

# SPORT *Aerobatics*

JUNE 2010

OFFICIAL MAGAZINE of the INTERNATIONAL AEROBATIC CLUB



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Giles Transition**

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# CONTENTS

*"When my eyes met the broken wire I was inverted,  
through about 135 degrees of pitch.."*

Phillip Gragg

## FEATURES

- 6 **Broken Flying Wire** •  
Phillip Gragg

- 14 **The Overhaul**  
Do it yourself  
Patrick Carter

- 24 **Giles 202**  
Making the transition  
Elizabeth Maynard

## COLUMNS

- 03 / President's Page  
Doug Bartlett

- 32 / Ask Allen  
Allen Silver

## DEPARTMENTS

- 02 / Letter from the Editor  
04 / Sun 'n Fun 2010  
30 / Contest Calendar



## THE COVER

Patrick Carter overhauled his own engine, saving money and learning much in the process.

Photo by Wayne Stanfield.



PUBLISHER: Doug Bartlett  
 IAC MANAGER: Trish Deimer  
 EDITOR: Reggie Paulk  
 SENIOR ART DIRECTOR: Phil Norton  
 INTERIM DIR. OF PUBLICATIONS: Mary Jones  
 COPY EDITOR: Colleen Walsh

CONTRIBUTING AUTHORS:

Doug Bartlett  
 Patrick Carter  
 Phillip Gragg  
 Elizabeth Maynard  
 Reggie Paulk  
 Allen Silver

IAC CORRESPONDENCE

International Aerobic Club, P.O. Box 3086  
 Oshkosh, WI 54903-3086  
 Tel: 920.426.6574 • Fax: 920.426.6579  
 E-mail: [reggie.paulk@gmail.com](mailto:reggie.paulk@gmail.com)

PUBLICATION ADVERTISING

MANAGER, DOMESTIC:  
 Sue Anderson  
 Tel: 920-426-6127  
 Fax: 920-426-4828

MANAGER, EUROPEAN/ASIAN:  
 Willi Tacke  
 Tel: +498841/487515  
 Fax: +498841/496012  
 E-mail: [willi@flying-pages.com](mailto:willi@flying-pages.com)

COORDINATOR, CLASSIFIED:  
 Lesley Poberezny  
 E-mail: [classads@eaa.org](mailto:classads@eaa.org)

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**REGGIE PAULK**  
COMMENTARY / EDITOR'S LOG

## The IAC

It keeps getting better and better

A LOT HAS BEEN happening over the last couple of months, and the International Aerobatic Club has taken on a new communications platform that allows us to reach out more broadly to our members.

As the editor of both our *In the Loop* e-newsletter and *Sport Aerobatics*, I'm trying to synthesize the electronic and print mediums we now use. Now that you've had a chance to see a couple of issues of *In the Loop*, it may become apparent that you are seeing content online that complements what you're reading in this magazine.

For instance, last month, Rich Stowell wrote a piece about hammer spins in the Pitts. He followed that up by producing a wonderful video that went in the May issue of *In the Loop*. I intend to do these types of crossover stories often, and I'd like to hear what you think about it.

This month, Phillip Gragg brings us a story about a broken flying wire in his Pitts during an aerobatic routine. The subject came up on the ACRO Exploder a while back, and I decided to dig further into the subject

to see how this can happen, and what can be done to prevent it. He delves into the murky world of the flying wire, and does a good job explaining exactly what it does.

Quite a few people expressed interest in articles on building and maintenance, so Patrick Carter wrote about his adventure overhauling his own engine. He explains up front that the effort wasn't so much to save

money as to get intimately involved with his engine. His photos show just how intricate an engine is, and it's amazing to think of how all of that has to work in order to remain safely aloft. Patrick will be bringing us more.

The one take-away that I'd like for anyone who's had the patience to read this far is that the IAC is working hard to bring you the content you want to see. Feedback is always difficult to get, and I encourage it. Even if you need to rant, I'd like to hear what you have to say. It's the only way we can really bring you the content you desire.

I would like to personally thank each and every one of you who makes the effort to become an IAC member. You are the reason we're here, and you are appreciated. **IAC**

"You're the  
reason we're  
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appreciated."



## DOUG BARTLETT

COMMENTARY / PRESIDENT'S PAGE

# Getting the Word Out

The IAC is plugged in

**IT'S AMAZING TO SEE** how rapidly the International Aerobatic Club changes on one hand, and how slow it is to change on the other. Let me explain. The Internet has provided the membership with the opportunity to rapidly communicate with one another through a variety of channels. This capability has been around for years. To date, the IAC has not taken advantage of these channels of communication in a formal manner. We are now.

Most of us in the aerobatic world read the ACRO Exploder; many of us have Facebook accounts; fewer still are signed up for Oshkosh365's Unusual Attitudes forum. Then there is Twitter, which is not even understood at this time by your author. Along with this, we have our IAC web page, magazine, and new e-newsletter, *In the Loop*. Each of these methods of communication has a purpose and a place in IAC member communications.

Some of these platforms are great for getting information out quickly, such as Twitter. Others are slower, but get to 100 percent of our members. This magazine is a good example. The ACRO Exploder is great for staying on top of the "acro buzz," and it's a forum open to anyone, with very little censorship. Oshkosh 365's Unusual Attitudes forum is a place where only IAC/EAA members can comment. The content is moderated by the IAC. Facebook stands somewhere in the middle where the IAC has an account and many of our members have an account. Lorrie Penner has shown how a member can creatively use Facebook in support of the IAC. She has been working on archiving the IAC photo library, having many of our members help in identifying

individuals in older photos. Nice job, Lorrie!

So how does the IAC intend to control the communications channels? Well, we don't. We only hope to be able to explain how we best intend to use them. Our web page will be the place to find content that is slow to change. Here you will find links to other websites, general information, contest information, and many of the documents that are needed by members in club activities. Our magazine will remain our standard publication, while our e-newsletter will continue to grow in content and diversity as it allows us to bring multimedia content to our members.

The IAC intends to use Twitter to reach our membership quickly with information that may be important or just plain ol' fun. Twitter information will be posted to Oshkosh365's Unusual Attitudes forum. What is posted there will be forwarded to our Facebook page and then sent to the ACRO Exploder. Through these channels, we hope to be able to communicate with our members in the most complete manner possible.

For input to your directors and officers, direct e-mails will still be the best method of communication. Oshkosh 365's Unusual Attitudes forum will be recognized as input from members only, while Facebook and the ACRO Exploder will continue to be valuable input channels for any aerobatic enthusiast.

By the time this article appears in print, the IAC intends to have started

communicating to our members in the much broader methods indicated above. I know the IAC can't control the many ways our members choose to communicate with us, nor do we want to. But we will begin to use the Internet in many additional ways

**"I am still recovering from the severe beating Mike Mays inflicted upon me . . ."**

to inform our members and other aerobatic enthusiasts of the happenings within our club. Please let me know what you think of our efforts toward better communications, and please pass along any ideas to make it better.

I just got back from the Sun 'n Fun Fly-In at Lakeland, Florida, and had a wonderful opportunity to talk to many IAC members and a few of the chapter presidents from

around the country. I am still recovering from the severe beating Mike Mays inflicted upon me when he cornered Tom Adams, our southeastern director, and me in the Sun 'n Fun Aerobatics Tent. For the members in Mike's chapter, I can promise you he has expressed your concerns!

The question most often asked me was how the chapters can get more participation from their members, and how can they encourage new members to join. My simple answer to both questions is always the same. Make it fun for everyone who comes to a chapter event. Nobody enjoys listening to people who complain—not even the people doing the complaining! So plan events that are fun. Enjoy working with people who want to volunteer, and share all the knowledge you have about our terrific sport. Fly safely and have fun!

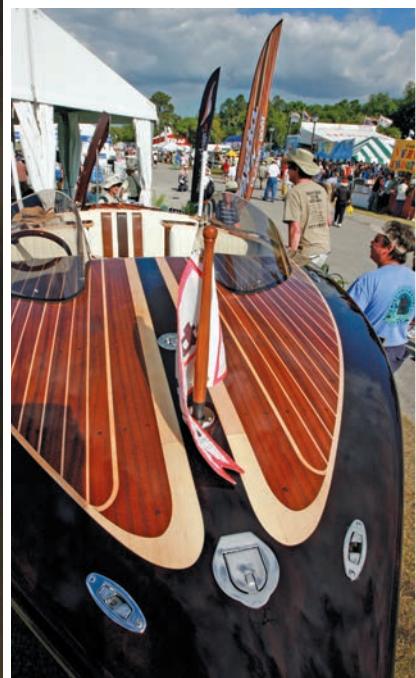
## SUN 'N FUN 2010 IN PHOTOS



Lakeland attracted a biologically diverse range of aerobatics enthusiasts.



Greg Koontz poses with a young fan at the American Champion Aircraft booth.



Jim Kimball Enterprises, famed for their Pitts Model 12s, have brought their superb woodworking to a new line of classic boats and boat kits. The Saetta is a work of art.



Ed McCaskill brought this gem ... We'll be running a feature about the one-of-a-kind Pitts in a future issue.



The one-seat MXS on display.



IAC Hall-of-Famer Bill Finagin's new Pitts S-2C alongside of Aviat's "off road" offerings.



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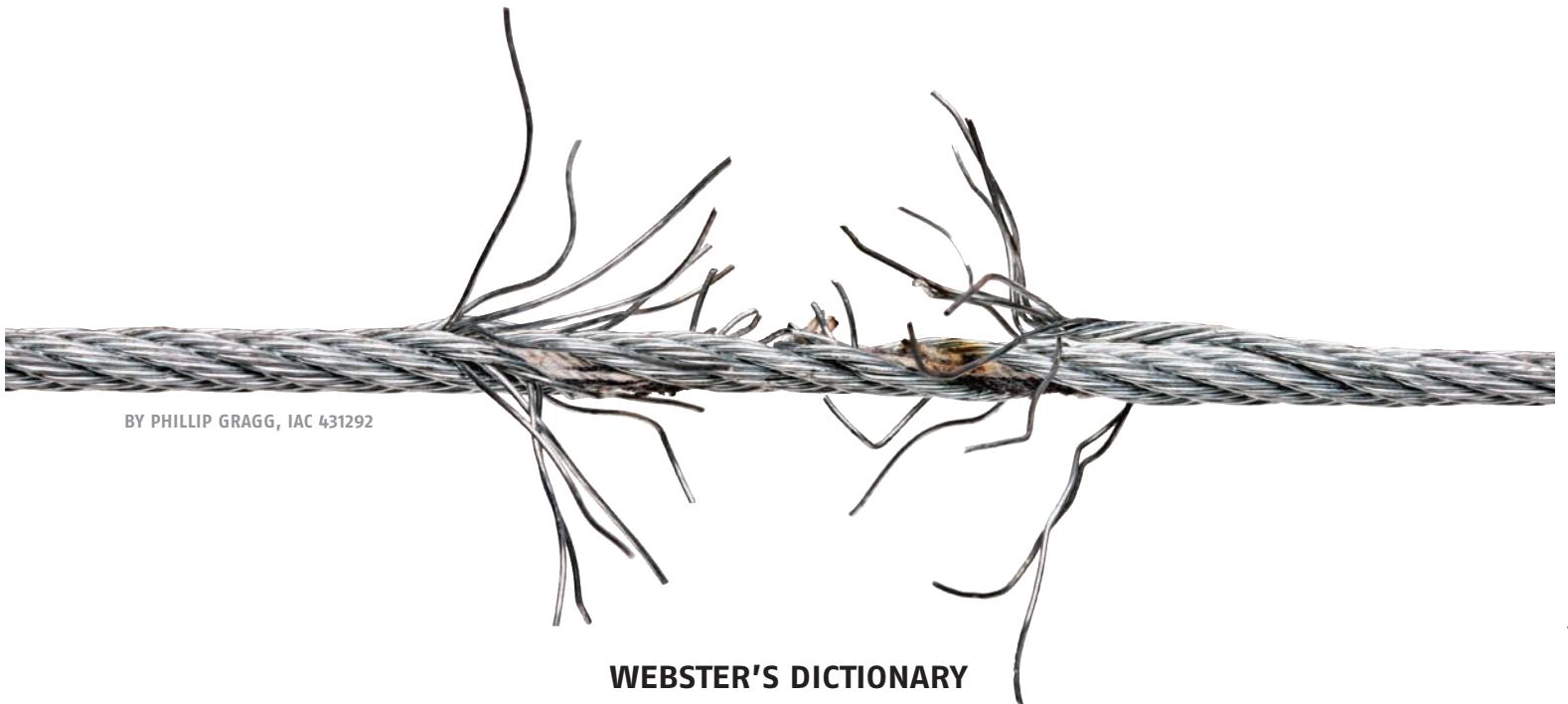
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# Down to the WIRE





BY PHILLIP GRAGG, IAC 431292

### WEBSTER'S DICTIONARY

defines an emergency as an unforeseen combination of circumstances or the resulting state that calls for immediate action. How we deal with unforeseen situations often has more to do with the final outcome than the nature of the problem itself.

This is not a story of insurmountable odds met with strapping heroism.

It is the story of how an unexpected event in flight motivated me to learn more about the hardware and equipment to which we entrust our lives.

**ONE WEEK TILL NATIONALS.** *Watch those boundaries! What's the wind doing? Roll. Airspeed good. Pause. Pause. Pull...good rotation...eyes to the left wingtip...ease off the g a bit...TWANG!* My heart skipped a beat as I heard the sound of a piano wire being cut and I felt a slight vibration through the control stick. My eyes went straight to the slack bracing wire running from the lower wing spar to the top of the cabanes. When my eyes met the broken wire I was inverted, through about 135 degrees of pitch. I slowly pulled and rolled out of the maneuver at about 2,200 feet, reduced power, and settled in for a level cruise that seemed to stabilize the wire.

I was fortunate to be practicing in a box that was directly over an airfield at the time. My basal instincts told me to dive for the ground. The primordial part of my brain quickly figured out that I was in fact not a creature of the air, but rather a land-loving animal that wanted no part of this situation. Fortunately pilot instincts and training are strong, too.

"Fly the plane. Fly the plane," I told myself. I had heard it in my ear many times from many instructors, and I chose to fall back on this idea. "Do I still have an airplane?" I wondered. My definition requires three-dimensional control. "Do I have a landable airplane?" *But wait! Before I*

*answer this, if I don't have control, am I ready and willing to leave this airplane?* That's a serious question, and one I needed to think about long and hard. The fact is that even having this option is a good thing. There are many of our compatriots who never had the luxury of such a choice.

"Yes. I'm ready to leave this plane if I need to, and I'm ready to go to work." It was a deep and sobering moment, and I think it took about 15-20 seconds. From what I could already feel and see about the airplane, I was 99 percent sure I had control and sufficient structural integrity to land the plane. What gave me great pause was the potential for the second landing wire on the same side to go, and the potential for the broken wire to start flapping and do some serious damage. While all this was going on I had reduced power in order to reduce airspeed and to reduce the influence of the prop wash. I had also initiated a slight climb to 2,500 feet. I wanted a little more altitude, but not so much more that coming down would be an additional challenge. I began my control check with a slight turn to the left. The wire instantly became very slack and threatened to begin flapping. A slight turn to the right kept the wire taut. Right turns it will be! After planning my traffic pattern, I cleared the area and made a



*With the javelin removed, it's easy to see the potential for a streamlined tie rod to do considerable damage. Javelins reduce vibration, but they also limit the movement of the wires.*

wide, sweeping, descending right turn down to an uneventful landing.

A quick inspection revealed that everything was okay, except for the failed wire. I'd be scrambling to acquire one in time for Nationals. I had no idea how easy or hard it would be to locate a wire within a week. At the same time I began to wonder about these wires I had relied on so heavily but often took for granted.

#### WHAT EXACTLY ARE FLYING WIRES?

Flying wires are actually a kind of wire rope called *streamline tie rods*. Although we tend to generically call them flying wires, on a Pitts, for example, the wires running from the top wing to the bottom of the firewall are the flying wires, as they take the positive g flight loads. The *landing wires* are attached between the lower wing and the top of the rear cabanes. Although streamline tie rods used to be manufactured in this country by Macwhyte and others, Bruntons Aero Products Ltd. ([www.Bruntons.co.uk](http://www.Bruntons.co.uk)) is currently the only producer in the world. All wires in the United States are distributed by Steen Aero Lab ([www.SteenAero.com/products/flying\\_wires.cfm](http://www.SteenAero.com/products/flying_wires.cfm)).

David Stone is Steen Aero's resident wire expert. If you have questions about a project or replacement wires, he is an excellent resource of flying wire knowledge. David says that Steen usually has a good supply of common wires for the Skybolt and S-1 series of planes. "Occasionally there will be a run on our stock, but we generally have a ready supply," he says.

David is clearly passionate about flying wires and enjoys the close working relationship between Steen Aero and Bruntons. David and one of his colleagues traveled to Scotland in the fall of 2003, and the managing director of Bruntons, Alan Hook, has visited Florida several times over the years. David encourages IAC members to look up Bruntons and request a tour if they should find themselves in and around Edinburgh.

When I asked David what really stands out about working with flying wires he didn't hesitate: "The most exciting projects are the old restorations where aircraft are reborn. The wires they require are unique and can be as long as 200 inches!" It's the history and legacy of such aircraft that is so energizing. "A whole new generation will get to see an airplane that hasn't existed for decades," says David. One such project is the Seattle World Cruiser, led by Bob Dempster ([www.SeattleWorldCruiser.org](http://www.SeattleWorldCruiser.org)). When completed, the airplane will follow the route of



## IAC member . . . but not a Full EAA member? It's time to reconsider!

The entire collection of EAA's flagship publication is now online. Starting with the first "Experimenter" newsletter in February 1953, which evolved into *Sport Aviation*. In January, IAC members received the newly reformat ted version of *Sport Aviation*. The look of this publication has changed greatly, but more than 670 issues full of technical information, history, and good old-fashioned hangar flying are now online, adding value to your membership. To access this new resource log into [www.Oshkosh365.org](http://www.Oshkosh365.org), using your e-mail and password, and then click on "EAA Members Only."

The screenshot shows the EAA Sport Aviation Magazine Archives website. At the top, it says "Welcome to EAA Sport Aviation Online". Below that, there's a search bar with fields for "Year", "Month", "Page", and "Topic". To the right of the search bar, there's a link "Having trouble? Try finding the answers on our FAQ page." Below the search bar, there are two buttons: "Browse Back Issues" and "Search for Articles". There's also a small image of the magazine cover.

TO SEARCH for a specific year, month, or page number.

TO SEARCH for a particular topic. The Search For Articles feature allows you to select a date range or keywords in the title, author, or article text.

SEARCHING HINT: If you have difficulty with a search, refresh your web page and try again. Also, sometimes it is more efficient to search in a different field, so if the title search doesn't work, try the author instead. This is an incredible search tool and a great reservoir of collective knowledge now available to EAA members at the "click of the wrist."

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The screenshot shows the homepage of the EAA Sport Aviation Magazine Archives. It features a red header bar with the text "EAA Sport Aviation Magazine Archives" and "Welcome to EAA Sport Aviation Online". Below the header, there is a thumbnail image of several magazine covers from different years. To the right of the thumbnail, there is a brief description of the archive, a "Browse Back Issues" button, and a "Search for Articles" button. A small note at the bottom right says "Having trouble? Try finding the answers on our FAQ page."

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the first circumnavigation of the world by the original Douglas World Cruiser in 1924.

Although we are most familiar with the round tie rods used for internal bracing and the streamline wires used for external bracing, *Aircraft Maintenance* by Brimm and Boggess (Pitman Publishing, 1940) shows a variety of different wire configurations, including a style called "full streamline" (i.e., there is actually a leading and trailing edge, although the airfoil is symmetrical). The symmetrical streamline tie rods we know most commonly reduce drag to 1/6th of an equivalent round tie rod. Tie rods are also manufactured to *exceed* minimum strength standards, so the vast majority are stronger than the load they are designed to handle.

#### FAILURE IS RARE, BUT NOT UNHEARD OF

Other than the potential for fretting against aluminum javelins, when wires fail, it is often at the lower portion of the threads nearest the "shoulder" of the wire and prior to the flattened, streamlined portion. It is interesting to note that a close inspection of these wires in this failure location would require the removal of the wires from the airframe, so it is unlikely we are going to get a good look at this part of the wire on a regular basis.

Still, there are some important things that we can remember about maintaining and working with streamline tie rods:

- They should be cleaned and inspected regularly. The wire should be free of nicks and corrosion. A light oil can be applied, but if you have stainless wires in a relatively dry environment, they should hold up well without it.

- When installing wires or new hardware, use a light oil or grease on the threads to protect both the nuts or clevis and the wire threads. In applications using a clevis and a jam nut that locks the wire to the clevis, the jam nut should be tightened only 1/6th of a



turn beyond contact with the clevis. Over tightening improperly stresses the threads of the clevis and the wire.

- If you need to tighten or remove a wire, use a flying wire wrench. The idea is to use a metal softer than the wire to prevent damage to the wire. Steen Aero makes one of soft aluminum that has custom notches for several sizes of flying wires. Brimm and Boggess suggest that aluminum, brass, or "fiber" stock can be notched and rounded to the same effect. In any case you should never "crank" on a wire. (An S-1's main wires can be adjusted to the proper tension using leather gloves over a bare hand! Plan on sore fingers, though.) Slow but firm pressure will get the job done. When the wire is being rotated it is often necessary to adjust one end and then the other a little at a time so that the wire does not begin to twist. Streamlined wires, truly being *ropes*, can handle a great deal of tension but no compression, and do not handle twisting well.

- When tensioning a tie rod, use a tensiometer. You can get close by guessing, but there's no substitute for doing things right. Holloway Engineering ([www.RadialEngine.com/flywire/](http://www.RadialEngine.com/flywire/))



The wire failed near the end of the threads.



*index.html*) makes a tensiometer that is compatible with beam and dial type torque wrenches for a fraction of the cost of an all-in-one unit.

#### RESOLUTION

The evening the wire broke I was on the phone to a gentleman I had met at the Cajun Contest the previous April, Ken Squires. Ken runs an aerial application company in Jeanerette, Louisiana ([www.Penn-TexHelicopters.com](http://www.Penn-TexHelicopters.com)). He had acquired an S-1S that had been wrecked by Hurricane Ike, and we had spent quite a bit of time talking about his project and my airplane. It's funny how the friends you make at a contest can become your support network. I thought he might just have the wire I needed, so it was only a matter of convincing Ken to let me borrow or buy the wire. In truly generous fashion, Ken offered me the use of the wire before I could even ask: "If I have what you need, you're more than welcome to it!" After confirming he had what I needed, the next morning I drove four hours round trip in a hard rain from Baton Rouge to Jeanerette, Louisiana. Within a few minutes of returning to the airport, my mechanic and I had the wire installed and properly tensioned. Weather kept me grounded for an additional 24 hours!

With the help of Ken, and the sage counsel of many of my aerobatic friends and mentors, my experience with a failed wire proved but a minor inconvenience. In the final analysis, this emergency proved to be a manageable one. I did as I was trained: flew the plane, prepared myself mentally to do what I needed to survive (including bail out, if necessary), determined the fly-ability and condition of the plane, and designed and carried out a plan of action. **IAC**



*Even with a simple beam style torque wrench, this style of tensiometer is highly accurate.*

#### For more about the history and manufacturing of tie rods, please see:

- Davisson, Budd. "Flying Wires and Fittings: They Must Do More Than Shine." *Sport Aviation*. July 1995, pp. 92-96.
- Petersen, Norm. "Revival At Macwhyte." *Sport Aviation*. July 1987, pp. 59-62.
- Whittier, Bob. "All About Streamline Tie Rods." *Sport Aviation*. March 1969, pp. 15-20.

All of these articles are now available to EAA members at [www.Oshkosh365.org](http://www.Oshkosh365.org) (see page 9).

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*The spark plug on the left is dirtier than the one on the right because it was in the bottom hole on the cylinder and exposed to more oil due to gravity. This indicates leaky rings, and is very common in aircraft engines. A good reason to clean, gap, and rotate your plugs at every oil change.*



# OVER HAUL!

TACKLING THE ULTIMATE MAINTENANCE TASK

STORY & PHOTOS BY PATRICK CARTER

**I**"I purchased my aircraft with approximately 1,000 hours on the airframe and engine, and the ominous thought of an engine overhaul had been looming in the back of my mind since day one."

**THE ENGINE PERFORMED WONDERFULLY** the first three years and 370 hours; however, I was not comfortable pushing it through another season and flying past the recommended time between overhauls (TBO) of 1,400 hours. In December we received our first snowstorm and the hangar door had frozen shut, so I decided it was time. My plan was to complete the overhaul and have the airplane back in the air in 12 weeks. For the past few years I had researched engine overhauls, helped several mechanics, and read anything I could find on the subject. I hold an airframe and powerplant mechanic certificate, but my actual knowledge of the engine overhaul procedure was rudimentary. When the time came, I made the decision that I would take on the challenge. The foremost reason was my desire to know as much as possible about my airplane. I have now overhauled, recovered, or repainted every piece of the airplane. Unfortunately, the financial difference in performing the overhaul myself or having an engine overhaul shop perform the work was insignificant. I did not share this fact with my wife until after I completed the overhaul in her living room.

The teardown process is relatively easy, and anyone with a set of tools and slight mechanical ability can tear just about anything apart. However, experience can be valuable, as this is the most revealing part of the entire process. A trained eye can spot possible points of failure based on the wear patterns. The biggest eye-opener for me was



*Patrick Carter's Aviat Pitts S-2B is powered by a 260 horsepower Lycoming AEIO-540.*

during the disassembly and inspection of the number three cylinder. I found one of the valve guides cracked and ready to fail. The fact that this piece would have failed in short order justified every penny spent on the costly overhaul.

#### THE TIME BETWEEN

Whether you fly a cross-country machine or low-level aerobatics, any mechanical failure—especially in the engine—has the potential to end badly. The theory that TBO is simply made up by the manufacturers for liability reasons only is completely bogus. The FAA mandates extensive testing to the point of failure before any engine can be certified. Contrary to popular belief, the TBO is set on anecdotal evidence of failure with a defined safety margin. The FAA's guidelines, then, dictate the TBO recommendation the manufacturer is allowed to make. Every manufacturer is keenly aware that the higher it can set the TBO, the more marketable its engine is. Why any manufacturer would arbitrarily set a low TBO is beyond me. An aerobatic pilot exposes himself to more risk in the event of an engine failure, places more stress on every component, and usually flies around without an air



*Patrick learned a lot about his engine by overhauling it himself.*



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filter. If you add the stress of aerobatics to an engine's life, it is even harder to justify taking it past TBO.

#### DIVIDE AND CONQUER

It took less than two days to tear my engine down after removing it from the airframe. Even though the overhaul manual provides instructions and specifications for the entire overhaul, the bulk of the work requires extensive tooling and skills. Even the most advanced engine overhaul shops contract with a limited number of machine shops that hold an FAA repair station certificate for this work. So, the next step was selecting the repair stations and shipping the pieces to them. Generally these repair stations specialize in certain areas, so I had to ship parts all over the country.

The crankshaft, camshaft, and all ferrous (magnetic) parts must be inspected using non-destructive testing methods. I had previously visited Aircraft Specialties of Tulsa, Oklahoma, and toured its facilities. I was impressed with its shop and processes and was eager to take advantage of its millennium balancing process for my crankshaft. Greg Merrill and the rest of the folks at Aircraft Specialties have truly been students of

**... these repair stations specialize in certain areas, so I had to ship parts all over the country.**

their trade for more than 30 years, and the intellectual property they have accrued is unprecedented. The company's most recent product, ASL Camguard, is a scientific solution to the systemic problems related to corrosion and wear Aircraft Specialties has identified over the past 30 years.

Most pilots are aware of the need to balance any rotating mass, but until recently, precision balancing of the inner working of a piston aircraft

*UPPER: Bottom of cylinders. Notice black exhaust stains on top 2 cylinders. This can be difficult to see on a typical preflight, but can be very serious.*

*CENTER: Signs of an oil leak. This is a 3-way intersection and a favorite spot for oil to leak out.*

*LEFT: Carbon and lead deposits are common due to 100LL fuel that is burned in this engine.*

engine has not been available. The advent of computerized balancing machines makes it possible to balance a crankshaft to much tighter tolerances than ever before.

However, I must admit, I am a realist, and all of the technology in the world is worthless if I cannot tell the difference in the end product. There is not a subjective test to measure the gains realized by precision balancing any one component of the engine. The true test is in the seat of the pilot's pants, and the most objective way to refine this is a dynamic balancing machine. After the engine was assembled and flying, I had a dynamic balance performed, and the engine and propeller balanced within 0.01 inches per second (IPS). The FAA guidelines for dynamic balancing state that any reading below 0.20 IPS is smooth and acceptable. I am quite certain this is not due to my superior ability to turn a wrench, so it leads me to believe that Aircraft Specialties precision balancing



*Number five piston, showing carbon deposits and scoring on piston pin cap. These are obsolete piston pin caps and will be updated.*

capabilities made this possible. As the pilot who has put almost 100 hours on the engine since overhaul, I can subjectively state that the seat of my pants agrees with the dynamic balance results.

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After taking the ferrous parts to Aircraft Specialties, I still had to take the case and accessories to their repair stations. I sent my case to Nixon's Machine Shop in Santa Maria, California. Hines was great to deal with, and he performed minor repairs to the case that he said were typical of all overhauls and then shipped it back to me promptly for the price he quoted. The fuel servo and distributor also needed to be overhauled, and I chose Airflow Performance Inc. due to its support of numerous aerobatic pilots and experience with high-performance engines. It also performed the requested overhauls on time and on budget as advertised. The magnetos would normally be due for an inspection, but Aircraft Spruce & Specialty had an upgrade special on new Slick magnetos. I purchased a new set of slick mags for \$1,100 with a set of fine wire plugs and new ignition harness, by trading in my Bendix mags and old

harness. I am by no means a business expert, but this was a good deal considering an overhaul for one magneto runs about \$550.

My engine had the stock fuel injectors from Lycoming, and during the teardown I noticed that the brass flats on several of the injectors had been worn to the point that replacement was necessary due to the repeated removal and installation. I run GAMIjectors in several normal category aircraft and have always been happy with the results both rich of peak and lean of peak. After visiting GAMI's facilities I am also confident that it has an unprecedented level of expertise with piston

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engine operations and is not selling anything that has not been extensively tested and proven. The GAMIjectors will allow you to run an aerobatic engine lean of peak on a cross-country if you have a good multi-cylinder engine monitor. Although flying lean of peak does not make sense for aerobatic operations, balancing the fuel flow



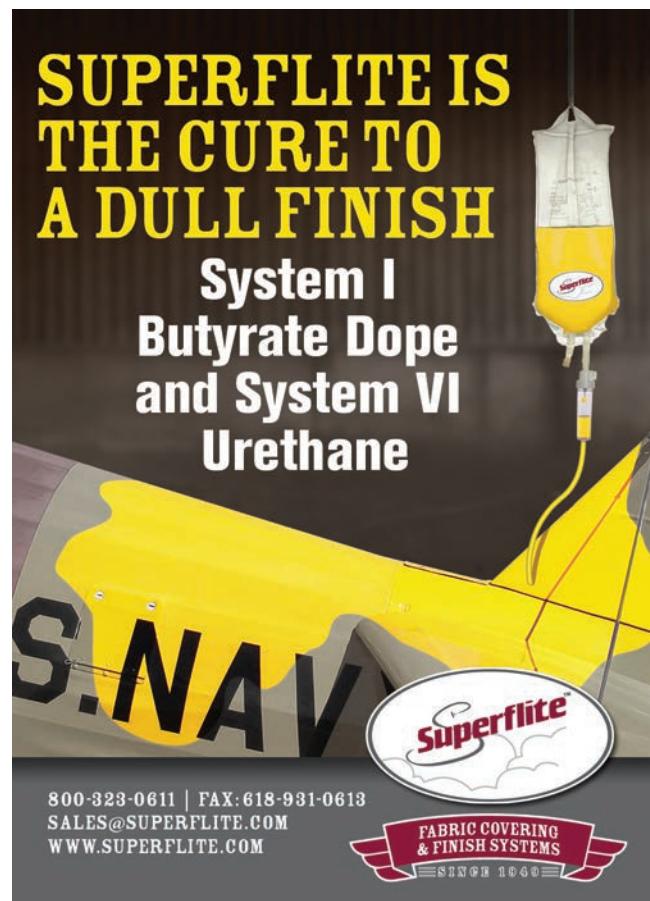
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#### REUNION

After receiving all of the parts back from the various repair stations, it was time to start reassembling. Probably the hardest part of this whole process was acquiring all of the nuts, bolts, washers, etc. since Lycoming hardware is not the same as standard Army/Navy (AN) hardware. The build process is much more straightforward in my mind than re-covering an airplane or rebuilding a wing because almost everything is spelled out in the overhaul manual. Although Lycoming does leave a little to be desired in its antiquated publications, if you have decent attention to detail and can follow directions, you can put an engine together. In my opinion, the black magic of engine building is not in making it safe but in knowing all of the tricks to keep it from doing things like leaking, especially during aerobatics. For this I decided to get a much more experienced engine builder and longtime friend involved for some help and a mini-vacation. In less than a week, we had the

engine back together and ready to hang on the airplane. However, I had sent my firewall out to be powder coated, and UPS managed to lose it for a week. So, after a week delay, we started hanging the engine. Two days later, we had it back on the airplane and ready to run. We followed the Lycoming recommended break-in procedure of heating the engine by running it for varied lengths of time followed by cooling before the first flight. This also allowed us to identify any potential problems before it was airborne.

When the time came for the first flight, I will admit it was exhilarating and a little nerve-racking to take off behind an engine that I overhauled. My biggest fear was that something would go wrong and all of the work I had done would be in vain. Not to mention the embarrassment that would follow if it was due to something simple. The engine came to life at the end of the runway, and as soon as the plane left the ground I remembered how fun the Pitts is to fly. I put a short flight on the engine and then landed for another inspection to ensure that no problems had surfaced. The inspection was clean, and I decided to fly the aircraft five hours before de-cowling and inspecting again.

The first five hours went well and the airplane flew great, but the inspection revealed an oil leak. I began the search for the pesky leak, and after several different attempted fixes, it was still there. I removed the cowling and wrapped every hose and fitting, which were also replaced during the overhaul, in aluminum foil and then ran the engine for 15 minutes at takeoff power. This allowed me to isolate the location of the leak—one of the oil-cooler lines. My first thought was that I had a loose or cross-threaded fitting, but after inspection no evidence of either was present. I tightened the fitting to the specified torque and ran the engine again; the oil leak was still there. I spoke with the hose manufacturer and it ensured me it was not the hose: "Every hose is pressure tested before it is shipped." Finally, after several more hours of frustration, I realized something about the fitting on the hose did not seem right. I sent it back to the manufacturer, and sure

enough, the fitting had not been installed correctly and was about to come apart. Often, I let my desire to fly an airplane override trouble-shooting nuisance squawks like oil leaks. I tell myself I will just clean the belly when I get back or that it's not a big deal—all airplane engines leak. I am glad the

**... as soon as the plane left  
the ground I remembered how  
fun the Pitts is to fly.**

weather was less than stellar this day, because a separation of the oil cooler hose fitting with 70 psi of oil pressure would have made quick work of lubricating the belly of my airplane, making all the hard work and money spent on my engine go up in smoke at best. No matter how we try to rationalize it, every time we get in an airplane, we trust our lives to a machine.

I now have almost 100 hours on my engine and just finished the first annual since overhaul. I held my breath as we performed the compression checks. When they all came back in the mid 70s, I felt quite satisfied. The engine I overhauled has held up during the first 100 hours and is now out of the infant-mortality zone that plagues piston engines. I had to order a new O-ring for my dipstick and a gasket for my filler-neck this week because it is leaking oil during inverted flight. Even though the financial gains of performing the overhaul yourself are not significant, the knowledge gained and satisfaction are immense. I am happy with the end result, and I did spend less than I would have at an engine overhaul shop. However, the most pleasing part is that I am confident the knowledge gained will return dividends for years to come. **IAC**

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# METAMORPHOSIS

THE TALE OF A TRANSITIONING PILOT





IT'S JUNE IN TEXAS, HOTTER THAN MIDDAY ON MERCURY AND MORE HUMID THAN THE AMAZON RAIN FOREST. I AM IN A SUPER DECATHLON, INCHING MY WAY UP TO 3,500 FEET. IT'S MY FIRST PRIMARY COMPETITION, AND THIS WILL BE MY THIRD FLIGHT. MY SAFETY PILOT AND I ARE CHATTING ABOUT THE COMPETITION, AND THE CONVERSATION NATURALLY SWINGS TO THE SUBJECT OF MY OPPONENT—THE OTHER PRIMARY COMPETITOR. WITH HIS FIRST TWO FLIGHTS SCORING HEALTHILY IN THE 80S, WHILE MINE SCRATCHED THE BOTTOM OF THE 70S, HE'S BEATING ME HANDS DOWN.

BY ELIZABETH MAYNARD

"**BUT IT'S NOT FAIR,**" I complain to JJ behind me. "He's flying a Pitts."

Adding to my sense of unfairness is the fact that my opponent told me he had had only three flights in the Pitts before this competition, and here he was, whipping my butt. I, on the other hand, had spent tens of hours and thousands of dollars, sweated buckets, and even sacrificed blood just trying to get a roll that would score at least a five.

"But Liz," says JJ, as we claw our way through 3,000 feet, "this will make you a much better pilot. You'll easily be able to fly a Pitts, but I bet he can't fly a Super D."

Having returned from many a flight doubting my ability to master the art of aerobatics, these words give me hope for my future. Yeah!...Take that, Mr. Three-Times-Pitts Guy.

We enter the box and I begin my Primary sequence: the six-maneuver wrestling match with the Super D. We land and I step out of the airplane, with my customary bruises on each knee, my thumb bent backward, and a cut on my knuckles, to find I have come in a healthy second. But I'm not disappointed. We'd all like to become the national champion on our first competition, but it ain't happening. Mr. Pitts Guy was a nice young man, and he flew well and deserved his first place. (But still...he was in a Pitts.)

I fly one more Primary that summer, which I win by virtue of the fact that my opponent is flying a Pitts for the first time ever. Then buoyed by my success and hoping I'm on a roll, I move up to Sportsman for Nationals. I come in solidly near the bottom (damn the fair-play system, right?), but I have the time of my life.

By the end of the season, my husband, Glenn, and I realize this whole aerobatics thing has transcended far beyond the level of casual interest into a major obsession (actually, I knew this after my first aerobatics flight). It's time to get a spunkier aero mount. We set our hearts on the Giles 202—something about that monoplane knock-'em-dead look gets to us—and two weeks before Christmas, we are heading out to Georgia to do a pre-purchase inspection and get some training in what will, we hope, be our new toy.



*Before the transition—Liz Maynard in Super Decathlon mode.*

Gary Ward, a Giles expert, air show pilot extraordinaire, and member of Team Chaos, has kindly agreed to help us through the process and train me to fly it safely. In preparation, I had a couple of flights in a Pitts at a school near my home to introduce me to landing with only limited peripheral vision. Landingwise, the Giles is much easier than the Pitts; visibility is much better and it's not as twitchy on the ground. By the time Gary finished shaping me up, I was comfortable with that bat-out-of-hell-style approach and was confident I could get safely back to earth as long as the cross wind was less than 7 knots. But that aero stuff...

#### TRY IT ON

On my first flight with Gary, we head out to do some air work. I make a couple of clearing turns, climb, descend, and do some steep turns...nothing too bad so far. Rather nice, actually. No problem. But—and I recognize this later—I am checking it out as you would check out a Cessna 172 you are

buying so you can take your grandparents out for burgers on Sundays.

"Do a loop," says Gary, and, no doubt remembering my Super D background, adds, "Don't dive for speed."

Earlier in the year, a friend had taken me for a flight in his Extra. When he pulled into a loop from level flight, I had experienced a fleeting rush of panic. It just wasn't natural. I have a similar feeling now. It's all I can do not to push the stick forward.

Knowing enough not to do a Super D stick-embedded-in-your-lower-intestines kind of pull, I think I gently ease the stick back. The airplane quickly pitches to the vertical. Then suddenly, and rather violently, it bucks, rears, and kicks out like a stallion catching the scent of a mare. It even lets out this awful high-pitched whinny—no, wait, that was me. We pop upright. I try to casually flick my hair out of my eyes and regain my composure. I mean, I'm a gold medal-winning Super D pilot, right?

"Err, what was that?" I ask Gary politely. What I really want to say is, "Holy cow, what the #\$\$% just happened?" (Please excuse my language.)

"You stalled," he says.

And I think, Stall?! Stall?! A stall in the Super D was this nice buffety thing, like riding an electric floor polisher. It certainly wasn't as if some astral being had taken a sledgehammer to the elevator. My Super D training is letting me down big time. I feel humbled. I feel my confidence waning. What other nasty little tricks does this aero imp of an airplane have up its devious sleeve?

Gary explains that I have to use pressure, don't pull, just squeeze the stick.

**"A stall in the Super D was this nice buffety thing, like riding an electric floor polisher."**

"Try another loop," he tells me.

I squeeze the stick with an unhealthy amount of timidity. We execute this giant 3g L-shaped thing that has some looping elements to it, but that is as complimentary as one could get.

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Passivity is creeping in. I've lost my Super D-inspired edge (or maybe I only thought I ever had it). Here I am, flying with one of the best aerobatic pilots out there, the chance of a lifetime, and I'm flying with the mindset of a mouse on tranquilizers. I'm mortified that this is happening.

"Try a hammer," says Gary.

I pull...I mean squeeze...to the vertical. Out of habit I start to count. One, two, three, four... five?...six? Oh, crikey. Did I miss it? Are we sliding backward and I just don't know? I kick the left rudder anyway. I do something with the stick—not sure what—involving the smallest squeezes I can make, and we twist and torque our way



*N330MS, the aerobatic workhorse of Four Winds Aviation.*

'round, inventing several new maneuvers on the way. We end up at a 70-degree angle to the ground, 90 degrees off heading, and I have no idea where we are anymore. I am internally berating myself for having forgotten to bring my Primary medals with me to prove to Gary that I can actually fly. Really, I can.

And so my checkout in the Giles continues. Gary tries in vain to find the uninhibited aerobatic pilot in me. He is an inspiration, the smoothest-flying pilot I have ever flown with, and I will be eternally grateful for all that he taught me. But at the time, I felt like a 4-year-old wearing her mother's shoes. I mean, I was only just out of Primary.

So, let's fast-forward a few days. After an interesting flight home which involved moments of fear and terror—yes, I'm the one who fell to her knees and kissed the ground as if greeting a long lost friend each time she got out of her airplane—we get the airplane back to Texas. (I won't go into it too much, but amongst other things, I did learn that if you are flying a dedicated aerobatic pony, you can't let go of the stick to refold a chart with an 18-gallon fuel imbalance between the wing tanks.) My first thought as I close the hangar

doors on my new bundle of joy is to have a serious talk with JJ. That hot, sticky day in June, at 3,000 feet, I had believed him. I thought being a Super D pilot meant the transition to the Giles would be easy. All I had done was totally embarrass myself in front of Gary. My self-esteem was in the gutter. How could JJ have done this to me?

### UNLEARNING

I recognize I need to get back to basics. So the first sunny day in January, I don two complete sets of thermals, three pairs of long socks, insulated pants, two woolen pullovers, coat, scarf, and gloves, and I squeeze myself into the Giles. I fly out to the practice area and begin with 45-degree lines...45 up, push over the top, 45 down...up and down, coordinating with rudder to try to keep the aircraft straight. After five of these my Super D-style rudder inputs start making me feel queasy. I take my feet off the rudder pedals and try again. Ahh. Much better. Not coordinated, but much less of that riding-a-bus-with-a-lousy-suspension feel. Feet back on the rudders. I start by just thinking about pushing on the rudder pedals and gradually increase the pressure until my lines are straight in all the required dimensions.

I then move to the roll. The Giles is capable of 360 degrees of roll in less than a second. You can really just throw the stick over and hold on for the ride. But I had invested so much heartache in the slow roll in the Super D, and could actually perform something that fell within the bounds of decency, that I don't want to waste that skill. So I squeeze the stick over and begin that whole rudder-and-stick dance thing. What comes out is not really a slow roll or a barrel roll, nor a snap roll or an aileron roll. It's big and ugly and takes up half the sky. Queasy graduates to nauseated. So, I take my feet off the rudder pedals, pitch up a little, and do a pure aileron roll. Again...ahh, much better. Then feet back on and back to minimal pressure.

And so I continue, every sunny day, working my way through each of the maneuvers I know, learning to be more subtle with my control inputs. I no longer need to fly as if mud wrestling baby elephants. I must now apply my piloting skills with more decorum, as if taking tea with the Queen.

But it is not until our chapter has its first critique day that I begin to find my edge again. I am approximately in the box; Bill is on the radio critiquing my vertical, horizontal, and 45-degree lines, and suddenly I hear that little voice in the back of my head, aggressively barking out commands to me...pull...stop, one, two, roll...stop,



*A perfect three-point landing—after the bounces.*

one, two, three, pull...stop and so on. It's good to hear it again. It means I am getting comfortable with my new aerobatic beast. It means I am no longer thinking, Way-he-y, what was that? halfway 'round a quarter-clover. It means my airplane and I are bonding. It means I am in control. Yes, welcome back, little voice. I thought I'd left you in the Super D.

#### COMPLETE

And so, I hear you asking, did my numerous hours aboard the Super D help me at all with my transition to the Giles? After some thought and a few more aerobatic hours in the Giles, the answer I finally arrived at was yes and no. Yes, because the Super D is a difficult aircraft to fly well—or mediocre-ly, in my case; if I didn't fly a figure exactly as per Alan Cassidy (British aerobatic ace), I was guaranteed to lose a much-needed 300 feet or end up 90 degrees off heading. Yes, because the Super D forced me into the books to understand the whats, whys, and hows of each maneuver. Yes, because it forced me to practice over and over and over (and over and over). But no, because every airplane has a different feel; the weight

of the controls and the responsiveness vary, and it is only by flying a particular airplane that one can develop the feel for it. No, because what is important in one airplane may not be in another. For example, when flying a hammer in my 200-hp, 1,000-pound, mean-machine Giles, torque and slipstream are a much greater factor than they ever were in the Super D. But then, the energy-management issues of the 180-hp, 1,800-pound, built-like-a-mini-bus Super D have all but evaporated. Of course, the lateral boundaries of the box...is it my eyesight or did the box just get smaller?

Back on the ground after my critique flight, I sit on the bench in front of the hangar, lean back against door, and bask in the sun that beams down for a brief moment between clouds. I watch Scott beating up the box on what is only his second flight in his new Sukhoi. Having recently parted company with his Yak, he is bobbling, dishing, over-rotating, and flying 60-degree lines, and I think, Been there. Well...I still am there, really, but it's getting better. The transition is underway. My metamorphosis from Super D to Giles pilot is happening while we speak. **IAC**

PHOTO BY AJIT NEGANDHI

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**Location:** Tara (4A7): Hampton (Atlanta), GA

**Tel:** 706-326-4877 • **E-Mail:** marty.flournoy@fcrealtors.com

**// U.S. -Canada Aerobatic Challenge (Northeast)**

**Saturday, June 5 – Sunday, June 6, 2010**

**Location:** Olean Airport (OLE): Olean, NY

**E-Mail:** penn.lorr@yahoo.com

**// Northern California Supreme Box Ballet (Southwest)**

**Friday, June 11 – Saturday, June 12, 2010**

**Location:** Paso Robles (PRB): Paso Robles, CA

**Tel:** 510.579.3407 • **E-Mail:** martin@pull.gs

**Website:** [www.iac38.org/paso2010.htm](http://www.iac38.org/paso2010.htm)

**// Lone Star Aerobic Contest (South Central)**

**Friday, June 11 – Saturday, June 12, 2010**

**Location:** Grayson County (GYI): Sherman/Denison, TX

**Tel:** 469-713-4505 • **E-Mail:** Loop4fun@aol.com

**Website:** [www.IAC24.org](http://www.IAC24.org)

**// Ohio Aerobatic Open (Mid-America)**

**Friday, June 18 – Saturday, June 19, 2010**

**Location:** Union County (MRT): Marysville, OH

**Tel:** 614-505-6555 • **Website:** [www.iac34.com](http://www.iac34.com)

**E-Mail:** jgranger@columbus.rr.com

**// Apple Cup 25th Anniversary (Northwest)**

**Friday, June 18 – Saturday, June 19, 2010**

**Location:** Ephrata Municipal Airport (KEPH): Ephrata, WA

**Tel:** 603-860-4456 **Website:** [www.iac67.org](http://www.iac67.org)

**E-Mail:** AppleCupCD@gmail.com

**// Wildwoods AcroBlast (Northeast)**

**Friday, June 25 – Sunday, June 27, 2010**

**Location:** Cape May County (KWWD): Lower Township, NJ

**Tel:** 717-756-6781 • **E-Mail:** cwisman@comcast.net

**Website:** [www.iac52.org](http://www.iac52.org)

**// Midwest Aerobatic Club Challenge (South Central)**

**Saturday, June 26 – Sunday, June 27, 2010**

**Location:** Seward Municipal Airport (SWT): Seward, NB

**Tel:** 402-785-1060 • **E-Mail:** lynn.bowes@hotmail.com

**Website:** [www.2connect.us/mac80](http://www.2connect.us/mac80)

**// Green Mountain Aerobatic Contest (Northeast)**

**Friday, July 9 – Sunday, July 11, 2010**

**Location:** Hartness State Airport (KVSF): North Springfield, VT

**E-Mail:** wsgordon@earthlink.net

**Website:** [www.iac35.aerobaticsweb.org](http://www.iac35.aerobaticsweb.org)

**// Michigan Aerobic Open (Mid-America)**

**Saturday, July 10 – Sunday, July 11, 2010**

**Location:** Jackson County – Reynolds Field (KJXN): Jackson, MI

**Tel:** 734-255-2263 • **E-Mail:** rtbutts@live.com

**// Salem Regional Aerobatic Contest (Mid-America)**

**Saturday, July 17 – Sunday, July 18, 2010**

**Location:** Salem/Leckrone Airport (KSLO): Salem, IL

**Phone:** 314.369.3723 • **E-Mail:** bruceballew@earthlink.net

**// Hill Country Hammerfest (South Central)**

**Friday, August 6 – Saturday, August 7, 2010**

**Location:** Llano Municipal (AQO): Llano, TX

**Tel:** 512-497-9656 **E-Mail:** acroguy@aol.com

**// Hoosier Hoedown (Mid-America)**

**Saturday, August 7 – Sunday, August 8, 2010**

**Location:** Kokomo Municipal Airport (OKK): Kokomo, IA

**Tel:** 765-864-0096 • **E-Mail:** mike.wild@comcast.net

**Website:** [www.hoosierhammerheads.org](http://www.hoosierhammerheads.org)

**// Beaver State Regional Championship (Northwest)**

**Friday, August 13 – Saturday, August 14, 2010**

**Location:** Eastern Oregon Regional At Pendleton (PDT): Pendleton, OR

**Tel:** 503-472-8017 • **E-Mail:** flyhran@aol.com

**// Doug Yost Challenge (Mid-America)**

**Saturday, August 14 – Sunday, August 15, 2010**

**Location:** Spencer Municipal Airport (KSPW): Spencer, IA

**Tel:** 712-335-0744 • **E-Mail:** Aaron.mccartan@gmail.com

**Website:** [www.iac78.org](http://www.iac78.org)

**// Harold Neumann Barnstormer (South Central)**

**Saturday, August 28 – Sunday, August 29, 2010**

**Location:** New Century AirCenter (KIXD): New Century, KS

**Tel:** (913) 369-5569 **E-Mail:** Grant.Wittenborn@gmail.com

**Website:** [www.iac15.org](http://www.iac15.org)

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## ALLEN SILVER

### COLUMNS / ASK ALLEN

#### Q: ARE YOU READY to fly?

**A: IT'S NOW APRIL**, and by the time you read this I'll have returned from the Sun 'n Fun Fly-In at Lakeland, Florida. Most of my customers have come out of hibernation and are getting their aircraft back in the air. If you stopped by a parachute rigger's shop in the past couple of months, you have seen us performing our magic. Packing and repairing parachutes and getting them ready for another season of flying is just a small part of flying safely.

Mental attitude is just as important as anything else when you push the throttle forward and the wheels leave the ground. Have you taken the time to consider your mental state? There are many things that can cause stress. You are eager to get back into the air, but are you well rested or are you fatigued? Are there other issues to contend with such as bad weather or heat? What about home or job-related issues that are consuming a large part of your concentration? If so, you need to stand down and address the issues at hand. Military aviators recognize and understand the importance of doing this before the problem gets out of hand and causes a serious safety issue.

*Think before you fly. Are you prepared to bail out?*

Stress can cause poor decisions, delayed decisions, and other bad judgment calls. When flying, you need to be as close to 100 percent prepared as you can so you'll make correct and timely decisions. Pay attention to the visual signs that can cause a flight to end in disaster. In the unlikely event you ever have to bail out, make sure it is not because of indecisiveness or poor judgment. If necessary, ease back a little on your "mind throttle" until you have dusted off the mental cobwebs. This could save you from toasting your rigger with a bottle of their choice or, worse, from having your friends toast you. Remember the old saying, "Takeoffs are voluntary, but landings are mandatory." Will the landing be in your aircraft or under your parachute? The choice is yours. Once you leave the ground you will be landing, so prepare wisely.

#### Q: WHAT'S THE BEST way to protect my parachute when shipping it?

**A: ONE OF MY** customers recently came up with a great idea. When I received his parachute for a routine inspection and repack, it was properly boxed, as are many of the parachutes I receive. But the owner took an additional step that I've never seen before. In addition to the parachute being in its nylon-carrying bag, the entire carrying bag was placed inside an inexpensive plastic garment bag. It was the type with a zipper down the front that often accompanies the purchase of a new suit. This was a clever idea that added yet another layer of protection from external damage. Shipping boxes often get wet during the winter months.

#### Q: WHEN DOES THE 180-day repack of my parachute actually expire?

**A: MANY RIGGERS PUT** the next due date on a brightly colored piece of paper taped to the rip cord handle. This makes it easy for the wearer to determine when the chute needs repacking and recertification. However, this can sometimes lead to confusion. Let's say the due date on the label is December 25. If the FAA decides to give you a Christmas present in the form of a ramp check on December 25, is your parachute legal? Is the repack due that day, or can the parachute be worn through that day? I could leave you hanging and offer a prize for the first correct answer, but I'll cut through the suspense. The repack is good through that day up until midnight.

#### Q: HOW FAST DO I decelerate once I bail out?

**A: THE SHORT ANSWER** is very fast! If you would like a more detailed explanation, visit [www.SilverParachutes.com](http://www.SilverParachutes.com) or e-mail [allen@silverparachutes.com](mailto:allen@silverparachutes.com) and I'll send you a graph that shows deceleration versus exit airspeed. This graph appeared in the October issue of *Sport Aerobatics*, but was printed a little on the small size, especially for those of us who have the 40s syndrome and need glasses to read with. While you're e-mailing me for the easy-to-read graph, ask a question or two about your parachute! **IAC**

**Remember, I'm** also available for bailout safety seminars. Call or e-mail for details. Have a fun and safe flying season.



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