Turn & Bank

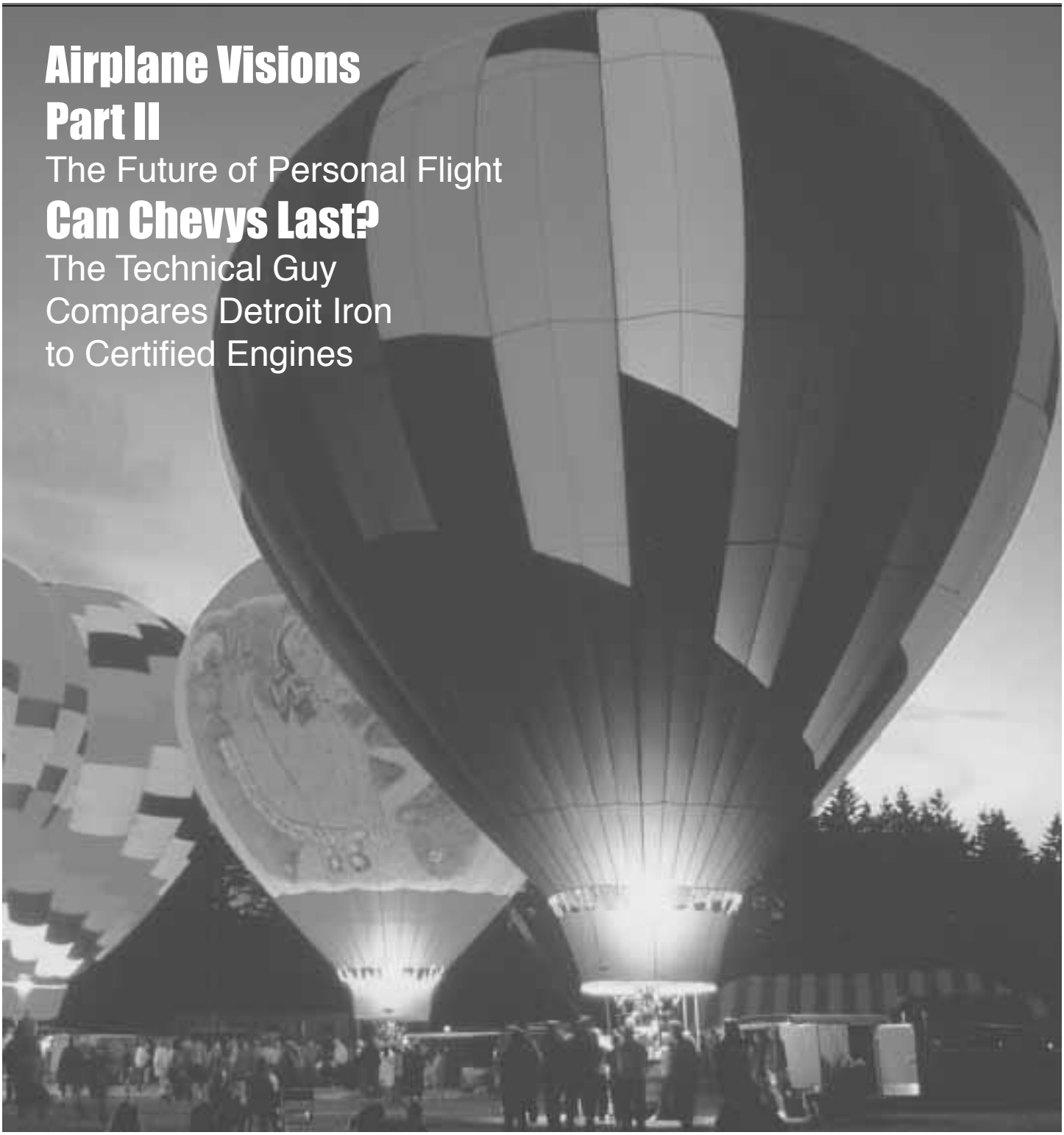
OFFICIAL NEWSLETTER OF RAAC CHAPTER 85 JUNE 2001

Airplane Visions Part II

The Future of Personal Flight

Can Chevys Last?

The Technical Guy Compares Detroit Iron to Certified Engines



Cover: The balloons of Arlington. Rob Prior Photo
Above: Murphy's Super Rebel

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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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RAAC National Homepage: http://www.inforamp.net/~raac
RAA Chapter 85 Homepage: http://www.b4.ca/raa_85
Delta Heritage Air Park Homepage: http://home.istar.ca/~bb4
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Technical Guy

Tips from the Western Canada RVator

Can Chevys Last?
Tedd McHenry, Editor,
Western Canada RVator

Judging by the RV List, one of the most consistently hot topics among RV builders is alternative engines--especially auto engines. I'm in the strange position of being more comfortable with auto engines than aircraft piston engines. I only have about 30 hours in the air with pistons, and I've scarcely even seen the insides of a Lycoming. But I've rebuilt quite a few auto engines, for both road-going cars and racing cars. And I've watched with interest as the durability of auto engines has shot up over the years. I can remember--and I'm a youngster compared to many RV builders--when it was a real milestone to get 100,000 miles out of your car, especially if it was a four-cylinder. Now, the manufacturers are talking quite seriously about having the first scheduled service at 100,000 miles! So I'm inclined to be skeptical when people confidently claim--without any analysis--that an auto engine couldn't have reasonable durability in an RV.

But it's quite correct to claim that the duty cycle of an aircraft engine is very different from the duty cycle of an auto engine. While it's true that auto engines typically last a lot longer, in hours, than aircraft engines, they also operate well below their peak power output for most of that time. So it's quite appropriate to ask, "How long will that auto engine last if it's putting out 120 horsepower in sustained cruise, and 160 horsepower in TO and climb?"

On the other hand, one very inappropriate discussion that often takes place is about the percentage of rated power that the auto engine runs at. Auto engines aren't rated the way airplane engines are. An aircraft engine's rating is, by definition, a measure of how much power it can put out for some defined period of time. So, naturally, it can be expected to last that long. An auto engine's rated power is simply the peak power that it can produce--far more than an aircraft engine of the same size would be expected to produce. For example, the Chevy 4.3 V6, with a displacement about the same as an O-235, is rated at 200 HP. If the auto engine was rated the way airplane engines are, it's rated power would be much less, and you would find that it's cruising at a much higher "percent of rated power" than the 20 or 30 percent that's often quoted.

Given all this, is there some way that we can fairly compare an auto engine to a Lycoming when used in an airplane? Here's my suggestion: compare the two on the basis of mean piston pressure (MPP), mean piston speed (MPS), and peak piston acceleration (PPA). These factors are used by engine designers to provide a feel for the amount of stress the engine is experiencing. You can find the equations to calculate them in most mechanical engineering handbooks. I used the Bosch Automotive Handbook, 2nd Edition, to compare the Lycoming O-360 and O-320, and the Chevy 4.3 V6. I have assumed that the Chevy would use a reduction drive, allowing it to rev to 3,600 RPM.

Engine	O-360	O-320	4.3 V6
Displ., in^3	361	320	262
Peak HP	180	160	160
Cruise HP	135	120	120
RPM	2,700	2,700	3,600
MPP (peak), psi	146	147	134
MPP (cruise), psi	110	110	101
MPS, ft/s	33	29	35
PPA, g	600	521	836

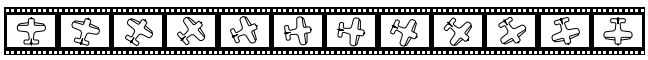
I was quite surprised to find that the MPP for the Chevy was actually less than for the Lycomings, despite producing the same power as the O-320 with only 80% of its displacement. This lower pressure is a direct result of higher RPM. That is, less piston pressure is required to produce the same horsepower at a higher RPM. The penalty of the 900 extra RPM, of course, is piston speed and acceleration. Nevertheless, because of having more cylinders (allowing a shorter stroke), the Chevy's piston speed is only slightly higher than the Lycoming's.

Piston acceleration is another story, though. The Lycoming's is quite a bit less than the Chevy's, again due mostly to lower RPM. How significant is this difference? It's important to bear in mind that piston acceleration is a function of RPM only, not power output. In the days before overdrives became common, a V6-equipped car with 15-inch wheels and a 3.73 rear end would have turned about 3,500 RPM at 120 kph (75 mph). So, presumably, GM would have anticipated sustained speeds in that neighbourhood. And, because piston acceleration is proportional to the square of engine speed, the piston acceleration that the Chevy experiences at 3,600 RPM is not even half of what it experiences at peak power in an automotive application. So there's every reason to believe that the main bearings, wrist pins, and so on in the Chevy are designed to withstand the 3,600 RPM accelerations with a decent fatigue life.

All things considered, it appears that the Chevy wouldn't be experiencing a lot more distress in an RV than a Lycoming is. You could even make a case that it's operating further below it's operating limit than the Lycoming. There are a lot of other considerations to an auto engine conversion, of course: auxiliaries, reduction drives, cooling system, and weight, to name just a few. But durability doesn't look like a problem, to me.

I'd be interested to know what other builders think of this analysis. Are there other factors you think should be analyzed? Other engines? If you have any thoughts about this, please write and I'll include them in a future issue of the WCRVator.

AIR Frame



Aircraft Portraits

Rob Prior
www.b4.ca/airframe
rv7@b4.ca

3032 Carina Place, Burnaby, BC, V3J 1B5 604/422.8446

Bulletin Board

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.

Want to learn more about aircraft construction? Get involved in the J-5 project! Also, we are looking for help from someone knowlegable in fabric work. Talk to a member of the executive and they'll put you in contact with the right people.

To ALL interested in RESERVED Camping at Arlington 2001 and pay for ALL five nights in advance. Contact Don souter at dwsouter@lynx.net or phone at 572-6079 and leave a message. He'll get in touch with you shortly with details. Last year's price was $100 US. This includes camping and admission.

June 16 - Sechelt

June 30 - Delta

July 11-15 - Arlington

June 2-3, Revelstoke, BC. Call 250-837-3510 or e-mail Amber at Amber@Revelstoke.net for more information.

June 2-3, Nanaimo, BC. Nanaimo Flying Club's annual fly-in. Warbird pilots and crew eat free. For more information call Gerry Budlong at Tel.: 250-748-3110; E-mail: gtbud@home.com, or John Hubbard at Tel.: 250-245-7435; E-mail: johnmargaret@home.com.

June 3, Vanderhoof Flying Club fly-in breakfast from 9 a.m. until noon. For more information contact Leonard Muir at Tel.: 250-567-5998.

June 17, Williams Lake Father's Day fly-in at the Springhouse Airpark (AQ4 - 10 minutes south of Williams Lake). For more information call Larry or Judi Chambers at Tel.: 250-392-3195.

June 17, Salmon Arm COPA Flight 80 / Salmon Arm Flying Club's Annual Father's Day Air Affair at CZAM. For information call Harry Chapin at Tel.: 250-833-0053 or E-mail: chapin@telus.net.

June 30-July 1, Hope. BC: Breakfast to be held at the Chilliwack Flying Club (Chilliwack Airport) 9 a.m. to 11 a.m. Breakfast, spot landing, flour bombing, barbecue and free camping. For more information contact Charlie Robinson at Tel.: 1-604-807-9262; E-mail: robisonc@home.com.

July 11-15, Arlington, WA: EAA Northwest Fly-in. Contact Betty Scott or Barbara Tobert at Tel.: 360 435 5857; E-mail: flyin@nweaa.org; Web page www.nweaa.org.

July 14, Nimpo Lake, BC: BCFA AGM/ Social to be held at Nimpo Lake at 1 p.m. Contact Mary at Tel.: 250-742-3239 for accommodation.

July 15, The Kamloops Flying Club will be hosting a fly-in breakfast. Contact Ken Barry, COPA Flight 82, at Tel.: 250-376-6969 or E-mail: kabarry@sageserve.com.

July 21-22, Fort St. John, BC: Snowbirds event.

July 25, Smithers, BC: Snowbirds event.

July 28, Kelowna, BC: Snowbirds event.

July 29, Comox, BCSnowbirds event.

Minutes

Jim Hunter

Minutes of the General Meeting,
1 May, 2001

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

Walker/Thompson: that the Minutes of the General Meeting of 3 April, 2001 be adopted as printed in the Turn and Bank. Discussion Carried.

Correspondence:

Letter received from BCIT acknowledging that Chapter's bequest of $500 last year to their bursary find has been granted. See "New Business" these Minutes.

Committee Reports:

Treasury: Verbal report relayed from Don Souter.

Membership: Rob Prior: 106 total membership of whch 97 are paid up regular members and the other 9 complimentary.

Buildings: Dan Weinkam/David Bell: Tie down spots are available. All accounts being satisfied. Big Annual Clean Up this coming weekend.

Library: Tim Baker: Going fine. Tim has received a huge load of books anonymously. If you brought them in, please talk to Tim so he can sort them out properly.

Vice President: Emily Clemens: Emily not here but apparently there were about 74 people present at the bash so should even be financially successful. Well done to Emily and to her crew says we all.

Program: Tonight we have Mr. Roy Casbert who was involved with Radar during WW2.

Newsletter: George Gregory: Going fine (and with the usual supplication)

DHAPCOM: Terry Wilshire: Nothing to report but, in response to an observation from the floor, the committee will look to see if incursion onto the field by non-flying persons is a problem, and, if so, what might be done about it in the context of the field remaining people friendly.

Aircraft: Tedd McHenry: the Turbi has been run up at Sechelt but not flown because of another minor but annoying and unrelated problem. Tedd is now taking orders for block time on theTurbi.

A motion: McHenry/Hunter: that a cheque for $200 be presented to the Sechelt Chapter in thanks and appreciation for all that they have done while our Turbi has resided at their field. Discussion Carried.

and, Gaetan and the J-5 squad will be working on the airplane this Saturday. Come and join in.

Old Business:

The June 30 Fly-In. Bruce Prior: Committee meets this next Tuesday. Need lots more man power. A sign up sheed coming around.

New Business:

Hunter/Baker: that the Chapter donate the sum of $500 to the Bursary Fund for students enrolled in the Aircraft Maintenance Engineer Program at the BC Institute of Technology.

Discussion Carried.

Wilshire/Hunter: that we adjourn, and so it came to pass.

Jim Hunter, Secretary.

AIRPLANE VISIONS 2

By Bill Husa
www.oriontechnologies.net

A SUCCESSFUL LOW END AIRPLANE should have features which will significantly surpass anything available today in terms of aesthetics, performance, comfort, safety and operation. If the airplane is used for training it needs to have performance more in tune with the more advanced aircraft the pilots will be flying in future years. The following are some design goals that were used in a proposal for a light aircraft development, submitted to a Seattle area composite manufacturer back in 1984:

Cruise Speed - Speed capability has to be significantly greater than that of current trainers and utility aircraft in order to be more in line with the advanced phases of a students' eventual goals, and for good cross country applications. 180 mph was selected.

Stall Speed - Should be less than 55 mph to allow slow approach and landing speeds for safer low-time student operation. Coupled with sufficient power, the resulting configuration should provide good short field and amphibious capabilities.

Climb - Rate of climb should be significantly greater than that of current trainers, preferably better than 900 fpm.

Structure - Should be as simple as possible with a minimum of parts. Also needs to be able to withstand a significant amount of energy in case of impact with an immovable object (such as the ground), and it should have some inherent float capability for post ditch safety. Further crash considerations require that no fuel is stored in nor has access to the cockpit area.

Power - For economical operation while delivering required performance levels, the engine should be at or above 160 horsepower.

Range - For better cross-country use the range should exceed 800 miles; goal was 1000.

Flight Safety - For safer operation the airplane should have the capability for hands-off stall and spin recovery so in order not to test the energy absorbing structure.

Weight - Gross weight should come out at about 1,900 lbs. for the two place and 2,800 lbs. for the four place - enough for the airplane to be able to carry ninety percentile people, their baggage and full fuel. Today's practices of off-loading fuel or baggage to fill all seats was considered unacceptable.

Visibility - The design should incorporate the highest visibility possible, bubble canopy (with roll-over protection) preferred.

The aforementioned proposal resulted in four generic concept aircraft suitable for development in two and four seat configurations. The following listing shows a generalized summary of the performance capabilities of the two place concepts.

Maximum sea level speed 205 mph
Cruise speed 175 mph
Stall speed 54 mph
Rate of climb 1,100 fpm
Power 160 hp
Ceiling 25,000 ft

These figures were of a preliminary nature, based only on the general physical properties of the configurations considered, but they still showed a significant improvement in performance against current lines of certified trainer/utility aircraft. Based on analyses which considered performance, utility, operational capabilities and aesthetics, a baseline aircraft was chosen. The following is a brief description of the submitted configurations. (See accompanying sketches.)

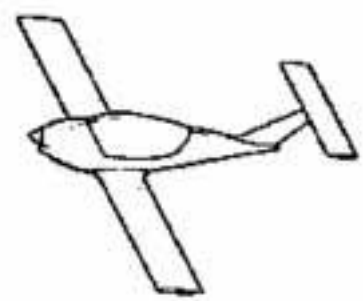
#1 - The first concept, a high winged V-tailed pusher was unique due to its relatively easy conversion for amphibious operations. The design consisted of a fuselage

with simple lines that seated two crew comfortably in a high visibility cockpit. The fuselage width at the shoulders for this and the other concepts was forty eight inches so even ninety percentile people could fit in with ease.

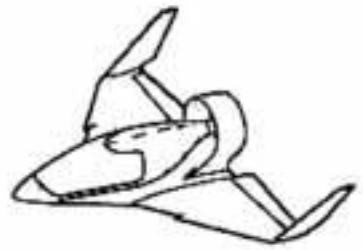
The "V" tail was mounted on a boom which could either be part of the fuselage mold or a separate aluminum tube (molded configuration was eventually selected). The wings swept forward primarily for positioning the allowable CG range near the seats and the baggage area. (Further study has shown however that the sweep could be eliminated with refinement of various component positions.)

#2 - The second airplane was a take-off on the Lear-Fan or Mini-Imp configurations, attractive for the simplicity of its lines. Out of the four concepts it was determined to be the easiest to manufacture and assemble. The performance of this model

was somewhat better than that of the other three and would therefore lend itself well to uses that require range and speed.



#3 - Again a simple fuselage design, the third concept was developed along more conventional lines. A T-tail tractor much similar in overall appearance to the low wing trainers one sees today, it was designed as a more traditional configuration for those whose tastes in aircraft tend toward the norm.



#4 - The fourth concept was based on an airplane developed in 1973 by the Rhor Corp. for entry into the two place trainer market in direct market competition with the Cessnas and Pipers. The configuration was a delta wing powered by a 180 hp Lycoming and a ducted propeller. A unique feature (especially for 1973) of the aircraft was the fact that the entire airframe was made out of pre-molded foam and fiberglass. Unfortunately in the mid 70's the company suffered some financial setbacks which forced them to abandon the project, however, prior to the program's cancelation three aircraft were built, one of which accumulated almost a hundred hours of flight time. At the end all three vehicles and their tooling were cut up and scrapped. The preliminary analysis showed this fourth concept to have some major benefits but the performance numbers with anything less than the 180 hp were poor therefore the configuration was out of the running early in the evaluation.

The final tally of the proposal showed that the winning concept was #1. Further work then continued in the design effort to define the systems, the structure and the performance envelope.

The project was eventually canceled since at the time the company's marketing people decided that the firm's niche was as a subcontractor rather than a prime airframe manufacturer. Never the less, some important lessons were learned. The first and foremost was that if a manufacturer wants to build a low cost airplane in today's economy it most likely will have to consist of a combination of metal and laminate structures, but most importantly, it needs to be designed with composite structure concepts in mind. As soon as a company designs a composite airplane with metal thinking, the efficiency of the structure suffers, sending the weight and costs beyond reasonable limits. Good examples of this type of construction are many of the popular composite kits sold today. Although pretty and relatively good performers, they are built largely in the same way a metal airplane would be, making the assembly procedures difficult, inaccurate and time consuming. In many cases the empty weights for two place aircraft are as much as 200 pounds heavier than if the components were optimized for the materials and service conditions.

The following statement made by the chief designer of Piper aircraft is an extract from an "Interavia" magazine issue published in the first part of 1984. Relating to the Malibu, it clearly demonstrates the attitude of those not intimately familiar with composite technology.

"Piper's engineers have been juggling with the design of this aircraft for almost four and a half years in order to find the best solutions. The use of composites to lighten the fuselage was envisaged at one point but was rejected for three main reasons. The first of these was economic. The cost effectiveness of composite materials is still very low whereas the manufacture of structures from aluminum alloys is a well understood and comprehensively mastered technique. The same cannot be said for composites, be they glass/epoxy or carbon fiber.

"The second reason is the difficulty of producing structures capable of coping with high localized stress loads. Such structures are difficult to design and can entail considerable weight penalties.

"The last and most problematic of the three reasons is that it is still difficult to predict the exact strength of a composite structure to a satisfactory degree of accuracy. Tolerances seem to differ from one part to the next.

"Finally, a secondary, but no less important consideration, is quality control. This is difficult to perform on completed parts. The only solution for the manufacturer, therefore, is to monitor the manufacturing process. This is an open invitation to take risks over quality and standards. These risks do not exist if one sticks to a well known process such as 'tin bashing'. The costs involved in inspecting, testing and repairing a metal airframe are definitely in the minor league compared with those involved in a plastic aircraft."

Although it includes some justifiable points, the statement reflects an unfamiliarity with the technology, an unfamiliarity that is, twelve years later, still commonly encountered in the aerospace industry (specifically general aviation). The main problems are education and economics. Actually I should say the lack of education. As long as the program managers and others in leadership positions are ignorant to the benefits of composite technology and the techniques of its application, it will be difficult for the industry to make any significant inroads. Making aircraft interiors and fighter skin panels is a start but it is not significant. Making light airplanes as limited production kits is even a better start but the kind of advances I'm talking about are fabricating reasonably priced kit and certified aircraft on a regular and large scale basis, fabricating reasonably priced fighters or a commercial transport such as the 747 out of composites - that would be significant. Imagine a 747 that would be damaged but not knocked out of the sky if bombed. Its possible and it doesn't need to cost billions.

The economics of today's airframe producers are a little tougher to fight. If a company is set up to manufacture airframes by "tin bashing", the cost of converting to composites would be formidable; not to mention the cost of redesigning the product(s). A start-up company producing a new design however, does not have this economic problem, and although more and more people and organizations are willing

Continued on Page 8

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Wings: ribs and minor spars done. Spar diaphragms done. Two spar-grade spruce planks. No other wing parts.
$15,000 firm, complete and not interested in parting-out
Jim Hunter 576-2678

FOR SALE:
1957 Tripacer Wings uncovered, all reworked. New leading edge. New ash tip. All Zinc Chromate ready to fabric. Included: 2-18 gal. gas tank, 2 - gas tank cover, landing light, aileron and flap, front and rear struts. Asking $4000 Canadian.
Roger Gauthier (Kelowna) (250)-763-1529
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Wanted: PA 18 or PA 20/22 Wings. Some damage OK. 946-5881

For Sale: Electronic Tach 2.25" with generator (new) $125, 6" castoring tailwheel, $50, Electronic dimmer control, $25, 2 New 600.6 Goodyear Tires, $125 for pair, Combo EGT/CHT (needs probes),$50, Tach Cont.C85-0200, $35, Temp (OAT) gauge, new, $35, Windscreen Ant., Van's, new,$15, 525 battery (new) never had electrolyte, $75, Fuel Pressure Gauge O/H, $35, Lycoming Starter 0-290, 0235, 0320, 0360, for $375.
Bob Cutting 275-1603

FOR SALE: Fleet F7 Biplane replica. Very close to original copy except for uncowled engine. Engine: Kinner R55 160 hp. Aircraft is modified for solo operation from rear cockpit. Extra bellytank with wobble pump. Original Fleet wheels, brakes, pedals and stick column. Original parachute accommodating bucket seats, oversize tires, Stits covering, voice activated intercom. Ted Hendrickson Propeller, manual and extra key magswitch.
$35,000 Canadian. (604) 478-6048
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David Clark Headsets $225 (mostly 10-30 type, helicopter and airplane.
Telex PT-300 PTT $30.
Full map GPS Garmin 195 - Nicad pack, Pacific NW map chip, PC/MAC computer cable kit, mounting bracket. $1500 or $1200 without map data chip.
Bendix RSA 10 ED1 Injector Body, no history, $400. Woodward Prop Governor #210681, no history, $400.
National 360 Parachute, blue with matching carry bag $900
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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
Building Partner Wanted:
partially completed Kitfox Model IV-1200. Time too limited to complete myself. Seeking building partner with some experience. Partnership arrangement - terms to be discussed. Call Marty Billinkoff
Days (604) 322-7545 Cell (604) 351-0222
Evenings (604) 946-6475
email: martyb888@aol.com
WANTED: CASSUTT sport/racer preferably in flying condition. Will consider a project or an RV project. Contact Adrian Cooper
tel/fax (604) 324-2104, or email at adriancooper@canoemail.com

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to dedicate their projects to composites, the progress is slow.

The same concepts demonstrated in kit planes and the few certified production programs could be optimized and scaled down in order to produce small, lightweight, but well performing two place trainer and utility vehicles. We don't need to copy or redesign the 150, we can make something better. If an efficient and low cost structure was designed the airplane could become a reality in the very near future. Companies like Glasair, Lancair, Wheeler and the Cirrus have taken the correct steps toward this goal but have not advanced far enough beyond "metal thinking" to attain the design efficiencies, part quality, performance and comfort required for this next generation of light aircraft.

Needs this be expensive? Of course not. If the development group is kept small and efficient, costs will stay reasonable. Beware of those that offer their services then begin by putting their "design team" together. This type of individual is probably one who came from a large organization and is used to doing things on a grandiose scale. Furthermore, this person may have some level of expertise in component design but overall is not qualified to design a general aviation product.

Designing a small airplane shouldn't take more than one or two people. If they are skilled enough they could possibly also be the ones building the first prototype, cutting the costs further still. The day of the large general aviation company is long past; today's new and innovative developments are going to come from individuals and small establishments dedicated to aviation, quality, and efficiency.

Another high cost item in the airframe is the engine. As I mentioned earlier, the technology base of today's trainers reaches back over fifty years, and the engine is no exception. The Lycomings and the Continentals (among others) that first came out so long ago are almost identical to the engines being produced today. In general they are heavy, have a low power to displacement ratio, have poor specific fuel consumption, and are very expensive to purchase and maintain. If the new aircraft is to have a selling price of around $50,000, it cannot have and engine that costs over $20,000.

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Just to give a brief comparison of costs, a brand new GM Quad 4 engine, capable of producing in its stock configuration over 170 horsepower (dependable 250 hp if boosted), and if maintained correctly capable of lasting over 150,000 miles (roughly equivalent to about 1000 aircraft hours) sells retail at just over $10,000. A distributor ordering in lots of 50 gets a price of less than $1,500 each (prices approximate - provided by GM representatives at the 1996 Seattle Auto Show). Compare this to a 320 cubic inch Lycoming which produces around 160 horsepower costing new close to $30,000.

The ideal two place trainer powerplant would come in over 160 horsepower, weigh no more than 280 lbs. installed and cost around $5,000 retail. With the use of an efficient unducted fan (optimum for pusher configurations such as the one selected in the 1984 proposal) turning between 4,500 rpm and 6,000 rpm, propulsive efficiencies could stay well above seventy percent, eliminating the need for a gearbox to slow down the crank speed and making the installation lighter and of course more reliable.

The technologies exist today for this kind of development (engine and airframe) and yet little is happening. Why? Part of the reason is funding. Government money is generally not available for this type of development and as for the private sector, it makes more sense to build a shopping center and start getting a return on investment in about a year than to develop an aircraft venture (assumed risky by many) which may not show a return for two years or more. Furthermore, unless the partnership or corporation doing the venture is set up correctly, the financial backing is open to risk due to liability problems. Either way the results are the same - the private development of new aircraft is for the most part stagnant.

Our industry needs a mechanism for introducing the aviation enthusiast with the necessary capital for investment, to the individual or small company that has the necessary technological skill and capability for the development. As an example our company has a number of well developed designs which range in performance from about 180 mph to more than 500 mph, yet without outside funding the first one may not be in the air for more than five, possibly six years. With outside funds the first can be airborne in as little as twelve months.

We are at a point where financial, technical and legal support is required if the low end aircraft industry is to survive and grow. The technical visions and capabilities are here, they just need to get from the drawing boards to the shop floors. An investment needs to be made to make this happen, an investment in tomorrow.