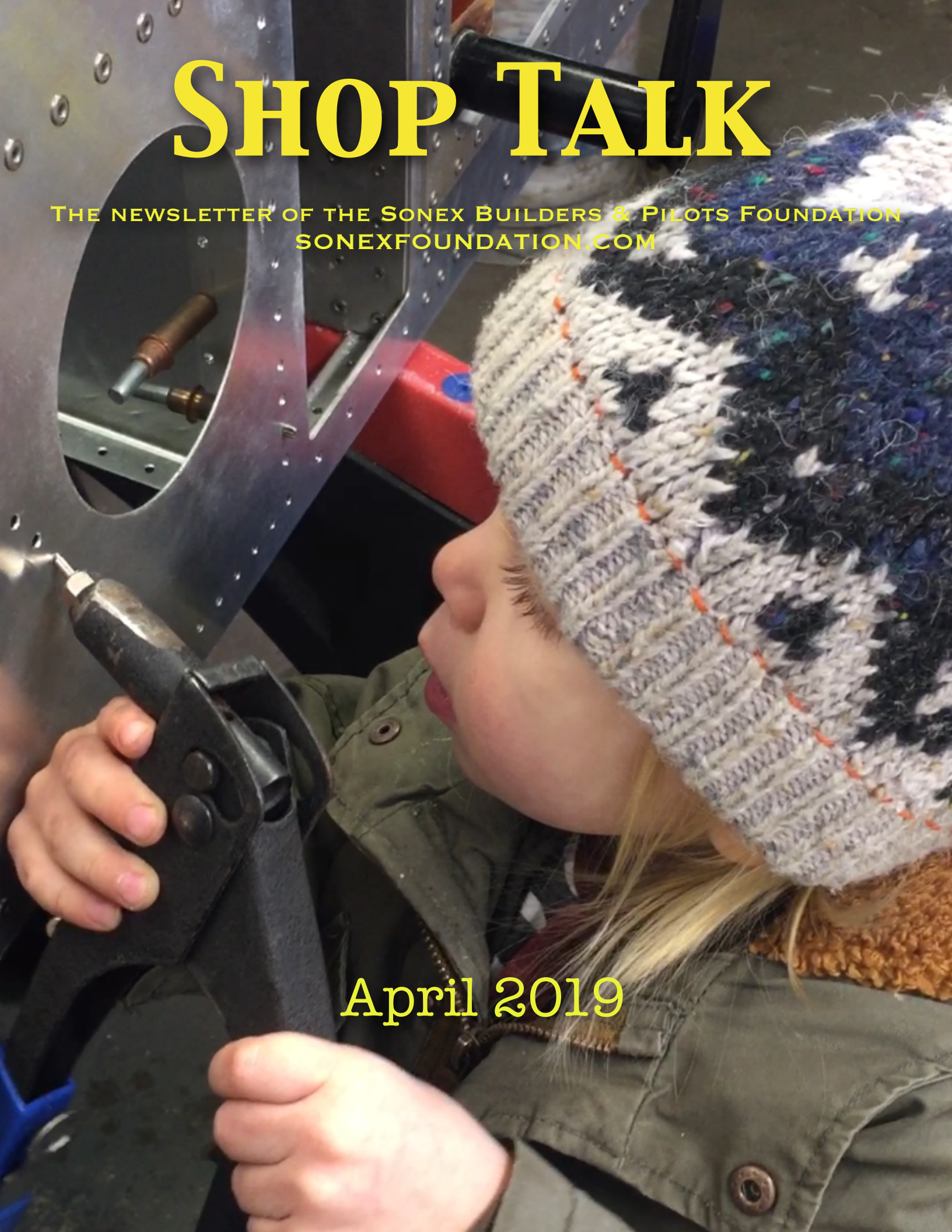


SHOP TALK

THE NEWSLETTER OF THE SONEX BUILDERS & PILOTS FOUNDATION
SONEXFOUNDATION.COM

April 2019



[Shop Talk](#)

[From the Jump Seat](#)

[EAA Give Flight Waix](#)

[Your Own Blank Canvas](#)

[Engine Maintenance – Preparing Your AeroVee](#)

[Engine Conversion](#)

[Experimental Aircraft Safety Update](#)

President – Michael Farley
Vice President – Mike Singleton
Secretary – Dana Baker
Treasurer – Tom Jones
Membership – Dana Baker
625 Members
21 Voting members
www.sonexfoundation.com

Submissions are always welcome at robbie@sonexfoundation.org

Club membership is free, and for those who wish to participate in elections and help direct this member-run organization, a voting membership is \$25 annually. Your donations help us keep the websites running, and allow us to publish this newsletter. We sincerely hope you enjoy it.

Shop Talk

Michael Farley, President

Spring Has Arrived!

Happy Spring to all fellow friends and Sonex enthusiasts! Winter is finally drawing to a close, and with it we are finally experiencing longer days, warmer temperatures, and the increased chance of a lot more Sonex flying! I don't know about you but personally, I am more than ready for the beginning of this year's flying season, and I hope 2019 turns out to be a great year for all of us.

For those of you with a flying Sonex, now is a great time to perform a thorough check of the airplane, and start knocking off that winter rust we all get after a long winter season. I've been able to start flying my AeroVee powered WaieX taildragger over the last several weeks, and just like all of you, every opportunity I get to fly is guaranteed to bring a big smile to my face! What a fun little airplane to throw around the sky!

For those of you who continue to build on your projects, please do yourselves a favor and keep at it! You've heard me say it before but just to say it again; once you have turned your kit into a completed airplane, you are in for a real treat! I promise you will love your airplane, so keep up the good work on those kits!

As I write this note we are in our last full week of March, and that means SUN 'n FUN is only a week away! Often thought of as the kick off to airshow season, if you're in the central Florida area be sure to stop by and check it out! Sonex Aircraft, LLC. will be there so if you want an opportunity to look at a Sonex up close, this is a perfect time to stop in and take a look.

Speaking of airshow dates, don't forget that AirVenture 2019 is now less than 4 months away! It may seem like a long time until we get to that magical week in late July, but time will go by fast and I hope to see all of you up there this year!

I hope you enjoy the spring edition of Shop Talk: the quarterly newsletter of the Sonex Builders and Pilots Foundation. I'd like to offer a special thank you to our

newsletter editor and publisher, Robbie Culver, who puts a lot of time and effort into these newsletters. Thank you for all of your hard work Robbie!

I hope everyone enjoys this newsletter has a wonderful spring full of flying and fun. Please continue to fly safely, and I hope to see all of you soon!

Have a great spring,

Mike Farley

President, Sonex Builders and Pilots Foundation

From the Jump Seat

Robbie Culver

The signs of spring are all over Chicagoland as I write this, and flying weather seems to be back. The other evening I spotted some cranes flying near KARR, where I am currently based – a sure sign Nature turned it's back on winter in the Midwest.

And none too soon. Personally, I am just putting the finishing touches on my engine conversion project – just started the new engine for the first time and am now putting the gremlins to rest. Nothing major, just the usual stuff when you tear your airplane apart and put it back together again.

In this issue we feature a wonderful cover photo, share Mike Singleton's story of making the first flight in a Waix that was a chapter build, Michael Farley writes about the joy of having a blank canvas, Jeff Shultz about the AeroVee awakening after a winter slumber, and I continue my saga of the engine conversion. Spoiler alert! I flew it!

With your input, there could be more content in the next newsletter! We are always looking for member supplied stories and photos, and we can edit it for you if you aren't comfortable writing the article. Just send us what you've got! Actually, while we are on the subject, we could use YOUR help with the foundation. We need active members who are interested in our mission.

I hope you enjoy the newsletter!

EAA Give Flight Waix

Mike Singleton

At the 2015 AirVenture convention, airplane wings were donated by Sonex, Van's and Zenith. Each manufacturer recruited employees and/or volunteers to begin the wing assemblies. Convention participants were then given the opportunity to install and set a rivet, followed by adding their initials with a permanent marker. Once completed, the wings were donated to EAA chapters with the completed airplanes to be flown to Oshkosh for a future AirVenture convention.



The Waix wings supplied by Sonex Aircraft, LLC were donated to Chapter 555 in Las Cruces, New Mexico. While ferrying a Sonex from Arizona to Texas in August, 2017, I had stopped in Las Cruces and visited with Chapter 555 members and looked at the progress they had made on the Waix project. Since all looked quite good, I volunteered to do the first flight test if they so desired. A year later I received an email from Wes Baker, president of the chapter, asking if I would still make the first flight. Of course I agreed so Robert Barber and I decided to make an adventure of the trip and flew loose formation to Las Cruces on August 17, 2018. Upon arrival we were treated like VIPs and were provided with very nice hotel accommodations and a rental vehicle. We were also treated to a fine dinner that evening with Wes and his lovely wife.

Prior to checking in to the hotel and going to dinner, we spent an hour or more giving the Waix a complete inspection. The workmanship and attention to detail by the chapter builders was such that we could only find a couple of minor items to tweak before the plane would be ready for flight.

After an early arrival at the airport the next morning and one final preflight inspection, I climbed in, buckled in, started the engine and checked all systems. Taxiing to the end of the runway and performing the run-up, I discovered that the mixture control was stiff and in an awkward location for easy manipulation. I then thought about possible options and decided that I would do the run-up to adjust the mixture as much as possible for this altitude, and if everything on the takeoff was ok that I would not try to adjust the mixture in flight.



With a brief pause to admire the beauty of the mountains I refocused on the task at hand and rolled onto runway 26 and began the takeoff. I expected the acceleration and takeoff roll to be a little sluggish as compared to what could be expected with the Jabiru 3300 but the 2180 VW seemed to be ok, if not impressive. Once airborne it became obvious that I had not leaned quite enough for the altitude. I prefer to have the mixture slightly rich on first flights to provide a little better cooling with new engines. However, the adjusted mixture setting for this flight only allowed for about a maximum 150fpm climb. There were no obstacles to worry about in the close vicinity of the airport so, after reaching about 300' I began a slow and easy circling climb to about 500' above pattern altitude. Left turns up to about 15 degree bank proved solid so I made a couple of right turns of the same bank angle. Up to this point all systems were good with no engine temperature or pressure problems.



After turns to the left and right at increased bank angles I circled down to enter the pattern for landing. On a slightly high base leg I slowly and carefully added one notch of flaps. Once on final and slightly high I added another notch of flaps and adjusted my alignment for touchdown. I intentionally approached at a slightly higher speed than normal which resulted in just a slight bounce. Otherwise the landing was normal for Sonex/Waiex aircraft. Once down I taxied back to the end of the hangar row, shutdown and began a postflight briefing for all who gathered.



In summary, I must say that the plane was well built and handled nicely. Other than the mixture, there were no surprises. Once the mixture control is adjusted and the engine is broken in, I think this plane will do fine at this altitude even with two aboard if the density altitude is carefully considered. I know it will be a

lot of fun to fly and hope to see it and meet up again with Chapter 555 members at AirVenture.



Your Own Blank Canvas

Michael Farley

I know I don't need to state the obvious to this group, but just for the entertainment value, allow me to offer up this thought: There can be a great many advantages to building and flying your own Experimental airplane.

There, I said it! And if you're like me, after reading this statement, the first thing that probably comes to mind is the follow-up thought, "Gee, I could have told you that, Mike!" I think we can all agree that, between the overall cost comparison and savings verses certified airplanes, ability to perform your own maintenance, and the capability of customizing your airplane exactly how you

want it, there's really no surprise why Experimental aviation continues to grow in popularity.

The Sonex line of homebuilt airplanes is a perfect example of this concept. Easy to assemble, fun and sporty to fly, and simple to maintain, it's really no wonder why there are well over 500 Sonexes now flying and a great many more under construction. In an age where a simple Cessna 172 is now over \$350,000 to purchase, having the option to assemble a basic Sonex for well under \$50,000 is an amazing bargain!

Throughout previous newsletters we've discussed the economic advantages of the Sonexes, and we've certainly covered more than a few articles on aircraft maintenance. For this article I wanted to spend a few moments and discuss a third advantage of homebuilding; the ability of each builder to customize their airplane exactly how they want it. Figuratively speaking, I look at it this way: the day you receive your new airplane kit, you are given a "blank canvas", and it's up to each builder to tailor that kit into the exact airplane they want as they progress through the construction. What an amazing (and fun) opportunity!

Any time I have the chance to travel to a fly-inn, either AirVenture or other, I really enjoy the chance to walk around and look at other Sonexes. I find it very fascinating to look at other airplanes, and see what touches or details were incorporated into those builds. I think to myself that, at one time, all of these airplanes left the factory at Sonex Aircraft, LLC. as nearly identical kits, and through the hours of delicate labor each builder puts into those kits, beautiful, completed airplanes emerge. For me, what's really amazing to think about is that every kit starts off nearly the same, and yet once the kits are assembled, no two airplanes end up exactly alike. As we build, not only does each builder decide on big ticket items such as engines, paint schemes, avionics layouts and interiors, but small things such as switch locations, wiring schematics, and optional accessories must be considered as well. These airplanes truly become realities of each builder's imagination and hard work, and I always appreciate the

accomplishment, dedication and perseverance needed to complete these projects!

A few weeks ago, I was able to take advantage of some warm, early spring weather and fly my AeroVee powered Waix through the skies of central Ohio. Between traveling for work, family commitments, and winter weather I haven't had an opportunity to fly the Waix much over the winter, so I was really enjoying my opportunity to burn some 100LL avgas. As I cruised around in my airplane, I scanned over the instrument panel for any telltale signs of a problem, only to find that all was in order. All engine temperatures and pressures were comfortably "in the green" and the AeroVee was running smoothly, so there was little else to do other than sit back, relax, and simply enjoy the flight. A few moments later I performed another instrument scan and this time, I asked myself a question I've asked myself a million times before; "What upgrades or modifications do I want to do next on my Waix?"

I'm sure you've all asked yourselves the same thing. Perhaps there are cosmetic upgrades that you wish to complete on your airplane, or maybe there's a new EFIS system you have your eye on. Going back to my "blank canvas" analogy, there are days it feels that the "painting" will never be truly complete (i.e. there will always be something to upgrade on the airplane).

As for me personally, any time I think about an upgrade to my Waix, there is always a mental debate on cost and downtime vs. increase in capability. As I built my airplane, I adhered to the KISS (keep it simple, stupid) principle pretty religiously in an effort to keep the build quick and the cost down. In fact, one of the favorite sayings I had heard during the build was that 'any part you do not purchase and install adds zero weight, costs nothing, and is 100% reliable'; a saying I have always appreciated.

Like many of you, however, after my Waix was flying, certain enhancements were deemed worthwhile; hydraulic brakes, a better interior, and a better EFIS have all been added to the airplane. Later this spring I plan on installing a fuel

flow sensor (aka, a Red Cube) and I have also purchased a red LED beacon I will install on the belly, just to make it easier to be seen when it's a little hazy outside.

On the other hand, I never have installed the LED landing light kit I have sitting on my shelf in the hangar. Sometimes I think about taking the time to install this kit, but since I don't plan on doing much night flying, is it really necessary? The same goes for the LED interior lights I have sitting there as well; it seemed like a good idea at the time, but when it comes right down to it, I just don't want to add the weight for parts that won't be used.

Such seems to be the way for Experimental aviation. As the builder and/or owner of your airplane, you have the unique ability to do virtually anything you want to your airplane at any time. Even if you didn't build your homebuilt, any of us can perform modifications, upgrades, or changes anytime we wish to do so. Personally, I find that freedom a very unique and welcome part of owning a homebuilt; we should all be cautious when performing any modifications no question, but if you want to experiment on your airplane, do it!

In the future, I'm sure there will be more upgrades to my Waix as I continue to make it perfect for me, and I will continue to enjoy incorporating those little upgrades into my airplane in an effort to make it exactly how I want it.

Isn't Experimental Aviation great?

Fly safe everyone, and have a great day!

Mike Farley

SBPF President

Builder and Owner, N569KM

Engine Maintenance - Preparing your AeroVee for the Flying Season

Jeff Shultz

Winter is finally on its way out, and the flying season is upon us! If your weather was anything like the Midwest this past winter, you may not have gotten any more flying days than I did.... In any case, it's time to give some attention to your AeroVee and ensure it's ready to go for another season of fun.

AeroVee maintenance is really no different than any other aero engine. It is typically conducted along with the annual condition inspection, and that could occur at any point during the year. Each builder will decide for themselves when to schedule their inspection, but I'll suggest that a spring condition inspection makes good sense. You get a chance to clean off the winter gloom, prepare the engine and airframe for increased usage, and proactively get a good look at everything. Once the flying season starts in earnest it becomes rather more difficult to take the plane out of service while the inspection and maintenance is done!

The goals of your maintenance plan are to assess the health of your engine, perform any required periodic servicing, and to identify and address issues before they become problems. Maintenance can be broken down into the following steps: prep the engine, expose everything, conduct an initial visual inspection, clean the engine, service (methodically), reassemble, check your work (arguably the most important part), and finally test run and return to service. Several references are available to assist you, including the maintenance schedule and checklist contained in the AeroVee Assembly Manual, Appendix D to Part 43, 14 CFR (the same one referred to in your operating limitations), and various customized inspection checklists. Links to these can be found at the end of this article.

The first task is to prep the engine. You'll want to run the engine to warm the oil, then remove the cowl. Depending on the state of charge in the aircraft's battery

you may need to plan ahead and put the battery on a charger to ensure a reliable engine start. Although not expressly required to run the engine, you'll short-change yourself if you don't – oil will be thick and drain slowly (or incompletely), moisture and contaminants will remain in the engine rather than being flushed out with the old oil, and cold cylinders and heads may not give you accurate readings on a compression test. Running until oil temp has warmed to 100 degrees F is a good target, but ensure you don't overheat the heads waiting on really cold oil to heat up.

Once the cowl is removed, you may need to remove additional components as well, such as lowering a bottom-mount oil cooler from the engine sump, removing the cooling baffles from the heads, removing the air filter, and possibly removing heat shields that limit access or inspection. The visual inspection commences as soon as the cowl comes off. Start with a quick overview at first, looking for obvious things, then move to a more detailed and measured inspection. Don't start wrenching on things right away – take notes of what you find (write it down, don't rely on your memory!) or place a piece of blue painters tape on the part, or something equally noticeable. Jumping into action too soon may cause you problems later, as you may stop inspecting and never really pick back up where you left off, or you might focus on one item and totally miss another. Items you'll want to look for include: cracked baffles, leaking hose clamps on intake tubes, loose case hardware, powdery metal residue around the magnetrons and alternator, grimy electrical contacts on the alternator wires, regulator terminals, and oil temperature and pressure senders, leaks at valve covers and pushrod tubes, leaks at the oil pump, oil cooler and oil line fittings, increased end play in the crank shaft (meaning worn main bearings) or a “wobbly” prop hub (worn front bearing in the case). Each of these items is best detected visually and before anything else is done.

With the initial visual inspection conducted and a list of discrepancies or observations made, you can start cleaning things. Cleaning is conducted in conjunction with the detailed visual inspection. Don't clean anything until initial

overview is done, then clean as you inspect. Some things you can't get a good look at until they're cleaned up first. The goal is to remove any oil drips, seeps, exhaust stains, etc, but only after the significance is first understood. I like to use gentle aerosol solvents in a spray can, like electrical contact cleaner or mass airflow sensor cleaner. Be careful about collateral damage, like soaking header wrap with cleaner or getting overspray onto delicate surfaces and causing damage. Avoid harsh chemicals that can damage paint, plastics, or etch aluminum and steel, and make sure to remove all residual hiding in corners with a towel or compressed air.

Servicing the engine is best done methodically. You can organize your work into major sub-sections, similar tasks, or something like front-to-back or top-to-bottom. Any approach is fine so long as you have a good plan, and preferably work from a written plan or checklist. I like to organize my work into major sub-sections: top end, case and accessories, and oil/filter change.

Top end servicing consists of the heads, cylinders, pistons and rings. First up is inspecting the spark plugs. Inspect the color for an indication of your carb mixture, the presence of oil fouling, or damage to insulator (damage to the electrodes is pretty rare, and we change them often enough that wear isn't usually a problem). Clean and gap them according the manual (0.018" mags, 0.032" coils), or simply replace at each annual. You'll need 12mm x 3/4" reach plugs, and the manual calls for Autolite 4163 as standard. You can also use NGK D8EA (Part # 2120), DR8ES (Part # 5423) resistor plugs to cut down ignition noise, or DR8EIX (# 6681) high-performance iridium plugs. There are others as well - Champion RA6HC (# 809) - but remember that most Type 1 VW's are 14mm x 1/2" reach (not our size) so check your plugs before purchasing.

With the plugs removed you're ready to conduct a differential compression test. I won't go into the details or techniques here, but simply encourage you to conduct one. It's an aviation standard practice, and can provide useful information of the health of your engine. I suggest searching online for how-to articles and videos if you'd like more info. A differential compression test can

indicate leaks in rings (hissing air can be heard in the oil breather tube or oil fill plug), or indicate valves that don't seal properly (heard in exhaust, or in carb). In conjunction with the compression test, a borescope inspection can really tell you a lot about the health of your cylinders and heads. Borescope inspection allows you to look at the cylinder walls for scoring or discoloration, look back at valves – both the face of valve to inspect for even coloration, and the edges of the valve to look for metal erosion, damage, or edge warping. I use a Vividia VA-400 borescope (\$200 on Amazon or Aircraft Spruce), and it works wonderfully! Don't bother with the low-cost flexible borescopes that you can get online – you want an articulating head able to look back on itself to see the valves. Should you see a problem with the valves, you'll likely want to remove the heads for more intensive maintenance. If the valves look damaged, replace them with new stainless steel valves from Sonex or CB Performance. If a valve is simply leaking, you can remove the valve spring and lap that valve by hand (again, search online for how-to videos). Most VW shops can do valve jobs, including installing new valves, guides and seats, for about \$150 per head.

Continuing with maintenance on the heads, Head bolts need to be re-torqued. Follow the manual (see pg 22), and note that to get access to some of the head bolts you must remove the rocker arm shaft. Don't skip this step out of convenience! After reinstalling the rocker arm shaft, you can adjust the valve gap (0.006" cold, but it will be less if engine is still warm) – follow the guidance provided in the manual (pg 29).

Moving to the case and accessories, inspect the case hardware, exhaust pipes, intake pipe, ignition components, and the carb / fuel system. Case hardware should remain tight for the life of the engine, and if you find anything loose that could indicate case fretting internally. Inspect the exhaust pipes for cracks at the mounting flanges, evidence of leaks at the EGT probe holes, loose or missing exhaust bolts, or damaged exhaust gaskets (you'll see fragments of gaskets poking out the sides). Check nearby parts for heat damage (look for blistering on the cowling), and ensure that if you use header wrap it is secure. Inspect the

intake Y-pipe and carb socket, ensuring that the worm-drive clamps are tight (but not cutting into the rubber), and for any visible deterioration in the rubber couplers. Carefully examine the magnetrons and coil triggers for evidence of rubbing. Any rubbing between mags and trigger magnet cover will generate lots of heat and destroy mags. Tell-tale signs of rubbing include powdery residue, and heat discoloration. Check the magnetron gap is set properly at 0.010". Use the stainless-steel shim that came with your engine or a standard thickness business card. Inspect the ground connections to the mags and trigger modules.

Start the fuel system inspection at the AeroCarb, looking for leaks (blue staining from 100LL), a stiff or "sticky" carb slide, and carbon/residue build-up inside the carb and on the slide. Use a bright light and look into the carb throat. Find anything really obnoxious and disassembly of the carb might be required to clean everything out. Ensure the throttle and mixture controls are secure, and are undamaged by heat from the exhaust. Ensure the locking set screw is tight against the needle carrier to prevent the carrier from migrating settings due to vibration. Check the safety wire is intact and securing the carb to the intake manifold, or replace as needed. Replace the paper air filter element, or clean and re-oil if using a K&N filter. The K&N E-3120 is a direct replacement for the standard paper filter, and is very high quality. Clean the fuel filter or gascolator screens, and re-assemble properly – safety wire the bowl, or torque the fuel filter housing and fuel line fittings.

The remaining items are a collection of misc things to look over. Check the motor mount rubber bushings for damage or distortion causing a sagging engine. You can reinforce the bushings with hose clamp "girdles" around rubber bushing to help it hold their shape longer. Inspect the breather tube and/or oil recovery bottle for blockages, excessive oil or moisture, drain any old oil, and secure to the engine. Check the starter ground strap, starter pinion gear for excessive wear or lack of lubrication, and mounting bolts for proper torque. Ensure the electrical system is undamaged, paying particular attention to the voltage regulator, grounds, signs of overheating terminals, or loose connections.

Make sure the alternator AC wires and terminals are properly supported – if unsupported it's only a matter of time before vibration will break the wires where they exit the stator coil. Lastly, change the oil, replace the oil filter if using one, and service the oil screen as needed.

There's a lot to check when servicing the engine, and make sure you keep good notes. If you find something slightly out of place during one year's inspection you can consult your notes to see if the problem resurfaces or continues into a negative trend. I can't emphasize it enough – write things down and work methodically!

With the servicing work complete, re-assemble everything and check your work. Checking and rechecking is paramount here. NTSB analysis shows that maintenance errors usually result from loosening something and then failing to tighten it. The 2012 NTSB Safety Study (see link at the end) has an interesting discussion of this conclusion, and is worth reviewing. The real error we make is failing to notice the half-finished work before sending the plane back to service! Re-install the heads (if removed), rocker arm shafts, and valve covers. You may need new valve cover gaskets and o-rings on the securing bolts, and use Loctite to prevent loosening. Don't overtighten the bolts or you'll permanently damage the valve covers. Torque the spark plugs (8–12 ft-lbs), and don't overtighten or you risk stripping the heads. Set the spark plug caps firmly back on the plugs and make sure the metal insert ends clip properly on the spark plug terminal caps. Finally, reinstall the baffles and reattach the bottom-mount oil cooler shroud.

The last step is to go back over everything with a critical eye, looking for improperly torqued bolts, shifted components that might now be rubbing, hose ends properly torqued (even if these fittings weren't specifically loosened, they could have been jostled and loosened inadvertently). Ensure the oil is filled properly, the oil filter is tight, and that no tools are left lodged somewhere forgotten.

Test run the engine and ensure the idle is smooth and proper, and that the engine achieves full throttle static RPM is normal. Check oil temp and pressure, CHTs and EGTs, and that the alternator is charging (alternator problems during maintenance are very common due to jostled wires or broken terminals). Check each mag to ensure the kill wires are working and that no plug wires are dislodged. At this point you can finalize any notes in your records and update your engine logs. The job isn't over until the paperwork is complete!

Common errors include not re-tightening things loosened, disconnected wiring, and inadvertent damage. Distractions are the main culprit in not re-tightening fasteners. A checklist is important insurance to prevent this. Disconnected wiring is often the regulator wires, spark plugs, or mag kill wires, and may not be noticed right away. Inadvertent damage is likely to be broken probe leads, deformed probe ring terminals, and stripped spark plug threads. Take care to avoid these things as you go, and give your work a final check over before you button things back up.

A detailed, meticulous inspection and mindful servicing of your AeroVee will not only ensure your engine continues to perform well, it will give you the confidence to get out and enjoy flying behind this efficient powerplant. Take care of your engine, and go fly!

Jeff Shultz

For more information, please see the following links:

- SonexFlight Podcast, Episode 54 AeroVee Maintenance
 - o <http://www.sonexflight.com/54>
- Sonex Aircraft AeroVee Assembly Manual (Maintenance Checklist on page 62)
 - o http://www.aeroconversions.com/support/instruction_sheets/AeroVee_2point1_Manual.pdf
- Appendix D to Part 43, 14 CFR

- o <https://www.ecfr.gov/cgi-bin/text-idx?node=pt14.1.43>
- Example Experimental Amateur-Built Aircraft Operating Limitations
- o <http://www.faa-aircraft-certification.com/amateur-built-operating-limitations.html>
- Differential Compressions Test – EAA Video
- o <http://www.eaavideo.org/detail/videos/feature/video/2363274331001/differential-cylinder-compression-test>
- Example Sonex Annual Inspection Checklist
- o http://sonex604.com/misc/N604X_Condition_Inspection_Checklist.doc
- Vividia Ablescope VA-400
- o <https://www.aircraftspruce.com/catalog/topages/vividia12-04891.php>
- Example Borescope Inspections Results
- o <http://sonex604.com/borescope.html>
- NTSB Safety Study (NTSB/SS-12/01)
- o <https://www.nts.gov/safety/safety-studies/Documents/SS1201.pdf>

Engine Conversion

Robbie Culver

As regular readers of the newsletter may recall, in June 2018 a loss of oil pressure led to my landing Sonex 1517 on an old farm strip near Byron, IL. Once we got the airplane back to KARR, the process of replacing the AeroVee with a brand new Jabiru 3300 began. What an adventure it's been.

As winter settled in to Chicagoland, I continued working to convert the engine. I was very grateful for a heated hangar. The new mount was on, the engine was installed, and the long list of to-do items began to shrink. I took advantage of the conversion to install a new horizontally split cowling, new EMS, and ADS-B, so

the project had many phases. As I began wiring up the engine and EMS systems, I went to great effort to ensure the wiring was clean, well-labeled, and carefully secured. Every zip tie on the engine mount was covered with heat shrink tubing to reduce chafing, and every wire had a label so I could identify where it went.

The Jabiru came with a Bing carburetor, and I decided early on to stick with that. After installing the electric carb heat, I had to run and connect the fuel lines, oil lines, and electrical system to the engine. I used adel clamps where necessary in addition to the zip ties, and made sure everything followed good practices and was secure. Because I used some existing wiring, I had to do a bit of work to change over the ignition setup from the AeroVee's primary/secondary to the Jabiru's left/right. By taking my time, I was able to accomplish that over the course of several weekends.

Fitting and installing the cowling was a serious challenge. This would be much easier on a build project as opposed to a conversion. It took over a month and a half of weekend and some weekday evening work to get to where it fit, and several re-works of the engine baffles before it all was complete. My favorite tool came in handy again – the strap duplicator.



This allowed me to drill accurate blind holes where the top cowling overlapped the bottom, and along the firewall top edge by the windshield. I used standard

rivets, not pulled rivets, to install the receptacles for the fasteners. It helped that friends building RV's had both rivets and a squeezer.

I used SkyBolt fasteners, which were not cheap but certainly are high-quality quick removal fasteners for the cowling. I was slightly disappointed at the supporting documentation for these, as installation instructions were a bit less than expected. I figured it out, but not very quickly. There are specialized tools required also, so anyone going this route please reach out to me for loaners.



The cowling is a very tight fit and the front four fasteners are a serious challenge to fit and install. The fit is so tight that I have to put those four fasteners in after I put on the top cowling, instead of permanently installing them. I'm certain this will become easier as things break in. The SkyBolts are definitely everything they are advertised to be. Quick locking, secure, and they look sharp. But if you want to go the inexpensive route, stick with screws and nut plates.

New systems. Lots of wires, lots of configuration to do. The entire setup is fed to the GRT Mini. I drew schematics as I laid out the new equipment installation, and made sure to follow the wiring very carefully.

Eventually I got to the point where it was time to turn the power on again and see what I missed. As I did so, it was very satisfying to see the nav lights and strobes working, the landing lights lit up, and the new EMS and ADS-B working. At first, the GRT Mini was not talking to the EMS or Serial Port Combiner that had the ADS-B connection, even though the devices had power. This turned out to be a configuration error on my part, as there were a lot of menus to wade through and baud rates to set. Once it began talking, I was then able to configure the EMS limits and program the ADS-B. All of this took time and patience.

The uAvionix Echo was very easy to configure. There is a phone app, and the device has WiFi. You connect from your phone, open the app, enter the data, and it's done. It literally took ten minutes. The required data includes the hex code assigned to your aircraft by the FAA, which can be located by looking up your registration online.

I had chosen the GRT Model EIS-66R Remote Engine Information System, and while I am very fond of GRT, I am not a fan of their documentation. Thankfully the technical support team is very good and quick to respond. The -66R connects to the GRT Serial Port Combiner, as does the uAvionix Echo ADS-B out system and GRT Safe-Fly GPS. One drawback to the -66R is that it cannot be located forward of the firewall due to heat issues, so all wiring had to feed through from the cabin.

By late February, I had reached the point where there simply was not a lot left to do. My list was running out of to-do items, and it was apparent it would soon be time to start the engine. To prepare for this, I went back over the entire installation slowly and thoroughly. After I did that, I had three people go over it independently and made a list of what they found, then fixed it.

On Sunday, March 17th, we pulled the Sonex out on the ramp and started the engine. It growled to life and drew a cheer from a friend building an RV two hangars down from where I am based. What a great feeling.

The real payoff was Saturday March 23rd, when I was able to fly it. Having flown the Turbo-AeroVee, the normally aspirated AeroVee, and now the Jabiru 3300 all on the same airframe, I expected a slight performance gain over the turbo. I was

wrong. With the 3300, my Sonex has performance that is simply unbelievable to me. It's like a different airplane altogether. It was well worth all the time, money, and pain.

Experimental Aviation Safety Update

Robbie Culver

When the Sonex Builders and Pilots Foundation was formed in 2013, one key goal was to work towards reducing the accident rate of Experimental Amateur Built (EAB) aircraft, specifically Sonex types. Almost 6 years later, the numbers show that we are making great progress in doing so. In 2018, there were 44 fatal accidents involving Experimental aircraft, with 33 of these being amateur built. Two of those fatal accidents involved a Sonex.

The “Not to Exceed” number set for 2018 was 51, so we did well in our improvement. I think we can all agree this is still too many, and any death is a tragedy. Most, if not all of these accidents are preventable. Ironically, it is no longer builder error that kills us. It's pilot error, often involving a second or third owner. My friends, we continue to be the problem.

I am not the only one here who has lost friends to EAB accidents. It's a sobering fact of life when we fly EAB, or any aircraft.

We have made admirable gains in safety. Personally, I am not trying to preach to anyone – in fact, I will be the first to admit I am not qualified to do so. One of the key reasons Michael Farley, Eric Seber and I started this adventure in 2013 was to work towards increasing the safety of building, operating, and owning these treasures we make. It's a community effort and if we collectively fail to strive for increased safety, as I have said before, none of us will like the results.

We try to “reach the unreachable” as a good friend and mentor likes to say. It's a tough mission, one I know we are all up to. As spring blossoms into summer, stay ahead of the airplane, my friends. Fly safe and fly smart.