
CAA Chapter 32 News

The official publication of Experimental Aircraft Association Chapter 32 - St. Louis, MO (Jim Bower, Editor)

March, 2019

Another bird leaves the nest!



Art Zemon proudly giving us the obligatory thumbs-up from the pilot seat of his BD-4C. Art flew his creation already, and is busy flying off his Stage 1 time. See the details in this issue.

**We will see you at the ARC for the March meeting
10:00 am Saturday, March 16! (Weather permitting)**



Fellow Chapter 32
Members and Friends,

It's getting warmer! We're back on Daylight Savings time! The end of winter is now in sight. Snow in our area has melted. Something many of us are concerned about is the heavy snow north of us, which will melt and flow down the rivers. Climatologists are predicting that rivers in our area will flood this spring. How much it floods is dependent on how much rain we get and how quickly it warms up north of us. I hope it's a slow melting of snows up north, and a dry spring. Nevertheless, we must be prepared just in case the Mississippi river rises and floods Smartt Field where our ARC is located. We do have contingency plans in that event, and will pay close attention to river levels. At present, we're not in danger (yet).

Over the past month, several things have been going on behind the scenes. We got a letter from the Mo DNR letting us know we needed to do something about the well that was installed when the ARC was constructed. They gave us two choices; 1) reactivate the well and use it for things like watering the lawn or 2) officially abandon the well, plug it and register the abandonment with Mo DNR. We chose to abandon and plug the well. This involved removing the pump and piping going down into the well, filling it with Bentonite clay chips, cutting the well pipe a foot below ground level, and covering it with dirt. After that, it needed to be registered as officially abandoned in accordance with DNR code. This was done last week.

We've been excited about the Ray Foundation Scholarship, which awards a ten thousand dollar grant for an EAA Chapter to administer to a selected candidate. I'm pleased to report EAA Chapter 32 was awarded one of the scholarships offered. Our candidate has accepted the offer. His name is Kyle Hanson. Kyle has been an active Young eagle participant and Chapter 32 volunteer for about five years now, and is a member of our chapter. I've taken him flying a number of times, as have a number of our chapter pilots. Congratulations Kyle!!! I know you'll get great enjoyment during your journey into the world of flight. And thank you for all you do helping our chapter. We do appreciate it, and look forward to hearing about your journey through flight training.

President's Corner

by Dave Doherty

Last month, I wrote about an opportunity for EAA32 to sponsor an Aviation Explorer Post. We discussed it at our February meeting, and the consensus was for us to go ahead and work toward that goal. I'm pleased to announce Chapter 32 has applied to the Scouts for sponsorship of the Explorer Post. We needed at least five adults to become Post leaders, and accomplished that. While we started with five adults, we can certainly have more. If anyone is interested in helping our with this program, please contact me and we'll get an application to you. After our March regular Chapter meeting, we'll be meeting in our ARC conference room working on fleshing out a preliminary schedule for the post (a requirement to get authorized with the scouts). After that, the Scouts will be recruiting youth, ages 14 to 21 to become members of the Aviation Explorer post, and we'll have an introductory meeting sometime in April. This type of activity serves as a great follow-on to our Young Eagles program, and I'm proud of our chapter for committing to this effort. Thanks to everyone.

Dues are Due!! EAA32 has paid the fees associated with being a chapter plus insurance coverage to HQ in Oshkosh. Your dues cover the costs of that as well as building maintenance, supplies, upgrades, and doing all the aviation related stuff we do. \$40.00 is a small price to pay for keeping our chapter going strong. If you've not renewed, please do it now. We need you.

The March meeting will be a presentation by Chapter Treasurer Don Doherty on the state of finances of the Chapter in addition to our regular business.

April's meeting will feature guest speaker Bill Flores, who will talk about his experiences in the USAF during the 1950s and 1960s. It promises to be a very interesting presentation.

I look forward to seeing everyone at our March 16 meeting. Location, as always, will be our Aviation Resource Facility located on Smartt Field (KSET) at 6410 Grafton Ferry Rd, Portage Des Sioux Mo. Meeting time is 10:00 AM. See you there!

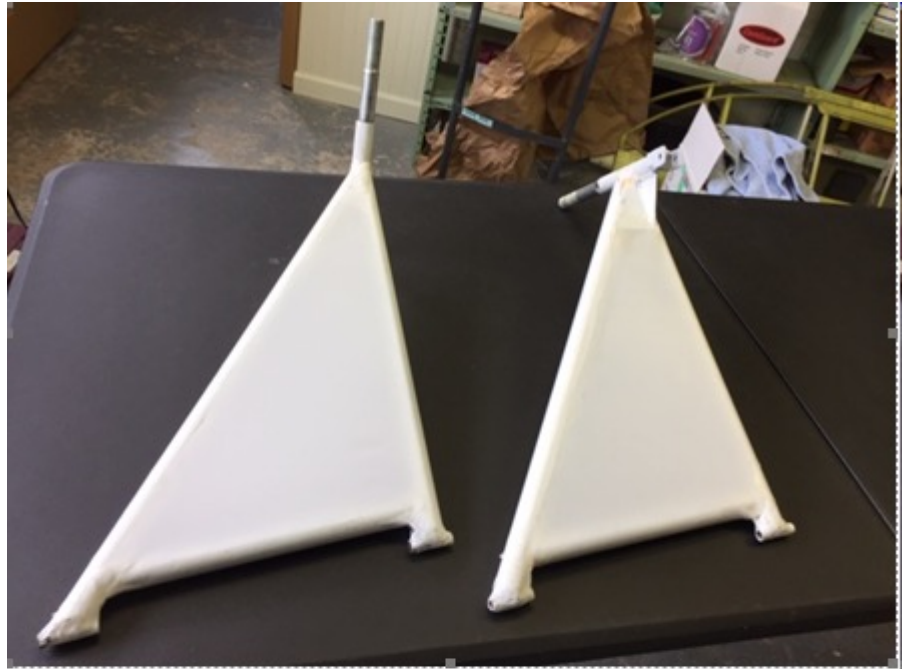
Blue Skies,

Dave Doherty

Dave McGougan's Kitfox Project

Editor's Note: This is the latest installment in Dave McGougan's effort to get back into the sky. After planting his Ridge Dodger in a bean field, Dave decided to go upscale and build a Kitfox. He bought a project, and has been doing a great job cleaning it up and making it his own. To add a bit of fun to the mix, Dave recently moved out to Eureka. We all know moving is a big pain, especially in the winter. Now, Dave has a 1-hour commute to get to his project. If that's not dedicatiion, I don't know what is.

After 4-5 tumultuous months of moving from Florissant to Eureka I was finally able to get back to work on my Kitfox. The final pieces that had to be covered were the gear legs. I was able to get both covered and ironed out in one day. Next up is to coat these two parts with Polyfill which I am out of. Before I started the move I had Primered the tail feathers, wing tips, cowling, and flap-erons. I still have to do the wings and fuse-lage, oh and gear legs. Once all primed the entire plane gets painted. I would like to paint in May. My goal is to then assemble everything and start working on the power plant, long range is to taxi test by fall.



March Meeting Minutes

Dave Deweese

February 2019's meeting began with the Pledge, Dave Doherty presiding.

No minutes to approve from January: the meeting was canceled due to threat of Polar Vortex.

Don Doherty gave the Treasurer's report including checking and savings account balances from January and February. Note that the chapter re-charter was an approximately \$1,300 charge.

We've got a number of new members for 2019, Dan and Kyle Noble were in attendance. They're starting on a Corvair-powered Zenith Cruiser.

Visitors included Eric Reed who plans to become a member. He's got a Hyperbipe he's planning to take home and recover: we tried Don Jonas' trailer but it wasn't quite wide enough and we're looking for another solution. Dave proposes that we think about a wider trailer as a gadget the chapter could use.

This month is our chapter's 62nd birthday: we're one of the earlier chapters.

Chris Ward debriefed us on his Zenith Cruiser which he's building as a youth project: construction will take place Tuesdays from 6 to 8. He's also working on the Ray Scholarship and notes that they want a lot; they asked if the chapter has a youth-build project and he put his own forward. Chris is a substitute teacher and works with other groups and has been drumming up interest. Chris has a goal that, if we score the Ray Scholarship, he'll provide his airplane to the pilot for flying Young Eagles. Further notes on Ray Scholarship: multiple YE flights in multiple planes, involvement in chapter events, have attended an aviation camp, and then they move onto technical issues such as passing the physical for a 3rd class medical. Then you have to apply for your student pilot certificate from the FAA. The candidate writes an essay; on our part we document the learning process: it doesn't cost the student money so we document commitment and time. Chris also offers to accompany the applicant to multiple flight schools to help make a good choice. The first two scholarships are already

granted in California and Florida; they're planning on a total of 90, and are holding 10 in reserve.



Kyle was in attendance we're planning on putting him forward as a potential candidate.

Rick May spoke on 2018 and our upcoming 2019 Young Eagles season. Numbers are in our last newsletter. He gave out certificates to volunteers who missed the holiday event. Dave notes that we should get our 8,000th Young Eagle this year. Rick reminds us that the youth protection program needs to be renewed every 2 years, so those who took the quiz 2 years ago need to renew. This is required for pilots and strongly encouraged for ground crew. There should be an email from Oshkosh HQ if you've done this before. Note that the website has been revamped and passwords reset. Chris recommends calling if you're having trouble and they'll reset your password.

Dave Doherty took the opportunity to give out his pending certificates as well. He also presented Jim Bower with his lifetime membership jacket: the chapter voted in 2018 to award him a lifetime chapter membership in honor of his many years as editor of the newsletter.

Dave notes that this is his 10th year as president and this will be his last term: keep that in mind if you've a mind to run.

The Explorer Scouts asked if we'd be interested in sponsoring an explorer post for aviation. The group is open to ages 14 to 21, which overlaps Young Eagles somewhat. Events are estimated to involve 10 to 20 attendees. We'd need several volunteer leaders, note that, as with Young Eagles, there's a youth protection program. One of the leaders is also involved in STEM programs which could lead to openings for the chapter.

Dave would like to renew our signage before the Young Eagles season. There's a firm in Earth City that could make a metal sign. Dave can look into costs. Art asks if it's possible to have a marquis on the street-facing sign.

Dave presented a preliminary 2019 calendar of events including meetings and Young Eagles events. He asks the membership if there are any specific events we'd like to see in the New Year. Art suggests a speaker from Silver Creek at Greenville, Jon notes that there's another local glider club. Dave will contact both. There's a local Icon contact, Bill thinks they're based in Illinois. Dave McGougan knows a retired painter from Boeing who's going to paint his plane, and who also might be willing to speak.

The discussion wandered into inflatable paint booths. Dave M is going to look further into this possibility for the chapter.

Art knows someone involved in Flight Safety who could help arrange a tour. Dr. Miriani might also be willing to speak again. Chris Ward would like to hear about ballooning. Dave asked about interest in a fly-in in conjunction with the October open house. Doug suggested a fly-out, remembering a previous to Lambert's. Jon would like to hear from Wings of Hope.

On the subject of events we discussed "IFlyStLouis", a Facebook group, and other options regarding a local aviation events calendar.

Burt Biermann has built a linear servo for his CX-5, the plenum is in for the front vent. He notes he has all the parts: canopy and prop are arriving this week. Art Graves gave an update on his 750 STOL project. He asked if a potentiometer is available; Dave notes that the chapter needs one. The chapter used to own one but it has disappeared.

Following the chapter meeting will be an executive meeting.

Learning as we Go (Part I)

“The Latest Way to Introduce Kids to Flying”

mr. bill



Editor's Note: Our mr. bill has been submitting articles to Chapter 1387 as well as to us. As of this writing I have not received 1387's newsletter, so I am including Captain Jagust's article here to (hopefully) avoid confusion.

As I am finding out everywhere I visit, every group I talk with, every flight school I check out, and most Universities, all are looking for Certified Flight Instructors. Most schools know when their current flight instructors will be leaving and it is not boding well for the students at the schools. At one University I was offered a place in student housing if I could stay for a week at a time to help with some of the advanced flight students.

I am presently in (rainy) Arizona practicing a bit of back seat flight instructing in a Schweizer SGS 2-33A glider. My CFI-Glider Add On Rating ride is at the end of this month. More about that later.

One of the new training aids I noticed at the 2018 Oshkosh Airshow was in the Pilot Resource Center Building. It is a cool flying device for the absolute beginner that was called the American Gem Glider. Check this video out.

<https://youtu.be/FNWdq5eGhcl>



Look at the faces on those kids. Half look scared but they are learning to judge height above the ground which will help them learn how to “round out and flare” any aircraft. Heck, they pay me big bucks to do that so they can use the airplane again!

Location, location, location. From the looks of it I believe you would need a large area to utilize this apparatus. Like at a glider port where it could be set up and teach the youngsters. They hope to have the whole project set up and running at Oshkosh this year so they can get kids interested in and to start flying the gliders. For more information check out their site:

www.CupertinoClubs.org

Also inside the Pilot Resource Center building were all the commuter airlines and freight flying companies looking for First Officers for their flying machines. Wow, what opportunities now for the young pilots. Signing bonuses and company paid check outs in the right seat so one can log Second In Command (SIC) on a twin engine aircraft. With a Second In Command Checkout in the Shorts 360 or a Swearingen Metro IVs, a young flight instructor can sit in the right seat and LEGALLY log second in command time and build up their multi-engine flight time in these machines. Several companies are helping the newbie get the required insurance flight time in the plane so they can slide them into the left seat when they acquired the minimum flight time. Many opportunities for the youngsters looking for that precious multi-engine time!

I say youngsters BUT the last time I jump seated home I was bumped by a “youngster” who was 58 years old and who was hired to fly for American Eagle. He was getting his “observation (of the flight crew) time” in before he started ground school. He had white hair and the flight crew were not even 30 years old!

Q? What age can a young person solo a sailplane?

A: 14 years old.

Q? What age can a youth get a Private Glider Certificate?

A: 16 years old.

Q? What speed record was recently set flying from L.A to London in a Boeing 787?

A: The Virgin Atlantic 787 was clocked at over 801 mph over Pennsylvania as it rode the fastest jet stream on record, blowing east at 231 mph. The B787 flight completed the journey in 9 hours and 14 minutes, much less than the 11 hours scheduled.

Learning as we Go (Part II)

“Old Guy Learning New Stuff”

mr. bill

With the first part of this article we saw the latest idea for introducing kids to the basics of flight training. The looks on their faces and the attitudes of the youngsters was great. You could see the “yeah I got this figured out” attitude with some of the kids at the flight camp. What a great confidence builder for the future aviators. I could not tell how high they were descending from (~100 feet) but they were having a blast working the controls of the glider “flying” down to that landing area. Can’t wait to see this company’s set up at Oshkosh 2019.

But enough about the youngsters let’s chat about the “old guy” who is going for his first (non-airline) FAA checkride at the end of this month since his Learjet Type Rating ride in 1988. (That is another story for another day.) After college and returning to the parental Chicago home, my Private Pilot college roommate and I added the Glider Add-On Ratings. With his Private Power Rating he only needed to have TEN solo flights in a glider, some ground instruction, and a FAA Checkride for the Private Glider Add-On Glider Rating. With me holding a Commercial Power Rating, I needed 20 solo flights, and a FAA Checkride to Add-On the Commercial Glider. That was back in 1983. I had hoped to add the (Certified Flight Instructor) CFI-Glider back then but here we are 36 years later. So what has changed? Well today’s sailplanes have the latest carbon fiber “glass” construction materials. Along with that glass outside the “glass” cockpit technologies on the inside are outstanding. These glass instrument panel displays today show everything and can tell you

all about the air around you. Whether you are in rising air or sinking air, or whenever the temperature is changing. Add the terrain mapping feature and you have more than enough to look inside at. A lot of info for the price (about \$15,000) of a good used two seat Schweizer SGS 2-33A training glider.

On the outside of these hi-tech sailplanes we have sustainer engines that can actually run and lift the sailplane aloft to a cruising altitude where the engine is shut off and stowed in the body of the glider so one can return to a sleek high performance gliding machine. Heck for the rich guy (\$185,000 dollars) you can get yourself a jet powered glider. Really now? Check this pre-flight action out:

<https://youtu.be/e9pM6ZxZ1f0>



Pre-flight check of the JS 1 Revelation sustainer jet engine

Continued on next page

Learning as we Go (Continued)

But wait, typical of Oshkosh, one person has ONE jet sustainer engine, somebody else has to show up with TWO sustainer engines!

While all this is fancy and expensive it is part of the evolution of the last 30 some years of sailplanes. Strange thing is the only required instrument for the Schweizer SGS 2-33A is.....an airspeed indicator. Pretty old school. What also has evolved is the “way we teach flying.” The days of the “stump the chump” with questions have been replaced with Lesson Plans, Positive Reinforcement, Critic and Evaluation in the Present Time. Ending with a thorough debrief of the day’s lesson and events.

We also “transfer controls” from student to instructor and back again. A positive three-step process in the exchange of flight controls between the pilots is a proven procedure and one that is strongly recommended. When the instructor wishes the student to take control of the aircraft, he or she will say, “You have the flight controls.” The student acknowledges immediately by saying, “I have the flight controls.” The flight instructor again says, “You have the flight controls.” When control is returned to the instructor, follow the same the same procedure. A visual check is recommended to verify that the exchange has occurred. There should never be any doubt as to who is flying the aircraft. Words right out of the FAA-Practical Test Standards book!

Also with many foreign students in the US of A learning at flight schools an applicant must be **ABLE TO READ, COMPREHEND, AND SPEAK ENGLISH**. Do you know there is a test for that? A flight school or flight instructor can determine this. But if these two groups do not feel safe with the test it is issued by the Federal Standards (District) Office. Those Federal employees MUST understand the answers to the question given to the applicant.

In prepping for the CFI-Glider Add-On flight training I have been subject to “everything a glider student can do to you in the training situation in a glider” because the examiner does not want you to be “surprised” by any unusual attitude the student may get the glider into!”

At least in the Schweizer SGS 2-33A the instructor can reach the student and thump them upside the head. In the fancy ASK’s or Grob sailplanes, the student is a stone’s throw away from the back seat. Not a easy thing to deal with when you NEED to get their attention. Maybe carrying a brick or a stone the instructor can toss would work out?

Q? What certificate is required for an engine/jet powered sailplanes?

A: Just an aircraft sign off on its operation.

Q? What aircraft has flown the world’s longest flight by a purpose-built business jet?

A: The Bombardier new Global 7500 this week logged 8,152 nm after taking off from Singapore at 7:12 am local time on March 04 and landed in Tucson, AZ at 08:19 am.

March Executive Committee Meeting Minutes

Dave Deweese

Dave Doherty, Bill Doherty, Jeff Stephenson, Jim Bower, Doug Killibrew, Jon Thayer, Rick May, Don Doherty, Dave Deweese, Chris Ward

2018 Holiday and Awards Banquet: any improvements to be made? We'll see about Creve Coeur as an option for 2019. Rick points out that the weather is more of a factor at Smartt. We've enjoyed All Occasion in the past. A silent auction is an option.

Rick mentioned Young Eagles in the general meeting. We're at around 7,800 and will likely hit 8,000. We should do something for number 8,000; Jon and Jim recommend a t-shirt as we have those available. Dave suggests replacing some of our worn-out materials. Dave showed a design for feather flags. Rick suggests 2 items printed with Young Eagles and 2 for EAA only for events like the air show. Dave advises that this will cost several hundred dollars. We approved it as a group. Lead time is several weeks so we could have these by April. Note that we'll stick with the heritage EAA logo.

Rick, regarding Air Academy, noted 3 or 4 in the past year that had repeat flights so there aren't too many potential candidates. We need to iron it out by April or May as HQ needs to know. Rick has been in contact with a set of twins but we can only send one; their mother knows.

Rick also updated us on Flying Start. (Chris is also involved in this.) He has half a dozen or so possible interested. Our Young Eagles events are our primary venues for promoting this. Dave suggests an event late in the summer after Oshkosh for the current group, then pushing this at the air show in September and doing something else in the fall.

Ray Foundation expenditures: we get money from the foundation to pay expenses. Don envisions a separate account if we go this way.

Aviation Explorers: Jon Thayer and Chris Ward (Tuesday Nights) volunteer as leaders. Jeff Stephenson also expressed interest. Jon notes that Boeing is associated with a few groups. Dave has spoken with the Boone Trails (St. Charles) organization. There's a fee for leaders which Dave would like to see the chapter cover this. The objective of the explorers is to form young adults: this is an older group; they get exposure to positions of some responsibility. Members don't necessarily have to be Scouts but join as part of the program. Dave will attend a "round table meeting".

Display board: need a volunteer to collect pictures.

Membership: Jon asks if we have anything in 8.5 x 11 format to post around Boeing. Dave passed around a document he's sending to remind people of the chapter. It will go out via U.S. Mail in the next few weeks.

I (Dave Deweese) gave an update on online roster and website progress: will have a version of the new design available online by next executive meeting.

We discussed door codes.

We discussed time estimates for the CX5 and Chris's 750. Chris intends to have his finished this year. Originally we had intended the ARC only for final assembly but consider education projects somewhat differently.

We have budgeted for a large air mover fan.

Bill is getting marshalling wands in.

Dave will order pennants.

Dave will have a cost estimate for new EAA32 signs by the next chapter meeting. If they come out too expensive we're still intending to look at something more durable than MDF.

Movies of the month: Dave wants a list of movies so he can publish a schedule for the year, Don will provide a list of 5.

We have two guest speakers lined up and more possibilities.

The next board meeting will be May 18 after the chapter meeting.

Don asks what will be the fate of the modified PJ-260 biplane donated to the chapter. It's currently taking up space in the chapter hanger and we need to decide its fate.

My Bede BD-4C

By Art Zemon



“All” that I had to do was fix the issues that he found.

Gale was only one of many helpers. The first time that the chapter showed up in force was in July 2013 when I needed help sliding the wings onto the center section of the spar. (How many of you remember huddling under the wings in my driveway during a July thunderstorm?) I cannot even begin to count the number of times during the build that you guys

showed up and pitched in, no matter how unglamorous the task, lifting, schlepping, and occasionally sympathizing.

I could have built my airplane on my own, without EAA32 support but... no, not really. Our EAA chapter literally made it possible for me to build my Bede BD-4C. More than a club, more than family, I got several things from our chapter, which I found nowhere else.

First and foremost, you fine folks in EAA32 actually understood me and were supportive throughout my seven year adventure. Most people, including my parents, responded with incredulity when I told them that I was building an airplane. My family and friends gave me plenty of, “Do you mean a drone?” and “I could *never* do that” and “Will you fly in it?” and (to Candy) “Will *you* fly in it?” and “*What?!?*” But here, I could count on interest in the specifications of the BD-4C and the details of the kit.

Here I could talk to kindred souls about why a Bede instead of a Vans, why a Lycoming instead of a Chevy, and why was I building something that looks like the box an airplane ships inside of instead of building an airplane.

Gale Derosier spent hours and hours making my plane safer in his EAA Technical Counselor role. This was my first build but not Gale’s. Unlike most free advice, worth every penny that you pay for it, Gale’s was invaluable (in a good way). He always spied stuff which made the plane safer.



Building an airplane requires bunches of tools. For a solid year (or two, Candy might say), the hole in our checkbook poured money directly into my toolbox. That was OK for the tools that were reusable or relatively inexpensive but our ARC has a cache of stuff that was too pricey to buy for one-time uses. Think 37° tube flaring tool (better than \$100), or a metal-cutting band saw (even the cheap ones are over \$250 and take a lot of floor space), or a vehicle scale for doing the weight & balance (topping 1 AMU*), or a sheet metal shear (can you say “multiple thousands of dollars?” sure you can!).

Then there is floor space. Eventually, my BD-4C outgrew the garage. Our ARC stood ready to be Final Assembly Heaven with good lighting, plenty of electrical outlets, a clean floor, and acres of table tops. As a bonus, I shared the space with experienced builder Burt Bierman and many other experienced folks drifted through offering tips, advice,

and helping hands.



Just off the top of my head and in no particular order, I owe my appreciation to: Bill Jagust, Dave DeWeese, Jeff Stephenson, Jim Bow-

er, Bob Murray, Dave Doherty, Don Doherty, Rich Emory, Jim Hann, Chris Seto, and Rick May. I'm sure that I have neglected to list some of you so please forgive my aging, uh, what's it called? oh yeah... my memory.



I have photos and video of the first flight on my blog at <https://cheerfulcurmudgeon.com/firstflight/>

Now that N2468Z has flown, whose plane will be next?

* 1 AMU = 1 Aviation Monetary Unit = \$1,000

Types of Constant Speed Propellers and Governors

by The Cheerful Curmudgeon (aka Art Zemon)

On the first test flight of my Bede BD-4C airplane, I discovered that I could not properly control the engine RPM. I learned that I have the wrong type of governor for my propeller. This blog post outlines the two different types of constant speed propellers and governors, how they work, and how I ended up in this situation.

BACKGROUND

I purchased a used Lycoming engine with a used Hartzell constant speed propeller for my airplane. The seller disclosed that they had come off of an aerobatic airplane and that the prop had external counterweights. Since I knew that I would be replacing the propeller, I did not care about the counterweights. I should have because the presence of counterweights implies something about the way that the propeller works. It also has implications on a third component in the system, the propeller governor.

When I first tested the engine and new propeller on my airplane, I discovered that the propeller control knob was operating backwards. When I pushed it in, the prop slowed down. When I pulled the knob out, the prop sped up. It should have been the other way around.

I fixed that by rerouting the prop control cable (much like a bicycle brake cable) so that it pulled on the prop governor lever when it had been pushing, and pushed when it had been pulling. Easy peasy; problem solved. However, my A&P noted that the prop governor still did not seem to be acting quite right because sometimes the prop would go to high pitch when he expected it to go to low pitch, like when the engine was just idling. (See below for what “high pitch” and “low pitch” mean.)

During taxi tests, everything seemed fine so I continued with the test program, planning to address the prop governor issues later, when I had something more definite to go on.

The first flight provided the “something more definite.” I either had full RPM, meaning 3000 RPM, or the RPM was dropping below 1400 and still falling. I could not select any speed in between. Immediately after takeoff, I looked at the tachometer and saw 3000 RPM. I started backing the prop control out, expecting to reduce the

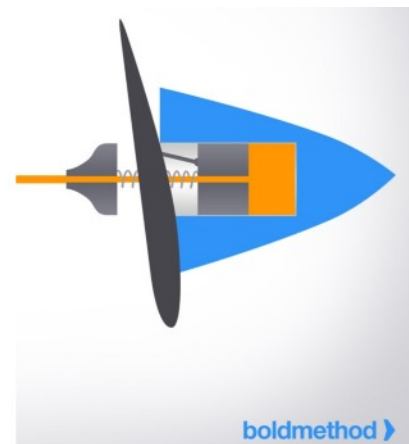
RPM. Nothing happened. I kept moving the prop control. Still, nothing happened. I kept moving the prop control and suddenly...**WUMP** the RPM dropped to 1400 (way too low) so I shoved it back in. The engine speed returned to 3000 RPM. Since the propeller governor was not working right, I had to back off the throttle to lower the engine speed below the engine red line.

Propellers and Transmissions

On an airplane, a constant speed propeller works like a transmission in a car. It allows you to pick a convenient engine RPM and hold that speed even though you will need to vary the throttle position some. This analogy is not perfect because a car transmission allows the engine RPM to vary while a constant speed propeller keeps the engine RPM set at exactly one number. In my airplane, I expect to take off at 2700 RPM and cruise at 2400 RPM. I use the propeller control to set those speeds.

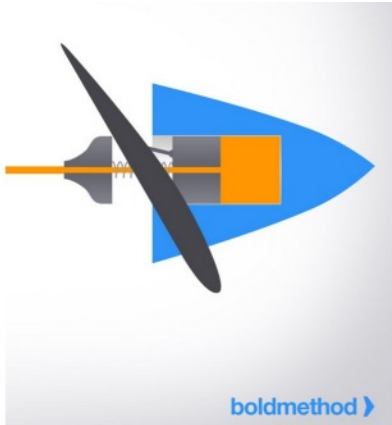
In a car transmission, you select engine speed by shifting gears. In first gear, you might pull away from a stop sign at 2000-3000 RPM and then shift to second gear. Ultimately, you end up cruising down the road at the same engine RPM.

With a constant speed propeller, you change the pitch of the blades instead of changing gear. This changes how hard the propeller pulls against the air. At low pitch, it pulls (relatively) gently, allowing the engine to turn faster. You use this to for takeoff. Boldmethod drew some great pictures:



Takeoff configuration of a constant speed propeller

At high pitch, used for cruising, the propeller pulls harder against the air. You get the lots of thrust with lower engine RPM.



Cruise configuration of a constant speed propeller

To change the pitch of the blades, you move the propeller control. It is the blue knob in the center of the instrument panel. Shove it forward for takeoff (high RPM) and pull it out for cruise (low RPM).

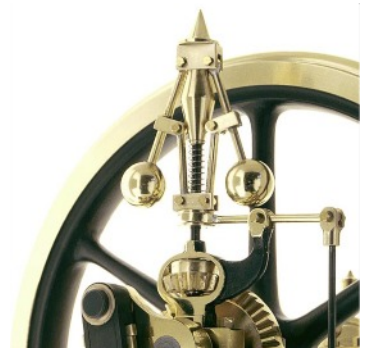


In case you are curious, the black knob to the left of the propeller control is the throttle. You push it forward for fast and pull backward for slow, much like a car's accelerator pedal. The red knob to the right is the mixture, forward for lots of gas (rich mixture) and backward for less gas (lean mixture). You lean the mixture out as you climb to higher altitudes so that the engine runs efficiently.

Propeller Governors

When you move the propeller control knob, it moves a cable (think of a bicycle brake cable) which moves a lever on a device called a "propeller governor." This is a thing about the size and shape of a small soup can, attached to the back of the engine. The governor uses the engine's oil and oil pressure to change the pitch of the blades on the propeller. It is a hydraulic system but without the weight and complexity of a hydraulic pump and reservoir of hydraulic fluid.

The governor sounds mysterious but it isn't. You have seen devices just like this. Here is one from the top of a steam engine. When the engine goes too fast, the balls swing out which works a valve which makes the engine slow down. Simple.



Inside a propeller governor are a pair of weights which work just the same way. When the propeller goes too fast, the weights swing out which operates a valve which changes the oil pressure in the propeller which changes the pitch of the blades to slow things down. When the propeller turns too slowly, the opposite happens; the weights swing inward which operates the valve in the opposite direction to change the oil pressure to change the pitch of the blades to speed things up.

To learn more about constant speed propellers, go read Boldmethod's article [How A Constant Speed Propeller Works](#). It is a well written article, even including animations.

Continued on next page

Types of Constant Speed Propellers and Governors (Continued)

My Problem

When I bought my engine + propeller + governor, it came with a Hartzell propeller model HC-C2YR-4CF. I replaced it with a Hartzell propeller model HC-C2YR-1BF. The last part of the model is the important part and details a critical difference. According to the Hartzell manual:

-4CF = CONSTANT SPEED, OIL PRESSURE TO LOW PITCH, COUNTERWEIGHTS TO HIGH PITCH

and

-1BF = CONSTANT SPEED, NO COUNTERWEIGHT OIL PRESSURE TO HIGH PITCH, BLADE CENTRIFUGAL FORCE TO LOW

(Hartzell Propeller Owner's Manual, number 115N)

Being told about the counterweights should have tipped me off to check the propeller operation closely. The part that I should have looked up and paid attention to was "oil pressure to low pitch" versus "oil pressure to high pitch." In plain English, that means:

- When the propeller is turning too fast, the governor that I have lowers the oil pressure which would have made the old propeller slow down but it makes the new propeller speed up.
- When the propeller is turning too slow, the governor that I have increases the oil pressure which would have made the old propeller speed up but makes the new propeller slow down.
- The old governor, paired with the new propeller, is perfectly wrong. If the prop turns too slowly then the governor makes it turn even slower. If the prop turns too fast then the governor makes it turn even faster.

The Solution

Learning the problem was the hard part. The easy part is solving it. I just had to buy a new propeller governor. The new one is constructed so that it increases oil pressure to make the blades move to high pitch (instead of low pitch). The new governor will be here in about two weeks. Installing it is pretty easy; just four bolts hold it onto the engine. Once I have it installed, I will be back in the air.



PCU5000 Propeller Governor

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