EAA 245 OTTAWA, ONTARIO
NEWSLETTER
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CARB HEAT - Hot Air and Flying Rumours

Meetings - 3rd Friday at the National Research Council Building Auditorium
100 Sussex Drive, Ottawa, 8 pm

Feb.'85

Notes on talk by Canadian Astronaut Dr. Bjarni Tryggvason

Canada has been involved in space programs for many years - we are one of the few countries that make money out of space via our telecommunications satellites. The participation of our new Canadian astronauts in the U.S. shuttle program and the Canadarm however have made us all more aware of our involvement. The January meeting was privileged to have Bjarni Tryggvason talk to us about Marc Garneau's recent flight and the shuttle program.

Some interesting comparisons with the homebuilts we are familiar with no doubt went through everyone's mind! The shuttle weighs about 200,000 lbs (a stretched Boeing 737 weighs about 120,000 lbs). The whole thing - booster rockets etc., weighs roughly 5 million pounds at launch! Within the first minute it has reached an altitude of 26 miles. By two minutes it is moving at 3000 mph. The jettisoned rockets are retrieved about 60 miles downrange and the engines burn for another six minutes giving the shuttle a speed of 17,000 mph and an altitude of about 150 miles, by which time it is roughly 150 miles down range. Surprisingly the G forces are not that high (for an astronaut) - a maximum of only around 3. They are purposely kept low to reduce stress on the payload. The shuttle engines give the most accelleration (after the boosters are gone).

Slowing down to come back out of orbit is done by firing up the engines for two minutes which reduces the speed by 270 mph (obviously with the shuttle travelling backwards!). This is done over Australia. They enter the atmosphere over Alaska at about 400,000 ft. and 17,000 mph and glide from there until they're over the button of the runway in Florida between 30,000 and 40,000 ft. at 210 knots. Fortunately they don't have to eyeball it like a glider pilot all the way from Alaska to Florida - computers take care of getting them there. From their vantage point over the button at 30,000 to 40,000 ft. it's one turn-around and onto the ground. Practicing for this is done with a Gulfstream aircraft equipped with extra drag devices and with engines in reverse thrust! Sounds worse than you're average forced landing!!

Canada spent $100 million developing the first Canadarm and $15 million each to produce four more. A simulator in Toronto is used for training - one astronaut has spent 300 hours perfecting his skills on it.

Also in Toronto is a laboratory for studying motion sickness, which the astronauts get to visit quite regularly to ride the machines. One spins you on a axis about your ears for ten minutes (or until you get sick which is usually after about three minutes!). They also get to spin about the vertical in a chair, putting their heads up and down. It only takes between one and one and a half minutes to get sick doing that. The idea we were told is to understand and recognise symptoms of motion sickness and build up tolerance.

Some of the biological problems encountered in space flight:

Major ones - puffy faces and bird legs, and sequelae ("morbid condition or symptom following upon some disease")
- cardiovascular decompensation
- loss of minerals from bone
- problems involving the vestibular system - motion sickness and disorientation.

Minor ones - exposure to cosmic radiation
- inability to burp normally

One also looses track of where one's arms and legs are in space. Everyone recovers everything normally except for loss of minerals from bone.

Space is not totally empty - at orbit altitude there are roughly 10 million molecules per cubic centimeter (about a millionth of what's on earth, but nevertheless a lot). The erosion they cause on different materials is tested through exposure on the Canadarm and is quite severe. Carbon is completely stripped away after 30 hours is space.

A robotic or space vision system is planned for about 1986. A TV camera will be co-located with a light beam and used via a computer to calculate the position of satellites so they can be retrieved. A lot of work is yet to be done in designing the computer system.

The assembly of a space platform is to begin around 1990. Six to eight people will be housed in each capsule for about 90 days. There are plans for a permanent moon base maybe around the year 2000.

Regarding motion sickness: if any poisons get into the body they affect the vestibular system and cause one to feel dizzy, then the body's protective machanism triggers vomiting. If one is made to feel dizzy the body thinks it's being poisoned and away you go. However people can be trained - part of the training is to teach people to relax (bio feed-back). The success rate is about 80%. One's attitude affects the proneness to sickness - being tense heightens susceptability. Drugs are useful but no drug will cure all the reasons one gets sick.

The astronauts get to practice weightlessness by flying in a Boeing 707 that does a series of 40 zero-G profiles per flight. People are usually sick after about the third zoom! For the remaining 37? Well, Marc Garneau was sick 37 times! Tolerance however can be built up - Marc was okay after the fourth flight. How's that for perserverance?

Tidbits:
- Geosynchronous orbit is at 22,000 miles.
- There are approximately 4000 pieces of equipment/junk in orbit.
- The shuttle's maximum orbit is around 250 nm.

Bjarni said he has about 2400 hours of flying time (including 1300 - 1400 hours instructing) and wants to design and build his own aircraft.

T E C H N I C A L   T I P S

by

Garry Fancy

1. Finishing up on last months article on fabric work, I'll outline a few points and problems that I encountered whilst fabricating the wings.

   Cut pieces from the roll of fabric of sufficient length to wrap around the wing chord, that is from trailing edge forward over the leading edge and back to the trailing edge, allowing several inches to spare. Most synthetic fabric comes around 60" widths so enough pieces must be cut to do the wing length and those sewn along the seamed edges.

2. Do not sew the seamed edges. It is very tempting to do so as they provide a neat straight edge. However, the seamed edges are double thickness and cause havoc when trying to sew. Instead cut this seamed edge off and sew on a machine with about a 7/8" overlap. The manuals specify a French feld or folded feld seam but I have found three rows of sewn stitching on the 7/8 overlap provides more than adequate strength. The actual sewing can be a tricky business. I have had some good results and some very messy results. Use the synthetic thread for the material and a "rounded" sewing machine needle. Short pieces of fabric sew beautifully, but two or three pieces 60" by twice the wing chord are another matter.

3. The fabric is attached to the wing in a straight forward manner. Glue the upper trailing edge on with the fabric to the rear (see sketch). Then wrap it around the trail edge gluing the fabric to the trailing edge again, bring it around the leading edge (its not necessary to glue it to the leading edge) and glue the fabric again so both surfaces of the trailing edge, and trim the fabric. The final fabric cut must be straight so that it will look neat. Glue the roots and tips. When cutting and glueing the fabric, remember it will shrink in both directions (span wise and chord wise) so allow sufficient slack, particularly chord wise.

   The fabric is now ready to be tightened with the iron after which the strengthening tapes can be struck on the tops and bottoms of the ribs, and the rib stitching intervals marked off. I found a premarked cardboard strip very handy for these, with the rib stitching intervals (1-1/2", 2", etc.) marked on the cardboard. When marking the rib stitching intervals on the fabric, ensure they fall in a vertical plane so that the stitches are directly above and below each other (see sketch). Also don't forget to allow for aileron pushrods or other rods that may run along the wing.

   The rib stitching strengthening tapes are stuck to the fabric prior to rib stitching and prevent the rib stitching from pulling through the fabric. This tape can be purchased at any hardware store in 3/8" or 1/2" widths and is commonly called box-wrapping tape (it has synthetic threads running lengthwise).

Odds and Sods

STAPLES: The problem of removing staples from glued wood members without gouging is greatly facilitated by first laying down a strip of plastic banding/wrapping tape or strong twine. Once the joint has dried or cured, a pull on the tape/twine will either lift out the staple or make it easier to grasp with pliers. (Designee Newsletter, Nov, '84)

GROMMET HOLE CUTTER: An electric soldering gun, frequently used for this purpose, leaves an upturned ridge around the grommet hole on the inside, thus trapping water. An X-Acto 3/16 inch punch (#131--fits a #3005 handle), when applied to the grommet and twisted, produces a clean hole and also removes the plug. (Designee Newsletter, Nov. '84)

MARVEL SCHEBLER CARB FLOATS: Facet Aerospace Products Co, who have acquired Marvel Schebler carburetors, have issued a Service Bulletin advising that ALL Marvel Schebler carbs with "MS" on the lower portion of the nameplate or carrying the Facet Aerospace nameplate be converted to metal floats. Kits are available through local distributors. (Designee Newsletter, Nov, '84)

COLOUR AND HEAT: Black--especially a thin coat of flat black--readily allows heat passage in either direction, and is thus a good colour for radiators, fins, valve covers, crank case, oil cooler, etc. A black surface, in fact, radiates heat more than 10 times better than a plain cast surface. White, by contrast, impedes heat transfer in either direction, and is hence a good choice for exhaust stacks. Horizontal surfaces are more prone to heat rise than vertical ones; for example, a suuny 75° F. day will heat a horizontal black surface to 190° F., but a white one only to 123° F. Soaring Mag., Sept., '75, lists the following figures:

Ambient Air Temp.	80° F.	110° F.
Black	198	237
Brown	191	231
Red & Green	178	219
Orange & Tan	162	198
Light Green	155	193
Purple & Silver	148	183
Light Blue & Aluminum	143	177
Yellow & Pink	134	169
White	128	163

Cockpit colours will also have a direct bearing on materials and accessories that are heat sensitive, so think about playing it COOL. (adapted from Roger J. Van de Weghe's article in Sarnia's 199 News, Nov., '84)

BREAKING IN A NEW ENGINE (from Bill Groman in the Pacific Flyer, by way of Windsor's Log Sheet, Mar., 84).
The object here is to match the rings to the cylinder wall (called "seating") so that compression is high and oil consumption is low. If the run-in is not carefully managed, however, the friction between rings and cylinder wall will result in "glazing," a hardened, polished condition which resists further matching of rings to cylinder wall--a condition likely to result in low compression and high oil con-

sumption. The trick is to keep a high power setting while maintaining low temperatures, a requirement most easily met by flying. Avoid steep climbs, keep a constant power setting (about 75 per cent) for at least one hour. A CHT gauge will show a rapid drop when the rings become seated. Carefully monitor oil levels and oil and temperature gauges. Ground running time should be kept to a minimum, with R.P.M. not exceeding 1500.

In general, start and run the engine for 1 minute or less at 1,000 R.P.M. Shut down and inspect for oil leaks and other problems. After 10-15 minutes, re-start the engine. Perform mag checks at 1500 R.P.M. while taxiing (if possible). Shut down, re-peat the engine inspection performed earlier. Top up oil if necessary. Wait 10-15 minutes and re-start the engine. Taxi into take-off position and immediately begin take-off roll at about 1500-1700 R.P.M. At 40 m.p.h. indicated, advance throttle to take-off setting and establish best-rate-of-climb or slightly faster angle. Avoid excessive climb time. At cruise altitude, set power to 75 per cent, constantly monitor engine instruments (especially oil pressure and temp, and CHT), and remain thus for 1 hour. Return to airport and carefully inspect engine. Remainder of break-in time as recommended by manufacturer can now be flown using normal (but not abusive) procedures. [This sounds great for a plane whose previous flight characteristics are well known, but it doesn't lend itself very well to the homebuilder who requires extensive groundhandling and high-speed taxiing before blasting off into the wild blue yonder. Anyone care to submit their ideas, preferably tested, on the subject? (the reviewer)]

PERSEVERANCE AWARD

(The following story comes from Canadian Flight Magazine via Windsor's Log Sheet, June '84).

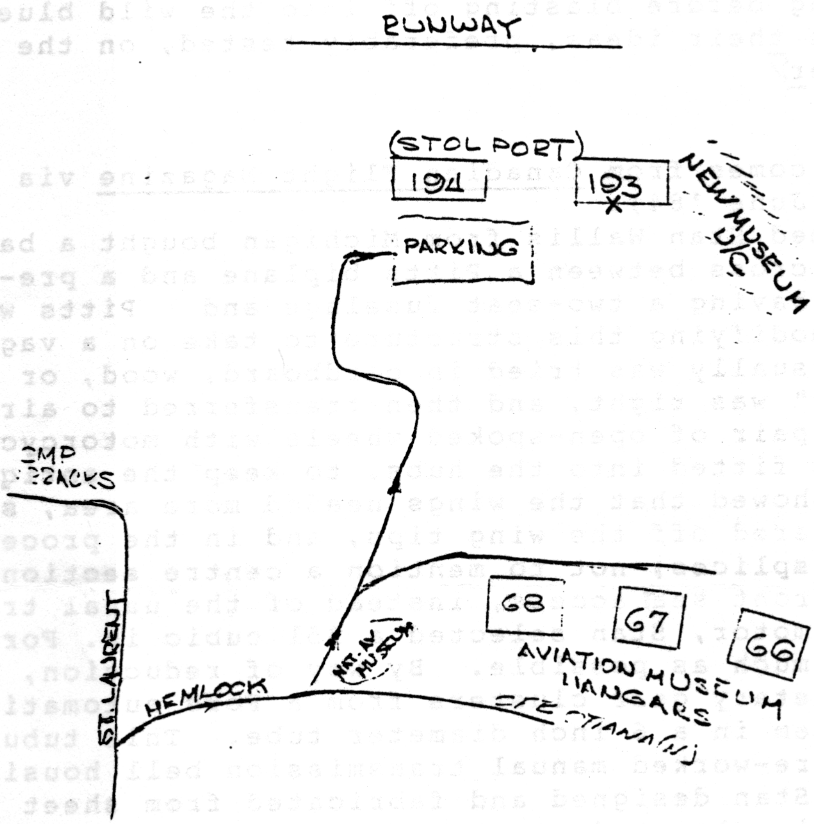
In 1970, a fellow named Stan Wallis from Michigan bought a basic airframe which was a cross between a Pitts biplane and a pre-war Great Lakes Trainer, having a two-seat fuselage and Pitts wings. Stan promptly began modifying this structure to take on a vaguely antique look. Work usually was tried in cardboard, wood, or scrap metal until the "look" was right, and then transferred to aircraft material. He made a pair of open-spoked wheels with motorcycle tires and small disc brakes fitted into the hubs, to keep the antique look. Calculations showed that the wings needed more area, so Stan added three feet, squared off the wing tips, and in the process, made 8 (eight!) wing spar splices, not to mention a centre section with a lift-up panel for front seat access, instead of the usual trailing-edge cut-out. For a motor, Stan selected a 351 cubic in. Ford, and then lightened it as much as possible. By way of reduction, he used two sets of planetary gear clusters from a Ford automatic transmission and housed them in a 6 inch diameter tube. This tubular housing was then bolted to a re-worked manual transmission bell housing. For greater reliability, Stan designed and fabricated from sheet steel a new water pump housing located at the rear of the engine and driven from the crankshaft. The alternator was mounted (with great difficulty) inside the gear box. After 3 months, 42 matched pieces of Douglas fir emerged as a propellor of over 8 feet in diameter and 118 in. pitch. Engine shut-down nearly tore the engine out of its mounts, so Stan built a one-way roller clutch from a Ford transmission into the hub. Finally, test-flying time. After 25 hours, however, gear-box failure at 500 ft. resulted in splintered prop, ruined landing gear, and a damaged lower wing. Undaunted, Stan redesigned the gearbox, re-made the cowling due to a new thrust line, made a new propellor, and repaired the airframe. Two years later, the plane was flying again!

(Roger Fowler)

MEETING

Friday, 15 February, 1985

A tour of the National Aviation Museum Workshops and Museum has been arranged. Our host will be Mr. Ed Patton, Assistant Curator and licensed AME. We will be touring the workshops and storage areas and seeing aircraft awaiting restoration and those under restoration. This is a rare chance to get a behind-the-scenes look at our National Aviation Museum. To get to the Workshop proceed out to the Stolport area (see sketch) and meet in Bldg 193 at 7:45 pm (note change in venue from that announced at the January meeting).



Ed Patten started his aviation career in 1956 when he started working for the De Havilland Engine Company at Stag Lane, England. In 1958 Ed started a five year apprenticeship with the D.H. Engine Technical School. In 1963 he graduated as a gas turbine engine tester. He continued to work for De Havillands, now called "Bristol

Siddeley Engines" as a production engine tester on the Gnome turbo shaft engines at Leavesden. In 1965, Ed moved to the engine company's experimental test site at Hatfield where he worked on the development test cells.

In 1967 he came to Canada with his wife and worked for United Aircraft in Montreal testing the P.T.6.gas turbine. He moved to Ottawa and started working for Laurentian Air Services at Uplands and Schefferville, Quebec. It was during this time that Ed obtained his A.M.E. licence.

In 1971 he joined the Aviation Museum as a restoration technician. During the past years Ed has participated in over 30 airshows throughout Canada and at present holds the position of Assistant Curator, Aviation.

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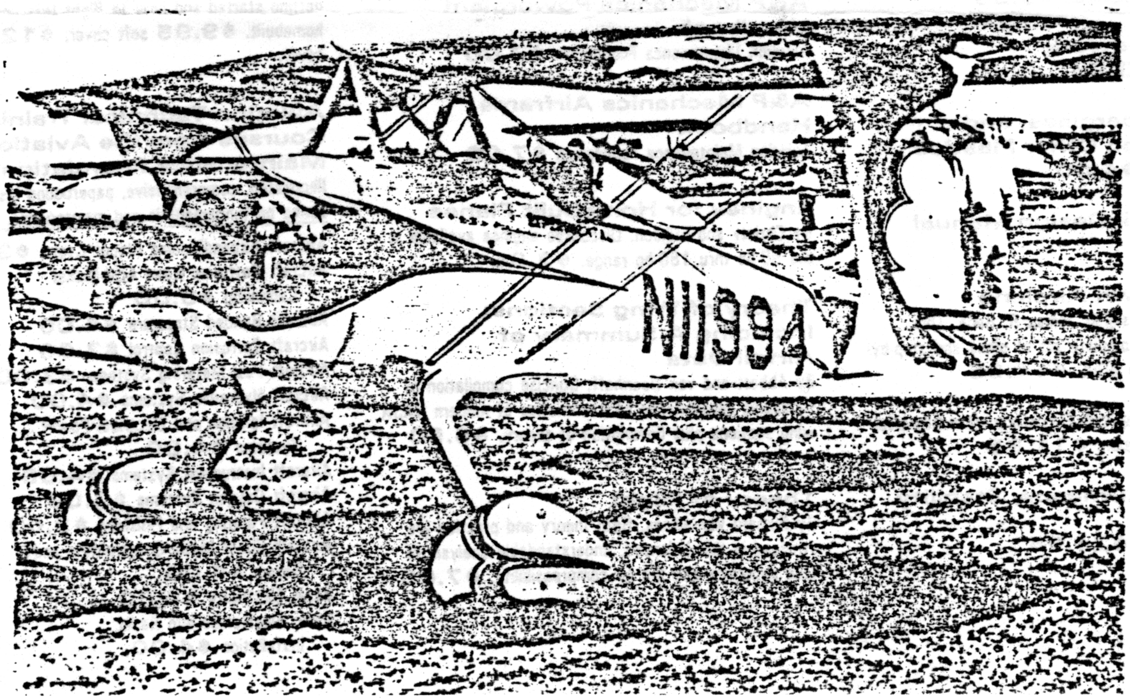

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