The Cleco

Experimental Aircraft Association Chapter 393

August 26, AirVenture Recap

Guy Jones will be giving the presentation at the August 26th meeting. He is organizing pictures and impressions of AirVenture, the premier aviation exhibition, fly-in and air show.

Upcoming Speakers/Topics
Dates and topics ~~may~~ will change!

September 23: Heber Smith, a WW II, will talk about his experiences as a B-17 bombardier on over 30 missions.

Bill is seeking input regarding speakers for our meetings. If you know of an interesting, willing and available speaker, let Bill know. Our members represent another untapped resource. If you are doing something interesting that you could talk about, let Bill know and get a talk arranged.

Are you pilot material? Capable? Able to lead? Then consider being a Chapter officer! Contact Guy Jones with your qualifications

Presidential perspective:

Aviation in a Carbon Neutral World...part 4

In the last installment we looked at one option to replace the current fossil fuel based aviation model with a likely renewable alternative. This month we explore a little farther into the future with some more exotic options.

Electrical and **Fuel cell**

Consideration must go to electrical as the next most likely candidate. This is the one I'm most interested in. I don't believe that this option will be available in the near term, but perhaps in the medium term it will turn out to be the most economical player.

This may seem an unlikely situation until we take efficiency into account. Your typical internal combustion engine has a conversion factor of about 28%. That is to say, that for every 100 kwhr. you put in, you only get 28 out. The other 72% is pretty evenly divided between exhaust heat and cooling heat. Your typical electrical motor averages above 85%. So, right there you get a 3x advantage, and that means a lot less batteries right from the start. If you want to see a really comprehensive breakdown of where all the energy goes in an aircraft engine, I refer you to the KitPlanes 8/09 issue page 30. It is a great article and has some very interesting WWII research rediscovered.

Let's take your typical cross-country flight. That would be 4 hours at 8 gal/hr. or 32 gallons of Avgas. This translates to:

35.2 kwhrs./gal. x 32 gal. = 1,126 kwhrs.

Now we multiply by the relative efficiency of the Avgas power plant to get the actual energy delivered.

1,126 kwhrs. x .28 = 315 kwhrs.

The current state of the art energy density in Li-ion batteries is .091 kwhrs./lb. This translates to 3,464 lbs. of batteries to replace 32 gals. of

Avgas that weighs 192 lbs. On the face of it this would never work. But remember that we had 620 lbs. to work with, and I believe that with proper development, the motor weight will come down to something approaching 100 lbs. This leaves 520 lbs for the batteries.

Recent developments in battery technology using silicon nano-wires have demonstrated that it may be possible to increase energy density by a factor of 10. This would mean that our batteries would weigh a more manageable 365 lbs. for a combined weight of:

100 lbs. + 365 lbs. = 465 lbs.

At this weight we could even afford another 150 lbs in control electronics and wiring.

Now we could seriously consider switching to electrical power as our motor/battery weight would approach the traditional 620 lbs. we are used to.

There is still the problem of refueling. Most cross-country flights don't stop with just one tank of fuel. There can be several fuel stops/day on many trips, and what does this mean for the electric plane? Well, fortunately, once again recent lab results come to the rescue. A fellow from MIT recently demonstrated that it was possible to construct a Li-ion battery that was able to reduce the normal 8 hour recharge time to just 5 minutes, using a revolutionary new electrode material. This approximates the average fuel stop quite nicely. So even this problem has a potential solution.

However there are still the elements of cost and longevity to consider and these items will not be known for a few years. But it's good to know that the physics and chemistry are not showstoppers. Electric aircraft look quite reasonable for the future.

The last possibility to consider is the fuel cell. This option is to use a fuel cell in combination with an electric motor. This would mirror the electric/battery option discussed previously. The fuel cell/fuel system would have to be lighter and cheaper than the proposed battery system, in order for this to make economic sense. Currently, although progress is being made as demonstrated by the Honda FCX Clarity already on the road in L.A., existing fuel cells are reported to be very expensive. However I have read of progress in developing catalysts, that rather than being based on platinum, are based on a much more economical nickel.

I consider this to be a very long-term option at best. This option breaks down into 2 separate components.

The 1st aspect to consider involves what fuel source to use.

The hydrogen, currently used in fuel cell cars currently on the road, comes 2 ways. They either run directly on hydrogen gas, or generate their hydrogen from a hydrogen rich hydrocarbon such as gasoline, propane or methane.

In the 1st case, pure hydrogen, currently comes 2 ways: compressed to 10,000 psi in tanks, or as a liquid in ultra refrigerated tanks, neither of which are particularly light or formfitting, as are our current gas tanks.

The 2nd case involves generating hydrogen from a liquid source of hydrocarbon more familiar to us: gasoline. It requires a device known as a reformer. These devices use several different tricks to liberate the hydrogen from the carbon. The important consideration is that they require some energy input to accomplish this task, as well as taking up space and adding weight. The important thing here is that fuel cells can run on today's fuels but at the cost of weight and expense.

A 3rd case has recently come to my attention. This involves a breakthrough using a chemical called ammonia borane or H6NB. According to Wikipedia, it has a higher density of hydrogen than liquid hydrogen, at normal temperatures and pressures. It does currently require the help of an exotic catalyst, but not nearly in the same league with the fuel cell itself. You just pass the liquid through the catalyst and it spontaneously generates hydrogen gas. However, the remaining H2NB must be reprocessed, which adds the complexity of a source tank and a sink tank to the mix.

We now come to the biggest obstacle by far in the use of the fuel cell. And that is the cost of the catalyst. The catalyst provides the magic that allows the combining of the hydrogen with atmospheric oxygen to produce not heat, but electricity. Currently the fuel cell stacks required to provide the roughly 40 kw, which could replace our 160 hp motor, contain over $10,000 worth of precious metals such as platinum, that are not

only rare but very expensive. Again we have hints at a possible solution on the far horizon. I have read of progress in developing catalysts, that rather than being based on platinum, are based on the much more economical nickel, but this research has just begun and any progress seems a long way off from all accounts.

There are probably many other options that I have missed, but this should give you a good overview as to what could be in store for tomorrow's aviators. It doesn't look as hopeless for the green aviator as I was afraid it might when I began this exploration several months ago. I literally began this article having no idea where it would lead and I have to say that I'm a lot more optimistic about things now that I've actually crunched the numbers.

I have had several requests for links to some of my source material, so I'm providing links to some of my favorite sources here.

Gasoline
http://en.wikipedia.org/wiki/Gasoline

Lithium-ion battery
http://en.wikipedia.org/wiki/Li-ion

New battery material could lead to rapid recharging of many devices
http://www.physorg.com/news156000014.html

Nanowire battery holds 10 times the charge of existing ones
http://www.physorg.com/news117212815.html

New clues about a hydrogen fuel catalyst
http://www.physorg.com/news168691007.html

The Menu by Rick Bourgeois

The tentative menu for the next meeting is as follows (for just $7):

- Pot Roast
- Mashed Potatoes
- Green Beans
- Garlic Bread
- Chocolate Chip Cookies
- Drinks

Let Rick know your suggestions. Some we've already heard are: turkey, and corned beef.

Rick thinks a **pancake breakfast** would be fun. Do you? **Would you attend? Let Rick know!**

Fly-outs by Tom Howard

Fly-outs are usually scheduled on the Saturday following our regular monthly meeting. If the weather's not conducive for flying, the event is often postponed to the following Saturday. Watch for email from Tom TurnPrez@SBCglobal.net ; and be sure to give us your email if you haven't been receiving fly-out information.

We are seeking ideas for new fly-out destinations.

[Editor's note: Informal fly-outs also occur on irregular Wednesdays. Email HarvardHolmes@comcast.net to get on the list if you are interested. Often there is a spare seat for wingless aviators.]

Young Eagles by Dick Sperling

Dianne Cole was asked about the Buchanan Airport Open House and she replied that a report would be forthcoming, but she was delayed due to a fire at Pine Mountain, where she has a house. Informally, about 3,000 people attended, and 500 hot dogs were sold. Quite a few people asked if we would do it again.

Our next Young Eagles event is scheduled for September 12. We may hook up with a group promoting education for young girls.

As a result of our Young Eagles flights, we have a "credit" with EAA National, that allows us to spend $505 on Young Eagles related items and get reimbursed by EAA National. A flight simulator setup for Young Eagles to use is a possible and engaging project that can be accomplished within the budget, if we get some help from the Chapter members. Are you interested in helping?

All the best, Rich Sperling

EAA Chapter 393, Young Eagles Coordinator

EAA – National Six-Month Free Trial Membership by Bill Reining

In an effort to generate more interest in the EAA among prospective members, EAA headquarters has instituted a six-month trial membership program. Each prospect will receive all EAA member benefits during this time with no cost to them, or to the local chapter. This complimentary six-month period is intended to build a bond between prospective members and the local chapter, resulting in a higher member recruitment and retention rate. Let's all reach out beyond the usual crowd around the airport (church, other clubs, co-workers) to connect with people unaware of our chapter, or those who just need to be asked! When a prospective member is identified, let one of the board members know – all it takes to enroll them is a simple entry on the EAA web site.

EAA 393 Picnic Report
July 18, 2009

Thanks to Rick Bourgeois and Louis Goodell for hosting this event. There was lots of food: hamburgers, hot dogs, chicken, salads, sushi, side dishes, cookies, ice cream, and every other kind of food.

Estimates are that about 33 people showed up. We had lots of people show up who can't always make our evening meetings. Unfortunately, our trees had been severely trimmed and we had precious little shade. We'll do better next time!

EAA 393 Board Meeting Notes

August 4, 2009

Attending: Ken McKenzie, Bill Reining, Louis Goodell, Harvard Holmes, Dick Sperling, Rick Bourgeois, Guy Jones

1. Louis Goodell, Treasurer reported $1,051.75 in checking, and $2,652.39 in our money market accounts.

2. Rick Bourgeois announced his menu plans for the upcoming August 26 meeting.

3. Bill Reining related that our presentation for August 26 would be an AirVenture review. Guy Jones will collect photos and impressions from Bill Reining and Pete Mitchell and provide a slide show and his personal impressions of the show.

In September our speaker is Heber Smith who was a B-17 bombardier.

4. The proposed sign for the end of our building was reviewed. A draft by Rick Bourgeois was favorably received with some suggestions to further simplify the design.

A more detailed sign at eye level near the corner of the building was also proposed. A sign next to the door (below MDPA) is already in the works.

It was also proposed that we investigate a sign in the airport viewing area near the tower. Ken McKenzie will contact the Airport about this possibility.

5. Guy Jones, head of the nominating committee, led a discussion about possible candidates for various positions.

6. Bill Reining led a discussion on how we might create a project to get people more involved in the local Chapter. There is a hangar on the east side of the airport that might be a possible space for a construction project. A Chapter project would not use the full hangar, and could not afford it either. We would have to get two or three other projects to share the space and expense to make this work.

7. The Cleco input is due Wednesday, August 12, 2009.

Informal Fly-out to Petaluma

July 15, 2009

Bob Sinclair, Bryan Krey, Bob Belshe, Harvard Holmes, Phil Jenkins, Tom Howard (not shown)

Sucking up the wheels…

Informal Fly-out to Stockton
July 22, 2009

Clinton Beacham, Duane Allen, Vi Egli, Harvard Holmes, Tom Howard, Phil Jenkins (not shown)

Informal Fly-out to Auburn
July 29, 2009

Sara and Harvard Holmes. A (nearly) last flight - the Mooney is looking for a new home!

Clockwise from left: Tom, Phil, Bob Sinclair, Sara, Harvard, Bob Belshe

Bob Belshe, yellow Lancair 235/320; Bob Sinclair, Lancair 320.

Phil Jenkins' Glasair II S RG

Informal Fly-out to Lakeport, Lampson Field
August 5, 2009

1966 Mooney M20E for Sale

http://home.comcast.net/~harvardholmes/N2669W_Ad.pdf

Special price for EAA 393 members! The price is going down and it will be sold soon! Speak up if you are interested.
Harvard Holmes 510 526-5347

Thanks to our Donors and Sponsors

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Thanks to our Donors and Sponsors!

Meeting and Event Schedule (2009, 2010)

Board	Y Eagles	General	Fly-out	Other
Aug 4		**Aug 26**	Aug 29	
Sep 1	Sep 12	**Sep 23***	*Sep 26*	
		* nominations		
Oct 6	Oct 17	**Oct 28****	Oct 31	
		** elections		
Nov 3		**Nov 18**	Nov 21	
Dec 1				
Holiday Party				***Dec 13***
Jan 5, 2010		**Jan 27**	Jan 30	
Feb 2		**Feb 24**	Feb 27	
Mar 2		**Mar 24**	Mar 27	
Apr 6		**Apr 28**	May 1	
May 4		**May 26**	May 29	
Jun 1		**Jun 23**	Jun 26	
Jul 6			Jul 31	
Arlington Fly-in, Arlington, Washington				*Jul 7-11*
Chapter 393 Picnic				***Jul 17***
AirVenture, Oshkosh, Wisconsin				*Jul 26-Aug 1*
Aug 2		Aug 25	Aug 28	
Sep 7		Sep 22	Sep 25	

Our meetings are open to the public. Join us for dinner at 6:30 pm ($7) with the general meeting at 7:30 pm on the above dates in the building at 161 John Glenn Drive north of Sterling Aviation. Enter from the airport side of the building.

Chapter 393 fly-outs are open to chapter members and guests. See the newsletter for arrangements.

EAA Chapter 393
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EAA
The Leader In Recreational Aviation

We are on the Web!
http://www.eaa393.org
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