

# THE LEADING EDGE

## NEWSLETTER OF MUROC EAA CHAPTER 1000

Voted to Top Ten Newsletters, 1997, 1998 McKillop Award Competition

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

January 1999

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:



(Well, maybe one more time...)

### Weather Safety Seminar, Part Deux

AOPA "Seminar In A Box" Series  
 Tuesday, 19 January 1999  
 1700 hrs (5:00 PM Civilian Time)  
 USAF Test Pilot School Auditorium  
 Edwards AFB, CA

OK, this month because of the over whelming response to last month's presentation (take a bow, Gary), and the cries of more, more, more from the balcony seats, we are going to complete the famous "Seminar in a Box Series!" Yes, you heard me right, the Seminar in a Box series....

For those of you that could not make the last meeting, Seminar In a Box is actually a safety seminar from AOPA. I requested it a couple of months ago and they sent it. What I actually found in the box was pretty complete. There is a hand out on weather flying along with a videotape that provides the weather situation. We watch the tape, follow along and see if we can spot the mistakes that the pilot in the video makes, and offer suggestions for improving the procedures. The tape we have is from the Never Again series. It is taken from the Never Again column in AOPA magazine. The tape is stopped several times during the presentation for discussions on decisions made in the video and how they influenced the situation.

We completed the first of three weather flying situations last meeting which depicted a Cessna 180 pilot accidentally getting into an IFR situation. This month, now that we know what were doing, we'll finish up the last

two weather situations. They even include door prizes and some AOPA propaganda (flyers to join AOPA).

So that's about it, everybody show up, this is going to be an interesting meeting (now that we know how to handle the technical stuff, you know, start the VCR, stop the VCR etc.), lots of good food, friends and airplane talk.

(Also come find out what great new ideas we picked up at the Chapter Leadership Workshop!)

- George Gennuso

### Operation Rubidoux Sundown VII



They're going to do it! Our good friends at EAA Chapter 1 have agreed to work out their problems, have new management, and will be hosting their 45<sup>th</sup> Annual Open House and Fly-In on 27 - 28 February 1999. Of course, that means that the **Project Police** will have to go check out how they're doing...

Therefore, **Operation Rubidoux Sundown VII**, the annual **Project Police** raid on Flabob International Airport, is scheduled for **27 February 1999**. A duly authorized **Project Police Tactical Assault Force (PPTAF)** is being formed for this event. For proper coordination, some initial action on your part is required. If you have an **Aerial Assault Vehicle**, you need to call pre-raid coordinator **Russ Erb** at 805-258-6335 or e-mail at [erbman@compuserve.com](mailto:erbman@compuserve.com) and tell him if you have room for any additional **Project Police** Officers. If you do not have access to an **Aerial Assault Vehicle** but wish to participate in this exciting event, you need to call pre-raid coordinator **Russ Erb** at 805-258-6335 (*hey! that's the same number!*) or e-mail at [erbman@compuserve.com](mailto:erbman@compuserve.com) and get matched up with an airplane.

Appropriate identification placards will be available from Russ for your aircraft. Display of the placards is mandatory to avoid the embarrassment of the **Project Police** accidentally inspecting your aircraft. They also

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have the desirable side effect of striking fear into passers-by.

Last year's raid started with a sumptuous breakfast and pre-raid briefing at the Apple Valley (APV) airport restaurant, where the **Project Police** practiced their graffiti skills. We made our raid, accomplished our objectives, and were still home in time for dinner. You can still read about it on the chapter web site.

The uniform for this operation includes the black **PPTAF** T-shirts, sunglasses, and appropriate headgear. Definition of the remainder of the uniform is left as an exercise to the reader.

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### Last Month's Meeting

#### EAA Chapter 1000

Scobee Auditorium, Test Pilot School, Edwards AFB  
1700, December 15, 1998

**Gary Aldrich**, Presiding

The meeting was called to order at 5:34 following schmooze time, our illustrious Schmoozemeister doing his usual outstanding job.

#### Announcements

The Wright School of Building and Restoration is offering classes at the EAA Air Academy. The week-long classes go for \$800.

The Chapter will be ordering Chapter Recognition Pins from EAA to use as rewards to members for their work for the chapter.

The Chapter has an info pack and a video on the Voice Nav System (a talking ILS??). Contact the chapter librarian if you're interested.

#### Minutes

Accepted as published.

#### Old/New Business

None.

#### Program

This month's program was AOPA's "Seminar in a Box" interactive weather seminar. This is one of a series of seminars taken from the *Never Again* column in AOPA Pilot. This particular seminar concerned a Cessna 180 pilot in northern California with get-home-itis. A video reenacting the event is interspersed with discussions on what the pilot did right, did wrong, had in his favor, had against him, etc. The seminar is available in the chapter library.

#### Adjournment

The meeting was adjourned at 6:23, at which time many attendees decided to gather at the Burger King, a.k.a. **PPHFFRC** (**Project Police** High Fat Food Replenishment Complex), where good times were had by all.

- **Miles Bowen**

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### The Prez Sez...

*(As of the publication deadline, Prezident Aldrich was cruising the War Zones in the Middle East on a secret spy mission (OOOPS! I wasn't supposed to mention that!) with his lovely wife Anne (she reads this too...). Tradition holds that we take a moment to assassinate the character of any chapter officers who are gone and unable to defend themselves. However, tradition also holds that I'm too busy putting together the newsletter to do it. It's a wonderful system, and no one gets hurt.*

*The Prez will be back in time for the meeting, so ya'll come and ask him about his Greece-y Turkey.*

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### Heroes of the Project Police, First Class

Kudos to the following **PPO's** who have done their part to make the Treasurer's life easier by paying their dues prior to 1 January 1999. For the rest of you, send your \$20 **NOW** to **Gary Aldrich** (address at the end of the newsletter). The honorees:

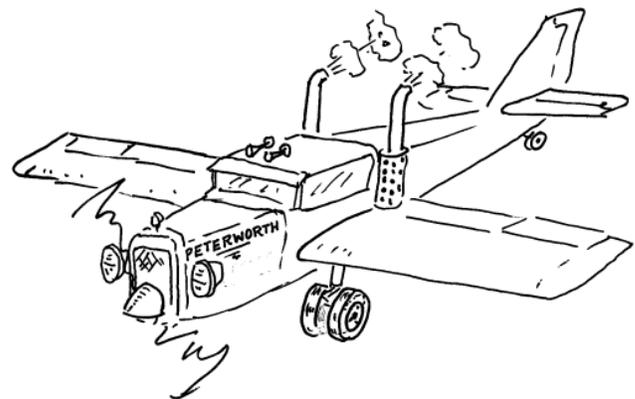
**Don Alderson, Bernie Bakken, John Blaha, Miles Bowen, Graham Byass, Harry Crawford, Russ Erb, Dan Falbe, Chuck Firth, Pete Freeland, George Gennuso, Bill Grahn, Mark Hiding, Rodney Howes, Mike Melville, Mike Meyer, Mauro Mezzacappa, John Miltner, Pete Moore, Ray Narleski, Bernie Nitz, Gary Sobek, Concha Trippensee, and Charlie Wagner.**

*(Gee, I can't help noticing a certain prominent name missing...oh, well, we'll get to the delinquents in a few months...)*

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### Is There a Diesel in Your Future?

*(Vance Jaqua presented the following as a forum at Copperstate. Since we all missed his forum, he was good enough to supply the text version for our favorite news-rag)*

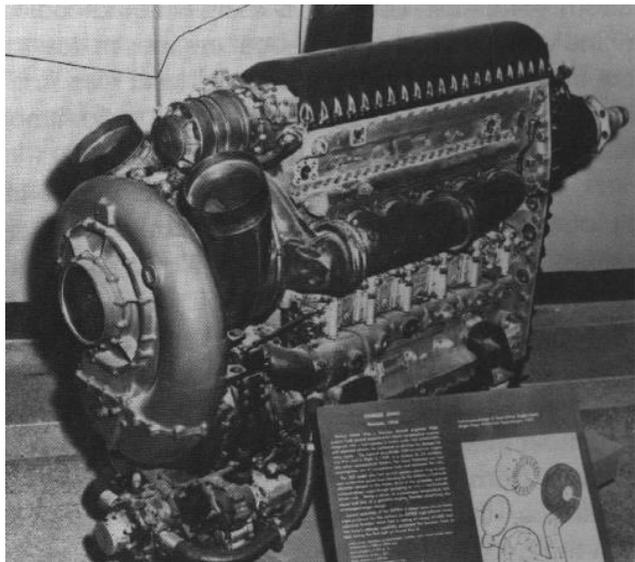


The latest rage that seems to be sweeping the general aviation outlook is the Diesel aircraft engine, with many prototypes and pipe dreams attracting wide attention.

Like many others in the general aviation community, I have been looking at the proposed next generation of Diesel engines for aircraft with anticipation and enthusiasm. I am still quite interested in the new designs,

and proposed modern technology, but a look at the past is tempering this enthusiasm quite a bit. The promise of improved fuel economy, and the very real threat of no leaded avgas in the near future, are still pretty strong drivers, but in our haste we are pushing some very real problems with the Diesel back into the closet.

Diesel aero engines are not new; they have existed before, and some of them were very successful in their intended applications. The Junkers inline opposed piston two-stroke Diesels of the thirties powered many long range sea planes quite effectively (see photo).

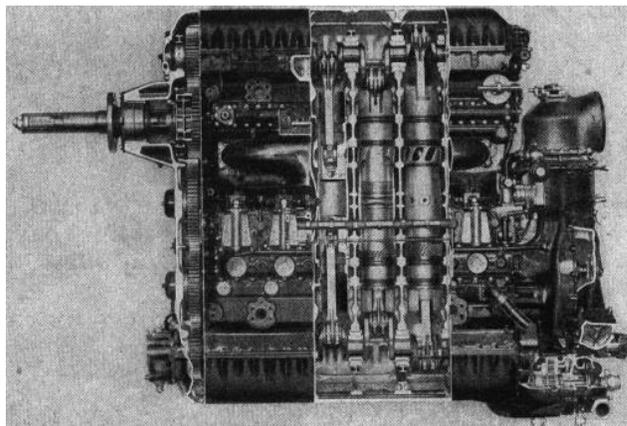


The great airships (Zeppelins) of the past used Diesels for both the good fuel economy, but also because of a perceived greater fire safety. The Packard motor car company produced an air cooled radial, four stroke Diesel in competition to the Wright Whirlwind family of engines. The power output of these engines was competitive, and the fuel economy allowed records to be set and long distances to be spanned. So why did they not prevail?

The people that flew the Packards remember mostly the smoke and smelly exhaust and other fumes. These problems became even more acute with altitude, as combustion became more ragged with reduced air pressure. Popular memory states that the fumes were so bad that the aviator's clothes reeked with the unpleasant odor for hours after the flight (to the complaints of his wife and family). The Packard Diesel's unique design approach actually intensified this problem. Since the inlet was only air, and no fuel, and the exhaust also just exits to the air, Packard engineers came up with a single valve at the top of each cylinder, with no manifold, so the exhaust belched freely all around the cowl. Other innovative design features, such as a "turnbuckle hoop" to retain the cylinders, allowed this engine to be competitive on a power to weight basis with the contemporary Wright Cyclone engines.



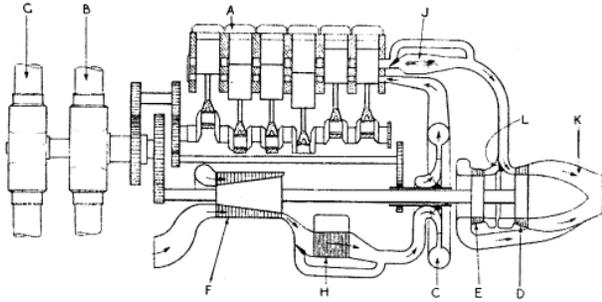
The Junkers engines were generally mounted outboard in nacelles, separating some of these problems from the passengers. These larger scale engines were also supercharged, which improved combustion characteristics, and probably had better injectors. These engines were externally scavenged two-stroke designs, which is a popular approach for smaller high output Diesel engines. The opposed piston design, as shown in the cutaway picture, was somewhat bulky, but provided a very effective way to use ports instead of valves, while still providing the ability to close the exhaust port while the inlet is still open, pressurizing the charge. Old technology, you might say, but just follow a modern city bus, or a new Peterbuilt, to see if you think the new designs are that much better.



After WWII the Diesel concept was picked up once again by the famous British engine builder Napier and developed to an incredibly advanced state with outstanding fuel efficiency. This engine, called the Nomad, was conceived as a two-stroke Diesel with turbocharging and exhaust turbine compounding. It was a large engine (flat twelve, about 2500 cubic inches), intended for long distance propeller driven transport applications, providing over 3000 effective horsepower at maximum, and a cruise specific consumption as low as 0.33 pounds per horsepower hour. The multistage axial compressor and multistage axial turbine look very much like a complete turbojet beneath the engine. A continuously variable transmission was used to keep turbine speed matched to engine speed, and the system could even employ afterburning in the exhaust stream for short term extra thrust. It was flight tested in a British bomber, but was probably a case of too much too late, and was not matched to an appropriate airframe. The interim need for efficient

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large piston driven propulsion was filled by the Curtiss Wright 3350 turbocompound engine, and all piston engine large commercial aircraft were swept away by the incoming turboprops and jets.



Some of the arguments that are mounted by the Diesel engine enthusiasts are:

### “Diesel Fuel or Jet Fuel is Cheaper Than Avgas”

Well, that is true for now, particularly in Europe where the gasoline is heavily taxed. However, just look what happened in the U.S. market when just a few automobiles started using Diesel fuel. The current urban gas station sells premium unleaded gasoline cheaper than Diesel fuel. It takes about the same amount of petroleum feed stock and labor to make either fuel, and when the market ratio begins to strongly exceed the normal refining ratio, the high consumption product becomes more costly to produce. Well, you say, we are going to run on Jet-A, so that won't be the case. If you purchase Jet-A at the smaller FBO's frequented by general aviation, you will find that it is only about ten cents a gallon cheaper than 100 Low Lead.

Also, Diesel fuel is not just any petroleum product, it utilizes a Cetane rating that may be just as important as octane for our gasoline. You can probably bet that our benevolent FAA is going to certify the fuel, along with the engines - and that has never cut the retail price. The experience base for Jet-A in compression ignition engines is very limited. I asked one of the Continental Engine engineers on their Diesel program, "What does a Diesel smell like when it is operating on Jet-A?". The answer was "Gee - I don't know".

### What About Fire Hazard?

Surely the volatile gasoline is a greater fire hazard than jet or Diesel fuel. In the normal storage and handling, the results are much more different than you might expect. The possibility of combustion or explosion of the fuel vapors in a tank containing liquid gasoline is very small. Unless you forcibly introduce air in to the tank volume, the vapor in that area will be so fuel rich that it will extinguish a flame rather than explode. This fact has been demonstrated by brave (foolish?) souls who have dropped a lighted cigarette into a gasoline container - where it is promptly extinguished (*don't try this at home*). The lower vapor pressure of jet or Diesel fuel frequently results in an explosive mixture in partially filled tanks at lower ambient temperatures (the stated reasons for the TWA 800 explosion are difficult to accept). In the case of violent crashes, where the tanks are ruptured and the fuel is sprayed into the atmosphere, the danger would appear to

be high for either fuel. In spite of the TV chase scenes, violent automobile crashes almost never cause explosions, and subsequent fires are generally the result of leakage and incidental ignition sources.

### Noise And Roughness

General aviation aircraft engines spend a significant amount of time at or near idle power settings on the ground and taxiing into position. In this mode, the Diesel operation is very fuel efficient, but demonstrates significant noise and roughness. This roughness could be more than just a nuisance with geared engines, where flywheel action must be transmitted from the propeller back through the gear train. The two-stroke version of the Diesel is well suited to direct drive (providing good power at low rpm because of the power stroke per each revolution), but Continental, for one, is showing a gear reduction in their proposed engine.

### Fuel Economy

The improvement of part-throttle specific fuel consumption with the Diesel engine is less of an advantage with aircraft applications than for automotive or truck applications. The aircraft engine can spend a great portion of its mission operating at a consumption "sweet spot" by using a constant speed propeller. The aircraft engine is not transitioning up and down in load like an automotive application, and cruise operation of a modern gasoline engine can provide fuel consumption within 10 percent as low as a Diesel with equivalent technology. The proponents of Diesel engines have PROMISED us a fuel specific of 0.35 pounds per horsepower hour some time in the future, while a modern aircraft gasoline engine (the O-200L on the back of the "round the world Voyager") has DEMONSTRATED specific consumption below 0.37 pounds per hour over 15 years ago. Even such garden-variety engines such as the IO-360 will operate down at 0.39 with intelligent leaning and propeller settings.

Although the fuel economy is real, just how big a factor is it to the average aircraft owner? The average owner operates his plane less than 200 hours per year. If we assume a 200 bhp class engine with cruise consumption about 12 gallons per hour, and avgas at \$1.70 per gallon, that is about \$340 per month. If we credit the Diesel with 25 percent reduction and \$1.60 per gallon it comes to roughly \$240 per month, a saving of \$100. That would not even pay the interest on a loan for the extra \$20,000 that the Diesel engine would have probably cost.

### Durability

The legendary durability of Diesel engines is based on heavy weight, low specific power output, expensive, truck and industrial engine applications. There is absolutely nothing intrinsic about compression ignition engines that leads to long life nor durability. Actually, most experience would suggest that the opposite should be the case. The lighter weight automotive engines such as the ill-fated GMC 350 V-8 Diesel have demonstrated lower durability than equivalent gasoline engines, and generally less than satisfactory overall performance. The combustion roughness of the Diesel imposes extra mechanical loads on engine structure, and Diesel combustion products have

demonstrated adverse effects on lubricant additives required for high bearing pressure wear reduction. Built to the same specific weight characteristics, and with equivalent technology, a spark ignited gasoline engine should outlast a Diesel engine.

## Torque and Power

Many people are under the impression that Diesel engines produce more torque, or low-end power than spark ignited gasoline engines. This is just not so. Virtually all internal combustion engines are a form of air pump. Air is pumped up to a higher pressure, and energy is added by burning an appropriate amount of fuel with this air, and the hot air is expanded to extract this energy. The gasoline engine pre-mixes and vaporizes the maximum amount of fuel for energy release. The Diesel engine injects the fuel into the compressed air at a local point where it cannot reach all the air, and an unacceptable level of smoke is produced (the "smoke limit") before the fuel ratio can reach the desired level for full combustion (chemists call this mixture stoichiometric). Since less fuel has been burned, there is less energy released to be harnessed by the expansion. For a given amount of air (displacement times volumetric efficiency - which can be over 100 percent with supercharging), the Diesel has trouble providing 75 percent of the power that the gasoline engine produced. The unfortunate owners of the previously mentioned GM 350 cubic inch Diesel V-8 will gladly testify to that. To deliver the same power as a gasoline engine, the Diesel must be boosted to a higher inlet pressure. Fortunately, Diesels thrive on increased supercharging.

## Reliability - We Get Rid of Those Pesky Spark Plugs

As an owner of a modern automobile, which has given you the most problems, ignition or fuel injectors? As Perry Mason might say, "I rest my case".

## Environment

Many people tend to think of the Diesel as a "green" engine. This is not really the case. The only major emissions advantage is in the area of carbon monoxide. Smoke, soot, and other particulates from Diesel combustion are much higher than for gasoline engines, and are strongly suspected to have severe carcinogenic effects. The proposed fuels are higher in carbon content than typical gasolines, producing a higher output of the currently maligned "greenhouse gas" carbon dioxide for each BTU delivered. The compression ignition process results in higher local temperatures in the combustion chamber for more NOX production.

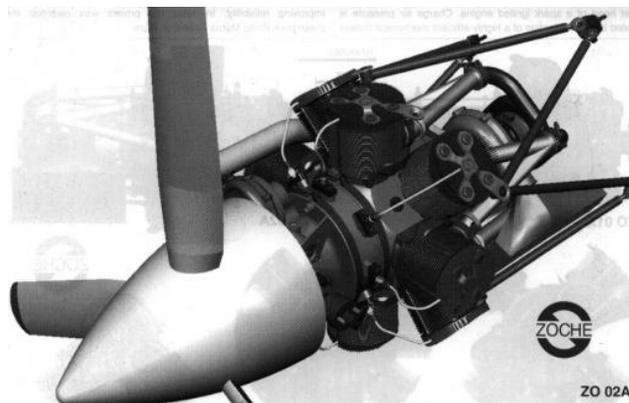
## Promising Candidates

Some rather interesting engine programs are underway in the drive to push Diesel power into the forefront. About 20 years ago, I was involved in a Rockwell program to assist GM with some of the problems that they were having with the ill fated 350 cu in V-8 Diesel. In researching these areas, we visited the NASA facilities in Cleveland where they were pushing an advanced two-stroke Diesel concept for general aviation. They were running single cylinder static tests exploring high boost pressures that they envisioned for a heavily turbocharged

two-stroke Diesel. A computer generated section view of this paper engine was featured on the cover of Popular Science Magazine (a program death knell if there ever was one). Several papers and reports were produced and published before the program faded into obscurity. However, many of these engine features have been revived in the current crop of Diesel designs, with the Zoche engine being the closest relative. I will endeavor to describe some of the more promising current candidates, and share some of my personal cheers and catcalls.

## Zoche

Obviously I am not proceeding in alphabetical order. This family of engines is perhaps the most fully developed candidate on the horizon, but because he is going for German certification, it will be neither quickly available, nor low cost. This is an air-cooled, port-timed, two-stroke Diesel in modules of 4 cylinder radial configuration with both geared and turbine driven boost for scavenging and supercharging. If you hate electricity, this one is for you, since in addition to no ignition system it utilizes air start, spinning the geared blower and "boot strapping" the scavenging. This engine family has been through several major upgrades, driven by a studied program of development testing and upgrading. A significant amount of test stand time has been accumulated, but no flights to my knowledge. The certification time target seems to slide forward in time, as those things so often do. Seemingly self-financed by a resourceful and dedicated team it is almost assured of mechanical success (market success is another high hurdle). Target price range is stated to be "competitive" with Continental and Lycoming.



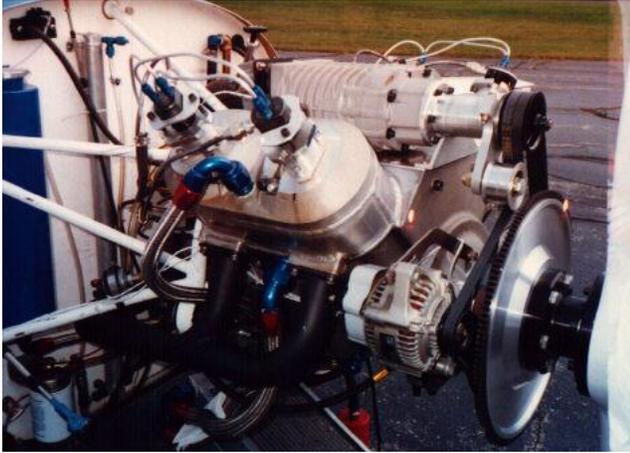
Personal negatives - I feel that pure port timing is a limitation in being able to effectively utilize the supercharging of the high boost pressure. Mechanically I am not a fan of "slipper" type connecting rod bearings, where any tensile forces are reacted by a ring shaped bearing system around the outer surface of the rod end.

## Delta Hawk

A very promising, but probably underfunded program developing a liquid cooled V-4 two-stroke Diesel. The 90-degree V-4 is a very appropriate configuration for a two stroke engine. A simple single-plane crankshaft will provide a uniform firing order with 4 power pulses per revolution. The common crankpin 90-degree Vee has numerous balance advantages. This uses a pure port timing similar to the Zoche which avoids the tall engine height

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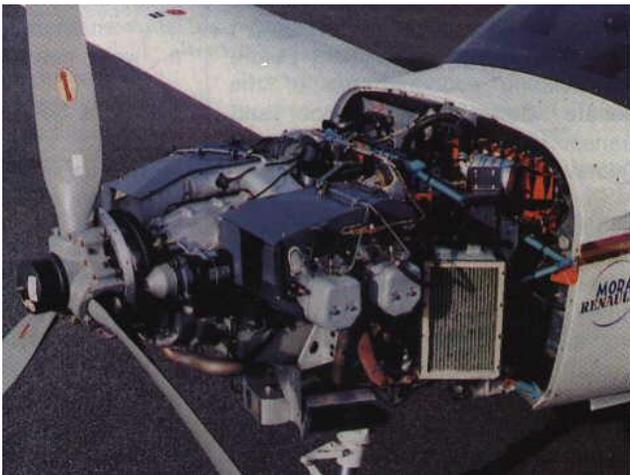
associated with upright Vee configurations. Again, this limits the ability to precompress the charge in supercharging, but the design point for this engine is not based on high boost. The prototype engine has been running on a test stand, and a static aircraft installation, but has not yet flown.



### Renault/Scota

Reportedly primarily a product of the Renault racing division, this engine was displayed at Oshkosh last year, but was not demonstrated. Current reports indicate that it is now in flight testing. This is a classic air-cooled, four stroke, overhead valve opposed engine that looks just like a Lycoming or Continental. The baseline engine is rated at 180 hp with turbocharging and direct drive at 2000 rpm. Uprated engines with geared reduction drive to provide 2000 rpm prop speed with 3000 rpm engine speed are rated at 250 hp and 300 hp. This engine may well benefit from the huge fuel price unbalance in Europe, and since it is being developed in cooperation with a major European aircraft manufacturer, will undoubtedly be the first new Diesel on the market.

However, do not expect this to be a cheap engine. The projected price for the 180 hp model is \$40,000, almost twice that of an equivalent spark ignited engine. This engine utilizes heavy turbocharging with intercooling to be competitive in power to weight ratio with existing gasoline engines. The low propeller speed, which is in keeping with European low noise requirements, will force the use of a large, expensive variable pitch prop.



### Continental

Partially funded by NASA in the AGATE program, and still in only drawings and plastic mock up stage. Pitched as a low cost, advanced design engine, I doubt seriously that we will ever see this flying on an airplane in its presently planned configuration. A liquid cooled flat 4 two-stroke Diesel, it has numerous design features that are the total antithesis to low cost. The flat four requires a two plane 90 degree crank for an even firing order, and a fixation on keeping the opposed cylinders precisely in line has led to an expensive slipper rod system similar to the Zoche engines. Even though Diesel engines do not lend themselves to high rpm operation, it is designed as a gear reduced engine with a roughly 2 to 1 ratio. This subjects the design to the impulse load problems in the gearing, and the low output rpm forces the use of an expensive variable pitch (constant speed) propeller.



The scavenging system is good. It uses the system widely used by the GM truck Diesel Division, utilizing intake ports fed by supercharging and in-head exhaust valves. This adds to complexity and engine package volume as compared to simple ports, but provides best control over scavenging and charge precompression. They seemed to have a little problem in selecting the supercharging system, since the section drawing shows a positive displacement unit and the mock up shows a turbocharger. You can't start an external scavenged engine with just a turbocharger, so they are planning an electrical boosted turbocharger from Turbodyne. They are not showing much progress, and I suspect this engine will disappear if the NASA money goes away.

### And the Answer Is...

In view of all these things, I am not planning to rush out and invest my money in aircraft Diesel engines. As for the rest of you - diversity is interesting, and I like to see new things being developed - let your conscience be your guide. To answer the initial question asked at the start of this discourse "Is there a Diesel in your future?"

If you are willing to --

Spend more money -

For an engine that is -

heavier

rougher running and noisier

smokier

to get a little better fuel economy

Then - MAYBE.

- Vance Jaqua

EAA Chapter 1000 Det 8, Camarillo, CA

**Q-200 Spinner Front Bulkhead**

One of the little “difficulties” that I experienced building the Q-200 was the whole world surrounding completion and fitting of the propeller spinner. I used the SN-4 Spinner Kit as supplied by Aircraft Spruce and Specialty Company. I spent a lot of time making templates for the propeller blade cut outs and Bob Waldmiller gave me an enthusiastic hand at accurately cutting the thing without completely screwing it up. The spinner ended up fitting and tracking very well. One thing was, however, missing from the package. You see, Aircraft Spruce does not provide a front plate for hub thicknesses greater than 3-3/8”.



I had noted that a good number of other aircraft builders had experienced success without the front bulkhead (i.e., and after all it was listed as an option in the ACS catalog). I flew my aircraft for some time without any kind of front-end support on the spinner. Then, guess what happened? I noticed some small hairline cracks in the paint at the notched corner in the spinner cutout on one side. After sanding through the paint and primer, I could see that my spinner had developed fine cracks. I had also noted that there was a resonance associated with lower power settings and certain angles of attack coming from the nose of the aircraft. I also noted that there was some degree of flexibility at the nose end of the spinner.

Roger Knight (in the hangar next door) had mentioned to me that the spinner could be rewelded and that he had experienced the same thing on one of his aircraft. I went out and had my spinner rewelded. I primed it and repainted it. I reinstalled it and flew for several more hours. Then, guess what happened? I noticed some small hairline cracks in the paint at the notched corner of the cut out. Well, I talked to some builders and after I got several responses that said “they all crack”, I went out looking for a Kevlar spinner. My new composite spinner had no forward bulkhead either, but it was easy to fit up and attach, much more so than the aluminum. The only drawback was that it just didn’t look as good. It also didn’t have the precision fit of that aluminum piece of jewelry. Frankly, due to the characteristic abrasion resistance of Kevlar around cut edges, it looked like crap. So I went flying with an eye to one day attacking that forward bulkhead issue.

**The Solution:**

After talking with my hangar buddy Bob St Clair, I got the idea that all I needed to do was have a good friction fit with any bulkhead that I was to put up front. All I needed to do was support the nose end of the spinner against torsional bending moments. I didn’t want to try to do it in aluminum, because that looked too hard. I had severe reservations about squeezing any part of a fiberglass bulkhead between the prop and crush plate and taking the chance that it would disintegrate under load.

After looking at the problem for the last two years I figured that I could approach this thing from a simpler direction. I could use the 3/8” thick crush plate outside perimeter as the mounting surface to capture the bulkhead. The bulkhead is a snug fit around the crush plate and is held down around the plate by the snug fit of the spinner constraining it from the top. I fabricated this idea and it goes like this:



**Fabrication:**

Laminate one ply of RA7725 BID with fiber orientation at 0 and 90 degrees to the edge of your layup board. Make certain that the ply orientation is straight throughout. Lay a second ply of RA7725 BID at 45 degrees to the edge of the layup board. Squeegee and allow this two ply lamination to cure.

Locate, layout, straighten, and tape down plastic wrap on a board of 10” by 10” or more. Find a center point for the lamination and create a small indentation at that center point with a small drill bit. Using a compass, draw a 3 inch radius circle about the center point. Sand about and at least 1 inch outboard of the 3 inch radius line with 100 grit sand paper until the surface is dull. Re-draw the 3 inch radius circle and use it to locate your 6 inch diameter (3/8”thickness) aluminum crush plate. Using the crush plate as a template, mark and carefully drill the prop bolt hole pattern into the fiberglass.

Remove the aluminum crush plate and apply one ply of 3M fine line tape to the outer edge of the plate. Allow the tape to overlap no more than 1/2 inch. Apply automotive finish wax or bees wax to the outer and inner faces of the crush plate.

Relocate the aluminum crush plate on the laminated fiberglass plate and secure using three prop bolts. Apply two ply of RA7725 BID around the edge of the of the crush plate on the taped surface only. Each ply should be oriented such that the fibers run 45 degrees to the top and

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bottom surfaces of the crush plate. Each ply should lap onto the sanded area of the fiberglass plate outboard of the 3 inch radius by 1/2 inches all around. This lamination will create a mounting ring about the aluminum crush plate. NOTE: *During the lamination, there should be no contact between the epoxy and crush plate metal surfaces. Peel ply the surfaces which lap onto the laminated fiberglass plate. Allow this layup to cure completely.*

Carefully measure the inside diameter of the spinner for the location at the top face of the propeller (i.e., the diameter at the fuselage station of the prop face/crushplate interface). Mark the location inside the spinner using a felt tip pen. Using a compass centered at the indentation of the laminated fiberglass plate, draw the inside spinner diameter on the fiberglass plate. Using a bandsaw, trim the plate to the inside spinner line.

Apply one ply of duct tape 1 inch above and one inch below the prop face fuselage station inside the spinner. Laminate 2 ply RA7725 BID on the duct tape inside the spinner. Peel ply the entire lamination. Do not allow resin to run down the spinner walls. After cure, remove the peel ply and lamination. Fill any surface imperfections with micro and sand as required. This forms the inner dome interface for the forward bulkhead.

Remove the aluminum crush plate from the fiberglass mounting ring and plate assembly. Remove the fiberglass from the plate assembly which was below the location of the aluminum crush plate and trim to the face of the mounting ring. The plate and ring assembly should have a snug fit on the crush plate. If the fit is too loose, apply a light coat of micro epoxy and sand to fit.



Assemble the propeller, spinner backplate, and crush plate. Place the fiberglass mounting ring and plate assembly about the crush plate. Place the fiberglass inner dome interface inside the spinner dome. Apply about 4 dabs of floc to the fiberglass inner dome interface and the fiberglass ring and plate assembly. Ensure that the spinner, prop, and crush plate are appropriately masked off from any excess floc. Bring the spinner and prop assembly together and insert the spinner machine screws through to the spinner back plate. Allow the assembly to cure.

After cure, remove the spinner. The inner dome interface should be bonded to the ring and plate assembly. The forward bulkhead assembly is finished by laminating the inner dome interface to the plate assembly with two

bias ply RA7725 BID. The final step is to trim off any remaining rough edges.

Finally, a spinner forward bulkhead of this type is currently flying on my Q-200 with my aluminum spinner. I have had no cracks to date with this arrangement. There are also no indications of harmonic rumblings at any power setting or attitude.

- Brian Martinez

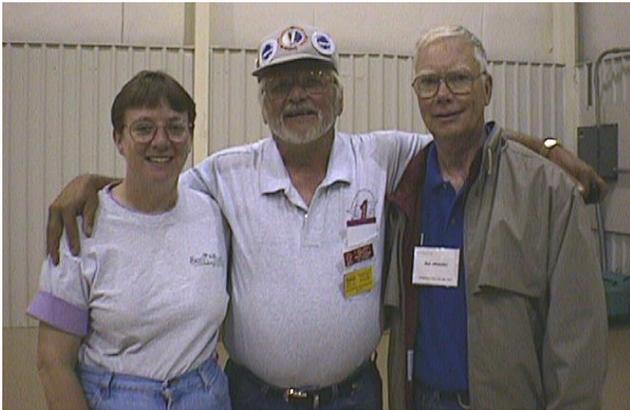
## Winchester Fly-In

Mein Herr Erbmeister,

In my wanderings at the Winchester Fly In I came across this strange looking flivver, I thought you would like these photos of your parent aircraft. Actually a nice looking bird.



The second set of photos consist of my plate of C<sup>3</sup>s with walnuts and a photo of self with Bob Schumaker, Chapter 186 President and Ms Tangy Mooney, NL Editor and Fly in coordinator. These shots were at the Volunteers steak dinner held Saturday night. Note in the photo I am wearing my Chap 1000 Badge.



The weather was perfect and the turnout was good. The surprising thing was the number of RV fans because they were everywhere! At least three T-6s were present. Along with a Tiger Moth and a CJ6, this made up the Warbird contingent.

There were lots of Pipers, Luscombes, Aeroncas, Cessna 170s and one 195! Among the experimentals were RVs, Lancairs, Glasairs, Long EZs, and a beautiful Cirrus VK30 flown by an elderly couple from PA.

Also available were helicopter rides.

The crowd was aided by the Virginia State Chili Cookoffs in the park across the street and a Boy Scout camporee next to the cookoff. Talk about a built in crowd!!

Along with the Fly-In Chapter 186 held a terrific Pancake breakfast in the hangar Sunday morning.

- Bernie Bakken

### More From Copperstate

**Mick Myal**, publisher of *Contact!* magazine (a must have if you are considering an auto engine conversion) captured the following photos of the Copperstate **PPTAF** inspecting a roadable airplane on display. Remember, to be used legally on roads, a "car" has a maximum width of 8 feet, which makes for a rather short wingspan.



The **PPTAF** identify a possible discrepancy



The **PPTAF** registers its evaluation of the concept, awaiting actual flight test data

### Another Cessna 170B Comes to Chapter 1000

**Ryan Smith** must have decided that **Miles Bowen** and **Tony Ginn** were on to something, and recently bought a 1953 Cessna 170B. He sent us the following photo. See it in color on the EAA Chapter 1000 Web Site.



Ryan Smith's "New" 1953 Cessna 170B

## Buck Rivetz' Web Page Review

Project Police Det <DATAMASKED>



*"We're here to help!"*

### Target for the Month:

**EAA Website**

**URL:** <http://www.eaa.org>

**Date of Review:** 8 December 1998

### Buck's back!

After a long absence from the pages of the world-acclaimed Leading Edge, I'm back at it again. Fit, relaxed, and ready to take on any web site deemed worthy of review. After a quick peek at the new EAA web site, and a subtle hint, this month's review is the web-travelers' peek at the revised EAA web site.

It may be of coincidence, but early in this year, EAA had posted a public job offering for an individual to grow and nurture (isn't it enough to make you barf?) the EAA web site. Well, I just had to check it out.....

Let's take a look, shall we...

The new and improved EAA site opens quickly, a good thing for first impressions, and displays to the world some nifty graphics. Looks like the art department has been busy stylin' some pix, and it seems to work. The initial impression is a well-organized site, but let's wait! This is just first impression.

The navigation bar (buttons) are located on the usual left side and the button format appears to be straight out of MS FrontPage 98. Could that be!? Professional web sites with FrontPage? Who needs the other WYSIWYG (term of the month: What You See Is What You Get) tools anyway? The nav buttons are easy to read and generally present the information they intend to portray. Note that the main picture changes each time you reload the page. (Way Cool, 10 points). For the sections of the site, we find Home, Members Hangar, Members Benefits, AirVenture Oshkosh, Cool Pix/Videos, Reach for the Skies, Kid Stuff, Quick Shop, and finally Search.

The rest of the page is dedicated to recent news headlines. Did you know that EAA is giving out new membership cards? Did you know that Meigs Field is celebrating its 50th anniversary? Hey, even the chapters will be getting a new video on EAA issues, to be delivered several times a year. Also contained on the page are short blurbs from each of the divisions, Aerobatic, Antique/Classic, Warbirds, yadda, yadda, yadda. There are also EAA hyperlinks at the bottom of the page, this time including the insignia/logo of the organization at the far end of the hyperlink. Aside from the table format that the links are contained within, it looks pretty good. As every good site should have, all the contact info is at the bottom. So far, so good. Wait! No hit counter?! Well, that's a subject of another discussion...

I also checked out the "kid stuff" button, not really knowing where this was going to take me. It turns out that this one takes you right to the kid's stuff. Imagine that. You'll find the usual on Young Eagles, with a link to that site ([www.youneagles.org](http://www.youneagles.org)), the EAA Air Academy, and other information aimed at the kids. Got to start 'em young and this section shows that.

Next stop was the "reach for the skies" button. I had to wonder if this was a cyber robbery. "Reach for it mister!". "Badges, we don't need no stinkin' badges!" Honestly, I had no earthly idea where this was going but the old "<BACK>" button can get you out of any mess. This page is geared more toward the kid in us. There are links to Education (Young Eagles, Air Academy, the EAA Aviation Foundation, and the EAA's Boeing Aeronautical Library. An outreach section takes one to the EAA Air Adventure Museum, a Flight in the EAA B-17, something called the Vision of Eagles, the Pioneer Airport, and other aviation web sites. If I had a couple of hours I could go through some of these, but the space in the newsletter is limited, so I think I'll move on.

If you have an overriding need for that EAA hat, sweater, shirt, pet rock, patch, or anything else, take a look at the quick shop. Method of payment resembles Oshkosh. There are multiple ways to separate you and your money. But my favorite way is to use the on-line "shopping cart" and order over the web. If you still don't trust the web with your credit card, I have to ask; "Do you give you card to the waitress at your favorite restaurant?" What's the difference? Anyway, the online catalog is good and intuitive. By the way, I work with a guy in my real job who still won't use an ATM because he's been ripped off by a coke machine (but he uses on-line stock trading).

AirVenture Oshkosh. I don't care what EAA says. Oshkosh is still, and will always be "OSHKOSH!!!!!" AirVenture! Who thought that one up?! OOP's. Better get off my Office 98 user's manual, er, soapbox. This year organizers did a great job in presenting the day-to-day activities of the Fly-In and the site is still active. I was unfortunately not able to make the trip this year, but I did follow the convention vicariously through the web. From the look of things, web coverage is just going to get better.

HINT to EAA WEBMASTER: It would be really cool to have an on-the-fly listing of aircraft as they arrive, especially for the homebuilts. Can you say Active Server Page?

To cover the "members hangar" in total will take another session but it's worth an overview now. Some things you just have to do for yourself. I can't do everything, ya know. The member's section has received the same treatment as the main site but it has one irritating feature; it keeps requesting you to provide, for information purposes, your e-mail address. I turned over my address (under duress) and the darn thing wouldn't go away! Between that and the page header, half my screen is useless. "Please, make it STOP!" It did take some time to find the chapter web site directory as well as other chapter contact info. Otherwise, there's lots of good stuff on the chapter programs. The last time I reviewed the site, there were no on-line interviews, but this time there were half a dozen or so. I read the interview with Rinker Buck (Author, Flight of Passage) and it was well done, although

a little on the short side. Over all the members hangar is a nice improvement over the last rendition.

I probably skipped something in this review but I only have so much time. As you already know, I don't spend time on the riff-raff of the web. Only those sites worthy of my minuscule free time are deemed acceptable for the Chapter 1000 Webzins. The site has really improved as of late, and it shows a lot of thought and effort to make this site both informational and entertaining. Some sites are pure eye-candy, and others 100% content, but to achieve the balance is tough. All the formats are consistent through the domain (eaa.org), to include the headers and footers. The contact information is quickly available as is basic information on the EAA (the "What is EAA?..Why should I join?..How can I join?") banner follows you everywhere). There appears to be updated news information to keep a visitor coming back. If it's been a while since your last visit, there's a log of news articles so you can spend some time catching-up. I do like the graphics. They're not too overpowering and seem to add just the right flair. Very well done site.

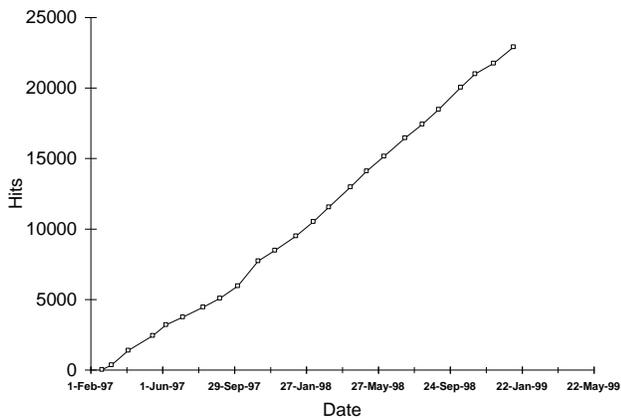
My congratulations to the webmaster. Nice Job! I hereby grant this site

**APPROVED!**

- Buck Rivetz

**Web Site Update**

As of 8 January 1999, the ol' hit counter stood at **22888** hits. This brings the hit rate back up to a typical 35 hits/day, so I figure that the dip last year was indeed due to the change of servers. As usual, see activity below:



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

We continue to occasionally receive e-mail comments on our web site. On New Year's Day, **Chuck Larsen**, a national EAA Education Director, sent this message: "Russ, New (first home) computer for Christmas.....1940 BL-65 Taylorcraft owner/flyer.....came to the Chapter 1000 WEB Page through the link to the T-craft WEB Page...nice job....enjoyed....moving on. The best to you and yours in the New Year."

The original inspiration for the creation of the Chapter 1000 web site was to create a way to get useful

information published in our newsletter to a larger audience who did not have a chance to see it the first time it was printed. (There was also that part about making articles from past issues easier to find for ourselves...)

The particular article that first came to mind was the building plans for the EAA Chapter 1000 Standardized Work Tables (<http://www.eaa1000.av.org/technic/worktabl/worktabl.htm>), designed by **Bob Waldmiller**.

Two years later, it's still a popular article, and not just among aircraft builders. **Roy Hickman** e-mailed to say "I want to thank you for posting the plans and building instructions for your EAA Chapter 1000 standardized work tables. I am a woodworker, and I needed some kind of a table for use as an outfeed table for my table saw. I saw the plans on the web and have just completed it. I changed the plans a bit (What?! Is that legal?!) - built it a bit taller to match the height of the saw table, 4' 6" long, and modified the top by allowing for a 2" overhang on each side. It is a super-strong table and just what I needed. Thanks again, Roy Hickman"

Dave Musgrave e-mailed to say "Great web site (EAA Chapter 1000)! And thanks for the tutorial on starting a web site. I always wondered how that was done! Good Job! Dave"

- Russ Erb, Webmeister



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

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

**Dues Are Due!**

Unless your name appears on page 2 as having paid your 1999 dues, it's time to pay up! Make your life easier, make sure you keep getting your favorite newsletter, and help keep the Chapter checkbook off of life support. Simply give your check for \$20 to a chapter officer or mail it to Gary Aldrich at his address shown over here

**Chapter 1000 Calendar**

**Jan 19: EAA Chapter 1000 Monthly Meeting, 5:00 p.m.**, Edwards AFB. USAF Test Pilot School, Scobee Auditorium. (805) 490-1476

Jan 30: EAA Chapter 49 Annual Awards Banquet, Antelope Valley Inn, Lancaster, CA. Speaker: Mike Melville. (805) 948-0646

Feb 9: EAA Chapter 1000 Board of Directors Meeting, 5:00 p.m., Edwards AFB. Test Pilot School, MOL Room (805) 490-1476

**Feb 16: EAA Chapter 1000 Monthly Meeting, 5:00 p.m.**, Edwards AFB. USAF Test Pilot School, Scobee Auditorium. (805) 490-1476

Feb 27-28: EAA Chapter 1 Open House, Flabob International Airport, Riverside CA. (909) 682-6236

**Feb 27: Operation Rubidoux Sundown VII**, Chapter 1000's annual flyout to Flabob. (805) 258-6335

Mar 3: EAA Chapter 49 Monthly Meeting, 7:30 p.m., Sunnydale School. 1233 S. Ave. J-8, Lancaster, CA. (805) 948-0646

Mar 9: EAA Chapter 1000 Board of Directors Meeting, 5:00 p.m., Edwards AFB. Test Pilot School, MOL Room (805) 490-1476

**Mar 16: EAA Chapter 1000 Monthly Meeting, 5:00 p.m.**, Edwards AFB. USAF Test Pilot School, Scobee Auditorium. (805) 490-1476

Apr 7: EAA Chapter 49 Monthly Meeting, 7:30 p.m., Sunnydale School. 1233 S. Ave. J-8, Lancaster, CA. (805) 948-0646

Apr 13: EAA Chapter 1000 Board of Directors Meeting, 5:00 p.m., Edwards AFB. Test Pilot School, MOL Room (805) 490-1476

Apr 11-17: Sun 'N' Fun EAA Fly-In, Lakeland FL.

**Apr 20: EAA Chapter 1000 Monthly Meeting, 5:00 p.m.**, Edwards AFB. USAF Test Pilot School, Scobee Auditorium. (805) 490-1476

May 5: EAA Chapter 49 Monthly Meeting, 7:30 p.m., Sunnydale School. 1233 S. Ave. J-8, Lancaster, CA. (805) 948-0646

May 11: EAA Chapter 1000 Board of Directors Meeting, 5:00 p.m., Edwards AFB. Test Pilot School, MOL Room (805) 490-1476

**May 15: Seventh Annual Scotty Horowitz Going Away Fly-In**, Rosamond Skypark (L00), Rosamond CA.

**For Sale:**

Sonerai IIL project. Fuselage and wings 95% complete. Modified for A65 engine. Engine torn down for overhaul but complete with a great many spare engine parts. Includes instruments. Hydraulic brakes. All excellent work. Call Fletch Burns 760-373-3779

*To join Chapter 1000, send your name, address, EAA number, and \$20 dues to: EAA Chapter 1000, Gary Aldrich, 42370 61<sup>st</sup> St. W, Quartz Hill CA 93536. Membership in National EAA (\$40, 1-800-843-3612) is required.*

Contact our officers by e-mail:

Gary Aldrich: [gary\\_aldrich@pobox.com](mailto:gary_aldrich@pobox.com)

George Gennuso: [pulsar1@qnet.com](mailto:pulsar1@qnet.com)

Miles Bowen: [miles\\_bowen@ple.af.mil](mailto:miles_bowen@ple.af.mil)

*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)*

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>**

**ADDRESS CORRECTION REQUESTED**

**THIS MONTH'S HIGHLIGHTS:**

**REGULAR MEETING 19 JANUARY AT TPS**

**IS THERE A DIESEL IN YOUR FUTURE?**

**SPINNER COMPOSITE FRONT BULKHEAD**

**NATIONAL EAA'S NEW WEB SITE**

