TURN AND BANK

OFFICIAL NEWSLETTER OF RAAC CHAPTER 85 October 1998

The Davis Effect

AN UNTRAINED AERONAUTICIST WOWS THE EXPERTS

Plus:

Volkswagen Conversion Problems

Vortex Generators

INSIDE

On The Cover:
Today, B-24s are scarce, but 55 years ago the bombers covered the ramps at Abbotsford and Boundary Bay. Photo by Mark Munzel

The TURN AND BANK is the monthly pub - lication of RAAC Chapter 85 and is intended to keep members informed as to the club's activi - ties, and to promote safety and technical excel - lence in the field of sport aviation. No responsi - bility 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

RECREATIONAL
AIRCRAFT
ASSOCIATION
CANADA
Delta Heritage Airpark
Vancouver, B.C.

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RECREATIONAL AIRCRAFT ASSOCIATION
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For inspections of Amateur Built Aircraft Projects contact the Recreational Aircraft Association Headquarters at 1-800-387-1028

Regular Meetings are held on the first Tuesday of each month at 20:00 hours in the clubhouse at:
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 held on the third Tuesday of each month at 19:30 hours in the clubhouse.
Chapter aircraft pilots, mail cheques (Payable to RAAC Chapter 85) to:
Brad Short, 8052-122a Street.Surrey. B.C. V3W-7R4

Technical Guy

Tips from EAA's Technical Counselor News

Volkswagen Engine Problem
by Ralph Ball
Technical Counselor, EAA 138654

He sent along a newspaper clipping of a fatal accident to a fellow member; "I did not know this man, but I am sick at heart, from knowing what caused his VW powered aircraft to crash soon after lift-off. Twenty-five years ago, a friend of mine built, and attempted to fly a VP-1. The engine failed soon after lift-off. Fortunately, my friend landed of field with a broken prop and other minor damage. I autopsied the engine and found him to be the victim of an unscrupulous mechanic.

It took me two tear-downs to make it airworthy. Due to the fact that I had the first line-boring bar in Santa Barbara County, I had numerous occasions to post-mortem VW and Porsche engines. I was a also the victim of the engine I had in a "bug". I then went on a crusade to determine "why so many rod failures, why the failures on take-off?" I did find out, but I never published the "why". The reason the V-Dubs fail on take-off is the clearances of the piston-ring lands. The heads swell at full-throttle and seize in the barrels. This also caused a lot of rod-bearing failure. My authority on this is the comparison of Corvair clearances to that of the V Dubs. Corvairs do not seize up. Another problem in the VW's is inadequate crank end-play. Also, never fly a VW without the "case saver" bushings for the cylinder studs, There is more, but these are the basics, A VW engine can be made airworthy, but so many are not.

Possible - not Probable
Problem with Vortex Generators
by Allen Kennedy
Technical Counselor, EAA 147749

West's third lay of dynamic frustration states "The solution to every problem creates another problem". I was checking on my Dragonfly after a rather strong storm. As I walked closer and closer, I could hear a mournful howl like a sad puppy. The sound was coming from my row of Vortex Generators. The wind was about 25 mph and quartering about 30 degrees off the nose of the aircraft. I now wonder what it would be like at 180 mph. I installed the Vortex Generators because my stall speed in light rain increased 18 mph over my dry air stall speed. When I installed these, I first tufted the wing and noticed places on the wing where the air stood completely still and some places where the tufts were flapping violently and some places where the relative wind was actually travelling from rear to front. Roughly following the information in the Dragonfly Builders and Flyers Newsletter, I installed the generators in pairs in a symmetrical configuration - wing to wing; in about two foot sections (between test flights) The Vortex Generators did the job as advertised and made the tufts lay down. An added benefit about which I had never been able to get an answer: it reduced my dry air stall (landing) speed approximately 3 mph and my cruise airspeed about the same. This had been previously tested by other Dragonfly builders. My reason for writing this account - noise is vibration, vibration is flutter (even if it does not damage). This information from which I was working was a bit fuzzy and no two Dragonfly wings are exactly alike. Very little of the wrong variation from what had been recommended could create a fully fluttering aileron or at least a buzz at high speed. I am reading of more and more different styles of Vortex Generators and Murphy's Law stipulates, in censored form, "if it can be done wrong, it will be done wrong." The point I am trying to make is, don't jump in whole hog to an unknown area. I can see a hydraulic leak or oil leak, a crack or a tear, but like electricity, I can't see the air just by looking. I see the possibility of creating a disaster by making a vortex generator the wrong size, shape or position. ***T&B***

The cockpit of the Confederate Air Force's Heinkel 111

BULLETIN BOARD

*Re: **Classified Ads:** If you are running a business card size ad or larger in the Turn and Bank, there is a nominal charge. Rates are on page 7: see The club Treasurer to make payment.*

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.

Re: **Border Crossing Permits:** it's that time of year again!

Ask for: Foreign Civil Aircraft Special Flight Authorization (SFA) No. NE/AC-1013.

For permits contact:
Duty Officer
Federal Aviation Administration
Seattle Manufacturing Inspection District
Office ANM 108 S
1601 Lind Avenue SW
Renton, WA 98055

They will need your aircraft type, model, registration and serial number. A rough itinerary (eg: Arlington, Evergreen, etc.) is required along with point of departure and first landing destination in the States, but they seem to want it comprehensive to; so put in just about anywhere you are likely to go or wind up. Give also dates for which you need the permit. They will also require a photocopy of your C or R and of your journey log page containing your most recent annual.

They are willing to give 180 day coverage that should certainly take in the season. Mail you request to the above address or fax it to (206) 227-1159; or you can phone it in at (206) 227-2173.

Lost and Found Dept: **Lost:** one hat! Arlington Airport Thursday July 9. Blue. RCAF Association crest plus an enameled Long-eze Pin. Give Gordon Hindle a call at 535-0592. ***T&B***

Minutes
by Jim Hunter

MINUTES OF THE GENERAL MEETING, 1 SEPTEMBER, 1998

Call to order: 8:00 pm by President Pat O'Donnell, who welcomed visitors and new members.

Spence/Walker: that the Minutes of the General Meeting of 4 August, 1998 be adopted as printed in the Turn and Bank. Discussion Carried.

Committee Reports:

Treasury: Verbal report by Treasurer Tim Novak.

Membership/Library: Rob Prior: one (or two) new members tonite. Library fine.

Buildings: Colin Walker: Buildings fine but Colin beginning to wonder about how much longevity can be squeezed out of our clubhouse.

Aircraft: Brad Short: Turbi flew 22 hours in August. 100 hour is done.

Fly-outs: Dirk Post: North Pender strip is open and in good shape. Recollect that it's a one-way strip. Plan early if you don't like the looks of it.

Butler's fly-in 5 September. it could be its last as progress is eating into the runway.

Campbell River: fly-in 19 September.

Anyone interested in going on a bus trip tour to the Boeing Museum, see Dirk or talk to Gogue at the CMFT at Langley.

RAAC: Bruce Prior: RAAC AGM at Langley, October 2,3 and 4. The actual meeting is at langley Best Western on the third and Chapter members are welcome. See Bruce after the meeting tonight if you can help with ground transport and/or accommodation for out of town delegates.

AIRABA: Bob Cutting: the DABI program is now fully national. the "owner maintenance" program proposal is still on hold.

DHAPCOM: Terry Wilshire:

1) Appeals for volunteers to look after small portions of grounds keeping. Talk to Terry or Phil Bill.

2) Fuel pumps being re-located.

3) Committee looking seriously at re-opening the coffee shop.

New Business:

1) Remembrance Day fly-past is on. We will have our mandatory two practice sessions. More later. George Spence (AC2, acting, temporary) will again be our peerless leader.

2) George Gregory, *Turn and Bank* editor says that he is out of material and threatens us with more of his own, but see below.

3) Kim Trask of CASARA gave a brief talk on the work of the Civilian Air Search and Rescue Service and they are actively recruiting members. Reach Kim at 541-0266. Editor and roving reporter George Gregory will publish an article by Kim in a forth-coming *Turn and Bank*.

Prior2/Spence: that we adjourn.

-and we did.

Jim Hunter, Secretary

Don't forget: October is the Chapter AGM and elections.

The Davis Effect

This restored B-24 shows off its Davis wing on approach. In truth, Davis was responsible only for the airfoil, and not the taper, high aspect ratio, or Fowler flaps.

Text and Photos by Mark Munzel

SEVERAL RECENT Turn & Bank articles have introduced new ideas for aircraft -- not planes that already exist, but better ones. Two years ago, Norm Helmer described his concept of the "Paradyne," a craft in which air is pumped away from the top of the wings to create lift. Last winter, George Gregory explained why he believed that a practical roadable aircraft design was possible. The former offered a new approach to flight; the latter argued for a new attempt to realize an old dream.

It's easy for readers, especially ones with a technical background, to be naysayers, doubting that novel ideas like these can ever take flight. Surely their proponents are naive! If the ideas are so promising, why hasn't someone already made them work? Clearly the inventors are blind to major flaws in their schemes, or are trying to do something which engineers have proven unfeasible. Right?

Perhaps not.

The following tale is condensed from What Engineers Know and How They Know It, a 1990 book by Walter G. Vincenti, professor emeritus of aeronautical engineering at Stanford University. About half of the book is sleep-inducing Sociological gunk; the balance contains some interesting case studies from aviation history. This one can serve as a allegory for the doubters: Sometimes, the inventors do build a better mousetrap ... or flying machine.

In the 1930's, the standard way for American aircraft designers to select an airfoil for a new design was to pick one from a catalogue of sections and data produced by NACA, the National Advisory Committee on Aeronautics. (The modern equivalent of this compilation is Abbott and Von Doenhoff's "Theory of Wing Sections.") NACA scientist had created and investigated thousands of shapes, which varied in almost every characteristic of wing geometry that could be imagined.

Consolidated Aircraft in San Diego was studying low-drag wing sections in this era.

> ...the Davis shape had less drag than any of the other profiles the company had tested.

Potential applications included long-range flying boats for civil and military service. Engineers from Consolidated built models of those NACA sections which promised little drag in cruise, and tested them in a Cal Tech wind tunnel.

Enter a self-taught inventor named David R. Davis. Davis had worked for a few aircraft companies in the 1920's, but trained engineers and designers had forced people like him from the industry by the following decade. Undaunted, Davis approached Consolidated president Reuben Fleet (previously of Fleet Aircraft) in 1937, with a new "in" -- an airfoil of his own design, claimed to be more efficient than any before it. Davis said he had developed his new section from mathematical formulae based on fundamental rules of aerodynamics. Of course, he would only give Consolidated the equations for a price.

To prove that he really had something to offer, Davis allowed Consolidated to test a model of his airfoil section. Shockingly, the Davis shape had less drag than any of the other profiles the company had tested. And the slope of its lift vs. angle of attack plot was 6% steeper than that of the previous best section ever studied at Cal Tech. Davis and Fleet signed an agreement: Davis got money, Consolidated got the wing formulae.

Once Consolidated's engineers saw the equations, they panicked. The formulae were based on fundamental aerodynamics only in the most tenuous way. Davis had created a geometrical transformation of the flow of a fluid stream around a rotating cylinder (i.e., the Magnus effect, for the engineers in the audience). There was no true relationship between this flow pattern and the ideal shape of an airfoil, but Davis was postulating one. Worse, Davis had set the values of some essential constants not by deriving them through experiment or theory, but by reasoning what the correct values might be. Davis' airfoil design was really just a wild guess at a good profile

Continued next page

One for the pacifist in the readership: the Davis airfoil on this PB4Y (basically a single-tailed B-24) lifts fire retardant, which helps to save trees for later...hugging.

Davis *continued from page 5*

shape, created with complicated mathematics.

But it was a good profile, all the same. Absurd as they were, the formulae yielded a superior wing section for a long-range aircraft.

By the time Consolidated had its new airfoil, the world was becoming a dangerous place. Before the company could build any aircraft with the new section, to see if its "real" performance matched that promised in the wind tunnel, the US Army Air Corps called. The Air Corps wanted Consolidated to help build Boeing B-17 bombers for the upcoming war. Ruben Fleet instead proposed that Consolidated produce a bomber of its own design, using the new "Davis wing" airfoil.

> Davis had unknowingly designed one of the first laminar-flow airfoils.

The new plane was built as the B-24 Liberator ... and built, and built. Eventually, 18,482 B-24's were completed, more than any other US warplane before or since. They served as long-range bombers, U-Boat hunters, and transports through World War Two and after. B-24 operators included the US Army Air Force, Navy, and Coast Guard, plus the air forces of Britain, Australia, and China. Canada flew the type, too -- indeed, Boundary Bay and Abbotsford were the home bases of a Liberator aircrew training school, and the "big hangar" at Boundary was built to shelter the four-engined craft. Another user, the Indian Air Force, retired its last one from service only in 1966. Today, a few PB4Y's, single-tailed Navy derivatives of the B-24, are still used as fire bombers in the US.

(Objectively, the success of the B-24 cannot be credited exclusively to the Davis wing. No equivalent NACA-winged aircraft was ever built for comparison, to show whether the Davis airfoil gave any real advantage. Mass production, rough maintenance, dents, ice, and bugs probably distorted the wing shape enough to take away its magic, anyway.)

What was the secret of the Davis profile? Why did it perform so well? Because Davis had unknowingly designed one of the first laminar-flow airfoils. The shape of his airfoil, with its maximum thickness further aft than was usual at the time, delayed the development of turbulent airflow on the upper service. More laminar flow meant more lift and less drag. The untrained Davis had created something before all the engineers and researchers could. Not until the early 1940's, in the pressured research of wartime, did NACA come up with superior profiles. Once they did, the Davis airfoil vanished into history. Just two aircraft besides the B-24, a one-off flying boat and the unsuccessful B-32 bomber, ever used the Davis section.

In his book, Vincenti treats the story of the Davis wing as a curiosity, an historical footnote. But it can also be viewed as a

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CLASSIFIED ADVERTISEMENTS

Classified Ads are free (within reason) to members. Display Ad rates are:

Business Card:	*$25 per year*	
1/4 page:	*$10/month*	*$100/yr*
1/2 page	*$15/month*	*$150/yr*
1 page:	$25/month	$250/yr

FOR SALE: KR2S. Plans built. Approximately 40% completed including lower fuselage, empennage, wing roots, spars, landing gear, and controls. $4500 and 600 hours invested. Has already completed one inspection and is almost ready for a second inspection. Asking $3000.00 obo. Jamie 467-0870 or 467-6646

FOR SALE: New 4130 Tubing - most sizes available. **Used** - Tripacer Fuselage (comes with logs), metal prop off 150 hp Tripacer (comes with logs) Cessna spring steel gear legs, misc. wheels, axles, brakes and parts, misc. instruments (no altimeters!) A75 engine case, 7 Continental cylinders, some Lycoming cylinders (big), carbs, mags, pumps, old radios, etc. Call Pat at home, 533-1839.

Avian Graphics

Layout, Logo Design, Letterheads, Business Cards, what-have-you.

George Gregory 882-8016

WANTED: Medium size air compressor, with or without tank.

Doug 275-1405

FOR SALE:

Walker prop 72x44 for 65 to 85 hp Continental; as new, $500. Also Prestolite DC hydraulic power pack (for retractable gear) $125, 5" Venturi, $40, 2" Venturi (brass) $50. Complete set windshield/rear observer plexigalss for Taylorcraft L2A, $350. One set of 4 Bungee Cords for J3, new, $100. RV6A Stainless (321) 1 3/4 crossover exhaust system with stainless forged flanges $750 obo

Bob Cutting 275-1603

Email rcutting@direct.ca

FOR SALE:

52" x 34" Shettler's propellor with hub, $100.

Vic Gabas (604) 853-2778

FOR SALE: SIROCCO PROJECT

Fuselage, canopy, tail group complete. Air frame control components done except for cable. Main-wheel gear, wheels and brakes done. Tail-spring and wheel included. Panel made, no instruments. Lycoming 0-290 GPU Zero-timed. Will Neubert stainless cross-over exhaust with stainless muffler/shrouds. Bendix PSC5 carb. Bendix mags with non-shielded leads. no starter, starter ring or alternator. Weldtech engine mount. McCauley prop.

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:

1 set (8) 60810 (68763) M10 main bearings $295 per set

1/2 set (4) of same $150 per set

1 set (8) 60810 (68763) M003 main bearings $295 per set

1 set (8) 61662 M10 Rod Bearings $175 per set.

All bearings fit Lycoming 0-235 and 0-290 (without C/S prop). All are new, perfect but certs mislaid,

Gogi (604) 823-6428

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
(250) 212-0832 (cel)

WANTED: PA 18 or PA 20/22 Wings. Some damage OK. 946-5881

Classified continued on page 8

Classified Ads
(Continued from page 7)

FOR SALE: Tailwind Project. I hate to let it go! All wood for wings, spars and ribs done, new wing fittings, control system, Cougar fuselage mostly modified for Tailwind use.
George Gregory 882-8016

FOR SALE: Lycoming GPU good jugs, crank and case (modified for A/C use), mags, turn and bank indicator. Fuel tank with gauge, cut down Sensenich prop, lots of other stuff.
George Gregory 882-8016

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
Will consider small antique aircraft engine as trade-in.

FOR SALE: Some Cont.0-200 parts: Case (checked, no cracks) Camshaft, Gears, Rods and Pistons; Carb and spider, Starter (pull type) and Generator, mags (one is disassembled). $2500 for the package, offers considered on individual parts. Also, Prop hub for Cont. tapered shaft, $350, Wing parts for Taylorcraft BC-12D (disassembled) including ribs, spars, compression struts, brace wires and strut fittings. Offers?
Contact David Smith (604) 513-0353
(604)513-0373 (fax)

FOR SALE: 1 pair David Clark Helicopter headset, 1 Telex MRB-2400 headset,1 Marvel Schebler MA3-SPA and 1 MA4-SPA carburetors. June McMann 943-5369

Aircraft Painting
Will paint, finish off aircraft for cash or part share in airplane. Prefer Cessna or Piper. Value of work is $6-8000 depending on condition of aircraft.
Kevin 580-6264

FOR SALE: 1967 Cessna 172. 4100 TT, 1750 SMOH, on condition, runs great. Dual NavComs, ADF, Transponder Mode C, Asking $28,000 obo. Chuck 826-8898

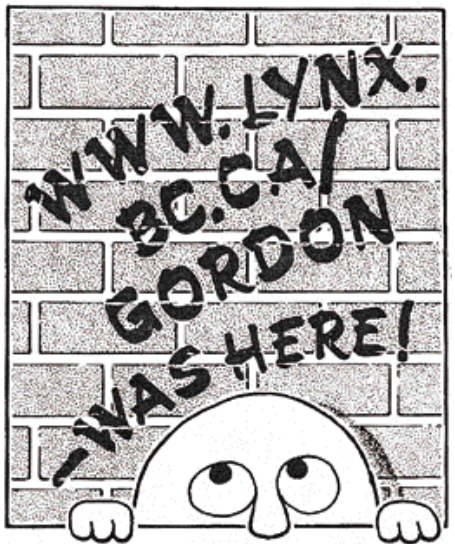
FOR SALE: One set of 1500 Murphy floats ready to go.
Ole #45-3931 198 st. Langley BC 514-1280

FOR SALE: 6 Factory new Franklin 180 hp cylinders includes installed valves $300 each, will not part out.
Tim Novak 271-8586

WANTED: No bounce landing gear for Aeronca Champ
Ken Morrison (604)524-1762

FOR SALE: Softcom 2 place Intercom ATC-2Y, with accessories $110.
Stuart Gear (604) 941-9402
E-mail:sgear@infoserve.net

FOR SALE: Lycoming180 HP 10-360-B1A 330 hours since homebuilt major, Full panel plus all the parts to get a kit plane into the air. $14,000.
Also: 1960 C-172, New annual, engine on condition. $21,500. Grant (604-536-6945



Davis
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lesson -- that it is possible for a creative person to change how people fly. True, engineers eventually design better airfoils than the one which Davis had made using faulty science. And since his time, sixty years of research has cultivated and harvested most of the field of aeronautics, leaving few novel ideas for an inventor to hobby-farm. But Davis' story verifies that there can be new things under the sun. Creative people have brought new technology into aviation before. Perhaps with a Paradyne or a roadable aircraft, one will again. ***T&B***

LAST WORD
GEORGE BIEHLER

WHAT A SUMMER! The combination of one of the sunniest summers on record and access to an airplane has allowed us to fly with impunity: I have logged more hours in the past month than in the past seven years. The Spousal Blessing has been upon these endeavors, especially since our holidays: I suspect we will be a flying family for as long as we can all fit in the airplane (at least until the newest, and final, addition is two). We will be parents again (fourth time around) by the time you read this. Maybe a Cessna 206...

Abbotsford was missed; even though it had gotten rather big and commercial, it was sort of a marker on the airshow season's calender. And it still celebrates aviation, and is a valued platform to get the word out.

I note with some displeasure that NavCan is looking at a fee for aircraft owners; if I understand aright, our class of aircraft will be billed sixty dollars a year under the revised fee structure. COPA has voiced our concerns. Have you contributed to the consulting process? Make a stink! We already pay our share through gas taxes. I can't imagine what huge profit *they* would get from the relatively small pilot population, yet its effects on personal aviation could be profound.

I got a kick out of Mark's article in this month's issue. You just never know...I almost feel inspired to go on another Roadable Aircraft Rant. There have been revisions to the idea; all I need is time (yeah, right) and a few gazillion dollars to test out my ideas. Until then, the only vent for my frustrated-inventor persona will be the pages of this publication. Being the editor does have its advantages. In the meantime, however, keep those cards and letters coming! ***T&B***