



SPORT

JULY/AUGUST 2022

# AEROBATICS

OFFICIAL MAGAZINE OF THE INTERNATIONAL AEROBATIC CLUB



► ARE BIPLANES STILL  
COMPETITIVE?, PG. 16

► GENPRO GENEVATION, PG. 22

► THE WING'S THE  
THING, PG. 48

N328PW BACK IN  
**ACTION**

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## Grateful for this caring community

BY JIM BOURKE, IAC 434151



**THANK YOU FOR ALL the cards, flowers, and messages of support after the passing of my fiancée, Marianne Fox. Marianne was a fierce competitor, a successful businesswoman, a fantastic mom, and a wonderful life partner. She gave 100 percent to everything she did, and I am very glad I had the pleasure of her company for so long. She inspired me, and I hope she inspired you, too.**

A big part of life is learning how to accept our losses. This one is not so easy for me to accept. But it is made easier by all of you.

Marianne got her start in aerobatics as a volunteer, serving as registrar at the Corvallis Corkscrew and the contests in Borrego Valley, California. She would have loved this special issue that is all about our volunteers. After many successes as a supporting player, she decided she wanted to try her hand at piloting, and then she surprised us all by entering her first aerobatic competition! People often asked me if I got her into flying, and the honest truth was that it never dawned on me to encourage her because I never suspected she would have even the slightest interest. Once she got a taste of aerobatics, her competitive nature took over and she dedicated herself to training. Her greatest success as an aerobatic pilot came at last year's Southern California Classic in Borrego Springs, California. She came in first out of 14 competitors, winning all three flights by a wide margin.

Marianne lost her life in early March on a short cross-country flight home from a training camp. Her last day was filled with the enthusiasm and confidence we all knew her for. Her end is something I may never stop thinking about, but not something I should cover in detail here. What I can offer right now is that she had a very bad day where everything just seemed to stack against her, and everyone who could do anything for her did all they could. She was a great pilot on her way to becoming one of our very best, but it wasn't meant to be.

Not a day has passed without me thinking about the accident and all the steps taken to arrive at that point, and I know I'm not alone in that. Analysis will not help Marianne, but after every accident we do what we can to make sense of things and learn from them. Marianne would

want that. She would want everyone to keep growing and pushing themselves, because that's what she was all about. A positive thing I can do for Marianne is use what I learned from her life and her accident to encourage others and give them a better chance of flying safely, so I will do that for her. You can do it, too.

She left behind all the usual complications of an outstanding life full of competitive spirit and vigor: a wonderful family, many employees, possessions, and too many accomplishments to count. She wasn't happy unless she was involved in many things, and she wasn't satisfied unless everything was well organized and done correctly. In fact, it's fair to say that she hated disorder, and she didn't have a lot of patience for complaining, either. I always joked that the years she spent as an accountant provided her with an internal ledger, and her life was about keeping the credits and debits in check. Yet, despite being so driven, she still managed to be very pleasant in her relationships with people. She loved swapping stories and meeting new friends, especially pilots. She enjoyed closeness. She was decidedly nonpartisan. For her, life was always about finding the right balance between accomplishment and close connection with people. I wish there were more people like her. She was made of good stuff.

One last thing I want to say about this is that when people lose someone, it really helps them to hear from others; not just friends but even people they aren't that close to. Grief is something we all experience, and everyone has a stake in it. Sometimes people call and say things like, "I don't know what to say," and of course, that's the case! How could anyone know what to say? But you don't have to be a great speaker to comfort someone. Sometimes when you grieve it's just nice to hear from people who are willing to share the burden. And when they have a story to share about the person who passed, that's even better! I know how afraid people can be to reach out to someone who has suffered a loss, because I've felt that fear, too, but loving human contact is comforting to people who are grieving, so let's all try not to be shy about it. **IACF**

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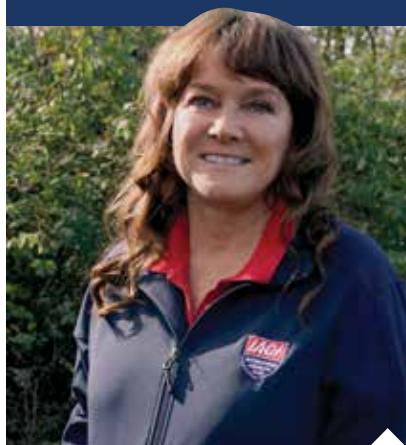
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# IAC Volunteers – The Lift Beneath Our Wings

BY LORRIE PENNER, IAC 431036



**WE ARE CELEBRATING IAC** volunteers this year at EAA AirVenture 2022 in Oshkosh, Wisconsin. “The IAC as an organization was founded by, and for more than 50 years has been supported by, volunteers. Because of this, we want to recognize and celebrate the work that is done by our membership, some seen but mostly unseen, that has carried our organization for all of these years,” said Jordan Ashley, AirVenture chairman who is marking his 27th year at AirVenture and his 14th as a volunteer.

Besides volunteering at the IAC Aerobatic Center during AirVenture, the IAC offers many volunteer opportunities throughout the year. Every activity organized by an IAC chapter is run by volunteers. IAC chapters organize fly-ins, practice days, Young Eagles flights, community appreciation barbecues, educational forums, judges schools, and competitions. Each one of these activities requires volunteers to guide participants and to provide logistics, safety oversight, and an exciting and fun environment for participants as well as guests.

In this issue we read about volunteers who are the recipients of IAC’s Frank Price Cup, an annual award that recognizes the person who has contributed the most to the sport of aerobatics in a given year. Their contributions contain a wide variety of accomplishments and volunteerism, from becoming

the IAC AirVenture chairman to serving as a chapter leader. Or from becoming an amazing ambassador for the sport to being recognized for hundreds of hours devoted to develop the IAC brand, or serving as a government relations representative. All of these people have touched the IAC in various ways to support the club’s mission in enhancing the safety and enjoyment of the sport of aerobatics.

No matter where you find yourself on your aerobatic journey, there is a place for you to be involved and help the sport grow. While you are volunteering you can discover more about yourself, learn about aerobatics, grow your skills, and be a part of this big aerobatic family.

If you plan on flying your airplane into Oshkosh, you can preregister online at [IAC.org/air-venture-iac-aerobatics-center](https://IAC.org/air-venture-iac-aerobatics-center). After you park and tie down, come into the IAC Aerobatic Center and sign our guest book. We’ll have a nice bag of items for you, including a 2022 AirVenture Oshkosh Show Plane travel mug. **IAC**

► **NO MATTER WHERE YOU FIND YOURSELF ON YOUR AEROBATIC JOURNEY, THERE IS A PLACE FOR YOU TO BE INVOLVED AND HELP THE SPORT GROW.**

## ► CORRECTIONS:

In the May/June 2022 issue of *Sport Aerobatics* was an article titled “Tale of Two Chipmunks” for which there are three corrections.

- In the article on Stan Humphrey the previous owner of Starr’s plane was Roger Byers, not Buyers. Roger structurally modified the wing and fabric was replaced with metal, but the wingspan did not change.
- Stan’s mentor was identified as Richard Cado, but the correct spelling is Cano. Stan is not a homebuilder, and Richard was the sole builder of the Lancair IV and Velocity Lindy award winning aircraft.
- The “Props for Cops” program for first responders and law enforcement airplane rides is still being formed. Stan expects to join his efforts to the program after putting new instruments in his Chipmunk.

# AIRVENTURE 2022



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# 2022 Officer and Director Elections –

## Candidate Profiles

**VOTING FOR THE 2022** officer and director candidates for this year's election begins on June 26 and closes on July 26, 2022, at 6 p.m. CDT. All votes must be done via electronic ballot. The election ballots will be tabulated by the IAC ballot certification committee chair. The results will be announced at the annual meeting of members on July 29, 2022. The meeting will be held in the Vicki Cruse Educational Pavilion at the IAC Aerobatic Center at 8:30 a.m. during EAA AirVenture Oshkosh, Wisconsin. Following are abbreviated profiles of the candidates. For full profiles, please visit [IAC.org/2022-board-election](http://IAC.org/2022-board-election).

### ► CANDIDATE PROFILES



#### JIM BOURKE | PRESIDENT

Thank you for another opportunity to serve as IAC president. As the leader of the organization, I work hard on your behalf to ensure fairness in our competitions, safety in our operations, and joyful participation of the sport in all its forms. I serve the IAC board by keeping our business orderly and making sure everyone has a fair chance to speak and vote on the issues in front of them. I help our members find a voice in the many policy discussions that come up throughout the year. I work with all of our committee chairs to facilitate their communication with the board and all our members. I manage our two full-time employees, our executive director, Steve Kurtzahn, and our editor, Lorrie Penner.

In my first term as IAC president, I created two initiatives to increase awareness of aerobatics and encourage new members. The first initiative, National Aerobatics Day, was a huge hit last year as it was celebrated all over the globe. In fact, this year we've chosen to rename it International Aerobatics Day. The second initiative, Get Your Start, is a marketing campaign designed to get people to take their first brave steps into the sport of aerobatics. These marketing efforts are working well for us, so they can continue as they are. In my second term, I want to focus on our website and social media offerings. These important services must be modernized.

Much of my time in my first term has been spent on governance and communication with other aviation industry leaders. I've strengthened our communication with our partners at EAA, NAA, FAI, and FAA. While there are some in the IAC who think we should withdraw from these important partners, I do not agree with them. It's very important that the IAC leverages every opportunity it has to gain visibility and participate in knowledge-sharing.

While my goal is never to wade into controversy or divisiveness, I've proven I'm not afraid to take a position and defend it, and I've tried very hard to model a respectful way of approaching disagreements. I am a strong believer in trying new ways to do things. If those ways don't work, we can always try something else or go back to how we did things before; our ways are not sacred, no matter how long we've practiced them. At every opportunity, we must evaluate new ideas and be willing to make mistakes so we can change and grow. I look forward to serving you for another two years.



#### SARA ARNOLD | SECRETARY

I have had the pleasure of serving as your IAC secretary for the past two years, and as a candidate again for that position, I am asking for your vote and support for another term.

What we call "grassroots" in the IAC is where I am most focused, since aviation and aerobatics have been a part of my life since I was little, flying with my father. I was eager to earn my private pilot certificate and then had the pleasure of competing against him both in regional and national competitions. Nothing gives me more pleasure than seeing others enjoy aerobatics as I have and watching them realize what they are capable of.

My first competition was in 2014, and ever since I have tried to become more involved every year. As a member of IAC Chapter 78, I have served in many positions at contests, including boundary judge, recorder on the judges line, contest director for our chapter, and volunteer coordinator. I am always active wherever I can help.

On the IAC national level, I have overseen scheduling webinars, writing articles for Sport Aerobatics, fundraising in 2020, and tending to the daily business as your IAC secretary. In 2020, I received approval from the board to create the American Champion medallion through American Champion Aircraft, who sponsors the medals. This year I serve on the AirVenture committee, working to enhance the experience for everyone who comes to the IAC building.

My full-time career is as a project engineer at the Des Moines International Airport, and prior to that I was an airport operations supervisor. Both jobs have helped me keep on top of the ever-changing climate of aviation, along with being able to handle multiple projects within the safety and guidelines that are set. In 2018, I founded the Women in Aviation Heartland Chapter, and in 2019 I was able to have the governor of Iowa sign a proclamation for the Girls in Aviation Day to be October 5.

Grassroots aviation is where I am the happiest. The camaraderie at competitions and training camps is the heart of this club. I believe the energy of the IAC is in the excitement that surrounds aerobatics, whether it is competition or recreational weekend loops and rolls. As secretary and member of the IAC board of directors, I will continue to represent those beginning in the sport and stand for clear rules and safety.



#### DOUG BARTLETT | DIRECTOR

I have been a member of the IAC for 20 years, and I am a president emeritus for the club. I started at the chapter level in Chicago with Chapter 1. It was there that I ran contests in Aurora and Peru, Illinois, and served the local chapter as a treasurer and president.

When asked to become active at the national level, I ran for the position as treasurer and served for three years. At the untimely passing of then-president Vicki Cruse, I stepped into the position of IAC president and served for three years. After stepping away from the leadership role for several years, I was asked by the board of directors in 2018 to be the vice president in support of President Robert Armstrong. I was reelected to that position by the members and served two additional years. I served as the contest director for the U.S. National Championships in 2007 and again for the 2021 U.S. National Championships.

I worked my way up the ranks as a competition pilot from Sportsman to Unlimited, but those days have passed, with my last competition being in 2018. Most recently my efforts have been in supporting and coaching local pilots in southern Florida and Chapter 23.

I am passionate about grassroots aerobatics and understand it is the foundation of our club. Further, I believe safety is job number one at the IAC. The P&Ps, rules, and historic protocols have made the club a cohesive and safe organization over its first 50 years. I know the way to provide future world-class competition pilots is to encourage fun and safe activities along with competition at the local levels. The stronger we make the base of the pyramid, the stronger the top will be. Both levels are important.

The high-end competition pilots and our national teams are well represented on the board by the abundance of Unlimited pilots and air show pilots holding director and leadership positions. The aerobatic enthusiasts and grassroots members (over 90 percent of our members) are not sufficiently represented on our board, resulting in a widening gap between the top of the IAC pyramid and the base of the club. In order to better represent the demographics of the IAC population, I am asking for your support. My addition to the board will provide experience and stability to the IAC, along with giving the grassroots members a much stronger voice.



#### MATT DUNFEE | DIRECTOR

- Employed as a senior test pilot for General Atomics Aeronautical Systems Inc. Have 5,000-plus flight hours developing the IGNAT and IGNAT ER, MQ-1B Predator, MQ-1C Gray Eagle, MQ-9 Reaper/Protector SkyGuardian variants, and YQ-11/MQ-20 Avenger series of aircraft.

- ATP/CFII/MEI with 3,000-plus hours of aircraft time.
- Lifetime member of EAA and IAC.
- I have been flying competition aerobatics since 2011.
- I have flown in 39 IAC contests.
- I have flown a wide variety of regional contests or aerobatic U.S. Team training camps in various states, including Washington, Oregon, California, Nevada, Arizona, Colorado, Tennessee, and Florida.
- I have attended the U.S. National Aerobic Competition continuously since 2017.
- I was the 2021 U.S. Advanced National Champion.
- I have twice qualified for the U.S. Advanced Aerobic Team.
- I represented the United States at the 2018 World Advanced Aerobic Championship in Romania, bringing two individual bronze medals home to the United States for the first and third Unknown flights.
- I have been a regional grading judge since 2014.
- I have twice been asked to serve as a U.S. Nationals grading judge for Unlimited in 2018 and 2021.
- I have a lifetime rho of 88 as an aerobatic grading judge across all categories.
- I currently serve on the sequence design committee, with Mike Ciliberti as the chair.
- I have worked on additional committees to assist Rob Freeman in updating the P&Ps for U.S. Team selection.
- I have worked numerous volunteer positions at IAC contests, including tech inspector, boundary judge, chief judge assistant, recorder, caller, and grading judge.
- I have served as a board member for IAC 36, helping to run the two annual Borrego aerobatic contests for numerous years.


**MARTY FLOURNOY | DIRECTOR**

I am asking for your continued support to be your representative on the IAC board of directors that stays in touch with our foundation of "grassroots" pilots. These same enthusiasts grow into our volunteers, competition pilots, and mentors for the future. Having been active in IAC since 1996, we have seen numerous changes, some good and a few not so well thought out.

With experience as a CFI and safety pilot for many college students in Primary and Sportsman level for 26-plus years, it has been rewarding to see aspiring aerobatic pilots grow in talent and ultimately become safer, more competent pilots. Those pilots grow to appreciate the longstanding 50-plus-year legacy and traditions that our IAC membership has passed on to us.

Safety is our cornerstone tradition and most important legacy, and maintaining integrity with our rules and contest organization has stood the test of time. I want to ensure we maintain that same tradition and legacy going forward, to always speak up and be willing to right a wrong – in other words, police ourselves.

We should support our contest directors, judges, and safety appointments in enforcing our own longstanding and common-sense crafted rules, policies, and procedures, thus helping to avoid federal intervention or insurance escalations.

My background includes:

- Twenty-six years in over 120 contests as volunteer, judge, pilot, and safety pilot.
- Regional/national judge for 20 years.
- CIVA U.S. judge team at World Aerobatic Championships, 2015, 2017, and 2019.
- Advanced team member, 2012, 2014, 2018, and 2020.
- Southeast regional director.


**BOB FREEMAN | DIRECTOR**

I've been flying for 50 years and a member of the IAC for 41 years. I started flying as a junior in high school, inspired by my dad and his love of flying. I joined the IAC at the Fond du Lac contest and became completely hooked. My focus has been on IAC aerobatics for most of my 41 years of flying.

Inspired by the success of the U.S. teams at the World Aerobatic Championships in the '70s, it became a goal to one day fly for the United States on the Unlimited team (accomplished in 2017). I've been on three U.S. teams and placed fourth overall at the 2002 AWAC. Balancing my IAC team goals with family, career, and financial constraints, I fully appreciate the challenges, from the grassroots end of our sport to the U.S. teams who represent us.

Over the course of my IAC years, I've served in many roles: contest director, chapter president, judge, assistant judge, boundary judge, and IAC board member. I volunteered and led the effort to find a new home for the U.S. National Aerobatic Championships. I was appointed by the board to serve as the team liaison, acting as a conduit and facilitator for communications between the teams and the board.

Our club has many challenges and faces many issues, but we are united in our love of airplanes, aerobatics, and our incredibly talented, interesting, and diverse members.

While on the board, I've worked on several significant, controversial issues. I do my best to take a thoughtful, objective, fact-based, and balanced approach to the resolution of these challenging issues.

- Led the effort to select a new site (Salina) for the 2017 Nationals, using a clear, objective, and nonpolitical process.
- Served as team liaison.
- Led a working group in the rewrite of P&P 504 for the selection of U.S. teams.
- Led another effort to consolidate three different versions of our team code of conduct, and to formally document the organization and process for managing our teams.
- Proposed, established, and administered the National Championship Point Series. I sponsor the trophies, along with Tim Just and Tom Rhodes.
- Proposed and established, with the assistance of Dave Watson, a new award in 2022 that recognizes our most active competitors annually as well as their lifetime participation.

I respectfully ask for your vote to continue to serve as one of your IAC directors.


**DOUG JENKINS | DIRECTOR**

Why I would like you to consider voting for me ...

**1.** I make decisions based upon facts, rules, and logic. I am not swayed by emotion, loud voices, or the crowd. I am not afraid to stand for what is right. I am also not an entrenched ideologue. I am willing to listen to all positions on an issue and change my mind if I become convinced of a better way.

**2.** I work for you. If you communicate with me, I will respond to you. I will spend our communication listening to you, not talking at you. I promise you that I will give whatever concern you have consideration. As your representative, I will take your thoughts to the board, even if I personally don't agree with them. If there is a clear majority position among the members I represent, I am willing to vote the way the majority feels versus my own personal opinions. That's representation.

**3.** I would bring a fresh (and needed) perspective to the board. I fly a 180-hp, open-cockpit biplane in Intermediate. This is the pinnacle of my aviation budget and skills. Among my aerobatic achievements are the "Grass Roots" and "Highest-Scoring Biplane" medals I have earned, which are the most meaningful. They represent the beating heart of our sport. This is not to disparage folks who fly upper categories and aspire to (or are on) our teams. Some of them are my friends, and I stand in awe of the things they can make an airplane do. But my (and maybe your) perspective is lacking on our board.

**4.** Obligatory aerobatic biography: I bought my Pitts in 2012. Our first contest was the 2012 Nationals, where I flew Primary. From 2013 to 2015, we flew Sportsman. From 2015 to 2017, my airplane was down for a rebuild, but I stayed active in the sport by judging and contest-directing. We returned to Sportsman in 2017. From 2018 to now, we have flown Intermediate at as many contests as we can afford. I am a regional judge (and have been for many years). I have been a multitime contest director. I created and manage the Texas Championship Series to enhance participation at and recognize excellence in Texas aerobatic contests.

For additional insights, I recommend articles I have contributed to Sport Aerobatics, specifically in April 2013, December 2013, December 2014, June 2015, December 2015, and January 2018.


**ADAM MESSENHEIMER | DIRECTOR**

I got involved with competition aerobatics in 2016. As many of you will probably agree, I found the welcoming and stimulating personality types within our community to be an incredibly attractive element of this sport. It was the generosity and encouragement of my peers that I credit significantly for my opportunity to train with the 2020 Advanced Aerobic Team. Furthermore, I have no doubt that the positive impact stemming from aerobatic competition flying has helped me in my professional career and current position as a Learjet captain.

My decision to run for the IAC board is taken with humility and the desire to bring more of an influence from the younger generation. I have been privileged to spend time training and learning under the guidance of so many accomplished individuals within our sport. As a director, my aim would be to continue learning while providing perspective that is unique to my experience and background. **IAC**

# N328PW BACK IN ACTION

BY LEIGH HUBNER, IAC 439393



**T**his is an Extra 300S, built by Walter Extra, who is also an aerobatic pilot," Patty Wagstaff said in 1993. She flew the plane at the 1993 U.S. National Aerobatic Championships to win her third U.S. National Aerobic Unlimited Champion title.

In 2001 Patty sold her Extra 300S, and the new owner promptly disassembled the aircraft for paint and upgrades. It stayed that way for 20 years. Until now ...

# N328PW BACK IN ACTION



**TOP:** Circa 1990s; (From the bottom: Sean D. Tucker, Patty Wagstaff, Matt Chapman, Gene Soucy, and Eric Haagensen.)

**MIDDLE:** Young Leigh getting his start with RC planes.

**BOTTOM:** Patty Wagstaff flies N328PW inverted over the countryside.

So let me go back a ways to give this all some context. I was an aviation-obsessed kid. None of my family was into aviation, but most likely it was a joy flight in a Cessna 172 at around 5 years old that triggered the obsession. I grew up in Australia in a small town, and my poor parents must have driven me to the local airport thousands of times. I'd hear a certain familiar sound, and we'd have to immediately race to the airport so I could see what airplane it was.

I remember becoming totally fascinated with aerobatics early on after watching a local air show performer, Barry Hemple, in his little yellow Pitts S-1. He'd hurl that thing around. I was fascinated.

Around 11 years old, after a lot of begging, I was able to convince my parents to get me into remote-controlled (RC) planes. That pretty quickly lead to RC aerobatic competitions, and I loved it. My dad, who was a brilliant cricket player but knew nothing of model airplanes, somehow learned all about them and built all of my airplanes — amazing!

At a similar time in the mid-'90s, home computers and software were improving rapidly, and the development of Microsoft's Flight Simulator for Windows 95 was everything an airplane-obsessed kid could ever dream of. It looked and sounded so awesome for the time. Of particular interest to me was the fact you could fly the BF Goodrich sponsored Extra 300S from famous aerobatic legend Patty Wagstaff! Who knows how many endless hours I spent looping and rolling that Extra around the simulator, but I loved every minute of it. The technology of CD-ROMs meant video was now possible, and included were many instructional videos from Patty, flying her Extra 300S through the various maneuvers. For a full display of my nerdy obsession, I can even remember that on the instrument panel you could see the registration of her Extra in the flight sim — N328PW!

Throughout high school, I worked afternoon jobs to help fund my flight training, my parents matching me dollar for dollar! By the end of high school, I had earned my private pilot certificate and enjoyed as much flying as I could afford. I realized the flying wasn't going to be a career for me. My creative side was emerging with photography. As a result, I've been able to have a 20-year career as a director of photography.

Like many private pilots, there are huge gaps in my flying, and ultimately I didn't fly at all during my 20s. It wasn't until my early 30s and moving to the United States that the desire to fly again was too strong to ignore. After the required retraining, I also began to pursue that childhood curiosity of aerobatics. I had always assumed it might be an uncomfortable feeling or maybe I wouldn't be able to do it. I was wrong — I LOVED IT!

When our second child was only months old, I somehow convinced my wife to let me buy a half-share in a Decathlon in Van Nuys, California, to pursue aerobatic competitions. It was a great airplane. (How I tricked my wife into this, I'll never know.) This promptly led to a Christen Eagle purchase (how my wife hasn't left me by now is beyond me), and while in the Sportsman category, I could feel my skills were coming together. In 2019, I was awarded the L. Paul Soucy Award for the IAC's highest-scoring aerobatic pilot of that year. It was a really nice confidence boost that this long-held interest in aerobatics was

heading in the right direction. While the Christen Eagle is a highly capable machine, and by no means did I outgrow it, I was keeping my eyes open for an aircraft capable of advanced aerobatics.

While sitting on the couch with the kids, I was doing what too many addicts do — looking at Barnstormers.com for airplanes we can't afford. A project had just been posted several hours before, and I yet again convinced my wife, Kamilla, that I should at least fly to Denver to explore this idea. Sitting under the best part of 20 years' worth of dust and old tarps was an airplane. A wing against one wall, tail leaning against another, and over in a plastic tub some parts that looked like they belong to this monster! It had been disassembled in the early 2000s to be repainted and cleaned up, but like so many projects, it had passed through different owners and just fallen to the side.

So, what was this project? It was an Extra 300S, and while I didn't know it at the time, I realized after seeing the aircraft and the logbooks that it wasn't just any 300S. It was N328PW — Patty's Extra, her BF Goodrich ride from the '90s and the same one I obsessed over as a teen! Patty had sold it to a pilot in Denver in the early 2000s, and on one of his first few flights, the canopy departed the aircraft due to being incorrectly latched. He landed safely, but the decision was made to pull apart the aircraft and freshen it up. That's as far as the project went!

Now, I've always said I don't want to buy a project plane. If it ain't flying, I ain't buying. I can fully appreciate that buying this wasn't the best idea. That being said, Extras are very expensive and this was affordable for me. When I think back to that original Barnstormers ad, it said, "Disassembled and ready for paint." Yeah, you could have also said, "One lady owner only flown on weekends." Both statements are a bit of a stretch.



## THE KEY TO SPONSORSHIPS AND PARTNERSHIPS IS IN YOUR BACK POCKET

One of the big questions I frequently got after sharing the news of the Extra coming back to life was how did I get a sponsor for the Extra? People were asking if I was doing air shows, to which I said no. I can't ever imagine having the skill set required for air show flying with the narrow margins needed in that type of flying. This generally left people scratching their heads.

I ask people, why do companies sponsor things, be it air show planes, race cars, big ticket events? Is it because they don't know what to spend the company's money on, or are they trying to reach new customers and solidify themselves with existing customers?

In very simplified terms, a business needs customers to grow, and it needs to evaluate how best to find those customers. In years gone by, the traditional means of advertising have been the big three: TV, radio, and print. If you've been remotely paying attention, you'll know that all three of those forms of media have seen declining numbers in their audience, but where are they going?

Good news: They landed in your back pocket! That's right, your cellphone now gives you access to the sort of eyeballs once reserved for TV stations and newspapers. Social media, for all its faults, is a remarkable way to reach people, connect with people, and really focus on a specific audience.

I confess I dismissed social media for a long time. I think this was due to my role as a cameraman working on big shows, with budgets that would be in the hundreds of thousands. I thought, "Who do these social media or YouTube people think they are? How dare they think they can compete with us fancy TV people!" Then as I could see our TV audiences slowly shrinking and the social media views increasing, it became clearer to me that as a society we weren't consuming less "media" — we just shifted where we get it from.

I ask people if they know of the Yak 110 or Goulian's yellow Extra 330SC. What about the Blue Angels? What about Joe McMurry's red Decathlon, Corey Gerulis' blue and green Extra 330SC, Mark Pollard's mid wing Extra. And guess what, I've only seen one of those in the flesh (Corey's), but most of us know about ALL of them! How? Simple. They share photos and videos, and as consumers, we enjoy seeing them and connecting with them.

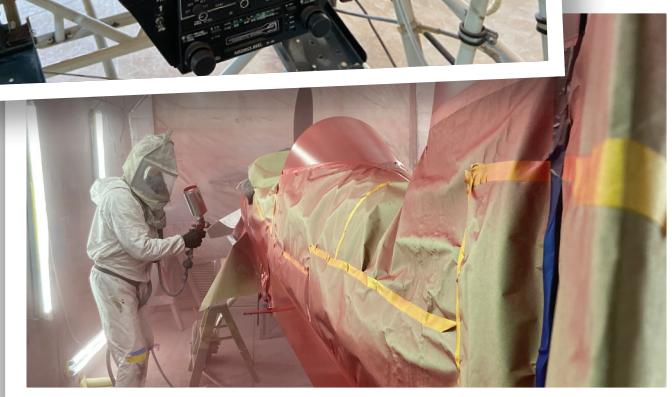
Looking at some International Council of Air Shows stats on the ICAS website, we can comfortably reach the same number of people from social media posts as they do at an air show, if not more. We get to comment, interact, share stories, etc. There are naturally many other facets to air shows that the bigger companies want — an in-person experience that connects with customers, or perhaps hands-on display of a new product is something that social media doesn't do, so there will always be the big players in that space.

For me, connecting with a small company like Wingman Watches was a perfect fit. Here is a business run by two brothers, making amazing, completely custom watches. Up until now, they had been focusing on military pilots, which made sense because one of the owners was flying the Viper Demo jet. They realized it's not just the military pilots who are passionate about their squadron or group; it's all aviators.

Whether you're a group of Cub pilots or Extra owners, having a custom watch for your group is something to share and be proud of. The cost of buying an ad in magazines can get very costly, plus it feels less "personal." The owners of Wingman Watches felt they would rather see their budget spent in a more organic way, help someone like myself live out a fantasy of owning the Extra, and have a grassroots feel to reaching new customers.

So what does all this mean? Whether it's trying to offset costs of competing or something bigger — perhaps offsetting costs of national team selection — there are new ways to approach sponsorships and partnerships. So many people are sharing their flying adventures online as it is; why not work with a small business and grow together? It might be a local business that wants to show their support in your community, or a brand that would like a more national reach. The power is in your back pocket. Take advantage of it!

# N328PW BACK IN ACTION



**TOP:** Leigh and his neighbor Ross Scroggs who would drop by at a moment's notice to help.

**MIDDLE:** One quirky thing on the panel; "I kept the installed cassette player, center at the bottom of the panel. It was too cool and retro to remove."

**BOTTOM:** "I totally underestimated the number of hours needed on the paint job."

Once again, I convinced my wife not to divorce me. I reminded her that 2019 has been great, with more work on the horizon. So in January 2020, I thought it would be a perfect idea to buy a bunch of dusty airplane parts and drive them across the country ... what could possibly go wrong?

I could probably write a small novel on what happened next, but we all went through it together, so you know what happened with shutdowns due to COVID-19. The reality is, the project was way more work than I would have ever guessed. However, the best part has been the support of everyone. I'm beyond lucky to have amazing people in my world. So many have chipped in to help me.

Kent Gordon was looking after the whole thing. He's an Extra guru, so that was a really big deal.

Painting! Man, I totally underestimated how much sanding was involved. On one of my Instagram posts, I jokingly said, "Does anyone know how long it takes to sand and repaint an Extra? It's pretty quick, right? A couple of weekends' worth of work?"

Mark, my neighbor, looked after the ADS-B. Perez was pulling cylinders and inspecting the engine.

Martinique has an Extra 300S at his place, and every other week I was down looking over his Extra, trying to figure out where the wings went and how they worked.

A hero of mine is Ross, one of our neighbors. Every five minutes his phone would ring with a dumb question from me. He'd drop whatever he was doing and come and save the day.

There were also a lot of companies that really went above and beyond to help me. Tom at Aircraft Specialty Flightlines donated the hoses. In record time, I'd get a delivery of all new hoses and lay them all out on the floor. Thanks, Tom and the Flightlines gang!

The old brakes — I wasted so many hours trying to make them work. I ended up reaching out to Beringer Brakes, and I am just so glad I did. The package turned up with this amazing setup inside. These brakes are as light as a feather and strong enough to stop a Mack truck.

Thank you to the gang at Hooker Harness for making sure I had a seat belt/shoulder harness set that matched the aircraft paint — it looks really awesome!

Patty herself has been so encouraging. She sent me emails and looked through all the photos from when she was flying the airplane.

After many a swear word, I'm super excited to say it's ready. First flight — I knew that when this day did finally happen, it would be exciting. But I think I completely underestimated just how exhilarating and overwhelming the whole experience would be. I think about the history of this aircraft, over 12 months of hard work. Sometimes I didn't really even

think this day would happen. When it comes to aerobatics in this thing, I've got a lot to learn.

The reality is, I couldn't have done this without the help of Wingman Watches. Two brothers who make these beautiful custom watches really took me under their wing. They should be sponsoring the top aerobatic pilots in the country, but instead they said to me, "We see what you are doing, and we grew up with the same sorts of dreams as kids, and we want to help you out."

I also am lucky to have the support of Flyt Aviation, an Atlanta-based flight training school. The owners started a top-of-the-line flight school with basically new aircraft in the middle of the pandemic. So, when it comes to challenges faced with aircraft and startup expenses, they knew firsthand what I was up against. They really stepped in to help.

2020 was a big year for everyone, and on some of the more challenging days I confess I was thinking a lot about my dad. Sadly, he passed away just a few weeks before Kamilla and I got married. I think about all the model RC planes that he built, the weekends away, the trips to local airports. He didn't get to see our place on the airpark, the runway in the backyard, the kids running around or sitting up next to me flying the C-195, or me living out a fantasy with the Extra. I think he would have gotten the biggest kick out of all of this.

I might be the world's most okay'est aerobatic pilot at best, but when it comes to pursuing lifelong dreams — and at the very least, giving it a go — I think I'm a winner! **IAC**

**Leigh Hubner** is an Atlanta-based director of photography working mostly on true crime TV shows. Born and raised in Australia, he moved to the United States in 2012. A private pilot with 500-plus hours' flight time, Leigh now flies an Extra and a Cessna 195, and often tows gliders in a Bird Dog.

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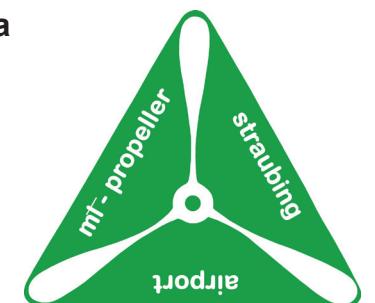
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# ARE BIPLANES STILL COMPETITIVE IN TODAY'S AEROBATICS?

BY JORGE MACIAS ALONSO, IAC 432353

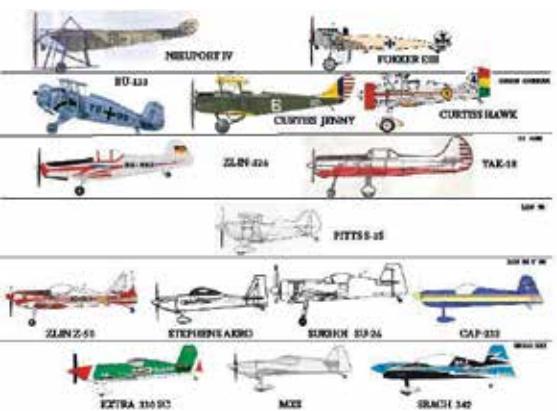
*Originally printed in 2013, this article still holds true today. With few new machine market demands and current monoplane costs, it could hold true for some time.*

At the 2012 U.S. Nationals, in the Advanced category, Patrick Clark won in a Pitts S-1T. How could this happen? How could a biplane have won in a championship of this level and against so many other great machines?

There are many of us who are saddened about the exciting end of the Formula One season. Not just because of Fernando Alonso becoming a three-time world champion. But also to see if a great driver with the not-so-competitive car could beat another great driver with a far superior car. Unfortunately, this was not the case in Formula One, but fortunately it was in aerobatics.

# ARE BIPLANES STILL COMPETITIVE IN TODAY'S AEROBATICS?

Evolution of the biplane and monoplane from Nesterov's first loops in 1913 to current day.



## BUT FIRST, A LITTLE BIT OF HISTORY

In 1913, only 10 years after the Wright brothers' first powered flight, Petr Nesterov in Kiev flew the first loop in aviation history. He did this in a monoplane Nieuport IV. Later on, biplanes began to emerge and dominate, which is the exact opposite of what people think of them today.

Aviation and aerobatics were "in diapers" at the time, and these monoplanes were aircraft that depended on struts and posts, which provided very little structural integrity. The most advanced aircraft at the time was the Fokker E-I, which was the protagonist of the movie *El Azote de los Fokker*, during the beginning of World War II, which was then phased out by biplanes. These provided a greater structural integrity, since one wing could transfer loads to the other. To explain this in simple terms, think of a cardboard box. Cardboard by itself is very light and not very strong. But if you arrange it in the shape of a shoe box, it is still very light but now it is much stronger.

This increase in strength allowed biplanes to endure a greater load during hard maneuvers that pilots would perform during combat, with the added benefit of being able to mount bigger and more powerful engines. Now, the biplanes dominated!

After World War I, competitive aerobatics and aerial demonstrations began to appear. New technology came from the war in the 1920s. Pilots who were hardened by many battles and gained so much experience in flight came back to now impress and delight the crowd and judges with their flying abilities, instead of using aerobatics to take down the enemy. These were the Flying Circus and great Aerial Festivals days, formed by former military and training aircraft. American aircraft like the Curtiss Jennys, German aircraft like the Bücker, the French Stampe, and the British Tiger Moth. These aircraft were made of steel tubes, wood, and fabric. Without a doubt, the most capable and best aircraft of this time was the Bücker Bü 133 Jungmeister.

These biplanes evolved into the monoplanes of WWII. Technology had advanced drastically, and they had very efficient yet light wings with the cantilever technology (where all the structural elements are inside the wing). With the exception of the sinking of the Bismarck by biplanes, its role in WWII had vanished (although it was still used to train pilots).

In the '60s, aerobatics started just like we know it now, under the umbrella of the Fédération Aéronautique Internationale and under the Aresti system. Now it was dominated by monoplanes. The Russian Yak-18 and the Czech Zlin family (Z-226, Z-326, Z-526) were some examples of aircraft that were lighter and stronger.

But everything changed at the 1972 World Aerobic Championship in France. The American team dominated with a Pitts S-1S and took gold in individual, team, and women's. Now biplanes dominated again. To see the whole story on Pitts and access the ExtraCrew.com articles, you may visit [ExtraCrew.com/es/](http://ExtraCrew.com/es/)

Russians later upgraded to the Yak-50, but these aircraft were not available to pilots who were not in the Soviet Bloc. The Czech took aluminum aircraft construction to the limit with the latest and greatest Zlin Z-50. Western pilots, however, still opted for Pitts, even in the late '80s.

Finally, the '80s saw the Russians switch from the Yak to the unbeatable Sukhoi, the Czech trying to squeeze as much out of their Zlin-50, and the French develop an amazing product made out of wood, the CAP 20 through CAP 232. But also, it saw multiple evolutions of an aircraft that revolutionized aviation and created a family of descendants. The Stephens Akro that evolved into the Laser (which turned Leo Loudenlager into a world champion in 1980), the Zivko Edge, the German Extra, and the Staudacher S-300. This was the last change that takes us to today's monoplanes.

## AND NOW A LITTLE BIT OF ENGINEERING

We have talked about the weight and structural advantages that biplanes had over a cantilever wing. And later on, composite materials were introduced. But even though carbon fiber was a stronger and lighter option, carbon fiber wings were still heavier than the ones on biplanes.

I can't think of a better way to compare than by choosing two similar aircraft that have competed neck and neck. These are the Pitts and the Laser 200, and the aircraft these have evolved to, both with steel tube frames.

Both of these started with a four-cylinder Lycoming IO-360 engine. Having the same power, the Laser was between 60 and 80 kilograms heavier. However, it was more streamlined and aerodynamic. This allowed the Laser to gain more speed, and in a turn, with longer and cleaner vertical lines. We also have to keep in mind that struts and flying wires produce a lot of drag. With the Laser having a longer wingspan, it was possible to place the ailerons farther away from the center of gravity. The Pitts, on the other hand, had the ailerons closer to the propeller's slipstream, which helped with control at any speeds. Judges were not looking for long vertical lines, but the maneuvers look cleaner when you have more time before rolls.

Both aircraft have been developed to their extremes. They no longer have four-cylinder engines; now they have tuned-up six-cylinder engines. Examples were the Pitts S-11B, S-2S, Ultimate 300, and many other biplanes that stood out in exhibitions and air shows in the United States, and also monoplanes such as the Laser, the Zivko Edge, and the Extra.

For similar or equivalent airplanes, the weight advantage still favored the biplanes between 30 and 40 kilograms while maintaining their steel tube, wood, and fabric structure. The Edge had evolved with a steel frame fuselage and the rest in carbon fiber, and it still had a slight weight disadvantage.



From a front view of the Pitts, wires, javelins and struts are seen, creating a lot of drag.

ARE BIPLANES STILL COMPETITIVE IN TODAY'S AEROBATICS?

# ARE BIPLANES STILL COMPETITIVE IN TODAY'S AEROBATICS?

This led monoplanes' prices to skyrocket and make them inaccessible for many people. This is a big factor to take into account, being that this is only a semiprofessional sport. The latest and greatest monoplanes, such as the MX and Sbach, are made entirely out of carbon fiber. These monoplanes are typically built at a factory, whether they are certified or experimental, while biplanes can be built as experimental by pilots themselves or built in factories with slightly lower costs.

Another difference is not about biplanes in general, but specifically about the Pitts. Initially, this was an aircraft that had a "chubby" and "curvy" aspect. This did not help the judges. When there are no straight lines on the fuselage, it makes it difficult to determine if the lines in flight look perfect, and this hinders scoring. The "Rising Sun" scheme design that Pitts originally had was based on confusing the judges so that they could not have any good references. With time, this was proven to be a bad strategy, and in today's biplanes, we can see more straight lines on the fuselage, parallel to the longitudinal axis, which helps with scoring.

This aircraft design has also evolved, and now Pitts have straighter edges and don't look as chubby or curvy as they used to.

So, if all of this seems so inconvenient, why are biplanes so competitive nowadays? There's an easy answer, and part of it has to do with the simplified technology. Basically anyone can build a biplane in their garage. There is no need for fancy ovens and machinery, nor a legion of engineers needed to build a wing like the ones on monoplanes. With a small investment, one can build an excellent aircraft with simple materials (wood, steel tubes, and fabric). An affordable, light, and competitive airplane with a small engine means reduced costs in fuel, maintenance, insurance, etc., which in turn leads to more flight hours. More flight hours allows the pilot to find perfection sooner, which is what the judges are looking for.

When we move up in categories, the maneuvers become more complicated. And therefore, we need more out of our machines, and with monoplanes, we can typically demand more out of them.

Here are a few examples from Sportsman to Unlimited.

In 2010, Javier Tabares debuted at the Spanish Championship in the Sportsman category. He flew in his Pitts S-1S. He was victorious and always talked about how affordable it was to fly and operate his aircraft in a sport that was supposedly very expensive.

We have to note that in the market, there are used Pitts S-1Cs from \$25,000, Pitts S-1Ss (180 hp and fixed-pitch propeller) from \$45,000, Pitts S-1Ts (200 hp and constant-speed propeller) from \$55,000, and Pitts S-1-11Bs (300 hp) for \$90,000. Two-seaters like the Pitts S-2 and Eagle II are from \$60,000. A monoplane like an Extra 330 SC, Sbach, or MX is no lower than \$400,000 new. Aviat announced that it will be building the S-1S again for around \$180,000.

In 2010, also at the World Advanced Aerobatic Championships, Alan Cassidy came in second place in his Pitts S-1T in the Q Program. That same Pitts, also flown by Nick Wakefield, would finish in an excellent 16th place out of 82 participants. Lastly, in 2007 at the Unlimited World Aerobatic Championships in Granada, Dan Clark debuted in his highly modified Patriot (based on a six-cylinder Pitts), obtaining an impressive 25th place out of 50 participants, which happened to be the last time a biplane participated at an Unlimited World Aerobatic Championship.

## CONCLUSION

We wouldn't use a 10-pound, \$100 sledgehammer to put a nail in our wall — for that we would use a smaller \$10 hammer, which would be more appropriate — but if it was for a stake to the ground, we would then use such sledgehammer. Also, no matter how much we try, it would be very difficult to use the smaller hammer on the stake. For the same reason, we should choose the type of aircraft based on its capabilities to fly in the category that we are looking to compete in.

There are many important things in aerobatics such as  $V_{NE}$ , g-limits, vertical penetration, power/weight ratio, etc. But also the price of purchase and the operating costs. With that being said, few airplanes are capable of giving so much for so little like a biplane does, and that is why it is still so successful. **IAC**

**Jorge Macias Alonso** is an airline transport pilot with more than 16,000 flight hours. A fourth-generation pilot, he started aerobatic training at 23 years old with Vytas Lapenas in Lithuania. In 2007, Jorge was the first pilot to represent Spain in the Advanced category at the European Aerobatic Championships. He has participated in World Aerobatic Championships with the Spanish team for many years and has a few Spanish National Advanced Champion titles to his name.



Dan Clark with his "Patriot", a modified design based on a 6-cylinder Pitts.

An advertisement for Extra Aerobatic Planes. It features a red and white Extra 330 SC biplane parked on a tarmac. The plane has "D-EXNG" on its tail. The background is dark. The text "EXTRA AEROBATIC PLANES" is at the top right, and "EXTRA NG 40 YEARS 800" is at the bottom. To the right, there is a vertical "FAA CERTIFIED" logo with a circular seal. At the bottom right, it says "FACTORY SALES CONTACT Christian Hochheim +49 285 89 13 718 sales@extraaircraft.com".

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# THE FERRARI OF AEROBATIC AIRCRAFT— GENPRO

New company and solutions from Europe

BY FERENC ZSIGO, GENEVATION PROJECT COORDINATOR

**S**EVEN YEARS ago in 2015, two ambitious cousins defined a vision to design and build the world's best aerobatic aircraft using the experience gained from a previous related aircraft design, along with theoretical knowledge and practical research experience. Csaba Farkas, Ph.D., is the technical director, and Viktor István Szabó is the managing director of Genevation Aircraft Ltd., established in Hungary with the support of investors who believed in the idea and held the founders in high regard. The company's new head office at the Jakabszállás Airport, Hungary (only an hour south of Budapest), benefits from 600-meter concrete and 1,000-meter grass runways, conveniently located for test flights.

After a year of preparation, Genevation's quest had begun. It was decided at the start to use only the best cutting-edge and innovative materials, under the umbrella of full computer-aided engineering (CAE). The first prototype aircraft was flown, and the results lived up to their most ambitious expectations, although it took six years to fully refine and develop the aircraft to make it what it is today. In the meantime, the initial team of eight has grown to today's 37 highly trained professionals, where six of the team are Ph.D.s and several are MSc- or BSc-level engineers who assist in the activities.

After tens of thousands of engineering man-hours and hundreds of thousands of development man-hours, the GENPRO unlimited aerobatic aircraft was born in 2016 and was followed by more than six years of fine-tuning. The performance is exceptional, and the structure is beyond comparison!



Left: VIKTOR SZABÓ managing director  
Right: DR. CSABA FARKAS, PhD chief constructor, chief engineer

After the initial test flights, Genevation worked with well-known aerobatic pilots, including world champions, to further improve and develop the aircraft.

"We wanted to create an aircraft that allows expert sport pilots to expand their skill set beyond their current limitations and to push themselves to a higher level in aerobatic flying. We are proud of our aircraft and its capability. We are now able to offer the GENPRO for training and competition, not only for potential champions but also air show pilots and formation flying," said Viktor István Szabó. "The GENPRO has been designed and built in accordance with the EASA Certification Specifications for Normal, Utility, Aerobatic, and Commuter Category Airplanes CS-23 Amendment 5."

The GENPRO is a single-seat, mid-wing aerobatic aircraft with a conventional fixed tailwheel landing gear arrangement that ensures exceptional flying capabilities for expert pilots flying at the border of physics. The GENPRO's geometry and flying appearance are optimized for all class-competitor and Freestyle aerobatic pilots who are ready to push their limits.

The aircraft has well-balanced, finely tuned handling, coupled with aggressive maneuverability within an exceptionally wide speed and roll rate. Stalling speed is 52 knots, and the  $V_{NE}$  is 228 knots. In addition to being a world-class aerobatic aircraft, it provides exceptional transit capability with high cruise speed and great range.

The GENPRO is the result of combining careful design with state-of-the-art manufacturing methods. The Lycoming AEIO-580-B1A or Thunderbolt performance engine, Hartzell or MT propeller, and on-board electronic systems can be tailored according to customer preferences. The fuselage has a unique steel-composite hybrid truss structure and an aerodynamically streamlined body cover, made of a very thin carbon-honeycomb sandwich structure. This system creates the ideal compromise between the stiffness of a composite monocoque fuselage and the robustness and easy maintenance of a steel truss structure.

## TWO PILOTS' IMPRESSIONS OF GENPRO

BY ADRIAN WILLIS AND MACIEJ KULASZEWSKI, BRITISH AEROBATIC ACADEMY



### ADRIAN WILLIS

We, at the British Aerobic Academy (BAA), have been operating the GENPRO aircraft for three years and have completely fallen in love with it. I have well over 7,000 hours flying Extras, and the quality of the GENPRO is immediately apparent. The CNC components, the beautiful finish, and the attention to detail are remarkable. The straight line speed (approximately 200 knots) speaks for the efficiency of the design. The surplus performance is such that energy management becomes a very small consideration. The flexibility and confidence of the 175-knot snap limiting speed is notable, but the most significant characteristic is the ease of flying. The aircraft is so much easier to fly well than most others.

Historically, aerobatic aircraft were designed to give great performance, and handling came second. With this aircraft, the performance is so extreme, far more than could ever be required, that the focus has been on handling. The ailerons provide almost linear response. The stalling speed on the aircraft is 44 knots, with

100 liters of fuel in the front tank and a less than svelte pilot. Flying an Advanced sequence, the throttle is closed on downlines because there is a surplus of energy. The plane can snap at 80 knots and consistently score well (in other aircraft this would almost always result in a PZ), and of course those flying the plane at the BAA routinely snap at 135 knots, which is explosive.

Of key note is the fantastic support provided by the Genevation team. They are immensely proud of their aircraft and give everything they can to support it. They are not afraid of challenges and work until the best solution is found. Each morning, I go to work with a smile on my face, looking forward to taking the GENPRO for a practice flight before I start teaching.

### MACIEJ KULASZEWSKI

When I saw GENPRO for the first time, I was amazed at how big, and at the same time how streamlined, it is. Despite its dimensions, it is incredibly light, and as a result presents well to the judges without any compromise on performance.

The aircraft has nicely balanced controls (which still have a lot of room for personalization), and it is very easy to fly. The cockpit is spacious, offers great visibility, and is well equipped.

The most noticeable thing about it is its great sound, which is a sign of POWER unleashed by its engine. I flew different types of aerobatic airplanes, including the Extra 330SC, but the way the GENPRO is accelerating or retrieving energy while flying an aerobatic sequence is simply amazing and incomparable.

Once you get used to it, the aircraft will reward the pilot with outstanding performance, which translates to less worry about energy management in the sequence. So far in aerobatic competitions, GENPRO has helped me to retain the British Champion title in the Intermediate category, take fifth place for the Free Known program, and take fourth place for the Unknown 2 program. As part of Team Poland, in the first European Intermediate Aerobatic Championship, I placed eighth overall individually and third place with the team. I have won a domestic competition in Advanced in the United Kingdom and achieved third place in the British Nationals as well.

So far this year, flying GENPRO, I won my first Advanced competition. I will be participating at the World Intermediate Aerobatic Championships in Poland, the Polish National Championships, the European Advanced Aerobatic Championships, and the British Championships. My ultimate goal is to get ready in GENPRO for the World Advanced Aerobatic Championships in Las Vegas in 2023.

I strongly recommend to any aerobatic enthusiast to at least try the Genevation GENPRO, and I believe you won't be disappointed. Many people I have spoken with after a flight in the GENPRO have mentioned their experience was a special kind of feeling, like flying for the first time.



The cockpit is spacious, offers great visibility and is well-equipped.

It has a one-wing unit construction, as the left and right wings are integrated with the main spar. The wing, stabilizer, tail, and control surfaces are all made from lightweight HEXCEL, composite prepreg laminates and carbon-aramid honeycomb materials that are manufactured to the highest aeronautical standards. Unusually, we use the same prepreg composite materials and technology in the construction of GENPRO as does the Airbus commercial aircraft. This type of construction is more costly but results in a much better product.

The GENPRO's shape was designed to present well to judges. The aircraft is larger than many aircraft in the same class to enhance impact, but despite this it still has leading performance.



PHOTOGRAPHY COURTESY OF GENEVATION AIRCRAFT LTD.

**"GENEVATION HAS WORKED HARD ON PILOT COMFORT AND ERGONOMICS. THE SEAT IS ADJUSTABLE, WITH MORE THAN 100 POSITIONS, AND THE CARBON COMPOSITE SEAT SHAPE CAN BE CUSTOM-MOLDED TO OFFER THE BEST FIT AND COMFORT."**

Genevation has worked hard on pilot comfort and ergonomics. The seat is adjustable, with more than 100 positions, and the carbon composite seat shape can be custom-molded to offer the best fit and comfort. The geometry and the size of the cabin and the canopy provide a spacious environment, even for the taller pilots. Even those with longer legs are able to focus on flying the aerobatic maneuvers without discomfort. Exceptional visibility is provided by the low-cut and large canopy. Due to the smart cabin design, anyone can find their individually optimized position. The control stick, the levers, the position of the various buttons on the dash, and their form, shape, and material can be tailored to customer preferences.

The GENPRO is equipped with a keyless start system.

The main flight, navigation, and engine instruments can be tailored to the requirements of all pilots. Genevation will help each GENPRO customer to map out the instrumentation to their taste, and we will custom-manufacture each aircraft accordingly.

Factor of safety applied during the material selection fully complies with EASA CS23 requirements. By using the highest-quality materials, the GENPRO's structure has ample redundancy to tolerate extreme loads. During development, all critical parts were tested with finite element modeling, and more than 1,000 hours have been invested into real static load and dynamic tests. Nondestructive testing of the manufactured elements was carried out to eliminate micro- and macro-sized structural defects in the internal structure and platform.

GENPRO can be equipped with a structural health and load limit monitoring system, which has 12 strain gauges, and a data-log unit that continuously registers the structure's accumulated loads during an entire flight session.



# GENPRO



For better situation awareness, an integrated voice annunciator system makes a voice notification to the pilot if the engine parameters are out of safety limits. This is reassuring and provides advanced notice of potential engine failures.

The landing gear is designed to be able to take off from and land on uneven and unpaved surfaces. The aircraft is equipped with a certified Beringer Aero 5.00-5-inch type brake system.

The Hooker Harness Aerobatic System comes as standard.

We actively encourage potential customers to visit our factory. We also offer demo flights to potential customers who are currently flying Unlimited category aerobatic aircraft. Today, the demo flight can be done at the manufacturer in Hungary and also at the British Aerobatic Academy in the United Kingdom, which has three years of experience flying and competing with the GENPRO. Many pilots flying with the GENPRO have competed and finished on the podium during numerous competitions.

#### THE GENPRO

- Unlimited class aerobatic airplane built with the most advanced materials and cutting-edge technologies.
- Allows expert sport pilots to further expand their skills and abilities beyond their current limits.
- Pays special attention to active safety solutions and to pilots' ergonomic requirements to help them fly without any distractions. **IAC**

<https://GenPro.Genevation.hu/>

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# CELEBRATING VOLUNTEERS

BY LORRIE PENNER, IAC 431036, AND JORDAN ASHLEY, IAC 434846

**COME JOIN US AT EAA AIRVENTURE** and celebrate you! Yes, you know who you are — the person who works at the IAC Aerobatic Center once a year, or the one who volunteers to set up the box markers for your chapter contest, holds an officer or director position at the local or national level, cleans the hangar after everyone has left, manages your chapter website or social media, or arranges your annual vacation so you can sit on the judges line at the U.S. National Aerobatic Championships.

Every year, the IAC recognizes outstanding contributions to the sport of aerobatics through the annual Non-Flying Awards. Join us for the IAC member gathering dinner at 6 p.m. July 29, 2022, at the EAA Nature Center on the AirVenture grounds in Oshkosh to celebrate these volunteers who have been nominated by their peers and selected by the IAC board of directors.

Following are stories of volunteerism from or about longtime IAC members — all are past recipients of the IAC Frank Price Cup. The award recognizes the person who has contributed the most to the sport of aerobatics each year.



**JIM AND JEAN TAYLOR, IAC, FRANK PRICE CUP RECIPIENTS 1998**

BY JORDAN ASHLEY, IAC 434846

**IN 2008**, as a freshly soloed 18-year-old pilot, I wandered into the IAC Aerobatic Center at AirVenture wanting to know what the IAC did and what all the hubbub was about. I asked Jim and Jean Taylor, who responded, “You wanna learn what fun and safe flying upside down is really about? The IAC is the place to be to do that.”

I did want to learn those things, so I decided to volunteer for a few hours that week in 2008. Little did I know that meeting the Taylors would change my trajectory with the IAC and lead me to fall in love with aerobatics, both at the competitive and teaching levels.

By the way, it was always Jim and Jean — never just Jim, never just Jean — although this story started with just Jim in 1980 after he purchased a 1979 Decathlon. Jim thought, *You know, I think I should go to Oshkosh during the air show and find out what I can do with this Decathlon.* Which is exactly what he did. He wandered into the IAC Aerobatic Center, which at the time was “basically a little one-room building with no airplanes around it,” as Jean recalled, and offered to volunteer.

Sometimes, he just hung out; other times, he helped where needed or talked to people who came in. Jim enjoyed his first Oshkosh experience. He learned a lot about aerobatics thanks to the Heuers, who were running the center at the time, and the other pilots who hung around during the week.

Jim felt that, during the week, “[the IAC] needed more people who didn’t come into the IAC with the sole goal of competing at the Unlimited/world level.” He decided that he should be present to talk to people, promote safety through aerobatics, and have fun overall. So from 1980 until 2017, Jim never missed AirVenture, volunteering with the organization every year.

Fast-forward a few years to 1984, when Jean volunteered at Oshkosh for the first time. While she was there, she ran into the editor of *Sport Aerobatics*, who mentioned that the IAC needed volunteers for the contest to be held in Fond du Lac a few days after AirVenture. So Jean helped at registration. There she met Sharon Heuer and Lillian Murray, who were working registration. They taught Jean how to register pilots for the contest.

"I was sitting around, and this guy comes up to me saying he needed help," Jean said. "Okay, fine, what do you need?" That guy was Jim Taylor, the volunteer coordinator for the 1984 contest. Jim needed someone to sit in the center box to pop smoke in case an airplane violated the box. "And I thought, 'I gotta watch the sky for airplanes,' but no one got close to the box except for the competitors, and some of them didn't even make it into the box during their sequences."

After their chance meeting, Jim and Jean had their first date on August 3, 1984. In January 1985, Jim and Jean became *Jim and Jean*. After getting married, they began volunteering at Oshkosh as a married couple. "If anything needed to be done during the week, we volunteered to do it," Jean said.

Early on, the IAC didn't have airplanes parked around the building like we do today. After Jim and Jean had spent a few years volunteering — and after they had a conversation with Tom Poberezny — a new building was built in a different location to better accommodate airplane parking around the building. We still park airplanes around the building at our current location.

In the late '90s, Jim and Jean became AirVenture IAC chairpeople, with Jim chairing IAC parking and Jean the IAC building. Jim and Jean continued to volunteer at Fond du Lac until the contest ended, and they also volunteered at Nationals well into the '90s.

They helped bring the IAC and aerobatics to SUN 'n FUN in the early '90s and continued running the Aerobatic Center there until 2017, when they retired. Jim and Jean also retired from full-time AirVenture chairmanship in the early 2010s and were awarded chairman emeritus status in recognition of their service to the IAC.

Jim never missed an AirVenture until 2018, when he lost his battle with cancer, and Jean, now 80, did not miss a single trip to Oshkosh until 2021. When asked why they continued to volunteer year after year with the IAC (37 years for Jim and 35 years for Jean), Jean gave several reasons, but they all had a similar theme.

"We kept showing up because we knew everyone, and we were there to help. We loved the people and the pilots. We never gave up on the IAC in the good and bad times. We never gave up on getting young, new people involved. They have a lot to offer the organization, and seeing the excitement of these people kept us coming back every year."

Now in my 30s, entering my 14th year volunteering with the IAC and serving as AirVenture chair and IAC treasurer, I can say I keep coming back each year for those very same reasons. Volunteering isn't about the individual. Volunteering is our way of giving back to an organization and the things that we care about. Jim and Jean inspired me to do this, even when I wanted to throw in the towel.

If you're not volunteering, I encourage you to do so. New people are what keeps an organization strong and healthy. If you are already volunteering, thank you. You truly are the lift beneath our wings that keeps the IAC flying.



**LYNN BOWES, IAC,  
FRANK PRICE CUP RECIPIENT 2019**

**WITH SOME 35 YEARS OF SERVICE** to the IAC, Lynn Bowes has filled every volunteer position imaginable. She has an unbeatable can-do attitude and boundless energy to complete every task with a professional approach while fostering lifetime friendships along the way.

2019 found Lynn's plate very full; she served as the IAC secretary, which included duties on the executive committee and the finance committee. She was also an integral part of a working group that was created to update the *IAC Policy and Procedure Manual*. Leading up to EAA AirVenture 2019, Lynn contributed her time and editing skills to creating the exhibition banners, which hang in the IAC. She also worked with the graphic designer on the IAC posters for AirVenture and the U.S. Nationals. Two other projects came her way, which she gladly led — the development and design of the Director Emeritus Awards and the new American Champion Aircraft flight medals. She worked with Sara Arnold to help guide the process of setting up a new award and connected her to the vendor who assisted with the award design.

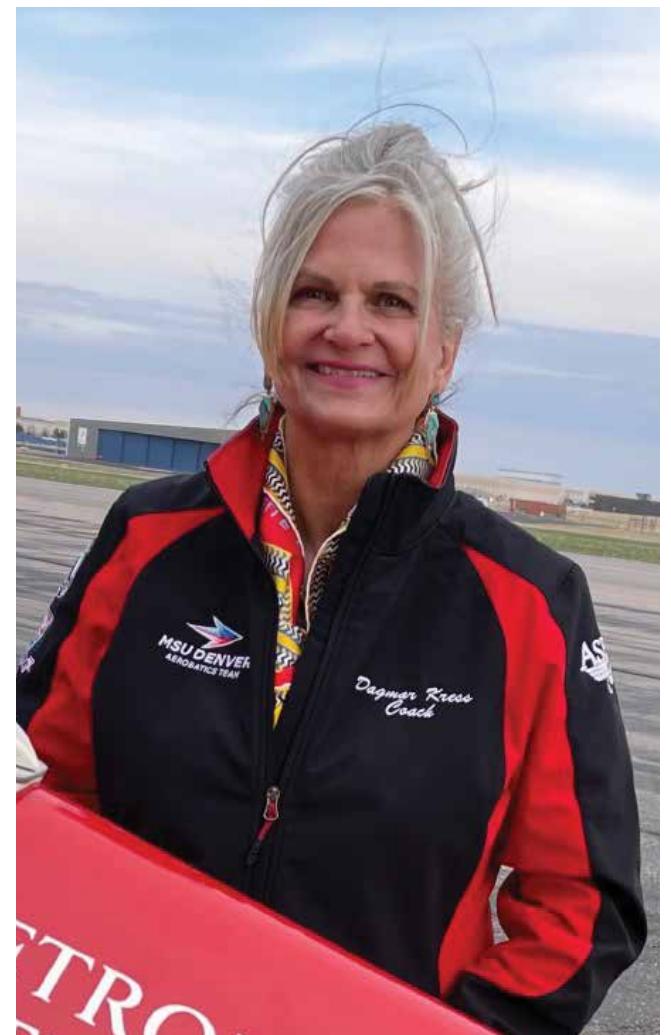
2019 was a year of change for the U.S. National Aerobic Championships, as a search group was formed to select a new home for the event. Lynn was part of the review team, led by Bob Freeman, that traveled to three prospective locations to meet with airport authority leaders and chamber of commerce representatives. Lynn's support and contributions to this team helped lead to the selection of Salina, Kansas, as the venue for the 2019 Nationals.

Leading up to the championships, Contest Director Ron Schreck relied heavily on Lynn's organizational skills and hospitality experience. She had already fostered working relationships with important players at the Salina Airport Authority and the Salina Chamber of Commerce during the review team's visits. Lynn even scoped out venues that would later be used for social gatherings and hotel accommodations during Nationals.

Ultimately it was Lynn who made all the arrangements for the key volunteer dinner, the on-site food service, the medal banquet, and the final awards banquet. She also developed the Nationals printed program and the awards banquet program in coordination with the graphic designer.

Knowing that the IAC looks to the Nationals as the largest source of revenue each year, Lynn served as one of the sponsor recruiters. Her longtime association with the IAC gave her the opportunity to meet and befriend hundreds of contestants, volunteers, vendors, and enthusiasts. She doggedly pursued potential sponsors and somehow left them happily relieved of large sums of money! The financial success of the Nationals can be credited in large part to Lynn's efforts.

While serving as the IAC secretary in 2015, Lynn joined forces with Margo Chase to bring Margo's vision of a renovated IAC building and store to Oshkosh. Margo created the plans, and Lynn became the "boots on the ground," doing the physical work to interpret the fresh vision, organizing a work crew, and traveling several times to Oshkosh in the cold winter and spring months to create the space we enjoy today.



**DAGMAR KRESS, IAC,  
FRANK PRICE CUP RECIPIENT 2018**

**DAGMAR KRESS, IAC**, almost singlehandedly put together a college aerobatics team. She has been an amazing ambassador for the sport, giving out countless rides and getting people into competitions. She does all of this on her own dime, too, letting members of her team fly her plane for just the cost of fuel. She acts as a safety pilot for everyone who flies with her, which means in a single competition she could fly as many as 15 times, not including practice day.

On top of that, she also attends many charity events, acts as a contest director, and is an aerobatic judge at multiple contests throughout the United States. She led the 2017 MSU Denver team that won the Collegiate National Championship Team Award.

While at AirVenture, she takes every opportunity to visit with people and share her love of aerobatics. She is also a popular forum speaker at the IAC Vicki Cruse Educational Pavilion.



**MARGO CHASE, IAC,  
FRANK PRICE CUP RECIPIENT 2014**

**MARGO CHASE, A PROFESSIONAL MARKETING** and branding specialist, spent hundreds of hours and devoted her skills and talents to developing a new brand the IAC began using in 2015. Her design of logos, posters, clothing, and other apparel has improved the look and image of the IAC and aerobatics.

She was also active in designing and ordering the uniforms for the U.S. Aerobatic Teams and the apparel and logos for the U.S. National Aerobic Championships. She also developed all of the marketing assets for the 2013 U.S. World Aerobatics Championships held in Sherman, Texas.

Last but not least, she was instrumental in the upgrade and refurbishment of Oshkosh's IAC Aerobatic Center, which serves as the IAC headquarters during EAA AirVenture. Her design skills were instrumental in the planning and organization of the Pitts 70th anniversary celebrations at AirVenture 2015.

**DR. WILLIAM B. "BILL" FINAGIN,  
FRANK PRICE CUP RECIPIENT 2013**

**FOR MANY YEARS, DR. WILLIAM B. "BILL" FINAGIN** has achieved tremendous success in his efforts as a tireless government relations representative on behalf of the IAC. As our national representative, Bill has worked extensively with the FAA and other regulators in Washington, D.C. He has earned the broad respect and genuine appreciation of government officials, others he's worked with, and the IAC member community.



### **GORDON AND LORRIE PENNER, IAC 431036, FRANK PRICE CUP RECIPIENTS 2007**

**EVER WONDERED HOW MANY VOLUNTEERS** are needed at an IAC-sanctioned contest? Having been a part of our IAC 34 Ohio contest since 2002, I have had a lot of time to think about it, plan it, and panic over it.

There is prep work, usually handled by the contest director in coordination with the assistant CD and the safety, registration, and scoring directors. That's five people, and we haven't gotten to the contest site yet. Then, if you have a five-judge line, you also need five assistant judges, five recorders, and a couple of score runners, so there's another 27. We haven't talked about tech inspections, the starter, boundary judges, or the chief judges and their assistants yet, so that could be another seven people. Looks like we are up to 39 people!

Becoming a nonflying member of the IAC happened by accident. After I married my husband, Gordon, one of the first places he took me was the 2003 Ohio Open Aerobatic Contest. I was quite impressed with all the aerobatics, which up until that point I had only seen at air shows. But this was different than an air show — it was more like an ice skating competition in the sky. I was thrilled by the precision flying and the comradery. I started volunteering at the contest the next year.

With my new friends' encouragement I went on to volunteer for 20 more years of contests. I would end up as registrar and scoring director for our IAC 34 contests, and then sporadically through the years I served as scoring director for IAC 62, 88, and 134; a score runner in Lakeland, Florida, for WAC

2003; a volunteer coordinator for AWAC 2008; assistant contest director for the 2012 U.S. Nationals; assistant contest director for WAC 2013; U.S. Nationals treasurer for five years; and, currently, assistant CD for the 2022 Nationals.

Other volunteer opportunities would arise that were not associated with contests. I've served as IAC 34 secretary; newsletter editor and webmaster for nearly 20 years; IAC Achievement Award chair for 10 years; the IAC secretary for two years; IAC.org website content manager since 2011; IAC social media manager; P&P revision working group member; and coordinator for the IAC AirVenture forums and IAC/EAA webinars.

Gordon became a prolific writer for *Sport Aerobatics* and served as the IAC 34 president and our chapter contest director (where he also found time to mentor new competitors). He became a Master Instructor-Aerobatic through masterinstructors.org and served as safety pilot for many of his students. He currently serves as a regional judge, volunteering around the Mid-America Region, and in recent years has been found working on the boundaries and at the chief judge table during the U.S. Nationals. He gives seminars as a FAAST representative, volunteers at the IAC forums at AirVenture, and is a popular speaker on the EAA/IAC webinars.

I know it will probably sound corny to some, but my feeling about the IAC and volunteering is best summed up through the memorable words of humorist Erma Bombeck: "Volunteers are the only human beings on the face of the earth who reflect this nation's compassion, unselfish caring, patience, and just plain loving each other." Gordon and I volunteer because we see the need and have some of the skills needed to fill the spots. And we love the IAC people; they are our family. **IAC+**





# Pitch and Yaw Forces in Aerobatic Maneuvers

## Flying Figures

BY MALCOLM POND, IAC 429965

**WHEN WE FIRST STARTED flying lessons, the instructor would typically discuss three forces of a spinning propeller. The first is P-force (asymmetric loading of the propeller, especially on takeoff, which causes a left-turning tendency during the initial roll). Then he would mention slipstream effect (the propeller wash twirling around the fuselage and striking the vertical stabilizer and rudder, which would produce yaw to the left). This explains why the engine and propeller are often canted to the right in order to reduce slipstream effect. Finally, the instructor would talk about torque (as illustrated by the tendency of the left wing to go down as the propeller spins to the right).**

However, I will discuss something entirely different. I'm talking about "angular momentum and gyroscopic precession." What?!

Aerobatic pilots need to appreciate subtleties in stick and rudder movement, especially while performing aggressive control deflections under high power and low speed. Every pilot, whether in Primary or Unlimited categories, should be aware of these principles. Air show and Unlimited pilots employ these principles to do gyroscopic maneuvers. But the competitive aerobatic pilot performing classic Aresti maneuvers should take advantage of these principles, too.

Unless you are flying a glider or a twin-engine airplane with counter-rotating props, angular momentum and gyroscopic precession are facts of life. The terms apply to the tendency of a rotating propeller to remain in the same plane in space, unless certain control inputs are applied to change that plane in space. In other words, stick and rudder forces.

Think about the basics of flight for now. There are three ways besides velocity to control the airplane: pitch, yaw, and roll. Pitch is controlled by forward and aft stick, resulting in down and up elevator, respectively. Yaw is controlled by left or right rudder. Roll is determined by the aileron movement of the wings. Forward/aft stick and rudder inputs produce forces acting on the spinning propeller, while aileron movement has a negligible effect.

Now let's talk about the physics of angular momentum. Linear momentum is a product of mass and velocity. An example is pushing an airplane up to the starter's line at a contest. Now consider momentum that applies to a rotating propeller. Angular momentum is a product of the propeller's rotational inertia (mass and rpm) and the angular velocity. The direction of the propeller's angular momentum is determined by the direction of the rotation. A simple way to explain this is by using the "right-hand rule." In a clockwise rotation, the fingers of the right hand represent rotation, and the thumb points in the direction of the rotational vector.

All Lycoming engines, and by extension all Decathlons, Great Lakes, Pitts, Extras, MXs, etc., turn to the right when one is looking out from the cockpit. So the concept is that, when a propeller is rotating, the direction of the angular momentum is forward.

## PRECESSION

Now let's say you want to apply a rudder or elevator control input. You are applying a vector force to the clockwise-rotating propeller, but the resulting response of the propeller will be offset 90 degrees ahead, in the direction of the rotation. You have just demonstrated gyroscopic precession.

In an excellent YouTube video published on September 28, 2014, Paul Anderson discusses the physics of angular momentum and gyroscopic precession. Another excellent YouTube video is "Gyroscopic precession – an intuitive explanation" by TheHue's SciTech (May 28, 2016). On April 25, 2020, Spencer Suderman published a YouTube video on this subject that's also worth reviewing.

In his comprehensive instructional book *Better Aerobatics*, published by Freestyle Aviation in 2003, Alan Cassidy mentions the slipstream and gyroscopic effects of various maneuvers and discusses how to manage these effects, but he doesn't go into any detail about causation. Most other aerobatic-themed books mention these concepts, but only in passing. The FAA's *Aeronautical Information Manual* says nothing at all!

## RUDDER AND ELEVATOR INPUTS

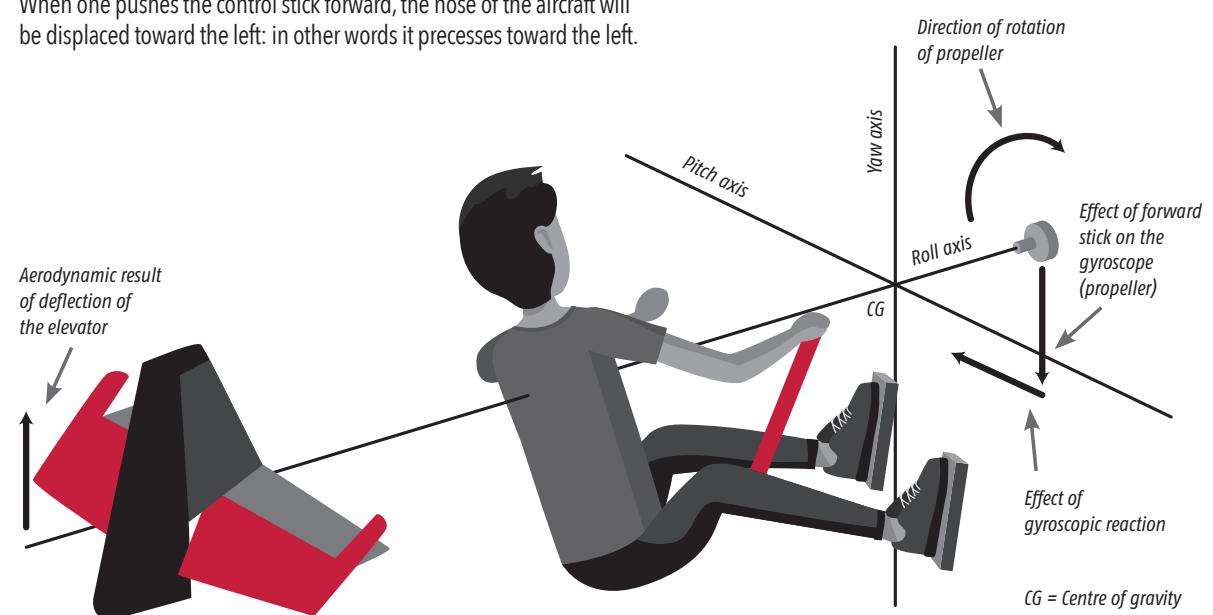
Now we will construct diagrams to explain the gyroscopic precession that occurs with rudder inputs, or elevator movements. These diagrams apply to propellers turning clockwise. Counterclockwise-turning propellers will result in opposite gyroscopic movements.

Forward movement of the stick creates an upward force on the tail. Since the tail is behind the center of gravity, this causes a downward movement to the propeller. Keeping in mind the right-hand rule, the resultant vector force is offset 90 degrees in the direction of the rotation and the reaction is a propeller precession to the left. (Fig. 1)

Using the right-hand rule again, pulling the stick back creates a downward force on the tail and an upward force on the propeller. As a result, the propeller has gyroscopic precession to the right. (Fig. 2)

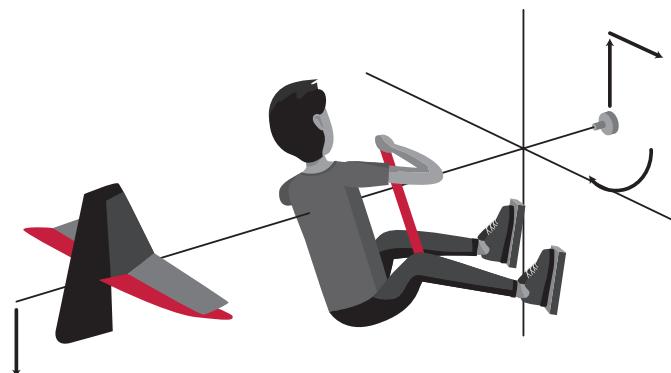
## Figure 1

When one pushes the control stick forward, the nose of the aircraft will be displaced toward the left: in other words it precesses toward the left.



## Figure 2

When one pulls back on the control stick, the nose of the aircraft displaces to the right; that is, it precesses to the right.



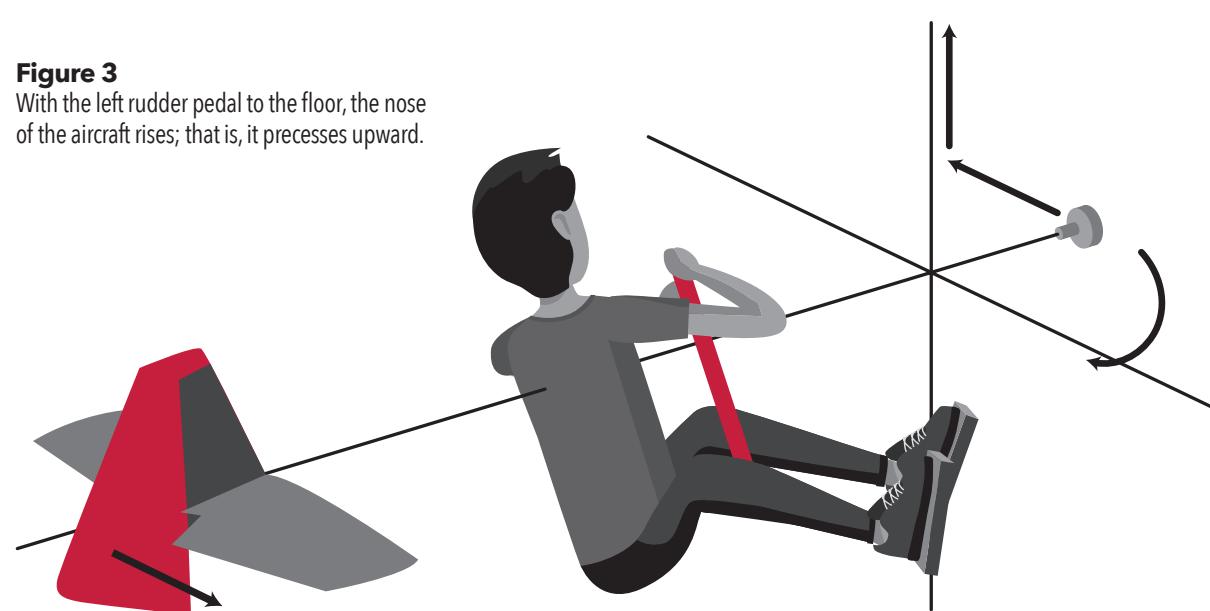
The same principle applies to left and right rudder pedals. Full left rudder pedal deflection (Fig. 3) causes the nose of the aircraft to rise, and full right pedal deflection causes the nose of the aircraft to go down. (Fig. 4)

Xavier de Lapparent goes into these concepts in detail in "The Aerobatic Four Minute Freestyle," published by Magic Voltige Publications in 1996. His illustrations of control inputs, angular momentum, and gyroscopic precession are excellent, and I recommend you study them.

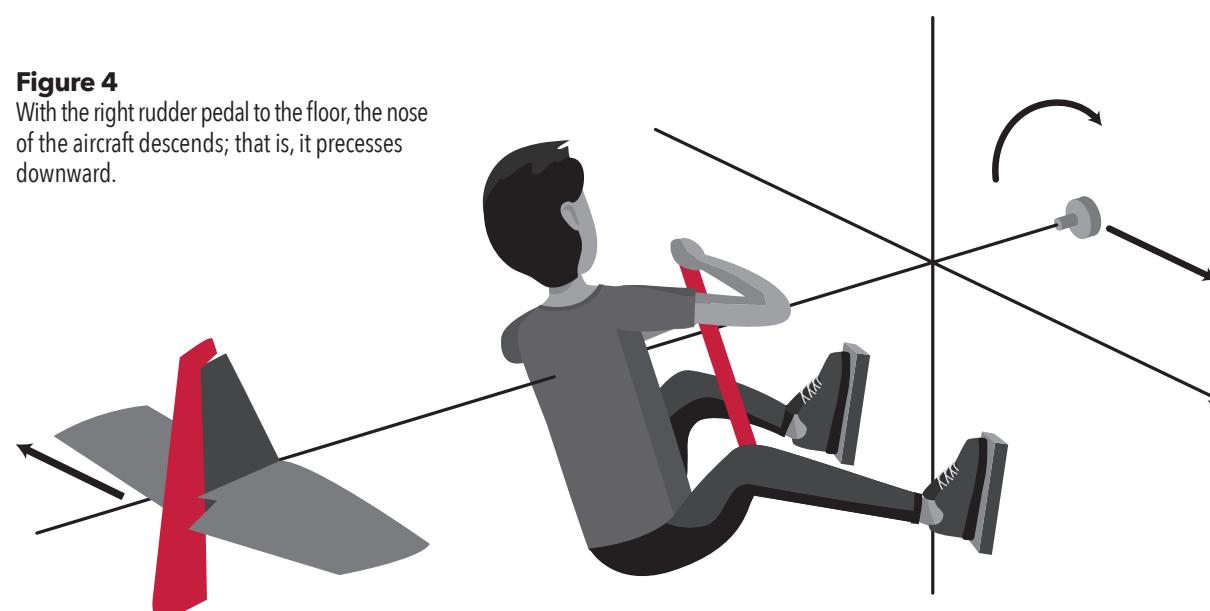
### PRACTICAL EXAMPLES

Enough of the physics lecture. Let's get back to aerobatics. Imagine you are flying along at a slow speed and high rpm; for approaching the high point of a shark's tooth or humpty bump. With your feet flat on the floor, you aggressively push or pull over, and what happens? Your plane yaws! The line down is not the same as the line up. Astute judges will notice the "error" unless you immediately apply appropriate rudder inputs in order to correct for the yaw induced by the rapid pitch changes of the elevator. (Fig. 5)

**Figure 3**  
With the left rudder pedal to the floor, the nose of the aircraft rises; that is, it precesses upward.



**Figure 4**  
With the right rudder pedal to the floor, the nose of the aircraft descends; that is, it precesses downward.



Anticipating that gyroscopic precession will happen, you can make appropriate control corrections. For example, you would anticipate reducing rpm or correcting rudder inputs before pitching starts (left rudder when pulling off a vertical line, right rudder when pushing off a vertical line).

Physics says this must happen. The key is that the airspeed is slow, rpm is high, and the vector force is powerful enough for gyroscopic precession to be noticed. If you have a metal two-bladed propeller, it is even more noticeable. To improve the accuracy of your figures, you need to anticipate the close interaction between pitch and yaw to avoid errors in the flight path.

Here is another example, but this time we are going to emphasize rudder input to see what happens to the pitch response. Assume you are entering a hammerhead. (Fig. 6) After establishing a vertical line, the airplane reaches its pivot point at zero airspeed and maximum rpm. Now give the airplane full left rudder but don't touch the stick. What happens?

The airplane pivots around toward the ground (yaw effect) but also comes over on its back because the torque of the prop is trying to roll the airplane left, and gyroscopic effects raise the nose of the aircraft. Remembering the right-hand rule, rapid left rudder input results in a movement by the clockwise-rotating propeller 90 degrees in advance and pitches the airplane up.

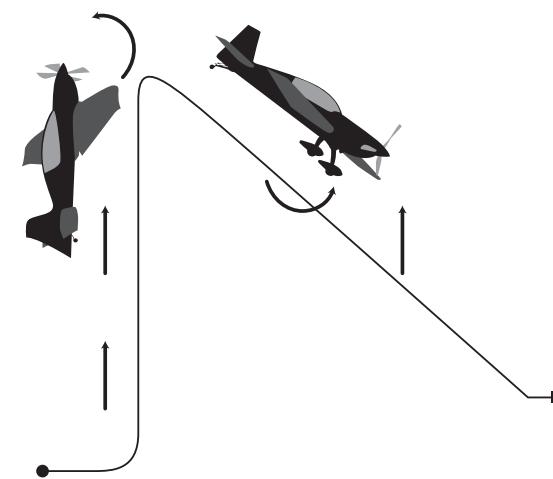
Left uncorrected, this could easily turn into an inverted power-on spin or spiral. Knowing what to anticipate, we correct the "pitch error" over the top by applying forward stick and using the right aileron to fly through the maneuver. In earlier years, some pilots spun into the ground inverted, particularly in the Pitts S-1, which is prone to torque and precession movements in a botched hammerhead. Remember the Beggs/Mueller way (power to idle, let go of the stick, and apply opposite rudder) to get out of an inverted spin.

The same principles apply to many other figures, particularly when the plane is subjected to high rpm and low airspeeds. Take an upright flat spin to the left. Left rudder input continues the spin, and back-stick with power applied causes the nose of the airplane to come up. By the same token, in an inverted right rudder flat spin, power and full forward elevator keep the spin flat, due to gyroscopic precession.

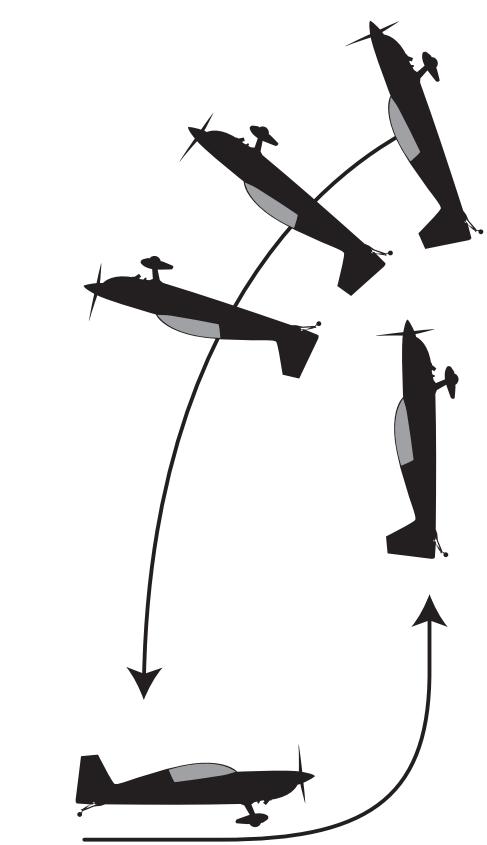
### ADVANCED MANEUVERS

Another example is a lomcovák. Obviously, this is not a competition maneuver, but it highlights the point about using gyroscopic precession to tumble an airplane. In the classic lomcovák, the pilot brings the plane to a climbing knife-edge trajectory, and then gives the plane full left rudder to align the fuselage perpendicular to the direction of flight while simultaneously applying full forward pitch to increase the yaw to the left and continue the forward tumble end over end. Gyroscopic precession drives this maneuver. (Fig. 7) It is very dynamic but hard on the crankshaft and propeller, and I would certainly not recommend the maneuver unless you have a three-bladed composite propeller and a capable aircraft. The three-bladed propeller has less mass than a two-bladed metal propeller and has less polar moment of inertia, so it is less likely to fail.

**Figure 5**  
Push over on shark's tooth maneuver at low speed causes yaw to the left.



**Figure 6**  
Left rudder at top of stall turn causes gyroscopic precession, so nose comes up as plane goes over on its back.

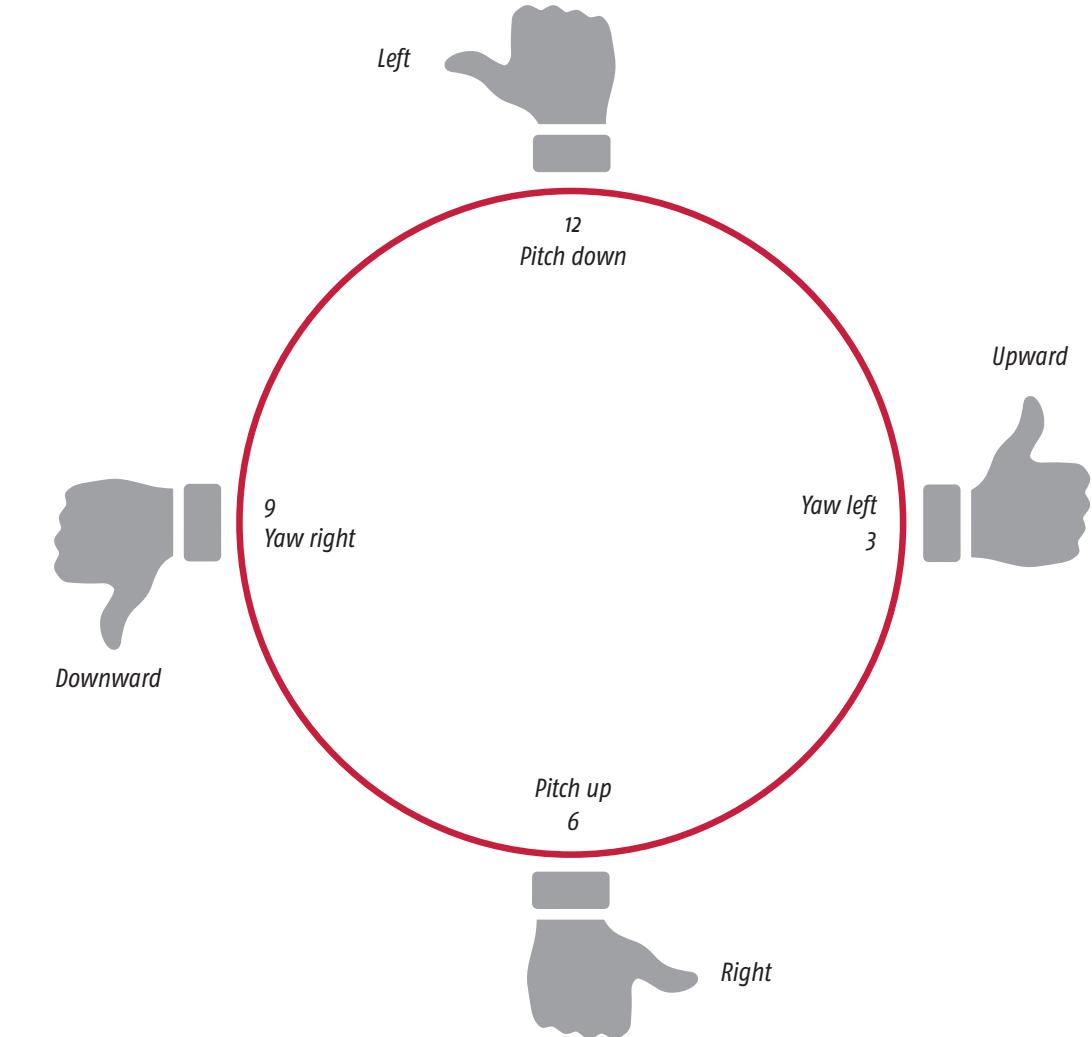
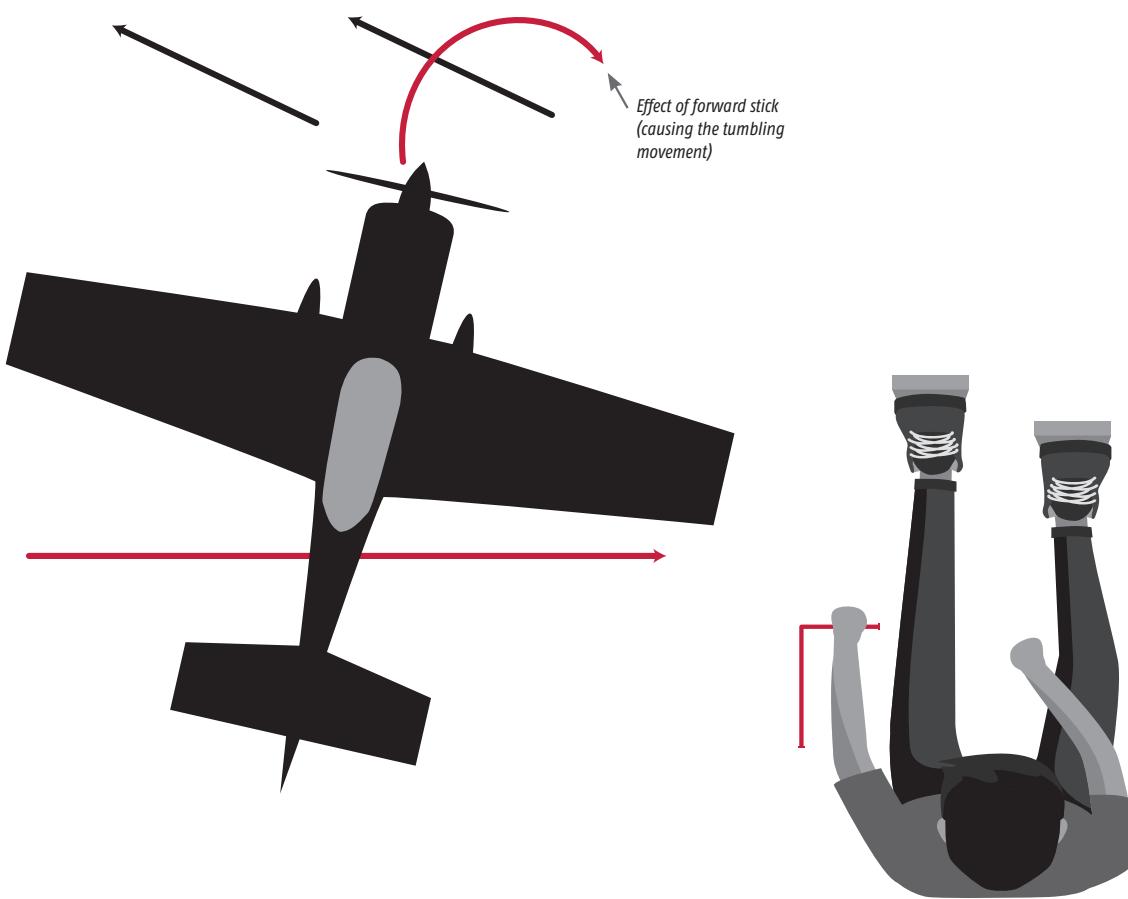


Notice that I have not mentioned gyroscopic precession with aileron movements. The angular momentum vector of the rotating propeller is parallel to the roll axis by the ailerons, so they do not provide any vector forces to the propeller. In other words, you can do competition rolls to your heart's desire without gyroscopic effect.

However, snap-rolls are a different creature, because momentary violent pushes or pulls on the stick and rudder bring gyroscopic precession into play. In my experience, positive snap-rolls (with the initial pitch aft) go quicker to the left because precession yaw to the right gives more effect with left rudder, while negative snap-rolls with rapid stick forward seem to go better to the right because of left yaw tendency and more bite with right rudder. However, I freely admit that I've become a little biased and leave it up to snap-roll experts to explain their methods.

Another way to look at gyroscopic forces is to visualize the rotating propeller from the cockpit as a clock face and apply the right-hand rule to the cardinal points. To reiterate, the palm and fingers of the hand represent the movement applied to the rotating propeller, and the outstretched thumb represents the resultant propeller movement. Precession occurs 90 degrees out of phase with force applied to the propeller. So forward movement at the 12 o'clock position causes gyroscopic precession to the left, forward movement at 6 o'clock produces precession to the right, forward movement on the 3 o'clock causes gyroscopic precession upward, and forward movement at 9 o'clock produces gyroscopic movement downward. (Fig. 8)

**Figure 7**  
Influence of gyroscopic reaction during a Lomcovák to the left.



**Figure 8**  
Direction of gyroscopic precession resulting from pitch and yaw movements, using the right-hand for a clockwise-rotating propeller (as seen from the cockpit).

In summary, gyroscopic precession can be either a help or a hindrance, depending on your aim of flying well-executed maneuvers. Study the physics of angular momentum and gyroscopic precession. Pay attention to high-power, low-speed maneuvers. Use of the elevator produces yaw changes, and use of the rudder produces pitch changes, even though pitch and yaw are typically thought of as a separate axis when flying aerobatics. In a sense, they are connected invisibly by the gyroscopic precession of a rapidly rotating propeller. **IAC**

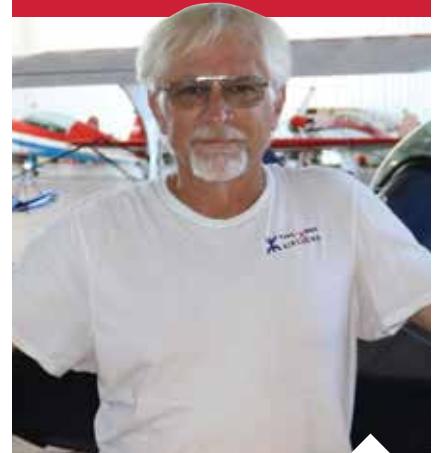
**Malcolm Pond is an Unlimited pilot**, flying an Edge 540 in Southern California. He is a retired cardiologist and previous U.S. National Aerobatic Champion in the Advanced category. He has contributed articles about the ABCs of g-tolerance and about vestibular dysfunction and the wobbles. He belongs to IAC Chapters 36 and 49. He gratefully acknowledges former NASA engineer and Unlimited category pilot Bob Meyer, IAC 3535, for his help and input in completing this article.

Some illustrations redrawn from de Lapparent's book *The Aerobatic Four Minute Freestyle*, Magic Voltige Publications 1996 and other diagrams obtained with permission from Alan Cassidy's book, *Better Aerobatics*, Freestyle Aviation 2003.

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# Frequent Flyer Award Created



## IAC Aerobatic Dedication and Lifetime

### Achievement Awards

BY BOB FREEMAN, IAC 8532

**OUR CLUB IS FULL** of incredible people who get involved because of our interest in cool airplanes, cool people, flying, and watching aerobatics. We spend a great deal of time on contest results and “the winners,” and so we tend to focus on who’s won various awards, who’s made the team, who did great at XYZ contest, etc.

To recognize our most consistently active competitors, I proposed, and the board approved, a new permanent trophy, which is documented in the *IAC Policy and Procedure Manual (P&P) 201*. Dave Watson, co-chair of the Achievement Awards committee, and I added a new style of achievement award to *P&P 201*. Now, in addition to the Aerobatic Proficiency Awards (Smooth and Star), we have the Aerobatic Dedication Awards. There are two types of Aerobatic Dedication Awards. One recognizes the most active pilot for a single year, and the other recognizes lifetime participation.

The IAC Contest Database at <https://iaccdb.iac.org> provides most of the data used to document participation levels from 2006 onward, but

that data will need to be expanded to capture pre-2006 participation for many pilots interested in the dedication awards. A form has been created to capture contest participation data for those who flew in contests prior to 2006. Any current IAC member can validate the substantiating data of a pilot wishing to record pre-2006 contests. The form will soon be available on the IAC website. Logbook entries, trophies, photos, score sheets, magazine articles, etc. can be used as proof of participation. Pilots who want to document their pre-2006 flying in pursuit of the annual or lifetime achievements are required to submit these forms.

#### AEROBATIC DEDICATION ACHIEVEMENT AWARD — AWARDED ANNUALLY: NAMES ADDED TO THE TROPHY WILL BE RETROACTIVE.

The name of the pilot who flew in the most contests each year will be added to a permanent trophy on display at the IAC pavilion in Oshkosh. This award recognizes pilots who have shown the most consistent dedication to our sport in a single season. The current record for the most contests flown in a single season is 11!

#### Most Active Single-Season Pilots From 2006 Through 2021

1.	11 Contests:	Sean Moran, 2021	Mikhael Ponso, 2010	Mark Steward, 2012	
2.	10 Contests:	Jim Bourke, 2015			
3.	9 Contests:	Todd Whitmer, 2006	Joe Haycraft, 2008	Charles Cohen, 2014	Jim Bourke, 2016
		Shaun Brautigan, 2017	Susan Bell, 2018	Vibeke Gaard, 2019	Jay Hansen, 2021

## Most Contests Per Season, 2006 Through 2021

2006	9, Todd Whitmer	8, Norm Dewitt	8, Vicki Cruse	
2007	7, Todd Whitmer	7, Paul Lopez	6, (five pilots tied)	
2008	9, Joe Haycraft	7, Steve Johnson	7, James Wells	7, Steve Packer
2009	8, Mikhael Ponso	7, Dale Evans	7, Steve Johnson	7, Andrea Luethi
2010	<b>11, Mikhael Ponso</b>	9, Ryan Waller	8, James Wells	8, Rafael Soldan
2011	8, Charles Cohen	8, Craig Gifford	7, Alain Aguayo	6, (six pilots tied)
2012	<b>11, Mark Steward</b>	9, Hella Comat	7, Francesco Pallozzi	7, Charles Cohen
2013	8, Bill Denton	8, Craig Gifford	8, John/Kathy Howell	7, Steve Johnson
2014	9, Charles Cohen	8, Stan Moye	7, James Wells	7, Marty Flournoy
2015	10, Jim Bourke	7, Charles Cohen	7, Marty Flournoy	7, Dave Watson
2016	9, Jim Bourke	7, Ron Schreck	7, Marty Flournoy	7, Tony Zorn
		7, Barrett Hines	7, Jerry Riedinger	
2017	9, Shaun Brautigan	8, Lawrence Macon	7, Vibeke Gaard	7, Sam Robinson
2018	9, Susan Bell	8, Vibeke Gaard	8, Antonio Davila	
2019	9, Vibeke Gaard	8, Brittanee Lincoln	7, Shaun Brautigan	7, Barrett Hines/ Dave Watson
	4, Doug Jenkins	3, (16 pilots tied)		
2021	<b>11, Sean Moran</b>	9, Jay Hansen	8, Jerry Esquenazi	

\*2020 saw a significant drop in the number of contests flown due to the coronavirus pandemic.

Appearance  
Maintenance

## FACTS, FIXES & TIPS

FROM THE PROS

### A VERY STICKY MATTER...

#### PARASITIC RESIDUE & AERODYNAMIC EFFICIENCY

Aerodynamic efficiency relies on the forces of lift and drag. A flat, waxed, solid wing surface forces faster moving air to flow uninterrupted, lessening air pressure, and facilitating lift. Physical disturbances on the surface create dangerous changes in airflow. Oxidation, corrosion, abrasion via scratches, dents, and pings exacerbate surface irregularities increasing drag resistance. One of the most confounding causes of drag is bug residue.



Bugs are ubiquitous. While small in mass, accumulating insects on aircraft wings can degrade aerodynamic performance. Regardless of location, time of year, or temperate zone, they are impossible to avoid at lower altitudes. When an insect explodes against the surface its exoskeleton cracks open releasing tacky blood or hemolymph. What's left is a messy splatter of sugars, fats, and proteins that harden throughout the flight making it increasingly difficult to remove. Highly acidic, bug guts left to decay attract bacteria and form a stronger bond with underlying surfaces.

While scientists and engineers have studied splatter patterns in efforts to develop coatings to minimize protein adhesion, truth is an airplane's leading edges or a helicopter's rotor blades are hard to protect. So parasitic deposits are best addressed in between maintenance polishes. Depending on your exterior surface, choose a powerful liquefier for pesky, baked-on insects. For painted surfaces, NUVITE's CitriCut® Concentrate and SS9-3 cover light to heavy-duty bug removal with great efficiency. Trust NUVITE's NuImage Cleaner & Debugger for bare metal.

### ALTERNATIVE TO DRYWASH IN WET CONDITIONS

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Don't let rainy season dampen drywash schedules. CitriCut® Xtra's powerful formula cuts through grime, cleans soil & stains, and leaves a hydrophobic barrier to protect and enhance the shine. Rain? No problem.

### PRO TIP!

LESS CAN BE MORE... Always refer to procedures and recommendations for use and equipment. A little bit of a high quality product will go a long way. NUVITE's NuShine® metal polish recommends just a few dabs. Too much will essentially act as a lubricant. Similarly, applying too much NuPower II® or NuPol® drywash on a painted surface will increase dry time and reduce productivity.

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**AEROBATIC DEDICATION LIFETIME ACHIEVEMENT AWARDS – AWARDED AT INCREMENTAL THRESHOLDS OVER TIME,**

The Lifetime Aerobatic Dedication Achievement Awards recognize pilots who have competed at defined levels in IAC-sanctioned contests over their aerobatic careers.

**LIFETIME ACHIEVEMENT LEVELS**

- Bronze ..... 50 Contests
- Silver ..... 70 Contests
- Gold ..... 90 Contests
- Platinum ..... 110 Contests
- Platinum - Elite ..... 130 Contests
- Platinum - Double Elite ..... 150 Contests
- Etc. ..... +20 Contest Increments



Pilots can request stickers and certificates as each level is attained based on the total number of contests documented on the Pre-2006 Participation Form and the IACCDB.

Here is a summary of the top 10 most active pilots over the past 15 years. Wow, that is a lot of flying! Our most active pilot over the past 15 years is Marty Flournoy with a whopping 79 contests! He is a frequent U.S. Advanced Aerobatic Team pilot, international and national judge, and IAC director.

<b>1.</b> Marty Flournoy.....	79	<b>6.</b> Stanley Moye .....	66
<b>2.</b> Barret Hines.....	72	<b>7.</b> Mike Forney.....	63
<b>3.</b> Dave Watson .....	71	<b>8.</b> Jerry Riedinger .....	60
<b>4.</b> (tie) Steve Johnson.....	69	<b>9.</b> Howard Kirker .....	57
<b>5.</b> (tie) Mike Eggen .....	69	<b>10.</b> James Wells .....	55



These numbers will be easily eclipsed once the pre-2006 database is built. Already, several pilots have unofficially logged well over 100 contests. It will be interesting to see who the most active IAC pilot of all time turns out to be once the database includes the pre-2006 participation figures.

It's not surprising to see a strong correlation between our most active pilots and some of our most successful pilots. The most active pilot each year will receive recognition stickers for their airplane and have their name included on the permanent trophy. **IAC**





## Game Composites

### GB1 GameBird



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- Range over 1.000 NM
- Garmin G3x, ADS-B "In"/"Out"
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- Unlimited Aerobatic performance

# The Wing's the Thing – A Pitts Wing Project

## Technical Tips

BY JOHN OSTMEYER, IAC 22969

**IN TODAY'S WORLD, WHERE** new Extras cost almost \$600,000, it can be tough to compete in the upper levels of IAC competition, but there is a way. For a mere fraction of the cost of the plastic wonder jobs, I used sweat equity to build up a great little Pitts that has proven itself more than capable of flying Advanced.

Like many of you, I flew RC airplanes as a teenager, and that's when I first learned of the International Aerobatic Club. My introduction came when our chapter hosted a competition and a representative of the local IAC chapter came to speak to us at a club meeting. I was immediately drawn to this and decided I wanted to compete.

Fast-forward many years, and in 2005 I was finally able to buy my first airplane, a factory-built S-1S. I flew that in Sportsman for two years before trading it in for

an S-1T. I was very fortunate to find a kit built T. In the '80s, the Pitts factory offered most of its airplanes in kit form. The fuselage and wings were built in the factory using their jigs. From what I can tell, you hung the engine and did the plumbing, wiring, covering, and painting – and that's about it. The nice thing about this is the airplane is now registered as an experimental/amateur-built aircraft, which offers some benefits if you plan on upgrading the airplane as you go. You can change engines, propellers, wings, and what-not while requiring much less FAA paperwork. Another benefit is that, as an A&P mechanic myself, I am able to do my own condition inspections.



"I was able to finish the ribs in less than five months."



Drilling cabane holes in the upper spar.



PHOTOGRAPHY BY JOHN OSTMEYER



Upper wing spars.



Leading edge and scarf joint.



Lower wing under construction.

I flew this airplane in its stock form in Intermediate and Advanced for a few years, finishing third in Intermediate in 2009 and even qualifying for the 2014 U.S. Advanced Aerobatic Team. But like most Americans, I'm a hot-rodder at heart, and the urge to modify and upgrade the airplane became overwhelming. I had long wanted to try my hand at a large project, and one night the opportunity presented itself. While browsing The Biplane Forum, I found a Wolf Wing rib kit advertised for sale and couldn't resist the temptation to build something great. In the recent past, I had flown Pitts aircraft with both the Raven and Wolf wings, and the difference in performance was amazing. I figured with a little bit of work I would have an airplane that would be much more competitive in Advanced. So I wrote a check and was off and running.

I was planning to have my dad help me with this project, as he was an award-winning scale-RC modeler. If you've ever seen anything he built, you know that his attention to detail was second to none. Unfortunately, just as I started this project, we lost him, so I was forced to go on without him. To this day I wonder how much faster and how much better the wings would have turned out with his help.

When I began to build, I figured it would take me about a year and half to two years to complete the wings. A good friend who had

recently restored a Monocoupe laughed at this and told me to take my estimated cost and time and triple it, and he was just about right on the mark.

I began by building up the ribs, which is a great place to start. It allows you to get in the swing of things and see some progress right away, which is always a good motivator. The Wolf Wing kit came with excellent rib jigs that made the process fairly easy, and I quickly found that I really enjoyed my time in the workshop. I was building about two ribs a day—an enjoyable pace that still led to good progress. When I tried to build three, my attention would start to wander about halfway through the third. But even at this slow pace—and with a job that took me around the world flying Boeing 747s—I was able to finish up the



Sliding ribs on lower wing.

ribs in less than five months. I remember stacking them up for a photo and being amazed that I had actually accomplished this.

Around this time I met Specialty Aero's Tony Horvath, the man behind the Wolf Wing kit. Over the course of the next few years we exchanged phone calls and emails, and we became friends as he talked me off more than one ledge after I'd thought I had really screwed something up. When I completed the rib kit, I called Tony for the spar kit, and a couple of weeks later it showed up. The spruce spars were beautiful. They were already milled to the correct dimensions, and most of the holes had been predrilled via a CNC router. The level of work was outstanding, and it saved me countless hours of shaping and drilling.



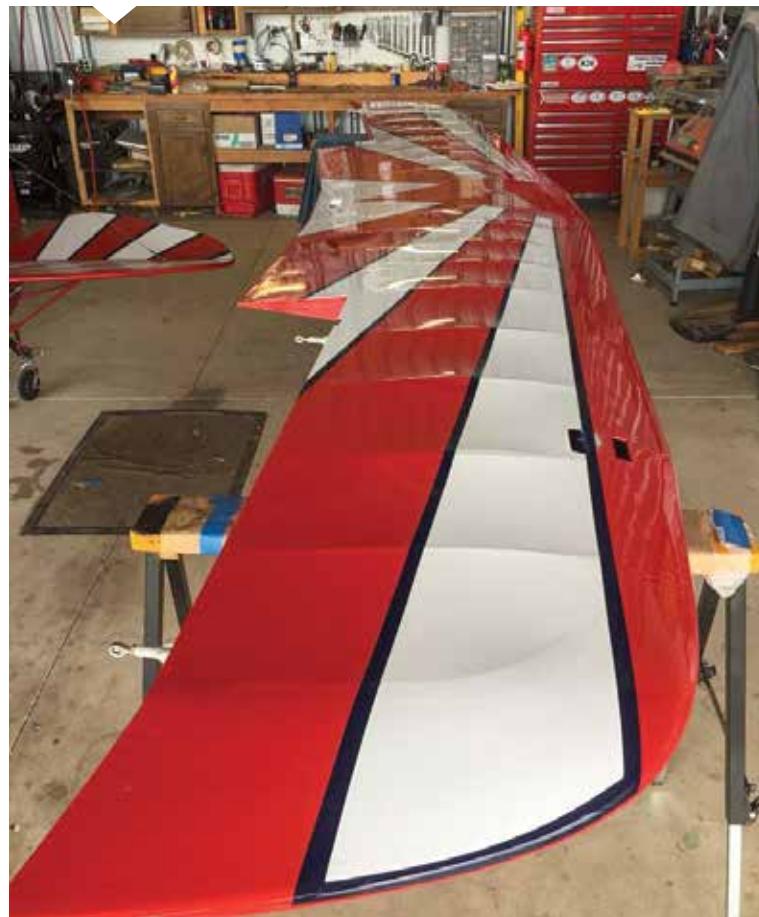
Gluing lower wing leading edges with the help of friends.



Ready for covering.



Lower wing in fabric.



Freshly painted wings.



At my airport, we have a very active VAA chapter that had recently built its own hangar, and they graciously allowed me to rent space so I could build the lower wings that winter. This gave me a heated hangar to work in and much more space in which to lay everything out. I would show up, turn the heat on, choose an old air show from their extensive VHS collection, and go to work. It made for a great workspace.

With surprisingly little effort, the ribs were slid onto the spars and the compression ribs were glued into place. The spars' drag/anti-drag wire holes were among the few holes that were not predrilled, and this became the first truly stressful part of the project. I built up a fixture to make sure the hole would line up when I was done, measured about a dozen times, and went to work with a drill. When I was done, I was extremely relieved to find that everything had come out okay. After the drama of drilling those holes, the rest of the lower wings went together surprising easily.

About this time, I got lucky again. While looking through Barnstormers late one night, I found a pre-owned but never used Whirlwind propeller for a really good price. I sent him a check almost immediately, not even bothering to haggle. This greatly improved the low-end performance of the airplane (though I did lose about 5 mph at the top end) while taking 10 pounds or so off the front of the airplane — something a T can really use.

Sometimes it's better to build your competition aircraft or improve what's already in your hangar than to get into a high-priced aircraft you can't really afford. Building up my Pitts S-1 with some sweat equity gave me a feeling of accomplishment and the added benefit of some great deals and a new friendship. **IAC**

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**John** flew his first contest in a borrowed Citabria with no inverted system. He currently flies his Pitts S-1T in the Advanced category. In 2018, he flew at the U.S. Nationals with the Pitts and became the U.S. National Advanced Aerobatic Champion. John is currently serving a term as an IAC director for the Northeast Region. He is a national judge and coaches aerobatic competitors. When not flying his Pitts, John flies a Boeing 747 for Atlas Air Cargo.



2018 Nationals Advanced Aerobatic Champion.

# G-Force Training and the Aerobatic Pilot, Part 2

**Human Factors**

BY JEFF GRANGER, IAC 19907

**IN PART 1** of this series on “G-force Training and the Aerobatic Pilot,” I shared an experience from June 2003 when I almost blacked out while flying the Rice Lake, Wisconsin, contest in my Extra 200.

Walking through the Unknown on the ground, it seemed to be a straightforward sequence and well within the capability of the four-cylinder monoplane, so long as I started with adequate altitude. So why was I close to a blackout? The culprit was the “unknown unknown” effect. In the Unknown sequence I was flying, I had not been prepared for a figure with a high positive g followed by a figure with a high negative g — a combination of figures I had never flown before in Unknown sequences.

Both competitors and recreational flyers would benefit from a regular comprehensive review of the effects of g-loads in aerobatic flight. In this article, we will read about the experiences of three pilots — Pawel Miko, Matthew Dunfee, and A.J. Wilder — with g-forces from the Sportsman, Advanced, and Unlimited levels.

I recall some years ago being at the IAC Chapter 61 contest in Salem, Illinois. An aeromedical researcher from the U.S. Air Force came by and interviewed our competitors. He was involved in g-force training for the military and was intrigued that civilian aerobatic pilots were pulling very high levels of g-force (albeit for very short periods of time) without much formal training. I never saw published conclusions from his work, but his concerns stuck with me.

**AEROBATIC FLYERS ARE AT RISK OF GRAYOUT OR BLACKOUT, ESPECIALLY WITH THE “PUSH-PULL” MANEUVERS IN THE HIGHER CATEGORIES.**



## POSITIVE G-LOAD

The pilot's face is pale and skin sags during the “pull.”

## NEGATIVE G-LOAD

The pilot's face is flushed and neck veins are distended as the “push” forces blood into the upper body.

Military pilots get comprehensive classroom instruction on g-force physiology, centrifuge training, and then training with skilled instructors in their aircraft. The civilian aerobatic pilot’s training tends to be irregular and inconsistent. Most pilots, I suspect, read articles like this, study textbooks, and train with instructors who don’t have a defined curriculum. They also pick up techniques by word of mouth at contests and training camps.

An official government source is the FAA Advisory Circular 91-61 from 1984 titled “A Hazard in Aerobatics: Effects of G-Forces on Pilots.” This is absolutely required reading for anyone doing aerobatics. The circular covers the history of g-force and outlines the physiological effects. It defines the three-axis notation system for g-force on the human body. Of course, the one that we’re concerned with is from the head to the foot: the gz axis. It covers the symptoms of positive and negative gz.

Once again, the accompanying sidebar interviews from Pawel, Matthew, and A.J. confirmed what I had expected: that our civilian aerobatic pilots and competitors are learning to compensate for the g-loads with a variety of educational materials and inconsistent instruction. Most learned by word of mouth at contests or training camps. Almost all have had a close call during training or competition, usually after cycling quickly between

negative and positive g. The similarity of their descriptions is what was most striking.

Aerobatic flyers are at risk of grayout or blackout, especially with the “push-pull” maneuvers in the higher categories. We have an obligation to read textbooks, magazine articles, etc., and teach ourselves the relevant cardiovascular physiology and correct anti-g straining maneuver (AGSM).

A final word about g’s. The most consistent points made by all of our interviewees regarding g-forces are:

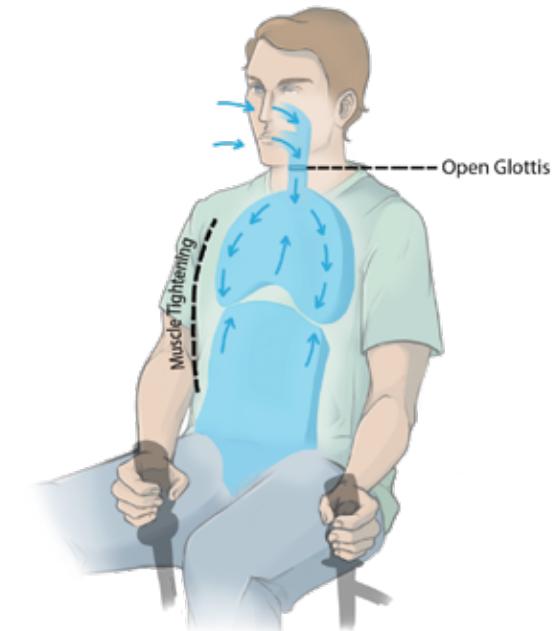
- Understand what is going on with the aircraft. Get good core aerobatic instruction, especially regarding upset recovery and spins.
- Use weight training to increase your g-tolerance. You can incorporate and practice the AGSM technique during weightlifting.
- Pay close attention to the sequence and identify potential high-g maneuvers before getting in the airplane. Make a note of the minimum break-off altitude on your sequence card.
- Develop a training routine to become physically and mentally safe.
- Go out with an experienced aerobatic instructor — see what your g-limits are at an altitude that will give you plenty of excess room for recovery.

When you’re at the contest site, be sure to pace yourself. Manage stress, stay hydrated, and walk your sequence, paying attention to the forces your body will go through as you do each maneuver.

Aerobatic pilots should maintain overall physical fitness as well as hydration during training camps and contests in order to prepare early and rigorously for the contest season. And they need to constantly monitor their response to the g-force effects. One should build up g-load gradually while being aware of the warning signs of decreasing blood flow to the brain, and then unload promptly when needed.

We in the IAC need to mentor our fellows in the lower categories so they can be prepared for g-force effects they’ll encounter as they move up in skill and category.

Fly safe ... **IAC**



## AIR FORCE CENTRIFUGE TRAINING

The pilot does the AGSM breathing in and out rapidly with the exhalation against pursed lips.

# G-Forces – Interviews

BY PAWEŁ MIKO, IAC 437539; MATTHEW DUNFEE, IAC 435623; AND A.J. WILDER, IAC 434702

## Sportsman – Paweł Miko

Paweł Miko has been flying aerobatics since 2014. He was flying a Great Lakes biplane in Sportsman and is currently transitioning to Intermediate in a Yak-52 and a Panzl. He is a member of the U.S. Yak-52 team. He teaches aerobatics in San Diego.

I was subjected to g-forces on my first aerobatic flight back in college. They never bothered me a bit. In fact, I've always found positive g comforting. I found a lack of g much more of a concern, so I liked loops and turns but didn't enjoy verticals. Several years ago, the Sportsman sequence contained a "goldfish" figure. The 45-push followed by a three-quarter loop would have me "seeing stars" every time. I was straining, but it wasn't helping. A friend (an F/A-18 pilot) finally told me I was straining too late, which is worse than not straining at all. He also gave me some tips on how to strain. I no longer gray out during the "goldfish."

Do a slow buildup after a break from flying. I was away from flying for almost a year during a military deployment. On my first flight back, I would gray out in simple 3g pulls. I took it easy and built up some tolerance over several flights. One of the things that mystifies me is how the body builds up tolerance. None of the articles explains that at all.

I don't do any specific physical exercises to train for g's. I'm on a strict pizza and taco diet.

My close call came while flying a Yak-52 in Sportsman. In the middle of the flight, the chief judge accidentally talked on the radio, which distracted me. The figure had a 2 of 4 on the second down 45. He started talking right as I was about to roll, and I didn't pause on the 2 of 4. No big deal. The judges had me repeat just that figure.

There was some additional confusion as I entered the box for the refly, and my emotions got the best of me. I said, "I'm going to show you guys the biggest, fastest goldfish you've ever seen." I dove to V<sub>NE</sub>, pulled directly to 7g, and "went to sleep." A funny thing happens. You can still hear things, but you can't see anything.

I have no idea what I did for the rest of the figure or when I woke up. I knew enough to be comfortable that I would wake up — I just

needed to breathe and give it time. I was kicking myself all the way back to the airport for screwing up a figure for no good reason at all. That should have been a 10, given all the time in the world to fly it.

When the scores came out, I realized that I'd flown the entire figure, including the 2 of 4. Scored 8.5. I will never know how. I didn't win the contest, but I did receive the Biggest Goldfish Award at the banquet. It was a bag of Goldfish snacks. I still have it in my hangar to remind me not to be stupid.

I would tell new competitors to go high and practice. See what your g-limits are. Experience grayout, or even blackout — preferably with a safety pilot. Articles mention several different straining techniques: You can tighten your neck, your abdomen, or your buttocks/thighs. Find what works best for you. Most importantly, you'll want to work on the *timing* of the straining. Finally, all of Primary, Sportsman, and Intermediate can be flown under 4g. More g is not necessarily better.



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**Advanced – Matthew Dunfee**

Matthew Dunfee is a senior test pilot for General Atomics Aeronautical Systems. He is an ATP/CFII-rated pilot with over 5,000 hours' flight-testing the MQ-1 Predator, MQ-9 Reaper, and MQ-20 Avenger series of aircraft. Matthew began his aerobatic journey 11 years ago, renting a Decathlon in the Primary category. He currently flies an Extra 330SC in the Advanced category and is the 2021 U.S. National Advanced Aerobic Champion.

I took an introduction to aerobatics flight in 2011 and was immediately hooked. At the recommendation of my instructor, I did my first Primary contest that same year. My early flights were in a Decathlon with a fixed-pitch prop. That limited the intensity and duration of g-force. I was 30 at the time and in good physical shape. The g-force was unpleasant at first, and I had some nausea, but I was having so much fun that I just pushed through it as the cost of doing business. My instructor did a good job of briefing me on what to expect.

I'd originally intended to compete in a Pitts through Sportsman, but it was down for maintenance at the time. I immediately jumped to the Extra 300. The increase in g-force and physicality was eye-opening. I realized I would have to give consideration to the accelerations I was putting my body through in competition.

I did some reading on military pilots and g-force straining techniques. However, the most helpful advice came from fellow competitors. One advantage I had climbing through the IAC ranks was being able to talk with pilots flying in the higher categories and benefit from their experience. It was tremendously helpful to have discussions with Advanced and Unlimited pilots while I was still working my way up through Sportsman.

The most important thing you can do to prepare yourself for g-tolerance happens before you strap into your aircraft. You should be

well rested and well hydrated. Too often we focus on what we do in the cockpit, but the time spent in preparation is just as important.

During aerobatic competition we experience high peak g-forces, but they are relatively short in duration. It's important to strain before you initiate a hard pull. If you wait to execute a strain maneuver until you are in a hard pull, you've already lost. I have found taking deep breaths while straining my stomach and thighs is the most effective way to prepare for a high-g figure. If you have repeated pulls in rapid succession, it's important to focus on continuously breathing. This seems obvious; however, I have noticed, particularly during extended negative g figures, that I tend to slow my breathing rate.

I developed a personal training program to help me reacclimate myself for aerobatic flight. The following list outlines what I consider the minimum preparation for getting myself ready for a contest. I would encourage everyone to develop their own training regimen based on their individual needs.



PHOTOGRAPH BY GARY SHENAMAN



<b>Day 1</b> – 2 x 15 minute flights	<b>Flight 1</b> – Fly old Sportsman sequences as Unknowns after warming up with basic figures, such as slow rolls and hammerheads.	<b>Flight 2</b> – Begin to work in some Intermediate and Advanced figures. I avoid snap-rolls and all pushes.
<b>Day 2</b> – 2 x 20-minute flights	<b>Flight 1</b> – On the first flight I reintroduce snap-rolls and practice the Known program in pieces.	<b>Flight 2</b> – I fly my Free program and spend any additional time working on snap-rolls that did not go well during my first flight.
<b>Day 3</b> – 2 x 20-minute flights	<b>Flight 1</b> – Introduce negative g figures and practice my Free program on the first flight.	<b>Flight 2</b> – If everything is coming together, I will fly the Known program in its entirety on the second flight. Any remaining time will be spent on inverted flight figures.
<b>Day 4</b> – 2 x 20-minute flights	<b>Flight 1</b> – Fly the Known and Free in their entirety.	<b>Flight 2</b> – Practice Unknown figures and clean up any items I'd like to address prior to departing for the contest.

I was very fortunate to experience the effects of blackout early in my aerobatic career. My first experience with the effects of G-LOC occurred while attending an aerobatic camp in Borrego Springs, California. I had been outside in the sun all day helping a fellow camp member repair their aircraft. I then jumped directly into the Extra 300 for my third and final practice flight. Nearing the end of my flight, I began to get tunnel vision during my pulls to vertical. I continued the flight, and on the very next pull I lost my vision completely, but I could still hear my coach's voice clearly. I concentrated on breathing, and my vision was quickly restored. To my surprise, I found myself on an excellent upline. I completed the figure, spoke with my coach, and returned safely to the ground. I cannot stress how important it was for me to receive this lesson early in my career. I often practice in Las Vegas in temperatures over 100 degrees at high-density altitude.

I got a lot of good advice from experienced competitors when I started, and I would pass the same advice on to new competitors. A contest is a marathon. You must manage yourself the same as you do your airplane. Protect your body. Don't stay up late. Limit your alcohol consumption.

Manage your stress levels and stay hydrated. Preflight your plane early while it's still cool. Take a few minutes to yourself. Accomplish your preflight and walk through your sequence without interruption. Making smart decisions will allow a competitor to execute contest flights at their maximum potential.

As you move up in the categories, look through the Unknown sequences and pay special attention to extended inverted flight followed by a hard pull. Make sure you've walked this part of your program and thought about the forces your body will go through so it is second nature while you are flying. This will help ensure you don't get caught off guard by a potential sleeper figure.



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Our partners:



## Unlimited – A.J. Wilder

A.J. Wilder is an architect with ATP/CFI single-engine, multiengine, helicopter, and glider ratings. He has competed since 2010 and currently flies an Extra 330SC in Unlimited. He has been on the U.S. Advanced and Unlimited teams.

I had an intro flight and Upset Prevention Recovery Training course approximately 10 years ago in a Citabria. Even those limited g's felt heavy at first, but they weren't much compared to what I'm doing now. On the early flights, I had a lot of nausea and had to lie on the ground afterward. But I was highly motivated to continue, and after 15 to 20 flights, it started to get better. I had become bored with everyday flying and wanted to do something more than push buttons.

I did no reading on my own at first. I would just hang out with people in Advanced and Unlimited and ask them, "What do you do? How do you deal with it?"

I learned the military pilot's "grunt" technique. I found it was very important to have strong calves, and I learned to tighten my calves instead of my stomach. I learned to relax during the negative g's. Straining while inverted doesn't help at all. Surprisingly, yelling and screaming helps. Just don't hold your breath. I keep my g-tolerance up during the off-season by:

1. hanging upside down in inversion boots about three times a week while reading
2. doing heavy weightlifting with particular emphasis on the calf muscles
3. doing neck-strength exercises



At least for me, it's important to avoid carbohydrates and sugar, to maintain hydration, and to get as lean as one can be. Every pound of excess body weight is multiplied by the g-load.

I've had two close calls. The first time I'd had a stomach virus but thought I had recovered. The sequence included an inverted spin into a P-loop, and I grayed out on the way up. I could faintly hear the engine but felt asleep. My hearing came back first. When my vision came back, I was confused and flew back into the box inverted. I realized then I clearly needed to land. I came down and got rehydrated. I scratched that flight and did not do the second flight that day. I was able to fly the next day after further hydrating.

The second time was during a double humpty with layout inverted. On the second pull of the figure, I failed to tighten up in time. By the time I was on the inverted layout I was grayed out. Grayout on a "push-pull" is very risky if you don't finish on an upline. The take-home lesson is that if you are not "prepping inverted" with a g-straining maneuver, by the time you are on the second figure of the "push-pull" it's too late.

In civilian aerobatics we don't have access to centrifuge training like they do in the military, so when starting out, you should fly with someone in a high-performance, two-place aerobatic plane. Preferably an instructor or an experienced competitor. Have them pull some g's progressively and demonstrate the g's that will put you to sleep. Don't start training solo until you have gained experience, know what your tolerance is, and have felt the cautionary sensations. If you try to do this all alone, you are risking an unexpected and possibly catastrophic loss of consciousness. **IACF**



## 2022 IAC CONTEST SEASON CALENDAR



[► IAC.org/Contests](http://IAC.org/Contests)

DATES	HOST CHAPTER	NAME	REGION	LOCATION	AIRPORT
Aug. 12, 2022	52	Kathy Jaffe Challenge	Northeast	Bayville, NJ	KMJX
Aug. 13, 2022	78	Doug Yost Challenge	Mid-America	Spencer, IA	KSPW
Aug. 19, 2022	12	Ben Lowell Aerial Confrontation	South Central	Sterling, CO	KSTK
Aug. 20, 2022	137	Central Canada Aerobatic Championships	International	Steinbach, MB	CJB3
Aug. 27, 2022	134	Yooper Looper	Mid-America	Sawyer, MI	KSAW
Sep. 3, 2022	26	Redlands Aerobic Cup	Southwest	Redlands, CA	KREI
Sep. 3, 2022	137	Canadian National West	International	Rodey Mountain House, AB	CYRM
Sep. 9, 2022	67	Apple Turnover	Northwest	Ephrata, WA	KEPH
Sep. 16, 2022	107	Hammers Over Hondo	South Central	Hondo, TX	KHDO
Sep. 17, 2022	137	Canadian National East	International	Midland, ON	CYEE



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