

Paul Price's recent flight to the PNW made for an awesome photo of Mt. Ranier!

EAA Chapter 691 Newsletter July 2024

On the Web @ eaachapter691.org

691

EAA 691 is:

President: Will Fox

Vice President: John George

Secretary: Pierre Levy

Treasurer: David Young

Web Editor: Marilyn Phillips

Newsletter Editor: April Fox

Young Eagle Coordinator: April Fox

Table Of Contents:

- Upcoming Events **pp. 3**
- This month's meeting **pp. 4**
- Letter from the Editor **pp. 5**
- President's Report **pp.6**
- Tech Corner pp. 9
- Member happenings pp. 11
- Gaining Experience with Flight Simulation by Skip Egdorf **pp. 13**
- Clickbait **pp. 17**
- EAA Chapter Renewal **pp. 19**



Upcoming Events

Meetings Schedule (unless otherwise noted)

9:30am - social time

10:00am - business meeting

10:30am - speaker/workshop/training

Upcoming Events

Check out our Chapter Website at <u>https://www.eaachapter691.org</u> for more information about upcoming activities.

Saturday July 20th @ Los Alamos Terminal Building Will and Skip demonstrate how to diagnose and service spark plugs.



A reminder that the EAA Chapter 691 July meeting will be held this Saturday, July 20th in the Los Alamos Terminal Building. As usual we will have coffee and donuts at 9:30, a short business meeting at 10:00, and the featured presentation at 10:30.

Join EAA 691 for a How-to Tech talk On Spark Plug Service and Diagnosis





Letter from the editor

by April Fox



Hello Chapter 691 members, we have had a very busy couple months developing a build and fly workshop as well as partnering with STEM Santa Fe on their all-girls Aerospace and Aviation summer Camp. A big thanks goes out to the volunteers, and we look forward to more opportunities to work with youth.

April

President's Report

by Will Fox



Holy Cow, It's A Madhouse

Hi Folks, Summer is in full swing and boy is Chapter 691 busy. We just started our Build and Fly activity last Saturday. More on that in a moment. This coming Saturday July 20th, is our regular monthly meeting where Skip Egdorf and yours truly will present a Maintenance Skills Class on Aviation Sparkplug Care and Feeding. Sound boring,? Actually it can be a shocking experience. Come to the meeting and you will get a chance to clean and take them apart and even test them in a pressure chamber. The Social starts at 9:00am, followed by a short meeting and then the class at 10:30 am. Starting at 1:00 pm in the afternoon at the EAA hangar we will have our second session for the Build and Fly project. Both the kids and mentors will be there working on the eKadet RC plane and everyone is welcome to drop by and see what we are up to. You can also see the completed Senorita RC model that the mentors built. Be careful though, you might get sucked into the fun vortex and glued to the airplane⁽³⁾

Last month we had a superb presentation on Gyrocopters and Helicopters by John George. John's ultralight helicopter was also on display. The turnout was great and by the number of folks who attended, it looks like we might have the potential for a few more rotary wing pilots in the Chapter.

The Chapter has also upped its game when it comes to simulators. The soapbox (or should I say the Distributed Network Computer) flight simulator has a couple more screens so you get a more immersive effect. Skip has the approach to AirVenture set up so if you want to practice for Oshkosh you can. Walt Atchison has also built a simulator to practice flying RC aircraft on. Stop by and try out your flying skills if you get a chance. See you there!

Check out our Chapter YouTube channel at

https://www.youtube.com/@eaachapter691 for the latest videos. For upcoming events, check out the 2024 Schedule that is posted on the Chapter website at https://www.eaachapter691.org/upcoming-events







John George talks about Gyros and Helicopters and how they work. He also had his ultralight helicopter on display. Can you imagine building a Coaxial helicopter that weighs less than 254 pounds?



Big Kids Having Fun





Regular Kids Having Fun





Tech Corner

by Will Fox



Hybrid Electric Aircraft

How would you like to own an aircraft that takes off and lands vertically, has a maximum speed of 200 mph, will carry five people over 500 miles, is so quiet you won't bother the neighbors, and its only emission is water? Welcome to Joby's VTOL Hybrid Electric Aircraft.

Joby, in conjunction with its newly acquired subsidiary, H2Fly, set a new distance record of 523 miles with their prototype hybrid electric aircraft that uses both a battery and a fuel cell for propulsion. The flight took 4.4 hours.

The new record was accomplished using a hydrogen fuel cell to supplement the battery. They carried 88 pounds of liquid hydrogen to power the fuel cell and landed with a 10% reserve. The battery provided the necessary power for takeoff, climb, and landing, while the hydrogen provided the power for the cruise portion of the flight. The Joby S4 requires 411 kw of power for hover but only 98 kw for cruise. The S4 is a very efficient aircraft in cruise flight and has a 12.5 to 1 glide ratio.

Let's compare the Joby S4's performance to a comparable air taxi like the Bell 407.

Cruise speed -Maximum speed -Fuel Burn (cruise) -Range -Empty Weight -Gross Weight -Occupants -Fuel Capacity -

Joby S4	Bell 206B
0009 04	
129 mph	130 mph
200 mph	140 mph
20 lb/hr (H2)	175 lb/hr (JetA)
532 miles	374 miles
4300 lbs	2331 lbs
5300 lbs	3350 lbs
5	5
100 lbs	610 lbs



The Joby hybrid electric aircraft set a new range record of 523 miles non-stop using a hydrogen fuel cell/battery combination. The only emissions came from water that was generated by the fuel cell.



The Bell 206 is a popular turbine powered multipurpose helicopter used all over the world.

The Bell 206 can only carry a pilot and one passenger with full fuel. The Joby S4 will carry a pilot plus 4 passengers, because the hydrogen fuel packs over three times the energy per pound compared to Jet A, and because it is much more efficient in cruise than the Bell 206. In addition the Joby S2 has 40% more range because the fuel cell and electric motors in the S4 are twice as efficient as the turbine engine in the Bell 206.

Ok, that's the hype, but let me put my engineering hat on and make some observations about the test flight. The S4 was flying at 108 mph during the test flight rather than its normal cruise of 129 mph. That is probably because it had added a rather large appendage to the bottom of the fuselage in the front. That appears to be the fuel cell stack which which needs a fair amount of cooling, because even the best hydrogen fuel cells are only 60% efficient. I suspect that Joby found that a lower cruise speed gave them more range with the additional cooling drag.

The hydrogen is stored as a liquid at -424 F which results in a little more energy density than pressurized hydrogen, but it requires a well insulated cryogenic tank. Liquid hydrogen is significantly less dense than Jet A, so forty kilograms of LH2 would need about a 22 cubic foot tank. That had to stuffed into the airframe somewhere, and my guess is it probably occupied one of the passenger seats for the test flight or possibly part of the battery compartment area that became available when they downsized the battery.

Joby indicated that they had installed a smaller battery, because the cruise portion of the flight basically uses the fuel cell for propulsion. The battery would be essentially used only for takeoff, climb, and landing because of the higher power requirements. The S4 normally uses a 200 kw-hr, 1900 pound battery and has about a 150 mile range. But with the fuel cell to provide cruise power it would only need a 100 kw-hr, 950 pound battery for those phases of flight. I did a rough estimate of what the fuel cell system would weigh for the cruise portion of the flight including a 100 pounds of LH2 and came up with around 900 pounds. So the numbers seem to check out.

Finally, this was the first test flight with the fuel cell and battery combo with very little actual information published about the details. There is a lot we don't know, but what we do know is that the Joby Hybrid Electric VTOL flew 523 miles using a hydrogen fuel cell and battery which is over three times its normal range, and that is remarkable.

Joby plans to incorporate the hybrid version of their S4 into a regional air taxi service between major cities. I can hardly wait to see how far this technology can take them.



The top map shows Joby's possible air taxi service area based on their battery electric aircraft. The bottom map shows a regional air taxi service area based on the battery/fuel cell hybrid electric aircraft



Member happenings

Jared flew up to Colorado Springs to pick up an 80hp Yamaha engine and gearbox for his kitfox project...



Northern Arizona

Mt. Rainier

Paul Price has been busy flying around the southwest and Pacific Northwest. Here are two photos he took while on his adventures.

Gaining Experience With Flight Simulation

The last few months with 691YE (and others)



Progress

Over the spring and summer our chapter flight simulators have grown in number and have been used in a number of venues. We now have not only the cockpit simulator 691YE but also two desktop systems similar to those that one would have in their home for personnel productivity and training. In addition we have added a simulator for Radio Controlled Model simulation as a part of the Build and Fly program. Each time these simulators have been used they have been met with very positive reaction and have provided valuable lessons to the chapter about their use.

Activities

At the chapter's March meeting the cockpit simulator 691YE and two desktop systems were presented to the chapter members. These three systems were exercised by several in attendance. The reaction for even such early prototype systems was good. It was interesting that 691YE got much more use than the desktop systems. In general we are learning that the desktop systems a very good for specific exercises and objectives, but in a public setting the charm of the cockpit simulator leads to consideration of how the chapter can use it appeal as a marketing tool as well as for educational purposes.

Given the experience at the chapter meeting, several additional simulation scenarios were developed and tested by various chapter members. Scenarios placing the aircraft 5 miles east of KLAM inbound for landing and placing the aircraft 5 miles south of KSAF were successful. A planned scenario anticipating a fly out to Angel Fire placed the aircraft over Eagles Nest Lake southbound toward Angel Fire. This was actually a useful scenario as the simulated performance of the Cessna near its service ceiling would have been quite educational to pilots unfamiliar with an airport like Angel Fire. These sorts of scenarios might be very useful once we gain more experience with all the details of the simulated flight dynamics.

With these scenarios the Chapter took 691YE and the two desktop simulators to the STEM Santa Fe workshop at the start of June. Reaction of the young ladies participating in the activity was very positive. Two bits of experience are worth relating. First, the plan was for an experienced pilot to sit with each participant to guide and mentor them on aspects of flying the simulator. However when the experienced pilot was called away for some reason it was amazing to see the young ladies take over, figure out how everything worked, and do their own flying. This was an exceptional set of participants!

Second, our assessment of the positive reaction was best expressed by the girl's request to Please leave the simulators for the rest of the week rather than taking them away at the end of the chapter's section.

A final exposure to the simulators was the initial meeting of the Build and Fly program at the start of July. This time 691YE and one of the desktop simulators was augmented with the RC model airplane simulator showing how the Kadet might fly. The participants were one again excited by all of the simulation tools.

Finally with Oshkosh coming soon, we have developed a scenario that starts just outside Rippon and allows one to fly the approach over Fisk into Oshkosh. Initial use seems to show that this sort of use can be a very useful training tool.

Lessons

The initial construction targeted low-end computers in order to test just how little computing power might allow a flight simulator. Current marketing insists that a high-end gaming system is needed for a flight simulator. We have found that older and low power systems can run simulations, but with reduced frame rates and thus jerkier motion.

Given the initial success of our prototype systems, the chapter has invested in some more powerful computers. In addition, we have begun experimenting with a three-monitor setup for 691YE similar to Marc's home system described at our March meeting. The ability to see to the side makes a marked improvement of usability for the system.

Ongoing Work

The flight Simulation software we use is a mature and complex system with lots of features as yet unexplored. Adding the ability to build switches, dials, and other controls and interface them to the simulation system is underway. We have not yet explored the very rich structure for adding new aircraft like the Dragonfly to the flight dynamics model. Working with more realistic scenery is interesting.

Many other parts of the system wait to be explored. Anyone wanting to acquire, learn, work with and extend the chapter's knowledge related to these systems would be welcome. Let us know if you are interested.

Clickbait

Thank you contributors!

What do you do when the controller asks you to do more than you are capable of:

https://www.youtube.com/watch?v=0uSUp_G3gjo

Joby Aircraft just flew a VTOL hybrid electric aircraft a record 523 miles nonstop:

https://www.youtube.com/watch?v=egR5buArDO4

The brilliance of Modern Gyrocopters:

https://www.youtube.com/watch?v=tQ_D1IxwgtM

Clickbait

Thank you contributors!

Joby leaps another technological barrier - 523 miles on battery and fuel cell. Check this out:

https://www.google.com/search?client=firefox-b-1d&sca_esv=cbc386de4b870031&q=Technical+evaluation+of+joby52 3+mile+flight+on+hydrogen&tbm=vid&source=lnms&fbs=AEQNm0A a4sjWe7Rqy32pFwRj0UkWd8nbOJfsBGGB5IQQO6L3J5MIFhvnvU242 yFxzEEp3BfRFWcyM5BvpTgNzM3vKj4sEjS6haKlrdzONTHhmted8cx_khEa_Z3cHwHtSvlyjg7xgmEGmKplb9HWHYqGPmQro9SpPPef TzAjrxUaEt-vdHGpw8V_Ejf8N5KpE5WixjenkuLDZPsP5jg1aGCY-ZhKEvoWQ&sa=X&ved=2ahUKEwjroojMg6CHAxVFGDQIHborBz4Q0p QJegQIChAB&biw=1791&bih=933&dpr=2#fpstate=ive&vld=cid:6e6d 5909,vid:egR5buArDO4,st:0

For comparison Joby flew 523 miles on 40 kg of hydrogen (plus battery) and the Bell 407Gxi that our local Medavac uses only has a range of 373 miles and use 460 kg of JetA. Max speed of the Joby is 200 mph compared to 160 mph for the Bell. Bell has higher useful load though and carries 7 people versus Joby's 5. The Bell is also certified and the Joby isn't "yet".

Go Electric!



EAA Chapter 691 Membership Application/Renewal Form

Please mail this form along with \$25 to our Chapter Treasurer, Checks can be made out to EAA Chapter 691:

David Young 819 Gonzales Rd Santa Fe, NM 87501

Name:				
Spouse/partner's Na	ame:			
EAA #:	Expiration Date (MM/YY)	/		
Address:		City:	State:	ZIP:
E-mail:				
Home phone:				
Work phone:				
Cell phone:				
Please list your curre	ently flying A/C and any finished or	in-progress projects:		

