

Turn & Bank



OFFICIAL NEWSLETTER OF RAAC CHAPTER 85

November 2000

Fuel Injection Vs Carburettors Skin Dimpling



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Carries Out
His Threat***



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A beautiful Cessna 170 at Arlington. Above: A Corsair, also at Arlington 2000. George Gregory photos

The TURN AND BANK is the monthly publication of RAAC Chapter 85 and is intended to keep members informed as to the club's activities, and to promote safety and technical excellence in the field of sport aviation. No responsibility or liability is assumed, expressed or implied as to the content of articles contained in the Turn and Bank: the intention is to provide a forum for discussion and exchange of ideas.

Newsletter contributions should be mailed to George Gregory, 19470-88th Avenue, Surrey, B.C. V4N 3G5 no later than the 12th of each month. Business Fax is (604)-469-3495. Please remember to indicate "attention George Gregory" on your fax.

Enquiries to the Membership Chairman should be mailed to Rob Prior, #204-130 E.11th St., North Vancouver, B.C. V7L-4R3

For inspections of Amateur Built Aircraft Projects contact the MDRA Inspection Services , ph. 1-877-419-2111 fax 1-519-457-0980 email: mdrainsp@on.aibn.com

Regular Meetings are held on the first Tues. of each month at 20:00 in the clubhouse:

Delta Airpark, 4103-104th Street Delta, B.C. Clubhouse phone: 596-3644

Mailing Address: Chapter 85, RAAC

c/o Delta Heritage Airpark, 4103-104th St., RR#3, Delta, B.C. V4K-3N3
 Executive meetings are on the third Tues. of each month at 19:30 in the clubhouse.

Chapter aircraft pilots, mail cheques (Payable to RAAC Chapter 85) to:
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 RAA Chapter 85 Homepage: http://home.istar.ca/~airframe/raa_85
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Technical Guy

Tips from the
Western Canada RVator

Push or Pull? Eustace Bowhay on Fuel Injection vs. Carburetors

I'd like to pass on my experience with fuel systems over the years and as related to my RV-6.

All of my flying with horizontally opposed engines since the sixties had been with fuel injection until my RV-6. At the time of building the -6 I didn't think I had a choice, with Van recommending only the 0-320 and 0-360 Lycomings.

My choice was the 0-360. With most of our flying here over hostile terrain and sparsely settled areas, I decided to install the Gem graphic display. This would give me advance warning of any valve problems, as well as mixture and ignition info. This is when the wide spread in mixture to the four cylinders showed up, and having to lean to the leanest cylinder wasn't really the most efficient.

Carb icing was a bit of a concern, with the difficulty of getting what I felt was adequate hot air for carb heat. Turned out to be a non-issue, with the crossover exhaust system located over the alternate air door.

I had my engine overhauled in 1996, and decided to give the Bendix Fuel Injection a try- a system I was familiar with. This

is a big change, requiring a change in both the engine driven pump. and the boost pump, because of the higher pressure and the extra plumbing required. This was another reason for moving the gascolator into the wing root (so that the gascolator would not be pressurized). I mounted the Weldon pump on the fuselage side of the firewall above the rudder pedals. That wasn't ideal, because of the lift, but didn't want it in the engine compartment because

leaning, and has the added benefit of no carb icing problems.

I am looking seriously at the Airflow Performance system for the -6A because of the pump (\$300 versus \$1000) and the purge valve. It uses a large capacity inline filter (I believe between the pump and the throttle body) that I would like to know a bit more about. I'll also use the Andair gascolator for its better quality and easier servicing.



A picture from the DHAP archives. Do any of the members remember the circumstances surrounding this picture?

of the heat and starting problems associated with fuel injection on short turnarounds. This problem was completely solved with the installation of an AirFlow Performance purge valve this year.

Flying with the fuel injection system is a real treat, to see the EGTs straight across, and the CHTs almost the same. The leaning is now the same on all four cylinders. Carb ice is a thing of the past.

So which system is the best? Here again I think it is a matter of personal choice. Cost is certainly a major factor with fuel injection. I believe fuel injection is more reliable but can honestly say I haven't had any trouble with either. It's hard to beat

the simplicity of the carb system, and in my opinion a carb gives easier all around starting with less wear and tear on the starter and battery. However, fuel injection has to be better for the engine because of its even fuel distribution and better

Elevator Skin Dimpling Christ Sheehan, Mississauga ON

Tip 1: Just use the male die in the squeezer without the female (i.e. the squeezer yoke acts as the female). That's actually not my idea; saw it on the web somewhere but it actually works.

Tip 2: Using a "pop rivet" die is tricky because it's hard to angle the "mandrel" (nail) through the hole. So I came up with the following: I used a short (2-3") length of 3/32" piano wire as a mandrel, and a 3/32" "wheel collar" (both hobby store items). I filed a notch in the wire close to one end, fed it through the male die, rib, female die and wheel collar (in that order) and tightened the collar set screw in the notch. Now just run the pop rivet puller on the mandrel as usual, and once the dimple is formed undo the wheel collar and take it all apart. Sounds time consuming, but there are only a few dimples to do this way and it takes about 1 minute per.

Tip 3: Regardless of how you manage to make the dimple, if it's not quite right a turn or two by hand with a piloted countersink finishes it off perfectly, barely removing any metal at all.

AIRFrame



Aircraft Portraits

Rob Prior

home.istar.ca/~airframe

3032 Carina Place Burnaby BC V3J 1B5

604/422.8446

BULLETIN BOARD

If you have questions or problems with your aircraft construction, we have members who have developed some expertise in various fields who have volunteered to advise you on methods, procedures and pitfalls in the capacity of **Builders' Counselors** something along the lines of the former designee programme. Please respect the fact that these are volunteers who may not appreciate late calls, and will not return long-distance calls on their answering machines. Also, none are inspectors, and although experienced in their various fields, cannot be held responsible. It is and

remains **YOUR** project. Their names and numbers are on page two and will be a regular feature of our contents page.

Please note that the locks for the clubhouse and the club hangar have been changed. If you want a key that works in both hangar and clubhouse, give Rob Prior a call at 980-7723.

Last I heard, Norm Helmer is looking for someone to help with his **Paradyne** project. The Paradyne is a cutting edge new concept in STOL aircraft that shows promise. If you're interested give him a call at 943-7887.

Dan Lawler would like you to send your email addresses to him at:

dan.lawler@kvaerner.com

He will create a database so he can send announcements about meeting programs, etc. Currently he has a list of about 20 e-mail addresses, and would like to expand it and keep it up to date.

The December meeting will be the Chapter's annual Wine and Cheese bash. Just bring your favourite munchies and a little extra for your mates and join in the fun!

Minutes by Jim Hunter

Minutes of the General Meeting, (The Annual General Meeting) 3 October, 2000

Call to order: 8:00 pm by President Tim Nicholas.

Souter/Wilshire: that the Minutes of the General Meeting of 5 September, 2000 be adopted as printed in the *Turn and Bank*. Discussion Carried.

Committee Reports:

Treasury: Tim Novak: Verbal report by Treasurer Tim.

Membership: Rob Prior: There are 139 members in grand total of all types.

Aircraft: Tedd McHenry: The Turbi is presently at Sechelt under the kind care of the Sunshine Coast mob after one of its jugs tried to absent itself unilaterally; sheared its mounting studs clean off. Engine being trucked down for the autopsy; shouldn't be too great a task. The J-5 is in our shop for the re-build. The engine to be test run right on the fuselage. Gaetan, the project leader, will be calling a meeting of all those who volunteer to work on the project.

Library: Don Souter. OK. Don appeals for more usage of our books and videos.

Program: Dan Lawler: Dan will be absent in Taiwan for the next couple of months but will delegate someone to do the December Wine and Cheese.

Newsletter: George Gregory: (Secretary of necessity absent during this report. He passes on what Terry Wilshire wrote thus having limited liability) George will feature an article on roadable airplanes. Apparently, University of Scotland sponsoring a roadable airplane competition (haggis powered) George delivered a 300 page report on roadable airplanes. The membership put forward ideas (possible about roadable airplanes). *Editor's note: this last bit highly spurious. I threatened to write another series on roadables if more contributions for the newsletter were not forthcoming. I do understand that there is interest at the university level tho'.*

RAAC: Bruce Prior: Bruce gave a verbal report on the RAAC AGM in Ville de Quebec in September. He will write a full report for distribution and/or "T & B".

Vice President Emily Clemens: John Blake will coordinate the December Wine and Cheese do. Emily asks that members bring more money for the draws; they help finance the Annual Bash.

DHAPCOM: Terry Wilshire:

- 1) New fuel tanks are in!
- 2) Management Committee meeting, 5 October, 7:00 pm, Clubhouse.
- 3) Everything fat!
- 4) Some major structural work to be done on the non-Chapter hangars.
- 5) There is MOGAS available at CYXX. A precedent and DHAPCOM is studying it.

Buildings: Dan Weinkam: Things proceeding apace. Although there are presently no

vacancies in the Chapter's hangar, Dan is developing a priority list. members may "buy" a ticket for the draw. \$50 refundable deposit (to discourage triflers). The drawing to be in December.

Old Business:

1) Election of Chapter Officers for 2001. Bruce Prior ably conducted final nominations and the election. The results are:

President Tim Nicholas

Vice President Emily Clemens

Treasurer Don Souter

Secretary Jim Hunter

Program Chairman Dan Lawler

Custodian/Librarian Tim Baker

Director: Three year term Paul Trudel

Director: Three year term Bruce Prior

Continuing as Directors for the remaining one or two years respectively of three year terms: Colin Walker, George Spence, Rob Prior, Terry Wilshire.

A Motion: Hunter/Prior 2: that the ballots be destroyed. Discussion Carried.

2) Bruce Prior lead a discussion about re-instituting the very popular **Pancake breakfasts**. The problem is that there is a need for a fresh crop of non-bagged volunteers to do it. Talk to Bruce if you are game.

New Business:

1) **Remembrance Day Fly-Past:** George Spence once again organizing one of our best events. Practice Sessions: Sunday, October 29 and Sunday, November 5. Meet at the Club-house, 10:00 am. Recollect: no brief, no practice, no fly. If you haven't been in on this before and want to, call George at 298-2541.

Purup/Eskofot: that we adjourn. Discussion Carried.

Jim Hunter, Secretary.

The Threat is Real!

Yet another treatise on Flying Cars as your Editor

journeys down the learning curve

By George Gregory

It's A SHAME, REALLY. I warned you what would happen if I didn't get more articles from the members: another article on (I can hear the groans) flying cars. Give me grist for my mill, or suffer the consequences.

The more I delve into this subject the more interesting it gets. As one learns, ideas get changed. Janet asked me a while ago if I ever got tired of doodling the Same Old Thing so many times: our house, my notebooks, my workplace are littered with sketches representing different versions of the Magnificent Obsession. Ideas get refined, some tossed, and alternatives developed.

I've come to the conclusion that the three surfaced aircraft represents the most elegant approach to the issue. As usual, I present the following as a learner, hoping for constructive criticism and/or affirmation that I'm on the right track.

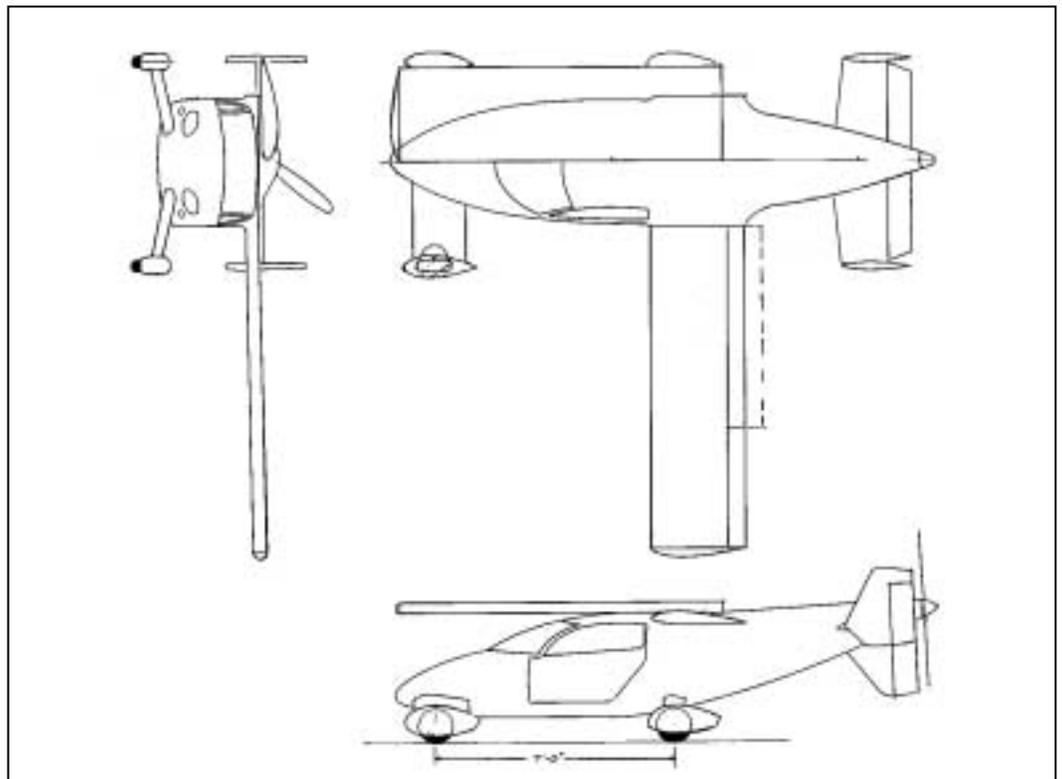
Using Martin Hollman's book has been, as I said, instructive. I've had to interpolate a few calculations but common sense leads me to

believe they are legitimate.

As before, it is incumbent upon the designer to envisage a vehicle that converts quickly and conveniently between modes. This suggests several things: one is to have as few folding parts as possible. The less things have to be changed in a conversion, the less time is involved, the lighter the structure can be, and the simpler it is.

One design has no folding parts, just a wing that has a deeper chord than wingspan and really big winglets to reduce the enormous induced drag that must be created. An RC model of this vehicle exists and has flown. I'm not personally crazy about it because it's pretty well 8 feet wide, the maximum allowable on roads, and I don't think it would be convenient to drive or get in and out of. But he doesn't need to fold anything; just move the shifter from D (drive) to F (fly). You've got to love that.

Another needed feature is that the fuselage should be short enough to serve as an automobile. If not, that has to be folded as well, unless you want to put up with something that needs to



Absolutely nothing to do with roadables. From the DHAP Archives, a beautiful Jungmiester



park with the RV's (as in Winnebago).

I have in the past favoured canard aircraft but the wing loading requirements for this configuration defeated me. You can't put flaps on a pure canard aircraft which means you need a larger wing, or you limit your gross weight. A big wing is likely to make the vehicle top-heavy if stowed on top, and is too deep to stow on the sides, assuming you want to be able to see where you are going.

So: how about a three surfaced aircraft? The canard can be used to move the aerodynamic centre forward, allowing a reason-

ably sized tail on a shortish fuselage. The spar carrythrough would be behind the occupants' heads, allowing a cantilevered structure. A three-surface configuration allows the main wings to be placed aft of the cockpit, so in folding forward they do not exceed the vehicle length. The wings could be kept small and therefore lighter as the canard adds to the total wing area. 60 square feet could do, with slotted flaps to keep the lift coefficient high enough to give a reasonable landing speed. A rear mounted engine is close to both rear wheels and a pusher prop drive.

A few features of this iteration:

I've moved the wings to the top of the vehicle for stowage. Esthetically not the best place, and they introduce weight up high where I don't like it; but even small wings seem to be just too much in the way when mounted on the sides. The wings fold forward after lifting vertically to clear the fuselage, moving weight forward for driving. A sliding fitting would be attached to the rear spar for this; it would not be a load bearing for flight purposes, but only for facilitating wing stowage.

I ran into a problem achieving adequate vertical tail area. A Y-tail looks nice, and is well protected from parking lot damage, but lacks adequate vertical tail volume. An inverted Y tail, like on some versions of Molt Taylor's Imp, is damage prone in the parking lot: it's low enough to trip over. Hence, a box tail with a vertical central member underneath, like the Streak Shadow or Professor Leshner's Teal.

With all these surfaces hanging out in the wind, the suspension is an unwelcome but necessary addition. Perhaps a retractable suspension could be incorporated; sexy, but weight adding. Could one mount the wheels on the front canard? This would save you weight and reduce the number of things intersecting the fuselage.

The canard and tail are dimensioned so as to not require folding; i.e., they are both 6 feet in span. Working with a fixed span means a lower aspect ratio. If you want a significant amount of area in these surfaces; remember, however, that design goal of this aircraft puts aerodynamic purity after multi-mode usefulness *within workable limits*. I'll take a 10 knot penalty if it means I don't have to fold the canard or tail surfaces; but it must still fly and drive well enough to have meaningful utility

What I don't know

A number of questions are raised. In his book, Hollman suggests that in three surface aircraft, the canard is usually 10 percent of the main wing's area, and the tail, 15 percent. My 62 square foot main wing area assumes a canard area of around 9 feet, or 14.5 percent of the main wing area; biggish by Mr Hollman's standards; the tail is about 22 percent of the wing area. Would this create a control problem, or is it perhaps less efficient? I can reduce the size of it, but that means a larger wing, which is either going to block my view or put extra weight up high when I'm driving. So for now, let's assume the larger canard is OK; we aren't anywhere near even building a model. The total wing area, canard and main, is nearly 80 square feet. At this point wing area is 62 square feet, the canard is 9 square feet, and the horizontal tail is 13.5 square feet.

Another thing: what happens to a fixed canard when flaps are extended on the main wing? I imagine the canard would need to be flapped as well. Further: notice

continued on page 8

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Pat O'Donnell 533-1839

FOR SALE: Zenith 250 plans and parts, wing rib moulds \$360. Christavia Mk IV project, 4130 steel tube, wing ribs, flaps ailerons, gear legs, wheels and brakes, tail stab and rudder, \$3600.

Paul Trudel 532-8570

Roadables (again) Continued from page 6

on page 5 the proximity of the main wings to the tail: too close? The aero centre might be in the right neighbourhood, but I imagine care would have to be taken to make sure the wing didn't somehow blanket the

tail surfaces at higher angles of attack, especially when the flaps were deflected; hence, the tail is mounted as low as possible. Does mounting the wing on a part of the fuselage that is tapering back create adverse flow conditions? Can I somehow incorporate the canard into the front suspension? Attractive from the point of simplicity and such, but

do I really want a flying surface taking the kind of pounding a front suspension usually does?

This exercise has gone a ways to convince me how complex an art designing aircraft is, even with such preliminary calculations (and they *are* preliminary) as I have attempted here. I guess all I'm really trying to do is gauge the real world feasibility of the concept: how many different ways is there to accomplish this? Can it be done at all, and if so, will the necessary compromises render it impractical? It's a fun challenge, especially when you start factoring real (albeit preliminary) numbers in to test your ideas.

You have probably not heard the last of this. I remain vigilant, I beg for other articles from members. Please. But it's still fun learning about this stuff, and I welcome you along as I journey down the learning curve.

Anyone remember my first idea? I've learned a lot since then.

