THE GRAPEVINE

EAA CHAPTER 663 Livermore, California Vol. XXV, No. 3, March, 2005

There is a very fine line between "hobby" and "mental illness."

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MEETING AND PROGRAM

Our March meeting will take place at 7:30 P.M. on the 3rd of March in the Terminal Building at the Livermore Airport. Our program will be a

MINUTES: GENERAL MEETING EAA CHAPTER 663, 2/3/05, 7:31 PM, TERMINAL BUILDING LIVERMORE AIRPORT.

Chapter President Ralph Cloud called the meeting to order.

Two guests introduced themselves.

The minutes for the January meetings were approved as printed in "The Grapevine".

The treasurer was not present, no report.

Business: Ralph reviewed the annual dinner. Everyone was warm for a change. Lane Wallace the speaker was outstanding. She gave us a great account of her trip in a blimp from Austria to Greece across the Alps, Italy and the Ionian Sea.

Bob Farnam reported the Cable Tensiometer is still missing.

Eric Helms, our new Young Eagles Coordinator, plans to start Young Eagle rallies some time in April or May.

Ralph made a pitch for renewing chapter memberships, $30 per year.

Announcements: The next board of directors meeting will be Feb. 17th at Ralph's place; all are welcome.

Members forum: Ralph summarized the Jan 30 City Council meeting concerning the Airport Master Plan Revision. Opponents outnumbered proponents probably 8 or 9 to one. The major concern by far is the possible increase in jet traffic and related noise. The proposed Update will be further updated.

Eric Helms made a brief presentation on the Hayward to Laughlin Pilot Proficiency Air Race. May 19-21. For a good time check www.hwdairrace.org . (Yours truly is also a repeat offender. Sign up by March 15 and the price is $300-includes 2 nights in Laughlin. I will donate finder fees from chapter members to the chapter.)

Break and then Program. Bill Jepson introduced chapter member Doug Henson who told of the virtues of working with wood that resulted in the completion of his beautiful Falco. After describing some of his trials of his four year construction time, the meeting adjourned to his hangar to view his accomplishment. Quite an airplane.

Meeting adjourned again for pie.

MINUTES: BOARD OF DIRECTORS MEETING, EAA 663, 2/17/05, ABOUT 7:30 PM, RALPH'S PLACE.

Those attending have the first letters RaCl, DaCl, GrTr, GrLu, LaFi, EaHo, JoMy, BoFa, and BrCr. (a slight concession to ScAl)

Business: There was a detailed discussion about the web sight which in being taken over by Greg Lum. The data base features may be in for some changes, and new software may be needed to. There are many issues involved in the transition.

Summer barbecue dates have tentatively been set for Sunday May 15th, Saturday June 11th, Monday July 4th, Saturday September 24th Airport Open House, and Saturday October 8th.

Tools: An effort will be made to locate the cable tensiometer. The chapter has been given a sheet beading tool; Bob Farnam would like someone to remove this 400# piece from his hangar.

The chapter needs a librarian! The library resides in Bob Buckthal's hangar and is in need of a custodian to catalog its contents and develop a lending system.

The program for March was to be presentations by Technical Counselors and/or Flight Advisors but may be about aircraft insurance instead. (Stay tuned. Ye Ed.)

Meeting adjourned for pie.

Respectfully submitted, Bruce Cruikshank Secretary

FOR THE TECHNICALLY INCLINED:

The web site http://naca.larc.nasa.gov/ is a site where hundreds of NACA (not NASA) Technical Reports dating from 1917 through 1958 can be found. There are various search skims for locating obscure aeronautical technical tidbits. Sadly, a few Technical Reports are missing.

SOME UPCOMING WEST COAST AVIATION EVENTS

March 12 **NAF El Centro Airshow**, El Centro, CA Home of the Blue Angels

Mar 12 **EAA 1073 Truckee Tahoe Pancake Breakfast.** Best deal in the high Sierra. 7am to 10 am. Norwegian pancakes and eggs with all the fixen's. $5.00 donation.

Six weeks out:

Apr 2 **Riverside Airport's 13th Annual Airshow**, Riverside, CA

Apr 2-3 **Davis Monthan AFB Airshow**, Tucson, AZ

THE SKY

The air rushing past us,
here we are soaring in the sky.
A content, joyful feeling fills my body,
and the sky is beautiful.
The air is cool,
but happiness keeps me warm.
The sun so bright,
the sky so blue.
Flying across the US with my buddies,
my lips form an uncontrollable smile
and I feel at peace with the world.

July 29, 2000
Melissa Triplett, Age 12
Departing AirVenture 2000 while
flying across western Wisconsin

AUTO ENGINES IN AIRPLANES ARE THEY STRONG ENOUGH?

From Corky Scott, on the Canard Aviators list

Max Freeman is the engineer in charge of GM's Premium Engine programs and has written an article for Mick Myal in the latest "Contact!" magazine regarding the development and testing of their new PV6 aluminum 90° bank angle V-6. It's a lot of technical stuff about why they chose this configuration or mechanical design over that, which is why I like it.

He also wrote about the kind of developmental

testing done on the engine to make sure that customers get an engine they can depend on, and I'd very much like to quote that section in full because it should lay to rest the question of whether auto engines can take the kind of power settings aircraft engines routinely manage.

PERFORMANCE

The engine in production form for 1999 develops 215 HP at 5600 RPM and 230 foot pounds of torque at 4400 rpm. As a routine part of an engine development program we tested the engine at full power, maximum RPM. We ran it at 6000 RPM, pulling 215 HP at wide open throttle, for 265 hours. That's a continuous 265 hours of wide open throttle, far worse than autobahn driving, because even on the German Autobahn, you wouldn't be at 6000 RPM. THAT IS A STANDARD DURABILITY TEST. (emphasis mine) We run many engines through this test as a matter of course.

Specific development focus is on the crank, pistons, rods, block structure, timing drive wear; we get a lot of full load cycles in a hurry. It isn't necessarily designed to replicate customer driving but to get development answers. Wear and fatigue are accelerated. The test is particularly applicable in proving out dampers and their effectiveness. If the damper is not properly tuned to the engine the crankshaft will inevitably break in that time period. *(note, this is evidence you should not discard the stock damper when using the auto engine for aircraft power)*

A number of other engine tests are utilized. We use a variety of specific tests to accelerate engine wear and to look at fatigue failures. The cyclic endurance test is now called PTED (power train endurance). It closely approximates cyclic durability. The engine is cycled from its torque peak to its horsepower peak, at wide open throttle, then down to idle, then accelerates up to shift points, then back down to the torque peak and then horsepower peak. This test is run for 400 hours. Once again, it's a wide open throttle test for 400 hours. The RPM for this engine, ranged between 4400 and 6000 RPM, back and forth in about a 5 minute cycle. The dyno computer will occasionally bring the engine down to idle, up to 6500 RPM shift points, and then back to the 4400 – 6000 RPM , 5 minute cycle.

Thermal cycle tests are run to define engine capability under cold weather condition. We run the engine at full throttle at 4000 RPM, bring it down to idle, stop it, switch the coolant valves to drain the hot coolant, pump the chilled coolant from the chiller until the metal temperature stabilizes at 0 degrees F. Frost forms on the outside of the block, as the cold coolant rushes into the engine. When it stabilizes at 0 F, we motor the engine, start it, come to full throttle at 4400 RPM, the valves switch and the coolant temperature starts to climb. It climbs back up to 260 degrees F. It takes 10 –11 minutes to complete one cycle. The engine must pass 600 cycles without any sign of failure. We typically run 1200 cycles and a probe test will run 1600 cycles. That's an excellent gasket killer test. Head gaskets are the first to fail because of the rapid expansion and contraction.

A power train endurance test simulates in-vehicle operation. The Ypsilanti plant uses it for testing transmission. We, of course, use it to look at engine performance. The equipment consists of an engine/transmission combination, which sits on a dyno with large steel inertia wheels. The inertia wheels are being driven by the transmission output shaft, just like in a car. The cycle is brutal; the engine is at idle in gear. The engine accelerates wide open to 6200 RPM, upshift occurs, 6200 RPM is reached, upshift occurs to 3rd, 6200 RPM is reached, upshift occurs to 4th, the wheels turn up to 135 MPH depending on the application. The second half of the cycle calls for a closed throttle down to 70 MPH, then wide open throttle with a downshift to 2nd, the engine goes back up to top speed, coasts down so that the transmission selects down to a lower range. The engine is in an overrun condition all the way down to idle; i.e., the engine is being used for braking. That's one cycle. One transmission life cycle is typically 12K – 13K cycles of the above test. We will run an engine through 4 or 5 transmissions. This is a very harsh schedule for the engine, particularly because of the overrun braking. Cylinders and rings suffer the most on this test.

We run some idle tests to verify low speed operation. The engine is run at idle for about 2000 hours to make sure of adequate oil flow at idle.

We use all those engine tests in addition to fleet tests and extensive vehicle road testing. The cus-

tomer can be assured that the PV6 engine is a thoroughly tested advanced design that matches or exceeds competing offerings."

STEWART 51 FLYS

by Owen Smith, Ch 723

My Stewart Mustang finally got off the ground during the last Chapter 723 meeting, 11 July, 2004. This all started in 1996, when I saw Elliot Cross fly the prototype in the airshow at Oshkosh. I was at the show looking at RVs and any other metal kit that caught my interest. After I saw the S51, nothing else seemed too interesting. It took the better part of a year for me to win the battle with my better judgment and put down a deposit. Looking back at a file folder of shipping invoices, I see that I received the first part of the kit on 4 Apr, 1997, so the total build time was a little over seven years.

I started with the wings, figuring they would be easier to store than the fuselage. Those of you that have seen Norm's wings know that they are preformed and fitted, so the drill of ream, deburr, prime or pro-seal, countersink and rivet went pretty quickly. After about 4 months they were largely completed. During this period I probably averaged 6 hrs per day on the project working in my garage. The principal motivation for this pace was the signs of stress I could see developing at the company. The surest way to get parts from Jim Stewart was to be finished with what you had on hand, and I definitely wanted the rest of the kit sooner rather than later. That turned out to be a wise decision, as I was able to get pretty much all the parts before the company went under. Many builders were left without important parts when Jim finally turned his assets and obligations over to PAE, which subsequently ignored the obligations part of the deal. After about 6 months of work I had the wings complete and the main gear installed. Ha, I figured, I'm 30% done. In a couple of years I should be flying! This was the point where the 'educational' part of the project began.

Needless to say, the fuselage took a lot longer. A good deal of forming, fitting and trimming was required for the radiator scoop, canopy and especially the cowling, but by far the biggest time sink was the start of the systems installation, where there was little or no guidance from the manufacturer. It took me another 18 months of fairly intensive work to get the fuselage riveted, the panel completed and the wiring stubbed in.

I brought the project out to the EAA hangar in 2000, when I began 'final assembly', e.g. mating the wings and fuselage and installing the remaining systems. During this time John Seymour, who eventually became PAE, was supposed to be assembling the engine.

Progress was slower on the airframe due the complexity of the systems and the fact that some design details were still in a state of flux due to operating experience of the first few builders that had finished. All this and the installation of metal fairings took about 2 years, over which I probably averaged 3 days of work per week.

The next year was basically spent dead-in-the-water waiting for PAE to complete the firewall forward package. By this time they were a year past the contracted delivery date, and the operation was beginning to look more like a Ponzi scheme every month. The last straw was when I began to hear that they planned on putting the engine constructed from parts I furnished into someone else's aircraft. That prompted me to take legal action for breach of contract and fraudulent conversion of property. Eventually the suit was 'settled amicably' for the parts I owned plus the gear driven accessory case being developed by RAE in its current (incomplete and non-operational) state. 'Amicably' must be the correct adjective since it's right on the paper I signed. In the meantime I began another engine based on an iron block I already had. Having learned my lesson, I did most of the assembly work on this one myself, working out of a race engine shop in Orange County. The new engine required some changes to the aircraft to accommodate the difference in weight between the iron block and the aluminum block I originally intended to use, and also the different ignition systems. The new engine ran successfully on the dyno on 14 Apr 2004, producing 496 hp at 4600 rpm. Installation went relatively rapidly, and by early June I had it running in the aircraft. A final delay of a month occurred while I sorted out a series of problems with the propeller governor.

The first 5 flights were made by Bob Meyer, a flight test engineer and test pilot at NASA Dryden Flight Research Center. Bob and his wife Marta are accomplished unlimited aerobatics competi-

tors, and Bob had previously done the flight testing for the Giles aerobatic aircraft offered a few years ago in kit form. The initial flights uncovered a number of minor discrepancies, but nothing that caused any excitement and could not be fixed easily. I did my first flight on 24 July, and even managed to make a pretty good landing. In fact, that one was better than any I've made in 2 subsequent flights.

We are 7 hours into our 25-hour Phase I test period now. Here are a few of the preliminary results. Stall is at 73K clean, decreasing to 65K with gear down and full flaps. In the clean configuration there seems to be a small left wing break, resulting in about a 10-20 degree bank before you can pick it up with the rudder. With the flaps down the stall seems to be pretty much straight ahead. All the trim and incidence angles seem to be OK as originally constructed. Stick forces are relatively heavy by homebuilt standards, especially in roll. A cruise configuration fuel consumption test at 10,000 MSL with full throttle and 3800 engine rpm resulted in a true airspeed of 210K and fuel flow of 19.4 GPH. Running lOOK on final with full flaps, 3800 rpm and 20-22" manifold pressure seems to work well for landing. After flaring to about half way between a level and 3-point attitude, it's pretty easy to make wheel landings at around 90K. The main thing we have found to watch out for is making power reductions on short final. Even minor reductions cause a large and immediate increase in the sink rate. It works much better to just fly it onto the runway, and then gradually reduce the power to idle.

So that's the story. After uncounted hours and dollars, a lawsuit and an ex-girlfriend, it's finally finished, or at least finished enough to start having fun with. I have enjoyed working on it for the most part, and learned more than I bargained for. I would probably do it again, but would likely leave out some of the night/IFR instruments and probably the built-in oxygen. For sure I would do my own engine. Will I build another aircraft? Probably so, but it will likely be a bush plane with simple systems.

EAA CHAPTER 663 MEMBERSHIP APPLICATION/RENEWAL FORM

NAME_____NEW ( ) RENEWAL( ) DATE_____

ADDRESS_____CITY_____STATE___ZIP_____

E-MAIL ADDRESS_____HOME PHONE_____WORK PHONE_____

FAX#_____WORKFAX#_____EAA#_____RATINGS_____

PROJECT_____FLYING?_____HOURS_____

SKILLS, PROGRAMS, I CAN GIVE, ETC._____ _____

NAME TAG YES( ) NO( ) NAME TAG INFO_____HANGAR No._____

SPOUSE_____

Please give or send this completed form with a $30 check (**No cash**, please) to:

Sharon Constant
3446 Jordan Road
Oakland, CA 94602

TOOL GUY REPORT

CHAPTER 663 has lost a tool, specifically, the cable tensiometer. Although he's younger than I, Bob Farnam can't remember who signed it out--if indeed someone did. He's not even sure that it was actually signed out. However, it's gone; it isn't where it is supposed to be--in Bob's hangar. If you have seen it--or, better yet--have it, please contact Bob as there are people waiting to use it and they would rather not have to guess about their tension. Perhaps if we knew what frequency your wires were supposed to be tuned to, we could have Jeremy Constant tune them by ear. If he can tune a Stradivarius, he can certainly tune an aluminum airplane--and probably make it sound better in the bargain!

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