



SPORT

Aerobatics

OFFICIAL MAGAZINE of the INTERNATIONAL AEROBATIC CLUB



Eagles and Extras
at AirVenture
2017

July 2017



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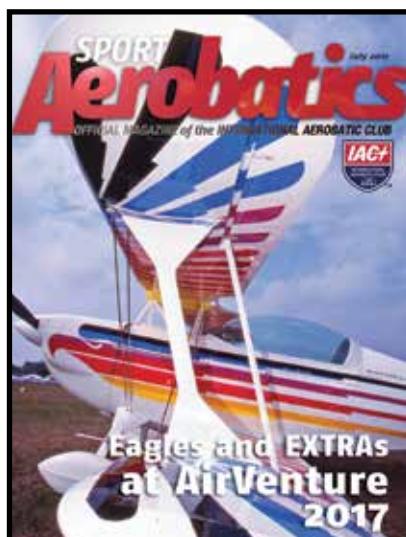
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An Eagle II built by Michael Mock on display in 1999. Photo by Leeann Abrams.

SPORT Aerobatics

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MEET WALTER EXTRA
AND EXPLORE ONE
OF THE GREATEST
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AIRPLANES OF
ALL TIME.

EXTRA

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OF FRANK
CHRISTENSEN'S
LEGENDARY
CHRISTEN EAGLE
WITH A HISTORY
TOLD IN STORIES
AND PHOTOS.

**IAC PAVILION,
AIR VENTURE
JULY 24-30**

IAC

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President's Page

AirVenture – Eagles and Extras

MIKE HEUER, IAC PRESIDENT, IAC 4

Please send your comments, questions, or suggestions to president@iac.org.

When you picked up your copy of *Sport Aerobatics* this month, I am sure you immediately noticed that this issue is thicker and packed with great information. Some months ago, we decided to expand the July issue as it is the one we have on hand to give away to aerobatic enthusiasts thinking of joining the IAC at EAA AirVenture in Oshkosh. Evan Peers has gone to extraordinary lengths to bring you a superb magazine that will be of wide interest to both IAC members and those who love aerobatics as we do. My hope is to eventually offer an expanded magazine to you each and every month, not just July.

All of us in the IAC leadership team are preparing for AirVenture as I write this. The *Eagles and Extras* exhibit is being finalized, and I know those of you attending AirVenture and visiting our pavilion will enjoy it. The celebration of the 40th anniversary of the introduction of the Christen Eagle at Oshkosh is something we look forward to. We have more than 40 Eagles pre-registered for the event so it will be a stunning display. In addition, Frank Christensen, the president and founder of Christen Industries, will be on hand later in the week and will attend our annual gathering of members in the Nature Center on Friday night, July 28. It will be a real honor to have him there and to recognize his outstanding achievements.

EXTRA Aircraft is the sponsor of our AirVenture exhibit this year, and we hope for examples of most of its models to be on display. The EXTRA 230 was the first in a line of outstanding aerobatic airplanes, and we highlight that airplane in our exhibit. Two examples are registered for the event. Walter Extra will also be on hand along with his record-setting EXTRA 330LE, an airplane powered by a Siemens electric motor. It will occupy a special place on Boeing Plaza for EAA's Innovations Day on Tuesday.

Regarding the Extras and Eagles, you will find wonderful articles on these aircraft by Jeff Granger and Cameron Grossl in this issue. I appreciate Jeff and Cameron providing these articles for your enjoyment and education. They are well done and complement the exhibit we are having at AirVenture. To top it off, Karl Gashler talks about his experience as a new competition pilot this year in his RV. Whether you are flying an RV, an EXTRA, an Eagle, or any other type, Karl has some great advice for you – he proves that coming to Oshkosh, attending some seminars, talking to knowledgeable people, and then signing up for a contest and making contact with IAC members in your area really pays off.

Thanks, Karl, for sharing this experience with us.

Beth Stanton also talks about the rebuild of a Laser that she co-owns with others. It's a great story. Aerobatic airplanes are flown hard and need close attention. Beth lays this all out in her story of the rebuild of this airplane. One of the hallmarks of the IAC since our foundation has been not only flight safety, but also the proper maintenance, inspection, and operation of our beautiful airplanes. IAC members have shared that information with each other, in various forums, for many years. Beth continues that long-established IAC tradition.

As you can see, this issue is all about building, flying, getting involved, taking proper care of airplanes, and then making IAC events a part of your life. The IAC is, indeed, a menu of choices that I have written about on many occasions and all made possible by outstanding and hard-working volunteers at all levels in the organization up through your team of officers and directors.

If you are coming to AirVenture, or have picked up one of these magazines at the IAC Pavilion, be sure to visit with one of the several officers, directors, and volunteers who will be on hand. These men and women are skilled and experienced and love to talk about airplanes and aerobatics. At AirVenture, we see friends, make new acquaintances, enjoy some great airplanes and aerobatics, and learn a lot about sport aviation and aerobatics.

In July, we are in the midst of our contest season. As Karl Gashler writes this month, the IAC is organized, professional, and disciplined in our competitions. It was pleasing to me to read that piece from a pilot who is relatively new to our sport but not new to flying. That said, it does require constant vigilance and attention to detail to keep our contests running smoothly and safely.

In September, we bring the U.S. Nationals to Oshkosh. Gordon Penner summarizes where we stand with the championships as of this moment. Even if you are not competing as a pilot at Nationals, I urge you to attend. Volunteers to staff all of the positions are always needed, and Contest Director Gary DeBaun needs your help. We have a great staff assembled for Nationals and what we call the key volunteer group, or KVG. From registration, to tech inspections, to flightline operations, to judging – the contest will have the very best people in place that we can find.

I hope to see you in Oshkosh for AirVenture and Nationals.



Fostering Membership Growth

by Doug McConnell and Lorrie Penner

Healthy Growth

Have you noticed how sport aviation activities have been picking up all around the country? As a result, the IAC has recently been enjoying growth in membership and regional chapter activities. Of course, growth is a good thing. Growth means that the IAC is having a good influence in the eyes of recreational aviators and interested enthusiasts. It means that the IAC is delivering positive benefits to our members — literally thousands of pilots and nonpilot enthusiasts all around the world.

First, the numbers. The IAC enjoyed its peak membership at 6,300 members in year 2000. That was before the recession and during a time when sport aviation was quite a bit less expensive than today. And then the recession hit. It took a toll on all recreational sports, and IAC membership fell several years in a row so that by 2012 we were down to 3,200 members. Life and times have been much better since the recession, because we have experienced continuous positive growth each year for the past five years.

I'm glad to report that the IAC membership at the end of 2016 stood at 4,343, which nicely surpassed our goal of 4,012 for the year. Our goal for 2017 is for a continuation in growth to a new total of 4,700. Can we do it? You bet your sweet ailerons we can! So how will it happen?

Personal Contact Is Key to Continued Momentum

The answer is, we are going to make it happen! Most of the readers of this magazine are already members, so we're mostly talking to a whole bunch of aviation enthusiasts like you, a current member with a whole world of experience and friends and contacts. The IAC board of directors has committed funds and resources to encourage and ensure successful recruiting.

So here's the strategy.

Engage the power and reach of our current 4,000-plus membership. If every current member would sign up just one person, we could double our current membership in one year.

People you already know are very likely good prospects in becoming new IAC members. Simply share your passion for aerobatics with a likely pre-qualified friend, son or daughter, flying buddy, local EAA member, owner of an acro-capable airplane, line attendant, aircraft mechanic, recent acro-aircraft buyer, local flight instructor, current/recent acro student, and so on. Don't overlook nonpilots who have shown interest and retired aviators who remain enthusiastic at heart.

The final strategic initiative is to add fertilizer and water to the seeds that you have planted! By that we mean, new members will be encouraged to renew if they feel part of the aerobatic community. Here are a few ideas that have helped this first renewal for others:

- Invite them to join your local IAC chapter.
- Be sure to introduce them to other IACers when you have a chapter event.
- If a pilot, get them into a practice day, critique day, Smooth Patch day, etc. with your chapter. Give them resources for some dual instruction before showing up for a chapter flying event. If not a pilot or owner, invite them to the event anyway — they can have a ball helping out, especially at a local area contest.
- Invite them to your Christmas party and other social events. Club membership depends primarily on the social equation and less on, in this case, the flying equation.

To the Future

So what is IAC headquarters doing to foster membership growth? Where is the partnership in this activity? To assure the IAC's future and a most enjoyable club experience worldwide, the IAC

leadership and management is actively focused on where we need to spend time, attention, and budgets for maximum effect. Here is a list of recent initiatives aimed at attracting and supporting new members:

- Starting with the president, Mike Heuer is a founding member (IAC 4) and followed in the footsteps of the original founding member, his father, Bob Heuer. Mike also has years of experience in key executive responsibilities with worldwide aerobatic activities and initiatives. Mike has earned his place in the IAC Hall of Fame, and now has once again taken the reins as our president. He has been contributing his knowledge, experience, and leadership to modernize and create effectiveness within the IAC.

- Active board of directors engagement. Focused assignment of experienced officers and directors with initiatives to work in the field in direct support of chapters and events. Every chapter has an assigned regional director to serve as a conduit for problem-solving and as an action partner who will help at the top level of the organization.

- New highly successful and qualified marketing and merchandising focus. The IAC's literature, website, e-mail newsletter, social media sites, IAC-

branded merchandise, and physical facilities have all been redesigned for modern effectiveness and maximum appeal.

- Renewed focus on an updated *Sport Aerobatics* magazine design and content strategy to maximize the success of this key benefit for members. Our new editor's mission is to ensure well-coordinated production and publication, along with content topics appealing to members' interests.

- Continued upgrade of the IAC Pavilion on the Oshkosh flightline to maximize its effectiveness as an AirVenture and U.S. Nationals gathering area. It includes a forums venue, merchandise sales area, and featured aircraft display. The redesign has also been aimed to improve visitor appeal and welcome, thus helping to make an impression on thousands of AirVenture visitors each year.

In summary, it is a new day within the IAC where good ideas are being received and implemented, and where the strategic future of the organization and the sport are being assured. Membership is growing, member benefits are updated, and new marketing and merchandising implemented. Welcome to *our* IAC!

IAC



Stop by the IAC Pavilion at AirVenture for your
Eagle and EXTRA theme merchandise.



Seventeen Years of Extras

The obsession

BY JEFF GRANGER
IAC 19907

PHOTOS COURTESY JEFF GRANGER

HAVE YOU EVER SEEN a kid playing with a toy airplane? It doesn't go straight and level. It zooms up and down and loops and rolls. When I first took flying lessons, I was disappointed at how mundane the flying was in terms of exploring the performance envelope. Learning aerobatics gave me back that

childlike joy of flying.

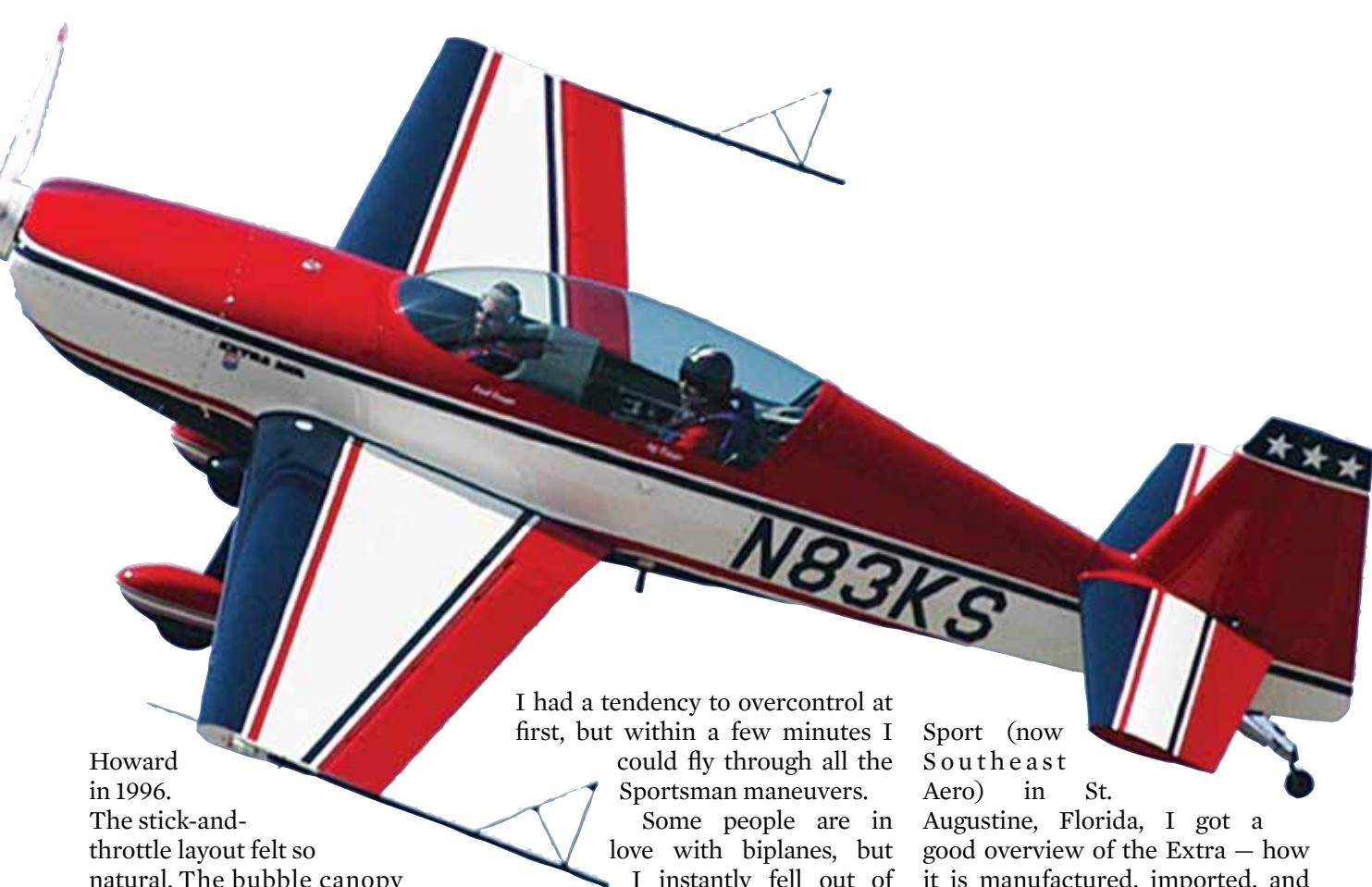
The thing I struggled with most, though, was balancing the costs and benefits of different types of airplanes, especially when it came to standard versus experimental aircraft. Could I justify the benefits of a factory-built airplane by citing ease of acquisition, reliability,

product support, and resale value? For me, the answer was yes. I bought an Extra because it allows me to do aerobatics frequently, easily, and safely.

I started contest flying in 1995 in a Steen Skybolt. It was an experimental aircraft, prone to breakdowns and difficult to get parts for. The intercom was bad, and with open cockpits the slipstream noise was extreme, making communication between the cockpits very difficult. Monoplanes were making inroads into competition in the 1980s and '90s, but they seemed to me to be exotic and expensive beasts. I assumed that if I made a move up from the Skybolt, it would be to a Pitts. So I was saving my dollars and keeping an eye out for the best S-2B. The obsession started with my first Extra flight with Brian



The Steen Skybolt



Howard
in 1996.

The stick-and-throttle layout felt so natural. The bubble canopy provided superb visibility all around, and we were treated to an overhead view of the enchanting blue sky instead of a biplane wing. Acceleration on takeoff was a real kick in the pants. Most of the flight was a blur, but what I remember best was the ease and comfort of flying through the maneuvers. I was able to talk to Brian on the intercom, and he gave me immediate feedback on my technique — something I could never get in the open cockpit. The stick forces were very light, and

I had a tendency to overcontrol at first, but within a few minutes I could fly through all the Sportsman maneuvers.

Some people are in love with biplanes, but I instantly fell out of love with them and became more and more attracted to monoplanes. From that first flight in the Extra, I knew that I had to have one. It was just a matter of time and money. The strength of the carbon-fiber wing the visibility afforded by the big bubble canopy, and the light and delightful control harmony were big selling points. Also, as a standard aircraft, it had excellent product support and was easy to maintain.

During regular visits to Aero

Sport (now Southeast Aero) in St. Augustine, Florida, I got a good overview of the Extra — how it is manufactured, imported, and marketed. All the characteristics of the airframe were easy to see, including its incredible strength and ease of maintenance.

Aero Sport's technical director, "Chip" Bonner, showed me the superb design philosophy and methods of construction. I got a look at the welded steel-tube truss fuselage, the one-piece composite wing, and the one-piece fiberglass landing gear, as well as the carbon-fiber fuselage top that can be removed in minutes for easy access



Southeast Aero workshop.



to the fuselage interior. The entire structure is certified to plus or minus 10g's for single-pilot operation. The engine is the aerobatic version of the familiar Lycoming IO-540, with Christen inverted systems. Up front is the lightweight MT three-blade composite constant-speed propeller.

In subsequent flights I was impressed by the light and harmonious flight controls and the nearly effortless stick movement, which allows the pilot to concentrate on the quality of the maneuvers instead of the amount of muscle needed. Some might say that the Extra gives entry-level pilots an exaggerated sense of confidence. However, I found that when I was not operating the airplane at the limits of its performance envelope and the limits of my strength, I learned faster and the experience was much more satisfying. Still, I was a long way from being able to afford an EXTRA 300L. I was 10 years into surgical practice by then and had most of the bases covered — house, life insurance, college fund for the kids, etc. — and was putting money away each month in a fund for the next airplane, but the Extra was definitely out of reach.

The 200

In 1996, EXTRA introduced the 200, a less costly and lower-powered variant designed to be an entry-level transitional aerobatic plane. Despite its lower cost, it was still capable of performing at the highest levels of competition and had the same g strength as other Extras, making it appealing to aerobatic competitors looking for an affordable yet competitive aircraft. It sold for a little more than half the cost of the 300 and directly competed with the factory-built Pitts S-2B.

There were few compromises in the design and construction of the 200. It has the same wings and tail as a (single-seat) 300S. Even with the four-cylinder engine it can climb at 1,600 feet per minute and

has a vertical penetration of 1,500 feet. Like its big brother, it can roll at more than 360 degrees per second. It looked like Herr Extra might have built just the plane for me. With a few more years of saving, I thought that it might be doable, especially as the used market developed.

In the spring of 2008, a good, pre-owned 200 came up for sale. Located in Potomac, Maryland, it was flown by Jeff Johnson, an F-16 pilot with the Maryland Air National Guard. He had owned it for several years and used it for dual aerobatic instruction and occasional air-show work. It looked like just the right plane for me at the time. We worked out a purchase agreement, which included transition training and delivery to my home base of Logansport, Indiana, and then completed the purchase on March 27, 2000. I was finally an Extra owner.

So now I should start winning contests, right? Not so simple. With advice from other competitors on transitioning between aircraft types, I thought it was best to take it very slow. The first few weekends I focused on just getting used to the airplane for normal category flying — doing lots of pattern work with normal takeoffs and landings. What I learned right away is how slippery a monoplane is compared to a biplane. Landing in the Skybolt with a steep, semicircular approach was pretty simple. Any excess energy was easily ripped away by the high drag from all those struts and wires. Without careful attention to speed on approach, however, I found that the little EXTRA 200 would float and float down the runway until I applied power for the go-around. I learned to get most of the power out on the descent to the pattern, then on the downwind, and to keep my eyes glued on that airspeed indicator through the base and final. It could tolerate a little Extra speed on final

and get rid of it with a slip. But not a lot.

I had flown only Sportsman contests in the Skybolt and felt it best to stick with that category for the first year. Ideally, one would have a coach and trainer on hand to help with the transition — or at least a nearby chapter with experienced competitors to provide informal coaching and critiquing. But at that time there was no IAC chapter in Indiana. It was rare for me to find someone to practice with or be critiqued by, but I could fly more or less as much as I wanted on my own and in the local area. Is it possible for someone with the right airplane and with a good foundation of instruction to go up and teach himself the maneuvers in a new airplane? Is it just a matter of running enough gas through the carburetor? I was going to have to try.

Bill Thomas provided me with my core aerobatic instruction in the winter of 1994-95. Twelve hours of dual instruction in the Pitts S-2B was followed by another dozen hours or so in the Pitts S-2A with another instructor in Indianapolis. I had Bill's books *Fly for Fun* and *Fly for Fun to Win* as well as *Basic Aerobatics* and *Advanced Aerobatics* by Szurovy and Goulian. So I started with the first chapter of Szurovy and Goulian and started working through it page by page.

The Extras have a center fuel tank between the front seat and the firewall that's used for takeoffs, landings, and aerobatics. The wing tanks, which are for normal category flight, must be empty for aerobatics. I found that I could take off with a full center tank and a couple of gallons in the wings, burn off the wing fuel on the way to the practice area, and then have about 30 minutes of aerobatic time. Minimal fuel was burned on the extended glide back to the field. I also practiced a complete power-off return to the field to simulate an engine-out and found



Salem Contest



Aurora Contest



that it could be done with at least a couple thousand feet of altitude. The Extra had probably two to three times the glide range of the Skybolt. With the power off and the propeller pulled back to coarse pitch, it was a nice glider and had nothing like the alarming descent rate in a power-off Pitts.

Basic Aerobatics became my bible. The first order of business was to go to 10,000 feet as I had done with Bill Thomas in the Pitts and then work through all the spins. It spins nicely flat, although I learned the hard way that when you flat-spin you need to leave a little bit of power in or you might get a complete engine stoppage. Basically she had no “bad habits.” With a thick, smooth wing, the airflow detaches and reattaches very predictably. Inverted spinning was very similar or, if anything, easier with the big tail surface projecting down.

I had heard about Sportsman-level competitors getting themselves into trouble with the dreaded “Immelspin” or “hammerspin,” twisting onto their backs at low airspeed with high control deflection and getting into

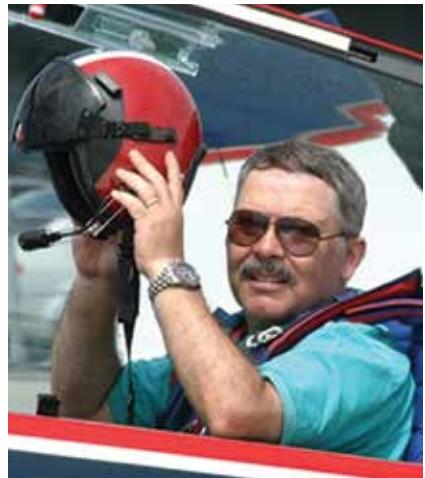
an inadvertent inverted spin. So I went up to a safe altitude and tried to deliberately botch the maneuvers. If the 200 did fall off into an incipient spin, all that was necessary was to pull the power off and neutralize the controls. Put a little rudder in against any rotation, and she was flying straight again.

My progress up the learning curve on Sportsman-level aerobatics was in large part a result of absolute confidence in the airframe. Having seen the methods of construction and knowing the airplane’s certified g-limits, I knew I was never going to break it. Plus, the enormous control authority from large and well-balanced flight control surfaces meant that I was always at the lower or middle portion of the performance envelope. There always seemed to be control authority to spare. With the composite propeller, there was very little gyroscopic force on rapid-pitch maneuvers. While the Skybolt required nearly full rudder deflection on a pull-push-pull humpty bump, the Extra needed almost none. Vertical 45-degree lines were easy to establish and hold with the wing-sighting guides.

That summer I was able to fly Sportsman at our IAC Chapter 34 home contest at Bolton Field in Columbus, Ohio, as well as at the Kenosha, Wisconsin, contest. That was a great and important first year with the Extra. No trophies, but acquiring and learning to fly the airplane through the Sportsman sequences had been more than enough. Late in the year, I was also practicing Intermediate sequences and getting a Freestyle prepared. After that, I flew only Intermediate.

Between 2001 and 2006, I managed to place in one or two contests per year and also held the Mid-America regional series title for three years. Having heard “move up” enough times from my fellow Intermediate competitors, I began practicing Advanced sequences in 2006 and got a Freestyle prepared. However, in spite of my best efforts at energy management and six years of experience in the airplane, I could not get through Advanced sequences without taking a break at some point to regain altitude. I never thought I would reach





The author, Jeff Granger.

the limits of the machine, but it was apparent that if I was going to move up and compete successfully in Advanced, I was going to need something the little 200 was lacking: horsepower.

The 300L

In January 2007, I called Doug Vayda at Southeast Aero and asked him to locate the best used 300L he could find. I was looking for a low-time airplane with no outstanding airworthiness directives (ADs). Of course, there is no such thing as perfection when it comes to buying a used airplane, and the best low-time machine I could find, N83KS, had an outstanding AD for crankshaft replacement. I budgeted that into the total



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EXTRA

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EAGLE

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purchase price, along with the cost of new parachutes and a plan to have the engine overhaul done after the first season. N83KS had only about 250 hours on it and was very well-equipped with an electric gyro package, an autopilot, a Garmin 420, and a King Nav/Comm. It had the four-blade version of the MT prop (a factory option). I flew to St. Augustine in April 2007 to complete the purchase.

David Kicklighter took me through several hours of transition training. It was very helpful to work through the spins again and get used to the added horsepower. There was definitely a big difference even on the first takeoff roll. With 300 hp, there was so much torque I found it best to bring the power in gradually and wait until the tail was up before getting the last third of the throttle travel in. Otherwise, it handled like the 200 but with more vertical penetration and the ability to cap off the top at nearly zero airspeed and then just accelerate and fly away.

The first season with the 300L was like the first season with the 200, only better. I was able to work through that long list of friends who had been promised demonstration flights but were just a little bit too big for the 200. The greater cruise speed and the GPS/autopilot combination made traveling to contests so much easier and faster. With the gyro panel, I was more confident about flying on top of a broken layer en route, knowing I could get myself out of trouble if I needed to.

Kilo Sierra had no trouble working through Advanced sequences, but the pilot was another story. Learning how to do the outside maneuvers required frequent and continual practice. For most of the summer, I had bruises across my collarbones and upper thighs because of the constant pushing. Advanced has inverted spins, rolls on uplines, and other “tricky turns” designed to make the competitor fly off in the wrong direction, but I learned various

mental tricks and mnemonics. It was hard work, but in that first year (2007), I managed to win second place in the Mid-America regional series for Advanced.

In 2008, I moved back to Ohio and got more involved with IAC Chapter 34. Eventually I served two years as member-at-large/programs coordinator, two years as VP, and two years as chapter president. I took several turns as contest director for the Ohio Open, and when I wasn't serving as contest director, I was always very involved in contest planning and execution. In addition to being my contest mount, *Kilo Sierra* was my primary recruiting tool for new chapter members. I had a standing offer of a demonstration flight for any new member in the chapter. On noncontest weekends, there was usually some event in central Ohio where I could go and put the plane on display to help promote the IAC and our chapter. EXTRA 300Ls are visually stunning planes, and they always attract a lot of attention.

I continued to compete in Advanced from 2007 through 2011, with nine second- or third-place finishes. In 2012, I found that although the airframe had not aged much, the pilot had. It was increasingly difficult to keep up the training schedule necessary for Advanced, and I dropped back down to Intermediate.

Although I'm no longer a chapter officer, I will participate in our Ohio contest this year and do other regional contests in Intermediate. As my focus turns from competition to judging, the airplane still fills a role as my fast traveling machine and helps me keep my connection with the competitors.

Walter Extra designed his plane to fulfill multiple roles: competition, training, recreational aerobatics, and touring. It has always served me well in whatever I wanted to do in sport aviation.

Thanks, Walter.

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Building the Christen Eagle II



Part 3

PHOTOS AND ARTICLE BY CAMERON GROSSL
IAC 435521



At the end of my last installment, I had just hung the engine and was completing its installation. At that point, all the wiring had been completed, all the plumbing figured out, and all the control cables routed. The next big step was to install the propeller. This took only a few hours, but it was really satisfying to see it on the aircraft. I went with a Whirlwind 200C.

Around this same time, I skipped ahead of the cowling install and started in on the fairings kit. One of the tweaks that I wanted to make to my Eagle was to come up with some nice-looking cabane fairings and a better landing-gear fairing. In my other life I'm an engineer, and I use SOLIDWORKS every day. So I designed what I wanted in CAD. This took many more hours than I thought it would, but I think I'll be happy with the end product.

After I got the design where I wanted it, I had some sample fairings 3-D-printed. These are made from a much more flexible material than most 3-D-printed parts. I liked the result so much that I think I'm going to be able to use the 3-D-printed parts on my airplane. My original plan was simply to make some molds over which I could lay up some composite fairings. Below is a CAD screenshot and the actual prototypes. They fit fairly well. I could have used them, but I knew they could be better. Revision "A" parts are on the way, along with prototype landing-gear fairings. If any other Eagle owners are interested in these, I will probably start selling them after I get them finalized.

While all of the above was going on, I was also fitting the wheel pants. I used a set of Sam James wheel pants, which a lot of the RV guys

use. I decided to use these mostly because they were much cheaper than stock Eagle pants. They're also a few pounds lighter and have less drag. Had I known how much work it was going to be to get these to fit, I probably would have just bought the Eagle wheel pants. I have at least 100 hours of work in them. This wasn't part of the kit, so I had to design and fabricate my own brackets to mount the wheel pants. So I got to make them several times, just so I could learn how not to do it. The fiberglass parts themselves had to be smoothed and fitted, which also required a considerable amount of work. I learned a whole lot; I had never worked with composites before. I see how versatile composite materials are, but unfortunately they don't like me. Although I tried many remedies, I finally just had to deal with the constant itching. The best solution I found was to wear long sleeves.

After the fairings adventure, it was time to start fitting the cowling. This went mostly by the book. I'm using a carbon-fiber cowling from Benny Davis. This is basically a copy of the original cowl. This was my first experience working with carbon fiber. It didn't take long to figure out that I'd rather work with fiberglass. I think it irritates your skin even more than fiberglass does, and on top of that it destroys drill and countersink bits. It's an amazing material, but I didn't really care to work with it. I'm starting to really like wood and metal. Anyway, enough complaining.

I did have to make a few modifications. My engine uses a front-prop governor, so I had to trim out a little for that. The Whirlwind 200C has a spinner with a forward-facing rear bulkhead, so I had to trim the lip off the cowling to clear it. I also had to do some filling around the spinner flange area so



was the manual, which is all you really need. The original covering process used Ceconite fabric with butyrate dope and an Imron topcoat. I've been building in my attached, two-car garage. I didn't have access to a professional paint booth for a few months, although I did look into renting one. I just could never find anyone willing to let me in their shop for that long. So I figured I'd have to find a way to cover and paint in our garage. Using solvent-based glues and coatings at home seemed like a good way to expose my wife and me to some really unhealthy stuff and seemed like a really good way to make the neighbors angry.

So my only real choice if I wanted to keep everyone happy was the Stewart Systems covering system. It's a completely water-based/waterborne system that uses conventional aircraft fabric. Everything — the glue, the fill coats, the primer, and the two-part urethane paint — is either water-based or waterborne. It's fairly new compared to other covering systems, and I've heard both horror stories and success stories from people who have used it. But I decided to give it a try. The Stewart paint is nice stuff, but it requires a different preparation and spraying procedure than what most painters are accustomed to. The glue is excellent to work with. Stewart Systems told me that people like me who have little to no experience covering and painting often end up with better results



that the gap between the spinner and the cowling was even. One thing I noticed is that the Hartzell spinner flows better with the lines of the cowling than the Whirlwind spinner. I have some ideas for how to mount a Hartzell aluminum spinner to the Whirlwind prop, but that project has been shelved for now. I will revisit it after I'm flying. Another mod that I had to make was to shorten the oil cooler tunnel by 2 inches so that it would clear the 4-into-1 exhaust from Raven.

Luckily, the Superior cold-air sump put the fuel servo in just about the same location as the Lycoming sump. It fit right into the air-box on the lower cowling.

And that brings me to the 921 *Rigging Kit* point in the build. I had just about finished with the 922 *Fairings Kit* at that point, so I basically had the airplane assembled and rigged. It just wasn't covered or painted.

So I was on to the 923 *Covering and Prefinish Kit*. All I had for this

than experienced veterans who think they already know how to cover/paint an airplane.

I had never covered an airplane before, and I have to admit that I was a little apprehensive about it. After all, this is what everyone will see first when they walk up to your airplane. On top of that, I was using a covering/paint system that was somewhat new and that had given some people problems. I really didn't want to spend all this time building the airplane of my dreams only to have it look bad. But, like all new things, you never know until you try, so I jumped in and tried. What was the worst that could happen? I would mess it up and have to do it again? Isn't this airplane-building adventure as much about learning new skills as it is about ending up with an airplane?

I didn't know anyone in my area who had used Stewart Systems, but I did have an excellent manual from Christen Industries and excellent



support from Stewart. I decided to follow the manual's suggested order of covering, so I started with the I-struts. The Christen manual gives you step-by-step instructions on where to glue and cut. I did have to make some adjustments to account for the differences between the Stewart glue and the glue that the kit specified. With the Stewart glue, you first apply it to

the glue surfaces on the part that you are covering and allow it to set up for five to 10 minutes. Then you put your fabric in place. The glue is still tacky, so you can position it, or reposition it, as needed. The iron can then be used to more securely tack the fabric down.

At this point you can pull the fabric off the structure, or you can complete the glue joint by



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brushing some glue on the outside of the fabric and wiping up the excess. This will fully encapsulate the weave of the fabric with glue. The Stewart glue attaches fabric to structure quite well, but where it really shines is on a fabric-to-fabric joint. I tested this with a couple of scrap pieces of 2-inch tape glued together with a 1-inch overlap. I could not pull them apart. Stewart Systems has many videos on YouTube demonstrating its process if you are curious.

The rest of the components that needed to be covered generally relied on the same process. Rib-stitching was a learning experience. Luckily, numerous resources are available to help with this, including several YouTube videos, a good write-up in the Eagle manual, and the AC43.13 document. The first parts that I stitched were the ailerons. I had to redo the first rib a few times, but after I got it down it went fairly well. I used the Poly-Fiber knot with flat rib stitching cord.

It took me about three months to get everything covered and ready for paint. After I got used to the work, it really wasn't that bad. I would do a few things differently if I had it to do over again. I would try to be more careful with the fabric application, just to make the final outer surface smoother, and I'd be more careful about glue application and wiping up the excess. The little globules of glue make life a little harder when you are trying to smooth everything up as much as possible for paint. I would also try double-covering next time. It will be a steep learning curve and will require more effort during the actual covering, but I think the reward of doing it this way will be less effort during the EkoFill application/sanding process and lead to a much better-looking and more durable overall finish. There may or may not be a slight weight penalty.

Before I started painting, I had to finalize my paint scheme.



I've always been drawn to the Christen Eagle paint scheme, but I also wanted something a little different than what most Eagles have. My original plan was to paint it yellow with black feathers. I've always liked the shade of yellow on my Acro Sport II, but with a little nudge from my wife (I already had a yellow airplane, she said), I started to think about other colors. I'm glad I did. So as I was driving, I would look more closely at the different colors I saw on all sorts of vehicles on the road. I found that I was always drawn to newer Camaros that had this burnt metallic orange color. I did a little research and discovered that this color was called Inferno Orange Metallic.

Stewart Systems has no way of matching automotive colors based on paint codes, so I had to buy some Inferno Orange Metallic base coat/clear coat touch-up paint, paint a sample, and send it to them for matching. Turns out I picked a very hard color to match. The GM color had some bronze-colored metallic flakes in it, and because of the BC/CC formulation it was next to impossible to get the same effect out of a single-stage urethane. But I asked them to try anyway. It took a few tries, but they got it pretty close to the original, and I'm happy with the color.

While all of this was going on, I wanted to get a better sense of how my airplane would look with the Inferno Orange Metallic paint and black feathers. Once again, I turned to SOLIDWORKS. I made a rough model of the Eagle in 3-D, applied the colors and feathers, and used SOLIDWORKS' rendering package to make some high-resolution pictures of my airplane sitting at my local airport. (You can see one of these on Page 21.)

So now it was time for some paint. I have done some paintwork in the past, but not much. I painted one car when I was 16 (it came out okay), a few motorcycles, and some parts on



my old Acro Sport II. I had never used a waterborne urethane before. The first step was to get some more tools and set up a temporary paint booth. I had to acquire a larger, 5-hp air compressor, some air filtration/drying equipment, and a spray gun.

For a booth, my dad and I built a 10-by-20-foot, wood-framed plastic enclosure in the garage. A few fans for ventilation, some eBay paint-booth filters, and some fluorescent lights got me up and running.

Before I started painting any

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airplane parts, I thought it would be a good idea to paint some test pieces to get myself acquainted with the fabric fill and painting process. So I made a couple of simple wood frames, applied some covering to them, and went to work, following Stewart's directions on applying the coatings. The first piece came out okay. I had more orange peel than I liked, but for a first attempt I was pretty happy. I used Stewart's recommended fog coat/wet coat application technique in which you spray on the first coat to the point

where it comes out very dry, with a texture similar to that of 1,000-grit sandpaper. The second coat is closer to a more normal "wet" coat, although you still don't pour the paint on like you would with a more conventional solvent-based urethane.

During this testing process, I figured out that the new Warwick 980HE spray gun that I bought for about \$300 wasn't really getting the job done. It just didn't atomize as well as it needed to, and my fog coats weren't as smooth as they

needed to be. I had seen many favorable reviews of this gun on the internet, and it likely is a fine paint gun, but it just didn't work for me. This could have very well been due to my experience level, the waterborne paint, or my gun setup. But I was frustrated enough that I went out and bought a Devilbiss Tekna Prolite spray gun for considerably more money. I have to admit, though, that it was worth it. This gun atomizes so much better, and it was much easier to get better results, and was more efficient with the paint.

So it was finally time to start painting airplane parts. I started



... I thought it would be a good idea to paint some test pieces to get myself acquainted with the fabric fill and painting process.





with the sheet metal and went on from there. I've included some pictures on page 20, although it's hard to see much detail in them. You can't really see the metallic effect until you get them out in the sun.

I almost used vinyl for the black feathers instead of paint, but in the end I figured that I would be happier with paint. Masking and painting the feathers has been a lot of work, but I'm glad I went with paint instead of a vinyl sticker.

And that brings us up to date — to where I was as of January 2017. I had all of the sheet metal, the tail feathers, and the lower wings painted. I still lacked the fuselage, the top wing, all of the composite parts, and some miscellaneous small parts. Still to go is final assembly, the finishing touches, and then time to fly. I'm desperately trying to have it ready for AirVenture 2017 and the Christen Eagle's 40th anniversary. We'll see ... look for the only shimmering Inferno Orange Eagle on the flightline!

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2017 U.S. National Aerobatic Championships



BY GORDON PENNER

With an air of excitement, the U.S. National Aerobatic Championships will be held at Oshkosh, Wisconsin, for the first time. Oshkosh offers the best facilities for an aviation event by virtue of its development over the last 46 years as the site for EAA AirVenture. Ninety to 100 of the best pilots in the nation will be heading to Oshkosh to compete at the new site.

The Nationals were held in Sherman-Denison, Texas, at the North Texas Regional Airport since 1972. With increased aviation activity at the Texas location, a decision was made to move the championships for the first time in more than 40 years.

Past IAC President Gerry Molidor said it best in his September 2004 *Sport Aerobatics* article about the National Aerobatic Championships: “Like any sport, if you don’t understand what’s happening, it can get downright boring in a hurry. But a few tidbits of information and some tutelage on what to look for can turn repetitious flying into a real horse race.”

In that vein Contest Director Gary DeBaun and his Key Volunteer Group (KVG) are not only pulling out all the stops to put on a world-class event, but also setting up ways for a first-timer to get that information and tutelage. The IAC website has been improved and updated to give all who wish to come the information they need before they head to Wisconsin.

As an extra treat we will have two luminaries attending the awards

banquet and closing ceremonies: keynote speaker Jack J. Pelton, EAA CEO and chairman, and Greg Principato, president of the National Aeronautic Association (NAA). It will be the first time the presidents of the NAA, EAA, and IAC will be together on the same stage.

Details, Details

Opening ceremonies are on Saturday, September 23, and the championships continue until Friday, September 29. Practice days are September 20-22. Information on schedules, hotels, camping, and the like are all listed and kept updated on the IAC website under the Nationals heading.

Short History

Every country has a national body that sanctions the running of aviation events and the setting of records. In the United States it is the NAA. All national bodies answer to the world body called FAI, or Fédération Aéronautique Internationale, located in Lausanne, Switzerland. NAA has granted the IAC full sanctioning power to administer contests in the United States under the FAI banner.

The IAC represents the United States at meetings of the FAI Aerobatics Commission (CIVA), which establishes rules worldwide for world and continental aerobatic championships.

The germ of the IAC started as the Precision Flying division of EAA in the '60s. There was a separate

organization called the ACA, or Aerobatic Club of America, which worked at developing the top level of U.S. pilots for world competition. In 1970 the IAC was formed to promote grassroots aerobatics and to formalize the Precision Flying division as a member organization. In the 1980s the ACA and IAC efforts were merged.

In promoting grassroots aviation the IAC set up a stepladder of categories: Basic (now called Primary), Sportsman, Intermediate, Advanced, and Unlimited. Many other countries have since adopted our category system. The Unlimited and Advanced categories are virtually the same throughout the world.

A look back into previous years finds champions on their way up the ladder. For example, 2007 National Unlimited champion Vicki Cruse was the Sportsman national champion in 1998, and won the Intermediate trophy in the 2000 Championship of the Americas.

In 2008 Rob Holland was the Advanced national champion. Rob now joins Leo Loudenslager as one of only two pilots in history to be a six-time consecutive winner of the U.S. Unlimited national championship. Rob is poised to win a seventh national title, matching Leo's record. On the world stage Rob is the only pilot to win the 4-Minute Freestyle event three times in a row.

The Nationals are also the selection vehicle for the U.S. aerobatic team for the world championships the following year. The Unlimited World

Aerobatic Championships, or WAC, are held every odd year, always in a different country. The top eight positions in the Unlimited national championship in the previous even year constitute the U.S. team for the following year's WAC.

In the 1990s carbon fiber-winged monoplanes started to take over competition from the biplanes, and their higher capability caused the upper categories to grow in difficulty to such an extent that now the Advanced category is as difficult as Unlimited used to be.

As a result there is now, at the world level, the World Advanced Aerobatic Championships, or WAAC, held in even years. 2017 is the team selection year for the 2018 WAAC, so the top eight positions in this year's Advanced category will meet the world's best next year in Romania.

Sponsors

Co-founder of Game Composites Philipp Steinbach has confirmed that the company will be the major sponsor of the 2017 U.S. National Aerobatic Championships.

Philipp is an engineer and an accomplished aerobatic pilot, but he is mostly a designer. Along with Steuart Walton, Philipp founded Game Composites in 2013. In July 2016 the EASA validation flight test was conducted, and the first public display was at AirVenture Oshkosh.

Philipp is tentatively scheduled to fly the GB1 GameBird on the first weekend of Nationals. Contest Director Gary DeBaun is looking forward to having him as a warmup pilot for the first flight of the contest on Saturday, September 23 — the Advanced Known.

It is not too late to join the sponsoring effort. In addition to Game Composites, the list of sponsors and donors appearing on the Nationals website include MT-Propeller, Oshkosh Convention & Visitors Bureau, Oregon Aero, Para-Phernalia/Softie Parachutes, Wild Aerobatics, Dell Aero Speed, MGL Avionics, Redfox Airshows, MX Aircraft, and IAC chapters 77 and 67, as well as many individual contributors.

In the End ...

There is nothing like attending Nationals. It is usually the pinnacle of a pilot's competition experience, after all the practice, coaching, and angst, no matter what category they compete in. Again from Gerry Molidor: "A national title is a big deal. And this puts people on edge, especially at first. By the end of the week the flying comes to a climax, and the pressure is released at a great banquet Friday night. There are also regularly scheduled evening events throughout the week to open the relief valve a bit. Sharing this experience with other pilots builds relationships that last a lifetime."

Well said.

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Good Morning IAC

As the sun rises, David Cohen walks a preflight around his EXTRA 300L prior to competition at the Coalinga Western Showdown.
Photo by Leigh Hubner.



Laser-Focused

Rally for restoration

BY DAVE WATSON AND BETH E. STANTON

This is a story about a Laser that was built by a friend and for the past 20 years has been owned and flown by friends. Friends contributed their time and talent to bring it back to life. It is an airplane so special to them that they did whatever it took to keep it flying, no matter the cost.

Hotel Bravo Is Born

In the mid-1990s Hans Bok saw an ad for a Laser project on a bulletin board at Oshkosh. At 6 feet 2 inches tall, he decided to build an airplane that he could fit into comfortably. The wing and frame were already completed. With the help of his father, Hans completed the control surfaces, avionics, fabric, and paint. He

built a pumped 10-to-1 IO-360 engine from various parts and installed a new constant-speed two-bladed MT propeller. Laser serial number HB-1, N230HB, flew for the first time in New Bedford, Massachusetts, in April 1997.

Hans was one of Dave Watson's first aerobatic mentors, and they soon became best friends. Hans bought a Sukhoi, and eventually his wife, Peggy, decided for "some silly reason," Hans said with a laugh, that he didn't need both the Sukhoi and the Laser. With two seats and a radial engine, Hans decided to keep the Sukhoi and sold the Laser to Darren Pleasance in 2005. At the same time, Dave was moving back to California. A three-ship formation with Hans in the Laser,

Dave in his Yak-55, and Sal Webber in Dave's Super Decathlon flew cross-country to the West Coast. Subsequently, Darren sold the Laser, and the airplane has since been owned by Dave and friends in a couple of different partnerships, currently with Dale Roberts, Beth Stanton, and John Haag.

Watching and Waiting

By 2016, the engine had about 1,500 hours on it and was being carefully monitored with compression tests and engine oil analysis. The hope was to make it through the contest season with a major engine overhaul planned for that winter. After almost two decades of flying hard aerobatics, the Laser's last flight was in September 2016 at the IAC 26

Delano, California, contest. Quite unexpectedly, it was the propeller, not the engine, that didn't make it to the end of the season. During takeoff, the hub of the MT prop failed catastrophically, gushing engine oil onto the canopy. Flying practically blind, Dave managed to touch back down and immediately realized there was limited runway left. After a go-around and a 180-degree turn to landing, he got the airplane back on the ground safely.

With its 1,500-hour homebuilt pumped engine, useless propeller, and numerous cracks in original paint patched with duct tape, the Laser had just gone financially into the scrap heap. It was left in a hangar at Delano. Dave, Dale, and Beth drove back the following weekend for *Operation Laser Rescue*. After installing the propeller borrowed off his Super Decathlon, Dave flew it back to Livermore. "It's convenient that you have a Super D that serves as spare parts for the Laser," IAC 38 President Josh Horwich pointed out to Dave. With the Laser back safely in its hangar, the restoration could begin.

Propeller

The propeller failure haunted Dave. "It had always been overhauled well within MT's recommendations, but on its last major overhaul just 18 months and 250 hours prior, we had to remove the prop after only two hours of use since one blade already had excessive rotational backlash," Dave said. "Despite that major mistake during the major overhaul, MT and the prop shop denied any culpability for this failure, yet offered no rationale why this prop was one of a very few that had failed in such a manner that one blade had over 10 degrees of rotational backlash and engine oil was capable of pouring out the blade seals." MT in Germany offered Dave a substantial discount on a new propeller since they were

unable to assign the failure to lack of any prior maintenance. With a four-month delivery on the propeller, there was plenty of time to get the engine overhauled and take care of accumulated deferred maintenance.

Engine

The engine had far exceeded the normal life span of a pumped IO-360, even though it still had good compression tests and performance. It was sent to Ly-Con in Visalia, California, for a major overhaul. "This part of the project went as anticipated, although the crankcase was determined useless from fretting that once corrected left it at the minimum of tolerances," Dave said. Three cylinders were found to have minor cracks, and one main bearing was found to be almost ready to spin. "Scary stuff for an engine that had been meticulously maintained," he said. "Some things are just invisible."

Tail Feathers

The tail fabric had been in dire need of replacement but was being delayed until the engine overhaul would ground the airplane. Jeff Rose volunteered for the job. After a landing incident that wrecked his airplane, *Race 23, The Reno Rabbit*, after winning the Gold Biplane category at the 2016 Reno Air Races, Jeff needed a project to keep his mind busy. "Jeff begged me to 'allow' him to re-cover the tail fabric," Dave said. "I had no clue as to the art of fabric re-covering, so Jeff taught us his skills. He spent his evenings sniffing glue and freezing in his garage throughout November and December."

Jeff stripped the five tail pieces with medium blasting by American Strippers and had them epoxy-primed. "I prefer the Air-Tech Coatings system because of the incredible glue and catalyzed primer that eliminates the tag chasing on pinked tapes other brands offer," Jeff said. He also enlisted his good friend Eric

BETH E. STANTON PHOTOS



Scheppers, a talented builder who taught Jeff fabric work 15 years ago. "It's no fun working on a project without him. He is super particular, and we work perfectly together." Jeff and Eric pulled 16-hour days to finish the taping to meet the deadline.

Turtledeck

After 20 years of heat and sun, the fiberglass turtledeck had become warped and wavy. The affront to aesthetics prompted Jeff to insist that he and Eric fabricate a new one fashioned from carbon fiber.



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Normally, a mold would be made from the part to be duplicated, but the turtledeck was too warped to copy. Instead, Eric made a fixture with bulkheads to duplicate the dimensions and lay a piece of aluminum down to be the basis of the mold. "Eric always amazes me with his ability to solve challenges," Jeff said. "I learn a ton from him."

They next placed the original turtledeck inside the fixture. With the compound aspect of the turtledeck (the part that fits around the vertical stabilizer) poking out, they glassed it as an extension of the mold. After the fiberglass set, the original part was pulled from the fixture. They captured the entire piece. They waxed and gel-coated the mold and

laid three layers of carbon with vinyl ester resin that weighs one-third less than the original part. When Eric brought the new turtledeck to Livermore for a fitting on the airplane, it fit perfectly. Without the airplane, Eric miraculously built a new turtledeck that defined the new presence of the airplane.

Fuselage

The fuselage and aileron fabric was in better shape than the tail. The original plan was to leave it intact and match the new tail feathers to the original blue paint. At this point, it was useless to cut any corners and save the old fabric and paint. It was decided that the Laser would be repainted in red, white, and black to match the rest of Dave's Evil Empire fleet of Super D N59AC and Pitts N77TW. Dave and A&P mechanic and Skybolt pilot Mike Flagella, KLVK hangar row mate and owner of Mike's AeroClassics, decided to re-cover the fuselage and ailerons. With the instructions and training in the Air-Tech system from Jeff, they took on the project since the fuselage and wing were in the hangar not going anywhere. Mike had done fabric repair jobs, but never such a large restoration job, nor had he used the Air-Tech system. "Mike did a fantastic job with the fuselage and aileron fabric, charging a fraction of his normal fees, since in his mind this was a learning experience for him," Dave said. After a few fits and starts trying to paint the fuselage, Mike arranged for T&P Aero Refinishers in Salinas to squeeze the project in so that the Laser would have a spectacular new paint job. "That decision reversed my ultimate desire to keep the wing on," Dave said. "Removing the wing for transport to a professional painter who repaints Sean Tucker's Oracle Challenger every year was small potatoes compared to the big picture of the project."

Sobering Surprises

Inspection of the fuselage revealed



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some surprises that will be shared in the hope that others may learn from them. One of the driving forces to finally pull the fuselage fabric was to reveal each weld from every angle. Despite having been flown hard its entire life, there were no structural cracks in the frame. It had been built from tubing thicker and

stronger than the plans indicated, adding only about 1 pound of weight. Twenty years later, it proved to be great foresight.

Other discoveries were not so great. The bracket supporting the battery was secured to the fuselage behind the pilot's seat with four Adel clamps. Upon

disassembly, it was discovered that just one clamp was intact. One had both arms broken off, and two had failed on a single arm. The 13-pound battery had been hanging on for +9g pulls and -6g pushes by the skin of its teeth. The Adel clamp breakages had been reported on previous annuals, yet repaired with the same design. It obviously wasn't working. Dave redesigned the attachment so that it now has eight Adel clamps such that none are subjected to cantilever-induced bending loads.

The new release mechanism Dave designed for the canopy was also hanging on by a thread. The canopy is attached to the upper longeron by four 0.050-thick steel tabs. They extend outward from the upper tangency point on the upper longeron, creating four simple cantilevers, and are covered by fuselage sheet metal so they are not visible. The two aft tabs were broken off clean at the longeron. This failure had happened before and had been repaired as designed. Dave had a welder add vertical gussets to the tabs to hopefully eliminate this failure again. Since the aft half of the canopy had been unsupported, excessive loads had been placed on the fiberglass canopy frame. After investigation and grinding into the numerous cracks and delaminations that were thought to be cosmetic, it became obvious it was more serious. The canopy frame had been previously been broken twice. The shortsighted repairs may have resulted in a catastrophic failure. The canopy was fully reconstructed.

Despite shortening the rudder pedal placement a couple of years ago, countless snap rolls had stretched the rudder cables. The pedal assemblies (cans holding the brake fluid) were making indentations in the back side of the firewall. New rudder cables and guide bushings had to be installed.

A single AN-3 bolt attached the Aviation Products tail wheel to

Leo Loudenslager completely modified the Stephens Akro monoplane into the Laser 200 in the mid-1970s. He went on to win an unprecedented seven U.S. National Aerobatic Championship titles between 1975 and 1982, and the World Aerobatic Championship title in 1980. "He took it out there and beat everybody badly," Budd Davisson said. "It was just slaughter. It wasn't even a competition." The Laser effectively ended the Pitts biplane domination of U.S. aerobatics. "Leo was on the world team," Budd said. "Everyone said, look at that, what a great idea. Everything went from there." Leo's Laser was the precursor and inspiration for all of today's modern aerobatic monoplanes.

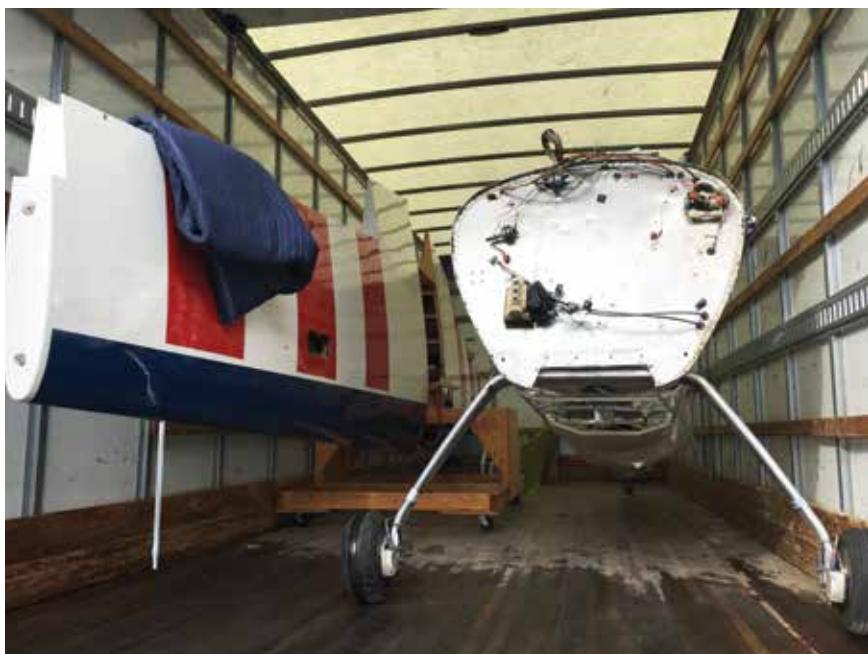
the round spring shaft. It had been replaced multiple times due to high bending loads. Widening the hole and going to an AN-4 bolt was considered, but the shaft diameter would be compromised. A second AN-3 bolt cross-drilled to the original was added, doubling the shear strength without compromising the integrity of the spring shaft.

"Aerobatics takes its toll on planes," Dave said. "Do not assume that since all is well, all will continue to go well. The broken Adel clamps that held the battery were within sight every time the pilot's seat was folded forward. Latching the canopy was getting more troublesome with every flight. Don't let creeping normalcy or complacency get you in trouble."

Friends Helping Friends

The total restoration was in no small part due to the remarkable generosity of many people. Pete Plum of Wood Wing Specialty cadmium-plated all the flying wire clevis ends free of charge. Jeff and Eric donated their time for the fabric work and turtledeck. "This selfless gift to us defined this project and the spirit of friendship and aviation," Dave said. Jake Carter, an aerobatic pilot who flies Dave's Super Decathlon, was the IA who oversaw the entire project. Every piece of the project was inspected three times: by Dave, Mike, and then Jake. The partners contributed as much sweat equity as possible with Dale and his life partner Kate Harps spending hours sanding and prepping aluminum body panels and fiberglass fairings.

A crew assembled at KLVK in Livermore, California, to remount the one-piece 25-foot wing when the airplane came back from the paint shop. The maiden voyage of the newly assembled Laser, now christened N230DW, happened on February 26, 2017, with Dave at the controls. "Seeing the plane painted and the pictures of your smiles after flying it made it all so worth it," Jeff said. "Pay it forward, and it always comes back at you more." **IAC**



BETH E. STANTON PHOTOS



The Road to My First Aerobatic Contest

A new guy's perspective

by Karl Gashler
IAC 438689

I am just back from my first aerobatic contest, the Hammerhead Roundup in Borrego Springs, California. My purpose for writing this is to describe what a contest is

like from the perspective of a new guy. Until recently, I knew nothing about the International Aerobatic Club or how to get involved in competition aerobatics. Are you

like me? If so, I hope my short diary is helpful.

Beginnings

I flew my RV-8 to EAA AirVenture



Oshkosh last year and happened to stumble upon Ron Schreck's RV aerobatics presentation at the IAC building. I was awestruck. For the first time, I realized that it is actually possible to compete in the RV and to join the ranks of some of the most talented pilots in the world.

Preparation

I joined the IAC for free for six months, bought a parachute, installed an inverted oil system, and fabricated a simple canopy quick release. Then I jumped in with both feet.

With new member card in hand, I logged in to the IAC website and read everything I could find. I also searched for old posts on the topic at

Van's Air Force (www.VansAirForce.com) and then introduced myself to some RV aerobatics experts there to ask questions. Thanks, guys, for your patience! Finally, I got in touch with my people in my local IAC chapter to get on their radar.

Then knowing that progress needs a goal, I signed up for the Hammerhead Roundup and circled the dates on my calendar.

Practice

The Aresti symbols looked like Chinese to me, so I found a very informative video series on YouTube called "The Aerobic Textbook: Aresti Symbols," put out by IAC Chapter 34. Then I downloaded the Sportsman Known

sequence from the IAC website and used the videos to figure out the sequence. I did order the latest Aresti catalog online but am still waiting for it to arrive.

I need to mention my training background. I flew lots of aerobatics in the Air Force. From my past life, I generally knew how to do everything in the Sportsman category except for a competition-style slow roll and a hammerhead. I also needed work on precise lines, timing, and crisp rolls. For all this, I read articles and books, watched videos, and then taught myself. I do not recommend this approach for everyone! Get coaching and instruction if you haven't been around aerobatics already. Really. In fact, now that I've



new and would have many questions. Answers and advice flowed freely, and I soaked up more in three days than I had in three months prior.

The Contest

I was immediately impressed with how organized everything is. An IAC-sanctioned contest is the real deal! Everything is official, organized, deliberate, and run according to the rule book. This is definitely not a bunch of guys showing up to informally flop around in the sky. To me, it felt like a college track meet and was operated with the same clockwork precision.

Pilots compete in different categories: Primary, Sportsman, Intermediate, Advanced, and Unlimited. Our RVs can compete well in Primary and Sportsman, and Intermediate, too, with some skill and the right equipment. The only reason I decided to go for Sportsman on my first contest was that it looked like more fun. Otherwise, Primary is a very reasonable starting point.



In Sportsman, there's the option to fly all Known sequences, or you can add a Free sequence of your own design. As the new guy, I decided to keep it simple and just fly three Known sequences in a row. I flew the Sportsman Known twice on the first day and once on the last day. I flew against one EXTRA 300, one Christen Eagle, three Super Decathlons, and one Great Lakes. Each flight was judged by a panel of five judges, who were each accompanied by an assistant and recorder.

Everyone is a volunteer—the contest cannot run without full participation from all the pilots. When not in the lineup to fly, I had the privilege of being a recorder. This was an excellent education. Between sequences, the judge took time to explain the finer points of aerobatics and what they were looking for. Of course, I took all this to heart to improve my own figures and presentation.

flown a contest, I see the need to attend an aerobatic training camp or two simply because there's no substitute for having a coach on the ground giving real-time pointers.

The next big thing for me to figure out was how to stay inside the aerobatic box: 1 kilometer square by 2,000 feet vertical (1,500 to 3,500 AGL). It's not easy, but it's a fun energy management and strategy challenge. Add a stiff wind and it gets downright silly for the uninitiated. First, I learned to laugh at myself, and second, I learned everything I could about energy management in the Van's RV-8. I no longer look at it as just a box. I now see it as a chessboard.

With the figures learned and the box tamed, I set out to practice the sequence as much as possible.

I spent the last month flying once or twice a day for 20 minutes at a time. I would bang out three or four sequences per flight, shooting video and taking notes on each flight.

Arrival

Landing in Borrego Springs, I felt like a kid going to his first day of school in a new town. I really didn't know what to expect. And here is the main point I want to get across: It's no big deal! I met some of the most inviting, friendly, and supportive people I've ever flown with. From organizers to judges to contestants, everyone was an absolute pleasure to be around.

All you have to do is take the first step. Show up and introduce yourself, and then you're "in." Just like that. I told everyone that I am



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Awards and Rewards

I placed third in the first two flights and then came in first place on the final flight. This got me an overall second place in the Sportsman final standings. I also got the Best First Time Sportsman Award and the Grassroots Achievement Flight Medal.

Those were just the awards, but the real reward was being able to rub shoulders with some aerobatic legends and world-class pilots. I got to ask questions of the experts in a relaxing and fun atmosphere, and the whole time nobody treated me like an outsider. In fact, many people told me flat out that they want to see more RV pilots in the IAC. As we all know, there are thousands of RV pilots out there who just need a little nudge to join the IAC and have some great aerobatic fun! Even if you're not interested in competition, the IAC is the place for people who may want to practice noncompetitive "sport" aerobatics or who just want to be more capable pilots by learning more about the flight envelope of their airplane.

The Adventure Continues

A few weeks have now passed. During this time, I went to another contest at Apple Valley, California, and have flown and reflected much. I want to write my thoughts about the whole experience and give an epilogue to my earlier observations. This could be a tricky task because whatever I say here is already well-known by folks who have more hours inverted than I have total flying time. I also run the risk of penning a pile of platitudes, such as "It's not the airplane; it's the pilot." Fear not — I will keep it pithy and engaging (or full of pith and vinegar).

My aim is to motivate new IAC members who will benefit from knowing that "if that guy can do it, then so can I." So here are the few nuggets of wisdom I have collected so far on my short journey.

Airplanes run on fuel, but aerobatics run on criticism and humility. The best thing I ever did was



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Cade the assistant, Malcolm the judge, and me the recorder. This is where the real learning takes place!

to show up and say, "Hello, I'm clueless." (And I am sure that some of you were thinking, "Yes, you certainly are.") It's delightful to see how IAC members want to help each other. For example, as I walked back after a flight four different people stopped me to offer some very useful suggestions. Since then, I have concluded that the quickest improvements come from surrounding myself with people who willingly tell me when I stink.

Good news! The smell is only temporary. Everyone knows that you can teach a monkey to fly if you have enough bananas and that anything can be improved through repetition. The trick for me has been to fly as much as possible. I do aerobatics every single day that I am home from my flying gig at Southwest Airlines. As a new competitor, I like reminding myself that I would rather be upside down than _____. (Fill in the blank with any mundane task that I would rather postpone.) As it turns out, this is a terrific way to do my two favorite things in life: flying and procrastination. Surely it's one of the great aviation paradoxes: One can be both achiever and underachiever at the same time.

Homebuilders might relate to this next one. No matter how clean I thought I was during construction, I

wasn't. Inverted flight had a way of finding every metal filing I thought I had vacuumed up but didn't. A few months ago, I flew a figure in my Van's RV-8 that liberated a hidden sliver of aluminum. It made its way into my mouth and caught in my teeth, reminding me of something my father used to tell me: "When you're full of bull, keep your mouth shut." The good news is that ever since then, I have so thoroughly wrung out my airplane that no more surprises remain in the hidden crevices.

Along the lines of homebuilding, I must say that it's been a ton of fun tinkering with my airplane to make it even better at acro. I am a true EAA experimenter at heart, so any chance to cut metal and bend a wrench is always welcomed. I installed a full Christen inverted oil system, tore out my unnecessary backup alternator and cabin heater, and fabricated a way to vent breather oil back by the tail wheel instead of on my belly. I also swapped out my heavy battery with a lightweight lithium one. My latest project was to design a way to anchor my new ratcheting double seat belt. That was a head-scratcher for a couple days, but nothing that couldn't be fixed with some 1/16th stainless steel and a drill press.

Here is another important point for RV pilots. There is a persistent



Mike Mohr (left), my IAC mentor, showed me the ropes every step of the way.

old wives' tale that the RV cannot stay inside the aerobatic box. This has been entirely disproven by so many RV pilots that I wonder how the fallacy can still have legs. Don't get me wrong; it was not easy staying in the box when I began. But this was a symptom of my inexperience, not aircraft capability. Feed the monkey more bananas and he will remain in the box. Remember to occasionally let him out to visit the restroom.

Finally, this is the big one for me. Coaching from the ground is not just a nice suggestion for improvement. It is a requirement. I launched into competitive aerobatics by hacking through the jungle alone for a while. Fun? Of course it was. Efficient? Nope. The best thing I did so far was to get coaching from fellow Phoenician Michael Mohn. Remember him from Part 2? My Borrego mentor stepped up yet again; before last month's Apple Valley contest, he offered to drive out and coach for 45 minutes while I beat up the box. Afterward, he debriefed me for an hour, and then he took me up in his EXTRA 300 to show me how he does it. Michael is a total class act. I have witnessed many others like him whose generosity with time and talent continue to advance our sport. To all of you who have helped me along the way, thank you very much — dinner is on me!

IAC

Just Do It!

Philipp Steinbach, design engineer and test flight engineer, demonstrates the beautiful performance of the prototype aerobatic airplane the GameBird.



by Sean Sweeney
IAC 436562
Chapter 61 Vice President



Earlier this year my wife and I read the article Mike Heuer wrote about the IAC and the importance of volunteers. It hit home: Our IAC chapters are going to be only what we make them. I had kicked around putting a practice day together at West Plains Regional Airport (KUNO). We are

in the rare position of being at an airport where the manager is very supportive of aerobatic activity, and had actually been suggesting we do this. So we began planning a practice day right about the time I ran into difficulties on my airplane. On my One Design DR-107, we had several delays in trading a fixed-pitch prop for a constant-speed prop; it would not be ready on time. Ah, here is a perfect reason to not pursue the practice day, but too late! The manager had taken hold of this idea and started talking it up. In addition, our chapter president, John Housley, was supportive and excited. Okay,

we will move forward.

It was a good idea, and we are glad we did it. The crowd was small, my airplane was still propless, but we had a great day watching excellent aerobatics, practice-assisting a dozen flights, and enjoying the friendship of our fellow aerobatic pilots. With encouragement, help, and support from John, we put a successful event together. John was instrumental with advice, guidance, motivation, and promotion. He was grateful for the area support and interest. "It is a pleasure to participate at a location that is supportive: The area sponsors, city officials,



Pilots taking a break and discussing performance and agenda. Seen here is the Pitts S-2B flown by John Housley, Chapter 61 president, of St. Louis, Missouri.



Sean preparing for another flight.

Probably the largest benefit of the day was the goodwill created and fostered in the airport community.



Don Nevels, IAC judge, educating the "newbies" on the how-to. Philipp Steinbach coaching pilots as the rest look on and listen!

neighbors, airport staff made us all feel very welcomed." It was particularly nice to have coaching by experienced pilots. With thanks to Don Nevels, IAC judge from eastern Missouri, we were able to get assisted flights recorded, and the pilots there had a chance to fly their sequence for the first time this year. Fellow pilot, IAC member, and friend Wes Minear took time away from a family holiday to grab his father visiting from California, put him in the back seat of an RV, and fly up to work with us also. Thank you also to our past president Bruce Ballew for getting the ball rolling by encouraging my wife to attend judging school and help the members during practices. To top it all off, it was a pretty perfect day with Philipp Steinbach and the GameBird showing up to practice with us! Not only was Philipp gracious and helpful in coaching pilots and instructing novice judges, but also he thrilled us all with several demonstrations of that fantastic airplane.

Probably the largest benefit of the day was the goodwill created and fostered in the airport community. A good number of people collected, including city council members who are airport fans. There was a



The finished One Design.



Wes Minear, IAC Chapter 27 member, instructs on calling techniques.

lot of visiting, handshaking, and welcoming of out of town pilots. We also managed to feed quite a few of the onlookers as we had more than enough for our pilots' lunch and breakfast! Everyone was excited about watching and learning about aerobatics.

We own a couple businesses and a commercial farm, so free time is not something we have much of. I am glad we took the time to put this together, and definitely plan on doing more. Watch for our spring practice day next year at KUNO, and in the meantime, we will see you at the regional competitions, and maybe a practice day your chapter will host!

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by BETH E. STANTON

bethstanton@gmail.com

Laughing and Learning

Father and daughter bond through aerobatics

I like being able to go upside down and feel the g-forces as I steer the plane. It's like a fairground ride but better.

— Lulu Hickman-Smith



The text read: "Would it be ok if Lulu used your Butler backpack parachute that is in the hangar?"

Dean Hickman-Smith was taking his 13-year-old daughter, Lulu, for an acro flight, and all the other parachutes were too big for her. The Butler parachute was bequeathed to me when I started flying aerobatics, but

I don't use it since I fly with a fanny pack parachute. It would be my delight for someone to get some use from it. Later that day, I learned that Dean was not just taking Lulu for an acro joyride; she was learning to fly aerobatics.



Lulu had been flying with her father for the past five years. In the beginning, she was too short to see out of the plane and could only fly headings and hold altitude on instruments. After she grew tall enough to see out the window and tried some steep turns, she wanted to try aerobatics. "She likes adrenaline sports and is enthusiastic when she takes on a new challenge," Dean said.

Lulu is a young lady who is no stranger to challenges. In addition to singing in concert choir, ballet dancing, and snowboarding, she has participated in equestrian vaulting – team gymnastics performed on horseback. Vaulting competitions are like aerobatic competitions with both a compulsory and a freestyle routine. After handstands on cantering horses, aerobatic flying must seem positively tame by comparison.

"We all take safety very seriously within the aerobatic community," Dean said. "You get an even more heightened sense when your child is in the plane." He checked with multiple people about what age was appropriate for a child to start flying aerobatics. The general feedback he got from everyone was just to take it slowly. "We are very lucky to fly in the San Francisco Bay Area," Dean said. "The resources and knowledge available from mentors is huge."

When Lulu sat in the front seat of her dad's Pitts S-2B, she couldn't see out of the canopy. Her first aerobatic flight was in a Super Decathlon with rudder pedal extensions that she could reach. "I like the Decathlon very much. It's quieter than the Pitts and more comfortable. The plane goes where I want it to without having to push or pull too hard. It's not too

noisy, and the view is good."

They started off easy, and Lulu never felt sick. "I did feel a bit tired after the first few times, but that went away quickly," she said. With Dean demonstrating the maneuvers, they started with rolls. Next was a loop, then a half-Cuban-eight. "That was a little nerve-wracking but fun," Lulu said with a grin. "She's a quick learner," Dean said. "You show her a maneuver, then she will follow me on the controls. I'm proud of what she can do now, and I'm excited about how she will progress over the coming season."

Lulu volunteered as a runner at the IAC Chapter 38's Coalinga contest in 2016 where Dean flew in the Sportsman category. "It was great fun spending the weekend with my dad around the planes," Lulu said. "It is definitely something we have bonded over, which I love. And the people were very nice. I like the way everyone helps each other. It's fun to talk with more experienced people and learn from them." She also likes the fact that there is no distinction between "girls and boys" in aerobatics. "Everyone competes against each other and is judged just on the accuracy of their performance," she noted.

Dean was surprised that she was interested in hanging out with him and his fellow competitors for a long weekend. "It's fantastic to be able to spend time with her, like it is my other two daughters of course. I'm very happy to be sharing the aerobatic experiences with her."

It was at the contest that Lulu realized she wanted to start taking aerobatics more seriously, enter a competition after she earns her private pilot



certificate, and perhaps even follow a career path in aviation. She is considering options of the Air Force, studying aviation in college, or becoming a commercial pilot and “seeing the world.” Dean also tows gliders for the Northern California

Soaring Association based at Byron Airport in California. He was equally surprised that Lulu was interested in coming out to the gliding club and spent the day pushing gliders around. The club welcomes young pilots, and Lulu

is currently working on her glider rating and hopes to solo when she is 14. Her first unassisted takeoff was in November 2016, towed by her dad.

The civilian formation aerobatic Patriots Jet Team is also based at Byron. Lulu loves being around the jets as well as the gliders. “It gives me such great awareness of different types of flying. I like seeing how different people enjoy doing different things. It is just such a great learning experience. I hope they will give me a ride in one of the jets soon!”

Dean is thrilled with his daughter’s passion for aviation and totally supports it. “I think it sends a very positive message to other girls that they can do anything they put their mind to.” He is very careful not to push her and burn out her interest in flying. “I want it to happen at her pace,” he said. “I hope the flying will help her in her schoolwork. We talk about the principles of flight, navigation, distance, speed and time calculations, things that will help her in science and math.”

“I hope Lulu can show people that getting into aerobatics is not a scary or physically demanding prospect,” Dean said. “I encourage anyone to take their children up when they’re ready and gently expose them to aerobatics. They will tell their friends and their friends’ parents about their experience and we can get the word out that aerobatics is a fun and rewarding sport.”

“I enjoy flying with Lulu enormously and teaching her everything I can,” Dean said. “But the best part is spending time together – trying new things, laughing, and learning.” Aerobatics makes Lulu feel totally free. “I love how fast everything can change,” she said. “You can be flying along normally, and then in a split second you will be upside down doing a roll. It makes me feel excited and very happy to be doing what I love.”

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Ripcord Pins

Are you constantly having to push your ripcord pins back in during preflight? Could your ripcord pull forces be part of the problem? Let's examine what you can do for your parachute to keep you safe and what your rigger's responsibility is to you.

Certain issues keep rearing their ugly heads these days. One of them is a subject I've written about on several occasions. See the photo on page 45. You can see the pin of the parachute is just about ready to come out. A lot of times, the thread attaching the lead seal that goes around the bottom ripcord pin is also broken. Whose fault is this? Well, do you preflight your parachute *every time* you put it on or just when you remember? The pins can work their way free in between flights when you take it off and when you put it back on. Wouldn't it be rather embarrassing to suddenly find your parachute lying on the ground? There is also the possibility of it inflating in strong winds and dragging you off of your aircraft if you still have it on, and along the ground, leaving portions of your hide and ego along the way. Serious injury or worse can happen in the process. Being dragged in high winds can be very dangerous.

Do you know the proper method of deflating your parachute if this happens? You should carry a hook knife such as the ones attached to the outside of my small survival kits to cut yourself free if you cannot get out of your harness. Some of you will say, I'll just take my parachute off before I get out of my aircraft and that'll solve

the problem. This is not a good practice because you need to know the nuances of getting in and especially out of your aircraft, with your parachute on. There have been documented cases of people bailing out without their parachute on because muscle memory kicked in reminding them to take it off before getting out of their aircraft – just like my previous article and the “normalization of deviance.”

But are you, the end user, really the initial cause of this problem? In most cases, I don't think so. The pack closing loops, between repacks, can easily stretch 1 to 3 inches out of tolerance. This is caused by the spring-loaded pilot chute that's been compressed from about 30 inches tall to around 2 inches. The pilot chute exerts a lot of pressure on the closing loops. Compounding this problem could be that your rigger might not be checking to make sure the pack closing loops are within the manufacturer's specifications. Many riggers do not have the means to manufacture closing loops or may not know how to shorten your existing closing loops. Having a sewing machine to do so is nice, but many outstanding riggers do not. What do they do? They keep a supply of closing loops in stock.

Some parachutes only require the rigger to untie an existing knot, shorten the loop back to factory specifications, and then retie it. Closing loops must be replaced or brought back into tolerance at each repack and when they are worn out. This may cost you a few extra bucks at repack time, but it's essential for your health and well-

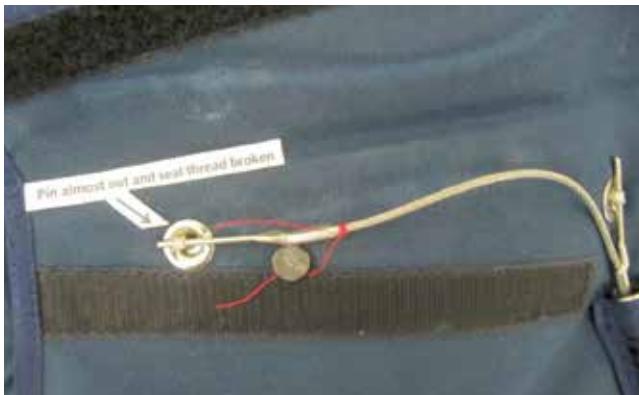
being. Is your rigger doing this? Finding out at your next repack may save your hide.

Your first line of defense initially lies with your parachute rigger doing their job properly. Packing your parachute at the 180-day interval is only part of their job. Your rigger *must* check your entire assembly for wear and tear and replace or repair parts as needed before the rigger can sign it off as airworthy.

Once your parachute has been properly packed and signed off by your rigger and handed back to you, it becomes your responsibility to maintain it between 180-day repacks.

I am concerned about your parachute rigger handing back to you a parachute not properly recertified. There is no excuse for a rigger not replacing or bringing back into factory tolerance all the parts, in particular the closing loops. All parachute maintenance/packing manuals are included when you purchase a new parachute. They also can be found online on all the manufacturers' websites. Make sure your parachute rigger has the necessary, current, and updated maintenance material. The manual was written for a purpose and must be followed to ensure your parachute has been packed properly and is airworthy.

If you'll take a few steps before you strap on your parachute, it will help to prolong your parachute's life. Placing your parachute onto a hard seat with no padding will speed up the wear and tear process. You need to pad your seat with something like a piece of carpet remnant to cushion it a bit. Leaving



it in the sun will speed up UV damage, or leaving it in the trunk of your car on a hot day also can cause problems.

The pull forces on a pilot emergency parachute cannot exceed 22 pounds in order to extract the ripcord pins and start the opening process. Most forces to pull the ripcord are less and average about 15 pounds of force. The pull forces will be dangerously reduced if the closing loops are not within factory specifications. For the first time, I've received many parachutes for repack with the pull forces less than 5 pounds. The slightest movement on your part when getting in or out of your aircraft or just removing it from its carry

bag can leave you with a pile of nylon at your feet.

Ask your rigger, "Are you replacing or shortening, as needed, the pack closing loops as required by the manufacturer?" In the interim, what can you do? If you constantly find your ripcord pins not deep-seated and constantly having to push them back in yourself, then you have a problem. If this is happening to you and you're not sure what to do, have your rigger or someone knowledgeable explain how to push (wiggle) the pins back in. This is a temporary quick fix to a problem that should never be a problem in the first place. Returning your parachute for additional maintenance may be the answer.

Having the closing loops the right length doesn't mean you no longer have to be careful while handling your parachute. Bending it while carrying it or not being careful getting in and out of your aircraft can cause the pins to slip and possibly come out, so be careful. Closing loops that are the proper length should protect you and your hide from a potentially dangerous situation.

If you have any questions about this or other parachute issues, please feel free to contact me anytime. I'm also available for safety seminars.

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2017

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WESTERN

- 7/13-7/15 | THE CORVALLIS CORKSCREW
Corvallis Municipal | CVO | OR
7/20-7/22 | CAN-AM AEROBATIC CHALLENGE
Cut Bank International | CTB | MT
8/10-8/12 | BEAVER STATE REGIONAL CONTEST
Eastern Oregon Regional | PDT | OR
9/01-9/03 | HAPPINESS IS DELANO
Delano Municipal | DLO | CA
9/01-9/03 | ROCKY MOUNTAIN HOUSE
Rocky Mountain House | CYRM | CANADA
9/07-9/09 | APPLE TURNOVER
Ephrata Municipal | EPH | WA
10/12-10/14 | BORREGO AKROFEST
Borrego Valley | L08 | CA
11/08-11/11 | THE TEQUILA CUP
Marana Regional | AVQ | AZ

CENTRAL

- 7/14-7/16 | HIGH PLANES HOTPOXIA FEST
Fort Morgan Municipal | FMM | CO
8/11-8/13 | DOUG YOST CHALLENGE
Spencer Municipal | SPW | IA
8/18-8/20 | UPPER CANADA OPEN
Hanover Saugeen Municipal | CYHS | CANADA
9/08-9/10 | ACE'S HIGH AEROBATIC CONTEST
Newton City | EWK | KS
9/20-9/29 | U.S. NATIONAL AEROBATIC CHAMPIONSHIPS
Wittman Regional | OSH | WI
10/06-10/08 | THE CLYDE CABLE ROCKY MOUNTAIN AEROBATIC CONTEST
Lamar Municipal | LAA | CO
10/12-10/14 | HILL COUNTRY HAMMERFEST
Llano Municipal | AQQ | TX

EASTERN

- 7/13-7/15 | GREEN MOUNTAIN AEROBATICS CONTEST
Hartness State | VSF | VT
8/24-8/27 | KATHY JAFFE CHALLENGE
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9/08-9/10 | EAST COAST AEROBATIC CONTEST
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