EAA Mount Rainier Chapter 326 Newsletter

Thun Field - January 2004

Meeting Notice

Tuesday, January 13th, 7 PM
CAP Building, Thun Field

Program: Dynon Avionics will show and tell their EFIS-D10. This solid state instrument combines in one display: attitude, direction, altitude, airspeed, vertical speed, AOA, clock/timer, g-meter, voltmeter, and more. It mounts in a standard 3 1/8 inch instrument panel hole. Price is about $2000. It is becoming a very hot seller.

Refreshments: John Brick

Adjournment: TBA

Johanson Sets New Polar Flight Record In RV-4

Australian pilot Jon Johanson, became the first person to fly a homebuilt, single-engine aircraft over the South Pole on Monday December 8, in what is also believed to be the first solo, fixed-wing aircraft, long-distance flight over the pole. Johanson made the record, non-stop flight in his custom RV-4 "VH-NOJ" from Invercargill, New Zealand, to the joint United States (McMurdo)/New Zealand (Scott) Base in Antarctica. The total flight distance was 3,345 nautical miles flown in 26.5 hours.

Johanson, a longtime EAA member and EAA AirVenture participant and three-time EarthRounder, has also flown over the North Pole. His RV-4 was modified with a specialized engine and increased fuel capacity. Johanson is delighted to achieve the record flight this week, just in time for the Wright brothers' centennial celebration.

The amazing flight was a true test of endurance in an experimental aircraft. Johanson left his hometown of Adelaide in South Australia quietly on Saturday morning for a 10-hour flight to Invercargill, then took off for his record flight on Sunday, at 5.30 p.m., Adelaide time (8 p.m. in New Zealand). Original plans were to fly direct from Invercargill to the Antarctic, over the South Pole and then to Ushuaia in Argentina. But headwinds were much stronger than anticipated and, with airports scarce in the Antarctic, Johanson changed his destination to McMurdo after overflying the South Pole.

They were not happy to see him. The folks at McMurdo refused to give Jon fuel so he could return to New Zealand. Thus began an international incident. McMurdo stuck to its policy of discouraging adventurers and offered to dismantle the aircraft and ship it back by boat at the earliest opportunity. They also offered Jon a seat on the next available air transport. But not fuel.

Fickle finger of fate: By amazing coincidence, Polly Vacher was attempting to cross the South Pole from the opposite direction. She was on an around-the-world flight in her Piper Dakota, departing from England, crossing the North Pole, down through the Americas to Ushuaia, Argentina, and then to Rothera, a British research station in Antarctica. On Dec 5th, her next stop was McMurdo where she had pre-positioned fuel and other arrangements. Like Jon, winds thwarted her flight plan…she had to turn back to Rothera before reaching the South Pole. Worse yet, she did not have enough fuel stashed at Rothero to continue her journey. When news of Jon's plight reached Polly, she donated her fuel at McMurdo to Jon. Lovely woman.

So Jon got back home and Polly is flying back up through the Americas and then across the Pacific to New Zealand where she will resume her original route, minus the South Pole leg.

It was reported that Jon had **34 hours of fuel** on board when he left New Zealand. With the aviation forecast, he expected to arrive in Argentina with some three hours of reserve. Jon converted his RV-4 wing to a complete wet wing including the tips and by using the large reserve tank in the rear cockpit that he used for his three previous round the world fights was able to get that amount of fuel. **His take-off weight was around 3200 lbs.**

Engine: IO-360 M1B6 180 hp. turbo normalized, four cylinder horizontally opposed, air cooled with programmable ignition.
Fuel burn: Average, 7.9 gallons per hour
Speed: Average 162 Knots
Range : Still air average – 5,832 nm
Endurance : Average – 36 hours non stop
Fuel: 285 gallons? (calculated from info above)

Safety equipment :
Emergency chest pack including :
Single place life raft
Life jacket
406 satellite/GPS emergency locator beacon
121.5/243 emergency locator beacon
Emergency flares
Desalination unit
Emergency rations (7 days)
Water
Sun block
Signaling mirror
Anti emetic medicine
General first aid equipment
Safety knife
Polar survival pack
Polar, down sleeping bag
Space blanket

Thermal protection mattress
Polar bivvy (sleeping bag tent)
Backpackers pillow
Electrically heated jacket, pants, socks and gloves
Freezer over-suit
Thermal underwear
Nomex fire resistant flying suit
Leather extreme weather hiking boots

Amphib Gear Warning

It makes such a mess when you land an amphib floatplane gear down in water that I was giving a little thought to an intelligent gear warning. This idea won't be automatic, but I did see something on a Republic SeaBee many years ago that I thought was the best I had ever seen on an amphibian. This owner had made two little boxes that each would hold a standard thirty-five millimeter photograph transparency slide. The boxes were mounted side by side at the very top of the instrument panel directly in the pilots line of sight over the nose. They were each equipped with a bulb to light the transparency

One was lighted by the gear up light circuit and the other was lighted when the gear was down. The gear up transparency was a view of an idyllic lake setting. The gear down light was a picture of a nice, well painted and marked, asphalt runway.

As long as the view out the window matched the lighted transparency, all was well. Of course, you still have to remember to look!

Bob Siegfried
Ancient Aviator

Prop Indexing

Over the weekend I had to pull the cowl and prop to make repairs on a broken aluminum alternator tension arm, and thought while I had the prop off anyway I would try a suggestion I had read about in the Sky Ranch Engineering Manual. It says that a flat four engine will run more smoothly if the prop is indexed to be in the same plane as the crank pins, meaning it is horizontal when the pistons are at top or bottom dead center. This orientation is 60 degrees away from the indexing that is traditional for Lycomings, which is a concession to ease of hand-propping.

Well, I tried it and it works. The difference in smoothness was noticeable from very first startup, and the engine is (subjectively) smoother at all rpm ranges. The prop now stops at about 1 o'clock position viewed from the front, as opposed to the traditional 10 o'clock position. The compression stroke is felt much lower down in the swing, making it indeed very awkward and dangerous to hand prop as you have to bend way over to pull it through. But since I never hand prop my plane, I consider it worth the trade off. I'm going to take a wild guess and say the vibration level is about half what it was before. I find myself now wondering if the dynamic balance I was considering before would even be worth the cost and effort. Now, if only we could solve the exhaust pulse floor vibration as easily ;-)

-Bill Boyd

Soldering Trivia

You can solder a hundred years and not discover the difference between 60% tin-40% lead and 63% tin-37% lead solders. Most sources give the melting points and that's that. But the real difference in tin-lead solders is far more subtle: 60-40 solder has a small "mushy" temperature range. 63-37 goes from solid to liquid with no mushy range at all (that's called eutectic).

The smaller the tin (first digit) the greater the mushy range. This is important if there are gaps to bridge, and there always are. When soldering sheet metal or stained glass for example, you really want a large range of mushy so you can stick a whole mess of solder onto the part to fill gaps, so you might use 50-50, which has a liquid temperature of 461F (maybe it's time for a propane torch) and a mushy range of 56F.

Why is 63-37 so common? It is shiny and pretty when it solidifies. This makes assemblers proud. It is also great for solder plating printed circuit boards (PCBs), for example. The 60-40 solder solidifies like a wax…first the lead solidifies, then a second later the tin solidifies. This leaves a hazy, frosted surface. You can also remember:

1) Tin melts at a lower temperature than lead, improves wetability, costs more, and is more flexible.

2) Lead melts at a much higher temperature, is poisonous, costs very little, is stronger but easier to fatigue crack.

3) There is a great difference between solders of the same kind. Ersin is very good, Alpha Metals has found its way into my junk box.

Use 60-40.

Eric M. Jones

Mag Timing

The following discussion throws cold water on the need for a timing light. Good words but electronic ignition guru Klaus Savier (Lightspeed Engineering) calls for using a strobe light to ops check his system. Here is an excerpt from his instructions:

> "Use a conventional "clip-on" inductive timing light to verify the timing accuracy and range. During start, the system will fire at TDC for standard compression engines with ratios less than 8.7:1. At idle the strobe light should indicate 21º ± 2º when the manifold pressure hose is disconnected and 40º ± 2º when connected."

Discussion:

Your Lycoming is "hard" timed. It doesn't vary. That is why there are schemes to retard the fixed timing for starting... impulses and show of sparks. Once running the stock mag doesn't change its timing. So static timing works very well for your engine. No need for a dynamic timing light. Now if you put on an electronic ignition, then and only then you might need a timing light. But even these are timed from a fixed point. With your car, they are load and rpm dependent so the need for dynamic timing. I would save my money for something else.

Cy Galley,

Let me add a little too much to Cy's response.

First, roughly said, timing is set to cause the maximum average of pressure created to exchange the most amount of rotary force into the crankshaft. The rate of fuel burn (180-220ft per sec) doesn't vary much within normal operating air/fuel ratios. So if the piston is coming up faster then one has to spark it earlier to achieve the above stated pressure cycle at the right time. This pressure timing point is known as Powell's magic angle (15 deg ATDC) and is true for all reciprocating engines. The other factors that effect the spark timing point is the rate that the induction and exhaust can ventilate the cylinder, and what RPM range the engine is designed to deliver its torque. In any event RPM is the big factor in spark timing.

Because aircraft engines are coupled to their drive environment hydraulically (ie a prop in air) rather than in a fixed fashion like a tire on the road, and the fact that this prop has a fairly tight range of torque conversion to thrust (ie AOA of the wing shape only delivers load to the engine, or thrust from the engine in a fairly narrow range of RPM, where a car has to deliver high torque from just above idle to max RPM) they only really need to be timed for a narrow range of RPM. It's easier and more reliable to fix the timing for one RPM value; below that RPM they are over advanced, and above that RPM they are under advanced in timing.

So lets say one sets the mags to be most efficient at 75% power which for a fixed pitch might be 2400 RPM. (This may vary slightly with constant speed engines, but they usually aim for a similar timing RPM, and that said, a constant speed engine is one place that an advanced electronic ignition can really add to fuel efficiency) If the engine goes above this the timing is retarded for that RPM, which is good because it reduces detonation some. If it goes below then it is too far advanced, but who cares because at power settings below 75% a little advance will add power without causing detonation. In any event the total RPM range from 50% to 100% power might be 600 rpm rather than the 4000 rpm range you would find in a car engine. The only time there is a problem is when starting, as the timing is way too advanced for 150-300 RPM. In this case they use devices to retard only during starting such as an impulse coupler or shower of sparks.

Therefore having the time change in an aircraft engine doesn't do much. And having it right on to the 10th of a deg is meaningless because you are just saying it most efficient at 2400 rpm rather than 2410. Who cares, it is far more important to get both mags equal then it is to get them on the right deg. And most specs allow for a fairly wide range of error, say 0.5 to 1.5 degs. Given that the radius of the ring gear is roughly 10 inches, the circumference is 62.8", therefore each degree is roughly 3/16" of travel at the ring gear. With static timing methods that's a lot of sensitivity, there is no need to have a fancy dynamic device for setting this.

The real advantage of dynamic timing is it allows one to also test the advancing features of the automotive distributor, but I can assure you that I can get an automotive distributor as accurately timed statically as I can dynamically. I've done it many times when it's a bitch to get the timing gun aimed on the pulley.

Wheeler North

Technical Counselors and Flight Advisors

It's renewal time! One of the requirements for the Technical Counselor and Flight Advisor programs is the biennial status review for each counselor and advisor. To improve program consistency, we ask that each Tech Counselor and Flight Advisor renew their status with us at the end of 2003; the next renewal will then be at the end of December 2005.

Renewal letters and individual datasheets have been mailed out to all active Tech Counselors and Flight Advisors (except for those who just started in the programs - their expiration will automatically be the end of 2005.

We ask that each Technical Counselor and Flight Advisor look over their datasheet, make any corrections or updates to their record, and then return it to the Safety Programs office as soon as possible. This will help us ensure that they are listed as current volunteers in our database.

If you have any questions, please feel free to contact Jan Streblow, EAA Safety Programs Administrator, at 1-888-322-4636 ext. 6864 or email to: safetyprograms@eaa.org.

New Roster

At the end of the year, we had 111 members on board. This year we start with 85. Both rosters are posted on our website http://www.eaa326.org/ on the Members page under "Members Only Login" If you are not on the new roster, check with treasurer Mark Hummel about dues.

While you are there, check the new progress photos of our builders and the Christmas Party photos. Post a message on the message board too.

Asking what a pilot thinks about the FAA is like asking a fireplug what it thinks about dogs.

Everything is accomplished through teamwork…until something goes wrong. Then one pilot gets all the blame.

A good simulator check ride is like successful surgery on a cadaver.

End

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