EAA Chapter 691 Newsletter
February 2022

On the Web @ www.eaa691.org

EAA 691 is:

President: Will Fox

Vice President: Marc Bonem

Secretary: Jared Haney

Treasurer: David Young

Web Editor: Brian O'Neil

Newsletter Editor: April Fox

Table Of Contents:

Upcoming Events

Chapter ”talks”

- **Taming Tail Wheel Shimmy** - Will Fox, February 19, 2022, KLAM Terminal/Zoom - 10:00AM

- **Chapter Fly-out to Questa** - Marc Bonem, March 19, 2022, (KSAF/KLAM) - 8:00AM

- **Central New Mexico A&P school talk**- TBA

Letter from the editor

by April Fox

A Big thanks to Paul Price and Andrew McMath for sending in updates on their projects. Looking forward to the upcoming Zoom on Taming the Tailwheel, and the Questa Fly-Out in March.

Let's get talking about our Fly-outs. We want all our members to get a chance to attend these fly-outs, and like myself, some don't have an aircraft… I'm putting together a roster of members with planes and an extra seat, and members who want to get to the Fly-out and who need a ride. Please email me if you have an extra seat, or if you want to go and need a ride. Let's get our members flying!
forkfox@gmail.com

Best,

April

President's Report

by Will Fox

I will be presenting an EAA Webinar on "Taming The Tailwheel Shimmy" (see below) that qualifies for FAA WINGS and AMT credit and is free to boot, so if folks want more information about what causes, and how to prevent, shimmy in tailwheels or nose wheels (same critter, just on the opposite end of the plane), you might want to tune in.

Will

Taming the Tailwheel Shimmy
WEDNESDAY, MARCH 30, AT 7 P.M. CDT
Presenter: Will Fox | *Qualifies for FAA WINGS and AMT credit*

https://pages.eaa.org/WBN-2022-03-30-Piloting-and-Proficiency_LP-Registration.html

Meet Marc Bonem- EAA 691 Vice President

Interview by April Fox

AF: Tell us a little about yourself; where you are from, what sparked your interest in aviation, and when/where did it start?

MB: I was born and raised in Chicago and my interest in airplanes started at a young age. I started to build model airplanes with my father, who was an engineer. He taught me all about engines like how they work etc… I think that's where my interest (in aviation) began. I started flying about 20 years ago and I got my pilot's license in NW Chicago (then- Palwaukee, now Chicago Executive) in a flying club called Windy City Aviation. I learned in a Piper Cherokee, passed my test, got my private certificate, did some fun things and then life got in the way and I had to let it go. Fast-forward 20 years, and about a year and a half ago I realized that I could retire early. So I asked myself, "What am I going to do with myself when I retire?" and it was a no brainer. FLY! Build an airplane and fly. I started training again with Sierra Aviation, got current, turned a horse barn into a build site and ordered a Vans RV-9a kit.

AF: What kind of airplanes have you flown in the past and which was your favorite?

MB: I have time in a Piper Cherokee, a Cessna 172, and an RV7- obviously the RV7 was my favorite.

AF: What brought you to the EAA?

MB: I was looking for a retirement plan. I knew I was going to build and fly, now I needed a social community with other aviation enthusiasts. I found the EAA part social, part getting into flying, part advice for building. It's about having fun and I liked the general context where everyone understands the physics and engineering aspects of aviation.

AF: You're building an RV-9A, why this particular kit plane, and what have been the biggest challenges you've discovered along the way (besides waiting for the kit!)?
MB: I Liked that Vans has a good reputation (they were) good kits, good instructions. I wanted a metal plane. I was most comfortable with metal. I wanted a safe airplane (low stall speed) that does good in cruise. If I had to do it over, I maybe would have picked something more modern in the Vans line.

(It has been) very challenging to build. The riveting by far has been the most challenging, in tight spots particularly. I'm halfway through the empennage, done with horizontal and vertical stabilizers. It feels tedious at times as well as challenging.

AF: What kind of flying do you plan to do in your RV9-A (x-country, local, aerobatics...)? JH: Stop making
MB: Probably start local and then visit all airports in NM. Definitely Carlsbad and some x-country. Fly to Denver, Chicago, and of course Oshkosh.

AF: Where do you see GA headed in the next 10 years, and how do you think the EAA can help keep the fire lit for GA and younger generation pilots and mechanics?
MB: I think electric could be a huge change for aviation. I also think that theories such as Mike Busch theories on engine monitoring (i.e. TBOH is BS, don't go by the clock, go by the health of the engine. Ideally engine monitoring, looking at oil, checking compression and if it's running fine and in good condition, doesn't need tear down) are catching on which is kind of a change (think cost) .

AOPA and EAA offer scholarships which is great. Both make a great effort to reach out to poorly represented groups of folks.

AF: If a Cessna 172 is a pigeon, what is an RV9-A?
MB: Maybe a kestrel… small, compact, fast

AF: Any wise words for fellow builders?
MB: When I started out I watched all the YouTube videos; Kitplanes "Metal Magic" series and EAA Builder series. Practice riveting, I did a lot of practice plates prior to working on my kit. Sometimes you need a third hand for riveting.

It starts off hard, and each step gets harder as your skills get better.

Member Project Updates

Paul Price's RV9A

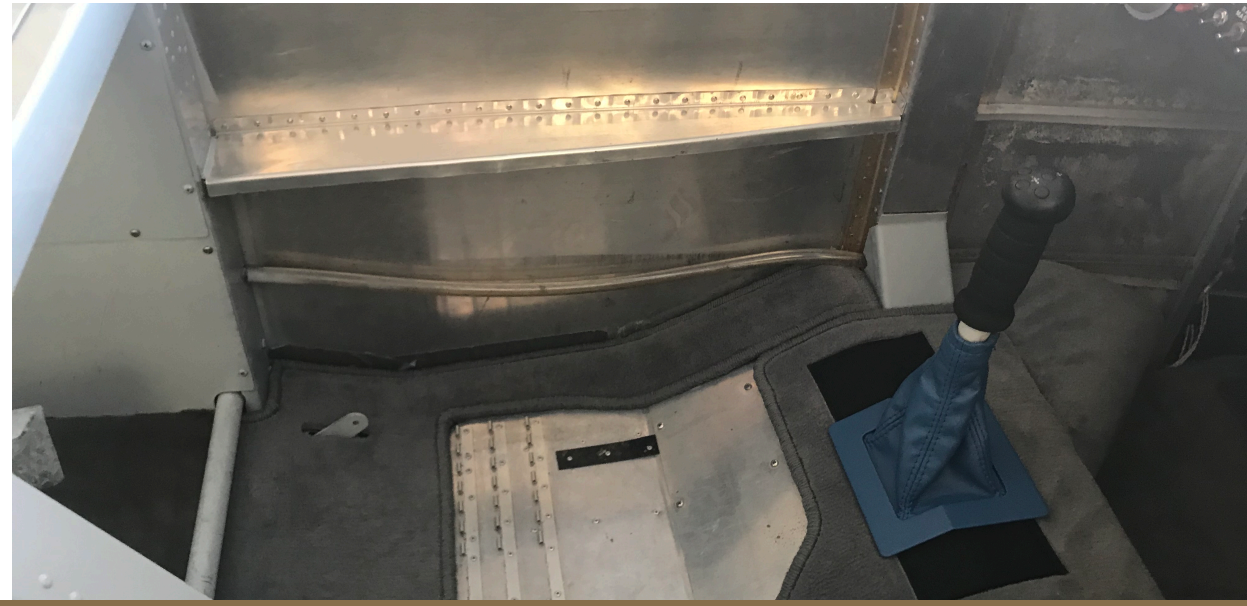
I love my RV9A. It was first flown in 2003 by the original builder who kept it for most of its life but a couple of years ago I found it on trade-a-plane and got there quick enough to buy it. The interior was in good condition but dated. Seats looked professionally crafted but side panels and other parts were not up to par with the craftsmanship of the overall plane.

After some research and foot-dragging, I bit the $4000 bullet at Classic Aero Designs and waited the 6 months lead time for packages to arrive. I went with synthetic leather and found lots of good color choices to pick from. Real leather is only slightly more expensive but fewer options.

Classic Aero has excellent services and took my many phone calls to make sure I knew what I was doing when I put together the color scheme and picks for each part of the interior; stock and custom embroidery also.

The least fun part was the cleaning and the prep work. The original work had a lot of material glued directly on to metal parts of the plane. It took lots of scrubbing and chemical removers but it worked and was finally ready for the fun stuff.

The parts are all precisely crafted for the airplane model and options. Everything went in easily and attached with a few new riv-nuts, custom connectors between parts and Velcro. I didn't change baggage area because that was really nice as is except for a few parts that needed paint touch up. Jones Paint and Glass auto section was great to work with and match edthe color perfectly with an oil-based paint. They will even put your custom paint in a reusable aerosol can.



My kit included carpets, seats, stick boots and side panels. I made some custom covers for the area beside and behind the rudder pedals. I think they really tied up all the edges for a clean, finished look.

Overall, I'm really glad I did it and enjoy it every time I fly.

-Paul Price

Member Project Updates

Andrew McMath's Paragliding and Rans S6 Coyote Project

One of my brothers and I started flying paramotors a little over a year ago, so we have been doing that quite a bit which has helped scratch the flying itch, but unfortunately has kinda cut into my time working on the projects. I have not done much to the Highlander since getting the Rans S6 Coyote that Will and Skip came and looked at.

I did do the items that (our technical advisors) had recommended such as applying the fabric tape to the leading edge, etc. After contemplating the engine I ended up selling the Jabiru that was on it and got a 2017 Rotax 912 ULS that was removed from a flight school plane. I have it mounted but need to finish running new gas lines, radiator hoses etc. The current project I am working on is installing a set of Roberts bush gear that I acquired. I ended up having to do some cutting and rewelding as well as making brackets to mount the new gear to the plane as I think it was made to convert a tricycle gear plane to taildragger whereas mine is already a taildragger.

Next step will be welding the brackets to the structure and then a little more fabric patching around the incision area. I guess I tore into the plane a little more than I originally intended, but it is coming along. I just need to finish the bush gear install and maybe do a T3 tailwheel while I'm at it , finish plumbing the engine, and then install the instrument panel. I already have a Grand Rapids engine monitor so am planning to get a GRT Sport EFIS and the small Trig radio and transponder for the panel. I guess I am probably at the stage they say is 90 percent done and 90 percent left to finish, but I am hoping to get it done very soon .

Tech Corner

by Will Fox

Taming Tailwheel Shimmy

Ever had a tail wheel shimmy on you? If you haven't, consider yourself lucky and know your time will come if you fly taildraggers for very long. The tailwheel shimmy can be one of the most annoying aspects of having a tailwheel aircraft. A perfect landing followed by a raucous, rattling vibration that threatens to shake the tail off the airplane and doesn't quit until you have almost brought the aircraft to a complete stop, is disconcerting at the least, and dangerous at the worst. You may have noticed the tailwheel shimmy on other aircraft when they land. Sometimes the wheel will spin completely around the steering axis as the plane skips down the runway. I had a tailwheel shimmy so bad that it broke the bolt holding up the front of the tail spring. I realized this had happened after a particularly bad shimmy caused the bolt to break and then the rudder hit the tailwheel making the aircraft impossible to steer. Luckily there wasn't a crosswind that day, and I rolled out and stopped on the runway. The pilot in the NTSB report below wasn't so lucky.

Scott tailwheel assembly with built in shimmy damper. Courtesy of Dave Prizio, Kitplanes.

"*The pilot stated that he was returning from an aerial application practice flight, in a tailwheel-equipped airplane, to practice wheel only touch-and-go takeoffs and landings. The first four landings were uneventful. During the fifth and final landing, the airplane touched down and bounced approximately one foot into the air. The airplane stabilized and the main wheels touched down for a second time. As the tailwheel touched down approximately two-thirds down the runway, it started to shimmy "violently" and the airplane veered to the left. The pilot corrected the airplane back to the right. The intensity of the shimmy increased and despite the pilot's control inputs, the airplane exited the right side of the runway and ground looped. The airplane's left wing was substantially damaged. Post-accident examination of the tail wheel assembly revealed wear on the locking mechanism. Additionally, "snake-like" skid marks were found on the runway that appeared to be the result of a tailwheel shimmy."*

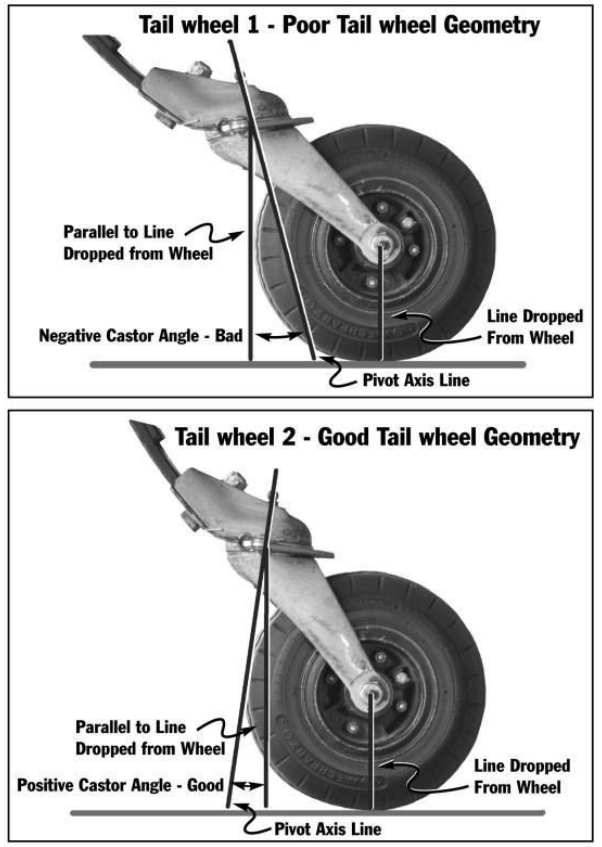
What causes shimmy and what can we do to fix it? That is what I hope to explain in this tech note. The shimmy in a tailwheel is not anything new. In fact, shimmy in aircraft landing gear has been around as long as aircraft have had landing gear. Nosewheel shimmy was such a big problem with the B-24 that they often carried a spare nose gear just in case it broke. Nosewheels, tailwheels, even main landing gear can all have shimmy problems. Shimmy is just a manifestation of a resonant vibration in the landing gear. Since all landing gear have a resonant frequency that they will vibrate at, they will all shimmy under a particular set of speed and loading conditions.

The goal of the aircraft designer is to design the landing gear in such a way as to make sure that these conditions are well outside of the normal takeoff and landing conditions for the aircraft. Much of what I will discuss in this article can also be applied to nose wheels, but let's focus on tailwheels and what causes them to shimmy.

There are many types of tailwheels out there. This discussion is aimed at those that incorporate a tail spring as the principal support and shock absorption mechanism. Several things can cause an otherwise stable tailwheel to shimmy. These are: a change in the castor angle due to an overloaded or bent tail spring; loss of friction in the dampening mechanism; or additional play in the swivel mechanism due to wear or improper maintenance. Other things that may contribute to shimmy in a tail wheel are: tire shape and pressure, type of rudder springs and tension, and load on the tail wheel, although these are typically secondary considerations in the shimmy equation.

Lets talk about the wheel castor angle first. The castor angle is the angle measured between the tail wheel swivel axis and a line perpendicular to the ground. Positive castor, which is what we want to see in the tail wheel when it is loaded, is when the axis drawn through the swivel bearing is tipped forward at the bottom of the swivel and rearward at the top of the swivel. Adding weight to the aircraft causes the tail spring to deflect and the positive castor will decrease, so we want to make sure that we maintain positive castor even after the aircraft is loaded. Don't over do it though, because too much positive castor makes the tail wheel difficult to steer. A tail wheel with negative castor is more prone to shimmy, but not all tail wheels with negative castor shimmy. Why is that? There is another part to this story, and that is called trail. Trail is the distance between where the steering axis intersects the ground and where the wheel touches the ground. As the castor is moved in the positive direction the trail is increased. Increasing the amount of trail increases the speed at which shimmy occurs, and if this is above your takeoff and landing speed, then *voila*, no shimmy. A tail wheel with enough trail may not shimmy even with a negative castor. Another factor is friction, and that is what we talk about next.

All dynamic systems want to oscillate under the right circumstances; it is a fact of nature. Friction is the reason that they don't, or if they begin to oscillate, it is limited in magnitude or quickly dampened out. Friction is inherent in all mechanical systems, but in many cases, additional friction is required to prevent vibration of the system at the desired operating parameters. This is often the case in tail wheels, and that is why many of them have a built in shimmy dampener. How much friction is required? Well, the amount of friction should be sufficient to prevent shimmy but not so much as to make it too difficult to steer. The tail wheel manufacturer typically specifies the amount of friction required.



Tail wheel with positive and negative castor angles—exaggerated. The terms positive and negative are simply the naming convention I choose to use, as they agree with my textbook references.
(Original location: http://www.pierceaero.net/techdata/tws.jpg)

A positive castor angle is key to preventing tailwheel shimmy. Courtesy of Gilbert Pierce of Pierce Aero.

The next cause of shimmy is inadequate maintenance and wear in the moving parts or, in some cases, the nonmoving parts of the tail wheel. A worn rubber block on your spring mount can change your castor angle from positive to negative, and that can lead to shimmy. Wear in the swivel bearing can lead to play and produce a shimmy. Tired pressure plate springs and worn pressure plates can reduce dampening and lead to shimmy problems. Worn seals in a hydraulic shimmy dampener can lead to shimmy. Basically any type of looseness or play can change the dampening or spring constant of the tail wheel and promote shimmy. So keep your tail wheel well maintained and lubricated.

Other things that affect tail wheel shimmy, but are not principal factors in shimmy, are types of rudder springs and spring tension, tire pressure, and load on the tail wheel. Rudder springs and chain tension can have a small effect on tailwheel shimmy characteristics. Some manufacturers recommend different size springs on either side of the tailwheel to help dampen tail wheel shimmy by changing the frequency response of the system. Some tailwheel locking and unlocking mechanisms can be sensitive to spring tension to function correctly. If the locking mechanism does not work properly, a shimmy may occur. For example the Scott 2000 tailwheel requires some tension on the springs for the locking mechanism to function correctly, while the Scott 3200 tailwheel works best with no tension or some slack in the springs for the unlocking mechanism to function properly. Tire pressure can also affect shimmy. Changing the tire pressure can change the response of the system. It does this by changing both the dampening and the spring constant of the system. The problem with this approach is that the tire should be run at the proper pressure to insure longevity and proper performance, and a properly rigged and maintained tail wheel should not shimmy with the correct tire pressure. The amount of load on the tail wheel also affects shimmy. The greater the load, the greater the propensity to shimmy. That is why you can often times stop a shimmy by pushing forward on the stick and reducing the load on the tail wheel. A properly designed tail wheel should not shimmy under normal loading conditions, but may shimmy when overloaded. An overloaded tail wheel may also result in a bent tail spring, thus changing the castor angle and cause a shimmy even after the overloaded condition is corrected. Speed also causes shimmy. The higher the speed, the more energy there is available to overcome friction and energize the shimmy. That is why sometimes you can ward off a shimmy by keeping the tail up as long as you can and only lower it after you have slowed down below the shimmy speed.

In conclusion, tail wheel shimmy can be caused by a number of factors, such as negative castor, inadequate trail, insufficient friction or dampening, and worn parts or excessive play. One of the most common problems is a tired tail spring that results in a negative castor and less trail. Re-bending or replacing the tail spring should take care of this problem. Most high quality tail wheels incorporate some sort of dampener or friction mechanism. These help to prevent shimmy and should be properly maintained. Finally, proper maintenance and elimination of play in the tail wheel assembly will help to prevent shimmy and assure a long operational life for your tail wheel.

A B-24 Liberator, shown after suffering a nose wheel failure at a base in North Africa. Nose wheel shimmy was a serious enough problem that they often carried a replacement nose gear with them on cross country flights.

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.

Chapter Links – Do you have a link you'd like to share?

EAA 691 Website

http://eaa691.org/

New Mexico Pilots Association

https://www.nmpilots.org/

LiveATC – Listen to the Santa Fe Tower and Ground Frequencies

http://www.liveatc.net/search/?icao=ksaf

LiveATC – Listen to the Albq Tower and Ground Frequencies

http://www.liveatc.net/search/?icao=kabq

EAA Chapter 691 Membership Application/Renewal Form

Please mail this form along with $25 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: