Contents
Your feedback is welcome and encouraged as we continue to improve this manual. Please send all comments to tech@sonexaircraft.com. All comments will be reviewed and considered for inclusion in future revisions of this manual.

As always, your success is important to us. If you have any questions while assembling your engine do not hesitate to seek technical support by emailing us at tech@sonexaircraft.com.

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Disclaimer and Limited Warranty

THE EXPERIMENTAL AEROVEE 2.0 ENGINE KIT IS SOLD “AS IS”. NO WARRANTY IS EXPRESSED OR IMPLIED!

Sonex Aircraft LLC makes every effort to assure the supplied components of the AeroVee 2.0 Engine Kit meet high quality and durability standards, and warrants to the original purchaser that these components are free of defects in material and workmanship for the period of one year from the date of purchase. This warranty does not apply to damage due directly or indirectly to improper assembly, misuse, abuse, negligence or accidents, repairs or alteration outside our facilities, or lack of maintenance. Due to the experimental nature of the AeroVee 2.0 Engine Kit, the end user is solely responsible for determining suitability of application, assembly, installation and operation.

Sonex Aircraft LLC and its agents will in no event be liable for death, injuries to person or property, or incidental, contingent, special, or consequential damages arising from the use of our product.

Sonex Aircraft LLC and its agents will not be responsible for any incidental or consequential damage including direct or indirect labor, repair, medical, or legal expense in any way attributable to the use of any AeroConversions, Inc. product or to the delay or inconvenience caused by the necessity of replacing or repairing any such item.

Engine Monitoring Instrumentation

Sonex Aircraft LLC requires the use of a the following cockpit-installed engine monitoring instruments in every engine installation: oil pressure, oil temperature, cylinder head temperature (1 minimum), and exhaust gas temperature (1 minimum). Failure to properly monitor your engine may result in severe engine damage which is not covered under this limited warranty.

Not TSO’d for Certified Aircraft

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AeroVee 2.0 Engine Kit Documentation
This manual is your primary document for the assembly and operation of your Experimental AeroVee 2.0 Engine Kit. The included assembly DVD is an additional aide, but when there is a discrepancy between this manual and the DVD, the information in this manual takes precedence.

Other AeroConversions Resources
AeroConversions continually improves and monitors its products. It is in your best interest to stay abreast of these improvements and implement them as needed.

AeroConversions Website
AeroConversions, Inc. maintains a website which is continuously updated. Perhaps the most important part of the website for an AeroVee 2.0 builder/operator is the Service Bulletin section. You are encouraged to periodically check for Service Bulletins which may affect the performance of your AeroVee engine.

The AeroConversion website is aeroconversions.com

AeroVee Internet Discussion Group
AeroConversions operates an internet discussion group which is open to all owners and enthusiast of the AeroVee 2.0 Engine Kit. Joining this list will get you in touch with other engine owners and is an additional form of mass-communication between AeroConversions, Inc. and its customers.

Information on joining this list is located on the AeroConversions website at aeroconversions.com.

AeroConversions Tech Support
AeroVee owners can receive individual tech support by email or phone. We encourage you to contact us via email first, as this allows us the opportunity to formulate a clear, concise answer to your question.

The email address for tech support is info@aeroconversions.com

AeroConversions' Service Bulletins
AeroConversions, Inc. is committed to providing quality products. We do this through the constant improvement of our AeroVee 2.0 Engine Kit, and also by identifying parts or procedures which we feel require the attention of the existing AeroVee 2.0 Engine Kit fleet.

When we identify parts or procedures which we feel require the attention of AeroVee 2.0 owners, we issue a Service Bulletin.

Required Service Bulletins
A Required Service Bulletin, as the name implies, must be complied with. It may be a part or a procedure which we feel must be corrected for the continued use of your engine.

ASSEMBLY/SERVICE RESOURCES

Upon compliance of the Required Service Bulletin, an entry must be made in your engine log book.

Required Service Bulletins are posted on the AeroConversions website, announced on the AeroVee Internet Discussion Group, and mailed to the address of record of each AeroVee 2.0 Engine Kit owner. It is your responsibility to keep us informed of any address or engine ownership changes, and to check the AeroConversions website for Required Service Bulletins.

Optional Service Bulletins
An optional Service Bulletin is issue when we identify an area which we feel will contribute significantly to the reliability/longevity of the AeroVee engine. Optional Service Bulletins need not be complied with but we strongly encourage all AeroVee 2.0 owners to implement the suggested change/upgrade.

Upon compliance of the Optional Service Bulletin, an entry must be made in your engine log book.

Optional Service Bulletins are posted on the AeroConversions website and announced on the AeroVee Internet Discussion Group. It is your responsibility to check the AeroConversions website for Optional Service Bulletins.

Additional Resources
There are many books, magazines, and videos available for the assembly, maintenance, and operation of "Type 1"-based engines. We highly recommend "How to Rebuild Your Volkswagen Air-Cooled Engine" by Tom Wilson (ISBN 978-0-89586-225-9).
AeroVee 2.0 Assembly Manual

Weights and Dimensions:
- Weight (Less Oil & Exhaust) ......................... 160 lbs.
- Length .................................................. 24.25”
- Width .................................................... 30”
- Height ................................................... 20.0625”

Mount Dimensions (Viewed from behind)
- 4.8”
- 4.8”
- 5.55”
- 5.55”

Prop Hub Bolt Pattern
- 9/16” Dia. Drive Lug Hole - Typical 6 places
- 5” O.D.
- Drive Lugs Centered on 4” Dia. Bolt Circle
**General Specifications** (Subject to change without notice)

**Power and Displacement:**
- HP @ 3400 RPM...........................................80 HP
- Static RPM @ WOT (with correct propeller)......3000 RPM
- Bore .......................................................92mm
- Stroke ...................................................82mm
- Displacement.............................................2.0cc
- Compression Ratios (Builder Adjustable):
  - 7.0:1 For use with automotive gasoline with a posted (R+M)/2 of 90 or greater conforming with ASTM D 4814.
  - 8.0:1 For aviation gasoline 91/98 minimum grade conforming to ASTM D 910

**Ignition System:**
- Firing Order............................................. See Photo
- Spark Plugs.............................................Autolite MP4163 or equal
- Spark Plug Gap:
  - Top Plugs .............................................0.018"
  - Bottom Plugs.........................................0.032"
- Timing:
  - Primary Ignition (Magnatrons).............. Fixed @ 28° BTDC
  - Secondary Ignition (Electronic)..............28° BTDC
  - Ignition Module Gap (Primary Ignition).....0.010–0.014"

**Cooling and Lubrication:**
- Primary Cooling......................................Air
- Secondary Cooling...................................Oil
- Oil Capacity........................................2.75 US Qts.
- Oil Type................................................SAE Multigrade 20/50

**Fuel System:**
- Carburetor............................................Aero-Carb ACV-C03, 32mm
- Approved Fuels:
  - 7.0:1 Compression: Automotive gasoline with a posted (R+M)/2 of 90 or greater conforming with ASTM D 4814.
  - 8.0:1 Compression: Aviation gasoline 91/98 minimum grade conforming to ASTM D 910

**Electrical System:**
- Battery Required (minimum)........................12v @ 20 amp
- Starter......................................................Geared
- Alternator................................................20 amp

**Propeller Drive:**
- Propeller Drive........................................Direct (1:1)
- Prop Bolt Pattern......................6 holes, 9/16" dia., on 4" dia. center
- Prop Drive Bushings.............................9/16" dia. x 7/16" long

**Valve Setting:**
- Valve Setting (cold).................................0.006" to .008"

**Operating Limitations** (Subject to change without notice)
- Idle RPM ..................................................700–900 RPM
- Cruise RPM..............................................3200 +/- 200 RPM
- Maximum RPM.........................................4,000 RPM
- Oil Temp. - Min........................................160°F
- Oil Temp. - Max........................................230°F
- Oil Pressure - Min....................................20 PSI
- Oil Pressure - Max.................................100 PSI
- Oil Pressure @ Cruise...............................40–50 PSI
- CHT @ Cruise............................................350°–375°F
- CHT @ Climb (5min.).................................420°F
- CHT Max................................................450°F
- EGT Max..............................................1400°F
**Tools Required:**
- White Lithium Grease
- Socket Wrench
- 14mm Socket
- "Red" Locktite (High Strength Threadlocker)
- Torque Wrench (25 ft.-lbs. capacity)
- Feeler Gauge

**Parts Required:**
- ACV-P01-33 Connecting Rods
- ACV-P01-59 Rod Bearing Set
- Crankshaft Assembly

**Assembly Instructions:**

*Note: Both parts of each connecting rod are stamped with a unique number, identifying them as matched parts. The connecting rods must be re-assembled as matched parts, with the numbers together as shown in this photograph.*

1. Remove the nuts from each Connecting Rod (ACV-P01-33) and carefully separate the two parts. Do not scratch or score the machined surface of the connecting rods.

2. Wipe the mating surfaces of the connecting rods and bearing halves so they are free of oil and dust. Install the bearing halves (ACV-P01-59) by aligning the tab on each bearing half with the notch in each connecting rod and pressing the bearing halves into place.

3. Apply an even coat of white lithium grease to the exposed surfaces of each bearing half.

4. The connecting rods are attached to the crankshaft, as shown in the photo below, with the stamped numbers facing up. **Be sure to re-assemble the connecting rods as matched parts.**

5. Apply "Red" Locktite to the threads of each rod bolt and install nuts. Torque each nut first to 8 ft.-lbs., and then to a final torque of 25 ft.-lbs.

6. Check each connecting rod for freedom of movement and .005" to .020" side clearance.

*Note: The clearance between the rod bearings and rod journals must be between .002" and .0025". When assembling new parts, as provided in the AeroVee 2.0 kit, the proper clearance is often assumed. When rebuilding an engine using remanufactured parts, this clearance must be checked. Detailed instructions for checking this clearance are given in Tom Wilson's book "How to Rebuild Your Volkswagen Air Cooled Engine".*
Tools Required:
- Socket Wrench
- 13 mm Socket
- Plastic Mallet
- White Lithium Grease
- Aviation Form-A-Gasket #3 or Flange Sealant

Parts Required:
- ACV-P01-55 Maxi Oil Pump for Oil Cooler
- ACV-P01-56 Optional Pump for use without an oil cooler

Assembly Instructions
1. Install Oil Pump Gasket and align Pump Housing with oil galley ports.
2. Tap oil pump housing into place with a plastic mallet.
3. Liberally grease the top gear and install it, making sure it engages the cam.
4. Liberally grease and install the free running bottom gear.
5. Apply a very thin coat of Aviation Form-A-Gasket or Flange Sealant to the oil pump cover. Make sure the oil passages are aligned properly.
6. Install the 4 mount bolts and torque them to 14 ft-lbs.

Oil Cooler Installation
Installation of an oil cooler is described in the Sonex/Aerovee Firewall Forward manual, included with your engine purchase. All oil cooler installations must use threaded AN fittings and high quality -06 hose.

Operation Without an Oil Cooler
To operate your AeroVee without an oil cooler you must either run a loop of -06 hose from the output side of the pump to the input side of the pump, or replace the entire pump with the optional ACV-P01-56 Straight Pump.

Important: Do not plug the output and input ports with plugs. This will prevent oil flow and cause significant engine damage.

Important: Do not replace the pump cover with a non-ported cover. This will prevent oil flow and cause significant engine damage.
Tools Required:
__ 5/16-18”X 2” Hex Head Cap Screw (not supplied in kit)
__ 5/16-18 Nut (not supplied in kit)
__ 5/16 Washer (not supplied in kit)
__ 5/8”Socket

Parts Required:
__ ACV-H01-11 Prop Drive Bushings

Assembly Instructions
__1. Insert a prop drive bushing into the prop hub.
__2. Insert the bolt through drive bushing with socket as a spacer.
__3. Use the bolt, washer, nut and socket to pull the drive bushing into the hub.
__4. Repeat for other 5 drive Bushings.
INSTALLING the EXHAUST

Parts Required
__ Optional 2-into1 Exhaust Kit (p/n ACV-E01-02)
__ Exhaust Gaskets (from ACV-P01-69 gasket kit)

1. Using the supplied Exhaust Attach Bolts (ACV-Z01-39), temporarily attach the exhaust manifolds to the cylinder heads without exhaust gaskets.

Note: If your cylinder heads have exhaust studs installed they will need to be removed to fit the 2-into-1 exhaust.

Note: The left side exhaust pipe (pilot's side) may contact the super tin and/or cylinder head baffle. The super tin and/or baffle can be reformed as needed to minimize the contact, though some contact is not a concern.

2. Slide an extension pipe onto each manifold. It may be necessary to shorten the length of the exhaust manifold if the extensions interfere with the firewall. Do not shorten the expanded portion of the extension pipes.

3. After each exhaust manifold has been trimmed to the proper length, remove the manifolds from the cylinder heads and re-install them with new exhaust gaskets (included in the ACV-P01-69 gasket kit).

4. Attach a spring between each pair of spring clips. It may be necessary to shorten the springs for your particular installation.

5. Attach a loop-type line support clamp (AN742 or equivalent) to the firewall approximately 3" above the spring clips on the exhaust extensions.

6. Attach a spring between the support clamp and each exhaust extension. It may be necessary to shorten the springs for your particular installation.

7. Trim the ends of the exhaust pipes to final length. The pipes must be long enough to ensure the exhaust gases exit the cowl, yet pipes which extend too far below the cowl will add drag and reduce your airspeed.

Trim the end of each exhaust manifold (arrow) as needed to get the exhaust extensions to exit the cowl in the desired location.
START-UP and BREAK IN

Break-in, the First 25 Hours
Proper break-in will help you get the best performance and longest life from your AeroVee engine.

- 1. Limit ground running to what is needed to properly tune the engine and assure no oil leaks.
- 2. Do not "baby" the engine during the first few flights. As soon as possible, climb to a safe altitude over your airfield and run the engine at wide open throttle for at least an hour. This will seat the rings. Monitor the engine temperatures and reduce throttle as needed to keep the engine temperatures "in the green". Step climb as needed. Higher than normal temperatures during the break-in period are to be expected, however, temperatures which exceed the redline or continue to climb must be investigated.
- 3. Change the oil at 1 hour, 5 hours, 10 hours, and 25 hours.
- 4. Adjust the valves at 5 hours, 10 hours, and 25 hours.
- 5. Torque the heads and adjust the valves at 10 hours and 25 hours. Always torque the heads before adjusting the valves.

After 25 hours you should see the engine's temperatures decrease and stabilize and there should be little change in the head torque.
Minimum Maintenance Interval

1 Hour Accumulated
__ Change the oil and wash the oil screen.

5 Hours Accumulated
__ Change the oil.
__ Adjust the valves (cold engine). See page 28.

10 Hours Accumulated
__ Change the oil.
__ Torque the heads to 18 foot pounds. Do NOT loosen the nuts prior to torquing them. See page 21 for proper torque sequence. The rocker shaft assemblies must be removed to torque the heads.
__ Adjust the valves (cold engine). See page 28. Valves must be adjusted after torquing the heads.
__ Check all fasteners for tightness and security.

25 Hours Accumulated
__ Change the oil and wash the oil screen.
__ Torque the heads to 18 foot pounds. Do NOT loosen the nuts prior to torquing them. See page 21 for proper torque sequence. The rocker shaft assemblies must be removed to torque the heads.
__ Adjust the valves (cold engine). See page 28. Valves must be adjusted after torquing the heads.

Every 25 Hours
__ Change the oil.

Every 50 Hours
__ Change the oil and wash the oil screen.
__ Adjust the valves (cold engine). See page 28.
__ Inspect and/or replace air filter.

On Annual Inspection
__ Change the oil and wash the oil screen.
__ Torque the heads to 18 foot pounds. Do NOT loosen the nuts prior to torquing them. See page 21 for proper torque sequence. The rocker shaft assemblies must be removed to torque the heads.
__ Adjust the valves (cold engine). See page 28. Valves must be adjusted after torquing the heads.
__ Inspect and/or replace air filter.
__ Inspect and/or replace spark plugs.
__ Check all fasteners for tightness and security.
__ Check all hoses for condition, tightness and security.
__ Check all wiring for condition and security.
__ Perform a leak-down test of each cylinder. 80 psi is normal, anything below 60, or a large deviation between individual cylinders, requires additional investigation.

When to Rebuild Your AeroVee
Experimental engines, such as the AeroVee, have no TBO. As the owner/operator of an Aerovee engine you decide when it will be rebuilt and to what extent.

Signs an engine needs some degree of rebuilding include low compression, loss of power, increased oil usage, and low oil pressure.

Torque Values

<table>
<thead>
<tr>
<th>Item</th>
<th>Socket</th>
<th>Ft. lbs</th>
<th>In. lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Case Nuts</td>
<td>19mm</td>
<td>25</td>
<td>300</td>
</tr>
<tr>
<td>Cam Case Nuts</td>
<td></td>
<td>10</td>
<td>120</td>
</tr>
<tr>
<td>Small Case Nuts</td>
<td>13mm</td>
<td>14</td>
<td>168</td>
</tr>
<tr>
<td>Cylinder Head Nuts</td>
<td>15mm</td>
<td>18</td>
<td>216</td>
</tr>
<tr>
<td>Rocker Arm Nuts</td>
<td>13mm</td>
<td>14</td>
<td>168</td>
</tr>
<tr>
<td>Prop Hub Nuts</td>
<td>30mm</td>
<td>70-80</td>
<td>840-960</td>
</tr>
<tr>
<td>Flywheel Gland Nut</td>
<td>36mm</td>
<td>227</td>
<td>2724</td>
</tr>
<tr>
<td>Connecting Rod Nuts</td>
<td>14mm</td>
<td>25</td>
<td>300</td>
</tr>
<tr>
<td>Oil Pump Cover</td>
<td>13mm</td>
<td>14</td>
<td>168</td>
</tr>
<tr>
<td>Oil Pan Cover Nuts</td>
<td>10mm</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>Rear Unit Mount Bolts</td>
<td>17mm</td>
<td>25</td>
<td>300</td>
</tr>
<tr>
<td>Prop Bolts/Nuts*</td>
<td>1/2&quot;</td>
<td>11</td>
<td>132</td>
</tr>
<tr>
<td>Spark Plugs</td>
<td>11/16&quot;</td>
<td>22</td>
<td>264</td>
</tr>
</tbody>
</table>

*Refer to the propeller manufacturer's torque specification. In the absence of a manufacturer specification, use these values.
This page is a quick reference of electrical schematics associated with the AeroVee installation. Detailed instructions for each sub-system are provided elsewhere in this manual.

**STARTER WIRING SCHEMATIC**

```
MASTER SWITCH
- -
20 GA. MIN.
- -
STARTER SOLENOID
6 GA. MIN.
- -
MASTER SOLENOID
START and SOLENOID
- -
STARTER GROUNDS THRU MOUNTING BOLTS. ADDITIONAL WIRE MAY IMPROVE GROUND PATH.

BATTERY
- +
```

**ALTERNATOR WIRING SCHEMATIC**

```
ALTERNATOR
- +
9 GA.

REGULATOR
- +

TACHOMETER
20 AMP 6 Pulses / Rev.

10 AMP 6 Pulses / Rev.

BATTERY
- +
```

**MAGNATRON IGNITION SCHEMATIC**

```
FLYWHEEL
- -
20 GA. MIN.

MAGNATRON
- -
20 GA. MIN.

TO UPPER FRONT SPARK PLUGS

TO LOWER REAR SPARK PLUGS

MAG SWITCH DPST - N.O.
```

**SECONDARY IGNITION SCHEMATIC**

```
RIGHT COIL
- +
18 GA.

LEFT COIL
- +
18 GA.

TO LOWER REAR SPARK PLUGS

TO LOWER FRONT SPARK PLUGS

IGNITION SWITCH SPST - N.O.

BATTERY
- +
```

**SAMPLE**

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