

SPORT *Aerobatics*

October 2012

OFFICIAL MAGAZINE of the INTERNATIONAL AEROBATIC CLUB



AirVenture 2012

- Extreme Decathlon
- Operating Limitations



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So the first logical step was to transition to a tailwheel-type aircraft.

—Greg Koontz

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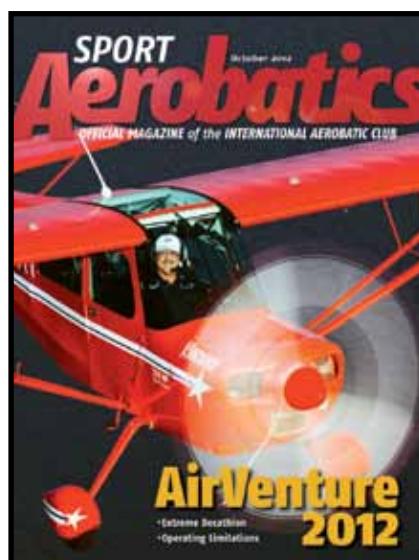
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Greg Koontz flies the Extreme Decathlon. Photo by Russ Munson. See Greg's article about the Extreme Decathlon on page 4.

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REGGIE PAULK
 COMMENTARY / EDITOR'S LOG

Our aerobic community sees new offerings

AirVenture pulls it all together

OCTOBER IS UPON US AND that means we only have a few competitions left before the end of the season. We can only pray for the winter to help make up for what the summer lacked. What a scorcher it was!

fortable in my teardrop out next to the highway than the unfamiliar bed of an air-conditioned hotel.

I was pleasantly surprised by some of the new offerings in the aerobic community this year. When the economy tanked in 2008, a lot of ideas and innovation were put on hold. This year brought back the Pitts S-1S, a new Decathlon, a light sport aerobatic airplane with an aerobatic engine from Lycoming and a really slick ground-adjustable propeller from Sensenich. That's the most I've seen in the aerobic realm in the five years I've been attending AirVenture. Five years . . .

This month marks, I believe, the 49th issue of *Sport Aerobatics* since I took over the reins in 2008. I really can't believe it's been that long, but I sure hope you as our membership feel the magazine brings fresh ideas and insight every month. Please holler whether you like it or not!

On a personal note, I wanted to take a moment to offer condolences to Advanced Aerobatic Team Member Reinaldo Beyer's family and friends. We lost him recently during a training accident in California, and I was taken aback by the news. He'd made a few contributions to *Sport Aerobatics* over the last couple of years, and his voice was a welcome one.

IAC

That's the most I've
 seen in the aerobic
 realm in the five
 years I've been
 attending AirVenture.

I attended AirVenture this year, but with a new twist—I stayed in Camp Scholler in a wooden teardrop camper for the week. It was wonderful! Instead of making the drive to and from Fond Du Lac every day, as I've done for the previous four years, I just hopped on my bicycle and made the quick trip to the grounds in minutes. I worried the scorching temperatures and high humidity would play havoc on my sleep, but I have to admit to being more com-



NEWS BRIEFS

CP Aviation Inc. Awards Emergency Maneuver Training Scholarship in Memory of Vicki Cruse

SANTA PAULA, California. CP Aviation Inc. has awarded an Emergency Maneuver Training (EMT) scholarship to Adam Gillhom of Valley Village, California.

The flight school, based in Santa Paula, is known throughout the world for its specialized training curriculum, originally developed in 1987. CP Aviation is the home of two Master CFI-Aerobatics instructors, who have also been awarded National CFI of the Year by the FAA: Rich Stowell (2006) and Judy Phelps (2011).

The scholarship, now in its fifth year, is awarded each summer to a recipient who is a member of the IAC, holds a pilot's certificate, and wishes to pursue unusual attitude and basic aerobatic training. The scholarship is offered in memory of Santa Paula aerobatic champion Vicki Cruse, a member of the United States Unlimited Aerobatic Team and former president of the IAC.

Gillhom is a private pilot with an instrument rating. He is currently working on his commercial pilot license certificate and plans to become a CFI. He was inspired to pursue aviation after seeing two F-16s take off from Hickam AFB and, well, the rest is history.

The training is conducted in Citabria and Decathlon airplanes. The emphasis of the course is on creating safer pilots. The program is broken down into three modules: Stall Spin Awareness, In-Flight Emergencies, and Basic Aerobatics.

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IAC



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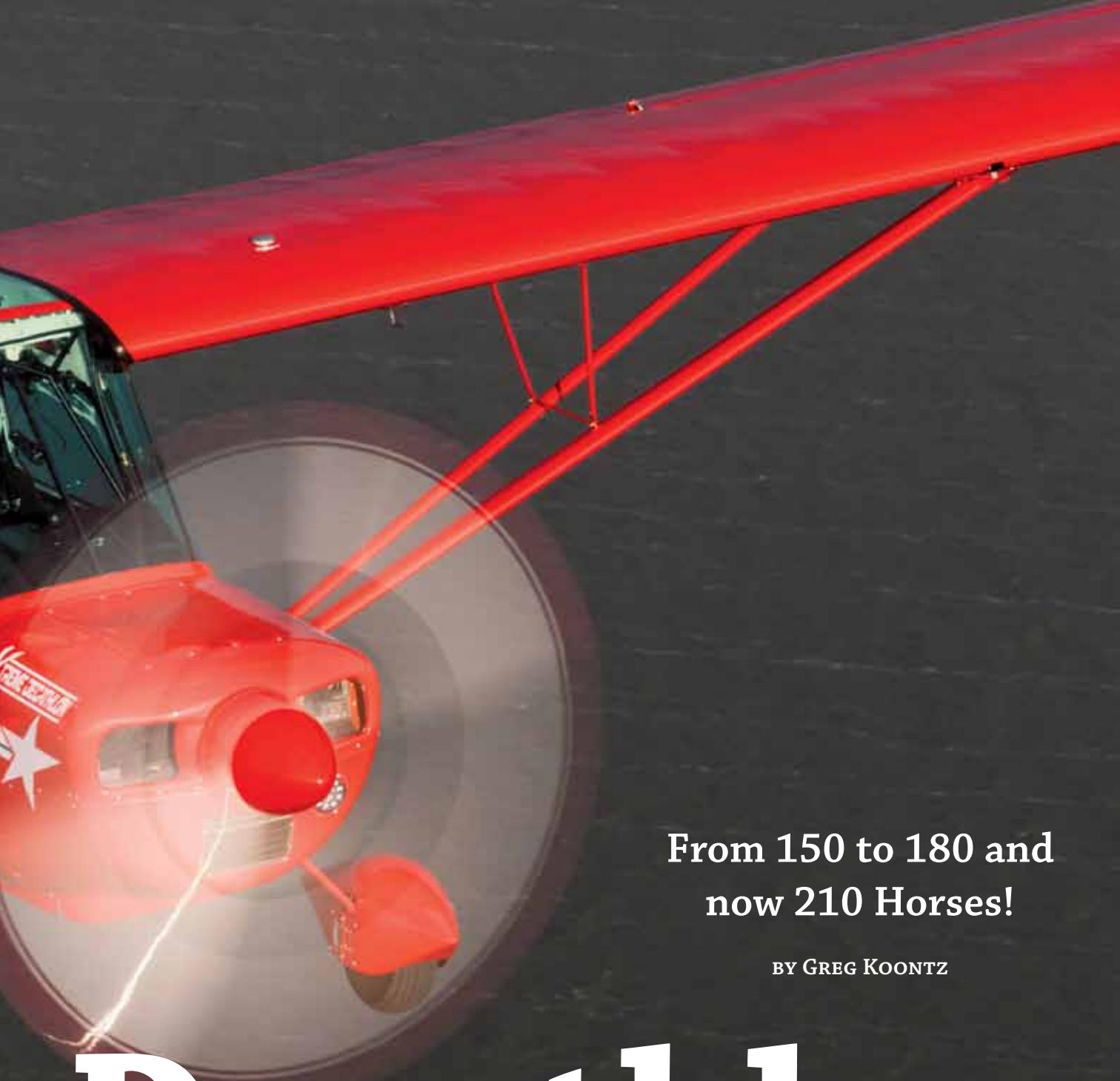
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EXTREME

RUSS MONSON

4 Sport Aerobatics October 2012



From 150 to 180 and
now 210 Horses!

BY GREG KOONTZ

Decathlon





RUSS MUNSON

Learning to fly, for me, was a means to an end. I turned 17 the day I took my private pilot checkride, and I already had my goals in place. One way or another, I was going to be an air show pilot. I didn't know exactly how, or even when, I just knew it was all going to happen.

So the first logical step was to transition to a tailwheel-type aircraft. A man named Bob Davis was a dealer for an aircraft company called Bellanca, and he even had a demonstrator at the local airport: a pretty new model 7GCAA Citabria (airbatic spelled backward). He was letting some people rent the plane, so I called him up and begged to have a chance at it. He put me with a well-known tailwheel/aerobatic guru named Jim Salsmann. By the very next Saturday, we were flying.

There I was, getting to fly a plane that, with its name being airbatic spelled backward, seemed plucked directly from my dreams. This was 1970, and I had just watched Jim Holland do an inverted ribbon cut in a 7KCAB Citabria in a show near Atlanta, Georgia. Now I was sitting up front with a big stick, tandem seating, tubular steel, fabric covering and, the big deal, a wheel way back under the tail. It was love at first sight! But disappointment hit when, the day after my checkout was complete, somebody bought the plane. You might guess that I would find a way to fly those planes some more. Forty years later I can say it has been a relationship outdone only by the one I have with my wife.

I did my first aerobatic act in 1974 in a show at St. Augustine, Florida, with a 7KCAB Citabria. I was work-

ing for Aerosport Inc., which was a large Bellanca dealer. The company soon got its first 8KCAB Decathlon, and let me trade off the Citabria for the better ride.

The Decathlon was a big improvement, with a constant-speed prop and a semi-symmetrical wing for much improved inverted flight. It opened up a whole new world of outside loops. A year later it got the new-and-improved Super Decathlon and, wow, did that ever improve the design. No longer did I find myself burning off altitude for enough energy to fly low-level acro. Like a good marriage, this was getting better all the time.

The 1980s brought a lapse of air show/acro for me. I took a corporate flying job and worked on paying mortgages and raising kids. But in 1993 I wanted back in, and the Super Decathlon was my long-lost love. By then she had improved without me!

A man named Jerry Melhalf had acquired Bellanca's line of aircraft, and had added metal spars to the entire production line. This was now, beyond the shadow of a doubt, the best of the best. I had to have one.

I told you all of that to tell you this: I'm the Decathlon nut. I teach in them, I fly shows in them, I sell them, I travel in them, and I play with them. The Super D and my older mistress, the J-3 Cub, consume all parts of my life not already occupied by my family. If you don't believe me, just ask my wife (or kids, or friends, or Jerry Melhalf). So don't you think it makes sense that the editor asked me to write about the latest version of my obsession?

If you're a pilot, then you know that more power is, well, better. It just is. I don't care if I already have enough. It doesn't matter that the two-seat Super Decathlon is pow-



ered by an engine that usually pulls four people through the air in any other aircraft type. When the factory called me and said they were putting an IO-390 in a Decathlon, I had to let out a holler. We've gone from 150 to 180 and now 210 horses! It seemed unnecessary, opulent, and delightful all at once. Yes! Give me more! And to sweeten the pot, they said they were redesigning the aileron, too. Who could ask for anything more?

The Extreme Decathlon was debuted on Monday at EAA AirVenture Oshkosh 2012. It's a less-than-imaginative name, in my opinion. The word "extreme" has been used to describe everything from sky diving in wing suits to bubble gum. It has become almost meaningless. But despite the overused moniker, the plane was met with deserved excitement. One change requires another, and that inspires more.

The engineering staff might just be as nutty about the product as I am, and their enthusiasm shows. But you couldn't expect a couple of engineers to show up at a press conference with party hats and balloons. I think I noticed some new pocket protectors just for this occasion.

The real excitement was to find that the crew at American Champion Aircraft decided to upgrade our beloved aircraft. A quick walk around



RUSS MUNSON

YES!
Give me more!

If you like the Super Decathlon, as I do, I can just bet you're asking, “Will the Extreme do a full vertical roll?”

reveals a new prop from our friends at MT. Better yet, MT isn't stopping there. It is at the “drawing board” right now, designing a wide-chord “high-thrust” prop for the actual production version of the Extreme.

Right behind that prop, you'll find an all-new cowling. First you notice what's not there—the odd chin you find on the Super to accommodate the air filter. This adds a smooth classic look. Then you notice the whole side of the cowl opens on both the left and right giving great access. No more peeking through the oil door trying to preflight or troubleshoot. A good look through the doors revealed a clean exhaust system that better channels the exhaust in harmony with the engine.

You also might notice there are two oil radiators. Testing done on

the 210 Scout, released earlier, revealed that the extra power of this strong Lycoming demands more cooling. Two coolers more than took care of the problem, meaning a hard workload on this machine on really hot days will be much easier on the engine (and probably your pocketbook over time).

In the cockpit you find the expected roomy cabin and luggage space. Weight has been a real passion for Jerry Melhalf. Adding an engine that weighs a few more pounds set him out on a quest to shave it off somewhere else.

Gone are the familiar old “airplane carpets.” They have been replaced with really cool carbon-fiber floors. I think Jerry would pierce his ears to get the weight down, so this doesn't surprise me at all. While

they are always encouraging a “lean and mean” panel, customers can have a wide variety of avionics and other goodies for their high-tech pleasures. Every panel is custom-built to each pilot's desires.

Now let's go out to the wingtip. That new designed aileron is hard to detect from a distance, but stands out big time when up close. It's a symmetrical flight control, mounted in a fitted, contoured cuff just like those fancy-pantsy high-performance jobs.

Surprisingly, the factory's goal was to decrease weight (What did I tell you?). By designing a control surface that has lower aerodynamic pressures, they feel they can eliminate the old gap kit and, believe it or not, the spades! So any noticed increase rate of roll will be an accidental by-product. New shorter wingtips look great and just might get some credit for better roll rate. We'll get to see just how well this works when we get to the flight.

The prototype at AirVenture sported the “flying tail” seen on the new Scouts. This is an aerodynamically shaped stabilizer that noticeably increases the Scout's elevator authority, mostly in the low-airspeed envelope. A more positive elevator wouldn't hurt the Decathlon. But, to tell the truth, the real motivation to try this tail on the Extreme goes back to weight.

The engineers were faced with countering the heavier engine with some ballast, and figured a useful tail mod was a lot more sensible than a hunk of lead. But aerodynamics is a fickle thing, and the jury is still out about the tail mod working for the Extreme.

We pushed the Extreme from the ACA display at AirVenture through a maze of people, vehicles, and exhibits to get it in place for an early morning photo flight on Sunday. I broke ground at 6:30 a.m. to rendezvous with the EAA photo team at 2,000 feet (I never should have stayed up for that great night show on Saturday, but, was it ever cool!).

After a brisk 1,700 fpm climb-out (half fuel tanks and just my big

fanny inside) I reached the checkpoint plenty early, only to find out that the photo crew was running late (those guys work their tails off all week). Of course, I had to grin. Make me fly the new Extreme for an extra 30 minutes? Please, just throw me in the briar patch!

So any red-blooded pilot already knows what came next. Flat-out full power gave me 157 mph. More than is ever needed to loop, so I did. A half-roll out of level flight was just possible. They didn't want me near 180 with the yet-to-be fully tested new tail, so I left the vertical at that. If you like the Super Decathlon, as I do, I can just bet you're asking, "Will the Extreme do a full vertical roll?" I can only speculate right now, but my money is on yes.

Let's talk ailerons. Just in case you haven't heard, symmetrical ailerons have positive centering and input pressures that require some pressure to start a roll, but, typically, not much more pressure to complete

the aileron travel. I am told by those who fly them more than I do that this varies with design, and is a factor of aileron thickness, cord, and hinge point. Whatever.

The Extreme prototype currently has a very positive centering, which I like, but as speed increases, an ever-increasing breakout pressure, followed by easier pressure, to full deflection. All are too much. At close to 160 they feel like a strong compound bow for archery. They are good, maybe even sweet, at low speeds but load up too much at the upper end. But don't fret yet.

The key word to understand here is "prototype." We flew this plane a bit early, kind of in the middle of testing. With the knowledge that is out there on this now common type of aileron design, it is only a matter of trial and error until the engineering team at ACA fine-tunes this into what we want. The good news is, they are letting qualified people fly the ailerons, and they are listening

to what we want. Who could ask for anything more?

More good news. The Super Decathlon will still be available. And even better, when the new ailerons are right, they will come with that plane, too. I have even been told a retrofit is in the works to re-aileron past ACA-built Super Ds. This is possible because the Extreme and its improvements are being added to the 8KCAB type certificate just like the original Super was just a new engine on that cert.

I just bought a new Super Decathlon demonstrator with an agreement to get the new ailerons retrofitted as soon as they are perfected. That's my confidence level in the ACA factory and its committed team!

It took a long while to make a significant upgrade to the ol' Super D. That just makes sense to me. It's hard to tamper with such beauty. But like a friend of ours who is married to a plastic surgeon, a little upgrade here and there sure looks good! **IAC**

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...I had to dead stick my Pitts in and an old timer said "Nice save. Someone taught you well." Yes they did! Thanks, Budd. -Craig H.

My insurance company covered me, a low-time, low-tailwheel-time pilot in a single-hole Pitts largely because I went to Budd for my training. -Tom P

... the engine failed at low altitude and the accident investigators said that my fundamentals saved me. Thanks my friend. -Maynard H.

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AIRVENTURE 2012

AirVenture 2012 did not disappoint. Even with the economy in such poor shape, we saw some refreshing innovation in the aerobatic realm.

The Decathlon has received a welcome makeover. Boasting 210 horsepower, new ailerons and an aerodynamic tail, the Extreme Decathlon (left) will be interesting to keep an eye on. Read Greg Koontz's article on it in this issue.

The IAC pavilion (lower left) was a very popular venue, and the chairs got quite a workout as people filled it up to listen to all of the wonderful speakers who gave so generously of their time and expertise.

Camping at Oshkosh is the way to go. Editor Reggie Pauk brought his teardrop trailer (lower right) to Camp Scholler, and what an treat that was! The extreme temperatures of Oshkosh were bearable without air conditioning, and facilities are more than adequate for a week on the grounds. Highly recommended!



REGGIE PAULK PHOTOS





DJ Molny flew his Giles 200 from Colorado and parked in front of the IAC building.

We can only wonder how often he had to land in order to wind it up for the next leg.



Where is everybody? A storm with winds in excess of 50 miles per hour howled through Oshkosh, forcing dozens of people to seek refuge in the Aerobic Center (below).



Where else but Oshkosh? When you own a Super Cub, it would seem only appropriate to adorn the wing strut with a boar's head.

REGGIE PAULK PHOTOS



Factory New Pitts S-1S? Yes!

Aviat Aircraft in Afton, Wyoming, has decided to again build the single-seat Pitts S-1S.

For the entry-level aerobatic competitor, or even the seasoned veteran, the Pitts can handle anything you can throw at it. Besides, how can you beat that factory-new smell?



REGGIE PAULK PHOTOS



FK-12 Comet

Aerobatic light sport aircraft have tried in fits and starts to gain any kind of foothold, but the FK-12 is one to watch.

With two seats and the new aerobatic Lycoming 233 engine, the FK-12 is being wrung out by some aerobatic heavyweights.

The folks at Renegade Light Sport Aircraft were planning to have the airplane at the U.S. Nationals in September, and we'll let you know if they were able to make it.



REGGIE PAULK PHOTOS





Matt Chapman

DEKEVIN THORNTON PHOTOS



Sean Tucker



Mike Goulian

Sensenich Quick-change Ground-adjustable propeller

Throw away those safety wire pliers and protractor; you won't need them with this ground-adjustable propeller from Sensenich.

This yet-to-be-named propeller is being developed in conjunction with Lycoming for use on their new 233 series engines.

The unique pitch key only requires you to loosen the bolts holding the hub together; place the key with your desired inches of pitch; rotate the propeller blades until they engage the key holes; and then torque the bolts back down on the patented locking washers—no safety wire or protractor required!



REGGIE PAULK PHOTOS



DEKEVIN THORNTON



PD-2 Roadable Kit for Glasair Sportsman

We've seen many different flavors of roadable airplanes over the years. The PD-2 Roadable Kit for the Glasair Sportsman offers an interesting take on the genre.

Mating strutted front wheels with what appears to be the rear end of a motorcycle, the PD-2 promises to turn heads at your local drive through.



BRADY LANE





Melissa Andrzejewski Pemberton gave it her all in her Edge 540 during an air show performance in Oshkosh. She was anticipating a positive outcome at the U.S. Nationals in September. She'll know whether she's made the Unlimited U.S. team by the time you read this.

DEKEVIN THORNTON



REGGIE PAULK PHOTOS



YAEIO-233

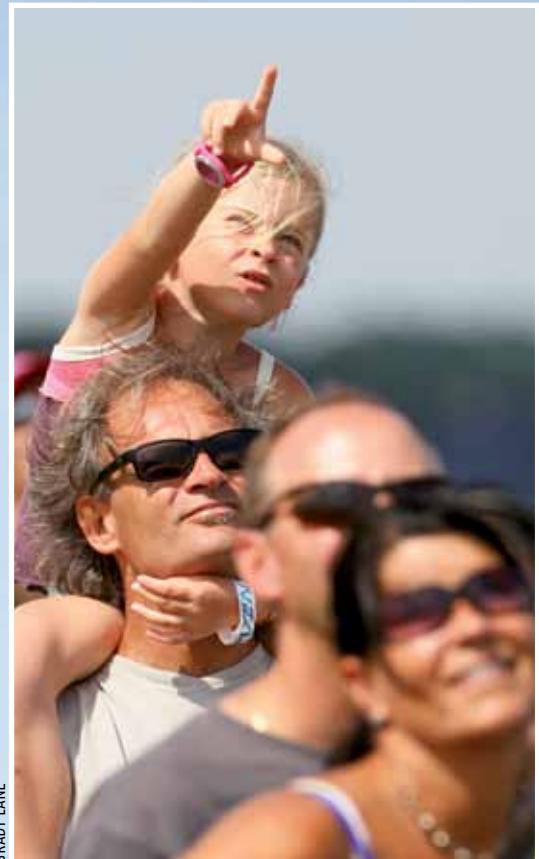
The economy is still in the doldrums, but that hasn't stopped Lycoming. Yes, that 'A' in the designator stands for aerobatic!

The new 233 series aerobatic engine is being developed on an FK-12 Comet test bed aircraft. Sporting a tuned exhaust, inverted fuel and oil and a demonstrated horsepower considerably higher than its rated 115, the Lycoming 233 is an engine to keep an eye on.





Rob Holland



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Operating Limitations?

Experimental amateur-built aircraft owners beware!

by AJ Hefel IAC 23752

Since everyone's earliest days of aviation we've known that, to operate an airplane, it must have several required documents onboard. Most of us remember and still use the acronym "ARROW" as an aid to recall the required documents, with the "O" referring to Operating Limi-

tations. As a competitor, we know it's also one of the items the technical inspector confirms prior to flying in the contest. The question as to *how* and *where* they are documented depends on the type of aircraft you're operating. Are you operating a manufactured standard

airworthiness certificated airplane or are you operating an experimental amateur-built special airworthiness certificated aircraft? Some of you may already know the answer to this, but this wasn't as clearly understood as I thought. How this came to my attention at our Chapter 119

Aces High Aerobatic regional contest last year isn't as important as what I've learned. The information that follows is to help you avoid any potential problems if you're an experimental aircraft owner and unsure of *how* and *where* operating limits are to be documented onboard your aircraft. I'll also share some more information on the *why* and *how* to get an experimental aircraft's operating limits reissued or amended.

So let's begin our research concerning operating limits with 14 CFR Part 91 (also referred to as the FAR's by us older folks). They're not the easiest to read, actually they can be a great cure for insomnia, but the information contained within is significant. Starting with 91.9(a) it states, "No person may operate a civil aircraft without complying with the operating limits specified in the approved Airplane Flight Manual (AFM), markings, and placards..." We already know this. Furthermore, 91.9(b) states, "No person may operate a U.S. registered civil aircraft... unless there is *available in the aircraft a current, approved Airplane Flight Manual . . .*" So a **normally** certificated airplane has its operating limits documented within its AFM (or Pilots Operating Handbook for some aircraft), markings, or placards. That's simple enough and nothing new. As a side note, IAC contestants have a waiver for AFM carriage during a contest or IAC sanctioned event. Nobody likes getting hit in the head by a loose AFM in the middle of an aerobatic sequence or trying to find where it went after the flight. The question that still remains is how and where are an experimental certificated airplane's operating limitations documented and displayed?

Let's again refer to the 14 CFR 91. In particular, 91.319, Aircraft having experimental certificates: Operating Limitations. Within the regulation, paragraph c, states, "Unless otherwise authorized by the Administrator in **special operating limitations . . .**" By this statement we know there must be "special

operating limitations" and they surely must be carried on the aircraft. However, the regulation never clearly states how they are issued or where they are to be carried. This is one of those implied situations and only after sitting down with the local flight standards district office (FSDO) folks did I get the "big picture" with all the FAA documents to back it up. Before we get too far ahead, let's talk a bit about experimental aircraft and their process for special airworthiness certification. Why is this important? As you'll see, there have been several changes made over the years. Some of these changes will have an effect on owners of older experimental aircraft and their operating limitations.

tion of completion to the local FSDO. The FSDO would then replace the previous airworthiness certificate and Phase I operating limits with a new special airworthiness certificate and Phase II operating limitations. Remember this for later discussion. In fact, the way to verify the Phase II operating limits are the original is to compare the issued dates with those on the special airworthiness certificate; they should coincide. Most of these older Phase II operating limits had no written guidance as to where they should be kept for proper documentation. In some cases, such as my aircraft situation, they were stapled to my airframe logbook. Nowhere on that document did it state where it should be posted, nor is it crystal

Some of you may already know the answer to this, but this wasn't as clearly understood as I thought.

In earlier days, the builder of an experimental aircraft would apply for a special airworthiness certificate once the fabrication was completed. The builder would be issued a certificate with a set of Phase I operating limitations. These limitations gave the builder a prescribed number of flight hours within a specific geographical area to complete testing of their newly built aircraft. Upon completion of Phase I testing, the builder would present logbook documenta-

clear in the FAR's. Imagine my surprise when I was suddenly grounded for not having them in the aircraft. I'm sure you're asking, well what did I have? I had an AFM, placards, and markings, but these do not apply to an experimental aircraft that should have on-board a set of Phase II operating limitations. How is this different than today?

Hang with me. Today's process for experimental aircraft certification starts with reference to FAA Order

So what if you can't find your experimental aircraft operating limits?

8130.2G, Section 9. Who reads this order unless they are a builder, mechanic, or an FAA inspector? Regardless, this section has a great deal of information that I'll omit to get to the heart of the matter. If we go to section 4102; certification process, it walks us through the method for obtaining an experimental special airworthiness certificate. What's different is very clear in paragraph h where it states, "The FAA will issue Phase I **and** Phase II operating limitations for an unlimited duration during the initial airworthiness certification." Remember from our earlier discussion that Phase I is for testing? Why is this important? What if you have to do a major repair or modification to your experimental airplane? If you had older issued operating limits, you would have to go to a FSDO and request to re-enter Phase I. This would require more paperwork, something most of us dread. Now you have a way to put your aircraft back into Phase I testing without surrendering your airworthiness certificate. That doesn't mean you can do it without letting the local FSDO know about it, but it does make it easier. More on this later.

We still haven't found any guidance on where our operating limitations need to be carried. If we go just a little further in 8130.2G, section 4104, Issuance of Experimental Amateur-Built Operating Limitations, it will become crystal clear. Within

paragraph b it states, "The following operating limitations shall be prescribed to experimental aircraft." There are 28 limitations that may be applied to any particular aircraft. In every case, sub paragraph 1 is always applied and it contains the following sentence, "These operating limitations are a part of FAA Form 8130-7 (special airworthiness certificate), and are to be *carried in the aircraft at all times* and be available to the pilot in command of the aircraft." There it is, finally. Contained within the issued operating limitations themselves is the actual verbiage that they must be carried on the aircraft. This wasn't always the case with some older experimental certificated aircraft.

So what if you can't find your experimental aircraft operating limits? First, don't fly the airplane; you know it's a required document that needs to be on-board for flight. Second, contact your local FSDO and begin the process for reissuing the operating limits as though they are lost. At the same time you may want to talk to them about amending the operating limits for reasons you'll see later.

Getting back to Section 4104, there are also several other subparagraphs we should note. Subparagraph 16 addresses aerobatic flight and the documentation for the maneuvers that are test flown and approved for flight in your ex-

perimental aircraft. Subparagraph 19 of the limitations provides guidance for further testing should you incorporate a major change to your aircraft as well as addresses the documentation necessary for later changes. Is this important? Well it could be. This leads us to the *why* you might want to get your older operating limitations amended.

Let's say for discussion's sake that your older certificated experimental aircraft logbook has a written statement that it is, "approved for loops, rolls, and spins" after completing its Phase I testing. Does that cover all the maneuvers you're going to be flying in this year's Sportsman contests? No. Can your aircraft do them without falling out of the sky in smaller pieces? Most likely, if flown properly. However, in this scenario, since a hammerhead or a humpty-bump is not specifically addressed in the logbook during Phase I, they are not technically allowed to be performed in the aircraft. How do you fix that? Well if you have a newer set of operating limits, you put the aircraft back into Phase 1 testing, fly the maneuvers, and then document the parameters to which they can be safely flown in the aircraft logbook. Along the way you will need to notify the local FSDO of your intentions, but it shouldn't be as much of a nuisance as with an older operating limitations requirements.

Even newer Phase I and II operating limitations may need to be amended. What if you're operating your newly purchased experimental amateur built aircraft from a location that is far away from its originally defined Phase I testing area? That's okay. However, even though the operating limits may allow re-entering Phase I, you wouldn't be able to do so unless you actually moved the aircraft back to the defined testing area location. That could be a big logistical problem that is better dealt with by a simple paperwork drill that I'll explain.

The *how* to reissue or amend a special airworthiness certificate and op-



erating limitations is fairly simple. First fill out FAA form 8130-6. These are available online, but I recommend you contact the local FSDO for guidance before proceeding. The second thing needed is a Program Letter that outlines the actions that will be taken for the requirements of 14 CFR 21.193(d). Having gone through this recently, I just reviewed each item of the regulation and addressed it with brief statements that I ran by the FSDO. Most important of these was to define the area for experimental testing from my airplane's based location. Once these documents are submitted, they're reviewed and if approved a new special airworthiness certificate, as well as Phase I and II operating limitations, will be issued. You'll then exchange the old ones for the new ones and you're in business.

So all of us experimental amateur built aircraft owners now understand *how* operating limitations are documented and *where* they should be kept. We know we can't fly without them. We even know *why* we might want to get them amended and *how* to do it. If you decide to amend your special airworthiness certificate and operating limitations, the local FSDO folks will be glad to help so you won't lose a day of flying. At least that's how a storybook ending would go.

Fly smart, fly safe, have fun!

IAC

(Note: A special thanks to Joe Gonsalves at the Wichita FSDO for his time and expertise in helping with the writing of this article)

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Minimizing the bone-crushing landing

THE SUMMER FLYING SEASON IN some parts of the world is wrapping up, but there is still the possibility that one day you may have to see what your parachute looks like for real.

John, a member of an IAC chapter in Canada, e-mailed me about safely landing by parachute after a bailout. I hadn't given it much thought before, because after all, once you bail out, your landing is inevitable whether your parachute is open or not. But wouldn't it be nice if you could minimize the possibility of getting injured on landing?

I touch on this in my seminars, but maybe it's time I expound upon it a little more. Everyone, it seems, has seen World War II movies where the airborne troops are put through what seems like endless PLF (parachute landing fall) training. The instructor is yelling at them to get it right or screaming, "Give me 20 push-ups!" for doing it wrong. It's riveted into their minds that done incorrectly, a parachute landing will break every bone in their bodies.

Times have changed, and not everyone wants to go through airborne training. Still the thought may go through your mind as you drift down to terra firma. Some portions of the earth are more "firma" than others, so pay attention.

There is some good news. Modern-day parachutes are much smaller/lighter, steerable, and most importantly, they typically come down slower than the early Leonardo da Vinci models. I'm not saying you won't get hurt on landing, but the alternative of staying with your aircraft is not a viable option.

I have no idea where you're going to land. It could be in the trees, on a pile of rocks, or on a nice soft sandy beach with someone waiting to hand you a nice, cool piña colada, but you will land somewhere. The wind may not be blowing at all, or it could be howling at more than 20 mph.

Still, I hope I can help minimize the risk of a hard, bone-crushing landing. If you follow a few simple rules I teach my customers in my shop and at my seminars, you should be able to make your landing a little easier on your body. I'll mention this in more detail later, but *never lock your knees*.

. . . with a red cape wrapped around your shoulders thinking you were Superman.

Let me begin by asking you what's the highest thing you've jumped off? You know, like out of a tree or from the house or barn roof with a red cape wrapped around your shoulders thinking you were Superman. Many of us have done this as children, and assuming you landed on your feet, you probably used your legs like shock absorbers. You kept some tension in them, but allowed them to bend under the pressure of your landing to help absorb some, if not all, of the landing shock. If you were lucky you didn't twist an ankle or worse, and you survived to do it again, before your mother caught you.

What I'm getting at is we've all jumped off something about four to five feet above the ground. This is about what it would feel like landing under your parachute for the majority of you. Of course I haven't taken into consideration density altitude, your weight, and a host of other variables. I'm speaking in general terms here. Four to five feet is something we're all familiar with and can relate to. I just want you to change a couple of things.

I have several thousand jumps, and I know that hanging in your harness under your parachute for most of you

will be a new experience. It's also very comfortable to hang in your harness with your legs out in front of you at about a 45-degree angle.

Let me remind you that you're only going to have one chance to get this right. Before you land you MUST get your legs underneath you. Trust me, you don't want to land with your legs out in front of you. You would land heels first, followed quickly by a back-breaking jar to your tailbone. This could easily cause severe injury to your back. You would experience the same bone-jarring feeling if you were sitting in a chair and someone suddenly pulled it out from under you. I think you get the picture.

Next, you must NEVER lock your knees. If you were to stand up right now and jump up and down with your knees locked you could very easily hurt your back or shake a filling loose, and that's by only jumping a few inches off the ground.

Keeping your legs tight together and very slightly bent will set you up for the best landing position you can expect. Another advantage of keeping your knees tight together is it helps keep them from shaking badly from fear.

All I'm telling you to do is to slightly modify what you already know about jumping off a ledge. There is nothing magic about this. You don't have to yell "Airborne!" or "Geronimo!" Just try to absorb most, if not all, of the landing with the balls of your feet. I'm not saying you won't sprain (or break) an ankle or leg, but trying to absorb the majority of the landing on the balls of your feet may help prevent head injuries when you fall over in your attempt to do a PLF. Having a clear head after you land is important to your survival.

Speaking of a clear head, keep those questions coming. Thank you, John, for a good question.

IAC

TECH TIPS

BAD GAS

REPRINTED FROM THE INTERNATIONAL AEROBATICS CLUB

TECH TIPS MANUAL, VOLUME IV

OVER THE YEARS THERE HAVE been many reported fuel system problems. Some of them are mechanical in nature such as cracked fuel tanks, loose fuel pump screws, chaffed and failed fuel lines, blocked fuel vents, etc. There have also been fuel system problem reports that are more chemical in nature such as deteriorated fuel hose linings, dissolved carburetor floats, deteriorated carb diaphragms, etc. The following Tech Safety report falls into the chemical category and relates to fuel quality.

"I built and fly an SIC Pitts with an 0-320 Lycoming, a PS5C pressure carb, and the Christen inverted fuel and oil systems. My fuel problem started when I had to abort a takeoff when the engine didn't come up to anywhere near full power. I drained the sumps, pulled the fuel strainer, and found no contamination. After letting it sit a while I tried a full power runup which showed everything to be normal. I took off, stayed above the airport and after a few minutes experienced a rough engine with very low power. The fuel pressure was under 5 PSI and variable. I was able to bring the fuel pressure up with the wobble pump and the engine ran reasonably well. Conclusion, failed fuel pump.

"I borrowed a used AC 41272 fuel pump from an IACer in Colorado Springs, swapped it out and flew back to our farm strip without problems. After a few more short flights, I experienced the same problems with the used pump. Conclusion, another failed, used pump. I then met with the problem of AC 41272 being out of stock. Aircraft Spruce and Specialty

had just sold the last one they had in stock and I found that Electronic Manufacturing Associates had bought all remaining pumps from AC. After waiting a couple of months to get the pump. I installed it and tried again. Same problem.

"It was then that I found hose rubber in the carb fuel strainer and thought my problem was solved. A short test flight and my first power-on landing in months indicated I had indeed found the problem. Off we went the next weekend on a local airport-hopping flight. I didn't make it to the first airport. Halfway there I had a power problem just as I had experienced before. Furious pumping on the wobble pump wouldn't bring the pressure up or sufficient power to the engine. I landed on a county road which has become known as M Field and trailered home. I then went through my fuel system from tank to carb, took hoses apart, inspected, and found nothing.

"It was about this time that my hangar mate started experiencing power problems in his 150 HP Citabria. His engine would quit in a slow roll and finally would not develop enough power to climb. Unlike my Pitts, he could maintain level flight in the Citabria. Others in the area began having similar problems and we have concluded that it was bad auto fuel. I had been burning auto fuel more out of convenience than cost. We had a tank at our farm strip filled with auto gas. I drained the auto gas and refilled with 100 octane. I have had no further problems. "My conclusion is that we got a bad batch of auto fuel that

didn't meet minimum vapor pressure requirements. My problem was probably magnified because of the pressure carb. I would recommend that anyone flying with the PS5C stick to 100 octane. The saving in time and money seemed trivial at 100 feet AGL when looking for a place to land."

The question of auto fuel vs. Avgas has been discussed in just about every aviation publication and the pros and cons of the two fuels are well-known. However, since most IAC members operate aircraft powered by Lycoming engines, it should be pointed out that the above report in a way supports Lycoming's position on using auto fuel. It is our understanding that Lycoming's major concern about auto fuel is its apparent inconsistency. They feel that auto fuel quality and chemical makeup varies greatly from company to company and from batch to batch and, therefore, you cannot select fuel system components/materials or tune an engine to accommodate all the possible variables.

In closing, first we must give a large thank you to the IAC member making the report on his auto fuel experiences. IAC member field reports are the essence of the IAC Tech Safety Program. It should always be remembered that when you become an IAC member you are automatically on the IAC Technical Safety Committee — your input is necessary. Second, we appreciate that the fuel subject is a controversial topic and there are plenty opinions on what is right. And in that light, we hope we have stated Lycoming's position correctly. Let's keep IAC as an open forum on this issue and leave the decision making up to each individual member.

IAC

TECH TIPS

THE CLIPPED-WING "CUB" AND COMPETITION AEROBATICS

BY GILES HENDERSON
EAA 53234, IAC 159

REPRINTED FROM THE INTERNATIONAL AEROBATICS CLUB
TECH TIPS MANUAL, VOLUME I

Giles Henderson is a name nearly synonymous with the "Clipped Cub"—the aerobatic version of the venerable Piper J-3 Cub. Please enjoy this article written by Mr. Henderson and reprinted in the IAC Technical Tips Manual Volume I.

—Ed.



Giles Henderson of Charleston, Illinois spends most of his spare time strapped in his highly modified Clipped Wing Cub. Over his 20 year flying career he has established a national reputation in precision aerobatics. He is a two-time national champion in the Sportsman Category of the International Aerobatic Club (1971 & 1975) and has also won the Canadian Championship in 1974 and the L. Paul Soucy Award in 1975. In the past few years he has won over 20 aerobatic competition meets. After watching Giles snap and tumble over and over through his famous "wifferdill" maneuver, it's hard to visualize him as a Chemistry Professor. He has been employed by Eastern Illinois University for the past 12 years and has published over two dozen papers on molecular physics and related topics. Giles is also a spelunker, amateur radio operator and a certified scuba diver.

SINCE THE ARTICLE "A COMPARISON of a Stock J3 With a Clipped-Wing 'Cub'" appeared in the December, 1970 SPORT AVIATION, I have received numerous requests for specific information on modifications of the "Cub". This article has been prepared in an attempt to answer the most frequently asked questions. Please keep in mind that the following comments reflect the opinions of a professional chemist that engages in competition aerobatics as a hobby and not those of an engineer or aircraft mechanic. Also, in view of the gross sacrifice in performance (take-off, ground roll, increased stall speed, rate of climb, glide ratio and, in particular, the tremendous loss in useful load) discussed in the previous article, shortening the wings of a stock "Cub" deserves considerable consideration. In all fairness to the ever-decreasing quantity of good "Cubs", the would-be akro pilot should be absolutely certain that he knows what he wants and what he will get from a clipped-wing "Cub" before he starts sawing.

It has been my observation that it is almost always cheaper to buy an already modified "Cub" than it is to modify one yourself. Rebuilding a clipped-wing

"Cub" would involve considerably less work than starting from scratch, and at the same time preserve the relatively scarce "antique" classic stock J3. Furthermore, in rebuilding, and possibly more extensively modifying, a clipped-wing (or any other aerobatic aircraft) you will have the opportunity to become thoroughly acquainted with the mechanical condition of the machine. The peace of mind that this knowledge provides is indeed a valuable security. Needless to say, exposing an aircraft of unknown structural integrity to the stresses of aerobatics has frequently proved fatal. Not only is the quality of the aircraft's structure a cardinal safety factor but also an important element in the quality of the pilot's airmanship. It is essential to have complete confidence in the aircraft's structural integrity before the pilot can concentrate completely on the precision of his maneuvers. Somehow you just can't execute a quality nine descending snap roll if you are haunted by the thought of a wing coming off.

Any modification or alteration that results in a departure from the original Piper Type Certificate will revoke the Standard Airworthiness Certificate unless it conforms to an approved Supple-

mental Type Certificate (STC). There are indeed, several STC's available for major alterations of the J3. Probably the best known is the Reed-Lippert conversion, which allows shortening the wings seven feet. This STC is appli-

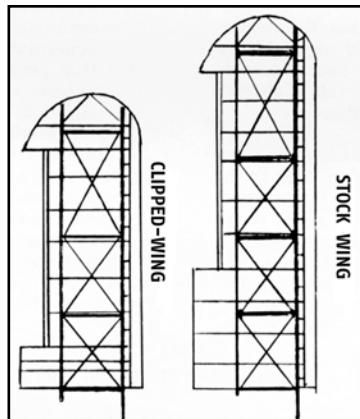
cable only to wood-spar wings. Other STC's are available for similar metal spar modifications. Information concerning STC's and the name and address of the holder is available from the FAA. It is necessary to comply with and obtain the FAA approved data for a particular modification from the STC holder. Usually the holder will fix a user's price for the privilege of using his engineering data, drawings, etc. Of course, the actual alteration must be conducted by an A and P mechanic, and an AI or FAA approved repair station must complete the paper work, including the 337 forms, to return the aircraft to service. In some instances, it is possible to incorporate modifications without STC's by placing the aircraft in the Restricted Classification and operating with a Special Airworthiness Certificate and Restricted Operating Limitations. This approach requires the production of complete engineering data describing the modification. A third alternative, is to license the aircraft in the Experimental Exhibition Classification in accordance with FAR 21.191. This type of certification offers the highest flexibility in the nature of the alteration, but is usually the most restrictive in operating privileges. The specific limitations are made at the discretion of your local FAA GADO. It should be noted that a modified production aircraft is ineligible for certification under Experimental Amateur Built Classification.

In some cases it is possible to obtain certification in multiple categories in accordance with FAR 21.187. For example, this alternative might allow a Standard Category, Reed clipped-wing "Cub" to utilize a portable smoke system or inverted system under Restricted classification during air show performances and be returned to Standard Category after removal of the equipment, provided sufficient design and engineering data is available for the modification.

To the best of my knowledge, it is not possible to build up a fully aerobatic clipped-wing "Cub" with available STC's under Standard Airworthiness.

The extent of specific modifica-

tions is naturally contingent on the competition category the "Cub" will be used in. Hence, the modifications are discussed approximately as they apply to current competition levels.



Sportsman Category

The obligatory routine of the Sportsman Category is composed of basic positive G maneuvers. Furthermore, the competition rules provide 2000 ft. of altitude to complete a typical sequence of ten maneuvers (3500 ft. max.—1500 ft. min.). These two important factors make it possible to be competitive with low horsepower and no inverted power. Of course, a maneuver such as a 45 degree ascending half roll (Aresti 9.2.1.2.1; 18-K) is much easier with a big engine that runs inverted. However, by trading altitude for air speed and using proper timing, it is possible to fly such a maneuver with a quality 8 score using an A-65 running on three cylinders. Furthermore, the typical Sportsman Sequence can be completed within +4.2 and -1.5 G's and 120 mph. Hence, a clipped-wing "Cub", modified per Reed-Lippert type conversion, is well suited for this type of performance envelope. A typical Sportsman Category competition "Cub" might include the following modifications:

1. Balanced 65-90 hp engine, equipped with a balanced metal prop and standard float carburetor.
2. Fuel tank equipped with either an inverted check valve in the cap, or a pressure cap with a vent line running from the filler neck to the bottom of the engine cowl, with proper clearance from

the exhaust system.

3. The crankcase breather line is rerouted and possibly a "separator slop can" installed to minimize oil losses while inverted *
4. Wings shortened seven feet from the root bay.
5. Wing strut fittings modified and reinforced since they are no longer collinear with the new strut angle.
6. Aileron cables shortened.
7. The struts are replaced with custom-build struts, manufactured from streamlined tubing equivalent to (or preferably stronger than) the original front struts and equipped with 7/16-in. (Piper 13710) or larger forks.
8. Fuselage strut fittings modified.
9. Lower door modified to clear struts.
10. Install G-meter.
11. Since the weight of the pilot and parachute may frequently exceed 1000 lbs. during aerobatic routines, the original canvas-sling, rear seat is usually unsatisfactory. I have personally had the misfortune of discovering this, halfway through a competition flight. It should be emphasized, that this can potentially lead to very grave consequences since tearing the canvas seat could cause a seatpack to jam the elevator bellcrank located directly behind the seat. Hence, I would recommend that the canvas seat be replaced by a suitable metal seat, constructed to provide the proper elevation with a seat pack or security parachute. It is probably impractical to utilize a back pack in the rear cockpit of a "Cub" without major alterations.
12. Install shoulder harness and additional military type seat belt in the rear cockpit in accordance with IAC regulations (Sec. 2.1).

* If a return line is used between the can and the oil sump, provisions should be made to drain condensed water from the lowest point. The smallest drop of water in contact with a hot bearing can total the engine.

In addition to these alterations, there are certain critical points that

deserve close attention. The tail-wire fittings (Piper part nos. 40521-08, fin; 40521-07, top stabilator; 40521-09, bottom stabilator; and 40531-00, fuselage) may crack after prolonged use under high stress. They should be checked routinely in every pre-flight. I personally keep a spare set of the fittings on hand and exchange them every hundred hours and Magnaflux the set removed. Likewise, the strut forks and bolts should be periodically Magnafluxed. All of the engine mount bolts can be replaced for less than \$2.00 and a couple of hours' work. This is another high stress area in which failures have occurred. I'm sure most experienced aerobatic pilots are personally acquainted with fatal mishaps involving engine-mount structural problems.

One final point. The fuel system should be inspected very carefully. Aerobatics will cause the fuel to slop around with a lot of momentum. This will put a great deal of stress on the seams of the tank. Furthermore, the support straps are subjected to frequent, high G loads. If the tank moves or shifts slightly during aerobatics, the fuel line connecting the tank to the gascolator will eventually become brittle and crack if it is made from copper tubing. A serious in-flight fuel problem can be avoided with proper maintenance.

Intermediate Category

Although the intermediate category has no outside maneuvers in the obligatory routine, it does require prolonged inverted flight, vertical roll maneuvers and higher G positive maneuvers. Hence, a good inverted system becomes essential as well as higher overall performance capabilities. Fuel can be obtained while inverted by using a standpipe or floptube in the main fuel tank or by installing a small V2 gal., auxiliary "header tank", usually located on the floor of the front cockpit between the rudders and just behind the firewall. Each of these methods have certain advantages and disadvantages. In terms of overall mechanical safety and simplicity, the stand-pipe arrangement is undoubtedly the best, although aerobatics must be done with



AMOS TOWNLEY

Presentation and the precision of a stall are frequently the decisive factors in Sportsman competition. Although smoke is popular for airshow appeal, it is not used in competition flying.

a full tank of fuel. The best inverted systems utilize either a fuel injection or a pressure carburetor. The fuel-injector systems are becoming increasingly more difficult to locate.

A pressure carburetor such as a PS-5 will require a custom-built adapter for the intake manifold spider and probably require modification of the engine cowling to accommodate the larger carburetor and adapter. Sufficient fuel pressure can be obtained from some diaphragm pumps driven by the cam shaft from the front auxiliary pad of the Continental "C" series engines. Probably the most difficult problem is getting proper metering and mixture control. This is a job for the professional carburetor specialist (if you can find one).

Inverted oil pressure is a controversial point. Many pilots feel that as long as the aircraft is only flown a few moments inverted (such as in a square loop) oil pressure is not important. In fact, you can find many engines that have flown several hundred hours of aerobatics where prolonged inverted flight was avoided, with no apparent damage upon teardown. On the other hand, factory representatives, and in many instances engine mechanics, shudder and have fits at the mention of such abuse. I suppose the old premise "better safe than sorry" is in order.

In my opinion, it is not possible to be competitive with a clipped "Cub" in the Intermediate category without at least 85 hp and a good inverted system. I would highly discourage the use of the float-carburetor modifications that are frequently suggested. These methods have proven totally unsatisfactory for competition aerobatics.

Many of the maneuvers in the Intermediate sequence will require substantially higher entry speeds than the Sportsman sequence. Experimental category "Cubs" are often operated 10-15 mph above the original Piper redline air speed. Hence, not only will the ship need higher performance and inverted capabilities, but it will also need to be stronger. The following modifications will improve performance and strength of the "Cub":

1. Replace the normal Vs-in. (0.125) windshield with 3/16-in. (0.187) Plexiglas, if available. Also, brace the windshield near the top center from the cabane structure.
2. Use heavy gauge leading-edge material in the wings, such as that manufactured for the "TriPacer".
3. Replace all of the false ribs with full ribs. Note that although this will greatly strengthen the wings, some pilots claim that the inverted flight characteristics are poorer than with the standard rib spacing.
4. Use closer rib stitching.
5. Modify the compression members (such as using double tubes, one above the other) to prevent torsion of the spars. Abrupt, high-G maneuvers such as multiple snaps or square loops can cause torsional stresses in the wing which may result in multiple rib failures.
6. Rig the wings with no dihedral. This will lessen the stability but improve inverted-flight characteristics.
7. Install full-length tubes in the center of the struts to increase the compressional strength.
8. Modify the wheel rims by removing a center section to take 5.00 x 4 tires and wheel pants.
9. Remove the bungee shocks and weld the gear solid.

PRIMARY/SPORTSMAN CONEST RESULTS			
Year	Contest	Place	No. Of Contestants
1968	Rockford, Ill.	3	15
1968	Oak Grove, Tex.	3	16
1969	Monroe, La.	3	17
1969	Ottumwa, Iowa	4	18
1969	Oak Grove, Tex.	2	31
1970	Hammond, Ind.	1	6
1970	Monroe, La.	3	11
1970	Aurora, Ill.	1	14
1970	Fond du Lac, Wis.	2	23
1970	Centralia, Ont.	1, 2, 3	17
1970	Newnan, Ga.	2, 3	11
1971	Vivian, La.	1	23
1971	Morris, Ill.	2	10
1971	Centralia, Ont.	3	10
1971	Fond du Lac, Wis.	1	31

10. Some pilots prefer to add stall strips to the leading edge of the wing (typically 7 in. long, installed directly in front of the strut fittings). This will change the flight characteristics considerably. In particular, snap rolls may be executed at substantially lower wing loadings. The abrupt, high-speed stall characteristics may or may not be desirable.

Advanced Category

A few years ago it was indeed possible to be competitive in Unlimited competition with high performance clipped "Cubs". Today, however, it seems extremely unrealistic that a super-modified "Cub" is going to be competitive with a Pitts, Stephens, "Chipmunk" or "Akromaster" in a sequence that is 50 percent outside and 25 percent vertical. In my opinion, ultra-modified "Cubs" could be a top contestant in the Advanced Category. You can probably count all of the F.B.U.H.P. (fire-breathing ultra-high-performance) "Cubs" in the country on one hand. These machines typically incorporate chopped T-Craft wings, beefed-up shortened fuselage with extra brace wires, tub-

ing and gusseted clusters, dorsal fin, balanced elevator, single-place cockpit, and 150-200 hp fully inverted engines with "Super Cub" pressure cowling. Modifications this extensive are clearly complex and require a master craftsman.

The clipped "Cub" has a very respectable competition record. The following table summarizes the "Cub's" Primary/Sportsman competition standing over the last few years at the major aerobatic meets. Anyone that has ever attended a Sportsman Contest can testify that there is some real close competition. Typically, at a major meet, virtually all of the well known and exotic akro mounts, including Pitts, Bueckers and Zlins are competing. To get in there and have a go at it with any kind of machine is a challenge to say the least.

Finally, let me say a word about cost. Question: "Could I buy a stock 'Cub', strip it down and build up a good little competition machine for, say \$3,000.00?" My answer: No, if you start from scratch with a stock J3, in all probability, it would cost twice that. It would be well worth your effort to look around a bit before you start butchering the beautiful little "yellow bird". **IAC**

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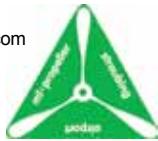
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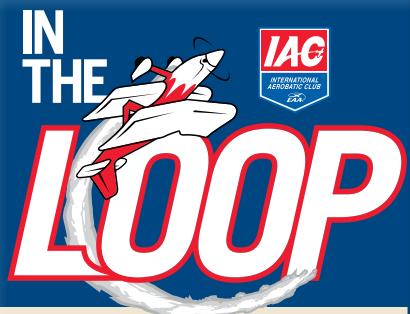
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Sport Aerobatics 2. Publication No.:0953-560. 3. Filing Date: 9/20/12. 4. Issue Frequency: Monthly. 5. No. of Issues Published Annually: 12. 6. Annual Subscription Price: \$18.00 in U.S. 7. Known Office of Publication: 3000 Poberezny Road, P.O. Box 3086, Oshkosh, WI 54903-3086. Contact Person: Kathleen Witman, Telephone: 920-426-6156. 8. Headquarters or General Business Office of the Publisher: Same as above. 9. Publisher: Doug Sowder, 118 E. High Dr., Spokane, WA 99203. Editor: Reggie Paulk, c/o EAA, 3000 Poberezny Road, P.O. Box 3086, Oshkosh, WI 54903-3086. Managing Editor: None. 10. Owner: International Aerobatic Club, 3000 Poberezny Road, P.O. Box 3086, Oshkosh, WI 54903-3086. 11. Known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amounts of bonds, mortgages or other securities: None. 12. Tax Status: Has Not Changed During Preceding 12 Months. 13. Publication Title: Sport Aerobatics. 14. Issue date for circulation data below: September 2012. 15. Extent and Nature of Circulation (Average No. Copies Each Issue During Preceding 12 Months/ No. Copies of Single Issue Published Nearest to Filing Date): a. Total No. of Copies Printed (4,337/4,055) b. Paid Circulation (By Mail and Outside the Mail): 1. Mailed Outside-County Paid Subscriptions Stated on PS Form 3541 (Include paid distribution above nominal rate, advertiser's proof copies, and exchange copies) (3,226/3,184). 2. Mailed In-County Paid Subscriptions Stated on PS Form 3541 (Include paid distribution above nominal rate, advertiser's proof copies, and exchange copies) (0/0). 3. Paid Distribution Outside the Mails Including Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid Distribution Outside USPS (473/465). 4. Paid Distribution by Other Classes of Mail Through the USPS (e.g., First-Class Mail) (5/3). c. Total Paid Distribution (Sum of 15b (1), (2), (3), and (4)) (3,704/3,652). d. Free or Nominal Rate Distribution (By Mail and Outside the Mail): 1. Free or Nominal Rate Outside-County Copies Included on PS Form 3541 (0/0). 2. Free or Nominal Rate In-County Copies Included on PS Form 3541 (0/0). 3. Free or Nominal Rate Copies Mailed at Other Classes Through the USPS (e.g., First-Class Mail) (166/165). 4. Free or Nominal Rate Distribution Outside the Mail (Carriers or other means) (153/155). e. Total Free or Nominal Rate Distribution (Sum of 15d (1), (2), (3), and (4)) (319/200). f. Total Distribution (Sum of 15c and 15e) (4,023/3,852). g. Copies not Distributed (See Instructions to Publishers #4 (page #3)(22/190). h. Total (Sum of 15f and g) (4,245/4,042). i. Percent Paid (15c divided by 15f times 100) (92.07%/94.81%). 16. Publication of Statement Ownership: Publication required. Will be printed in the October 2012 issue of this publication. 17. I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties). Manager: Patricia Deimer-Steineke, 9/20/12. PS Form 3526, September 2012

CONTEST CALENDAR

Mark your calendars for these upcoming contests. For a complete list of contests and for the most up-to-date contest calendar, visit www.IAC.org. If your chapter is hosting a contest, be sure to let the world know by posting your event on the IAC website.

Borrego Springs Akrofest (Mid-America)

Thursday, October 11-Sunday, October 14, 2012

Practice/Registration: Thursday, October 11

Rain/Weather: Sunday, October 14

Power: Primary through Unlimited

Location: Borrego Valley Airport (L08),

Borrego Springs, CA

Region: Mid-America

Contest Director: Gray Brandt

Contact Information Primary Phone: 970 948 0816

E-Mail: graybrandt@yahoo.comWebsite: www.iac36.org

Region: Southeast

Contest Director: Lori Costello

Contact Information: Primary Phone: 925-260-8073

E-Mail: costecc@gmail.comWebsite: iac288.org**Mason-Dixon Clash (Northeast)**

Friday, October 19-Saturday, October 20, 2012

Practice/Registration: Thursday, October 18

Rain/Weather: Sunday, October 21

Power: Primary through Unlimited

Location: Farmville Regional Airport (FVX),

Farmville, VA

Region: Northeast

Contest Director: Eric Sandifer

Contact Information: Primary Phone: 919-605-9585

Alternate Phone: 919-605-9585

E-Mail: moomp@yahoo.comWebsite: iac19.org**Thunder over the Valley (Northeast)**

Friday, October 12-Sunday, October 14, 2012

Practice/Registration: Friday, October 12

Power: Primary through Unlimited

Location: Westfield-Barnes Municipal Airport (BAF),

Westfield, MA

Region: Northeast

Contest Director: Bob Cipolla

Contact Information: Primary Phone: 413-265-6122

Alternate Phone: 413-862-8049

E-Mail: cipolla13@verizon.netWebsite: <http://iac35.aerobaticsweb.org>**Tequila Cup (Southwest)**

Friday, November 9-Saturday, November 10, 2012

Practice/Registration: Thursday, November 8

Gliders Categories: Sportsman

Power: Primary through Unlimited

Location: Marana Northwest Regional Airport (AVQ),

Marana, AZ

Region: Southwest

Contest Director: Jim Ward

Contact Information: Primary Phone: 603-860-4456

E-Mail: james.roger.ward@gmail.comWebsite: www.tequilacup.org**Ben Glattstein International Aerobatic Classic (Southeast)**

Friday, October 19-Saturday, October 20, 2012

Practice/Registration: Thursday, October 18

Rain/Weather: Sunday, October 21

Gliders Categories: Sportsman

Power: Primary through Unlimited

Location: Keystone Heights (421), Keystone Heights, FL

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