



## NEWSLETTER

Published by EAA Chapter 245 (Ottawa) P.O. Box 8412 Main Terminal, Ottawa, Ontario, Canada, K1G 3H8

# Carb Heat

Hot Air and Flying Rumours

## OCTOBER 1992

**NEXT MEETING: THURSDAY 15th OCTOBER**

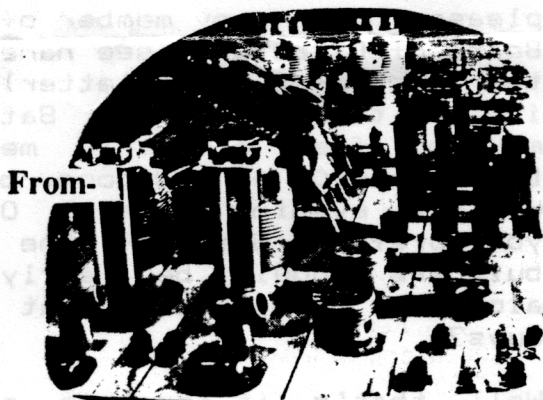
**TIME: 1930 HRS**

**PLACE: BUSH THEATRE**

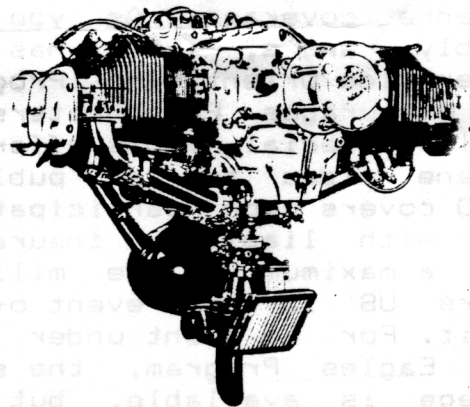
**NATIONAL AVIATION MUSEUM**

**TOPICS:**

- ANNOUNCEMENTS
- ANNUAL GENERAL MEETING
- BUSINESS
- MORE ELECTRICAL UPDATES
- ENGINE OVERHAUL & ASSEMBLY



To-



President: Lars Eif 837-6680  
Vice-president: Gary Palmer 596-2172  
Secretary: Luc Martin 744-5347  
Treasurer: George Elliott 592-8327  
Editor: James Oliff 724-6123  
Assistant Editor: Andy Douma 591-7622

Aircraft Operations: Dick Moore 836-5554  
Membership: Manfred Ficker 839-2292  
Tool Crib: Andy Douma 591-7622  
Classifieds: Andy Douma 591-7622  
Publishing: Dick Moore 836-5554

## President's Corner

Now that the summer of 1992 is officially over, have you noticed all the beautiful sunny days? We sure could have used those blue skies in June and July! Anyway, the fall is a great time to fly in Canada - cool mornings, no humidity and fantastic scenery as the autumn leaves put on their annual display of yellow and crimson.

The September meeting was very well attended. As you probably noticed, there was a slight hiccup as the Bush Theatre still had some finishing touches to add after the renovations from this summer. In their usual accommodating fashion, Ed Patten of the National Aviation Museum and John Bradley, our NAM representative, fixed us up with a meeting place in the restoration workshop and all worked out well.

Information about the Young Eagles program is steadily trickling in from Oshkosh. The latest letter deals with insurance coverage. As you are probably aware, EAA has a Chapter Ride Orientation Program which encourages EAA chapters to organize special events offering airplane rides to the public. AVEMCO covers each participating pilot with liability insurance up to a maximum of one million dollars US in the event of a lawsuit. For an event under the Young Eagles Program, the same coverage is available, but the application form must specify the latter program.

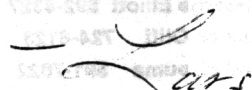
Of course, all Chapter participants must have up-to-date EAA memberships in order to qualify for this

insurance. The same applies to any pilot who participates in the Young Eagles Program on an individual basis.

The October Meeting is the Annual General Meeting of EAA Chapter 245. This is when we elect new Directors and amend the Chapter By-Laws as needed. Please come out and help get the Chapter on the road to another successful year. This year, we must fill the positions of Chapter President, Secretary and Newsletter Editor for two year terms. The Annual meeting is also a good opportunity for you to make suggestions as to what type of presentations you would like to see at our monthly meetings and what other activities you would like to see organized for the coming year.

Speaking of activities, project open houses are always very popular and well attended. If you are willing to have about ten visitors in to see your project sometime this year, please inform any member of the Board of Directors (see names on the front of the newsletter). An ideal time is the Saturday morning after a monthly meeting between 10:00 am and noon, but a weekday evening is also OK if you prefer. Some of the RV-6 builders should be fairly far along by now. How about it, Guys?

Well, that's it for this month. Keep working on those projects or flying your favourite bird (or both, if you are really lucky!) 'See you at the meeting!

 WRS

## CHAPTER ACTIVITIES

CONGRATULATIONS go out to John Richards whose Zenith CH-300 C-FKOC had it's maiden flight on Sunday October 4th with Stan Kereliuk at the controls.

The plane was scratch built over a 4 year period in John's basement and garage and arrived out at Carp earlier in the year for final assembly, ground testing and awaiting of the paperwork. The plane reportedly flew beautifully. John went up with Stan for 30 minutes of dual and his impression was of superb over the nose visibility and very easy handling. He's looking forward to many enjoyable flying hours.

Saturday and Sunday were also the dates of COPA's annual Fall Rendezvous at St. Jovite Quebec. Several of the Chapter members, Ken Mackenzie and Trish, Rodney Stead and Sharon, in their C-150's and Garry Palmer in his Lancair 235, made their way to St. Jovite to view the fall colours enroute and to "plane watch" at the Grey Rocks grass strip. On Sunday Garry the flew to Orillia but arrived too late for the RAAC Fly-in breakfast so he continued on to Brampton for a visit before scooting back home in his supergofast Lancair.

In other news. My Davis DA2B C-GYLS recieved it's flight permit on Tuesday September 29th and I flew one circuit on Friday October 2nd. Thanks are due to Jim Bradley who gave me some very valuable dual time in his Davis. Jim was also allways ready to answer the many questions I had about construction and assembly of the aircraft. Thanks are also due to Tim Robinson who help with the engine

overhaul. We will be speaking about that at this month's meeting.

After the first flight it was found necessary to alter the trim controls. The aircraft has to date been flown about an hour and performs beautifully. The Warp Drive carbon composite propeller seems to work very well.

Andy Douma

different directions and two different depths comparing against SSP 1776. Standard I.D. is .591 for the intake and .661 for the exhaust with oversizes available in .005, .010, .020, .030. Ream as needed to get a straight, on size guide boss. There is a technique to reaming guide bosses and great care must be taken to not get the new hole off axis from the old one or the seat/guide axis is destroyed and you will never get a seat to grind anywhere near co-axial to the guide. The finish is very important so use a good cutting oil to achieve a smooth, non-marred finish. The heat from the valves is taken thru the guides, not the seat. We want INTIMATE guide contact without being too tight at assembly. Now purchase the guides from your favorite supplier and get ready for a surprise. **THE GUIDES YOU JUST PURCHASED ARE NOWHERE NEAR READY FOR INSTALLATION.**

The guides as received are under-size on their I.D. and need to be pre-reamed prior to installation. Pre-reaming is best done by holding the long end of the guide in an accurate lathe chuck, the reamer in the tail stock and feeding with plenty of fluid and about 150 RPM. Maximum concentricity on the guide is .0015. If yours are more than that, the supplier should make them good. Now turn the guide around in the lathe and chamfer the I.D. to remove the burr from reaming. While you are at it, radius off the nose of the guide to make installation easier later. If you have access to liquid nitrogen this part is going to be easy.

Right about here I want to touch on the seats some because any seats that need to be replaced can be removed at the same time the guides are removed if you have the necessary pullers. They can also be removed by welding an old valve to the seat with the stem of the valve projecting thru the guide and driven out. The welding will shrink the seat enough that it can be removed. That bull in the overhaul manual about using a sponge wet with cold water — horse manure, that guy never worked out of his tool box.

Seat bosses can be cut oversize with the proper cutters and they should be if they are out of round or not square to the guide. They can be cut piloted from the guide boss or the preferred way, from the finished I.D. of the guide. The later method requires heating the cylinder an additional

time. Lycoming engines employ a seat design known as the "Allison Type". The main feature of the Allison seat is that the face area of the seat is never under any distortion caused by press fits or Delta Temperature in the head. See sketch exhibit B. By Ned, the rest of the seat/boss interface had better be right or there will be nothing but problems. SSP 1776 gives the fits and they should be favored to the low side even if you have to trim the seat to get it. I like .009T on the intake and .007T on the exhaust. While you are trimming, trim the guides to .0015/.0017T. Somebody is going to holler "the table of limits says .001-.0025T". .0025T will crack the guide boss-guaranteed.

Back to the guides. Let's put 'em and the new seats in the cylinders. If you have the nitrogen, super, if not get some dry ice and alcohol. Put the parts to be installed in the refrigerant (freon will also work) and heat the cylinders to 450-500° F. Using suitable holders for everything, install the guides first. They should fall in. Right when the frost starts to melt, rap the guides one time with a hammer and listen for the ring signifying the guide is bottomed. Turn the cylinder over and install the seats. They also should fall in. Repeat the rapping process that was performed on the guides. If anything goes wrong, fourth "Don't Never" — don't force things. If you do, get ready to repeat all of the above machine work. I like to take a small mirror, flashlight and look behind the seat after it is installed. If there is any metal rolled out of there, well, nobody is perfect and I just do it over. We enter it on our books as "Customer Good Will". If I don't, I will have another, bigger entry under "Litigation".

Okay, we got all the parts in, in the right place, pop a top and wait for the cylinder to cool off so we can proceed. The Sunnen folks in St. Louis make some real neat little honing tools for small holes like valve guides and any self-respecting shop should investigate them for finishing valve guides. A honed guide is absolutely straight, has a better finish, can be controlled to .0002 on the diameter, but if you haven't got 'em, ream 'em, being extremely careful to get a good finish. Remember, we are going to conduct heat out thru the guides. I'm not insane, you'll see why later. With a honed guide, I like .0015-.0020 clearance on the intake valve and .004-

.0045 on the exhaust. With a reamer, you take what you get but increase everything .0005 at least.

Face the valves keeping the stone dressed and using 45° on the exhaust and 30° on the intake. There are a whole bunch of "thou-shalls" on valves and for simplicity I am going to just list them:

- Keep the stone true
- Use light pressure
- Let the valve "spark out"
- Grind across the full width of the stone
- Collet the valve where it normally runs in the guide
- Break sharp corners with a slip stone

— and some "don't nevers":

- use a valve with a tapered stem
- try to grind excessive run-out from a valve
- grind the head to a razor edge (see table of limits)
- let a loaded up stone chatter a valve face
- run the face of the valve off the edge of the stone

Wash the valves up, set them aside in a handy place and let's get in to what is going to make this whole deal worth all this work we've done. It is the most misunderstood, abused, improperly performed task I see in the engine business. That is, grinding of valve seats.

In days of yore, when most valve seats were of soft brass or relatively soft material, and good avgas was available, it was common practice to grind what is called an "interference angle" on the seats. The seat primary angle was ½ degree different from the valve and during run-in the impact of the valve on the seat would "shape" it and give a good seal. Not now, brothers and sisters. The seats for this new fangled 100/130 LL are harder than your mother-in-law's biscuits. A seat angle that EXACTLY MATCHES the valve face angle is much preferred and to achieve this, here is how I do it. I apply prussian blue to the face of the valve and dress the seat stones so that the blue shows any difference in angle. The blue will feather off to the shallow side. If you must be off, make the shallow side on the inside. Now let's define some terms so that we all know what angle is which.

**Primary angle** — that angle which is common to the face of the valve and

the seat. It is 45° for the exhaust and 30° for the intake.

**Outer Narrowing Angle** — The angle applied to a seat to reduce the outer diameter primary angle. It is 30° for exhaust, 15° for intake, although the table of limits says 15° for the exhaust.

**Inner Narrowing Angle** — The angle applied to a seat to reduce the width of the seat by increasing the I.D. of the primary angle. It is 45° for the intake and 60° for the exhaust. The table of limits says 70° for both.

**Secondary Inner Narrowing Angle** — An additional angle used in flow-matching and/or high performance racing engines to adjust the air flow in the mid-lift region. We will not use this here as it is beyond the scope of this article . . .

**Back Cut** — A practice of trimming the head of a valve so that the material not in direct contact with the primary angle is removed for better flow.

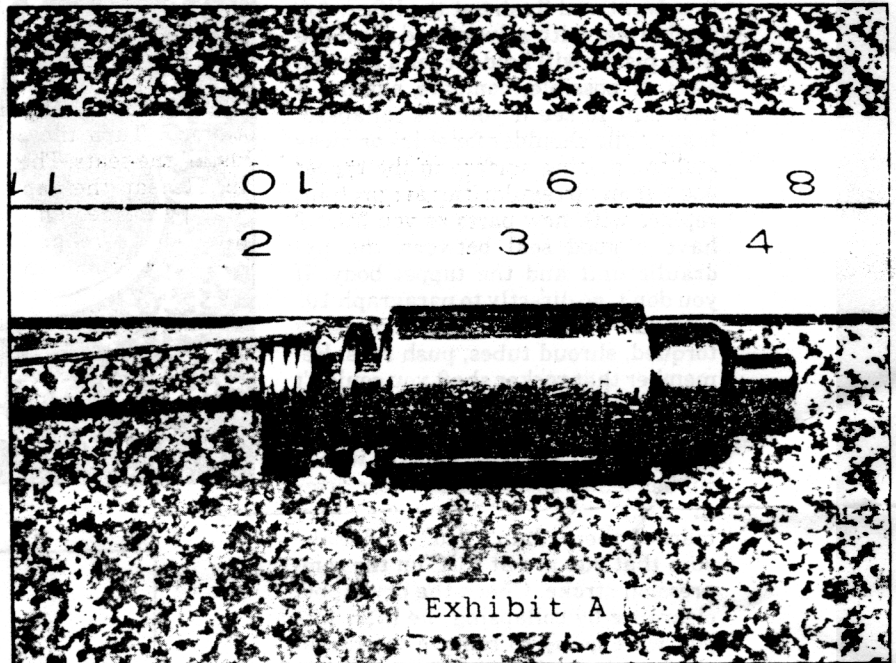
Okay, go to the grocery store, find the household goods department and purchase one of those little cylindrical brushes that homemakers use to clean the inside of a coffee pot. They are just right to push thru a finished guide to remove any grit or trash that was left after you carefully washed them. Install the proper pilots in the guides and drop a small spring over the stem that is capable of lifting the stone holder off the seat. With the coolant turned on, (grind wet if you can) grind the intake primary angle just a touch to see where you are. Be careful that the stone driver does not pull the stone holder up the cylinder wall and cut a big gouge in the wall. If the stone is not touching at least 2/3 of the way around, pull the seat, cut the seat boss to the next oversize, install a new seat and repeat. Grind the primary angle until the stone is touching all around and is producing a slightly wider than finished width. What happened is the guide boss was not reamed co-axially with the seat. When you cut the seat boss oversize be sure to cut the counterbore flat so that the new seat will contact all around. Failure to do so will result in warped valves in short order. Blue up a valve face and lightly "peck it" to determine where the seat is landing on the valve. If the seat is all the way across the face of the valve, the seat is too wide and will have to be inner and outer narrowed to achieve the desired results. Inner and outer narrowing also establishes a constant width seat which is mandatory for longevity. What we want is a seat width

about 1/16 wide for the exhaust, 3/64 for the intake and ideally in the middle of the valve face. The latter requirement will be hard to get on the intake, particularly on the angle head cylinder. There must be some outer margin at all costs. When you finally get the seat width correct, on the proper place of the valve face, and a constant width all around, you may lap LIGHTLY with extra fine lapping compound. Lap just enough to assure a good seal but not so much as to groove the valve. The seat widths that I recommend are somewhat narrower than the table of limits calls out but a narrow seat has higher force per unit area when the valve is closed and less chance of trapping a piece of carbon underneath. It also will not transfer as much heat as a wider seat. Now you know why I am so picky about the guide fit and finish. If you have trouble understanding some of the nomenclature, re-read the definitions and see sketch exhibit "C" and photo exhibit "D".

with clear, hot water, dry and lightly oil the cylinder walls. Fit the piston rings per the directions in the ring set, then push them up to the top of the travel and make sure you have .010 gap MINIMUM on the compression rings no matter what. If you have to file a ring, do it on one end only, keeping it square and de-burr with a slip stone when you are thru.

Paint the cylinder per the overhaul manual and keep the paint coat thin. Absolutely do not paint the area under the cylinder base flange or the hold down plates on narrow deck engines. You may paint any color you want but black barrels and natural heads look nice. If you live in Florida or any coastal area, at least Alodine the head.

Assembly is the reverse order of disassembly. Do not re-use the exhaust keepers or rotor caps if they show any signs of wear. Same for the intake parts if you have the rotating intake valve. Spring strength is not a problem in these engines unless they are

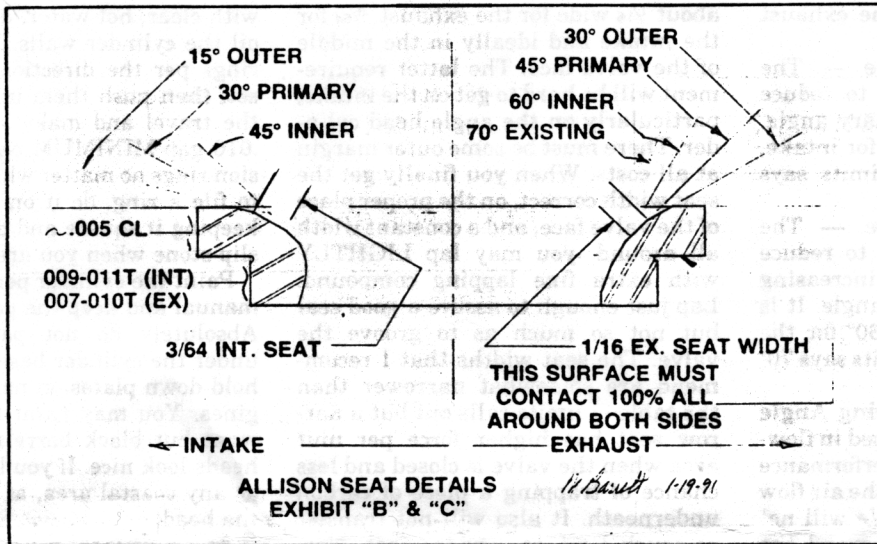


We should have all the guide and seat work done by now so hone the cylinder barrels to de-glaze, and remove some of the wear steps and taper. Use a rigid hone, not a ball hone. Wash the cylinders in clean solvent paying strict attention to the recess at the barrel/head junction. This is an easy place to overlook and trap a bunch of abrasive which will destroy all of your good work as well as your bank account. Now wash all parts in HOT-HOT-HOT soapy water using something like TIDE or OXYDOL. Squeaky clean is the ticket. Rinse

totally wiped out; check them if you wish and replace if you need. The main things during assembly are cleanliness, don't stake the valves. use ONLY mineral oil for assembly lube, don't stake the valves. proper parts in the proper places and **Don't Stake The Valves.**

Installing a cylinder on the engine is pretty rudimentary but there are a few things to watch beyond the obvious.

Remember that hydraulic unit you set aside in a clean place? Okay, hold that sucker in both hands and sepa-



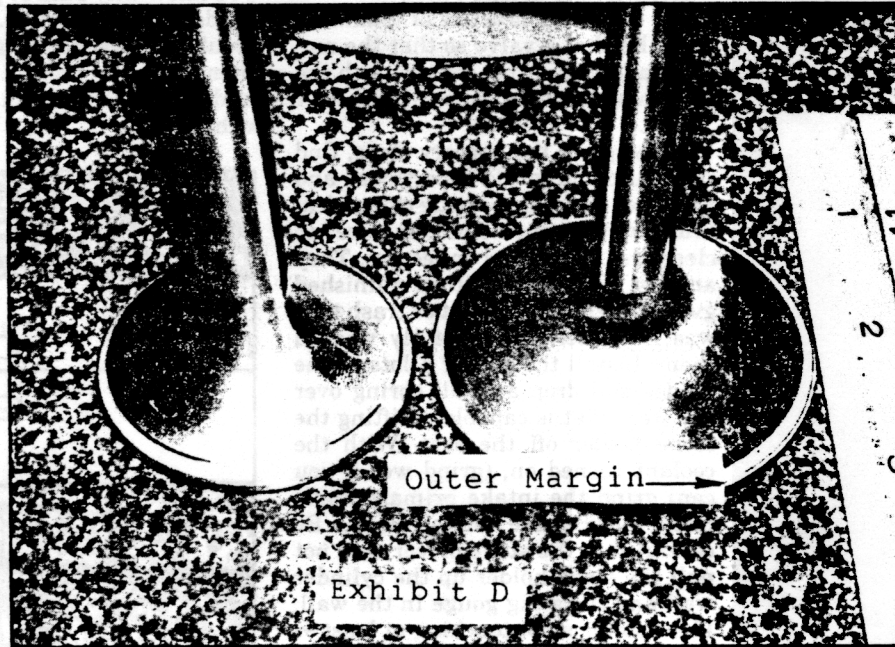
high power and normal cylinder head temperature. You pilots with 10:1 compression are at an advantage because one thing you can get is plenty of cylinder pressure. At any rate, try to get the rings seated before the cylinders glaze by keeping ground running and localized hot spots to a minimum.


If you have followed this treatise, I hope you have enjoyed reading it and you will have a decided advantage as far as the performance of the engine is concerned. Who Knows? The difference may take you to France in 1992.

rate it by twisting the two halves in opposite directions to unlock the spring. Dump the oil out and wash in CLEAN solvent. Take a piece of SOFT wire and insert through the nipple on the bottom, submerge the whole thing in solvent and flush out the lifter. Assemble wet with solvent and see if the little piston will hold air for a few seconds. If possible, compare against a new unit to see if yours is collapsed. Inspect the shoulder for chips or nicks and the mating surface in the tappet body. If any irregularities are present, replace with new parts as you MUST have a good seal between the hydraulic unit and the tappet body. If you don't, go directly to paragraph 10.

Install the cylinder, properly torqued, shroud tubes, push rods. Remember that rocker shaft you couldn't get all the way out of the angle head cylinder? Put it in before you install the cylinder and hold in place with a rubber band. Install the rocker arms in their respective positions, (you marked them, didn't you?) and make sure that you are at TDC on the compression stroke. Check the dry tappet clearance by collapsing the lifter like you were going to remove the rocker shaft and check for .028 to .080 between the tip of the rocker and the rotor cap or valve stem. Pushrods are part numbered and each successive higher part number is .050 longer. Check rocker side clearance per SSP 1776 and finish assembly.

About all that is left is some leak checking and ground running. Do a whole bunch of the former and very little of the latter. The best ring seating is accomplished with mineral oil.





**EVERGLADES AEROBATICS, INC.**  
BRUCE THALHEIMER, C.F.I.

3644 BOCA CIEGA DR.      TEL. 1-800-226-1720  
NAPLES, FL 33962      HM. (813) 774-4773

# CLASSIFIEDS

02 Oct 1992

## AIRCRAFT FOR SALE:

Zenith CH250TD taildragger, all aerobatic options, waiver applied for. 25 hours TT Lycoming O-320, 160hp. Quality built with solid rivets. \$30,000. Jim Robinson (613) 830-4317 Tim Robinson (613) 824-5044.

Piper PA-25 Pawnee - no engine.  
Piper PA-22 Colt 108hp.  
Stinson 108-1 150hp.  
Cessna 172, 1956 straight tail.

Homebuilt Super CUBy. Completed 1988. 100 TTAF. Lycoming O-320, 100 hrs SMOH; set up for auto fuel. Full gyro panel; 2-20 gallon wing tanks. Excellent condition. Contact Henri Beaudoin at (613) 749-9720.

## PROJECTS FOR SALE:

**!!! NEWCOMERS !!!** Looking to start or finish a project? These partial to nearly completed projects **will save you years of building time and barrels of money.**

Aeronca 15AC (Sedan) Project.  
Mike Sacoutis 729-3774

Cessna 140.  
2500 TT, 85Hp Continental 1100SMOH, New paint Blue on white. Fabric wings need recovering. Mike 729-3774

Baby Great Lakes Project: Fuselage 90% complete; all **solid** ribs and spars; Some instruments Mike Sacoutis (613) 729-3774.

## PLANS:

PLANS for Davis DA2A. Call Russ Robinson 831-4317.

## PARTS FOR SALE:

Bellanca Scout for parts.

### Engines:

Continental O-300C, 1365 hrs; O-300A, 1750hrs; O-300, 1200hrs.

Lycoming O-290 D2 135hp, 1000hrs TT

**Engine Parts:** for Lycoming, Continental, Franklin. Starters, generators, vacuum pumps, oil cooler and cylinder for a 165hp Franklin.

### Engine Mounts:

Piper PA-12, Mooney M-20, Champion 7AC 90hp, Cessna 175 O-300.

### Wheel Pants:

Cessna 172, Stinson 108, Aeronca Sedan.

### Propellers:

**Sensenich** - M74DM-61; M74DM6-0-62 cut to 71"; M74DM6-0-48; M76A-M-2-52

**Harzell** - HC82VL-1D1.

**McCauley** - 1C172-7653; 1C172-EM7653; 1A175-FC8467, -DM7651, -DM7655; 1B90-CM7448

**Pusher Prop**, 76", suitable or a VJ-22

### EDO Float Rigging:

- 89-2000 (deck fittings)

- C-172 (modern)

- C-140

Assorted struts.

### Radios:

Narco 122A VOR G/slope, Narco 810 COM, Terra TX720, Genave Alpha 600 N/C, Bendix ADF-F-12C

For all of the above items phone

**Mike Sacoutis 729-3774**

**FLOATS:**

**EDO 1650,s with fittings and rigging for C-140, Piper, Aeronca.  
Mike Sacoutis 727-3774**

**INSTRUMENTS:**

Altimeter, VSI, Tachs, DG, Horizon, Compass, Accelerometer, Turn and Bank (electric), CHT-EGT, Airspeed, Manifold Pressure.

**Call Mike Sacoutis 729-3774.**

Compass, Airpath C2400 L4P, pedestal mount, new & unused still in the box. \$75.00, call Gord Standing 224-2879.

Vari Eze landing gear legs. New. Call Peter Plaunt (613) 839-2283.

Randolph butyrate dope in unopened gallon containers; 1 gallon clear; 1 gallon Juneau white; 1 gallon Piper Lockhaven yellow (Maule yellow); 1 gallon insignia blue.  
- 2 large oil coolers (~8x9")  
- 1 hydraulic pump  
- 1 vacuum pump  
- 1 Lycoming dual accessory case adapter for above pumps.  
- Spinner, pointed, 11" base.  
- piston rings for Continental E-185-3.

Cylinders, four, Lycoming IO-360, wide deck, fresh chrome. Garry Fancy 836-2829.

Propeller, Hartzell HC82XL-2C constant speed plus governor for 320 - 360 Lycoming engines. Garry Fancy 836-2829.

For the above items contact **Garry Fancy (613) 836-2829**

Propeller, three bladed, ground adjustable, wooden blades, metal hub with spinner. Fits VW hub \$250.00.

Gauges, Westach 2 1/2 " square manifold pressure/ turbo boost. Brand new in the box \$50.00.

Autopilot, Federal, new, 2-axis, STC included for installation in C-172 A.B.C., \$250.00.

For the above items contact **Tim Robinson at (613) 824-5044** evenings.

**WANTED:**

**OTHER:**

The "Canadian Amateur Built Aircraft Registry" is now available from CASTC. Call Ted Slack at 226-8373.

**PLACE YOUR ADS BY PHONING  
ANDY AT 591-7622  
Classifieds Editor**

PLANS