

# THE LEADING EDGE

## NEWSLETTER OF MUROC EAA CHAPTER 1000

Voted to Top Ten Newsletters, 1997 McKillop Award Competition

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September 1997

Chapter 1000 meets monthly on the third Tuesday of the month in the USAF Test Pilot School Scobee Auditorium, Edwards AFB, CA at 1700 or 5:00 PM, whichever you prefer. Any changes of meeting venue will be announced in the newsletter. Offer void where prohibited. Your mileage may vary. Open to military and civilian alike.

### This Month's Meeting:



**Milestones of Flight Museum**  
**Speakers: Dave Kleiman**  
**Tuesday, 16 September 1997**  
**1730 hrs (5:30 PM Civilian Time)**  
**William J. Fox Field**

This month we will stroll down one of aviation's memory lanes when we visit the Museum at William J. Fox Airport. Our host for the evening will be **Dave Kleiman**, longtime Chapter 49 member and high muckity-muck for the Museum. Dave will show us rare aircraft (pieces, parts, and whole-fryers) and provide an interesting perspective on aviation in the Antelope valley. Those with wings are encouraged to fly in. We will meet at the Museum (East end of the runway) at 1730. Go past the terminal toward Apollo Park. Right before you get to the park, turn left. {Base folks can catch a ride in the **Project Police Paddywagon** which will leave from TPS at 1700 - sharp.} Post-meeting munchies will be at a location arrived at by democratic process (or a car...whichever is easier).

### Last Month's Meeting

**EAA Chapter 1000**  
 Scobee Auditorium, Test Pilot School, Edwards AFB  
 1700; August 19, 1997  
**Gary Aldrich**, presiding

#### Succession

After almost canceling the meeting due to lack of interest, a quorum was declared and the meeting was called to order at 5:10 PM by the newly commissioned president, **Gary Aldrich**.

#### Attendance Doldrums:

Only 11 members (including officers) were in attendance. It was suggested that the combination of meeting day, time, and place may be the cause of the recent poor showing. Please forward any suggestions to a Chapter Officer or Board Member.

#### Guests:

**Chuck Firth**, still a member in good standing, made his final appearance before leaving us to found our new East Coast Detachment.

#### Announcements:

**Dave Martin**, to be in charge of Operations at the Edwards Open House, will be ably assisted by **Norm Howell, Gretchen Lund, Russ Erb, and Chris Reeder**. Norm and Russ (in absentia) put out a plea for volunteers from Chapter 1000 to man (person?) the chapter booth. If you would like to take this opportunity to support your local EAA chapter, give Norm or Russ a call at 277-3131.

Also, Norm reminds us that Chapter 1000 members are automatically invited to display their aircraft at the Open House. **You must contact Chris Reeder** (again, 277-3131) **if you plan to fly in!** **This is still a military base and prior permission is required to land!** They will be displayed in the hangar, and will be roped off from the crowd a la Watsonville. If you have pieces of a project under construction that you would like to display, contact **Paul Rosales** at 805-948-0646 or by e-mail to [prosales@qnet.com](mailto:prosales@qnet.com). Same goes for displaying your project during the Fox Field National Air Races.



**Young Eagles Rally**  
**Saturday, 13 September**  
*(That's about tomorrow when you get this!)*  
**Fox Field at 8:00 am**  
**Pilots and Ground**  
**Crew needed!**

Chapter 1000 will be providing aircraft parking for the **Fox Field National Air Races**, with **Ron Applegate** as the

## THE LEADING EDGE

parkmeister. Ron needs 12 to 16 volunteers per shift (2 shifts per day). In return for a couple hours of time, each volunteer will be granted free admission to the races.

(Note from the Secretary:: I have it on good authority that those local area members not volunteering to support their chapter at the open house or air races will have their projects moved to the top of the *PPTAF*'s Surprise Raid List. Lack of a current project does not exempt you.)

Please remain on the lookout for a trailer suitable for storage and transportation of the chapter booth.

### Old Business:

None.

### New Business:

**Gretchen Lund** moved that the chapter purchase 6 2-way radios to assist the parking crew at the Air Races. Seconded by Chuck Firth (*Can he do that? He's leaving...*). Approved by members present.

### Program:

The program consisted of Oshkosh Reports by those fortunate enough to attend. **Gary Aldrich** had planned a slide show, but his pictures were being held hostage in a remote UPS distribution center. (Perhaps prompt planning of a *PPTAF* pilfering mission is appropriate.)

The hit of the show according to those in attendance was the Williams V-Jet-II, built to evaluate a new Williams 700 lb thrust turbofan engine to be made available for \$20,000 in quantity (yes - twenty thousand).

This is seen as a major step in realizing the goals of the NASA AGATE program - Advanced General Aviation Transport Experiments. For more information, check out the AGATE Home page at <http://agate.larc.nasa.gov>.

### Adjournment:

The meeting was adjourned about 7:00 to the Burger King where the exploits of the Oshkosh attendees were further expounded upon.

- Miles Bowen

## President's Two Cents

"I will not seek, nor will I accept the nomination of my party for the office of President..." "I do not choose to run..." "I am not a crook..." With the stirring words of former Presidents Johnson, Coolidge, and Nixon echoing in my mind, I reluctantly address you as your *interim* (emphasis intended) president. With Mike Pelletier's departure we have lost a truly dynamic and energetic leader. I will not pretend to assume his post with the same expertise but, with your help and encouragement; I will attempt to steer us through the very busy times immediately ahead. The upcoming Edwards Open House and Airshow, followed quickly by the Fox Field Air Races will prove to be our biggest challenge this year and the best opportunities for each and every Chapter member to show their support and bolster our reputation as the most vibrant and enthusiastic chapter around. The need for volunteer participation in these events is daunting, but

manageable if everyone pitches in. You will soon be contacted personally by a Chapter officer or committee chairperson to secure your support. Please dig deep into your appointment books to find some time to help out. With "many hands" we truly can make it "light work". Besides the excitement of attending two of the best aviation events in the world, you will get the satisfaction of making them happen! If you've ever attended a Chapter meeting or event and had the nagging thought, "I could help with that..." NOW is the time to act on that thought!. The success or failure of the events (as well as our aforementioned reputation) will ride on your willingness to give more than your dues in this, our busiest season. Enough of the hard sell--y'all just come on out and give a hand...you'll have a great time. Remember, when you get the call, the answer is, "Sure...I can help!".

-Gary Aldrich



## Young Eagles Update

We took our annual Oshkosh break and did not hold a Young Eagles Rally in August. If all goes well, the September rally should be in about a day or two, so rearrange your Saturday morning schedule and plan to be at Fox Field.

### Upcoming Young Eagles Rallies:

Sept 13, 8am at Fox Field

Oct 11, 8am at Fox Field

### Pilot Operations:

George Heddy  
948-4431

### Ground Operations:

David McAllister  
David.McAllister@dfrc.nasa.gov  
256-4829

## New Members

We welcome to our esteemed ranks our newest member **Jon Goldenbaum**. Jon is a retired Air Force Colonel who runs a small aviation paint and polyester company at Flabob International Airport. Perhaps you've heard of it--he calls it *Poly-Fiber*. He lists his occupation as "Clean bathrooms and help answer phones at Poly-Fiber. Retired Air Force, Retired Airline Pilot, can retire from anything." Not content to have just one fabric covered aircraft testbed, he lists a J-3 Cub, Taylorcraft, Stinson 108, Commonwoath Skyranger, and a Montana Coyote.

We sent him a copy of the August *Leading Edge* since he and his products were prominently mentioned in it. He responded by saying he wanted to join up with our chapter. (*I guess he liked George's article*) This puts him in the

enviable position of being the first person to be both a member of **EAA Chapter 1** and **Chapter 1000**. The **Project Police** are watching him carefully to ensure proper behavior during the upcoming **Operation Rubidoux Sundown VI**. Double agents can be especially tricky. (*Hey, Jon--The Leading Edge is a great place to announce those new developments from Poly-Fiber! How 'bout a meeting presentation sometime? We'd even accept a repeat of something you did for Chapter 1--how would we know the difference?*) E-mail him at info@polyfiber.com

Though not exactly a "new" member announcement, we would like to announce the relocation of **P4**, also known as **Mike Pelletier**. Mike, Michele, and Marissa have moved to Tucson AZ at the request of the government to work as a maintenance supervisor at Davis-Monthan AFB and to set up a Chapter 1000 Detachment, tentatively referred to as Det 7. His new address is 9930 E. Paseo San Rosendo, Tucson AZ 85747-9182. (*Mike wins the prize for longest street name in the Chapter 1000 database*) His new phone number is (520) 663-0722, and his new e-mail address is mpcubed@sisna.com. We'll be looking for a full report on the Copperstate Fly-In from him.

## Why I Joined EAA and Chapter 1000

Well, I finally took the plunge--after spending many happy months volunteering, picnicking and hanging out in general with various members of the **Project Police**, I became a card-carrying member of the EAA. The feeling of elation at being a member of what I consider to be an elite corps of fellow flight enthusiasts was quickly followed by a sense of panic--after all, I'm not a pilot myself. What would everyone think--that I'm a wannabe, a phony flier, or worst of all, a "poser" (pardon the Val-speak, fer-shur!)? Don't get me wrong--it's not that I wouldn't enjoy piloting an aircraft myself--I've spent some time at the controls, and I respect the awesome responsibility of keeping oneself and one's passengers aloft and alive, powered by the grace of God and a good engine. It's just that right now, I have a full and busy life, with many interests that vie for my attention (and my checkbook) and I must admit, sometimes I love to just look out the window thousands of feet above the ground and see the world from a new and beautiful perspective, letting my mind wander with the clouds and composing poems to read later at my theater group, or making up stories with which to regale my land-locked pals on the ground. While I initially worried that I had little to offer my chapter, the group has afforded me the opportunity to give assistance in many ways: by volunteering on the ground at Young Eagles rallies, I can help the pilots perform their job better and faster, and share with the kids their delight at flying for the first time. There's always a bag to be lifted, a box to be unpacked or a plane to be tied down, and quite often, a slab of ribs to be basted and barbecued (although in Chapter 1000 you have to fight for the right to wear the chef's bandanna!)

I've also realized the mutual benefit of flying with friends--more than just being along for the ride, I'm

learning to read and follow aerial directions, as well as performing the all-important job of holding the maps during rough weather. My presence in a friend's plane is an active choice to undertake a unique and exciting adventure, each flight a few special moments of communion with the pilot and other passengers, and an exercise in trust, as I rely on my friends to give me the gift of a safe and enjoyable experience. As for my piloting pals, they benefit from that same experience by knowing they've earned my trust with their expertise and love of flying, and they cherish the opportunity to share their enthusiasm and interest in aviation.

To me, this is the heart of the EAA--the warmth, the open hearts and minds. I've realized that we all have something special to offer, whether it's flight technique or our willingness to learn new skills and make new friends--and it has encouraged me to reach out, to create a new family of wonderful people, and bringing an enhanced sense of community to my life. And while my biological siblings would never wake me up at O-dark-thirty by singing reveille (and you **Project Police** members know who you are!), my chapter brothers and sisters won't embarrass me at family dinners by dragging out my old high school yearbook photo...

So if you love flight and friendship, don't hesitate to jump in--this passenger's having a great time!

- Michelle Holtzman

## Corrosion Control

(*Whether you're building an SR-71 or a homebuilt with a titanium gear spring, this will be important...*)

### DON'T MIX TITANIUM AND CADMIUM

**A cadmium plated bolt installed in a titanium part will eventually result in titanium "embrittlement."**

Just recently I found out the mechanism for titanium embrittlement: The cadmium, under pressure and/or heat, will flow (infuse) between the grains of titanium. This weakens the grain boundaries and when the titanium is stressed, a crack will initiate.

Use passivated stainless steel bolts in the AN and NAS series when bolting a titanium part. Examples are AN4C10 and NAS6304U-10. AN4C10 is a 1/4-inch diameter bolt, 1-5/64 (nominally 1 inch) long, 7/16-inch grip, made of a corrosion resistant steel in the 90 ksi tensile range. NAS6304U-10 is a 1/4-inch diameter bolt, long, 10/16 grip, made of A286 corrosion resistant steel and unplated.

Note: The NAS63xx series is A286 cres (*cres--corrosion resistant steel, i.e. stainless steel*) in the 160 ksi tensile range. The NAS62xx series is alloy steel and the NAS64xx series is 6AL-4V titanium in 160 ksi tensile range at normal temperatures. At 450 deg F it is good for 95 ksi. (Bolt selection is another long subject.)

Even the preparers of the NAS specifications had to learn about titanium embrittlement. When the spec was initially prepared in 1968 there was a cadmium plated titanium bolt defined. The galvanic table indicates that it

## THE LEADING EDGE

would act sacrificially as on a steel bolt. It was declared "Inactive for New Design" after December 1991.

Thanks again to Steve Mitchell and Ron Yarborough for sharing their knowledge.

### - Lee H. Erb

EAA Chap 1000 Det 5, Arlington TX; EAA Chap 34  
LeeErb@compuserve.com or (817) 275-8768

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## Q-200 Flight Test Update

*More updates on Brian Martinez's "I love my airplane/I hate my airplane" Q-200 Flight Test Program.*

FLIGHT 17

DATE: 11 MAY 96

TAKEOFF TIME (local): 1030

MET=0.8

**Ballast experiment.** This flight was performed with 25 lbs removed from the passenger baggage compartment leaving a total of about 27 lbs in that location. The passenger seat was uniformly weighted with 150 lbs. Takeoff was from runway 08. This led to a takeoff run of 23 seconds with liftoff at 90 mph indicated with moderate aft stick input. VSI indications were as follows:

<u>MPH (indicated)</u>	<u>VSI (fpm)</u>
95	900
100	500
105	800

This is strange. Will have to do this one over. Maybe it's real, maybe thermals.

Oil temp was at 230° today. About 85° this morning and climbing. Will have to really work on Sheehan's suggestion to remove the gascolator and duct air around the spin on oil filter. I am tired of watching those temps like a hawk. Due to the more aft CG positioning, only about 5° of up elevator was required to maintain straight and level. This is down from the usual 7.5° to 8° which I usually have. This was well within the spring trim power and is a lot more relaxing than what was previously experienced. We are firming up to the idea of putting the aircraft in a two week layup in the fall, cutting the main wing out and reinstalling it at a lower angle of incidence. Sheehan agrees that this is the way to do it. Flight track was Koehn Lake to Fairmont Dogbone. Landing was very good on 08. Still showing oil drips, but no noticeable sump losses.

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FLIGHT 18

DATE: 12 MAY 96

TAKEOFF TIME (local): 1155

MET=0.5

**Hot Day with Thermals.** Due to required maintenance, takeoff was later in the morning. Wind was beginning to come up and 90° or more. Still showing some oil drips.

Takeoff was from runway 26 and flight conditions were degrading due to winds and hot desert thermals. Ride quality was not good, but much better than what would be expected in a SPAM can. Decided to cut it short and fly another day rather than submit to the punishment. Remember to FLY SCARED.

Good landing on runway 26 after missing the first approach after being too high on initial. Still noting a slight nose to the left effect on first touchdown. Though I'm not aware of it, I wonder if I'm putting in some right aileron that's causing me to aileron steer. I will have to watch that.

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FLIGHT 19

DATE: 06 JUN 96

TAKEOFF TIME (local): 0909

MET=1.1

**Short Period Response.** Koehn Lake - Aquaduct Dogbone. Normal takeoff from runway 08.

Normal landing on runway 08. Couldn't get the braking down to make first exit. Too far down the runway in the approach.

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FLIGHT 20

DATE: 15 JUN 96

TAKEOFF TIME (local): 0904

MET=1.5

**Rudder Doublets - Pitch Response.** Koehn Lake - Aquaduct Dogbone. KT-76A checked good at the Avionics shop. Technician thinks it is the RST antenna and recommends installation of normal transponder antenna with normal coax connection. Technician believes that there is leakage at the split shield connection of the RST antenna (More things to do in the layup).

Normal takeoff from runway 08.

Header sight gauge showed meniscus at 1.3 hour point suggesting a transfer difficulty. Transfer pump was GLUB, GLUB, GLUB during taxi suggesting some problem. Was off speed on first approach to runway 08. Made approach to 12 after go around and landed normally.

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FLIGHT 21

DATE: 22 JUN 96

TAKEOFF TIME (local): 1107

MET=0.6

**Post Maintenance Test/High Winds.** Performed post flight work after flight 21. Cleaned inline filter between main tank and header. Some fine debris, but no great buildup as before. Transfer pump ran clean after this cleanup. Also washed aircraft down.....specifically the underside for oil blowing. Still showing leakage from upper seam screw locations despite attempting to dab Permatex. After noting the easy takeoff of a resident Defiant and reports from a BD-4 which just landed a flight was attempted. Takeoff was normal from runway 26. Air conditions were rough and decided to RTB over Rosamond. Returned and recovered with normal landing.

## FLIGHT 22

DATE: 23 JUN 96

TAKEOFF TIME (local): 0806

MET=1.2

**High Oil Temps and Tach Timing Notes.** Takeoff was from runway 26 with a strange drop off during takeoff which I have been briefed is normal from this direction at Mojave. Noted for the first time that flight time is significantly different from the Tach timing that is being recorded (*Noted that the Tach showed approximately .8 time elapsed while the watch showed 1.2 for the flight duration.*). Couldn't keep eyes off the Oil Temp indicator. After completing climb to 7,000 MSL noted temps edging 230 degrees. Backed power off to show 2500 RPM and leveled off. This brought the temps down to about 225 degrees. I'm uncomfortable with what the temps are doing and probably won't relax until providing some forced air cooling to the spin on Oil Filter. Landing was extended and a little bounce, but aircraft controlled out nicely.

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## FLIGHT 23

DATE: 29 JUN 96

TAKEOFF TIME (local): 0816

MET=0.8

**Duration Flight.** Noted excellent flying weather. Some oil runs on bottom of fuselage due to blow by from dripping. Added 10 GAL of 89 Oct Unleaded today. This brings the main tank short of full for the flight. Oil level at 5 and a quarter. Added a half quart which brought it up to six. Noted crack on top leading edge blade cutout of aluminum prop spinner. Paint was visibly cracked approximately .25 inches. Drill stopped the crack in the prop spinner. Takeoff normal from runway 08 with lowered climbout angle for temps. Noted some roughness, however, MP and RPM were normal.

Something felt wrong. Discontinued flight for cause and RTB'd from the Rosamond area. Made approach from windmills to 08. Approach was high which set up for an off airspeed condition. Made go around for the downwind and extended for a Super Viking landing number 1. This time the speeds came into the groove and landing was normal with good braking to the first exit. Post flight inspection showed propagation of the spinner crack another .125 inches beyond the drill stop. Current disposition is to replace spinner and try to fabricate a forward bulkhead for the next spinner. May also attempt to complete wheel pant mods, gascolator removal, and mixture linkage improvements while in spinner layup.

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## Darth Vader's Oil Cooling Tips

*(As you may know, Brian Martinez, like many other homebuilders, has been having some trouble keeping his oil temps down in his Q-200. He shared this e-mail conversation he had with Bill Berle with **The Leading Edge** for your possible benefit. Remember that a significant amount of cooling in an "air cooled" engine really comes from the oil system...)*

Thanks for the reply Brian.

There are a couple of solutions you might try before all else fails on the oil cooling. From my secret air racing vault buried deep under Manzanar Airstrip in the Owens Valley comes.....

### 1. The Robbie Grove racing airplane method...

Robbie put the oil cooler UPSTREAM of the overall engine cooling plenum chamber. The cooler was right in the front of the cowling scoop, which on Bummer's Bullet was very small and right under the spinner. The air went past the oil cooler at its minimum temp, gaining only a few degrees before filling up the plenum chamber inside the cowling. Robbie said that the slight gain in intake temperature of the plenum cooling flow was a small price compared to the improvement in the oil temp.

### 2. The Emperor's F-1 racing engine survival mod...

There is a sneaky racing trick that will make a big difference, although not particularly quick to accomplish with a flying airplane. You take out the O-200 oil pump gears and replace them with the GO-300 oil pump gears. These are wider and require machining of the rear case and the cover. Time and cost are there, but this mod will add 50% or so to your mass oil flow with the attendant decrease in temp and increase in engine cooling accomplished by the oil. You can open up all the oil clearances a little with this mod, going for lower pressure but higher flow. Again, this stuff is best suited during overhaul time, but it will cure the problem. See Star Wars again, then go back through the old racing books to figure out who the Emperor is. Many Rebel agents died to get this information.

### 3. The Swiss Cheese trick...

Add more oil cooling capacity the American way, by getting a bigger hammer! Remove the oil tank. Drill a series of holes through the tank, about an inch in diameter, from the front to the back. Drill the holes near the bottom of the tank. Be sure to not drill through the pickup tube! Weld some steel tubes in the holes, and make complete welds to re-seal the tank. The tubes pass clear through the tank and are open on both ends. This makes your oil tank into an auxiliary oil cooler. You can duct air from a flush scoop toward the tubes, to flow cooling air through them. This will make a difference in your oil temp. You will have to re-calibrate the dipstick to compensate for the reduced volume inside the tank.

### 4. The Great White Shark-fins...

If you have room inside the cowling, you can weld some mild steel fins on the outside of the tank instead of tubes inside. These will conduct and radiate heat from the oil if you arrange for some airflow inside the cowling. Not many fast airplanes have enough room for this inside the cowl, but it will work. Careful that the proximity of these fins to the exhaust does not backfire and absorb heat from the exhaust!

I hope one of these dastardly deeds will solve your problem. If not, then look at the overall heat rejection through the cylinder fins as well. Sometimes there is no

## ***THE LEADING EDGE***

delineation between the oil and cylinder cooling problems and their solutions. Remember that the oil is taking the combustion heat away just like the cylinders are, so whichever end you have to burn the candle on to win the war is O.K. Perhaps increasing the cooling capacity of your entire system will eventually lower the oil temp. Also make damned sure to use a synthetic oil if temperature is a problem, I do believe that the synthetics are better at hi temps. BTW, the indicated temperature that an O-200 cylinder will endure for a short burst is over 550 F! If you are not within gliding distance of a runway, say at Stead airport in September, the cylinders will not endure anywhere near this temperature. Don't try this at home...

**- Bill Berle**

Billy:

By the way.....this is really sneaky stuff!!!!

**- Brian Martinez**

You have no idea of the power of the Dark Side of the force...

I had been assuming that you already have an oil cooler! For goodness' sake put one in and your problem will go away! With a few plumbing fittings and some hose, you can put one in your oil system pretty easy. There is an adapter, I think El Reno or Sacramento Sky Ranch carries it. If that doesn't work, try the tubes in the tank. There is a possibility that you can't fit a cooler in your cowling, then do the tubes as mentioned. BTW, there is a way to put the cooler under the front of the crankcase, and hook it up directly to the main oil galley plug on the front of the crankcase. There is a large threaded plug that closes off the main galley after the initial machining is done during manufacture. The O-200 manual will show this. I do not personally know the exact way to plumb it, but the gist is that you have the cooler "inline" with the oil system, on the pressure side. The pressure oil goes through the main galley and then through the cooler, then back into the rest of the system. This might reduce the size and weight of the system somewhat, but poses a reliability issue.

The best way I ever heard of to do the cooler is perhaps the greatest example of brilliant thinking I have ever seen. It was of course part of the Death Star's engine built by the Emperor, and it went something like this... The oil cooler was put inline, on the SUCTION side of the oil system; the oil was sucked out of the tank, and first through the cooler on its way to the oil pump. This required a bit of fabrication to re-arrange the pickup and oil path, but not too terribly much. The benefit was that a leak anywhere in the oil cooler system or any external hose would simply suck in a stream of tiny air bubbles into the pump, and NOT spray the oil out of the engine. No oil slick, no fire hazard, no emergency shutdown or seized motor. The engine would run just fine and the bubbles would be squeezed out of the oil by the pump. Normal oil delivery and pressure, and you kill one potential weak link in the chain.

Anyway, put an oil cooler somewhere in your cowling, any way that's easy and cheap enough, and then

get some air to it through a simple flush scoop and some SCAT tubing. I'll tell you all the secrets of doing this with minimum drag and pressure drop later. For now, just prove out the temp drop with the cooler. If you are stuck with a very small cooler due to space limitation, we can do some dirty tricks to make it work better (aluminum tubing for the lines to and from the cooler with air blowing on them, etc) later. Also please look at the division between the "hot" and "cold" sides of your engine compartment. Putting a baffle or insulation between the oil tank and the hot parts will also make a difference. I have some insulation (hot rodder's header wrap tape) that I can give you to try out. You can wrap your exhaust system and carburetor with it, and this will also cool your oil and induction temperatures a bit. Let me know how you are progressing, and then we'll get into the really nasty stuff...

**- Bill Berle**

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## **How To Make An Air Fair Fun**

What really bugs me--other than not having a five cent drunk--is exhibiting your airplane and having the same insipid questions asked about it over and over. In an effort to reduce the senseless chatter to a low roar and to retain sanity many builder/pilots display signage which boasts of spectacular, possibly fictional, performance data. The unwashed masses are largely clueless as to the meaning of the specifications, and will happily suck your brain out of your skull with questions like "I don't care what  $V_{max}$  is, how fast does it go?". They will ask the questions no matter what you do. Even worse is a visitor who looks at your airplane and then will tell you their life's story no matter how tangential it is to flying. **Norm Howell** calls these people 'boogers' since they stick with you no matter how you try to shake them off. When assigned to accompany an F-16 at an airshow Norm advises them to leave or the "geek proximity fuse" will set off the nuclear device under the wing. Oh, to be so fortunate.

To the general public, small airplanes are a mystery. They know they have wings and an engine and make noise, but little else. When one adds a Long-EZ to the mix it thoroughly confuses them. On the occasion of the Hawthorne Air Fair I displayed my EZ for the sole purpose of tormenting the public. The fact that the airplane is apparently built backwards and is parked on its nose creates a sense of pointed unease for the casual observer. In an effort to make the platform somewhat more comprehensible to children, a parent will sometimes concoct the most fantastic explanations. While eavesdropping over an exchange between father and son I heard one brilliant interpretation. "Well junior, the reason this airplane is parked on its nose is that it was in an accident". Tempted though I was, I resisted the urge to demonstrate the father was woefully uninformed. It's bad enough the kid is stuck growing up with this creature as a father figure, there was no point in humiliating him further. But there were times when I surrendered to my baser nature. In one instance a pompous drunk came forward and declared, to his tattooed sweetie, that my airplane had forward swept wings. I asked him how he arrived at that

conclusion. He stated confidently that the main wings are always behind the engine and therefore, based on the planform, I had forward swept wings. I nodded slowly, smiled and mimed taking a drag of something powerfully narcotic.

After the first day of the Air Fair I resolved to make the experience less tedious and more entertaining for myself. Instead of displaying the usual bill board with all the meaningless specifications I decided that I would create one that addressed the most frequently asked questions. To make it more interesting I made some of the answers multiple choice. The purpose of this was to minimize repetitive conversations and see how gullible people were. I attached my sign to a fence post adjacent to my airplane and sat underneath the wing waiting for the public to take the bait. The sign contained the following:

**EVERYTHING YOU WANTED TO KNOW ABOUT LONG-EZ'S BUT WERE EMBARRASSED TO ASK.**

1. WHY IS IT PARKED ON ITS NOSE?
  - a. It's grazing
  - b. It's broken
  - c. the nose wheel is retracted
  - d. It does not have a nose wheel
2. IF IT DOESN'T HAVE A NOSE WHEEL HOW DOES IT GET OFF THE GROUND?
  - a. The pilot runs along side the airplane until it achieves flying speed and then jumps in.
  - b. The pilot gets in the airplane after extending the nose wheel.
  - c. Wheels have nothing to do with flying.

**3. HOW OLD IS THE AIRPLANE AND HOW MANY HOURS DOES IT HAVE?**

This Long EZ was first flown on May 5, 1988. Since then, it has accumulated over 1300 hours. The pilot was launched on June 1, 1949 and has many more hours than the airplane. The airplane however, is in much better condition.

4. HOW MUCH DID IT COST TO BUILD?
  - a. The cost of living room, dining room and bedroom furniture.
  - b. The cost of tuition for one child at a private university or two children at state universities.
  - c. A divorce
  - d. More than the pilot (and his wife) expected to spend.

**5. HOW DOES ONE RELIEVE ONESELF WHILE FLYING?**

A male pilot may use any container that is flexible. Ziploc bags with kitty litter work the best so long as you find calm air to do the deed. If you're female; don't plan any long distance flights over water.

**6. WHERE HAVE YOU FLOWN YOUR AIRPLANE?**

Long EZ N601VS has been all over the United States and Mexico in search of cheap or free food. It has participated in several air races and has won second and third place trophies. It has appeared at three air shows in

Guadalajara performing precision formation flying and some aerobatics when I had the nerve.

**7. WHERE WAS THE AIRPLANE BUILT?**

N601VS was built at Barker hangar at Santa Monica Airport. More to the point, it was built in a second floor office space known as the "Hole in the Wall" with five other Long EZ's. It was a place where odd people like myself could commiserate about the building process.

**8. IS THIS A GLIDER?**

Only when the engine quits

**9. IS THIS A POWERED AIRPLANE?**

Does Howdy Doody have a wooden tushy?

**10. WHAT DO YOU DO IF THE ENGINE QUILTS?**

Recite the 23rd Psalm

**11. IS THE AIRPLANE NOISY INSIDE?**

What?.....Let me turn up my hearing aid.

In spite of my demonstrated cynicism the sign achieved its intended purpose; it informed the public and kept the nattering to a minimum. If you or anyone you know is going to exhibit their airplane, please feel free to plagiarize any of my questions and answers. It'll keep you from going nuts.

- Verne "Catman" Simon (*a former Chapter 1000 member--pay up!*)

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**Design Group**

Bob Thomasson sent me some excellent questions about proposed modifications to the Bearhawk a couple of weeks back. While I recommended NOT doing most of them, I think you may learn something useful reading this and realize what all becomes involved when you think about making a "small" modification. The big one to watch out for is what I call the "design propagation nightmare" which can happen with just about any modification. Please remember that unless you know at least as much as the designer about aircraft design (and some of us may), it's best not to mess with it.

I have included Bob's original questions with his permission. Hope you enjoy it. I enjoyed putting it together and it gave me something to do on a long transcontinental airline trip other than just "eating my way across the country."

Russ,

*I was browsing the Chapter 1000 web page and discovered that you're building a Bearhawk. I've bought the plans, but haven't started on it yet. I have a couple of aerodynamic type questions. The purpose of my plane will be mostly long trips with heavy loads to Alaska, the Northwest Territories, etc., with floats eventually. I don't see trying to land on very many 100' long sandbars unless I have to. Efficient cruise speed is probably a higher priority than extreme STOL capabilities.*

## THE LEADING EDGE

*What do you think of the Bearhawk wing airfoil? At Oshkosh I noted that there are endless variations in airfoils for similar type planes. Some have flat profiles on the wing bottom, some are concave and some convex. The GlaStar wing is the most interesting to me, with the same airfoil as the Glasair with constant chord. It seems to work well and the Fowler flaps evidently help with STOL. How come nobody else has used this type wing with a "bush type" aircraft? I don't have any specific problem with the existing Bearhawk airfoil, I'm just hesitant to start bending metal when I don't have much of an understanding of the wing. I'm trying to avoid expending 9 million hours of labor only to decide I really wanted another wing airfoil. Did you modify yours at all, or consider any changes?*

*Same goes for those huge 50 degree flaps. I asked why the flaps don't start until about a foot away from the fuselage when all the other flaps I've looked at start very close to the wing root. The Bearhawk people told me that the flaps are built like that for ease of construction and had a surprise benefit. The propwash flows through the gap to the tail when the flaps are deployed and gives better low speed controllability. What do you think? It also seems to me that the flaps might be too wide and with the way they are hinged will sacrifice too much in wing area when deployed - only conjecture, but what do you think? I'm thinking of spending the extra time to build Fowler flaps. Did you modify the flaps in your aircraft?*

*Other changes I'm considering are some windows in the roof and a Wittman type gear, since I don't anticipate too much real rough field landings.*

*Thanks for your time, and I understand if you're too busy to reply. I really enjoyed the Chapter 1000 web site. Good luck with your Bearhawk. What are you going to power it with?*

*Regards, Bob Thomasson EAA 474976*

Bob-

You've asked several excellent questions. That shows you're thinking, which is a good thing.

The short answer: don't change anything (with one exception).

### **The long answer:**

#### **Glasair/GlaStar Airfoil:**

The airfoil you refer to in the Glasair and GlaStar wing is either the GAW-1 or GAW-2. A friend of mine refers to it as the "Gawd Awful Wing," and everyone I've talked to with opinions I respect feels that this airfoil is highly overrated. It has a very high pitching moment, which will factor into the stability and control of the aircraft. For instance, it would probably require a readjustment in the incidence angle of the horizontal tail or the wing incidence angle. Are you ready to deal with that?

Another problem with the GAW series of airfoils is they are very sensitive to proper shape. In other words, the wing skin must be rather stiff to maintain the shape of the airfoil in order to get the expected performance. On the Glasair, the composite skins are probably sufficiently stiff to accomplish this. You may be thinking "But the GlaStar

uses an aluminum wing." But that doesn't mean it's right. I'm guessing that Stoddard-Hamilton used the GAW airfoil on the GlaStar simply because that's what they were used to on the Glasair. Another concern I have with the GlaStar wing is that it uses primarily hat section stringers to maintain the shape of the wing instead of ribs. A local GlaStar builder told me that he did not find a single such stringer in his kit that was the proper shape. He had to make a forming block to force each of them into the proper shape. Since the stringers and skins are pre-punched, there is a reasonable chance that the wing will eventually get to the proper shape, at least to begin with. I'm not yet convinced about how stiff the wing skins will be.

An increasingly more publicized "failure" of an implementation the GAW airfoils is the Piper Tomahawk. When Piper was designing the Tomahawk, they were looking for any advantage they could gain over the Cessna 150 while using the same engine. One of the things they did was to use the "new" GAW airfoil to try to get slightly better performance. This worked out reasonably well on the prototype, which was used to do the certification. Unfortunately, in a story repeated far too often in history, the production engineers thought they were smarter than the design engineers and built the production aircraft with about half as many ribs as the wing originally had. (During a sheet metal workshop, I had the opportunity to de-skin a Tomahawk wing, and was surprised at how few ribs it had. This was before I learned this story.) Sounds good: less weight, lower parts count, right? Wrong! Remember what I said about this airfoil being very sensitive to the proper shape? The end result was that the skins were not stiff enough and would "oil can" under air loads, disrupting the airfoil shape. Wing bending under aero loads would also distort the airfoil. The biggest problem was with the stall characteristics. In the prototype, they were acceptable. On the production birds, the stall was unpredictable and would change from time to time. I did my flight training in a Tomahawk, and have most of my logged time in one (again, this was before I learned about the wing problem). Stalls in a Tomahawk are not a nice, gentle g-break like a Cessna 150. Instead they were characterized by a fairly sharp (violent?) wing drop, which seemed like at least 45° of bank and was unpredictable in direction. I'm not sure about FAR 23, but I'm pretty sure that the stall characteristics would fail the appropriate Mil Specs. My flight instructor tried to convince me that it was designed that way to "improve training," but I don't buy that anymore. I certainly wouldn't want that sort of "training" low to the ground during a botched turn to final, whereas a g-break would probably be recoverable. The clearest indicator to me was that I was sufficiently scared of the stall characteristics that I refused to practice any stalls in the airplane after I received my certificate. On the other hand, stalls in other aircraft, such as Cessnas or even the Piper Cherokee series are non-events. I recently read that the NTSB is calling for a re-certification of the Tomahawk stall and spin characteristics. The stories I have read correlate well with what I remember. I may have close to 100 hours in the Tomahawk, but based on what I know now, I really have no desire to ever fly in one again. Are you sure you want this airfoil?

One last thing on the GAW airfoils: the undercamber on the lower surface (the concave section) will increase the difficulty of construction and require redesign of the flaps and ailerons. The ailerons on the Bearhawk are of a very nice Frise aileron design. You will note that when the aileron is deflected trailing edge up, the nose of the aileron will poke out the bottom of the wing. The added drag of this nose offsets the additional drag of the opposite aileron (deflected trailing edge down, increasing lift and thus induced drag) and results in a reduction of adverse yaw. That means less rudder is required to coordinate turns. I wouldn't want to mess that up.

## Airfoil as designed:

Bob Barrows told me that the Bearhawk airfoil is essentially an NACA 4412 airfoil, which was actually what I expected. This is a very well known, time-tested and proven airfoil with well documented characteristics. You can find it in the classic airfoil text "Theory of Wing Sections" by Abbott and Von Doenhoff (Dover Publications). It's a blue paperback book about 1-1/2" thick that just about any aeronautical engineer will own.

The NACA 4412 has a turbulent boundary layer, which is actually a good thing for an aluminum wing. You may have heard a lot of hype about laminar flow airfoils and their lower drag, especially with respect to composite aircraft. The whole laminar flow business got started back in the early days of WWII, and is best remembered with respect to the development of the P-51. The P-51 was the first aircraft to be designed with an early laminar flow airfoil, which was supposed to give large gains in performance. However, it didn't turn out quite like it was planned. Laminar flow airfoils require very smooth surfaces to work properly. The P-51 had an aluminum wing constructed using traditional techniques, and all of those flush rivets and any waviness in the skins were enough to trip the boundary layer to turbulent flow. If not in the beginning, certainly after a little bit of hangar rash and dirt got on the surface. Traditionally, laminar flow airfoils have not worked well with aluminum structures. They have worked with composite structures because the skin could be made extremely smooth and stiff.

The turbulent boundary layer actually helps keep the flow attached to the surface and improves the stall characteristics. Laminar flow airfoils tend to have lower stall angles of attack because of the sharper leading edge and the fact that laminar boundary layers are not as likely to stay attached. The NACA 4412 has a nice rounded leading edge, and a two-dimensional unflapped stall angle of attack of 12 to 16 degrees. Why do I keep harping on stall characteristics? First, a high stall angle of attack indicates that the airfoil will be able to operate at a high angle of attack, which is necessary for STOL. Second, because a STOL aircraft will land and take off with a reduced margin above stall speed, it is imperative that the aircraft have gentle stall characteristics so that you can get yourself out of trouble shouldst you get into it.

Another nice benefit is that the bottom surface is almost flat, which makes the construction easier.

The 4412 has a design lift coefficient (i.e. minimum drag lift coefficient) of 0.4, which for a 2300 lb Bearhawk, would occur at 97 KCAS. I'm expecting with a 220 HP

engine a cruise speed of 140 KCAS. If the aircraft was to get heavier, the profile drag of the airfoil would actually decrease as the lift coefficient increased toward 0.4. Of course, the induced drag will increase, but the overall drag wouldn't change much. With this airfoil, there is still "growth" room.

As it turns out, airfoil selection has very small effect on aircraft performance compared to other factors. Generally you don't turn to tweaking airfoil performance until everything else has been optimized, because the improvements realized are typically no more than a percent or two. (As a side note, wing tips are another area that seems to be popular for changing, but again usually with small or no improvement, and sometimes a degradation in performance. After all, if it was so easy to improve, why wouldn't the designer do it that way in the first place?) Read the August 1997 *Sport Aviation* article on the Nemesis and Shadow on page 75. Note how small a gain is expected for using different airfoils. In air racing where fractions of a knot matter, the results are noticeable. For the type of flying I expect to do, you'll never notice the difference.

Changing the airfoil leads to a **design propagation nightmare**. When you change the airfoil, you'll probably change the thickness of the wing at the spar location. Thus, the spars won't be same height, which means you would have to redesign both spars. Assuming that wing got thinner, the spar would be heavier to have the same strength (weight is almost always bad). Well, when you changed the spars, you changed the whole structural analysis, and pretty soon you've designed an entirely new wing with unknown structural characteristics. In addition, you would have to redesign the flaps and ailerons to fit the airfoil, along with the flight control cables, pulleys, bellcranks, and pushrods. The designer won't recognize it as a "Bearhawk," and you'll be on your own as far as builder support. If you really want to do that, then design your own airplane. At least then you'll understand the entire system and the tradeoffs involved. If you "don't have much of an understanding of the wing" the last thing you want to do is to start redesigning major components!

You asked "How come nobody else has used this type wing with a "bush type" aircraft?" I think by now you should be convinced the reason is because it is not suitable for the "bush type" mission. Remember that the Glasair has very different mission in life. If one airfoil were truly the "best" for everything, then why do we have so many different airfoil designs?

## Flaps:

Let's start this discussion by reviewing the purpose of flaps:

1. To increase lift (reduce stall speed)
2. To increase drag to allow steeper approaches without gaining airspeed
3. To lower the deck angle on approach so that you have a chance of seeing over the cowling

Starting the flaps close to the fuselage would only gain about 9 percent more flap area, which would probably result in less than 1 knot stall speed reduction. The current design allows a good integration of the wing root with the fuselage. While I can't verify the claim that

## THE LEADING EDGE

it improves low speed controllability, it does not sound unreasonable based on my other experiences. Aeronca had problems in the past with flaps that came all the way to the wing root causing buffeting on the tail.

Deflecting the flaps does not result in a loss of wing area. While the planform area seems to be reduced (what you would see from above), the chord that the air "sees" doesn't change when flaps deflected. It just exists in more of a curved path. Overall lift and drag still go up when the flaps are deflected, otherwise the flaps wouldn't be deflected that far.

The flaps may seem large to you, but they are only about 23 percent chord, and the typical size of flaps for most aircraft is 20 to 30 percent. According to Budd Davisson's article on the Bearhawk in the October 1995 *Sport Aviation* (that convinced me to order the plans), Bob Barrows originally considered Fowler flaps for the Bearhawk, but decided to go with plain flaps for simplicity (read: reliability) and the resulting small change in longitudinal trim. Fowler flaps cause a much larger change in pitching moment, which results in the pilot having to make bigger trim changes when extending the flaps. Using Fowler flaps would also require extending the upper surface of the wing back to where the flaps would roll back to. This extension would require designing additional structure (here we go again), which would take up room in the airfoil, forcing the flaps to be thinner, resulting in less strength. Then, how would you mechanize them? The two basic choices: 1) external hinges, which result in increased drag and weight, not to mention a hazard on the ground for you to bash your head into, or 2) Cessna style internal flap tracks, which are a design nightmare, and would probably lead to serious questions of strength and fatigue problems. I figured out how much reduction in stall speed you would expect to get after all of this work according to a mathematical model I have built of the Bearhawk: about 1 knot! That's way too much effort with no noticeable payoff for me, not to mention the maintenance headaches you've created for yourself. Remember the designer's credo: Keep it simple, keep it light.

### Windows in roof:

Here's the one area that I would agree with you. The April 1996 issue of *Beartracks* (*the Bearhawk builder's newsletter*) has already approved installation of a skylight back to the rear spar. I still haven't decided if I want to do this. Flying around in fighter-type aircraft with big bubble canopies I find that the sun still makes it awful hot. It's wonderful if you want a greenhouse, but bad for comfort. Living in the desert, this is a significant problem. I've noticed many Navions and other aircraft with canopies that allow you to see straight up have some sort of sun shade over the pilot and passengers.

### Wittman gear:

I wouldn't recommend it. While it is true that it is very simple, it has virtually no inherent damping (shock absorption). As a result, when you try to plant the mains on the ground in any sort of landing, you'll probably bounce a few times. The landing gear as designed does very well for this type of aircraft. It is very clean and very

appropriate. It is not just a bungee system like a Cub. The Bearhawk gear as designed has an integral spring and damper in the strut that keeps the gear from spreading. Thus, you can plant it reasonably hard without bouncing. This system is very similar to what is used on the Maule, and has worked very well for that aircraft. If you are concerned about the additional drag of the additional support arm, then add a lightweight non-structural streamline fairing over it.

Another point to consider is that the Wittman gear will transmit the loads to the fuselage in different amounts at different points than the gear as designed. I'm not sure how this would affect it, but I'm pretty sure it wouldn't be good.

As for rough field landings, it doesn't matter if you don't expect too many. One rough field landing is all you need to bounce the landing and possibly damage something. The landing gear as originally designed is much more tolerant of this type of operation. I still recommend it.

In general, as an aeronautical engineer with a background in aircraft design, and having a father who has much more experience in aircraft design and is more concerned with analyzing the design than I have been, you would expect me to critically evaluate the design of any aircraft I considered building. I have been pleasantly surprised and impressed with the design of the Bearhawk, finding it to be very sound. In fact, so far the only modification I have made is to add a landing light in the wing leading edge outboard of rib 10. Prior to doing this, I checked with Bob Barrows for the best location to do that. I realize this will reduce the wing strength slightly, but we are working hard to minimize the impact and the propagating design changes. It has resulted in moving one of the nose ribs in each wing about 2 to 3 inches, which I wasn't real thrilled about. I also plan to add navigation lights to the wingtips and tail, but those should have minimal impact on the structure of the aircraft.

### Floats:

In the April 1996 issue of *Beartracks*, Bob recommends using thicker wall tubing in a couple of fuselage locations if floats will be installed. I plan to use the thicker tubing in these locations, even though I don't plan to add floats at this time. If I decide to later, I'm set. If not, it's only a weight penalty of a pound or two. It's far easier to build in the thicker tubes than to uncover the fuselage and cut it apart to retrofit them later.

### Engine:

I'm not a big fan of auto conversion engines. I'm not much of a gear head. I can do maintenance on engines, but I don't know much about modifying them. I don't care to get into propulsion development, which is what would happen unless I could buy a turnkey system. Additionally, I have yet to see a conversion that is as light as an aircraft engine, or that would fit into the current cowling design. I really like the sleek cowling as it is, rather than the "flat wall" behind the propeller typical of Cessna 172s and many auto conversions.

However, Lycoming and Continentals are ridiculously overpriced. I don't care to search around, hoping that the

right engine will pop up in salvage. I'm currently leaning toward the Franklin 220, which is a 220 HP engine of American design which is now being produced again by PZL in Poland. It's price new is about half of a new Lycoming. There are US distributors, so I won't have to deal with the mess of importing it.

Even so, it is still years until I have to make an engine decision, and I'm keeping an open mind about it. New and exciting developments are currently ongoing.

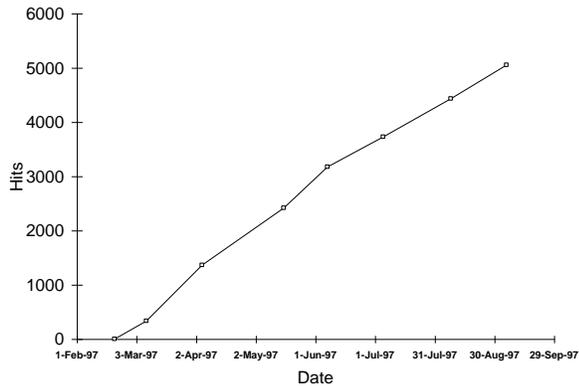
I'm also leaning toward a constant speed prop. I do expect to do a lot of operations on a very short (660 - 975 feet) grass field, and the increase in takeoff performance will justify the additional weight, complexity, and cost.

**-Russ Erb**  
Bearhawk S/N 164

You can find out more about Qnet at <http://www.qnet.com> or at 805-538-2028.

**Web Site Update...Past 5K!**

As of 5 September 1997, we have **5054** hits on our Web Site! See the graph of the activity below.



**Usage History on <http://www.eaa1000.av.org>**

In light of our recent high finish in the McKillop Newsletter Competition, several people have asked me (such as **Gretchen Lund**) when is EAA going to have a web site competition? On the event of our recent passage of the 5000 hit mark, I decided to do a little survey. (I don't know who was number 5000, but **Paul Rosales**, Chapter 49 webmeister, reported he was 5001). I looked at all of the EAA Chapter web sites that are linked by our web site, which would be all of the ones I have been able to find. Looking at those that were nice enough to include a counter on their home page and a date that it was started, I calculated the average hit rate per day. Of all of the other chapters, the highest rate went to our sister chapter, **Chapter 49**, at **11.8** hits per day! Next was **Chapter 25** at **9.2** hits per day (an excellent site, by the way), followed closely by **Chapter 655** at **9.1** hits per day (a site I need to look at some more--looks interesting). The other sites I could quantify were between 1 and 2 hits per day. **Chapter 1093** showed 5262 hits but no date.

What's our hit rate? 25.7 hits per day! I know **Norm Howell** is far too busy to account for all of those!

 Just a reminder that the EAA Chapter 1000 Web Site is hosted courtesy of Quantum Networking Solutions, Inc.

**Chapter 1000 Calendar**

Sep 13: Chapter 1000/49 Young Eagles Flight Rally. 7:00 a.m., Fox Field (WJF), Lancaster CA. (805) 948-4431

**Sep 16: EAA Chapter 1000 Monthly Meeting, 5:00 p.m.**, Fox Field. Milestones of Flight Museum. (805) 490-1476

Oct 1: EAA Chapter 49 Monthly Meeting, 7:30 p.m., Sunnysdale School. 1233 W. Ave. J-8, Lancaster, CA. (805) 942-7149

Oct 9 - 12: Copperstate EAA Regional Fly-In, Williams Gateway Airport, Mesa AZ. (520) 228-5480

Oct 11: Chapter 1000/49 Young Eagles Flight Rally. 8:00 a.m., Fox Field (WJF), Lancaster CA. (805) 948-4431

Oct 14: EAA Chapter 1000 Board of Directors Meeting, 5:00 p.m., Edwards AFB. Test Pilot School, MOL Room (805) 490-1476

**Oct 18 - 19: Edwards AFB Open House and Air Show.** Homebuilts on display in Hangar 1600.

**Oct 21: EAA Chapter 1000 Monthly Meeting, 5:00 p.m.**, Edwards AFB. USAF Test Pilot School, Scobee Auditorium. (805) 490-1476

**Oct 31 - Nov 2: 1997 Fox Field National Air Races.** Fox Field (WJF), Lancaster CA.

**For Sale:**

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*To join Chapter 1000, send your name, address, EAA number, and \$15 dues to: EAA Chapter 1000 Treasurer, Mike Meyer, 6809 Spaatz Dr, Edwards CA 93523. Membership in National EAA (\$35, 1-800-843-3612) is required.*

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*Contact our officers by e-mail:*

*Gary Aldrich: gary\_aldrich@pobox.com*

*Miles Bowen: bowenfam@tminet.com*

*Mike Meyer: aerosong@ptw.com*

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*Inputs for the newsletter or any comments can be sent to Russ Erb, 805-258-6335, by e-mail to [erbman@compuserve.com](mailto:erbman@compuserve.com)*

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*From the Project Police legal section: As you probably suspected, contents of The Leading Edge are the viewpoints of the authors. No claim is made and no liability is assumed, expressed or implied as to the technical accuracy or safety of the material presented. The viewpoints expressed are not necessarily those of Chapter 1000 or the Experimental Aircraft Association. Project Police reports are printed as they are received, with no attempt made to determine if they contain the minimum daily allowance of truth. So there!*

**THE LEADING EDGE****MUROC EAA CHAPTER 1000 NEWSLETTER**

**C/O Russ Erb**

**6708 Doolittle Dr**

**Edwards CA 93523-2106**

**<http://www.eaa1000.av.org>**

**THIS MONTH'S HIGHLIGHTS:**

**REGULAR MEETING 16 SEPTEMBER AT FOX FIELD**

**DESIGN GROUP: TO MODIFY OR NOT**

**OTHER GOOD REASONS TO JOIN EAA**

**DARTH VADER'S OIL COOLING TIPS**

**CATMAN'S AIR FAIR FUN**

