

cal transformation of the flow of a frictionless fluid stream around a rotating cylinder (that's the Magnus effect, for the geeks the audience). There was no true relationship between this flow pattern and the ideal shape of an airfoil, but Davis was postulating one. Worse, his transformation contained two important constants. Davis had chosen the values to be +1 and -1 - not by experiment or mathematical proof, but by reasoning what the correct values might be. Davis' airfoil design was really just a wild guess at a good profile 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. Rueben Fleet instead proposed that Consolidated produce a bomber of its own design, using the new "Davis wing" airfoil. 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



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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 flown in the US as fire bombers. (It should be noted that the B-24's success wasn't due exclusively to the Davis wing. No equivalent NACA-winged aircraft was ever built for comparison, to show whether the Davis airfoil gave the B-24 any real advantage. Mass production, rough maintenance, dents, ice, and bugs probably distorted the wing's shape

News and Stuff

Don't forget to renew your memberships for 2015! Membership is \$40 or \$55 if you are not a national RAA member.

We had a **Builders Group meeting** this past Tuesday and had a presentation from Darryl Murphy of Murphy Aircraft. He gave a 1 hour discussion on the Murphy Rebel and assured everyone present that Murphy Aircraft is still in business, and in fact they are ramping up production in response to increased orders because of the improved (for Americans) US exchange rate. This information now makes the decision even more difficult between the Zenair 750 Cruiser and the Murphy Rebel LSA.

The **Annual Awards Banquet** is Sat-

urday, March 28th at the Delta Town & Country Inn starting at 6:30pm. The guest speaker is Jack Dekens who will be talking about his recent circum-navigation flight around Canada in his Cessna 172. Jack published an extensive article about his flight in the December 2014 issue of COPA News.

Volunteer for chapter activities: we can always use people to help with upcoming chapter events like the Pancake breakfast, and of course the chapter fly-in in late June. If you want to help out, contact any member of the executive.

Interested in volunteering for the **Abbotsford Airshow**? This year's show is

enough to steal the magic, anyhow. The B-24 would probably have achieved just as much fame and glory had it used a different airfoil.)

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 surface. 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 lesson - that it is possible for a creative person to make something new or better than its predecessor. True, in this instance aerospace engineers eventually designed even better airfoils than the Davis one. And since Davis' 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 the story of the Davis wing confirms 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, they will again.

August 7,8,9. The event wouldn't happen without the hundreds of volunteers that keep the wheels turning. Check out their volunteer page at http://www.abbotsfordairshow.com/index.php?p=1_18_VOLUNTEERS. Positions are available to all members of the community, though some age restrictions may apply.

The Turn and Bank is a Publication of Chapter 85 of the Recreational Aircraft Association of Canada. We are located at Delta Heritage Air Park 4103 104 St, Delta, BC V4K 3N3.

Newsletter design by George Gregory. Any suggestions, pictures or newsletter contributions can be emailed to George Gregory at george@sidekickgraphics.com

TURN AND BANK

January - February 2015

The Davis Effect



Maxwell B-24" by U.S. Air Force photos

By Mark Munzel
(First Published in October 1998 in Chapter 85's Turn & Bank Newsletter)

SEVERAL RECENT TURN & BANK ARTICLES have introduced new ideas for aircraft - not planes that already exist, but better ones. Norm Helmer has described his concept of the "Paradyne," a craft in which air is sucked away from the top of the wings to create lift. George Gregory has explained why he believes a practical roadable aircraft design is possible. The former offered a new approach to flight; the latter argued for a new attempt to realize an old idea.

It's easy for readers, especially ones with a technical background, to be naysayers, doubting

that novel ideas like these can ever become reality. Surely their proponents don't think these concepts are viable? If the ideas are so promising, why hasn't someone already discovered them or made them work? Clearly the inventors are blind to major flaws in their schemes, or are trying to do something which engineers have already attempted and found impossible. Their ideas won't work. Or will they? There is at least one precedent that suggests they could.

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. Half of the book attempts to describe engineering in the language of social scientists. The other, more readable half contains some interest-

ing case studies from aviation history. This one can serve as an allegory for the doubters: Sometimes, the dreamers do build a better mousetrap ... or flying machine.

In the 1930's, the standard way for American aircraft designers to select an airfoil shape for a new plane 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 interested in low-drag wing sections during this era. The potential applications included long-range flying boats for civil and military service. Engineers from Consolidated built models of those NACA sections that 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 Rueben Fleet 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 the 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 was better than any NACA profile the company had tested. On a graph of lift vs. angle of attack, Davis' airfoil had a slope 6% steeper than that of the previous best section studied at Cal Tech. At the same time, the Davis design had less drag for given lift values, and a lower drag minimum. Davis and Fleet signed a deal: Davis got money, Consolidated got the wing formulae.

Once Consolidated's engineers saw the formulae, they panicked. The formulae were based on fundamental aerodynamics only in the most tenuous way. Davis had performed a geometri-

Minutes of the General Meeting Tuesday 3 February 2015

Preliminary

Attendance: Approximately 28 members attended. Executive Committee members attending: Tom Boulanger, Shawn Connelly, John De Visser, Cyril Henderson, George Gregory, Peter Lenger, John Macready, David Marsden, Eric Munzer, Tim Novak, Bruce Prior, Hugo Regier, Gerard van Dijk and Peter Whittaker.

Call to Order:

at 1936 by President Peter Whittaker.

Visitors:

Speaker Nick Hill, controller at Vancouver Air Traffic Control Centre. No other guests,

Tonight's Program:

President Peter introduced Nick Hill, a controller at the Vancouver Air Traffic Control Centre located in Surrey. All IFR flights entering, overflying, and departing the Greater Vancouver Area are controlled from there. Nick is a pilot and a controller. He was a controller at Winnipeg for four years and has been at Vancouver ATC for six years. He spoke to us about IFR operations above 2500 feet and how those operations impact or are impacted by VFR traffic below 2500 feet. His presentation generated many questions, which he answered in detail. After his talk, he handed out gifts - folding frisbees and eyeglasses and micro fibre cleaning cloths. He invited pilots or small groups of pilots to call the Centre for a tour of the facilities. Bruce thanked Nick for his presentation.

Chapter Business

Minutes: Motion (Macready/Novak): that the minutes of the 6 January 2015 General Meeting be adopted. Carried. Communications: There were no letters to the Chapter in the past month.

Financial Report

Tom reported on updated year-end results for 2014 (a net positive \$6,589.87) and also transactions to date for 2015 (income \$620.00 and expenses \$3,372.37). His financial report will be attached to the file copy of these minutes. Old Business: None discussed other than in Committee Reports.

New Business

John DeVisser expressed concern about deep water levels around the tiedown area and hangar bays. There's no drainage there. Peter will take it to DapCom.

Airplane Construction Project:

Peter told everyone about the extensive discussion at the last Executive Meeting on 20 January. Two motions were passed at that meeting, as listed below:

Motion (Macready/Connelly): that we will not proceed with acquisition of a certified aircraft. Carried.

Motion (Regier/Macready): that we will pursue purchase of a homebuilt kit and formation of a dedicated builders group to select the model. Carried.

At the Executive Meeting, in accordance with the motions, Peter asked the members of the Executive if they would participate in the proposed Builders Group Committee. Seven said yes: John Macready, Peter Whittaker, Shawn Connelly, Gerard van Dijk, David Marsden, Peter Lenger and Cyril Henderson.

Peter asked the membership who would be interested in joining the new Builders Group. No one raised a hand. Peter asked that any member who might be interested should speak to him about it after the meeting. John Macready asked for reiteration of the results of the Executive meeting. Peter obliged. The motions are listed above. Peter said the Group's first task is to agree on the homebuilt kit to purchase.

Bob Lalonde questioned why the membership didn't hear about recent efforts to find a certified aircraft. Peter asked Cyril to describe the last aircraft that was inspected—a Piper Tomahawk. This airplane was discussed in depth at the Executive meeting but was discarded as an option after the decision was made to proceed immediately with a homebuilt kit project. Bruce said that the membership had been kept up to date on all aircraft searches and inspections and that only the Tomahawk had not been reported before now. Tom, Bruce and John all spoke in favour of the recent decisions made.

Committee Reports

Membership: David reported that "a fair number" still haven't rejoined. He reminded us that membership is \$40, plus \$15 if you are not a national member. Claren Turner, who purchased the Turbi and lives in Manitoba, told

John Macready recently that he hasn't been receiving any Chapter 85 information. He is not on the internet. John will mail him recent editions of the Turn & Bank and also a copy of the Turbi landing gear failure inspection report.

Hangar and Workshop:

John reported that everything is "still full." Two tiedown spaces are available. Albert has moved his Cessna 150 to ZBB until the grounds are dry. He's taking his flight training there so it's better for him to tie down his airplane at ZBB for now.

Custodian:

The boroscope is currently borrowed by a member. Hugo is working on doors for the bookcase. John Macready reported that he cleaned out the excess dishes from the cupboards. They are stored in a cardboard box. He also suggested we have too many Christmas decorations and should dispose of some. Hugo will post the clubhouse doors as a "Private Meeting" for the upcoming Air Share annual general meeting on 28 February.

Vice-President:

An awards sheet was handed out for members to propose awards recipients. Gerard has Awards Banquet tickets for sale for \$40. The guest speaker will be Jack Dekens who flew his Cessna 172 around the perimeter of Canada. See the article in COPA Flight, December 2014 edition.

DAPCOM:

Peter reported on the RAA-Metro License Agreement meeting with Metro. Mitch Sokalski, Tom McComb, and Marcel Lebreche represented Metro. Trevor Skillen, John Macready, Peter Whittaker and Tom Boulanger represented RAA. The new License Agreement will be finished in May and signed off in June.

The Avgas price has been reduced to \$1.45/L. Tom reported that MoGas would have been here today but a technical problem prevented it. Water and methanol testers are now on hand for fuel testing. MoGas will sell somewhere around \$1.20/L. The MoGas will be farm gas; we won't be paying road tax.

RAAC National:

No report.

Newsletter:

George advised that he works afternoons sometimes when RAA meetings are scheduled

so he cannot always attend. He reported that the latest Turn and Bank was a little late but it's here now. An upcoming feature article will be about the Staggerwing restoration at Langley. Kudos to John Macready, Heidi Bekker and Peter Whittaker for their contributed articles.

Programs:

Sebastien didn't attend. Peter reminded us that

we have a speaker for the Awards Banquet.

Announcements

- RAA Awards Banquet: Saturday 28 March 2015.
- Next Delta Breakfast: Sunday 8 March 2015 (hosted by DAPCOM)
- Next Delta Breakfast hosted by RAA: Sunday 12 April 2015

- Next RAA Executive Meeting: Tuesday 17 February 2015
- Next RAA General Meeting: Tuesday 3 March 2015
- Next DAPCOM Meeting: Thursday 12 February 2015
- Adjourn: Motion (Prior/Lalonde): that we adjourn. Carried. And we did, at about 2135.

President's Report

Peter Whittaker / January - February 2014

The first quarter of 2015 is almost over and there are a few Chapter 85 activities that I would like to review. In particular, there are two substantial developments underway. One is the airpark operating licence renewal and the other is the decision to pursue a club homebuilt aircraft project to replace the Turbi, more on these items below.

This year will see the operating licence for Delta Heritage Airpark come due for renewal. This takes place at the end of June and the renewal process has started with GVRD (Greater Vancouver Regional District) Parks Board. Discussions for renewal began in mid-January and also involve DAPCOM (Delta Airpark Committee) which is the airpark operating subcommittee of RAA Chapter 85. Discussions with GVRD Parks Board indicated that they are satisfied with how the airpark runs and at the same time, maintaining access for the public to non-airfield areas. The licence renewal will be for another period of five years. This creates a unique operating model for an active airfield within a public park. The airfield is also unique within Greater Vancouver since it maintains a grass airstrip and is a NORDO (No Radio) airfield.

The second Sunday in January saw the first "fly-in" pancake breakfast of 2015, although the weather cancelled any flying so it was all "drive-in". The turn-out was low although the breakfast broke even and came out a few dollars to the good. It was still a good event for catching up with friends after the Christmas and New Year's season. The next Chapter 85 pancake breakfast is the second Sunday in April.

Chapter 85 meetings, which take place on the second Tuesday of every month at 7:30pm, have had three excellent guest



speakers thanks to the efforts of Sebastien Seykora, our Program Chairman. In January, Peter Murphy and Geoff Guest from Transport Canada reviewed the failure analysis findings from the collapse of the Turbi landing gear. This failure event took place late in 2013 at Delta Airpark on a landing. The Transport Canada investigation showed that fine fractures at a weld led to corrosion which further weakened the weld over the years. The weakened weld finally let go on what was an otherwise uneventful landing with no injuries and minimal damage to the rest of the Turbi. The Turbi has since been sold to an RAA member in Brandon, Manitoba.

In February, Nick Hill from Air Traffic Control at Vancouver Centre gave a very hands-on and practical talk about flying in the Lower Mainland and procedures for transiting Vancouver airspace as a light aircraft. His presentation gave a good

overview of how incoming commercial traffic is collected and sequenced for arrivals in "the bowl". The rush hour periods were described and it seemed like this was essentially all of the time. The March speaker was our own Sebastien Seykora who described flying in the Canadian Arctic.

A decision was reached in January, by the membership, on what approach was to be taken for replacing the Turbi which had served as the club airplane for the last 4 decades. The option to pursue buying a used certified aircraft was dropped in favour of seeking a homebuilt project. At this point, a Builders Group has been formed and several kit aircraft options have been considered. A high wing, all metal, 2 place aircraft is the type considered best suited for club flying activities and different models of Zenith Aircraft are currently under closer consideration.