



**Experimental
Aircraft
Association
Chapter 105
Portland, OR**

**Twin Oaks
Airpark—7S3
www.EAA105.org**

**The Purpose of
EAA Chapter 105
is to Promote Aviation
Education, Construction,
Recreation and Safety for
Enthusiasts of All Ages.**

122.75

J. Rion Bourgeois, Chapter President

History of EAA Chapter 105

I have been asked to write a history of the chapter for the new website. I thought that would be a good subject for this month's column, as well. I have only been a member since the early 1990's, so I have to rely to a great extent on the recollection of older members. Please consider this an outline, and feel free to write me or e-mail me with any recollections you have so that I can fill in the details for the website page. Also, please share with me any old photos you may have of chapter meetings, members, projects or fly-ins. I already have received quite a few from Hank Bullock (former chapter president), some of which will be scanned and posted on the website, and some of which appear in this month's newsletter.

The Early Days

Experimental Aircraft Association, Inc., Portland Chapter 105 is a local chapter of the Experimental Aircraft Association. Although the EAA hasn't maintained its earliest records, the chapter was apparently chartered in 1961. The earliest extent chapter status re-



Carl Battjes speaks with RV-3 pilot Norm Durell.

port is dated 12/31/65 at which time Dick Van Grunsven was president, there were 88 members, with 50 home-built aircraft under construction, 11 flying home-built aircraft, and 1 vintage aircraft under restoration. The chapter was incorporated on January 26, 1966.

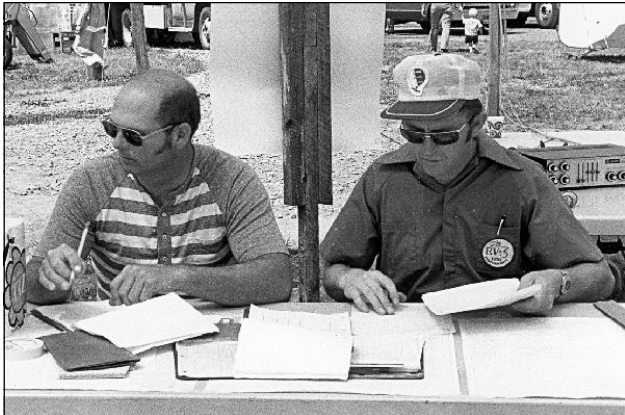
The chapter has held its monthly meetings in a variety of locations. In the late sixties, it met in the basement of a bank in Milwaukie. It met for a time thereafter at a hangar at Aurora State Airport, and at a hangar at Lenhardt's Airport. It then met for many years at the PGE office building at the intersection of Scholls-Ferry Road and Murray Blvd.

— Dues Reminder —

Many Chapter 105 memberships expired at the end of the year. Please renew promptly, and update contact and project information. A renewal form can be found on page 17.

In This Issue

122.75.....	1
Report from the Design Group.....	4
'Round the Patch.....	5
The February Meeting.....	6
Future Meetings.....	7
January Meeting—Kent Byerley's RV-9A.....	8
Experimenting—Pre-flight-able Brake Reservoirs.....	9
Ducts Vs Diffusers—Cooling.....	11
2004 Aviation Calendar.....	14
Board Meeting Highlights.....	14
Editor's Notes.....	15
Buy / Sell / Trade.....	16
"Contact" Chapter Officers and Staff.....	16
EAA Flight Advisors and Tech Counselors.....	17
Membership Registration / Renewal Form.....	17
Breakfast Volunteers.....	18
Chapter Calendar.....	18
Next Meeting.....	18



Norm and Van take your money at the registration booth of an early Lenhardt's fly-in.

In the '60's and '70's (I am unclear on the actual dates), the chapter held an annual fly-in at Lenhardt's south of Aurora. See the accompanying photos. The RV-3 belongs to Bob Larsell. He is still a chapter member, and still lists this RV-3 as one of two that he owns and flies. The guy he is talking to is Carl Battjes, still a member and a former president. The other picture shows Dick Van Grunsven and Bob Larsell manning the registration table. Both are still members and former presidents of the chapter. When anyone talks of the early days, the name Holly Fletcher always comes up. He was a mem-



On final for Lenhardt's.

ber of great enthusiasm who lived at Dietz Airpark.

Twin Oaks Days

Under the leadership of Del Zander and Bill Benedict, the chapter began renting a hangar at Twin Oaks Airpark in the early 1990's where it held monthly board meetings and chapter meetings. Because RVs were the most ubiquitous design, and because RV builder support was provided by the Home Wing, chapter meeting programs at the chapter hangar typically involved some other design or some other aviation related topic. The chapter sometimes held the monthly chapter meeting off site at aircraft projects (Lancair IVP, Thunder Mustang, T-34) or at an aviation related business.

The chapter has also held a fund-raising pancake and grits breakfast and fly-in at Twin Oaks the first Saturday of every month without missing a month since the summer of 1994. Attendance averages 150 to 200 diners, with lots of aircraft on good weather days. It has also held a Poker Run in June the last two years, with a barbecue afterwards for the participants.

The chapter restored the prototype RV-3 for donation to the EAA museum at Oshkosh in 1997. It also obtained 501c(3) recognition that year. The chapter owns and has a future project in the restoration of George Bogardus' Little Gee Bee which he flew back to Washington DC in the late '40s or early '50s. With the majority of the proceeds of the George Bogardus estate, the chapter in 1999 established the George and Lillian Bogardus Memorial Trust Fund to carry out charitable, scientific or educational purposes and to support the purposes of several aviation related 501c(3) organizations in the region, including Chapter 105.

Chapter 105 has also hosted the EAA's B-17, "Aluminum Overcast", at HIO in 2000 and 2002, and will host her again in 2004 on June 17 through June 21.

Second Saturday Kid's Series Speakers for Kids

Tuskegee Airmen - Red Tail Mustangs February 14th

Robert H. Strickland, Founding Director of Centers for Airway Science, private pilot and member of several aviation associations including the Tuskegee Airmen, will discuss the Airmen's heroic exploits during WWII as well as the interests and inspirations that led to his decision to develop Centers for Airway Science.

Hangar Flyin' Tales - Women Fly Too March 13th

A. A. Khat loves to fly! A member of the 99s, Whirly Girls, OPA & EAA, she flies helicopters, her Cessna 150, and will fly the RV9A experimental airplane that she's building while working towards certification as an Aircraft Mechanic (AAP). Women flying and some of her flying experiences will be shared.

The series runs every second Saturday from 10 to 11 AM at AEROFRAME Gallery, located at the intersection of I-205 & 99E (McLoughlin Blvd.) in the Oregon City Shopping Center, two doors north of Fisherman Marine Supply.



The Home Wing

The Home Wing of Van's Air Force was an unincorporated association of RV builders that met on the second Thursday of every month, usually at an RV project to view the host's project and discuss building techniques. Needless to say, the host project was the focus of the meetings. The attendees generally were either building an RV or considering it, and the level of enthusiasm at the meetings was very high. Although it was not chartered, it contained the very essence of an EAA chapter: builders banding together to assist each other with their projects.

The group was organized in 1991 or 1992 by four Chapter 105 members: Ken Scott (former Chapter 105 president), Steve Harris, Bill Kenny, and Don Wentz (former Chapter 105 president). In more recent years, the association was managed by Don, Randall Henderson, and Randy Lervold.

The group originally began meeting to provide builders' assistance to RV builders. Such builders' assistance is a traditional role of EAA chapters, but the Home Wing was type specific, dealing only with RVs. Members of several local EAA chapters also belonged to the Home Wing, and Home Wing members participated in EAA sponsored programs such as the Technical Counselor program and Young Eagles flights. Some Home Wing members belonged to the EAA, but didn't belong to an EAA chapter.

Since 1992, the Home Wing also hosted an annual RV fly-in at Scappoose Airport. In recent years, attendance has often exceeded 100 RVs. T-shirts adorned by a member's recently completed RV are sold at the fly-in and worn with pride by local builders. Some members, myself included, have

at least one example of every T-shirt. This fly-in is one of the premier aviation events in the Northwest. It has been successful due in large part to the efforts of Don and Janet Wentz who hosted it out of their hangar at Scappoose. The fly-in will again be held on its traditional Father's Day weekend on Saturday, June 19, 2004. This year, Mike McGee has volunteered to ramrod the fly-in. In 2004, the membership of the Home Wing merged into the membership of Chapter 105. Currently, we have 287



Above: Kelsey Hickman checks the Poker Run competition (Brent Anderson's RV-4). Below: Savanna and (Pres) Rion Bourgeois at a Poker Run stop.

members, and will be holding most of our meetings at aircraft projects.

Breakfast Volunteers Policy

Now that we have some new members, I thought it would be a good idea to explain the breakfast "volunteers" system. There are a core of regular volunteers who work the breakfast almost every month. You can recognize them because they each have their own

Please plan to attend the next Project Advisory Committee (PAC) Meeting

The focus of the PAC meeting will be the committee's review of technical documents, and a discussion of the study that will provide input to the Port project team and help produce working documents. Meeting topics will include the airport operations inventory; existing noise conditions; and the future role of Hillsboro Airport.

All meetings are open to the public and include an opportunity for attendees to offer comments.

The meeting facility is wheelchair accessible. Parking is available, and the MAX blue line serves the airport at the "Hillsboro Airport / Fairgrounds" stop.

When: Wednesday, February 25, 2004

Time: 6:00-9:00 p.m

Where: Red Lion Hotel Hillsboro, Cascade Ballroom
13500 NE Cornell Road
Hillsboro, Oregon

For more information please visit
http://www.portofportland.com/hillsbor_mp_pac_email_ann.htm

personalized aprons. (You can become a regular, too, if you want, and earn your own apron.) Each month, we also "volunteer" eight members for the 7 to 9 am shift, and eight members for the 9 to 11 volunteer shift. They are picked alphabetically each month from the roster and their names posted in the newsletter. We used to call them each month, but now Brent Anderson sends those that have an e-mail address a message reminding them that they have "volunteered". Members who live more than 50 miles away or on the other side of a mountain range are geographically excused, and will not be included in the posted list. (They are free to volunteer if they want. Just call Brent any month you want to serve.) Those who can not serve because they work Saturday mornings or for long-standing or permanent medical reasons can also call Brent who will annotate their name in the roster and they will not be included in the volunteer list.

If you are unable to attend for the month of your assignment, you are asked to try and find a substitute and notify Brent. There is no penalty if you fail to serve. We rely solely on our member's conscience and honor. You will be excused if you have a good reason, like getting married that month, major surgery, a bandage on your hand, a cold or other contagious illness, or some other catastrophe. Just try and find a substitute and notify Brent if you are unable to serve.

[The center column space was to be filled with pictures from the Design Group's visit to Van's Aircraft factory. My deadline arrived, but the film didn't. What was that someone was asking me about why I like my film camera so much? Ed.]



Arlington '96: Above: Team? (N272AF and N6082C); Center: Greg Fritz, Pitts S2-B (N6027V); Below: Salad Time team, Robinson R-22s.

Report from the Design Group*

Carl Battjes

On January 22, we met at Van's Aircraft factory at Aurora Airport for a very instructive and enjoyable tour and talk by Ken Krueger, chief engineer. Ken shared the details of design, testing, and manufacturing involved in RV aircraft kits. Everyone appreciated the tour and was impressed with the organization and efficiency of the operation. Even Ken said he enjoyed the interchange.

What impressed me the most was the evolution of the company, designs, and kits. I first met Dick Van Grunsven in the mid 70's, after he had built the prototype RV-3. He was struggling to put the RV-3 into kit form, while at the same time designing the RV-4. All this was done in very modest surroundings and with a pretty low budget. The design of the RV-4 was done amidst the clamor of the single-place RV-3 pilots salivating to get a two-place RV-4 so that they could share the pleasure of flying this type airplane. Dick did this design at his own pace and in his own manner. Each new RV design carried much of the structure philosophy of past designs, but with continuing improvements. Today, we have all of the models with preassembled spars and matched-hole drilled sheet metal. It's mind boggling to see what has evolved from 30 or so years of focused, unrelenting energy on the part of a talented individual and a dedicated team at the factory.

* The Design Group is composed of about a dozen individuals who are interested in the airplane design process. We meet every month at some house or hangar and/or project. In Chapter 105 we have Carl Battjes, Dick Monaghan, Phil Groelz, and Benton Holzwarth.

'Round the Patch

Mike McGee

Moving to the airport

Walt Foster is almost ready to fly. His RV-6A QB has been in the works for a couple of years and now it's in his hanger at Scappoose. He had some good things to say about Hillsboro Towing and moving his plane to the airport. These guys seem to have a bit of practice in moving airplanes and take extra care with your baby.

Fly-in Season Planning Starts Now

We are getting things rolling for the 13th Annual Home Wing Fly-in—The date is set, June 19th, it's time to start thinking about helping with the fly-in and burger feed. As in the past it will be located on the Scappoose Airpark. In years past with good weather we typically see about 100 RVs and feed about 300 burgers to pilots, passengers, builders and onlookers. Mark your calendar, unfortunately in the middle of the Golden West Fly-in in Marysville, CA. It's too bad they moved THEIR fly-in to the same day as ours. It's just going to cost them gate receipts. P-)

Next Meeting Newsletter Reporter

You've always wanted to try your hand at being a reporter doing stories on flying

machines and here's your chance! Backup reporter needed for February meeting—Yours truly will be tearing it up in Jackson Hole on February 12th. We need someone to take on the reporting duties for the meeting

at Randy DeBauw's RV-10 project. Here's your chance at that Pulitzer.

MGM



Meeting Coordinator:

Randall Henderson

503-297-5045
rv6n6r@comcast.net



February 2004 Chapter Meeting

Project: Randy DeBauw's RV-10

Address: 12445 SW 19th Ave, Lake Oswego

Date: Thursday February 12, 2004

Time: 7:00 pm

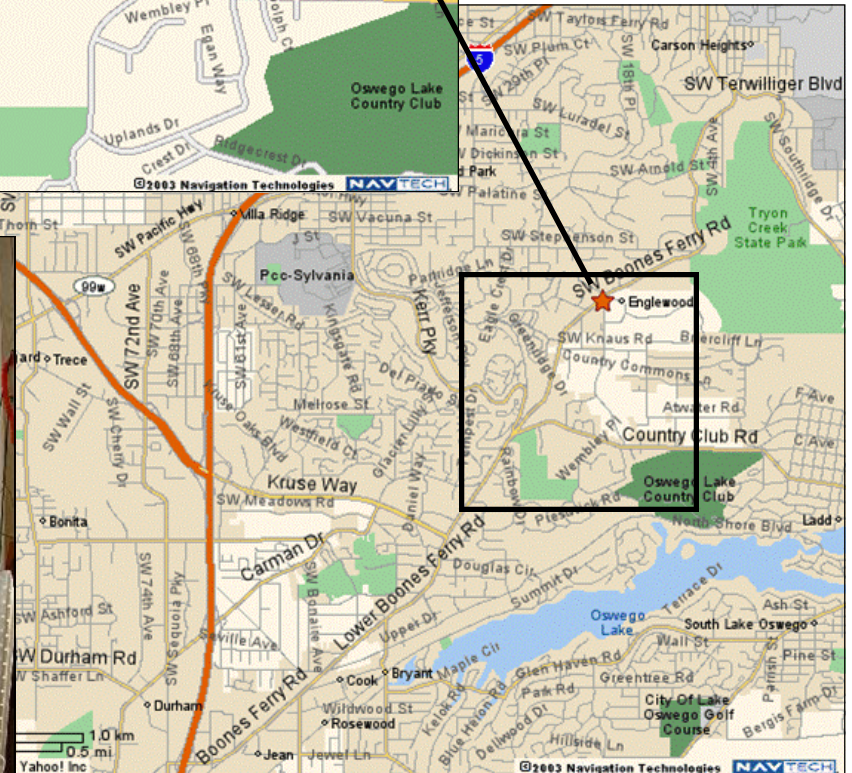
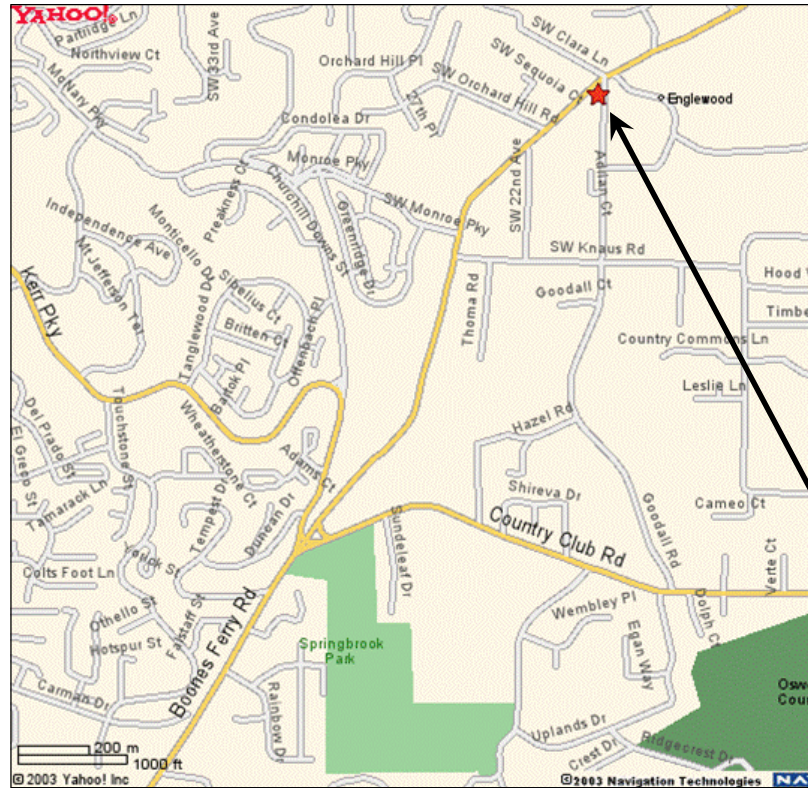
Phone: 503-245-8559

The February meeting

The meeting will be at Randy DeBauw's RV-10 project. This is the first customer-built RV-10 project we've had a chance to visit, and it's a good one too -- rumor has it that Randy is the fastest RV-10 builder in the country!

From I-5 south or north take the Kruse Way (same as Hwy 217) exit and head East on Kruse Way to Boones Ferry Road. At Boones Ferry Road, turn left (north). Stay on Boones Ferry, do not take the "Y" to the right at Country Club or you will go to downtown Lake Oswego. Turn Right at the yellow caution light which is 19th. Ave. Randy's is the first house on the right. Besides the driveway additional parking is available in the lower gravel driveway or in the grass field if you have 4 Wheel drive (it can be soft with the rain).

(There are several other ways to get on to Boones Ferry Road. All will work just fine, but they are more confusing than the above directions.)



Future Meetings

[March—Van's Aircraft Aurora](#)

[April—Ralph Hudson's Strojnik S-2A](#)

[Motor Glider](#)

[May—TBD](#)

About the meetings

Meetings are the second Thursday of the month, starting at 7:00pm, unless otherwise specified (here and in the newsletter), and are typically at the site of someone's experimental aircraft project or hangar.

The structure of the meetings is pretty loose. The first 40 minutes or so is generally spent socializing, eating chips and dip, and checking out the project. Then we get down to "business", with introductions of new members and guests, milestones, discussions of group issues, open items, and the host project. After that, it's back to BSing late into the evening.

Be sure to bring any tools, parts, etc. that you wish to sell, loan, give away, etc. And while you're there, throw a buck or two into the kitty, to help out the host for costs

of purchasing the refreshments.

All are welcome, building or not, group member or not. Spouses too!

Meeting places are always needed. If you would like to host a meeting, you will be expected to provide:

- A location that will hold 30-50 people. In the summertime this can usually include just about any size shop as long as we can overflow outside.
- Refreshments. You can get away with a couple of bags of chips and a few six packs of soda, or go all out and provide a full buffet bar with microbrew beer and smokies on toothpicks. We're all really there mainly to BS about airplanes, so don't feel like you have to go overboard with the food -- but feel free to do so if you want!
- A "kitty" -- a jar or bowl for folks to throw a buck or two into. No reason the host shouldn't get some reimbursement for all that food and drink.

[Contact the Meeting Coordinator](#) if you are interested in hosting a meeting. Once we get through the business part of the meeting, you'll be expected to talk about your project for 20 minutes or so. For example, people usually like to know:

This Month's Contributors



Mike McGee

HW Editor / Chapter
105 Associate Editor

With Navigator/
Proofreader.

- Anything in particular that led you to choose this particular project?
- Any 'gotchas' to let others know about?
- Any cool techniques or tips to pass on?
- What would you do different next time?
- Have you used a TC? Do you plan to use a Flight Advisor?
- What kind of primer did you use? ;-)

If you have a different sort of presentation that's fine, this is not a "required questions" list, just some suggested topics. Just let the meeting chairperson know how you want to handle it before the meeting starts.



Heli-Khat — "My RV 'n me."



Joe and Char Miller pose with their newly painted RV-9A, N282JC.



N27RV, now reg'd in Auburn, AL, was at the '93 Troutdale Airfair.

The January meeting was hosted by Kent Byerley at the Aurora Airport. Kent is building a Van's RV-9A that will replace the Cessna Skyhawk he is currently using to stay current.

The weather was daunting that night. Everyone in Vancouver was iced in and the Portlanders that came out were mostly in 4 wheel drives. Not a plane in the sky that evening, even for an airplane meeting at an airport, thanks to the weather. A hardy group of those you can't keep away were treated to a steaming pot of chili, hot dogs, and more cookies than I should have eaten.

Kent has been working on his plane for a couple of years. The tail and control surfaces are finished, the wings are mostly complete save for one skin and fuel tanks.

Kent gave us a rundown on the history and progress of his project and entertained questions about the construction process.

This was the first meeting of the joint forces of Home Wing and Chapter 105. It was good to see some new faces and we were treated to some discussion not normally seen at the Home Wing meetings.



Left: Chef Byerley serves up a mean chili dog. Below: Hangar for three and one in the works. Home of Kent's Skyhawk, a Pacer, a Stinson 108 and an RV-9A.



January Meeting at the Aurora Airport

Kent Byerley's RV-9A



Above: The Chief Editor of the Chapter 105 Newsletter gets familiarized with an RV wing. Benton is currently building a Bearhawk.



Right: The wing jig Kent uses is on wheels to accommodate all the airplane traffic in the hangar.



Experimenting

Pre-flight-able Brake Reservoirs

By Mike McGee

Have you ever wished you could take a quick look at your brake reservoirs on your preflight? That is without taking off the cowling or crawling under the panel and dip-sticking the reservoirs. I have a particular "sensitivity" to that desire having flown airplanes in the past that had an occasional need for a shot of MIL-5606 (hydraulic / brake fluid).

I was cruising the net one day and found where someone had made some real nice brake fluid reservoirs out of lexan tubes and CNC machined ends. Later, when I tried to find them to give them my business I had no luck at all. I thought I could come close with some parts



Home from the hardware store.

from the Aircraft Construction Equipment hardware store.

I was looking at the vinyl tubing and noticed that 3 inches was pretty stiff and thought it would make a good transparent brake reservoir. It would be easy to adapt to the brake system with standard NPT brass pipe fittings

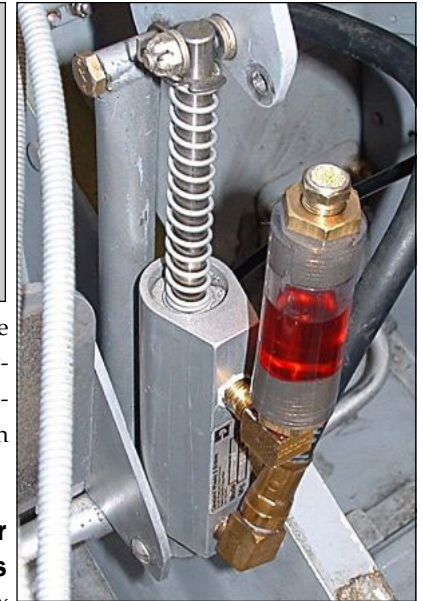
There is a caveat here...

If you look at a materials compatibility chart you will find that vinyl is not recommended for hydraulic fluid because it will become brittle over time. I happened to have a long term test piece in my hanger so I could see how much time they were talking about. I have a standard oil squirt can that I use to add brake fluid to the plane. It has a one foot piece of *clear vinyl tubing* attached to it that slips onto the fitting on the bottom of the brake caliper. This piece of tubing has had hydraulic fluid in it for 7 or 8 years. Yes, it is not as soft and pliable as it was when new. I would not characterize it as brittle. You could split it if you hit it with a hammer or squeezed it with pliers. Therefore I was comfortable using vinyl for the brake fluid reservoirs. They will never be under any pressure and I can check them regularly as well as at the condition inspection. If a pilot were to kick these hard enough to break them I assume there are much greater problems at hand than getting brake fluid on your shoes. I realize

this may make some pilots nervous. I feel the advantages outweigh the disadvantages.

Brake Reservoir Bill O' Materials

- (1) 1 ft 7/8" OD x 5/8" ID vinyl tube.
- (4) 3/8" x 1/8" NPT brass bushings.
- (2) 1/8" NPT double male elbows (pictures show elbows with nipples, I just used what I had on hand).
- (2) Van's Aircraft p/n BB-CAP Screened vented caps for your brake reservoirs. No check valves so they may leak slightly when inverted. You probably already have one on your plane.



Test-assemble the clear brake fluid reservoirs without the pro-seal.



(Dab) Pro-seal from the can you've got on the shelf. I use Permatex hydraulic pipe fitting sealer for the threads.

Assembly

Cut the tubing to approximately 2-1/2" lengths, one for each brake. This gives plenty of volume for the full wear of your brake pads by about double.

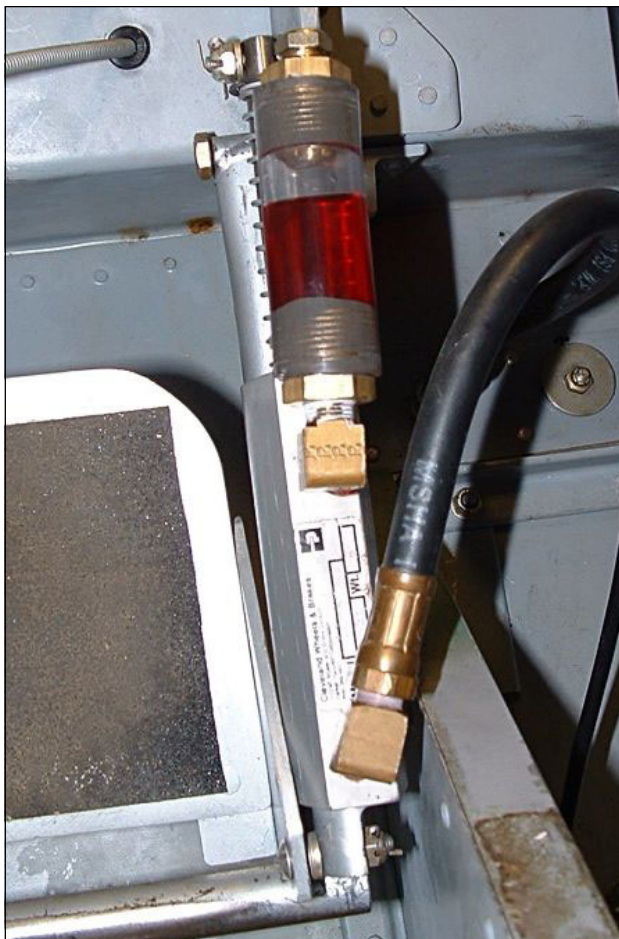
Trial fit the pipe bushings into the tubing to verify an interference fit. You should almost have to screw the bushing back out of the plastic. The hex head of the bushing will remain exposed.

Mix up enough pro-seal to fill the threads in the bushings and screw them into the plastic tubing. Give the pro-seal a couple of days to set up.

Using the thread sealant install the elbows on the master



Thread sealant — a little dab 'l do ya.



Pre-flight brake check. A flashlight will be helpful but you don't have to pull the cowling.

cylinders first.

Notice that the hex head of the bushings is exposed so you can use a wrench on it, install the reservoir on the elbow with thread sealant. DO NOT tighten the reservoir by twisting on the plastic.

Install the cap with two wrenches so you don't twist the bushing in the plastic tube.

Fill the brakes from the wheel cylinder until the reservoirs are about half full.

Check for leaks frequently or every time you pre-flight your brakes.

Log It

According to Das Fed, our local FAA inspector, this is a major modification to a flying aircraft. It will require a log book entry and short (5 hour) return to Phase 1 test period.

Happy pre-fighting.

IMPORTANT: The Van's Air Force Home Wing and EAA Chapter 105 newsletters are in no way a publication of Van's Aircraft or any other corporation. All products reviewed or mentioned are not necessarily recommended for use by the Home Wing or EAA Chapter 105, but are included for informational purposes only. All building or flying tips represent only the means by which the builder whose name is associated with the tip chose to build or fly his/her aircraft. Builder's tips are not meant to replace the plans and instructions from Van's Aircraft or any other company. All information is presented only as a source of information, and this newsletter is a forum for exchange and the sharing of ideas and construction methods only. NO responsibility or liability is assumed, expressed, or implied as to the suitability, accuracy, safety or approval thereof. Any party using the suggestions, ideas, or examples does so at their own risk and discretion and without recourse against anyone. The editors of the Home Wing and EAA Chapter 105 newsletters and the builder's tips submitters are not responsible for any product, incorrect construction, design failure, unsafe aircraft operation practice, nor any other peril. Any material printed within may not be reprinted without specific permission, and then should include credit to the original source and author. The Home Wing and EAA Chapter 105 newsletter is published monthly. A complimentary issue for new builders is available upon request. Mail or e-mail all subscriptions, ideas, tips, tricks, and articles to the newsletter editor.

Ducts Vs Diffusers – Cooling

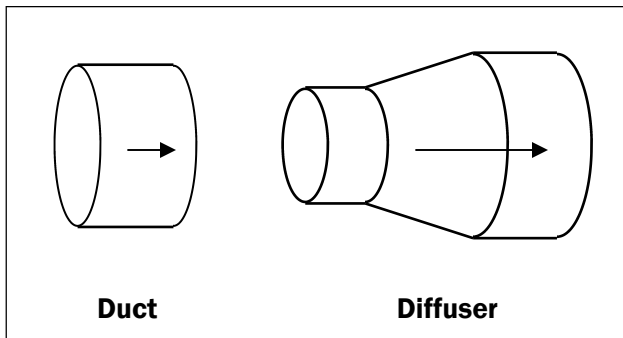
Ed Anderson

[Kevin Lane forwarded this post to the 'FlyRotary' mail-list. Thanks both to Kevin for bringing it to our attention and Ed Anderson for permission to publish and additional diagrams. Ed.]

Ok folks, I've been developing a bit more understanding (I hope) of the cooling science/art/mystery - still a long ways to go, but finally understood a bit more about ducts and diffusers and why you want to use a diffuser (where possible) in front of an heat exchanger.

What's a duct and what's a diffuser?

A duct can be thought of as an air-path with no change



in its cross-sectional area.

A diffuser on the other hand has an air-path that goes from a smaller to larger cross-sectional area or the area diverges (as they say).

Clearly the constant cross section duct is easier to build so why would you want the complication of making a varying cross-section diffuser? Note: The terms Duct and Diffuser are sometimes used interchangeably - so it can get a bit confusing when reading. But, for our purposes a duct is with unchanging cross-sectional area.

Well, it took me a while to understand what all the math meant in real world terms regarding a diffuser (assuming that I now have it correct.)

A subsonic diffuser does one principal thing—it slows down the velocity of the air mass entering it. "So?" you say. (When I want all the cooling air-mass I can get) why should I want to slow down the air? Well, because it's good for your cooling and your airspeed.

Yep! That's what it ultimately boils down to and why you want a diffuser rather than just a duct.

Don't ask me (yet) how to go about designing the diffuser you need at this point, but here is what happens in a nut shell. What the diffuser does is transform the kinetic and pressure energy of the air-stream. With the cross section area diverging (getting larger), the air pressure increases, the air density increases, the temperature increases (but not much) and the velocity decreases. The following is my attempt to explain how this happens.

Explanation of Diffusers

Picture a tube of air created by drawing a circle of area A_i (your cooling inlet) through the air at 120 MPH (176 ft/sec) for one second. That is then the air mass entering your inlet of area A_i for your Diffuser of area A_e (the large divergent end). The tube of air is 176 ft long (L_i) with an area of A_i which is the same as saying the volume is $A_i * L_i$ or since $L_i = V_i$ (for one second), we can say the volume is $A_i * V_i$. This is the volume of air that flows into the diffuser section with cross-section area of $A_e = 3 * A_i$ (remember to be a diffuser, the outlet area has to be larger than the inlet area) but where the velocity of the air-mass has dropped to velocity V_e (where $V_e = 1/10 * V_i$ nothing is 100% efficient so there will be some residual velocity left.)

Consider an air mass flowing at a velocity V_i through the

Some terms

Inlet:	small area
Diffuser:	large area
V_i :	Velocity ft/sec
V_e :	Velocity remaining in diffuser; always some
L_i :	= $V_i / 1 \text{ sec}$
L_e :	length of large area
A_i :	Area of Tube (ft ²)
A_e :	Area of large section
P_i :	Pressure at small area
P_e :	Pressure in diffuser
ρ_i :	air density (Lbm / ft ³)
ρ_e :	air density in diffuser
Mass:	= (Lbm)
Kinetic Energy: K_e	in BTU

inlet of area A_i to a diffuser for one second of flow. This volume of air is $A_i * V_i$, taking the density (ρ_i -air density 0.0076lbm/ft³ -not PIE) of this air mass, one can calculate the mass flow = $\rho_i * A_i * V_i$. Mass flow through the system does not change (subsonic velocity assumed)!!!!

Now have this mass flow be decelerated to V_e (where $V_e = 1/10 * V_i$ - a good value for a good diffuser) by a diffuser of area A_e placed at the end of the inlet. Assume that the area A_e is 3 times larger than the inlet area A_i or $A_e = 3 * A_i$. Consider what this means:

1. Since the mass flowing into the system must equal the mass flowing out, $\rho_i * A_i * V_i = \rho_e * A_e * V_e$. However we know that area A_e is 3 times larger than A_i , which means the product of $\rho_e * V_e$ must be smaller by a factor of 1/3 to maintain the mass flow equation balance. In reality, we know that V_e is also less as the basic function of a diffuser is to decelerate an airflow. This then means that the density ρ_e must increase. Actually the density ρ_e , the pressure P_e and the temperature T_e all increase as a results of converting the kinetic energy of the mass flow

into dynamic pressure and increased density within the smaller volume of the diffuser.

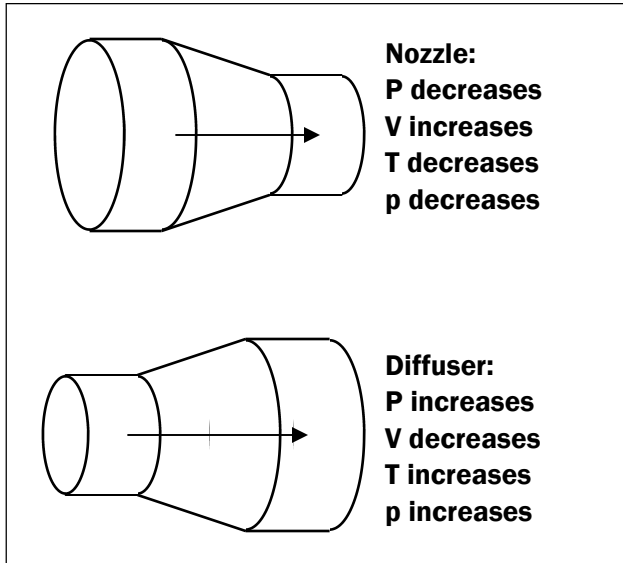


Chart summarizes what is happening in nozzles and diffusers at subsonic speeds. Note the diffuser shows that Pressure (P), density (p), Temperature (T) all increase (though the increase in density and temperature are small enough to ignore for our purposes at low Mach numbers ($M < 0.3$)).

2. It may seem counterintuitive to have the pressure and density increase when the area is increased. Most would predict that the density and pressure would decrease with an increase in area. This is indeed what would happen in a closed system. However, a diffuser with air mass flow into and out of it, is an open system and the air mass flow continuously brings energy and air mass into the system (diffuser).

3. Consider this: You have a volume of air L_i long traveling at speed V_i (think of a long tube of air) with kinetic energy of $m \cdot \frac{1}{2} \pi V_i^2$. This energy is for the column L_i long. Now when the air enters the increased area A_e , the

velocity has decreased to V_e . We have a volume of $A_e \cdot L_e$. Recall that A_e is $3 \cdot A_i$ however L_e is $(1/10) \cdot L_i$ because the length of the tube is equal to the velocity divided by time (1 second in this case), so L_e is effectively V_e at 1 sec. Therefore we have the same amount of kinetic and pressure energy that had previously occupied the volume of $A_i \cdot L_i$, but now it occupies a lesser volume of $A_e \cdot L_e$.

(I know, I know my duct is not 17.6 ft long ($L_e = (1/10) \cdot L_i = (1/10) \cdot 176 \text{ ft} = 17.6 \text{ ft}$). But that is for 1 second of flow after diffusion. Even at $V_e = (1/10) \cdot V_i$, my airflow would actually undergo the continuous diffusion process—the amount of time it takes for the denser air-mass to flow through my diffuser's larger area (approx 6" in length) would be $= 0.5 \text{ ft} / 17.6 \text{ ft/sec} = 0.0028 \text{ sec}$. So you don't need a diffuser length of 1/10 your V_i as the diffuser is continuously processing the air-mass as it flow in and out of it. (It does it very, very fast >:)).

So the air-mass that now occupies $A_e = 3 \cdot A_i$ and $L_e = (1/10) \cdot L_i$ (because we assumed the diffuser decelerated the V_i to $1/10 V_i = V_e$ (and for 1 sec timing $L_e = V_e$) so volume $A_e \cdot L_e = 3 \cdot A_i \cdot (1/10) \cdot L_i = (3/10) \cdot A_i \cdot L_i$. Again the diffuser volume $A_e L_e = 3/10 A_i L_i$ volume.

So the volume the 1 second of air-mass occupies after being processed by the diffuser is only 3/10ths (in this example) of the original volume it previously occupied in the 176 ft long tube of air.

4. So with the original column's air-mass now in a volume 1/3 the original size, we can see why the pressure, density and temperature increases in the diffuser. It's because all the kinetic and pressure energy of the original airflow (and its air molecules) now occupies a volume only 3/10's as large as it once did.

5. Therefore, in summary, the density, pressure and

temperature all increase and the airflow velocity decreases in a subsonic diffuser (you can check this in plenty of references).

Additional notes of interest: Duct vs Diffuser. So, Ok, fine a diffuser is magic, but so what? Here is the so-what!

Both a duct and diffuser act as a container for the air flow. However, the duct does not reduce the velocity of the air as does a diffuser. (Note: There is some reduction due to side wall friction and turbulence in a duct, but that is lost energy and not recoverable, and is nowhere near the reduction of airflow velocity caused by a diffuser.)

If the radiator were unshrouded, then while some airflow would continue to go through the center, much of the air at the outer edges would flow around the sides of the radiator as the path of least resistance. Both the duct and diffuser acts as a container. If a radiator were abutted to the end of duct the air trapped in the duct would tend to flow through the radiator (at a higher velocity, with more turbulence and energy loss) than the air out of a diffuser. Both diffuser and duct prevent this from happening. We're "even-Stephen" so far as containing the air flow goes - they both do it.

You could just make a duct to contain the airflow (to prevent it from spilling around the edges of the radiator) much as a diffuser would do. However, there is yet another factor that favors the diffuser. Drag is directly proportional to the frontal area of the radiator. Drag is also proportional to the square of the velocity of the air flow through that radiator area. So higher velocity through the radiator (say from a duct) causes more drag than just making your radiator larger. But, you say - if I slow down the air velocity (as a diffuser does), I'll impede cooling. Well, not quite.

While a diffuser does slow down the air velocity, it does not slow down the air-mass flow which remains constant (less velocity - but more density and area.) Remember it is the air-mass quantity not the velocity that cools. So velocity has slowed but air density has increased such that the air-mass flowing through the radiator is essentially the same (there is some loss) as originally entered the inlet.

So we get the same air mass for cooling but with much less drag due to the slower velocity of the air flowing through the radiator after a diffuser. (Remember the mass flow through a diffuser system and radiator does not change from one end to the other—can't make mass disappear). Note, this is one reason why if you do have less than perfect sealing of your diffuser to your radiator that your cooling effectiveness loss will be much higher than you would think. The air pressure is higher and the air is denser, both of which contribute to a relatively large air-mass loss even through fairly small holes.

Less drag would still be true even if we had made the radiator area larger to compensate for some of the pressure not recovered (nothing is 100% efficient) as the increase in area to compensate does not produce as much drag effect as a higher velocity air flow would. So by slowing the air velocity, we get better cooling and less drag than just using a duct would do for us.

In summary you want a diffuser and not a duct for your cooling system because you get better cooling and less drag.

Well, that's what I think I've learned—so those of you with aerodynamic backgrounds, how about hopping in an correcting me.

Now, when (if?) I can just get the design parameters figured out, I will provide that for you consideration.



A couple pictures at Twin Oaks following the first snow in January. Above: a Cessna 206 on Amphibs; Center: An L-13 Motor Glider; Below: Cessnas against a Ribbon Ridge backdrop.

Arlington '96: Above: Two Pitts' silhouetted against the Cascades; Middle: Bud Granley in his Yak-55; Below: Stinson Reliant (CF-OAZ).

2004 Aviation Calendar

Brent Anderson

Feb 21-22	Puyallup, Wa Northwest Aviation Conf & Tradeshow 866-322-7469
Feb 21-22	Casa Grande, Az (Phoenix Regional A39) IAC Ch 69 SW Regional Akrofest 602-852-0227
Feb 24	Gresham, Or Mt Hood Community College AOPA Safety Seminar "Maneuvering Flight, Hazardous to Your Health?"
Mar 5-6	Casa Grande, Az (CGZ) 46 th Annual Cactus Antique Aircraft Fly-in Chairman@cactusflyin.org
Mar 11-13	Reno, Nv 15 th Annual Women In Aviation Conference Reno Hilton 386-226-7996
Mar 27	Riverside, Ca Airshow 2004 909-682-1771
Mar 29-Apr 1	Las Vegas, Nv 47 th Annual Aircraft Electronics Assoc Trade Show 816-373-6565
Apr 13-19	Lakeland, Fl EAA Sun & Fun Fly-in 863-644-2431
Apr 26-28	Ephrata, Wa IAC Ch 67 Aerobatic Camp #1
Apr 29-May 1	Ephrata, Wa IAC Ch 67 Aerobatic Camp #2
May 14-15	New Braunfels, Tx (KBAZ) EAA SW Regional Fly-in 830-997-8802
May 15-16	Silver Springs, Nv Lyon Co Airfest 775-575-4459
May 18-20	Las Vegas, Nv Aviation Services & Suppliers Supershow 800-827-8009
Jun 19	Scappoose (SPB) EAA Chapter 105 Van's Homewing Fly-in

Jun 18-20	Marysville, Ca (MYV) EAA Golden West Regional Fly-in 530-741-6248
Jun 26	Twin Oaks, Oregon (7S3) EAA Ch 105 3 rd Annual Poker Run
Jun 26-27	Rocky Mountain EAA Regional Fly-in 303-452-9757
Jul 7-11	Arlington, Wa (AWO) EAA NW Regional Fly-in 360-435-5857
Jul 19-25	Farnborough, England Farnborough International Airshow 2004 609-987-9050
Jul 27-Aug 2	Oshkosh, Wi (OSH) EAA Airventure 2004 888-EAA-INFO
Sep 4-5	Aurora, Or (UAO) Van's Homecoming
Sep 9-12	Reno, Nv Reno Air Races 775-972-6663
Oct 7-10	Phoenix, Az EAA Copperstate Fly-in 520-400-8887
Oct	Las Cruces, NM Land of Enchantment RV Fly-in

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Board Meeting Highlights

Your Chapter 105 Board

Meeting Jan 15, 2004, 7pm, Twin Oaks Airpark

Attending: Rion Bourgeois, Ken Rentmeester, Joe Miller, Benton Holzwarth, Mike McGee, Randy Lervold, Dick VanGrunsven, Chad Clark, Brent Anderson, Mike Psiropoulos, Jenny Hickman, Art Frame, Mike Robertson, Woody Hall, Harvey Cheney, Al Cornelius, Hank Bullock, Randall Henderson and Bob Gresli.

- A quick recap of the holiday banquet was given. Best estimate is that 70 - 100 people attended, and most everyone at the board meeting seemed to be nodding their approval of the party.
- The HW treasury is to be distributed pro-rata between the local chapters according to their representation in the Home Wing. That will divert several hundred dollars, but should still contribute over \$5,000 to the 105 treasury. There has been some discussion of buying a dynamic prop balancer for the tool crib.
- Amit Daggan has agreed to stay on as ToolMeister. He's declining the nomination to the board and Quartermaster position, so that position remains open.
- Chad Clark (Twality Middle School teacher) attended to speak on his plans for the new year. Last year he led a group of students through the 'Wild Blue Wonders' EAA program, but feels its heavy reliance on MS-FlightSim vs. their lack of PCs makes it impractical. The board voted to grant Chad \$200 for his after-school aviation program. Two members will also check on PCs that might be available to donate.
- Randy reports that with the roster now merged the member count stands at 287. We're considering how to make the roster available to members. In the past we've printed paper copies, but would like to make it available on line in the future, only to members, and in some way

that makes it as difficult as the paper booklet to raid for email addresses. On the question of who can access the mass-mailing to chapter members, for now it's Randy, only. As to whether we can send out a specific reminder to the breakfast volunteers, Randy agreed that that's possible, and he and Brent will work it out.

- Due to FAA rules stating that their employees can't perform Airworthiness Inspections for members of clubs they belong to, Mike Robertson is agreeing to drop membership in Chapter 105. We'll be sure he continues to receive a comp issue of the chapter newsletter.

- MikeR has offered a trade of his RV-6 components, at a similar stage of completion as the RV-8 pieces the chapter is trying to sell. The thought is that there may be some advantages to the chapter if Mike takes the -8, and we move forward trying to sell the -6 pieces. Those parts will need to be carted in from Spokane before anything can be done along that line.

- Negotiations are ongoing with the Port of Portland over a land lease at HIO.

- The Board's consensus is to hold the July meeting at Arlington, perhaps as a Saturday evening BBQ.

- Leighton Mangels has offered to host a meeting to demonstrate FG techniques and have a look at his Testarossa replica project.

- John Halle has proposed an organized "ride swapping" list. The chapter would help facilitate getting folks together who can trade rides in their planes in exchange for a ride in the other, or help uncommitted folks reach a project decision. The Home Wing folks have had their annual 'Builder Motivation Day' for a long time. RandyL will look into organizing a one-day, chapter-wide event for early summer.

- Randall described his proposed chapter meeting (project visit) protocol, intended to gain the most information from the host and project.

- There was a proposal that we produce a 'chapter calendar' rather than sell the HQ-provided ones next year.

We sold 24 this year, half at list and half at discount after the turn of the year, essentially breaking even on the deal. The hope is that we could sell more of something done locally. Benton volunteered to check into 902's experience with their annual calendar and will check with Ken Scott, who is involved with Van's calendar.

- Young Eagles: Harvey has 18 girl-scouts lined up for rides. He'd like to organize a list of pilots he could tap for help at the YE events. As it is, he has a short list and appeals on some maillists and makes phone calls to bring out enough pilots to cover the needs. With a list he could go to, it would lower the stress and effort to marshal the help needed for each event.

- Harvey Cheney is also now the Chapter Liaison to Bob Duncan and the 'Friends of Aviation' group that are working to head off the airport opposition group that has been agitating (mostly around HIO.)

- Benton raised the suggestion that 105 organize an 'Aircraft Recovery Team' -- folks available to assist in the protection of a member's plane, should they, for instance, put down in a farmer's field and need to get patched up. Folks look out for pilot's interests, working with farmer to avoid moving plane with fork-lifts, protecting from vandalism, are available to help carry from field to trailer, etc. Suggestion came from something I read in the 902 NL. Mike Robertson offered to provide training in the FAA's requirements and related issues.

- Carl Battjes (not at meeting) has been lobbying for some mechanism for chapter members to express their particular av interests, so that others with shared interests might seek them out to set up SIGs (Special Interest Groups) similar to the RV Home Wing or the Design SIG. The folks present seem to agree that this is the sort of thing that the local chapters can and should be facilitating. We're not sure of what the best way to go about supporting it is, but will work with Carl and anyone with ideas.

- RandyL has suggested a planning session to bring

some order to the list of projects the board has been considering, and come to some decisions about which ones we will be able to work on immediately and which will need to wait for resources.

- Dick VanGrunsven believes he'll have some time to begin working on the restoration of the Bogardus Little GeeBee. He's looking to pick a few experienced people to assist, but mentioned need of someone who knows aircraft wood structures. Brother Stan is working on the Long Harlequin (Harley Davidson cylinders/pistons) engine. There was a suggestion that the project might make an interesting chapter meeting at some point.

[...and believe it or not, I cut this report down quite a bit from all that actually happened at the board meeting. It was a busy session. Ed.]

Editor's Notes

Benton Holzwarth



I hope you're enjoying the new, expanded newsletter, now with the merged content of the Home Wing and Chapter 105 newsletters. I'm delighted to have Mike putting together several good pages for each issue. You can help by forwarding interesting bits, taking pictures and writing about what interests *you* for the newsletter.

For myself, I'm going to enjoy seeing more projects under the new meeting format. There will be challenge in finding a new location every month, especially after dark, but that's a problem that'll right itself by and by. Call a friend or a friendly member and suggest a car-pool — it helps to split the pilot and navigator duties.

Buy / Sell / Trade

Ads are free but are subject to editing. Aviation related ads are given priority. We reserve the right to refuse any ad. Submit to the Editor, Benton Holzwarth (benton@siletzbay.com) or call 503-684-2008. Please let us know when your item sells. Ads will run for four issues, and may be renewed by contacting the editor. Last issue indicated by [mm/yy].

Classifieds

RV-8A Subkits for Sale by Chapter 105 — Empennage assembled; one wing assembled, one just started. Can be built as an RV-8A or RV-8 (tailwheel). Plans #81205. Located in Chapter 105 hangar at Twin Oaks. Asking \$5500. Contact Rion for viewing -- 503-646-8763 (eve), 503-670-1144 (day), 503-720-9394 (cell)

Ka-7 glider basketcase for parts — Wood/fabric wing; tube/fabric fuse. Also includes old glider trailer. \$500 or make offer. Thomas Johnson thojohnson@hotmail.com or 503-638-0384

Chard-6 Serial Number 2 is for Sale — It is owned by Ted Fields of Oklahoma. You can read about it in the June 2003 issue of Kitplanes. Unfortunately, since the article, this airplane has been injured. Ted Fields phone is 508-545-3411 [04/04]

RV-4 Tools For Sale — 3X rivet gun with air control valve, 12 rivet sets, and two holders - \$150; Tube flaring tool - \$40; Tube bender - \$20; Edge nibbler - \$10; EE model 50 Magneto synchronizer - \$10; 9/16" Cylinder wrench for C-85, etc. - \$10; Harbor Freight 1-ton shop (engine) hoist - \$100; Sporty's handheld transceiver with leather holster, NiCad pack, charger, and headset adapter - \$200; Grimes white strobe light (unused) - \$20; Stick Force Gauge - \$15; Shoebox full of misc a/c hardware inc. rod ends, fuel primer, light bulbs, instrument screws, lots of AN rivets (packaged) - \$35 -- Call Mike Bender 503-313-9640 (Ptld) [04/04]

Continental A-75 For Sale — Changing engines in my 1942 Taylorcraft L-2, N47625. Engine Sn 4331468, originally a Cont. A-65-8, earliest log 1955, ~1000 hrs. Over-

hauled and converted to A-75 06-06-88, at 2239 hrs. At 2338 hrs, disintegrating piston pin caps + bearings, rings, gaskets and seals replaced. Installed new Slick 4333 impulse mags, ignition harness and plugs, 07-17-01 at 2752 hrs. Annualled 02-12-03 at 2894 hrs, total time 2907 hrs as of 11-20-03. Dave Wiley at 503-636-4930 or email at wileyseaplanes@comcast.net [03/04]

Looking for KFM 107e engine — Ed Hawkins is looking for a KFM engine for a Moni motorglider. If you know of one, you could contact him at 503-257-1823 or hawkpdx@msn.com [02/04]

Open for Business

Top Flight Interiors — Fine Aircraft upholstery, impeccable quality, custom interiors, leather specialist, imported textiles. Jesse Cary at Twin Oaks or 503-475-1036.

Web Sites, Applications & Desktop Publishing — Oregon Media, Phil Spingola phillip@OregonMedia.com or 503-201-4896

Duckworks Landing Lights — Standard kits start at \$75. Round Halogen and Xenon HID lights are available for new installations and upgrades of our kits and others. For details/pricing see www.duckworksaviation.com or call 503-543-2298

AEROFRAME Gallery - Aviation Merchandise and Custom Picture Framing — Located at the intersection of I-205 and 99E (McLoughlin Blvd.) in the Oregon City Shopping Center, AEROFRAME Gallery offers a huge selection of collectible airplane models, aviation art, and aviation related items for all ages. Non aviation art is also available. Visit the gallery and/or the website to view the gallery, its items, and the custom frame selections. 503-557-1333 www.aeroframegallery.com



“Contact!” Chapter Officers and Staff

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Secretary	Michael Psiropoulos	503-681-3088
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Activities Coordinator	Brent Anderson	503-523-2012 (day)
Breakfast Crew Chief	Joe Miller	503-647-2059
Breakfast Crew Chief	Jim Pace	
Hangar Mgr	Ralph Schildknecht	
Librarian	Jim Mitchell	503-644-5258
Public Relations Mgr	Ed Mason	503-288-9275
Director & YE Coord	Harvey Cheney	
Director & Bogardus Trust Liason	Dick VanGrunsven	



More from the Troutdale Airfair 1993: Above: Bill Reeseman's Yak-50s; Center: Bill Reeseman's Mig-15; Below: The Evergreen Aviation Foundations's Ford Tri-Motor.



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Portland/Twin Oaks EAA Chapter 105 Membership Registration / Renewal Form



Renewal \$20 New Member \$25
Send to: Jennifer Hickman
 15890 SW Talus Pl.
 Beaverton, OR 97007

For Renewals, indicate **changed** information only
Check: New ___ Renewal ___ Amount Paid \$ ___
Paperless newsletter (e-only) OK? _____

Name: _____
Address: _____

City/St/Zip: _____
Home Ph: _____
Work Ph: _____
e-addr: _____
Spouse's Name: _____

National EAA #: _____
Own / Fly: _____
Project (Let us know what you're working on): _____

Completed: Yes / No / 90% done 'n 90% to go: _____
Pilot Ratings: _____
Additional (help for other builders?): _____

Breakfast Volunteers

Saturday, March 7th, 2004

7AM

Paul Loomis
 Terry Lorz
 Tom Louris
 Steve Mahoney
 Phillip Mandell
 Rick Mandrell
 David Mandrell
 Robert Martilla

9AM

Ed Mason
 Mike McGee
 Paul Metzger
 Gary Miller
 Jim Mitchell
 Richard Monaghan
 Bob Neuner
 Charlie Nicholson

Note to Volunteers who cannot serve: Please arrange replacements for yourselves, or contact a Board Member.

Chapter Calendar

Feb 7	HIO Twin Oaks EAA 105 Pancake Breakfast 503-646-8763
Feb 12	EAA 105 Chapter Meeting 503-646-8763
Mar 6	HIO Twin Oaks EAA 105 Pancake Breakfast 503-646-8763
Mar 11	EAA 105 Chapter Meeting 503-646-8763
Jun 19	Scappoose (SPB) EAA Chapter 105 Van's Homewing Fly-in
Jun 26	HIO Twin Oaks (7S3) EAA Chapter 105 3 rd Annual Poker Run

Note: Meeting is on Second Thursday!



**Next Meeting –
 Home Wing &
 EAA Chapter 105**
 Thurs Feb 12th, 2004 - 7:00 PM

Randy DeBauw's
 RV-10 Project
 Located in Lake Oswego
 See map - page ??



The Leader In Recreational Aviation



To:

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