Young Eagle John and his home built. More on page 6

EAA Chapter 691 Newsletter
March 2025

On the Web @ eaachapter691.org

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

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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 https://www.eaachapter691.org for more information about upcoming activities.

Northern New Mexico Chapter 691 of the **Experimental Aircraft Association** (EAA) will meet Saturday, March 15 at the Santa Fe Jet Center pilot's lounge, and will feature a presentation by **Cliff Chetwin** entitled **Flying the High Country, Almost Everything You Wanted to Know About Mountain Weather**. The meeting, open to all interested, will begin at 9:30 with coffee, pastries and informal discussion, followed by a short business meeting at 10:00 and the presentation beginning at 10:30.

Cliff Chetwin has been an active pilot since 1977. He retired from the National Park Service in 2006 after more than 30 years as a Park Ranger including 20 years as a Park Service pilot and aviation accident investigator. He served as the agency's aviation program manager in the Santa Fe and Denver regional offices, providing a wide range of aviation assistance to national parks throughout the western United States. Prior to joining the NPS he was a police officer in Washington, DC and later in San Francisco. He has extensive experience flying throughout the Rocky Mountains, Sierra Nevada, and Alaska. He is a Gold Seal/Master CFII/MEI, specializing in mountain flight instruction and has flown over 40 different make/models. He is an EAA life member (chapter 1267), a charter member and past director of the Society of Aviation and Flight Educators (SAFE), a Lead FAAST Team Representative for the Albuquerque FSDO, chairs the NMPA Mountain Flying Committee, and is a frequent speaker at regional and national aviation events. He currently owns a 1977 Superhawk and commutes to Santa Fe from his home in Kremmling, Colorado

Flying the High Country, Almost Everything You Wanted to Know About Mountain Weather: Based upon satisfactory skill sets developed during successful flight in the non-mountainous environment most pilots significantly overestimate their skill level for safe mountain flight. This is especially true in understanding th unique and often hazardous nature of mountain weather. The presentation is an abbreviated version of concepts presented in NMPA's annual three day Mountain Flying Clinic and will identify key weather conditions influencing mountain flight, the safety risks associated with them, and suggested techniques to ensure a safe flight.

EAA Chapter 691 (EAAChapter691.org) is a 501(c)(3) organization with objectives to support and promote general aviation, flight safety, and R&D on emerging technologies including electric aircraft. It also focuses on education on aircraft construction and maintenance, STEM education for youth, and providing opportunities for introductory flights through the Young Eagles program.

Hope to see you there!

This Saturday,
March 15th
@ KSAF

President's Report

by Will Fox

Check out our Chapter YouTube channel at https://www.youtube.com/@eaachapter691 for the latest videos. For a schedule of upcoming events, go to the Chapter website at https://www.eaachapter691.org/upcoming-events/

Is it March or is it April

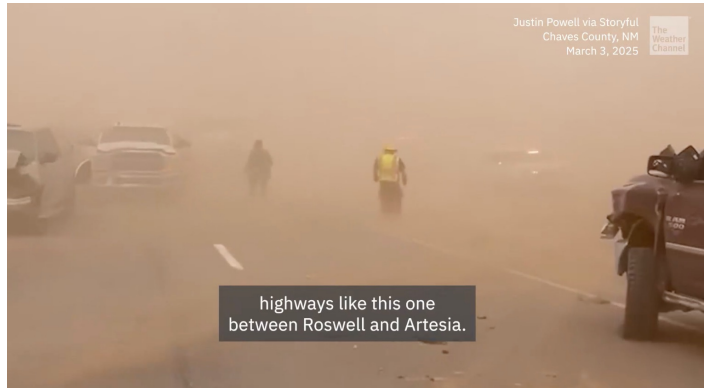
Hi Folks, it's seems like spring comes earlier each year. Between the wind, the snow, and the warm afternoons it feels more like April than March to me. They had a haboob in eastern New Mexico the other day. What's next, a hurricane☺ Anyway, this time of year you might want to double check the weather before you go flying.

Speaking of weather, we have a great talk coming up this Saturday. Cliff Chetwin will be talking about Mountain Flying and Weather. Cliff is a CFI, EAA member, and was a pilot for the National Park service among other things. He is also a great speaker, so please join us in Santa Fe in the Jet Center Pilot Lounge for the fun. The Social starts at 9:30AM with donuts and coffee, followed by a short meeting at 10:00AM and then Cliff's talk which will start at 10:30 AM.

Walt Atchison has been planning a Young Eagles Workshop for this coming April. Kids from 8 to 17 will have a chance to learn about aerodynamics, navigation, communication, and participate in activities ranging from building wing ribs to testing composite structures to flying simulators. Last Saturday the Young Eagle Mentors got together to get organized for it and started making wing rib kits along with figuring out how we are going to test composite structures, and what supplies we need for the other activities we have planned. We could sure use some help working with the kids on the activities. No special skills required other than to remember when you were a kid and how to have fun. Let Walt or me know if you are interested.

See you all at the meeting on Saturday.

Cliff Chetwin will be giving a presentation this Saturday titled "*Flying the High Country, Almost Everything You Wanted to Know About Mountain Weather*".



Spring weather brought a haboob to New Mexico on March 7, 2025.

Letter from the editor

by April Fox

The individual in the photo on the cover of this month's newsletter is one of our Young Eagles, John. Recently, John visited LAM to show off the R/C aircraft he had built at home and seek advice from the local chapter about it's flying characteristics. He was inspired by our Build and Fly workshop this past summer, and decided to build his own A/C out of whatever he had at home. That happened to be foam board, wooden dowels, hot glue, and his own 3D printed engine mount. He's currently in the process of modifying the A/C via moving the servo's closer to the wing in order to balance the CG and get the airplane out of Loop-d-loop mode. It feels really great to have a Young Eagle so inspired that they engineered their own R/C at home and is test flying it. A huge thanks goes out to our YE STEM mentors- here's to inspiring more kids to build and fly!

In other news, our chapter is putting together another STEM Workshop to be hosted at LAM in late April. Please consider volunteering to assist in the hands-on workshops. For more information you can reach out to any of the chapter officers. Thanks for your consideration!

Unpredictable! An Act of God.

By Skip Egdorf

We all remember our old instructor somewhere around our first flight lesson.

“Always look below for a spot to land if the engine quits!”

“Do engines quit often???” we all squeaked. Faced for the first time with the thought that something might interrupt our flight.

“No, they are quite reliable. But every now and then, out of the blue, with no warning, the engine may eat an exhaust valve. The bits of valve will beat the top of the piston. The piston will break up and pieces will jam the crank. With a sudden stop, all that energy must go somewhere and so the engine blasts parts of connecting rods and other engine parts out through the crankcase and you will need to glide down to a nice gentle landing.”

Not really convinced, “How can we tell when it is going to happen?”

“No way really. The engine is running smoothly, compression is good, starts easily. It is simply unpredictable. Just happens. An Act of God.”

And so we go through our training trying to remember to keep an eye out for a landing spot just incase that unexpected, unpredictable, Act of God happens.

But is it really so unpredictable?

A few months ago one of our chapter presentations involved using the chapter’s new boroscope to examine the internals of our engines. A program is being started to perform a specific examination of each cylinder, submit the images to a central group, and to train an AI system to look at thousands of such images and possibly predict some of those unexpected unpredictable incidents.

I thought that this was a worthwhile project. The Comanche was due for an annual and so I asked Will to help me collect the specific set of images for each cylinder on my IO540-D4A5 and submit them in order to add to the collected wisdom of our aviation community.

I expected no real problems. Compression has been good for several years. Oil analysis has been excellent. The oil filter is split and examined at each oil change and is clean.

Starting is immediate, running is smooth. Power is good. So although the engine has 1750 hours, it has been consistently good for a long time.

Running through the cylinders, the pistons looked good. The honing marks on the cylinder walls are there. Exhaust valves looked like the book says: like a pizza or a bullseye. Nice and round and symmetric.Here is #3.

By the examples, this is how the exhaust valves should look. A nice even round pizza look. Looks like the valve is working well.

When we got to cylinder #1, there was some question. The compression had shown a good leak that hissed down through the exhaust.

“Probably a bit of lead under the seat.” says the old A&P. With everything like idle, smooth running, EGTs, CHTs all looking good, go run it for a few hours. The lead will probably burn away and you will be fine. Not an uncommon suggestion for a new low cylinder.

But then in ran the boroscope….

Note how the exhaust valve in cylinder #1 is NOT a concentric round pizza shape or bullseye. The coloration says that the left edge (in the picture) of the valve has gotten very hot over time. There is probably erosion of the seat and a good possibility of small micro cracks starting on the valve edge.

The idea of going out and running the engine to free up whatever bit of lead is causing the leak (which is actually probably there) was shelved.

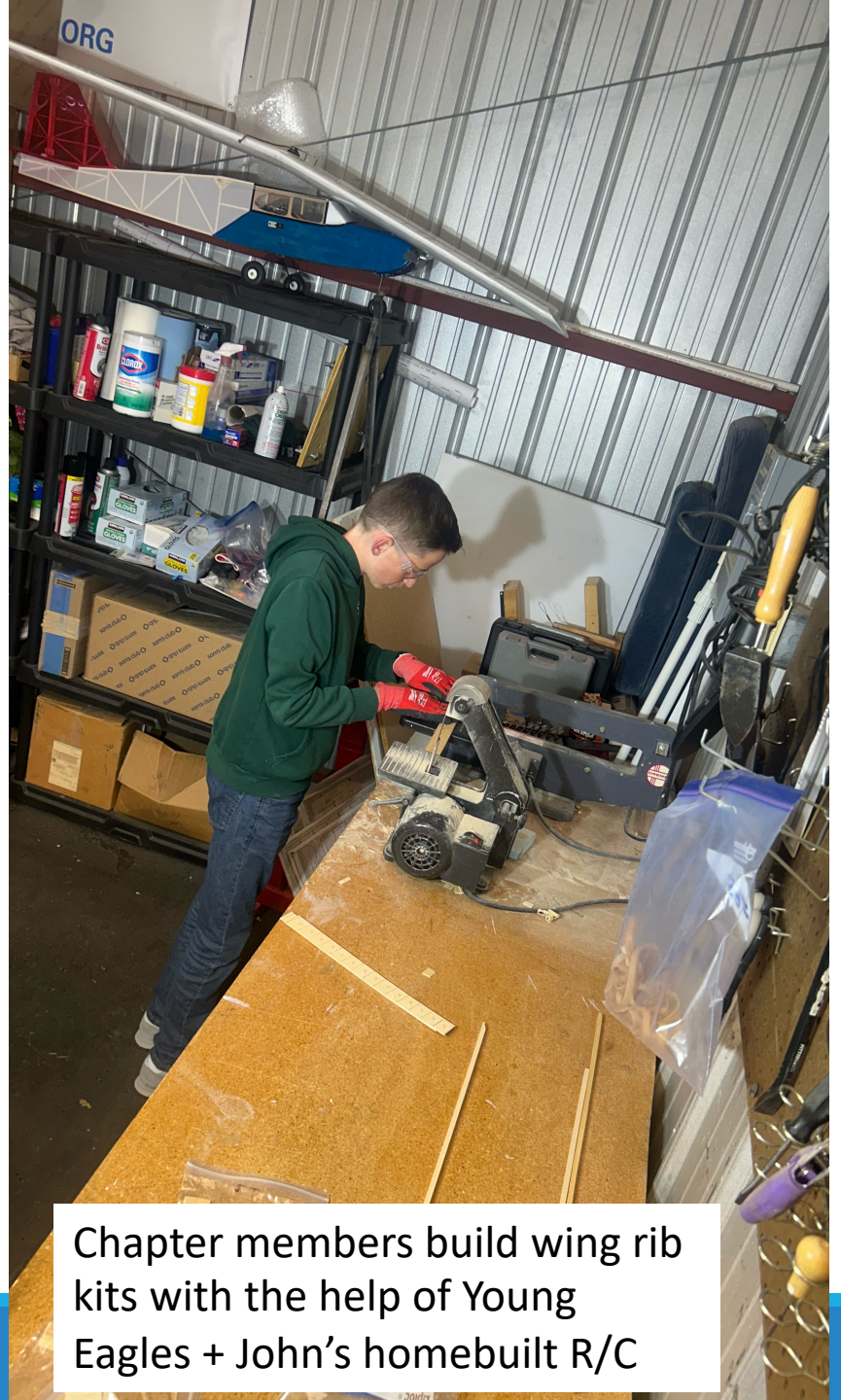
This looks like a valve that is getting ready to fail.

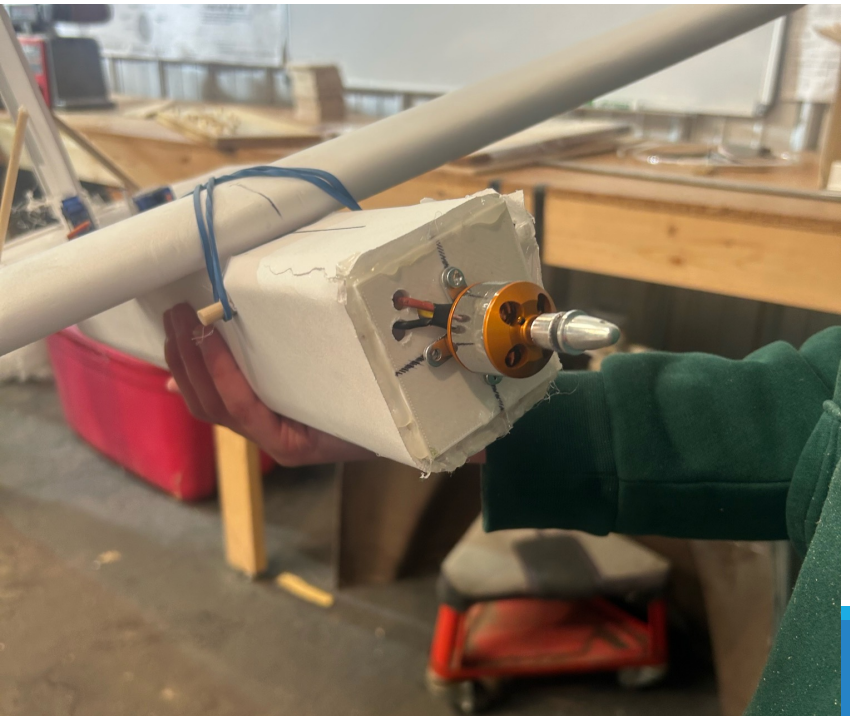
Had I been able to use the boroscope on each annual for the last five years or so, I believe that I would have seen this valve growing from the concentric round pizza look of #3 to more and more discoloration and off center heat patterns.

Quite possibly I could have done some simple work that would have corrected the situation at an earlier stage.

Now I am not happy about possibly having to send a cylinder off for (probably expensive) valve work. But I am much less happy over the possibility that somewhere, over some desolate mountain range or desert, that my #1 exhaust valve would decide to break up, hammering pieces out of the piston, jamming the crank, and causing all the stopped rotational energy to throw connecting rods and other random engine parts out through the crankcase. Thus, leaving me with very white knuckles, very wide eyes, and a deep regret that I had forgotten my old instructor's advice to always keep an eye out for a place to land.

And as I glide and descend toward those rocks and trees I would be shaking my head repeating to myself "Who could have known? Unpredictable, An Act of God…"So now I am a believer. The chapter boroscope is available to be used. At an annual, the plugs are out anyway for the compression test. Although it is not currently a part of a routine annual inspection, using the boroscope and taking the recommended set of pictures of each cylinder is fairly easy. It will not only add to the collected knowledge of our clan by submitting the pictures, but will give the owner and pilot a baseline that over time may allow the unpredictable Act of God to be just a little more predictable. So that maybe one day you are a little less likely to have white knuckles muttering " Who could have known?"





Chapter members build wing rib kits with the help of Young Eagles + John's homebuilt R/C

Tech Corner

by Will Fox

Gas Turbine Engine

Imagine what putting a gas turbine engine in your light aircraft would do for performance. It would be great! Less weight, more power, less vibration, greater longevity, simple operation, what's not to love? Well, turbine engines aren't known for their fuel economy for one . They burn almost twice as much fuel as piston powered engines for a given amount of horsepower. But what if there was a way to make a small turbine engine more efficient? Turns out there is, and a company in France called TurboTech has figured out how to do that. They have developed a 140 hp turboprop engine that burns about the same amount of fuel as a Rotax four stroke aircraft engine.

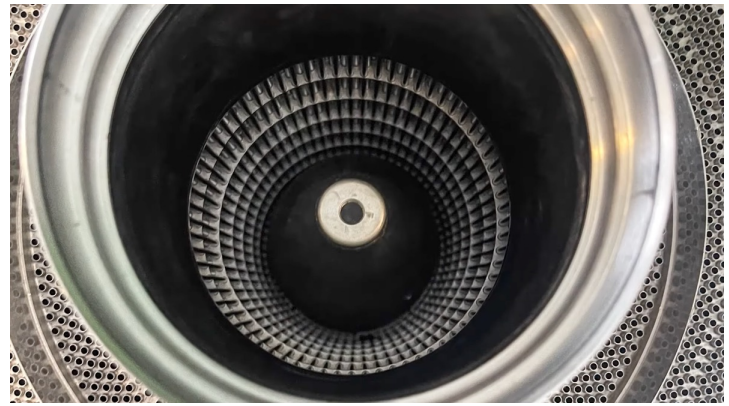
Typical piston engines use about 0.4 to 0.5 pounds of fuel per horsepower per hour. A typical small turbine engine burns more than twice that amount for the same horsepower. The reason is that a lot more thermal energy escapes in the exhaust of a turbine engine than in a piston engine. This is pretty obvious if you have ever seen the back end of a jet departing at night. The combustion process is continuous in a turbine engine, and you need to flow a lot of excess air through it to keep from melting stuff in the hot section. If you can recover some of that energy by using it to heat up the air coming out of the compressor before it goes into the combustor, you don't use as much fuel, and the efficiency of the engine improves. That is just what TurboTech has done. They accomplish this by taking heat out of the exhaust gasses and transferring it to the compressed

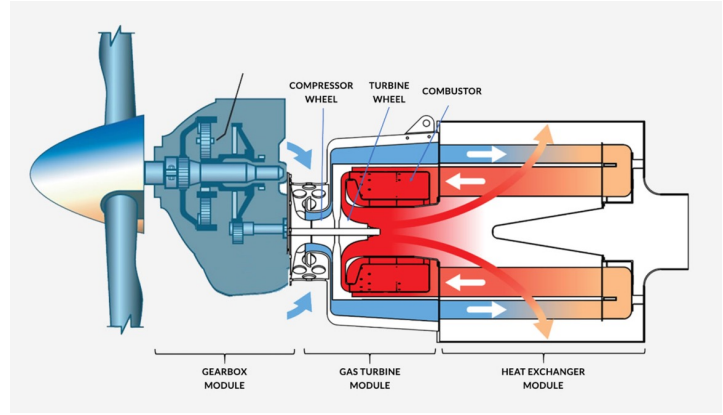
TurboTech has developed a highly efficient small gas turbine engine for use in Light Sport Aircraft.

air going into the combustor using a heat exchanger called a regenerator. A regenerator is particularly useful in simpler and lower cost turbine engines with lower compression ratios that use a single stage turbine and a single stage compressor in their design. The challenge is to move the energy from one side of the heat exchanger to the other side rapidly and efficiently. How they do this is pretty simple. The heat exchanger needs a lot of surface area to transfer the heat quickly and efficiently. TurboTech uses a fairly light weight and compact shell and tube design for the heat exchanger. Heat is transferred across a concentric array of very small thin-walled tubes carrying the compressor air that are heated by exhaust exiting through the shell that surrounds them. This is not a new idea and has been used in other applications. One you might be familiar with is the AGT-1500 turbine engine on the M1 tank that uses a heat exchanger to improve its fuel efficiency.

Turbotech has been flight testing the turbine engine on the XLB Bristol Light Sport Aircraft (LSA). They are also in the process of designing 250 and 400 horsepower turboprop engines for larger aircraft. Availability and cost are not known at this time. The cost should be relatively low compared to other turbine engines that use multiple compression and expansion stages to achieve high efficiency. But that doesn't mean they will be cheap either. On the positive side, TurboTech expects the TBO to be 3000 hours for the engine and maintenance costs to be less than a comparable piston engine. The turbine engine is capable of burning UL 91, JetA, and Diesel fuel.

TurboTech is also producing a very light weight 85 kW hybrid turbogenerator intended for the electric aircraft market. This could be a game changer in the electric aircraft industry. The turbogenerator could be used to power an electric propulsion system and have a much longer range than an all electric battery powered system. Such a system would have all the advantages of turbine engine performance and reliability along with the flexibility and performance offered by electric propulsion. Only the future will tell, but these are the types of propulsion systems needed to advance the state of the art in the design of light aircraft.





The TP-R90 turboprop engine produces 140 hp and uses a heat exchanger (top) to increase efficiency and reduce fuel flow to that of an equivalent piston engine .

Will Fox is a flight instructor and homebuilder. He also serves as a Technical Counselor and Flight Advisor for the EAA. In his spare time he enjoys working on and flying his two homebuilt aircraft, a Pegazair P-180 and a Questair Venture. He is also fascinated with solar power and electric vehicles, so his next airplane will be electric. Please feel free to contact him at tailspinfox@gmail.com if you have questions or comments.

Partnership Available

1 slot available in a 3-person partnership in an RV-7A based at KSAF. Build was completed in 2018; 500 hours TT on airframe and engine SMOH. Lycoming 180 HP O-360-A1D, fixed pitch 3-blade Catto prop. Burns mogas/avgas mix, 7-8 gph in cruise. Slider canopy. Integrated Dynon Skyview avionics with 10" HDX display, 978 in/1090 out ADS-B, AHARS, autopilot, engine monitoring system. Dynon D-3 independent attitude indicator with GPS altitude, groundspeed. Recently installed interior by Classic Aero Designs. Painted in 2022 by Master Aircraft Services. Always hangared. Call John 505-690-4212 or George 818-266-4925 for more info.

Clickbait

TWA Flight ABQ-SAF

https://www.youtube.com/watch?v=_mFepQvJg9Q

Hey Kids! Keep an eye out for upcoming work sessions to Electrify the Dragonfly!

EAA Chapter 691 Membership Application/Renewal Form

Please consider making a donation to our 501c(3) non-profit by mailing this form along with $35 to our Chapter Treasurer, Checks can be made out to <u>EAA Chapter 691</u>:

David Young
819 Gonzales Rd
Santa Fe, NM 87501

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