know someone who didn't make it out of a botched maneuver. Sometimes fate wins despite all our best efforts and doing everything right. More often, however, it's the unexpected that gets us. The more we train against LOC-I, even in the aerobatic flight regime, the better chance we have to live to fly another day, even when the unexpected happens. IAC

Barry Hancock has been an aerobatic pilot for nearly 30 years and has over 2,000 hours of aerobatic and UPRT instructor time. Founder of Pilot Makers Advanced Flight Academy in Provo, Utah, Barry implemented the first private pilot curriculum to incorporate both spin and UPRT training into the PPL training syllabus. He has flown over 30 different types of aircraft, nearly half of which are aerobatic. He currently flies the Airbus A320 for a major airline, is a check pilot for the Commemorative Air Force, and is the lead pilot for the Red Thunder Airshows formation aerobatic team, piloting the Yak-50. (www.RedThunderAirshows.com)

Barry Hancock flying formation.



It's Not About the Spin

IT IS ABOUT RECOVERY *BEFORE* IT BECOMES A SPIN

BY BRIAN LLOYD, IAC 438403

THE ARGUMENT OVER WHETHER or not to require spin training is a long-standing one. To spin or not to spin, that is not the question.

Loss of Control In-flight (LOC-I) accidents have little to do with spins. If the pilot delays recovery to the point where she has to recover from a spin, she is already late in recovering. An incipient LOC-I event really has to do with lack of awareness of angle of attack (AOA), the use of lift from the wing, and the energy needed to maneuver the aircraft back to level flight before the flight path intersects the earth.

It seems so easy, right? The problem is, flight training today, outside of the military or aerobatic training, typically does not include this. In fact, we are hampered by things people "know" that just aren't true, perpetuating the problem. So, question what you think you know!

There are a substantial number of old wives' tales floating around general aviation, and most of them are promulgated by flight instructors because ... well, that is what their flight instructors told them. If only we could get more CFIs and pilots to ask two critical questions:

1. Is it true?
2. How can I absolutely know it is true?

Think about these two questions, and then let's move on to "spins," or rather what I think the real problem is: misunderstanding the relationship between turns, airspeed, lift, AOA control, and energy—which leads to LOC-I accidents.

When we look at LOC-I accidents, someone almost always says, "Yeah, they stalled, and the airplane entered a spin." Actually, the airplane stalled, fell off on a wing (after all, no matter what you do, one wing will be more stalled than the other), but it is not yet spinning. A spin requires two things: stall and rotation about the yaw axis. Take away either of those, and there is no spin.

Christa Paradis spinning in a DR-107 One Design.

Until the airplane reaches the point of the fully developed spin, it is still just a gyrating stalled airplane. Recovery can almost always be effected with nothing more than reducing the angle of attack, i.e., "unloading."

However, I am going to add one other thing to that: time. It takes time for the spin to develop. It takes an airplane typically one-and-a-half to three turns to achieve a fully developed spin. Until the airplane reaches the point of the fully developed spin, it is still just a gyrating stalled airplane. Recovery can almost always be effected with nothing more than reducing the AOA, i.e., "unloading." This is what we need to be teaching, not spins. If you have allowed the aircraft to reach the point of a fully developed spin, you are already way too late with your recovery.

AIRCRAFT PHOTOGRAPHY BY **EVAN PETERS,** *AUTHOR PHOTO COUTESY OF* **IAC ARCHIVES**

So the recovery needs to be much earlier. During the first part of the departure from control we don't yet need spin recovery. The aircraft has little rotation about the yaw axis. It is mostly pitching and rolling. All that is needed to recover at this point is to reduce the AOA by unloading. Once the wing is flying again, the rest of the recovery is easy.

A key point here that is often not taught is that the elevator is not a pitch control; it is an AOA control. When you move the elevator, the elevator and horizontal stabilizer achieve a new equilibrium with the relative wind. The fuselage takes on a new angle to the relative wind. Consider now that the wing is also attached to the fuselage, so moving the elevator changes the AOA, and hence the lift, of the wing. This is where our maneuvering comes from, the change in lift of the wing.

How much we can maneuver depends on airspeed. Available lift from an airfoil increases by the square of calibrated airspeed. If our airspeed indicators don't have much installation error, we can use indicated airspeed instead of calibrated airspeed. So, we get two critical points from the lift formula:

- The elevator is the instantaneous lift control by changing AOA.
- The total lift available, and hence ability to maneuver, depends on our energy of speed and we look at indicated airspeed for that.

In most cases, we really want to execute recovery long before it develops into a spin. So, it is not about the spin.

I regularly teach spins and upset prevention and recovery training (UPRT). I get CFI candidates and I give them the required spin training. I also show them that if they reach the point where they need spin recovery training, they have long passed the point where proper recovery occurs. I have several scenarios I refer to as "stupid student tricks" so that the CFI candidate sees things that can happen. (Because in 25 years of being an active CFI, they have been done to me.) Interestingly enough, one procedure recovers from a plethora of sins:

- Unload
- Power to optimize energy state
- Roll wings level
- Transition to level flight, i.e., pull or push as appropriate, to put the nose back on the horizon.

This is the basic UPRT maneuver. It is what every pilot should do instinctively when the aircraft becomes upset. This procedure, just like spin recovery, needs to be instinctive and automatic. How do we build that instinct? Repetition! Practice makes permanent!

The problem we face with getting pilots to automatically react properly when faced with an upset is that the pilot's natural reactions go against the recovery procedure. Most pilots, when faced with a windscreen showing nothing but dirt, react by pulling on the stick or yoke, which, at low altitude, pretty much guarantees destruction of the aircraft and death of all aboard. This reflex ensures that the wing remains stalled and the upset will probably progress to a spin. This reflex must be unlearned and replaced by a new reflex to unload, even when looking at a windscreen full of dirt.

The present reliance on stall avoidance and on automation will never get us to the point of eliminating this accident scenario. Only changing pilot behavior through thorough understanding and repetition of correct behavior (what the FAA calls "learning") is going to fix this problem. That means we need to provide opportunities for the initiated pilot to experience upsets and then recover. Do this over and over again until it is a reflex.

So why am I writing this for the IAC *Sport Aerobatics* magazine? Because the people who can do this are here. You are the people with aerobatic aircraft who operate their aircraft at the edges of the envelope as a matter of course. You are used to upsetting your aircraft and recovering.

What about spins? I think we should all learn and practice them. Pilots should be proficient at entering and recovering from spins. (I know, I am preaching to the choir here.) However, from a safety point of view, it is not about the spin. It is about recovery before it becomes a spin. So, as I said in the beginning ... it is not about the spin. IAC

Brian Lloyd in a Lloyd Aviation aircraft.

Brian Lloyd has been flying for 57 years and has amassed over 13,000 hours in 105 different makes and models of aircraft. He has been an active CFI for 26 years. Brian's current focus is on helping to improve the quality of new CFIs through expanded education. His current aerobatic ride is a 1988 SIAI Marchetti SF260D, chosen specifically for this type of instruction.

PHOTOGRAPHY BY **JEREMY WALTERS**

SAFETY Series

"Unload for Control" and "Push"

BY GORDON PENNER, IAC 429704

"UNLOAD FOR CONTROL." "PUSH." Mr. Lloyd's article shines a light on a concept not well taught in regular pilot training. That is, the teaching of an automatic response of reducing angle of attack (AOA) at the first sign of the airplane not going where you want it. A significant loss in pitch authority or roll authority, or the nose yawing around, is a sign of an impending stall that is not emphasized at many schools. Reducing AOA immediately will usually prevent the aircraft from departing controlled flight in the first place. The military, upset prevention and recovery training (UPRT) operations, emergency maneuver training (EMT) operations, and now the airline and corporate training departments use the same phrase: "unload for control."

In *Sport Aerobatics*, we are normally talking to either those who have what air show pilot and instructor Greg Koontz calls "three-dimensional thinking" (from his great article in the May 2020 issue) or those who seek it. But remember, we in the IAC are safety ambassadors trying to "infiltrate" our all-attitude mindset to all the regular pilots we come in contact with. In the military they teach unloading to zero *g*. The stall speed of an aircraft at zero *g* is, you guessed it, zero. Also, since the aircraft temporarily weighs nothing, it accelerates quite smartly, not only un-stalling the wing but quickly getting back to a safe airspeed. The aircraft controls are also more effective against an aircraft that is, temporarily, much lighter.

I would like to point out some examples of great articles at EAA and AOPA that cover this area. AOPA has "Technique: Push" and "Technique: Push-Again," by Julie Boatman, written in 2007. Dave Hirshman wrote "Shake, Rattle, and Roll" on February 22, 2023, and "Fun With Purpose" on July 1, 2022. Schiff, both father and son, have done helpful articles on the "Impossible Turn." At EAA, there is excellent stuff abounding, capped by astronaut Charlie Precourt's articles on takeoff and landing emergencies. But regular pilots don't train for stalls realistically. In-level flight with power available is only a start. At a safe altitude and in a regular airplane, perform a climb at close to V_X, then simulate an engine failure. You'll be amazed at how *forcefully* you must push the nose down and how far you must push the nose down to prevent a stall. Now imagine you're at 300-400 feet AGL.

You must push over assertively enough to get light in the seat, and you have to get the nose lower than you think. At this point, you are not trying to maintain your best glide speed; you are trying to recapture it. And you're also trying not to stall the aircraft. Unloading prevents the stall, accelerates the aircraft to a usable airspeed, and keeps the controls working. If upset, unload and roll upright; *do not* pull. "Push" and "unload for control" now become pretty important terms, eh? ***IAC!***

PHOTOGRAPHY COURTESY OF **LORRIE PENNER**

WHAT'S YOUR STYLE?

Show your enthusiasm for aerobatics with one of these items from the IAC Unlimited Collection!

IAC Members receive a 10% discount.

Quantities are Limited, so hurry and order today!

iac.org/shop

IAC
INTERNATIONAL AEROBATIC CLUB
EAA

Texas 2-Step and 2024 Texas Championship Series Results

BY DOUG JENKINS, IAC 436255

Hammers Over Hondo 2024.

THE MIDDLE OF OCTOBER is the ideal time to hold an aerobatic contest in Edna, Texas — if you don't mind temperatures in the 90s, that is. Twelve intrepid pilots and multiple non-flying volunteers made for a fun weekend of aerobatics!

Primary saw Kjell Ballard's return from a multiyear hiatus result in a victory with 81.29 percent. Newcomer Cadence Bomgardner was close behind, in her second-ever contest, at 76.05 percent. Primary would not have been possible without the generous support of Jaret Burgess. He allowed both pilots to fly his airplane while he flew as a safety pilot for them. Thanks, Jaret, for making it possible for these two to fly!

Sportsman was close throughout. In the end, biplanes swept the podium! First place was Bo Kalabus with 85.28 percent. Jeff Cain took second with 83.84 percent. Third was Andrea McGilvray at 79.99 percent. That's an Eagle, a Bücker, and a Pitts S-1C on the podium.

Intermediate was won by Doug Jenkins with 84.03 percent. Todd Nelson was second with 80.17 percent. John Farrington took third at 76.56 percent. So Intermediate put a Pitts S-1E, a Skybolt, and a Super Decathlon on the podium.

Advanced saw John Harlan finish in first place with a score of 78.47 percent, flying his beautiful Pitts S-1S.

This was a true grassroots contest!

As with most of our Texas contests, we needed many non-flying volunteers to make it happen. Janet Fitzke handled registration and scoring. Lynne Stoltenberg was chief judge, and her husband, Jeff, served as a scoring judge. Both Lynne and Jeff were on the line for every pilot and every flight.

Chrissy Jenkins was a fantastic contest director, making sure we were well fed and hydrated throughout the event. Klayton Kirkland played every position on the judging line. Denny Beacham took care of the shirts and trophies. Rick and Kim McClure, who manage the airport, were our gracious hosts.

Special shoutout to Marissa Malley, who, likely not having any idea what she was getting into, accompanied Kjell to the contest. She learned enough Aresti in two days to be a highly competent assistant and a simultaneous recorder. She also tromped through a farm field and drove stakes through the hearts of box markers like an old pro. Well done! Thanks to every one of these folks for making this contest possible.

Again this year, Andrea McGilvray rounded up some super generous sponsors to make our contest happen. Special thanks to Aircraft Spruce & Specialty for the $50 gift card, Hooker Harness for the gift certificate, and Air Gizmos for control locks and chocks. These items were raffled off to some of our lucky pilots!

This year's Texas Championship Series included a full slate of three events: the Lone Star Aerobatic Championships, Hammers Over Hondo, and the Texas 2-Step. All three Texas chapters put on great contests, and a lot of fun flying happened this year.

When the Texas dust settled, the highest scoring pilots who flew the same category at all three Texas contests were:

	Lone Star	Hammers Over Hondo	Texas 2-Step	Average
SPORTSMAN				
1. Bo Kalabus	82.88%	85.18%	85.28%	84.44%
2. Andrea McGilvray	77.74%	84.54%	79.99%	80.75%
3. Jaret Burgess	74.95%	80.86%	77.67%	77.83%
4. Scott Beadle	71.04%	69.87%	70.70%	70.54%
INTERMEDIATE				
1. Doug Jenkins	83.19%	85.85%	84.03%	84.36%
2. John Farrington	62.47%	77.19%	76.56%	72.10%

Congratulations to all these pilots for a great season. Let's do it again next year!

Special shoutout to the 2024 sponsor of our Texas Championship Series trophies. IAC Chapter 107 member Andy Cruce generously donated the funds to cover the awards. Thanks, Andy!

The results of this contest also impacted the regional series for the IAC South-Central Region, giving several pilots the third contest they needed to qualify, or the fourth they needed to improve their season average.

- Bo Kalabus moved into second place in Sportsman with a three-contest average of 84.44 percent.
- Andrea, Jaret, and Scott also qualified, placing seventh through ninth.
- In Intermediate, Doug Jenkins finished first in the region with a season average of 85.05 percent.
- John Farrington climbed to fourth in the region for the season.

Congratulations to all the Texas pilots who qualified for the IAC Regional Series. Well done! IAC

PHOTOGRAPHY BY **CADENCE BOMGARDNER**

2025 IAC CONTEST SEASON CALENDAR


Lone Star Aerobatic Championship

Bear Creek Bash


2024 Mark Fullerton Memorial Contest

DATES	HOST CHAPTER	NAME	REGION	LOCATION	AIRPORT
March 27, 2025	89	Snowbird Classic	Southeast	Keystone Heights, Florida	K42J
April 11, 2025	36	Hammerhead Round-Up	Southwest	Borrego Springs, California	L08
April 25, 2025	23	88th Sebring Aerobatic Contest	Southeast	Sebring, Florida	KSEF
April 25, 2025	49	Duel in the Desert Returns	Southwest	Lancaster, California	KWJF
April 26, 2025	12	Ben Lowell Aerial Confrontational	South Central	Colorado Springs, Colorado	KAFF
May 9, 2025	24	Lone Star Aerobatic Championships	South Central	Graham, Texas	KRPH
May 16, 2025	3	Mark Fullerton Memorial Bear Creek Bash	Southeast	LaGrange, Georgia	KLGC
May 17, 2025	12	Torrington Tailslide AcroRodeo	South Central	Torrington, Wyoming	KTOR

IAC.org/Contests

Enjoy the skill, beauty and excitement of aerobatic flight as it is celebrated around the world and at an airport near you! Mark your calendars and reserve **June 28** for a worldwide celebration of aerobatic flight!

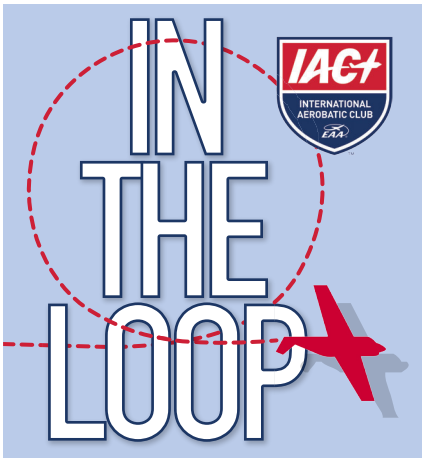
INTERNATIONAL AEROBATICS DAY

Watch our events calendar for events near you: **www.iac.org**

Saturday June 28, 2025

Celebrate Aerobatics!

FLYMART



STAY CONNECTED
with IAC's member benefits and the world of aerobatics online in our e-newsletter!

TO SUBSCRIBE GO TO:
WWW.IAC.ORG/IN-THE-LOOP

Brooks Mershon: Sukhoi SU-26M, Rick Volker: Marchetti SF260-C, Corben Meyer: Extra 230, and Justin Spence: Yakovlev Yak-50. Formation flight over EAA AirVenture Oshkosh 2024. Photography by Steve Koskella

DIRECTORY

IAC INTERNATIONAL AEROBATIC CLUB EAA

OFFICERS

PRESIDENT
Jim Bourke

TREASURER
Jordan Ashley

VICE PRESIDENT
Rob Holland

SECRETARY
Sara Arnold

EXECUTIVE DIRECTOR
Tim Dahnke

BOARD OF DIRECTORS

NORTHWEST
Doug Bartlett

SOUTHWEST
Phillip Gragg

MID-AMERICA
Nathan Ruedy

EAA REP/NORTHEAST
Michael Goulian

SOUTHEAST
Marty Flournoy

SOUTH CENTRAL
Shad Coulson

INTERNATIONAL
Mike Gallaway

DIRECTOR
John Ostmeyer

DIRECTOR
Bob Hart

DIRECTOR
Robert Armstrong

NAA REPRESENTATIVE
Amy Spowart

ACHIEVEMENT AWARDS
Dave Watson

ANNUAL AWARDS
Patty Anderson

CIVA RELATIONS
Mike Gallaway

COLLEGIATE PROGRAM
Nina Stewart

CONTEST SANCTIONING
Jim Bourke

EXECUTIVE COMMITTEE
Jim Bourke

FINANCE COMMITTEE
Jordan Ashley

GLIDER AEROBATICS
Shad Coulson

GOVERNMENT RELATIONS
John Smutny

HALL OF FAME COMMITTEE
David Martin

IAC HISTORIAN
Mike Heuer

JUDGES PROGRAM
DJ Molny

SEQUENCE COMMITTEE
Rob Holland

NOMINATIONS COMMITTEE
Doug Sowder

RULES COMMITTEE
Barrett Hines

SAFETY COMMITTEE
Keith Doyne

TECHNICAL COMMITTEE
Tom Myers

Remember, things don't always go according to plan!

At Para-Phernalia we are very proud that Softie parachutes were instrumental in saving four lives in 1999.

SOFTIE
EMERGENCY PARACHUTES
THE PROFESSIONALS CHOICE
from Para-Phernalia, Inc.

Toll Free: 800-877-9584
Intl: 360-435-7220
Fax: 360-435-7272
www.softieparachutes.com

Aircraft | Personal Non-Owned | Powered Parachute & WSC Trike | Accidental Death & Dismemberment | Flight Instructor | Hangar | Airport

EAA Insurance Solutions

Administered by Acrisure Aerospace

EAA.org/Insurance | 866-647-4322

When you insure with the EAA Aircraft Insurance Plan you are helping IAC promote and enhance the safety and enjoyment of aerobatics.