



SPORT

# AEROBATICS

OFFICIAL MAGAZINE OF THE INTERNATIONAL AEROBATIC CLUB

MARCH/APRIL 2023

► SAFETY SERIES – PAGE 8  
*Before, During, and After Aerobatics*

► SYMMETRY – PAGE 24  
*Fulfillment of a Midwing Obsession*

► AURA AERO – PAGE 34  
*Goddess of the Air*



ANNUAL  
**SAFETY ISSUE**

# Fly In, Drive In, Bike In, or Walk In.

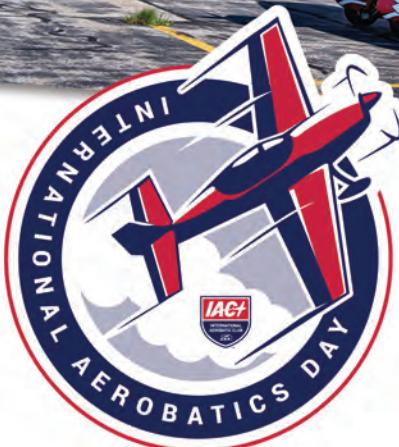


## INTERNATIONAL AEROBATICS DAY

**Saturday, June 24, 2023**

Find a schedule of events at [iac.org](http://iac.org)

Celebrate the excitement, skill and beauty of aerobatics. IAC chapters are hosting a multitude of events to share the passion of sport aerobatics. We look forward to seeing you there!



# CONTENTS



## FEATURES

24

### SYMMETRY THE FULFILLMENT OF A MIDWING OBSESSION

by Doug McKinney, IAC 14516

34

### AURA AERO GODDESS OF THE AIR AND ECO-EFFICIENT

by Lorrie Penner, IAC 431036, with Jacques Rocca, AURA AERO Communication Advisor



## DEPARTMENTS

### 2 PRESIDENT'S PAGE

by Jim Bourke, IAC 434151

### 4 EDITOR'S LOG

by Lorrie Penner, IAC 431036

### 6 LINES & ANGLES

by Dave Watson, IAC Achievement Award Chair

### 7 PROGRAMS AND COMMITTEES

by Dave Watson, IAC Achievement Award Chair

### 8 SAFETY SERIES: MAKE A PLAN

by John Morrissey, IAC 3238

### 14 SAFETY SERIES: HOW LOW CAN I GO?

by Allen Silver, IAC 431160

### 16 SAFETY SERIES: ANTICIPATION

by Tom Myers, IAC 16830

### 20 SAFETY SERIES: HOW TO CONDUCT AN EFFECTIVE DEBRIEF

by Doug Jenkins, IAC 436255

### 44 JUDGES' CORNER

by DJ Molny, IAC 25097

### 48 FLYMART

## COVER

### ON THE COVER:

This four-ship formation photo was taken after the 1989 U.S. Nationals. Clint McHenry is first in line in his Extra 300; next is Jurgis Kairys/USSR in the Sukhoi Su-26. Second from the top is Patty Wagstaff in her Extra 230, and at the top is Lyubov Nemkova/USSR.

Photography by Jim Campbell

### ABOVE:

The INTEGRAL R from AURA AERO is a two-place, side-by-side aerobatic training aircraft.

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# Safety and Rulebook Changes

BY JIM BOURKE, IAC 434151



**THIS IS OUR ANNUAL** safety-themed issue of *Sport Aerobatics*. In the middle of all the fun we have flying aerobatic airplanes, it's good to be reminded once in a while that we are operating in a high-risk environment.

## Safety Checks

Our rulebook has a section called Safety Checks that explains what competitors are allowed to do before entering the box. Things have been simplified a bit for 2023.

Pilots are now allowed to perform any number of half-rolls to inverted and back to upright, with pushes and pulls as needed, to ensure their harness is tight and effective. Previously, the IAC allowed only one of these exercises. During debate on this issue some pointed out that allowing any number of these inverted excursions could slow down the contest. If we see pilots abusing this allowance, we could always implement a "delay of game" penalty or impose an overall time limit for the performance. Let's see how it goes.

Pilots in the Advanced and Unlimited categories are also allowed to select from a list of 10 allowable aerobatic figures they can perform before commencing their sequence. If the competitor chooses to do this, they simply wait until they are cleared into the box and then they perform their safety figure without signaling (aka "wagging in"). After that they leave the box and set up for their performance.

## Tech Inspection Process and Forms

A big change for contests in 2023 is that the old tech inspection form has gone away. It's being replaced by two new forms: Pilot Document Review and Aircraft Review.

The Pilot Document Review Form should be filled out and witnessed by a volunteer who is responsible for visually confirming that the pilot has all their required documentation to fly their aircraft, including a pilot certificate, medical certificate, and proof of insurance. Note that the form does not have to be filled out by the registrar specifically; it just must be witnessed and turned in.

Meanwhile, the new Aircraft Review Form is used to document that the competitor's aircraft has been thoroughly inspected before operating in the aerobatic box. Again, this form must be witnessed, but it is no longer necessary that this witness be a member of the technical committee. Note that this form must be filled out per pilot, not per aircraft, meaning that pilots sharing an aircraft will each have to fill out their own forms. While this might seem tedious when 10 people share one aircraft, we don't want one pilot liable for what the other nine competitors are about to do.

Another new provision is that pilots are now expected to preflight their aircraft before every competition flight, with the starter responsible for verbally confirming this has been carried out by the pilot. There is no documentation to this step, just the honor system and some good common sense.

The overall idea here is that we are making it clearer now than before that pilot competitors are responsible for their aircraft. Our new practice should streamline the process of registration and should better place liability where it belongs: on the person operating the aircraft.

## Chief Judges and Safety

When I first chief judged a contest I got some mentoring from Tom Myers, who has been in the sport for a long time. He said, "The most important job of the chief judge is to make sure there is never more than one aircraft in the box at a time." That's good advice and apropos for our safety-themed issue! Keep your eyes peeled, chief judges!

Dave Watson also offered some advice: "If you ever need to tell a pilot to take a break, don't just say 'break' or 'break break break.' Keep

saying ‘break’ as many times as it takes until you see the pilot break, and then provide instructions.” When pilots are occupied, they might not hear the first “break” command or may not know what to do with it, and once they’ve taken a break, the first thing they are going to ask is “What now?” Whenever I brief competitors at a camp or practice, I tell them that I will keep saying “break” until I see them in straight and level flight and then they can expect further instructions.

Another quick safety thought is about noncompetition aircraft traversing the box. This is impossible to prevent for a couple of reasons: 1) It’s obvious that only a small percentage of pilots check NOTAMs, and 2) even the pilots who do check NOTAMs are probably only checking it at their point of arrival, not all the airports they intend to fly over. Remember, it is *far more important* to communicate with the aerobatic pilot than with the transient pilot. If you have two aircraft in the box, focus on the one that is doing the *whifferdills* and *whirligigs*.

Lastly, let’s talk about mechanical failures. There isn’t a lot you can do from the ground if a pilot is in trouble. If a pilot has a mechanical problem, there are basically two options: climb

or land. We climb if we can’t make a safe landing; otherwise, we put the airplane back on the ground. If we aren’t sure which is the safest approach, we climb. If the pilot needs to climb, they might as well climb to 10,000 feet. If you see a pilot struggling with their decision-making in an emergency, encourage them in the calmest way possible to pick between one of those two options. What you don’t want to see is someone hanging out at 1,000 feet AGL playing with a stuck control or trying to sort out an engine issue. Try not to distract an overwhelmed pilot with lots of words.

### Wrap-Up

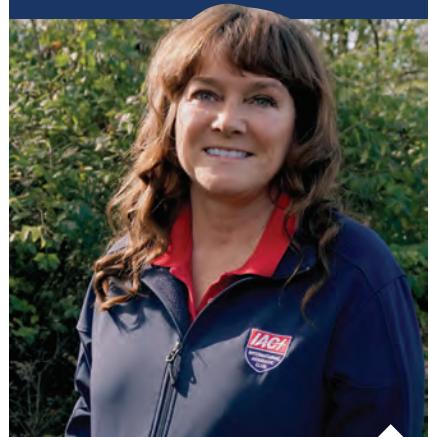
I hope you are enjoying a perfectly safe contest season in your neck of the woods. As always, I can be reached at president@iac.org. **IAC†**

The advertisement features a man and a woman in flight suits standing outdoors near a biplane. The man is on the left, holding a helmet, and the woman is on the right, also holding a helmet. Above them is a large logo for 'BUTLER' in blue, with 'HIGH SPEED - CUSTOM FIT' in red below it. To the left of the logo is a circular icon containing a stylized orange and white paraglider. At the bottom left, contact information is provided: 888-235-3280, sales@butlerparachutes.com, and www.butlerparachutes.com.

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# Safety – Before, During, and After Aerobatics

BY LORRIE PENNER, IAC 431036



**THE THEME OF THIS** safety issue is “Before, During, and After Aerobatics.” Each of our authors wrote about issues they have experienced and give great guidance for success in every faction of flying aerobatics.

Starting us off is John Morrissey’s “Make a Plan and Follow It When It Really Counts” article about his engine-out experience in his Pitts S-2. He discusses plans that you should rehearse for engine failure before the flight. He then goes on to talk about the things you should be prepared to do during the emergency and then wraps up with a debrief. “Learn from the experience,” he said. “Try to find out what happened and why. Be honest with yourself. If you were the problem, admit it. If it was a mechanical issue, file a maintenance defect report to the FAA.”

In Allen Silver’s “How Low Can You Go?” article, he answers the question definitively with real numbers. “This has been on people’s minds for as long as I’ve been working on parachutes,” he said. “After all, if you have to bail out, it’s nice to know a few facts to ensure your survival.” Allen’s article speaks to every phase of the bailout from being prepared through the practice, practice, practice of your egress plan. And knowing that **the distance it takes for your parachute to deploy will vary depending on the attitude of your aircraft.**

Tom Myers’ article “Anticipation” leads us to the hard facts that airplanes are collections of life-limited parts. There is no question about if parts will eventually wear out. The only questions are when and where. Anticipation is knowing what’s going to happen before it happens. That will help, so you don’t have to scratch your head when someone tells you, “Hey, your right brake caliper is wet,” when you are miles from home and no FBO is available.

Wrapping up the safety series is Doug Jenkins with the article “How to Conduct an Effective Debrief.” One of the most important keys to debriefing is to start with an objective. “Every activity has an objective; it is how you will measure success and forms the basis for the debriefing,” he said. “Without objectives there is no way to effectively debrief an event. Objectives should be tailored to your unique circumstances and reflect what you are trying to achieve.”

Thanks go out to these authors for sharing their experiences. They each show a sense of passion and responsibility in passing along the lessons they have learned that made them more aware, safer, and proactive in taking on the responsibility of being the pilot in command. As PIC, each pilot is responsible not only to know the rules under which they fly, but also to put into practice all the real-life education and training they have received. Their contributions to our aerobatic community help us to minimize risk by safely exposing us to the types of conditions that might prove fatal if we weren’t to practice them beforehand. **IAC**

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# 2022 US Nationals Advanced Scores Corrected

**IN THE JANUARY/FEBRUARY ISSUE** of *Sport Aerobatics*, we presented the final scores for all of the categories. Unfortunately, the results of the Advanced power category were incorrect because the Advanced category standings included the team selection flight. That flight is not part of the overall Advanced standings, and including the team selection flight in the results painted an unfair picture of how some of the Advanced competitors placed since there was a 0 percent averaged in with their overall score.

The correction is made in the results below. Thank you to those who reached out to let us know. **IAC+**



Advanced power: Don Hartmann, Mike Ciliberti, and Matt Dunfee



PILOT	KNOWN	FREE	UNKNOWN	FINAL
1. Matthew Dunfee	2717.21	2852.07	3193.71	8762.99
2. Michael Ciliberti	2689.07	2723.21	3120.86	8533.14
* Luke Penner (Canada)	2533.14	2704.36	3069.00	8306.50
3. Don Hartmann	2697.30	2612.71	2980.36	8290.37
4. Brittannee Lincoln	2619.54	2733.71	2922.94	8276.19
5. Marco Bouw	2598.00	2655.99	2950.44	8204.43
6. Michael Lents	2659.43	2420.90	3030.84	8111.17
7. Kyle Collins	2571.36	2610.37	2921.57	8103.30
8. Martin Flournoy	2551.00	2793.03	2673.76	8017.79
9. John Ostmeyer	2403.63	2689.01	2913.76	8006.40
10. Michael Gallaway	2529.14	2497.40	2933.54	7960.08
11. Michael Hartenstein	2466.93	2559.97	2828.99	7855.89
12. Ryan Chapman	2348.57	2551.87	2838.64	7739.08
13. David Taylor	2613.04	2549.54	2543.51	7706.09
14. Mario Mena Marqua	2353.93	2608.07	2550.79	7512.79
15. Tom Thomason	2120.07	2505.54	2508.33	7133.94
16. Klayton Kirkland	2359.91	2562.40	2101.14	7023.45
17. Stanley Moye	1623.31	2424.21	2870.77	6918.29
18. Grant Nielsen	1775.67	2455.99	2671.46	6903.12
19. Barrett Hines	1676.57	2514.84	2589.40	6780.81
20. Robert Dumovic	2239.31	1941.54	2454.14	6634.99
21. Duncan Koerbel	2490.14	2065.99	1730.07	6286.20
22. Anthony Oshinuga	1818.17	2227.17	1772.93	5818.27
23. Steven Johnson	2504.07	2745.36	0.00	5249.43

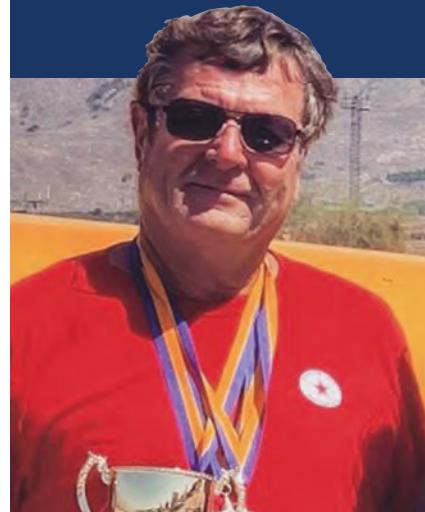
\*The U.S. National Aerobatic Championships awards championship titles to U.S. citizens.



## PROGRAMS AND COMMITTEES

# IAC Achievement Award Updates

BY DAVE WATSON, IAC ACHIEVEMENT AWARD CHAIR



### THE ACHIEVEMENT AWARDS PROGRAM

includes two types of awards:

- Smooth Awards, which may be earned by flying prescribed figures (for each category) in a noncontest environment. Candidates can earn Smooth awards by one of two methods. Method A: having the prescribed figures judged by an IAC judge from the ground (for example at a critique day), or by Method B: scored by the grading judge as an occupant in the aircraft (only allowed for Primary, Sportsman, and Intermediate Smooth awards).
- Stars awards must be earned in a competition at an IAC sanctioned contest. A grade of 5.0 or more must be received on each figure. (Exception: If there are fewer than four judges, one grade on each figure and presentation may be less than 5.0.)

Highlights: Congratulations to Mark Cunningham, who achieved ALL FIVE of the power Smooth awards. Mark is a member of the Canadian Advanced Aerobatic Team headed to the 2023 World Advanced Aerobatic Championships in Las Vegas, Nevada, in late October. Our congratulations also goes out to the Aerobatic Dedication Lifetime Awards recipients: Howard Kirker for 70 flights, Hugo Ritzenthaler for 100, and Dave Watson for 104 flights from 2006 to 2022!

### POWER ACHIEVEMENT AWARDS FOR 2022

NAME	CATEGORY	TYPE	CATEGORY	TYPE	CATEGORY	TYPE
Brian Pham	Primary	Smooth	Sportsman	Smooth	Intermediate	Smooth
Alexis Nahama	Primary	Smooth/Stars	Sportsman	Smooth/Stars	Intermediate	Smooth
Kevin L. Miller	Primary	Smooth	Sportsman	Smooth		
Hunter S. McCann	Primary	Smooth				
Caroline Kull	Primary	Smooth				
Matthew Bakker	Primary	Smooth	Sportsman	Smooth		
Loren May	Primary	Smooth	Sportsman	Smooth		
Blake Prewitt	Primary	Smooth	Sportsman	Smooth		
Jim Raticek	Primary	Smooth				
Adam Fern	Primary	Stars				
Calvin Owens	Primary	Stars				
Andrew Moehrke	Primary	Stars				
Andrew Fisher	Primary	Stars	Sportsman	Stars		
Tien Luu	Primary	Stars				
Robert Haag	Sportsman	Smooth/Stars				
Ted Hong	Sportsman	Stars				
Atamvir Multani	Sportsman	Stars				
Matthew Smith	Intermediate	Stars				
Eric Moore	Advanced	Stars				
Rory Moore	Unlimited	Stars				
Christian Baxter	Unlimited	Stars				
Mark Cunningham	ALL FIVE	Smooth				

### GLIDER ACHIEVEMENT AWARDS FOR 2022

NAME	CATEGORY	TYPE
Dave Watson	Sportsman	Stars
Patrick Koenig	Intermediate	Stars
Andrew Dever	Intermediate	Stars
Dante Cyrus	Intermediate	Stars

### AEROBATIC DEDICATION LIFETIME AWARDS

#### FOR TIME PERIOD 2006-2022

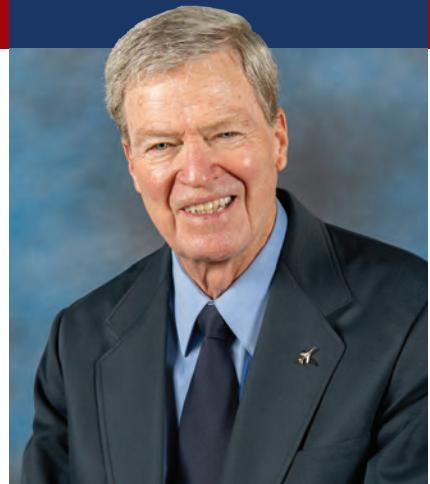
NAME	LEVEL	CONTESTS FLOWN
Howard Kirker	Bronze	70
Dave Watson	Silver	104
Hugo Ritzenthaler	Silver	100



For award applications and more information on the Achievement Awards program: [iac.org](http://iac.org) > programs > awards. We like seeing photos of your smiling faces with the awards that you earned! Please share your photos with [editor@iac.org](mailto:editor@iac.org) and tag Instagram @iac\_hq. **IAC**

# Make a Plan and Follow It When It Really Counts

BY JOHN MORRISSEY, IAC 3238, IAC HALL OF FAME INDUCTEE



**IT WAS A FINE** morning for flying on Saturday, October 10, 2019, when I departed Warrenton-Fauquier Airport (HWY) in Virginia for my home field near Kansas City. I had spent a few days with my fellow combat F-105 driver and IAC member Chuck Boyd at his northern Virginia home. My route would take me over the Blue Ridge and Appalachian Mountains, with ground elevations varying from 2,300 to 5,700 feet for the first 250 miles.

My first stop was the Buckhannon airport (W22) in West Virginia for fuel before my next leg to Lexington, Kentucky. The airport was one of those mountaintop affairs where the crest of

the hill is shaved level to put in a single runway that usually has about 500 feet of cleared-off grass on either side, followed by a sharp drop-off at the edges on each side and at the end of the single runway. The runway was in good shape, and the fuel truck met me on the ramp. The man who refueled my Pitts S-2A was quick and efficient, and he mentioned the field would be unattended later.

Before I left Warrenton, Chuck made it clear that he would act as my “command post” at all stops, asking that I call him (no texts) to confirm my arrival and en route time to my next stop. My pre-takeoff checks went well, and I paid my usual attention to mag checks and magnetic compass/runway heading verification.

Takeoff was uneventful. I leveled off at 8,500 feet and began my checklist:

- Liquids: Check oil pressure and temperature, fuel quantity, set cruise fuel flow, and check that the gas cap is on and secure.
- Electronics: Make sure that the alternator is charging and all circuit breakers are in.
- Belts: Check that they’re secure and tight.

Once that was accomplished, I verified my position on the course line and checked the distance to go on my sectional chart. I then began looking for potential forced-landing options. There were none: not one meadow or road to be found. The undulating ground was covered with trees. There wasn’t one flat spot to be seen, and I reconfirmed my assessment that the parachute would be my only option if the engine failed.

I was about 35 miles west of my departure airport when the engine “sneezed” like they do when leaned too far. I increased the fuel flow to 11 gph and all appeared to be good.

But not for long!

When a loud bang shook the airplane and the engine started cutting in and out, I began turning back to W22 while transmitting my request for assistance on guard frequency. I always fly on 121.5 while en route, as it is the only frequency I would need in a hurry. I made it simple: “Pitts 7 Papa Sierra on guard. Need a little help.” I received an immediate response from an American Airlines flight.

**You should have two rehearsed plans you can immediately fall back on if you have an engine failure: one for when you're wearing a parachute and the other for times when a chute is not available.**



John Morrissey at the IAC chapter 15 Harold Neumann Barnstormer aerobatic contest.

I was brief: "American, I have a very rough engine. No smoke, no fire. All engine instruments normal and plenty of fuel. I am unable to maintain altitude. I am on the 259 magnetic course from W22 at 34 miles descending through 7,800 feet turning left for their airport. If I cannot restore power above 5,000, I will bail out. Can you stand by while I try to restore some law-and-order north of the firewall?"

"We will stay with you."

While still in my turn to W22, I assessed the situation and decided the mags might be the problem. Fifty-eight years earlier in the summer of 1960, before I went to Air Force pilot training, I was a charter and instructor pilot for the Cessna dealership at the Kansas City downtown airport. They had several sales pilots who were mostly World War II vintage. One of those men told me that if an engine starts "acting up," you should make sure you're on the fullest tank, pull on the carburetor heat, and then switch between the left and right magneto positions. He mentioned that the mags can be fighting with each other if one has an internal problem, and you may still be able to isolate the good mag.

I tried that procedure, and it did not help. I tried it again and left the key at each left and right position a little longer. It worked better on the right mag, so I kept moving the key around slowly in the right mag position and finally got the engine to run. It was a bit rough, but it was not misfiring. I was able to arrest the descent at 5,800 feet and began a slow rate of climb. I reported this to American and reconfirmed my intention to proceed to W22 while climbing en route.

I then gave some information to help those attempting my search-and-rescue mission. I told American that I had a KX-99 VHF radio with a spare battery that I would transmit on guard every 15 minutes when on the ground, a SPOT satellite transmitter strapped to my left thigh, a smartphone, and a small portable GPS.

American replied, "Copied all and wrote it down." They said they were leaving my area and passed me off to a Southwest flight that confirmed they had received all previous information from American. Southwest then switched our frequency to Washington Center. Center and SWA responded immediately to my check-in. The controller asked me to squawk 77. "Unable, no transponder." She asked if I was about 12 west of W22. "Close. I am 10 miles on their 260 mag course." She said she had vague skin paint and would clear the airspace below my altitude over the airport.

I continued climbing until I arrived over W22 at 9,700 feet and began a circling precautionary approach over the field that would ensure a safe landing if the engine failed.

The landing was uneventful. I taxied to the ramp and shut down. A walk-around showed no external evidence of the problem. I went over to a bench just outside the FBO's door. It was locked. The field was unattended. I just sat down until the jangles subsided and called Chuck. All he said was, "I'll be there in an hour and a half in my T-34 to fetch you."

About an hour later, a gentleman showed up and asked if I needed some help. I told him what had just happened and mentioned I could use some hangar space. Fortunately, he had the name and phone number of the mechanic who worked Monday through Friday at the maintenance hangar. I was able to reach Nick Upton at his home. He said if he had to come out on a weekend it would be \$450, but if I could get my Pitts to his hangar, he would be there early Monday morning to help. We discussed the essence of the problem, and he gave me taxi instructions to the hangar as well as the procedure for opening and closing the door.

Chuck showed up exactly an hour and 30 minutes after our call, and we headed back to Warrenton. We had a fine time, and on Monday morning we

landed back at Buckhannon about two hours after sunrise and taxied to Nick's hangar. His large hangar door was open, and he had a "roll-around" table with every tool I would need right in front of my Pitts. He said I sounded like I knew what I was doing and to ask him if I needed help. And I did. Nick was a helpful and competent A&P/IA who, along with his wife, Tammy, watched over the whole maintenance procedure and took good care of me as well.

I had the left mag off in about an hour. It had had 250 hours since a factory overhaul. I unscrewed the threaded plastic cap on the side of the mag and began rotating its timing gear. I had expected to find that an oil-filled mag was causing the trouble. Instead, the large plastic timing gear, the one with the red tooth used for setting the timing, was missing a tooth. There was no play in either end of the shaft. Obviously, that missing tooth would change the timing significantly with each rotation of its metal drive gear, making it possible to fire plugs in different cylinders at once and put great stress on the gear teeth. The big bang I experienced began to make more sense.

In short order, a newly overhauled mag was ordered via next-day air from Aircraft Spruce & Specialty in California. Twenty-four hours later, that mag was delivered to Nick's hangar. We had the mag on and timed before lunch and hoped for an afternoon departure.

The test run was not good. The right mag was fine, but the left was still barking and banging. I gave this some thought and asked Nick to remove the main primary-lead (P-lead) from the left mag, the one used for the "shower of sparks" starting system. There are two P-leads and two sets of points in the left mag. One is used for starting and the other for normal running when the switch is moved to both mags or left mag. With the ignition switch in the start position and the battery switch on, the running points for the right and left mags are grounded to prevent kickback, and the shower of sparks ignition is activated through its starting points. When the engine starts, the ignition switch key moves to the "both" position, the starting points are grounded, and the left and right mags are ungrounded. The P-lead's job is to ground the magnetos as required by the position of the ignition switch. The only time the starting points are active is when the mag switch is held in the start position while both mags are grounded. The engine ran perfectly with the left P-lead removed.

That left two possibilities: A bad P-lead will cause intermittent grounding if its insulation is cracked or frayed and its bare wire touches the airframe. It can also be grounded inside a faulty ignition switch, causing intermittent grounding within the switch that can cause cross-firing between the plugs. In my case, the P-lead integrity looked good. That left the Bendix ignition switch as the problem. Nick and I disassembled it and found that metallic dust had gathered during its 40 years and 3,578 hours of operation, leading to a large amount of metallic debris that had become heated and melted between two or more contact positions. When that happens, some serious problems can occur, as they did in our case. So a new \$500 Bendix ignition switch was ordered and installed.

All of this will probably make more sense when one realizes that there are nine electric-current-bearing wires connected to the back of the ignition switch (see photos). One of these wires goes to the battery. The wires are attached to the nine vertical tabs on the rear of the switch by nine small machine screws with a common slot head (see photos).

**If you fly single-engine aircraft, it's just a matter of time before an engine lets you down. When that happens, follow your plan when it really counts.**

These must be installed with the switch still in the aircraft. If you ever try this, make every possible effort to get a screwdriver that will hold the small screw in place while offering it to the correct post on the back of the switch. Neither Nick nor I had one of these must-have tools. I sat backward in the front seat with a large towel spread over my lap and forelegs to catch the errant screw that I knew would drop. I learned from this experience that it would be a good idea to check the security of these nine screws during annual inspections. After an hour and a half, the wires were finally attached. The ground run was good. And so was the test hop!

Let's now take a closer look at this episode as it occurred before, during, and after the flight.

### **Before the Flight**

You should have two rehearsed plans you can immediately fall back on if you have an engine failure: one for when you're wearing a parachute and the other for times when a chute is not available. Study your route on sectional maps to review the undulating ground-elevation lines you will encounter. You can carry and use these maps — they don't need batteries. If you're using electric navigation systems and the panels go black, you better know where you are and how to navigate to the nearest airport. Remember, ForeFlight and GPS are great support systems for air navigation. They make flying cross-country much easier, but when they fail (and they do), you must be able to transition seamlessly to plan B and use your sectionals to revert to your basic pilotage, time, heading, distance, and groundspeed navigation, which you'll put on your maps before the flight. This transfer to the map step is a lot easier if you keep the map in your left hand with your thumb on your position. You may not be on course, but you will always know where you are. This is how I navigated during the summer of 1960 as a charter pilot going to locations with no section lines, VORs, or ADF beacons.

Three years later in Okinawa, I was sitting on the 24/7 nuclear alert pad in a single-seat F-105 with a 1.1-megaton nuclear bomb to deliver. The only navigation instruments I had available to find my target, a Soviet ICBM site in Siberia, were an accurate multifaceted clock, an accurate flux-gate compass backed up by a good magnetic compass, and the maps in my mission folder. I had committed the time at each checkpoint and the target to memory, along with mileage, the compass heading, and the groundspeed required for every leg of



There were seven burned points and nine burned and damaged contact areas. When first disassembled, there were also melted metal strips contacting two and possibly three contacts.

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John launched from Warrenton-Fauquier Airport on the fateful day in 2019.

the flight. The time on target had to be 15 seconds or less to avoid the plethora of nuclear fireballs delivered by every submarine, ICBM, or B-52. Every one of those nuclear weapons had a coordinated time on target. Keeping my exact times and positions would provide a clear path to my target and back to my recovery airfield in northern Japan. The entire flight, from brake release to the recovery airdrome, is conducted in radio silence.

Now, returning to your flight preparation, make a plan for the minimum above-ground altitude you will accept before bailing out. I use 3,000 feet. You may think this is too high. Believe me, it is never too high to jump if the terrain is not favorable for an off-airport landing. Keep in mind that it may take up to 30 seconds to exit your airplane once you make the decision to jump. In a Pitts, your engine-out rate of descent is 2,000 feet per minute.

If you have a parachute, you can reasonably fly in a straight line to your destination. If you don't, you should pick a more favorable route over flatter

and lower ground in good weather at a higher altitude to give you a better chance if your engine fails.

#### Carry basic survival items:

- A SPOT satellite position-reporting system will enable you to press an emergency button that will activate a coordinated search and rescue. In a nonemergency situation, it tracks and reports your position every 10 minutes to anyone you select. This is especially helpful if you are trying to walk out following your parachute or off-field landing in the middle of nowhere. All you need for the SPOT to be effective is visual access to the sky.
- Carry a handheld radio with a spare battery. Your survival rate in an off-airport landing is greatly enhanced if you can talk to somebody — anybody.
- Carry a smartphone.
- Tell a responsible person where you are going and when you will get there.
- And file a VFR flight plan.

#### In Flight

As soon as a serious situation develops, immediately ask for help on 121.5. Tell whoever answers your N-number where you are and what your plan is. If you have time, tell them what's wrong. Be unambiguous. Be brief. Declare an emergency. I did not, and I should have. And finally, know when it is time to jump, and do it!

Remember this: If you are experiencing a serious problem and are able to climb, do so while sorting the issue. When I ejected from my F-105, everything worked well except one little thing. The chute would not deploy from its pack. It took me awhile to sort the problem. I finally saw a white and orange part of the chute canopy over my right shoulder. I yanked and pulled on it for about an hour (in subjective time)



Buckhannon Upshur County Regional Airport.

before it finally blossomed. I hit the ground about 15 seconds later. Again, you can never get too high to bail out.

### After the Flight

There is no AD or service bulletin (SB) I can find in the Pitts S-2A annual inspection checklists for the Bendix switch and the shower of sparks ignition system. There's a requirement to turn the key off while the aircraft is in idle on the ground to see if it will ground the mags, and there's an SB to make certain the key cannot be removed from the switch when the engine is running. I don't know how frequently these checks are required, but I do this every time I shut down after the last flight of the day. Well, it did not help me. There is no time between overhauls on the shower of sparks mag switch. It's easy to disassemble the switch and inspect the distributor contacts, as well as any collection of metal dust inside the switch. I have added this to my preventive maintenance schedule. I replace my mags every 500 hours with factory-overhauled items.

Learn from the experience. Try to find out what happened and why. Be honest with yourself. If you were the problem, admit it. If it was mechanical issue, file a maintenance defect report to the FAA. If your problem was a procedural, come up with a better method to handle what you just experienced. Be a teacher; tell others. If I hadn't received that bit of advice from the Cessna sales pilot 55 years earlier, I doubt I would have gone directly to the mag switch.

If you fly single-engine aircraft long enough, unease about engine failure can be disquieting. The real question is what to do when your engine does fail. When my engine had its problem, I did everything possible to implement the engine-failure plan I'd made over 50 years earlier. I followed the same procedures when I was 26 and had to leave my F-105 after its engine failed, when I was 52 and my Pitts swallowed

an exhaust valve, when I was 69 and a Pitts S-2S engine failed at 150 feet just after takeoff, and when I was 80 over the hills of West Virginia.

If you fly single-engine aircraft, it's just a matter of time before an engine lets you down. When that happens, *follow your plan when it really counts.*

#### IAC†

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**John Morrissey** has been an IAC member since 1975. He retired in 1985 from the U.S. Air Force, having earned the rank of colonel. He was on the U.S. Advanced Aerobatic Team in 1995 in South Africa and again on the 1997 team in Lawrence, Kansas. John, his son Matt, and Gerry Molidor were the three key contributors to the gold medal-winning 1997 team.

His IAC judging experience ultimately earned him the Robert L. Heuer Award for Judging Excellence in 2013. In 2016, he earned the award named after his mentor: the Harold E. Neumann Award, which is presented to the outstanding chief judge of the year. In 2019, John was inducted into the IAC Hall of Fame.

In 1993, John coordinated his first training camp in Ashland, Kansas. "I do make certain that everyone who has been to Ashland for the past 29 years is handy with engine-out landings during competition flights in or near the box," John said.

# How Low Can I Go?

BY ALLEN SILVER, IAC 431160, SILVERPARACHUTES.COM

**EVEN THOUGH I CALL** myself semi-retired, I still sell parachutes and receive calls wanting information on what would be the best parachute for the caller and their aircraft. I encourage the potential buyer to ask as many questions as they have, so they end up with what they want. I want to make sure they have enough information to be an informed buyer of their expensive cushion. I've been in the parachute business and have over 50 years' experience and have seen a lot. Most has been good.

This brings me to one of the most often asked questions: "How low can I go?" This has been on people's minds for as long as I've been working on parachutes. After all, if you have to bail out, it's nice to know a few facts to ensure your survival. This is not a contest to see how low you can bail out and

**This is not a contest to see how low you can bail out and still have the parachute open. This is about your survival, and I can help dispel some of those rumors, myths, and misinformation.**

still have the parachute open. This is about your survival, and I can help dispel some of those rumors, myths, and misinformation.

Being prepared ahead of time for the possibility of an emergency bailout is the key to your survival. I've written about this before, but you need to practice, practice, practice your emergency bailout procedures before and after each flight to ensure everything will work in your favor and it becomes muscle memory. Practicing will often cut your egress time down 50 percent or more. You need information that is accurate, not hearsay. That's where I, or your parachute rigger, can help. Don't pretend or guess you have the all the answers.

When you have finished reading my article, I want to make sure you understand that **the distance it takes for your parachute to deploy will vary depending on the attitude of your aircraft** when you decided it was time to bail out. This also applies to you. Hesitating to bail out because you are not prepared will decrease the possibility and chance of your survival. This is not a game of Russian roulette.

First and foremost, I want to make sure you understand that the time it takes for your parachute to fully open and be descending at the slowest rate of descent will typically be between **two and three seconds** from the time you pull your rip cord. In many cases, it's closer to two seconds. So, at the end of that time if you're only 6 inches above the ground, consider yourself very, very lucky, and you owe the parachute rigger who packed your parachute an extra hug and bottle of their choice. After all this, some pilots still ask me, "How long does it take for the parachute to slow down after it's fully open?" **Let me repeat: ONCE it is fully open (approximately two to three seconds), that is the slowest it will descend.**

Now that we understand the time it takes to open, let me explain the distance, or loss of altitude, it takes to be fully deployed. This will depend on the attitude of your aircraft when you bailed out. Let's say, for example, you had an onboard fire and were able to control your aircraft and trade off some airspeed for altitude. Slowing your aircraft probably will make it easier to egress, but most importantly you need to be aware of your altitude and get your butt out of there. You've been diligently practicing your emergency procedures and are prepared. Muscle memory kicks in. You jettison your door or canopy, if you have one. Next you undo your seat belt(s) and get your butt out of there. Once you're out, tumbling through the sky, you need to locate your rip cord handle; it may well have shifted. Now pull the rip cord like your



life depends on it. Because you are traveling somewhat horizontally to the ground and have been practicing your emergency procedures faithfully, you may only lose around 150 feet (45 meters) of altitude, during the two to three seconds it takes for your chute to deploy. You're not a trained skydiver, so don't think you need to get stable before you pull the rip cord. Just pull the rip cord. Your parachute knows what to do. And then think about what your parachute rigger likes to drink.

Now, let's go to another scenario. You had a midair collision or a structural failure. You are rapidly spiraling/tumbling down like a lawn dart toward terra firma. It still takes approximately two to three seconds for your parachute to deploy, but your loss of altitude has greatly increased because your airspeed has increased and you're pointing straight down. All this may be compounded by an increase in g's. This is why you must make the decision to bail out quickly. This can only be done by practicing. You wouldn't think of going to a contest and not practicing ahead of time, would you?

One more thing to keep in mind: **AGL is much more important than MSL when making a bailout**. So, "How low can you go?" You can increase your chance of survival by practicing your aerobatic routine high enough for you to have the time necessary to egress safely, with enough altitude to enjoy the scenery and maybe even select a safe landing site. Many years ago, I had a customer who spent over 5,000 feet (1,524 meters) trying to escape his disabled aircraft that was pointing almost straight at the ground. He fortunately was practicing his aerobatics at 6,500 feet AGL. He never gave up and was finally successful as he was approaching 1,000 feet (305 meters) above the ground. His chute was fully deployed in about two to three seconds, but his loss of altitude was about 700-800 feet (213-244 meters). His one comment that I'll never forget was that the scenery was spectacular, but the ride under his parachute lasted only about 12-15 seconds. I did receive my thank-you bottle of wine. Being from the grape country of California, I always enjoy a good bottle of wine.

Remember, **NEVER GIVE UP**. At right is a photo of me standing next to Sean D. Tucker, taken in September 2011, five years after his successful bailout on his way to SUN 'n FUN in April 2006.

Your survival depends on many other factors, such as your mental and physical condition on that fateful day. Are you hydrated? Are you practicing at an altitude that will enhance your chances of survival? Pilots who have low-level waivers did not start out at 100 feet (30 meters) from the ground; they earned that right over time. Leave your worries and troubles at home or at your office when you're practicing. You must be in the right frame of mind and focused when you take off to practice or compete in a contest or an air show. That's why most air shows have a quiet area for the pilots to focus all their attention on their upcoming performance. Just because you're only a recreational or weekend aerobatic pilot doesn't mean you don't have to pay as much attention to details, such as practicing your emergency procedures. Your safety starts before you untie your aircraft and is not finished until



Sean D. Tucker with Allen Silver

you and your aircraft are safely back on the ground and secured.

In the September/October 2022 issue of *Sport Aerobatics*, Tom Myers, a good friend, talks about doing a pre-flight inspection of his aircraft and missing the rudder lock. Don't get sidetracked or interrupted when you are preparing to fly. You need to preflight your mind as carefully as your aircraft. All must work in close harmony.

I encourage you to talk to your rigger. You can also call, text, or email me, and we can discuss any questions you may still have. We can also Zoom, if you want to show me something. Zooming is a valuable tool and can be helpful. Consider going to my website. I have a lot of articles there, and I have a webinar I did for EAA in October 2020. The handout material that goes along with it is located right above where you click on the webinar. It goes down well with a cold beer or glass of wine.

Now go out and have fun, fly safe, and blue skies. **IAC**

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Allen Silver, silverparachutes.com

# Anticipation

BY TOM MYERS, IAC 16830



## AIRPLANES ARE COLLECTIONS OF

life-limited parts. It's a given that parts will eventually wear out. The only questions are when and where.

I fly out of the Palo Alto, California, airport. Its single runway is 2,400 feet long. Just beyond the runway is San Francisco Bay. When you land a slick aerobatic aircraft there, using brakes is not optional, unless you happen to be flying a slick aerobatic submarine. I am not, so I keep a particularly keen eye on my brakes.

When I bought my airplane eight years ago, I overhauled both brake systems at the first annual inspection. Other than routine brake pad set

replacements and brake fluid reservoir checks, no additional maintenance was required. There was no evidence of brake fluid leaks and no interesting brake system behavior.

The domino effect, 2022 IAC version: The National Aerobatic Championships are held in Salina, Kansas, usually in late September. This year, military operations were scheduled at the Salina airport during that time, so the Nationals were moved to early October. The Borrego Springs, California, contest normally occurs in early October, but because the Nationals were rescheduled, the Borrego contest was moved to late October.

That's how I came to find myself flying from Palo Alto to Borrego Springs at 9,500 feet through some seriously cold air. Colder than I ever see at 9,500 feet going to contests in the summer. Colder than I ever see at 3,500 feet going to and from my local practice area at any time. Cold enough to require a full set of winter outdoor gear for the flight. Cold enough, as it turns out, to have an interesting effect on some of my 8-year-old brake system components.

After an uneventful landing at Borrego Springs, I went through the usual routine of getting registered and tech-inspected. I'm indebted to Colleen Sterling for giving my airplane such a thorough tech inspection. At one point Colleen told me, "Hey, your right brake caliper is wet." Wet with brake fluid. Not dripping, however. Fortunately, not actively leaking. The left brake caliper was absolutely dry.

My initial hope was that the cold air up at altitude might have stiffened and shrunk the O-rings on the caliper pistons, and that the right one had seeped a little. Back on the ground in the warm air — after the brake system was warmed up by use during my landing — my aircraft might be fine. So, I dried everything off and borrowed a wrench to confirm that the caliper bleeder valves were closed tightly. They were.

First, I got in the airplane and pressed on the brake pedals, then checked the calipers again. Both were dry. I got in the airplane and did my normal engine run-up. Both brakes held just fine. Then I took off for my practice flight in the box. After I landed, the left brake caliper was dry again, but the right brake caliper was wet. Fortunately, it wasn't dripping. Just wet.

**It's possible for me to anticipate problems with my airplane now because I have owned it long enough to have worn out parts that I replaced when I first bought it, and I kept good documentation of the work I did and when I did it.**



Photo No. 1 shows the inner caliper body with the retracted piston face in the center.

Borrego Springs has no FBO, maintenance facility, or available hangars. It's located in a desert, so the ramp is covered with fine sand. I did not have a good feeling about taking my airplane and brakes apart there.

On the other hand, I was confident that there was plenty of brake fluid in the right brake system to get at least one more landing out of it. I could tie the plane down for the duration of the contest and then fly home. If I had any hint of trouble getting stopped at Palo Alto, I would hit the throttle and go next door to Moffett Field, with its 9,200-by-200-foot runway. It's common for the Palo Alto traffic pattern to extend over the top of Moffett Field — it is that close.

I then spent an enjoyable two days judging routines and pushing other people's airplanes around.

The brakes held just fine during the run-up for my flight home. The landing back at Palo Alto was absolutely uneventful. Once it was back in my hangar, the plane came apart for the annual. Needless to say, I dove into the brakes first.

Now you have the background information, so let's talk about what I discovered, learned, and decided to do in the future after servicing the brakes.

I wasn't surprised to find that the right brake caliper showed plenty of evidence of brake fluid seepage when it was slid off the wheel and brake rotor assembly. What was enlightening was what I discovered on the left brake caliper when I slid it off its wheel and rotor. Please see photo No. 1, which shows the inner caliper body with the retracted

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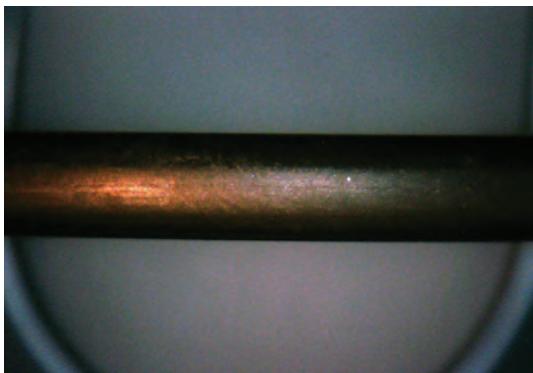


Photo No. 2 shows the outer circumference of one of the caliper piston O-rings viewed through a microscope while being side-lit.



Photo No. 3 shows the tail wheel with a ruler on top to highlight the uneven wear angle.

piston face in the center. Notice the wet area around the edge of the piston near the bleeder valve. This was the brake caliper that was dry on the outside at the contest.

The only way to tell that the left brake caliper was seeping was to remove it from the wheel. The piston



Photo No. 4, the tail wheel post acts like a lever arm trying to stretch the forward tail wheel post to the airframe attach bolt.

O-rings were likely in marginal condition before the cold cross-country flight, which probably pushed their condition from marginal to less than marginal. Cross-country trips originate from home. In other words, the brakes were likely to begin showing evidence of failing away from home. The piston O-rings were in marginal condition because I did not know beforehand what their life spans are. I sure know now.

As I mentioned earlier, it's a given that parts will eventually wear out. The only questions are when and where. Double bonus. I learned the answers to when and where.

Anticipation. Knowing what's going to happen before it happens. I anticipate that, given my current circumstances, my brake caliper O-rings will wear out again about eight years from now. I also anticipate that they will wear out away from my home airport. I do not want that "when and where" to occur. I will do my best to prevent that when and where from occurring by replacing my brake caliper O-rings four years from now — even if they're working just fine. I will also slide the calipers off the wheels and inspect them at every annual, even if the brake pads don't need replacement (otherwise easy to see without disassembly).

Please see photo No. 2, which shows the outer circumference of one of the caliper piston O-rings viewed through a microscope while being side-lit. You can clearly see how the outer surface of the O-ring has been flattened from eight years of normal wear.



It's possible for me to anticipate problems with my airplane now because I have owned it long enough to have worn out parts that I replaced when I first bought it, and I kept good documentation of the work I did and when I did it.

Here's another example. This past summer, I noticed that the plane was starting to develop a slight steering bias to the left. Before taking anything apart, I inspected the landing gear carefully and methodically. It didn't take long to notice that the tail wheel was wearing a little unevenly. Please see photo No. 3, which shows the tail wheel with a ruler on top to highlight the uneven wear angle. What would cause that? I jacked up the tail so that there was no weight on the tail wheel. The tail wheel assembly looked absolutely straight. There was no play in it. I was unsure of exactly where to go

next, so without any better idea, I gave the tail wheel a good solid tug to the side. The entire assembly, tail wheel post and all, rotated a couple of degrees. Aha!

Please see photo No. 4. The tail wheel post acts like a lever arm trying to stretch the forward tail wheel post to the airframe attach bolt. Every landing makes that bolt act like a spring. I replaced that bolt at the first annual after I bought the airplane. After eight years of landings, the bolt had stretched just enough to allow a little rotational play in the tail wheel post. The evidence of this manifested itself not in the obvious rotational play of the tail wheel assembly, but also in the uneven wear of the tail wheel.

The plan going forward is to check the tail wheel post for rotational play and the attach bolt for stretch at every annual, and to replace the bolt every four years. Who knows, maybe even sooner. Even if it is working just fine.

I suppose the steering bias to the left may have required a little heavier use of the right brake. The heavier use of the right brake may have caused the right O-ring to seep first. Another domino effect? Tough to know for sure. I'm doing my best to make sure that I never find out.

Fly safe. **IAC†**



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# How to Conduct an Effective Debrief

BY DOUG JENKINS, IAC 436255

**HAVE YOU HAD ANY** of these thoughts during your aerobatic flying career? “I’m not getting any better at this!” “I feel like my progress has stagnated!” “Why can’t I bring home a trophy?” I would wager a large sum of money you probably have. I know I have. In this article, I will offer a tool I hope will help you make positive forward progress in your aerobatic skills: the effective debrief. A debrief can be used to improve or correct any size event, from an individual maneuver to a figure, sequence, contest, or even season.

For a debrief to be effective, you need to start with an objective. Every activity has an objective; it is how you will measure success, and it forms the basis for the debriefing. Without objectives, there is no way to effectively debrief an event. Objectives should be tailored to your unique circumstances and reflect what you are trying to achieve. They may address a trend area or a recurring problem. Here are some examples of objectives based on specific situations:

**For a debrief to be effective, you need to start with an objective. Every activity has an objective; it is how you will measure success, and it forms the basis for the debriefing.**

- You are consistently losing points on 45s because you are shallow. OBJECTIVE: Do not be shallow on any 45-degree line.
  - You are losing points because your roller always finishes on heading with roll remaining. OBJECTIVE: Finish roller with roll complete at proper heading.
  - You are constantly short after a rolling element on 45-degree lines. OBJECTIVE: Match line length before and after roll to the foot.
- These are some “micro” objectives. Some more “macro” objectives may be:
- OBJECTIVE: Finish on the podium at this contest.
  - OBJECTIVE: Earn my Stars award at this contest.
  - OBJECTIVE: No hard zeros (HZs) in this sequence (or at this contest).

These are clearly defined and measurable objectives that you can debrief to. You can also see that micro objectives can support or enable macro objectives. If you accomplish the micro objectives, it is much more likely that you will meet the macro objectives. Before each flight, contest, or season, you need to establish your objectives. What are you trying to accomplish, and how will you measure success?

Given well-defined objectives, measuring success is simple. Did you meet your objectives? At a contest that can be based on judges scores and comments. On a practice flight it may be based on your video recordings, feedback from a critiquer/coach, or your own memory. Having tools that effectively measure whether you met your objectives is a necessity. For instance, real-time feedback from a ground observer is better than video review, which is better than post-flight recollection. But you need to work with what you have.

Let’s take a contest flight example for further discussion. In this hypothetical scenario, your objectives for the Known were:

1. No HZs.
2. Score at least 80 percent.
3. Finish in the top three pilots.

To begin the debrief process after the Known, you need to determine whether you met your objectives. For this example, let’s assume you met objective No. 1, but not 2 or 3. Now the question becomes “Why?” This is the most important question you can ask. You will usually need to ask why at least three times before you get to the root cause. That is your ultimate destination, the root cause. Until you determine the root cause of your failure to meet an objective, you can’t improve your performance.

Why did you not score at least 80 percent on the Known? Look at your Form A. Which figure(s) lost you the points that put your score at sub-80





Discussing the objectives at the 2019 U.S. National Aerobatic Championships.

percent? Did the judges give you any useful comments? The “Why?” process may go like this:

Q: Why did I score 78.75 percent on the Known?

A: Because my wedge and reverse half-Cuban scored 7.0 and 6.5.

Q: Why did my wedge and reverse half-Cuban have an average score of 7.0 and 6.5?

A: Judges consistently noted shallow 45s and short after on both figures.

Q: Why did I fly shallow 45s on both figures?

A: Because I stopped short on my pull.

Q: Why did I stop my pull short of 45 degrees?

A: TBD

Q: Why was I short after rolling on both figures?

A: Because I initiated back-stick pressure too early.

Q: Why did I initiate back-stick pressure too early?

A: TBD

With these “TBD” questions you are finally digging down toward the root cause, and to answer them you need a little more understanding of decision-making and learning.

I am willing to wager that you did not set out to fly shallow 45s or to be short after your roll elements. You intended to fly the perfect figure, right? So why didn’t you? Human mistakes are always due to an error in one of three areas:

1. Perception
2. Decision
3. Execution

Now you need to determine which regime your errors fell into.

Perception errors are the biggest picture of the three groups and can cascade into decision and execution errors. A perception error is made due to a flawed mental model of the world around you. Here are some perception questions to ask yourself to help answer our hypothetical examples above (shallow 45 and short after).

1. Did I know what the figure I was flying was supposed to look like?
2. Did I know where the winds were from and what their impact was?
3. Did I know where I was in the box?
4. Did I know the criteria the judges were using to score my figure?

A breakdown in any of these (or similar) factors would be a perception error. You must be brutally honest with your self-assessment. Any lack of honesty will prevent correcting the error. Based on your scores and comments you decide that:

1. You did know what the figures were supposed to look like.
2. Your wind awareness was minimal.
3. You knew you were about to exit the box to the south in both instances.
4. You are familiar with the judging criteria.

This leads to follow-up “Why?” questions.

Q: Why was my wind awareness minimal?

A: TBD

Q: Why was I pressing the south boundary?

A: TBD

After more honest assessment, you decide that the reason your wind awareness was limited was due to two things: lack of preflight study and failure to use your time in the hold to study the impact of actual winds aloft. These two failures led to an inaccurate perception of your environment, which (as we will see) contributed to not meeting your objectives. Now that you have sorted out your perception errors, we need to keep asking “Why?” to get to any decision errors.

Decision errors are incorrect choices that are made. They may be made due to incorrect perceptions, or they may be simply the wrong choice made with a correct perception in place. Here are some decision error questions that flow from our perception errors:

**Q:** Why did I decide to not adjust my 45s to appear correct to the judges?

**A:** TBD

**Q:** Why did I decide to fly the figures differently because I was approaching the south border?

**A:** TBD

Question No. 1 goes back to our perception error; we made an incorrect decision based on flawed perception. Had we accurately perceived the winds, we could have “fixed” our 45s. Question No. 2 is an actual decision error. You decided to fly the figures differently because of the border issue. Knowing that the border was looming, you rushed through the figures and flew them quicker than you planned to avoid an “out.” This is a flawed decision.

Taking an out is a relatively small penalty. Scoring a 7.0 or 6.5, versus the 8.0-plus you may have otherwise scored, cost *far* more points than an out. Had you decided to fly the figure to the best of your ability and taken the possible out, you would have greatly decreased the points you lost in both figures. This error ties back to a perception error, in this case perception of the rules. Did you know how many points you lost for an out? Did you understand the math of the situation? You can also see that your perception error regarding the winds set in motion this decision error. However, a better decision (fly the best possible figure) could have mitigated the flawed perception. Now that we have worked our way through perception and decision errors, we are ready to look at execution errors.

**Until you determine the root cause of your failure to meet an objective, you can't improve your performance.**

Execution errors are the actual movement of stick/rudder and throttle. In this example, our perception and decision errors make up the majority of the problems; execution errors were minimal. In a different example, we may have decided that inadequate forward-stick pressure after a half-roll on a 45-degree upline allowed the nose to fall and made the line shallow. If there were no decision or perception errors that led us to apply inadequate forward-stick input, then this would be an execution error.

Now we can look back at our hypothetical example and determine the root cause of failure to meet objective No. 2 (score 80 percent or better in the Known) by going back to our original and follow-up “Why?” questions:

**Q:** Why did I score 78.75 percent on the Known?

**A:** Because my wedge and reverse half-Cuban scored 7.0 and 6.5.

**Q:** Why did my wedge and reverse half-Cuban have an average score of 7.0 and 6.5?

**A:** Judges consistently noted shallow 45s and short after on both figures.

**Q:** Why did I fly shallow 45s on both figures?

**A:** Because I stopped short on my pull.

**Q:** Why did I stop my pull short of 45 degrees?

**A:** Because I did not compensate for a strong tailwind and downwind placement of the 45-degree line.

**Q:** Why did I not compensate for the tailwind?

**A:** Because I was unaware of the in-flight wind conditions.

**Q:** Why was I unaware of the wind conditions?

**A:** Inadequate preflight study and in-flight analysis.

**Q: Why did I not analyze the winds correctly?**

**A: I didn't understand their possible impact on my scores.**

**Q:** Why was I short after rolling on both figures?

**A:** Because I initiated back-stick pressure too early.

**Q:** Why did I initiate back-stick pressure too early?

**A:** Because I was focused on the south boundary becoming an issue versus flying the perfect figure.

**Q:** Why was I more worried about the south boundary than the perfect figure?

**A:** Because I had a flawed perception of the points lost for an out versus a poorly flown figure.

**Q:** Why did I have a flawed perception of the points lost for an out versus a poorly flown figure?

**A:** Inadequate knowledge of the rule book and scoring process.

The root cause is found in your answers to the BOLD questions above: Inadequate wind understanding led to shallow 45s, and poorly placed and flown figures, due to possible south boundary excursion. Now that we have arrived at the root causes (**inadequate wind analysis** leading to a



Adam Messenheimer.

PHOTOGRAPH COURTESY OF IAC138



Judges review paperwork at Hammers Over Hondo.



PHOTOGRAPH BY LEIGH HUBNER

flawed perception of the environment, and a failure therefore to correct for the winds, and **flawed decision-making in rushing figures** to avoid an out), we can fix it and improve future performance, which was the goal all along.

The fix might sound like this:

Use multiple sources to gather information on the winds aloft, and watch competitors who fly before you, to gauge the impact of the winds. Plan your sequence, to include optimum figure placement, thoroughly before you start your strap-in. While holding (or climbing), assess the impact of the actual winds aloft. Having done these things and matched your perception to reality, you can improve.

Knowing that the winds were straight down the X-axis and much stronger than you anticipated, you could have placed the figures farther upwind to not press the south boundary. Knowing that your 45s were downwind (and therefore prone to “appear” shallow to a judge), you could set them slightly steeper. Even if you had not correctly placed the figures, you could have still made a better decision and flown the figures to the best of your ability and risked the much smaller out penalty versus the lower scores because you rushed through the figures.

Objective No. 3 (finish in the top three pilots) is a little trickier. When you ask why, it will likely tie directly to objective No. 2 so the same fixes apply. But what if the pilots in first through third all scored 85 percent or better? In this case, even if you had met objective No. 2, you still would have not met objective No. 3. This falls under a different category.

My wife explained this one to me long ago. There was a time when she was running 5K races every weekend and she was fast. She could post the same time (one she was happy with) and finish anywhere from first to 21st, based on who else showed up. So, was she less happy with the same time if she finished 21st? Of course, that’s human nature ... but it makes no sense. In our example, if a bunch of good pilots show up, then meeting objective No. 3 will be extremely difficult. A score of 80 percent may win one contest and finish fifth at another. The ultimate root cause may be: “There were at least three pilots at this contest who flew better than me.” If you are happy with your performance and flew as well as you could,

then that’s okay. Your way forward is to effectively debrief every maneuver/figure/flight to continue to improve so that you can make your way onto the podium.

This is just one hypothetical scenario where we used objectives to measure success; then honestly assessed errors as due to perception, decision, or execution; then decided on a course of action to prevent reoccurrence of the errors in the future. There are an infinite number of scenarios and ways to apply this model. Just start with a measurable and realistic objective, assess whether you met your objective, and if you didn’t, keep asking why until you get to the root cause, which will always be an error of perception, decision, or execution. Then put into action a plan to remedy your errors and improve future performance. Fly fun! **IAC**

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**Doug Jenkins** has an ATP, and his day job is as a T-38C simulator instructor for the Introduction to Fighter Fundamentals program at Randolph Air Force Base. He has flown numerous aircraft types; however, the most interesting to him are the Pitts S-1, Taylorcraft BC-12D, Bellanca Decathlon, T-37, T-38, T-6 Texan II, and the F-15C. Total hours aerobatic flown are around 5,000, which includes military time in trainers and fighters. Doug is an Intermediate category competitor in his Pitts S-1E. In 2022, he was the first-place winner in the Regional Series in the South-Central Region. (Congratulations!)



# SYMMETRY

## THE FULFILLMENT OF A MIDWING OBSESSION

BY DOUG MCKINNEY, IAC 14516

**SYM•ME•TRY** ['simətrē]: the quality of being made up of exactly similar parts facing each other or around an axis, a sense of balance and proportion.

Without exception, symmetry defines the midwing Extra 300, designed and built by Walter Extra. Perhaps this quality is why it is so pleasing to the eye; everything is equal and in balance. Left is the same as right, top the same as bottom — true natural perfection by design. Just as the symmetrical flights of an arrow provide accuracy, so too does the midwing deliver aerodynamic perfection. Newer models such as the NG might be the best in composite and the SC best in performance, but in my opinion, the midwing is best by design. It has such a natural shape that symmetry almost becomes obsessive.

It wouldn't take you long in my workshop before you might realize I suffer from some type of midwing obsessive compulsive disorder (MOCD). There you will find that for better than three decades I have constructed and flown many large-scale radio-controlled Extra aircraft models. My first introduction to the midwing design was many years ago at the 1989 IAC Championships, and ever since, it has been my obsession at first sight. In that year, as a recently certificated private pilot, aerobatic enthusiast, and IAC assistant at this event, one of the first two midwings in the United States made its appearance in the Unlimited category. Guess who had the unfortunate duty marshaling this aircraft to park? Yup, me. Why unfortunate? Because that was the beginning of my MOCD. Much has been written about why Walter Extra conceived the design for the original Extra 300. In short, competitive pressure from the Sukhoi Su-26 and a need for a two-place Unlimited-capable aircraft required Walter to start with a new design. Limited supply of quality wood products and a desire to build a certificated aircraft drove the extensive use of composite structures that are now common on all Extra aircraft. A total of 68 midwing EA-300 models were produced before the more common and

*It was during that summer of '89 that these midwing aircraft found a special place in my soul. First was my personal introduction with serial No. 001 at the IAC Championships in Fond du Lac, Wisconsin.*

simplified front cockpit-access EA-300L became popular with aerobatic training.

The first two aircraft — serial No. 001 300PW and its identical twin, serial No. 002 89BR — were imported to the United States in early 1989. Brian Becker's Pompano Air Center (PAC) in Florida was the original Extra Aircraft USA facility, and PAC received, assembled, and performed the initial flights on both aircraft. Both aircraft remained registered to PAC and were flown by many pilots, including Walter Extra and the IAC Hall of Fame pilots Patty Wagstaff and Clint McHenry, to name a few, before being sold in August and December of that year. It was during that summer of '89 that these midwing aircraft found a special place in my soul. First was my personal introduction with serial No. 001 at the IAC Championships in Fond du Lac, Wisconsin, and then came the cover of

DATE 1-89	RECORDING TACH TIME	TODAY'S FLIGHT	TOTAL TIME IN SERVICE	DESCRIPTION OF INSPECTIONS, TESTS, REPAIRS AND ALTERATIONS ENTRIES MUST BE ENDORSED WITH NAME, RATING AND CERTIFICATE NUMBER OF MECHANIC OR REPAIR FACILITY. (SEE BACK PAGES FOR OTHER SPECIFIC ENTRIES.)	
				TEST FLIGHT	WALTER EXTRA
2-18	.5	.5	.5	"	WALTER EXTRA
2-18	.5	.8	.8	"	WALTER EXTRA
2-18	1.0	1.8	1.8	"	WALTER EXTRA
2-19	.5	2.3	2.3	"	BRIAN BECKER
2-19	.6	2.9	2.9	"	WALTER EXTRA
2-20	.5	3.4	3.4	"	WALTER EXTRA
2-24	1.0	4.4	4.4	"	BRIAN BECKER
2-26	.8	5.2	5.2	"	BRIAN BECKER
3-1	.7	5.9	5.9	"	CLINT McHENRY
3-2	.3	6.2	6.2	"	CLINT McHENRY
3-3	.5	6.7	6.7	"	BRIAN BECKER
3-4	1.3	8.0	8.0	"	CLINT McHENRY

The first test flights were logged by Walter Extra, followed by Brian Becker, then Clint McHenry.



Brian Becker in 1989.



Clint McHenry and Patty Wagstaff.

the August '89 issue of *Sport Aerobatics* that included a wonderful article featuring PAC and the two new aircraft. During this time, Clint McHenry used aircraft No. 002 N89BR to dominate a victory at the U.S. National Aerobatic Championships in Denison, Texas, which included invitational Soviet competitors flying the Sukhoi Su-26. The mold was set; I was determined to own one of these aircraft someday. While the summer of '89 left an indelible mark on me with these two midwings, and aerobatics became a principal goal for me as a future pilot, the reality of a poor college student set in. I was fortunate enough to spend a few days the following spring flying a Super D and Pitts S-2B at a school in Texas, but beyond those few hours early in my logbook, aerobatic aircraft were out of my reach. Soon a family and a career in commercial aviation became my path, and aerobatic flight and the passion for the Extra 300 became limited to the affordable RC aircraft I have today. Fast-forward about 30 years to 2020 when everything changed.

I love airplanes – the de Havilland Beaver on floats, C-195, Super Cub, and the Pitts – but I really only cared to own one airplane, an Extra. My search wasn't obsessive, well, maybe ... I always found plenty of available listings, but none I felt I could seriously afford. My mind frequently wandered back to that image of the 300 I first laid eyes on in '89, and a thought came to mind. I thought, "What about the midwing?" But the current aircraft listings were all for every other 300 variant, the 300L, LX, SC, etc., but never the perfection of symmetry, the midwing. I continued to wonder if perhaps the midwing had dropped off the market and perhaps could be found somewhere else at an affordable price. I quickly fired off a shot in the dark email to the Extra USA sales representative with just this simple question, "Do you see or know of any midwing aircraft available for sale?" To my surprise, within a week I had a name and contact on a midwing that might be available.

Within another week and with pictures in hand, I was planning a trip to look at an aircraft 1,400 miles away in northern Idaho. An easy flight followed by a two-hour car ride put me in the wonderful town of

Bonners Ferry, Idaho, where I found the welcoming hospitality of the airport manager and FBO staff. With their assistance, I was able to access the hangar where I met my hero. What commonly precedes this quote is "... be careful when ..." and this was no exception.

Anticipating the finest example of Walter Extra's symmetrical genius and meticulous craftsmanship, I was sadly confronted with a tired example of a neglected airplane. Care had been taken to wash off the many layers of dust that had accumulated over the years, but lacking was the care that can only be given by someone who has a midwing obsessive compulsive disorder. After walking around the airplane a few times and looking inside the cockpit, I was asked if I would like to push it outside in the light. With a disappointed sigh in my voice, I politely declined. I'd seen enough, I already believed I would need to financially overextend myself (and family) beyond comfortable limits to fulfill a completely selfish desire. No way could I justify making that commitment on this hangar queen. Sure, it had potential but not for me; it would be a task for someone with more resources. I knew the owner had another buyer interested, so I made the surprisingly

difficult phone call to say I wasn't interested. Previously, it had been arranged that scanned copies of the aircraft logbooks would be emailed to me for review, but due to my availability and desire to rush out and see the airplane, I never found time to open the documents. It wasn't until several days after dejectedly returning home that I found time to open the emailed aircraft documents.

I'm not sure why I felt the need to open the documents other than it was the closest I had come to owning the only aircraft I ever wanted. Once again with MOCD working on me, I began to sift through the attached email files. One of the first documents was a scanned copy of an earlier sales listing for this Extra dated 2009. In the margins of this listing were handwritten notes presumably scribbled by the current owner during a perspective prebuy. I was able to make out dollar figures, inspection dates, and the typical notes you might find from someone inquiring or making an offer to buy. One of the scribbles was a name, probably illegible to most but with the predominant letters CMH. For some reason I immediately knew that name was Clint McHenry; it had to be, but why? No way it was the Extra that Clint flew in 1989, beating the Soviets to win Nationals. I searched further, and the first pages of the logbook revealed it all, serial No. 002 N89BR. The first test flights were logged by Walter Extra himself, followed by Clint McHenry, Brian Becker, and several others. This was it! This dull, dejected hangar queen was once the greatest-performing Unlimited aerobatic aircraft in the world. It was not just a Nationals champion but also a feature on the covers of two issues of *Sport Aerobatics*, and it was showcased in the center section of *Flying* magazine. What had I done! I already told myself "No!" Worse, I had told the owner I wasn't interested. Panic and anxiety set in, so I needed validation, and most importantly, grace on what to do next — my wife, yup, that's it. I'm going to make her listen to the story, and then I'll do what she says, which would be either



Wing removal.



Loading for the trip from Idaho to Minnesota.



The moving crew (left to right): Jack, Josh, Sam, and Doug (the author).



Safely delivered by Jack, Josh, and Sam.



Bare fuselage. Engine removed and 1,000-hour inspection begins.



Results after polishing the horizontal stabilizer.

walk away or pursue. For some reason, she gave the green light to pursue, so with new determination, that's what I did. After nearly two-and-a-half months of planning and a second trip west to reevaluate the airplane, on December 1, 2020, I (we) became the proud owner(s) of an unairworthy Extra 300 midwing. Internal engine corrosion made it unflyable, so options to transport the airplane home via ground had to be explored. And what I was learning was not what I wanted to hear.

Therefore, on December 19, 2020, at 0600, with a rented 28-foot enclosed trailer, my crew and I set off on a 26-hour nonstop road trip to Bonners Ferry, Idaho. Our goal: to be home safely with the airplane in time for family Christmas obligations on the 23rd. My crew consisted of my two oldest boys, home from college on Christmas break, and one of their high school classmates and a longtime family friend home on break, as well. We left Minnesota in a snowstorm, driving through hours of heavy crosswinds and snowy Montana passes to arrive at the hangar shortly after 0800 on the 20th. My crew of course was well rested and excited upon arrival. I, however, after driving nonstop, was ready for bed. Regardless, with tools in hand and a maintenance manual to guide us, disassembly began. The wing and horizontal stabilizer would need to be removed for transport, and I knew if we didn't get that right, the whole thing would be a failure — stress! By noon, we lifted the wing off and placed it aside on four queen mattress pads to keep it safely off the floor; stress relieved. We then reassembled all the panels, canopy, cowl, and vertical stabilizer back on the fuselage before loading everything into the trailer — stress! Next, we leveled and tied down the fuselage so that decking could be placed beneath the tail, providing access to slide the wing in on the floor between the main gear — stress! With mattresses placed on the trailer floor, we slid the wing in on top, strapped everything down, and at 8:15 p.m., closed the trailer doors, stress relieved. Sounds easy, like you might see on a

# THE MILLENNIAL

BY DOUG MCKINNEY, IAC 14516

The data tag of EA-300, serial No. 002, has a date of manufacture of February 17, 1989, making it a millennial.

According to the aircraft logbook, the initial test flights of N89BR were performed the following day by Walter Extra, with subsequent flights by Brian Becker and Clint McHenry of Pompano Air Center (PAC). Over the next 10 months, the airplane was flown by numerous pilots, including the IAC Hall of Fame pilot Patty Wagstaff, and was used to compete at several contests around the country.

One contest worthy of mention is the 1989 U.S. National Aerobatic Championships held in Denison, Texas. Competing in the Unlimited category, with little time in this airplane, Clint McHenry triumphed in four of the five flights, not only winning but also securing a position on the 1990 U.S. Unlimited Aerobatic Team. At that time, the Unlimited category had the largest field of contestants ever – 37, including two invitational Soviet pilots flying the Su-26 aircraft. As a three-time Unlimited national champion, eight-time U.S. Unlimited Aerobatic Team member winning gold, silver, and bronze medals in world championships, and the first pilot to win all nine of IAC's aerobatic achievement awards, Clint would later recall the '89 Nationals win as his most exciting aerobatic experience.

N89BR appeared on the cover of the August 1989\* and March 1990 issues of *Sport Aerobatics* and graced the center feature article in the December 1990 issue of *Flying* magazine. All pretty center stage for this design, Walter debuted this aircraft as a prototype the year prior at the World Aerobatic Championships in Canada. The airplane was sold later that year and would spend the next 20 years moving through several owners, accruing limited flight time before ending up in Idaho waiting for restoration.

## EA-300 N89BR Specifications

Standard price (1989 U.S. dollars including delivery): \$180,000

Engine: Lycoming AEIO-540-L1B5D (300 hp)

Propeller: Three-bladed MTV-9-B-C

Seats: 2

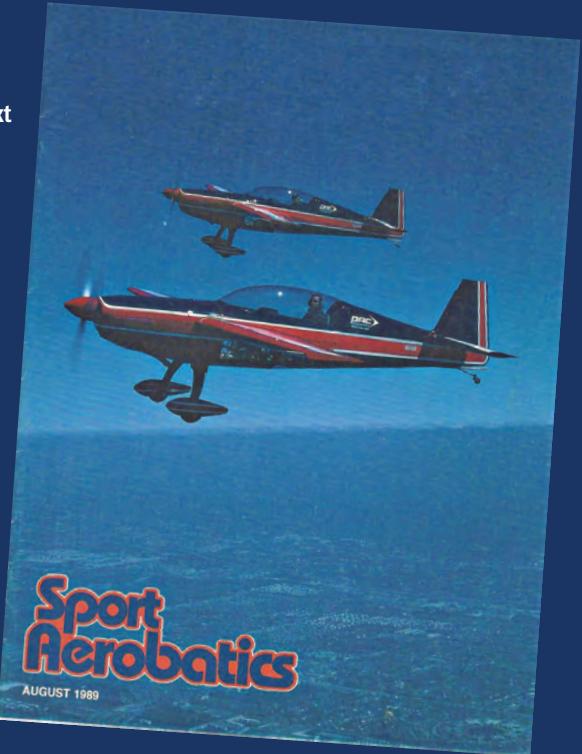
Length: 23.4 feet

Span: 26.25 feet

Empty weight: 1,466 pounds

Fuel: 52 gallons

\*Note: The author would be sincerely grateful to anyone who may have an original copy (and willing to part with it) of the August 1989 issue of *Sport Aerobatics*.





Wing on! The aircraft is shown with an overhauled engine, propeller, and the wing. Installation was completed at West Metro Aviation.



New engine.

***Anticipating the finest example of Walter Extra's symmetrical genius and meticulous craftsmanship, I was sadly confronted with a tired example of a neglected airplane.***

cable TV show when they restore a car in an hour. Truth be told, it was one of the most enduringly stressful tasks I have ever been challenged with. I can tell you that without the motivation from these three young men involved, I am certain I would have failed at this task. We went back on the road early on the 21st to arrive in Buffalo, Minnesota, at 11:30 a.m. on the 22nd. We covered 2,800 miles in four days, disassembled an airplane without damage, and checked the box for the ultimate road trip!

I now had what amounted to nothing more than a bunch of airplane parts, probably worth less than what I paid, so it was up to the pros at West Metro Aviation in Buffalo, Minnesota, to restore our Extra to airworthiness. With the experience to handle this type of project and the infectious motivation of Mike Wiskus and his can-do personality, work began immediately. This Extra is certificated experimental; therefore, under the guidance of a certificated mechanic, I can perform several tasks. Most important, I wanted to become intimately familiar with every piece of this airplane, so I set to the task of thoroughly cleaning and polishing every inch from tip to tail. Fortunately, no structural surprises were found, and only a couple of cosmetic hangar rash



The prebuy photo showing the cockpit before restoration.



New cockpit.

Appearance  
Maintenance



## FACTS, FIXES & TIPS

FROM THE PROS

### DRYWASH: THE UNSUNG HERO



DryWash, a waterless deep cleaning technology, uses a chemical formula to remove soil and grime, deoxidize, enhance paint gloss and provide a protective UV barrier. Increasingly popular, particularly since the elimination of water makes scheduling exterior cleaning flexible and convenient. DryWash can be adapted to surfaces by the extent, condition and type of soil. Its targeted surface application addresses signs of wear, corrosion and metal fatigue, all required checks for safety compliance.



A well-designed DryWash system deep cleans irregular surfaces, depositing a barrier against paint deterioration and inhibiting further oxidation, soiling and stains. The protective coating guards against UV and other atmospheric degradation, while reconditioning the surface, enhancing gloss appearance and intensifying paint color.

DryWash technology is the perfect solution to growing concerns of sustainable water management. Wastewater and runoff from wet wash pits cause very real problems with groundwater and soil contamination. This waterless application deftly addresses concerns for conservation and environmental compliance.

NUVITE offers a high-quality line of DryWash products - NuPol®, NuPower II®, NuGlaze® and CitriCut® Xtra. All engineered to clean, condition, protect, enhance and improve the longevity of your aircraft's appearance, each has attributes to meet specific surface conditions.

### TRY A DIFFERENT COAT ON FOR SIZE COATING VS SEALANT

Ceramic-based coatings are pricey as they require skillful application and follow up maintenance to meet longevity claims. NUVITE has another option...NuGlaze® Paint Sealant and Polish. Not technically a coating, but a chemical sealant that checks many of the same boxes. NuGlaze® locks out moisture, fights oxidation, repels bugs/soil, enhances color and extends shine. Application is easy and can be done anywhere - just APPLY, DRY, BUFF to high-gloss shine.



### WHAT'S YOUR ANGLE?

An angled buffer is too aggressive - it could burn the clearcoat or cut right through the paint. For painted surfaces it's better to hold the random orbital flat against target area, no more than 24sq inches. Running app. 1000 rpm's, move up and down, left to right in a crosshatch pattern until the target area is fully polished.

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issues needed to be addressed on the airframe. The original paint also polished up remarkably well; however, it will likely receive a future refresh. After stripping down the airframe and sending the engine out for overhaul, a fresh 1,000-hour airframe inspection was performed with new replacement hardware on all controls. Since the last time this airplane flew was in 2009, internal engine corrosion was the dagger that made it unairworthy. As a result, a new limited engine overhaul was performed, including plating the cylinders with carbon nickel to prevent future cylinder corrosion, and both the MT propeller and governor received a fresh overhaul, as well. With a new engine comes new instrumentation to monitor it, so I added a digital engine monitor to accurately track future engine health.

Fast-forward once again through COVID delays, and my availability to work on the project takes us to August 2022, and the first post-maintenance test flights. The first flight was a huge success, with Mike's praise that "... it flies hands off." Currently, EA-300, serial No. 002, resides with me in a beautifully heated hangar in central Minnesota. I have been blessed with an

opportunity too great to ignore, and this journey, which began with a dream in 1989, is only a reality because of the people in my life. Without them, this airplane and I would just be getting older and continuing to fade. So, thank you everyone for being there in your own way; this project has been a life lesson for me that I hope will positively influence others. We are told to follow our dreams and pursue our goals, and success will result from our efforts. All true with one exception: Success will not happen without the support of others. Someday a paint refresh will be in order, but for now my goal is to fly as often as possible and participate in IAC events at whatever level allows me the most fulfillment with this classic. I believe no greater honor for this definition of symmetry is to keep it flying long into the future.

Thank you, Walter. Mine is perfect!

IAC



Glamour.

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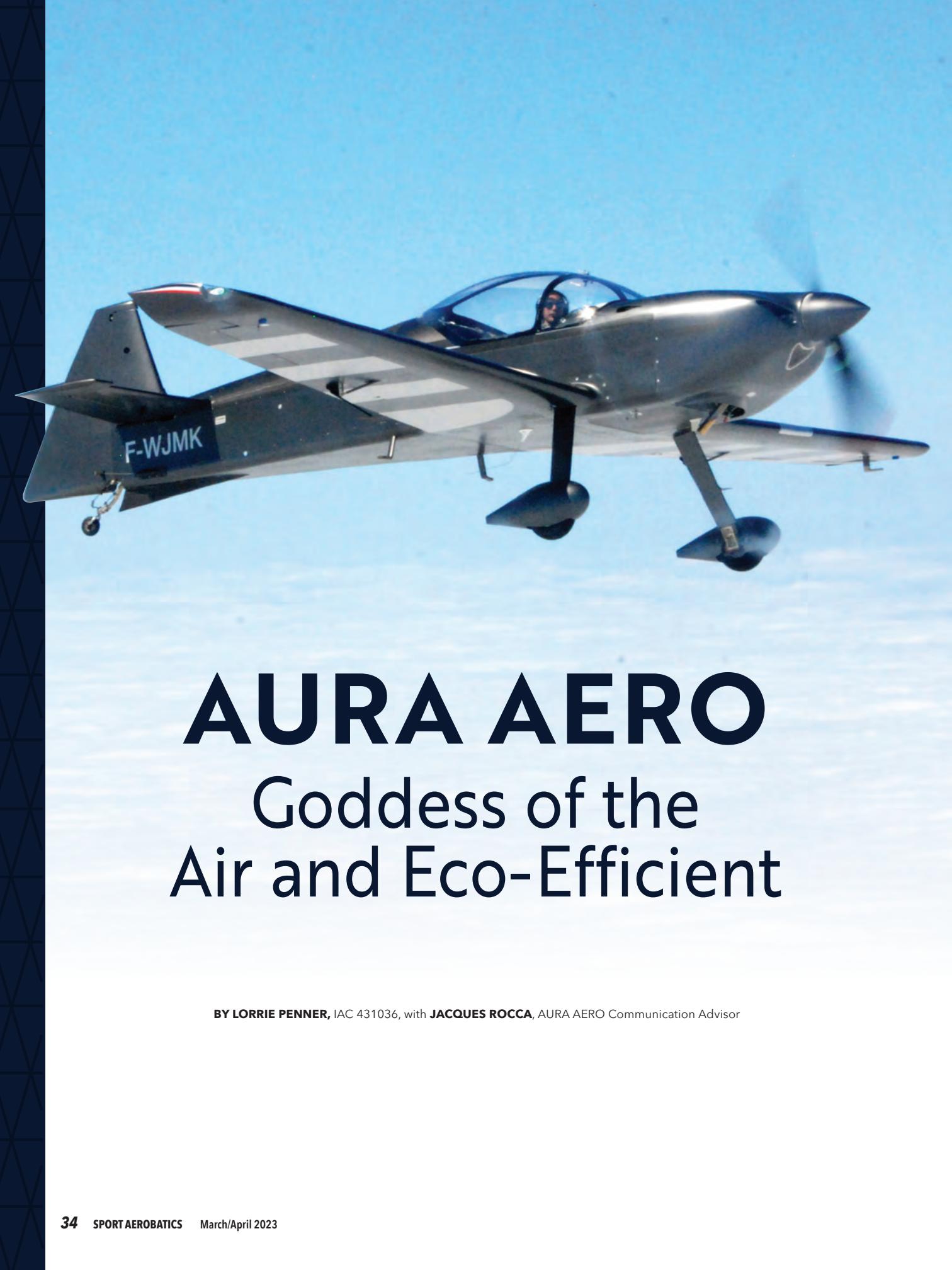
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# AURA AERO

## Goddess of the Air and Eco-Efficient

BY LORRIE PENNER, IAC 431036, with JACQUES ROCCA, AURA AERO Communication Advisor



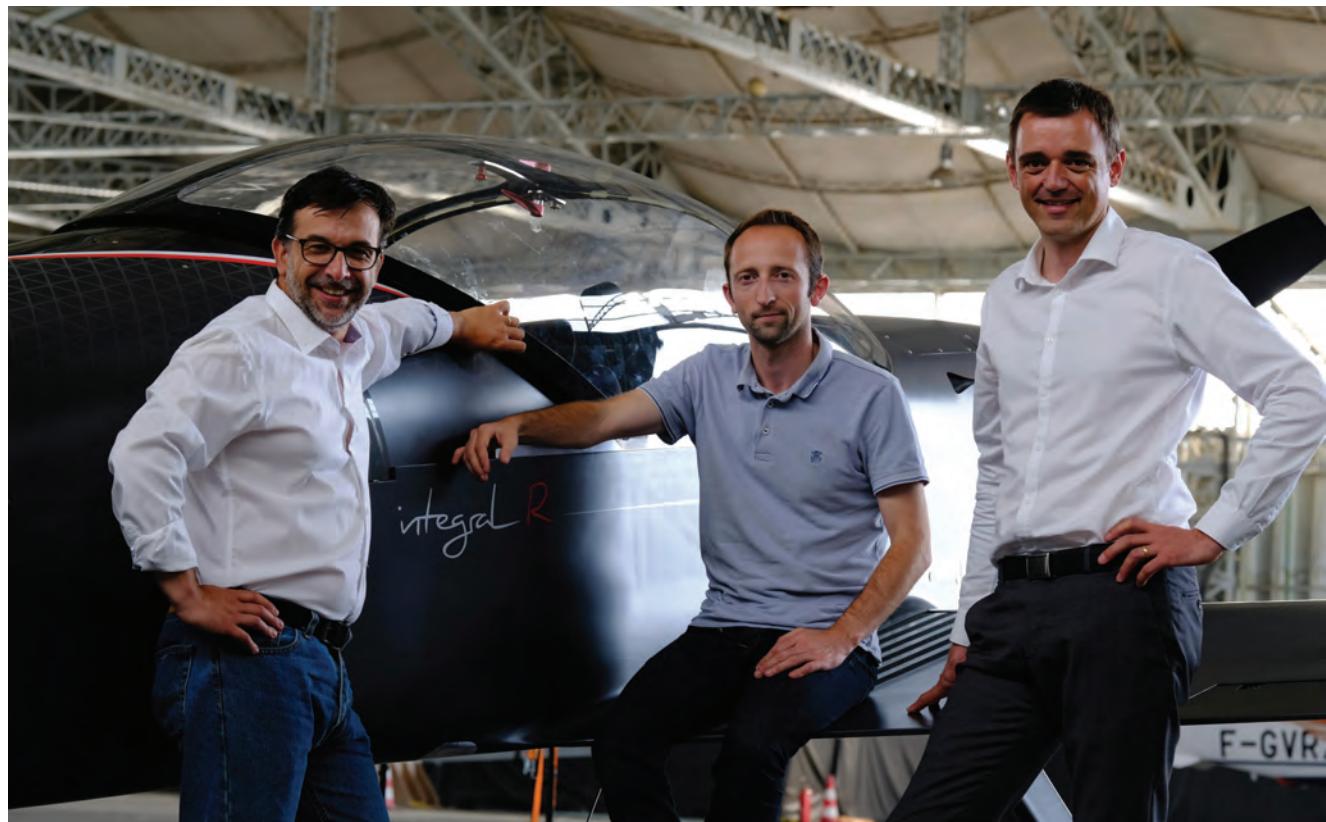
**AT ONE TIME OR** another, most children looked to the sky and wished they could fly with the birds or roll and loop like an aerobatic plane. For three men, brought together through history and restoration of Roland Garros' Morane-Saulnier airplane, the opportunity to make the aerobatic dream come true for many sees fruition in their company, AURA AERO.

AURA AERO was founded in 2018 by Jérémie Caussade, Fabien Raison, and Wilfried Dufaud. The three had joined the Replic'Air Association to build a near-replica of Garros' Morane-Saulnier H for the 100th anniversary of his flight and send the featherlight machine across the Mediterranean Sea nonstop, flying from France to Tunisia once more. The association manned by volunteers built the airplane replica as a Morane-Saulnier G, a two-seat version of the H.

The origin of the company name, AURA AERO, is based on the Latin word *aura*, which means “moving air, breeze,” coupled with Greek mythology, as the name Aura was the Titan goddess of the breeze. Aero is clearly related to aeronautics. It is an old Greek word meaning “air” and is used as a modifier to compound words such as “aerodrome” and “aéroplane.”

Through lessons learned in their various careers, the three AURA AERO co-founders were spurred on to start a company based on their desire not only to create a personal two-place aerobatic training aircraft of noble and lasting materials to ensure lightness, but also to create a range of aircraft from training to leisure, aerobatics, and regional transport. The men wanted to create a new aircraft manufacturing company with designs for its aircraft anticipating the impact of their use and their ability to be recycled.

AURA AERO uses small steps strategy: first designing aerobatic and training-oriented aircraft (INTEGRAL R and INTEGRAL S) that will be key for the next pilot generation's training. About 300,000 new pilots have to be trained in the coming years, with 85,000 pilots in the United States. Trainees will have the opportunity to pilot the aircraft and not only be regulated to simulators. INTEGRAL S, the



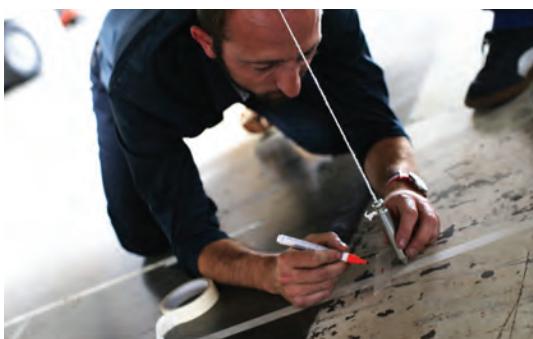
AURA AERO founders Fabien Raison, Jérémie Caussade, and Wilfried Dufaud.



Wood shop.



Wood shop.



Weight and balance.



Production ramp-up.



Design.

side-by-side, two-seat version with a tricycle landing gear, will help to face the lack of training aircraft usually encountered.

It was important to the co-founders to take into account the environmental impact that the INTEGRAL family of aircraft will have throughout their life cycle, in order to reduce that impact as much as possible. They set up the production space in Toulouse, France, on the historic site of the former Francalzal military airport in the HM7 hangar, the first air platform for the French army. The building that houses the design office, manufacturing shops, assembly lines, the test zone, and customer delivery zone for the INTEGRAL R was the French Army Air Force's first building.

“Being located close to a major industrial area and internationally recognized groups and on a historical French aviation site, we are in the best place on earth to manufacture aircraft,” said Jérémie. “It’s a very inspiring melting pot.” The hangar is 3,500 square meters and also will be home to a new assembly line for the Electric Regional Aircraft (ERA).

AURA AERO is a digital native company, which means that it uses digital at each step from conception to customer support through production. Collecting data and using digital will allow secure and comfortable flights and improvement of the training delivered by their aircraft, and they will ensure optimal maintenance and aircraft availability.

As part of its manufacturing philosophy, AURA AERO said control of operating costs is an essential criterion for this new aircraft. “Maintenance, for example, has been optimized since the design phase, with the existence of a ‘system bay’ and the possibility of changing the engine in less than one hour, thanks to a ‘plug-and-play’ propulsion system,” a company spokesperson said.

“Access to the vital organs of the aircraft is immediate, enabling to gain time during periodic inspections,” continued the spokesperson. “A dedicated digital system for follow-up of flight operations and maintenance is also available for customers, with the use of carbon-wood, a composite material enabling to combine light weight, resistance, and easy implementation and repair.”

The first member of the family to be built was the INTEGRAL R with its side-by-side cockpit intended primarily for VFR and upset

**The origin of the AURA AERO name:  
Aura comes from Latin meaning  
“moving air, breeze.” In Greek mythology,  
Aura was the Titan goddess of the breeze.  
Aero clearly relates to aeronautics.**

prevention and recovery training courses, aerobatic competitions, and controlled cost travel. The steel gray exterior of the prototype is sleek and reminiscent of its inspiration, the CAP. The INTEGRAL family was founded from CAP 10 and CAP 20L legacy and designed jointly with the father of aerobatics, Jean Marie Klinka. The company he founded, Air Menuiserie, has joined the AURA AERO group in order to maintain and spread his carbon-wood savoir-faire. Indeed, Air Menuiserie still repairs CAP 10 aircraft and uses its expertise in INTEGRAL family manufacturing.

The INTEGRAL R cockpit is spacious and equipped with seats and rudders that are easily adjusted in seconds. Construction of wood-carbon materials allows for a lightness of feel on the controls and overall weight of the aircraft. INTEGRAL freestyle enables

aerobic pilots to display their technical skills and the aircraft's ability to perform spectacular figures.

The airplane will go through EASA type certification; both EASA CS23 and FAA certifications are currently in progress, and the plane will be available as a factory-built turnkey aircraft and also as a kit plane. In 2020, launch customers were announced: The Midi-Pyrénées Voltige (MPV) chose the kit plane, and Dijon Voltige chose the factory-built version. Both are French aviation clubs specializing in aerobatics.

“I was seduced by the company’s industrial approach, when we met at the French one-seater and two-seater Aerobatics Championship, organized in September 2020 at the Chateauroux-Villers aerodrome,” said Bruno Barraud, president of the Chateauroux-Villers Flying Club. “The challenge represented by this



Production team with INTEGRAL R after its first public flight, July 1, 2020.



Baptiste Vignes and Simon de la Bretèche.



Eric Delesalle and Hervé Poulin.



EASA Part 21 Subpart G approval is received. AURA AERO launches final assembly of its first series aircraft; INTEGRAL R.

project, driven by a team on human scale, perfectly meets our values and our objectives."

You may wonder how INTEGRAL R flies. On June 22, 2020, the INTEGRAL R took its first flight. The aircraft, registered F-WJMK, flew for one hour during which test pilots Eric Delesalle and Hervé Poulin explored the aircraft's flight envelope. Delesalle said, "The flight commands prove to be remarkably balanced, and the efforts are consistent in both axes. Handling is excellent, and this aircraft should satisfy the requirements of experienced aerobatic pilots."

"First of all, this is the story of the encounter between the first aerobatics club in Toulouse and a team of passionate aircraft manufacturers!" said Jean-François Babi, president of the Midi-Pyrénées Voltige Flying Club. "But also, an attractive project mixing wood and carbon, modernity, and tradition in order to design and manufacture a modern, ergonomic, and performing two-seater aircraft in which our future champions will be trained. The plus for us is the



# AURA AERO — THE CO-FOUNDERS

BY LORRIE PENNER, IAC 431036, with JACQUES ROCCA, AURA AERO Communication Advisor

Jérémie Caussade is the president and co-founder of AURA AERO, boasting more than 13 years of experience in aeronautical engineering and is the company's chief engineer. He began his aviation career with Altran in 2010 as a helicopter flight simulator engineer. Altran is a world leader in engineering and research and development (R&D) services, now merged with Capgemini Engineering headquartered in Paris, France. Jérémie went on to join Airbus Civil Aircraft in 2013.

Holding a master's degree in fluids dynamic from Toulouse Paul Sabatier University (2009), Jérémie also has been the president, founder, and chief engineer of the Replic'Air Association for 10 years, where he has managed the reconstruction and flight of two historical aircraft: a Morane-Saulnier Type G (the aircraft with which Roland Garros crossed the Mediterranean for the first time on September 23, 1913) and a Dewoitine D551, a French fighter plane.

Wilfried Dufaud, co-founder of AURA AERO, is the chief programs officer of the company. Prior to the launch of AURA AERO, he was innovation manager at Assystem, where he was in charge since 2016 of the evaluation phases of technologies (virtual reality, augmented reality, 2D-3D transformation, and metallic additive manufacturing) and coordinator of the partners' network. Assystem does skills development



**Jérémie Caussade**



**Wilfried Dufaud**



**Fabien Raison**

and talent management, as well as R&D for the benefit of the energy transition internationally.

Like both Jérémie Caussade and Fabien Raison, Wilfried had a connection to Airbus when he was working at Assystem as head of fatigue calculation for the design phase of the Airbus' A350-900 program and junior project leader for the A-380 landing gear box. He is a graduate from Toulouse Paul Sabatier University (Licence Professionnelle Techniques Ingénieries Aéronautique et Spatial – conception, dimensioning, industrialization and production in 2000 and DUT Génie Mécanique et Productique).

Fabien Raison, co-founder of AURA AERO, is the chief operations officer for the company. Like Jérémie, he worked for Airbus where he held various positions, including preliminary project designer for engine pylons and head of atomic packing factor APF structure for the A380. Prior to Airbus, he worked as an aeronautical designer for EXcent, a French automobile brand. Previous to EXcent, he was the head of Citroën, also a French automobile brand, in preliminary projects.

Fabien holds a BTS (vocational training certificate) in industrial product design, and was awarded the Best Worker (Meilleur Ouvrier de France) distinction in 2007 in the Mechanics and Manufacturing category.



AURA AERO at AZEA First General Assembly Euro Control.

evolution of this project towards the aerobatics of tomorrow, with the development of an electric version of INTEGRAL R.”

In December 2021, AURA AERO received approval to start manufacturing its first series of aircraft called INTEGRAL. The Part 21, Subpart G, approval covers all of the company’s industrial facilities and was mandatory before it could officially launch serial production of the INTEGRAL general aviation aircraft family.

The INTEGRAL RE and INTEGRAL SE are the electric versions of the INTEGRAL R and INTEGRAL S. While both the INTEGRAL E and R versions have the same body type and have the tailwheel configuration with a constant-speed propeller, the E version will be powered by a Safran ENGINEUS rather than a Lycoming AEIO-390. The ENGINEUS electric motor is a self-contained direct drive propulsion power pod. The load factor range should be +6g/-4g with the electric motor as opposed to the R’s load factor range of +7.5g/-7.5g with two pilots. The electric INTEGRAL E is expected to take its test flight this year. The first deliveries are expected at the end of 2024.

The INTEGRAL E may one day become the workhorse of the glider world, as AURA AERO has signed a partnership agreement with the French Gliding Federation, which confirms its intention to buy one INTEGRAL E in tricycle version to use as a glider towplane within a gliding club. This aircraft will be the first French electric towplane. In France, gliding represents 162 clubs holding a total of

32 world champion titles. The development of an electric towplane will help reduce the noise impact and the carbon footprint of towing.

Many years and hard work have gone into the development of aviation aircraft design. From the beginning, one of the key elements has been the test pilot. From the Wright brothers to the Rutan brothers, all have accomplished many amazing innovations and also had their setbacks. AURA AERO has been fortunate to have experienced, talented pilots flying their test flights. However, like other aviation pioneers, they also have experienced setbacks.

In a routine test flight to evaluate the airplane’s capabilities in April 2022, well-known aerobatic champions Simon de la Bretèche and Baptiste Vignes perished in an accident in the prototype of the

INTEGRAL R in Saint-Girons, Ariège, France.

"Baptiste and Simon were our pilots and friends. Unfortunately, they died in the prototype's last step of the certification process," said Jérémie. "Our company had to be resilient in order for this accident to be both relevant and important to the advancement in aircraft research and design. They bravely contributed to secure mainstream aviation."

AURA AERO is poised on the edge of an impressive and valuable contribution to aviation. It continues to move forward with its mission to develop and produce a range of aircraft for training, leisure, aerobatics, and regional transport. And it is committed to serve mankind by designing and manufacturing aircraft that accelerate air transport decarbonization. **IAC**

**INTEGRAL freestyle enables aerobatic pilots to display their technical skills and the aircraft's ability to perform spectacular figures.**



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## INTEGRAL E

SUMMER 2023: First flight

2024: CS23 certification

2024: First deliveries

ELECTRICALLY POWERED AIRCRAFT –  
ELECTRIC ENGINE – LITHIUM BATTERIES

### TECHNICAL SPECIFICATIONS

**CONFIGURATION:** Two-seater/side-by-side

**LENGTH:** 7.26 meters (23.82 feet)

**WINGSPAN:** 8.78 meters (28.8 feet)

**HEIGHT:** 2.46 meters (8.07 feet)

**MAXIMUM TAKEOFF WEIGHT (MTOW):** 1,005  
kilograms (2,216 pounds)

**SAFETY:** Whole aircraft rescue parachute

**ENGINE:** Safran ENGINEUS



## INTEGRAL R

JUNE 22, 2020: First flight

2023: CS23 certification

2023: First deliveries

AEROBATICS AIRCRAFT –  
SINGLE-ENGINE PISTON

### TECHNICAL SPECIFICATIONS

**CONFIGURATION:** Two-seater/side-by-side/taildragger landing gear

**LENGTH:** 7.26 meters (23.82 feet)

**WINGSPAN:** 8.78 meters (28.8 feet)

**HEIGHT:** 2.46 meters (8.07 feet)

**MAXIMUM TAKEOFF WEIGHT (MTOW):** 1,005  
kilograms (2,216 pounds)

**SAFETY:** Whole aircraft rescue parachute, anti-deflagration fuel tanks

**ENGINE:** Lycoming AEIO-390/A3B6 (210 hp at 2700  
rpm)

**PROPELLER:** MTV-15-B-C/C193-25 (constant speed,  
two blades)



## INTEGRAL S

JUNE 22, 2020: First flight

2023: CS23 certification

2024: First deliveries

AEROBATICS AIRCRAFT –  
SINGLE-ENGINE PISTON

### TECHNICAL SPECIFICATIONS

**CONFIGURATION:** Two-seater/side-by-side/tricycle  
landing gear

**LENGTH:** 7.26 meters (23.82 feet)

**WINGSPAN:** 8.78 meters (28.8 feet)

**HEIGHT:** 2.46 meters (8.07 feet)

**MAXIMUM TAKEOFF WEIGHT (MTOW):** 1,005  
kilograms (2,216 pounds)

**SAFETY:** Whole aircraft rescue parachute, anti-deflagration fuel tanks

**ENGINE:** Lycoming IO-360-M1A (180 hp at 2700  
rpm)

**PROPELLER:** MT-Propeller MTV-12-B-C/C183-59b  
(constant speed, three-blade)



The INTEGRAL R rests next to the production space in Toulouse, France, on the historic site of the former Francalzal military airport in the HM7 hangar.

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# 2023 Judge Program Changes

BY DJ MOLNY, IAC 25097



## Wiki Version

- Regional judge and national judge titles are replaced with grading judge and senior grading judge.
  - If you are a national judge or have graded at least 250 flights, you will automatically become a senior grading judge and eligible to judge at U.S. Nationals.
  - “Regional-N” status is discontinued.
- New certification program for chief judges.
  - Anyone who served as chief judge for at least five contests in the past 10 years will receive the title automatically.
  - Contest organizers are encouraged but not required to use certified chief judges.
- Simplified requirements for becoming a judge and maintaining currency.

Full details are available on the website at [IAC.org/policy-and-procedure-manual](http://IAC.org/policy-and-procedure-manual), document No. 214.

## Why the Changes?

Several reasons.

The current judge titles and roles date back to about 1974. Originally, only national judges could grade flights at U.S. Nationals. Faced with a chronic shortage several years ago, the board of directors decided to allow regional judges with at least 250 flights under their belt to serve at U.S. Nationals. This largely erased the distinction between the regional and national

titles and, perhaps as a result, demand for the *Advanced Aerobatic Judging Seminar* dropped off dramatically.

The requirements for becoming a judge and maintaining currency have grown more complicated over the years, quite possibly to the point of diminishing returns. The revised *IAC Policy and Procedure Manual* (P&P) No. 214 is considerably simpler.

Members who are not current as national judges but *did* meet the currency requirements for regional judges were given the status Regional-N. This only applied to two or three members each year and was largely irrelevant once experienced regional judges became eligible to serve at U.S. Nationals.

Most importantly, the IAC offered very little chief judge training even though chief judges play a vital role in contest operations, especially with regard to safety.

## Becoming a Grading Judge

The steps are largely unchanged from prior years:

- Attend the *Intro to Aerobatic Judging* course, either in person or online.
- Pass the grading judge exam.
- Award practice scores for three flights under the supervision of a grading judge.
- Award practice scores for an additional eight flights, or serve as an assistant for 40 flights, or any combination thereof. (Each supervised flight counts the same as five flights as an assistant.)
  - At least two supervised flights, or 10 of the assists, or any combination thereof must be in the Advanced or Unlimited category, unless the candidate competed in Advanced or Unlimited within the current or previous calendar year.
- Pass a practical (oral) exam administered by a senior grading judge or a chief judge, plus a second judge of any rank.

## Grading Judge Currency

All judges must pass the revalidation and currency (R&C) exam each year unless they earned their certifications within the current year.

Grading and senior grading judges must attend judges school at least once every five years and serve as a grading judge, senior grading judge, or chief judge for at least 40 flights in the previous two years.

# 2023 Judge Program – Thank-You's

BY DJ MOLNY, IAC 25097

A special shout-out to Dave Watson and Chris Combs of IAC Chapter 38 for their amazing work in training new judges. Just since the start of 2022, Dave and Chris mentored Ross Ferguson, Chris Harrison, Bret Davenport, Shane Short, and Ben Lomov. All five are now IAC regional judges. Many thanks to all!



DAVE WATSON



CHRIS COMBS



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## Earning Chief Judge Certification

Senior grading judges can earn chief judge certification by taking the training course, passing a written test, and serving as a chief judge assistant for at least 10 flights. (The latter requirement is waived if you've served as a chief judge even once prior to 2023.)

The training course will cover the rules that the chief judge is responsible for enforcing plus various "soft skills" and best practices for safe and efficient operations. This includes managing the flow of competitors, organizing and checking paperwork, conducting conferences, preparing for and handling emergencies, weather considerations, and more.

As stated earlier, contest organizers will be encouraged but not required to select a certified chief judge. [IAC.org/exam/2022-judges-revalidation-currency-exam](https://IAC.org/exam/2022-judges-revalidation-currency-exam)

## Chief Judge Currency

Chief judges must pass the annual R&C exam. They must also attend chief judge training if they have not attended within the past five calendar years, and/or they have not served as chief judge for a combined minimum of 40 flights in the previous two calendar years.

**IAC+**

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**An IAC member since 1998**, DJ has been a judge for over 20 years and competed in the Advanced category. He serves on the tech committee and rules committee in addition to chairing the judges' program.



Judges at IAC 62



Judges at IAC 61

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April 28, 2023	36	Hammerhead Round up – West Open	Borrego, CA	I08
May 12, 2023	49	Duel in the Desert	Apple Valley, CA	KAPV
May 19, 2023	24	Lone Star Aerobatic Championships	Graham, TX	KRPH
May 26, 2023	3	Mark Fullerton Memorial Bear Creek Bash	Rome, GA	KRMG
June 2, 2023	38	NorCal Aerobatic Contest	Tracy, CA	KTCY
June 9, 2023	78	Doug Yost	Spencer, IA	KSPW
June 10, 2023	11	James K Polk Open Invitational	Midland, VA	KHWY
June 16, 2023	15	Harold Neumann Barnstormer	Ottawa, KS	KOWI
June 23, 2023	67	Apple Cup	Ephrata, WA	KEPH
June 23, 2023	80	MAC80 Aerobatic Championship	Seward, NE	KSWT
July 7, 2023	88	IAC Open Championship East	Bay City, MI	3CM
July 14, 2023	35	Green Mountain Aerobatic Contest	Springfield, VT	KVSF
July 15, 2023	12	High Planes Hotpoxia	Fort Morgan, CO	KFMM
August 12, 2023	134	Yooper Looper	Marquette, MI	KSAW
August 18, 2023	77	Corvallis Corkscrew	Corvallis, OR	KCVO
August 18, 2023	137	Central Canada Aerobatic Championships	Steinbach, MB	CJB3
August 18, 2023	52	Kathy Jaffe Challenge	Bayville, NJ	KMJX
August 25, 2023	34	Ohio Fall Frolic	Bellefontaine, OH	KEDJ
September 8, 2023	67	Apple Turnover	Ephrata, WA	KEPH
September 9, 2023	61	Hammers Over Hondo	Honda, TX	KHDO
September 9, 2023	61	Giles Henderson Memorial Challenge	Salem, IL	KSLO
October 7, 2023	12	Clyde Cable Rocky Mt. Aerobatic Contest	Lamar, CO	KLAA
October 13, 2023	36	Akrofest 2023	Borrego, CA	I08
November 10, 2023	23	86th Sebring Contest	Sebring, FL	KSEF



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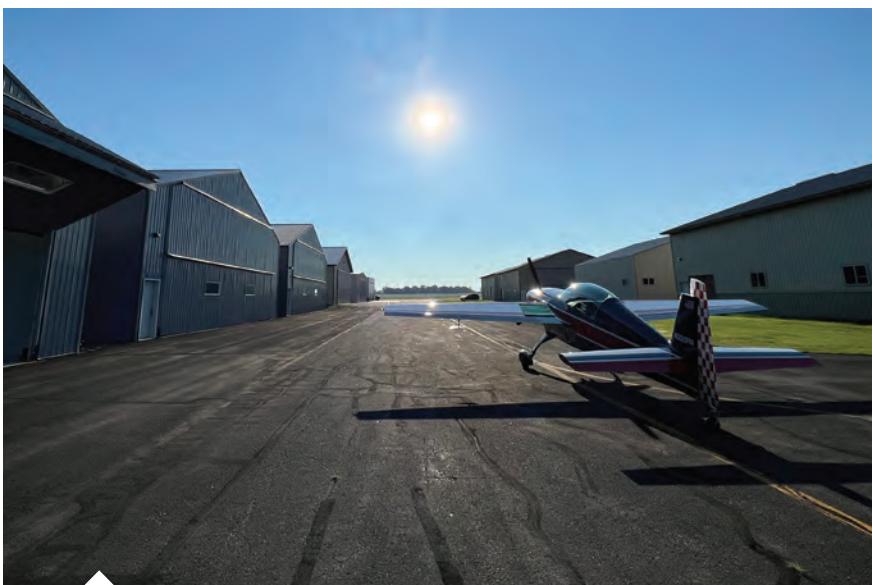
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