



# Chapter 1 - Pre-Installation Notes

## How Long?

Starting from the shipping crate, plan on 2 to 4 hours to physically mount the engine to your airframe with the help of one assistant. You will need several additional solo work sessions to complete the systems integration. Time to completion varies widely based upon your selection of engine instrumentation. The Grand Rapids Engine Information System (EIS) has been enhanced specifically for Eggenfellner powerplants and provides excellent value for your dollar. It is a complete system offering which is very easy to install. If you order this option with your motor, the engine sensors will be factory installed and wired. The remaining installation of the EIS is covered in it's own manual from Grand Rapids. The EIS system now offers fuel quantity senders and display if you would like to get even more value from your system.

## Ordering your Powerplant and Options

You may choose to purchase options and accessories at the time of order or as needed. Major options should be discussed at the point of initial purchase so we can provide the most complete package possible. These include items such as the "Soobercharger" and Engine Information System (EIS). Minor items can be purchased as needed. These include maintenance tools, such as clamp kits and OBD-II scanner.

## Ordering the RV Finishing Kit

When ordering your Finishing Kit from Vans, be sure to specify that you will be using an Eggenfellner Firewall-Forward Package. Vans should be familiar with the special requirements of this package. The following is a summary of these requirements.

Kit Requirements from Vans:

1. You will need the RV-7/A IO-360 cowling. This cowling does not have a carb air scoop. Yes the 7 & 7A cowls fit the 9 & 9A as well as the 6 & 6A. If you are building an RV-8 or 8A, use the IO-360 RV8 cowling.
2. You will need the nose gear leg and all related hardware. The gear leg will be undrilled.
3. **If you are building a tricycle gear model**, you DO NOT NEED the Lycoming engine mount. Vans will credit you a few hundred dollars.
4. **If you are building a tail-dragger model**, you NEED the Lycoming DYNAFOCAL engine mount so it can be modified by our factory for your motor.

# Things to think about before your powerplant arrives.



*Rollover image to peek Inside the Crate. Be sure to request a lift-gate truck.*

- **A place to store the motor?**

When the big truck finally arrives, you'll need a flat, dry, corner of your workshop to store the powerplant while unpacking, inspecting, and installing the motor. Be sure to request a lift-truck and hand cart for delivery unless you have a large fork-lift available. The motor in its wooden crate weighs around 400 pounds. The crate is 4' x 4' x 4'.

If you are not going to install the motor for more than 90 days, you should consider leaving it wrapped in a protective layer of plastic. Long-term storage requirements should be discussed with the factory. The normal procedure is to tilt the engine upright on the shipping skid (as it would normally be oriented), then add oil and follow operating procedures to start and run the engine for a few minutes once every month.

All motors are run at the factory before shipping to a customer. The initial oil has been drained from the crankcase for shipping. Coolant and PSRU lubricant may remain in the motor during shipping but should be checked before operation. A small amount of motor oil may leak from the exhaust pipe (if installed) when you first tip the motor off the shipping palette. This is normal and will quickly burn off when the motor is run. Expect a brief moment of smoke when you start the motor for the first time. Wipe away any obvious spillage. Refer to the section on fluids for more information.

- **A hoist and sling?**



A hoist and sling are required to lift the motor. Do not attempt to install the motor using several buddies instead of a hoist. The hoist is far more patient and less error prone. Most rental businesses will rent an automotive engine host for about \$20/day. You will need it for one day (half a day if you've done this before). A sling can be made from a set of four strong, thickly strapped, ratcheting tiedown straps at least one-inch wide. The sling is required to physically attach the motor to the hoist. Slings are preferred over chains because they are less likely to scratch or damage the motor.



You should orient the sling directly over the intake manifold, but do not attach to it! Attach straps running from the hoist hook to each of the four corners of the engine mount and also around the prop shaft bearing hub (never put a sling around the prop shaft itself as this can damage the seal). Adjust the straps with the ratchets so that the motor can be picked up and remain level. The sling running under the prop bearing hub will be useful to make the motor mount parallel with the firewall. Don't forget you can move the aircraft's empennage up and down too in order to get the engine mount to mate with the firewall.

**TIP:** If the exhaust pipe was installed when you received your motor, remove it first while the engine is still in the crate and you will avoid damaging it. The metal exhaust gaskets can be reused if they are not crushed or damaged. Replacements can be found at your local Subaru dealer. **Ask for gaskets for a 2002 Subaru WRX Turbo car.**

- **Room to Move?**



Your fuselage is about to become four feet longer and the empennage is going to sit very tall. You will need to position your airframe so that you can approach the fuselage with your hoist. The photo above shows that it is possible to install the motor in a typical garage, in this case, by hoisting from the side.. It is always easiest to hang a motor if the firewall is oriented 90-degrees relative to the floor. For most airframes, particularly taildraggers, this can be done by raising the tail of the fuselage as needed to square-up the firewall. Be sure to pad the tail however you choose to support it. I have found that suspending the tail section using two screw eye bolts into the ceiling and a long ratcheting tiedown strap slung under the mid-tailcone bulkhead (F-707) works well. This method allows some free swinging movement of the fuselage on its wheels, which can help with alignment and lessen any damage that might be incurred during installation.

The RV-9A and RV-7A aircraft use nose or main wheel legs which are integral fixtures of the motor mount. Until your motor is bolted securely to the firewall, the fuselage tail must be adequately supported. Keep in mind that as the weight of the motor is transferred to the airframe, the airframe will sit much lower on its legs than it does right now. Don't do anything that would result in a dent to the bottom side of the fuselage or top of your rudder.

- **Assistance?**

Two are company, three's a crowd. Hanging a motor can easily turn into a cause for Barbeque. Be forewarned of the shop lore that says increasing the number of humans, lowers the efficiency of anything involving a process. Having a second person with a good sense of what needs to be done is ideal. If they have prior experience with hanging motors, that's even better. Be sure to familiarize your assistant with the layout of the shop in case they have to fetch that special bent screwdriver thingy, or call 911, or operate the jaws-of-life to get you out!

- **Safety!**

You should have an ample supply of this on hand. Be sure that your hoist and sling are up to the job, that you have plenty of room on a solid, level floor, and when working with fuel and wires, have good ventilation, and a fire extinguisher standing by. Avoid letting any part of your body be underneath a suspended motor or airframe. Always consider what would happen if the motor shifted or fell. Be safe!

- **Batteries?**

If you haven't done so already, now is the time to acquire batteries. We use motorcycle size batteries. Several types are suitable, but the factory prefers the **Hawker Industries, "Odyssey PC625"** type of dry-cell batteries (Reference URL: [www.Batteries4Everything.com](http://www.Batteries4Everything.com) or [www.odysseydirect.com](http://www.odysseydirect.com) ). Prices vary quite a bit for these batteries, so shop around. \$60 to \$90 dollars is the going price per battery.

Whichever type of batteries you prefer, make sure they have suitable bolt-type connector studs. During cable installation, only tighten the nuts gently, using lock washers and flat washers, to avoid damaging the battery terminals. Avoid spillable batteries or ones with special venting requirements. The actual location and mounting of the batteries will be determined once the motor has been positioned on the firewall. If you intend to use your AUX battery to boost-start the engine, or you intend to parallel them for any reason, then the two batteries should be a matched pair to prevent overloading.

Eggenfellner Aircraft offers a prefabricated aluminum dual battery tray if you are interested in mounting your Odyssey batteries in the center of the firewall on the engine side. For other configuration, you will have to construct your own battery box or boxes.

- **Plumbing & Primary Wiring?**

There's a good amount of drilling, plumbing, and wiring that needs to occur after the motor is hung. In many cases, it is easiest to access this wiring without the motor present. For this reason, you can either dry-fit the motor to the firewall for measurement, then removing it for drilling, or with some care, you can drill while the motor is hung. See how you feel about this once the motor is in place. If you have the tools to work in close quarters, it may not be necessary to remove the motor again. Many of the holes can be measured and drilled before hanging the motor the first time.

Your powerplant requires twelve feet of #6 AWG primary power cable, ten feet of #8AWG cable, and proper terminal ends and boots. These are not part of the kit supplied by Vans. You may wish to order them early. Obtain a crimping tool of sufficient capacity to handle the cable sizes. Optionally, you may order ten feet of fireshield, fire-resistant hose covering to protect your fuel lines. The lines are size 5. If you have to slip the firesleeve over existing fittings, you can use a size 6 firesleeve as would normally be used on 3/8" lines. If you do choose to add firesleeve you will need our Oetiker Clamp Kit to remove and reinstall the hoses.

The redundant electrical system recommended by the factory includes several high-quality aviation switches, a pressure switch, and a relay. These parts must also be special ordered. Now would be a good time to review the related electrical diagrams and parts lists, and order these parts. Some of these switches are very specialized devices, so discuss any alternatives with the factory before deviating from the recommended parts list.

- **Fuel System Preparation?**

Your powerplant requires a continuous fuel supply loop.

Fuel is drawn from the fuel tanks, through a six-port fuel selector valve, through an optional forward fuel-flow sensor, through an optional primer pump (interesting to aerobatic low wingers only), through a gascolator, to a pair of redundant EFI (Electronic Fuel Injection) pumps, through a high-pressure filter, to the fuel injector rails. Excess fuel pressure not consumed by the injector nozzles, is returned through a fuel-pressure regulator, through an optional reverse fuel-flow sensor, back through the six-port valve, and back to the fuel tank from which it was drawn. This fuel loop is required to maintain proper fuel temperature at the injector rails and to flush away any vapor bubbles that might form in the system. Discuss any deviation from this design with the factory.

The optional forward and reverse fuel-flow sensors are designed to give corrected calculation of the fuel actually consumed by the powerplant. This is an optional item of the Engine Information System (EIS). A large volume of fuel is continuously circulated through the fuel system loop (approx. 35 gph), so only by subtracting the return volume from the supply volume, can you derive an accurate measurement of actual fuel consumption. The *Grand Rapids EIS* and *Blue Mountain Avionics EFIS/One* systems both support the subtraction of two sensor inputs as employed here. *Matronics* also sells a module which will perform this function if you prefer a hardware solution or wish to use other fuel flow instruments.

The standard RV kit does not provide the return fuel line as required by your powerplant. You must add this third line to each tank as described in the diagrams. The *Andair* six-port valve is required to coordinate the selection of fuel supply and return. This valve can be ordered through Eggenfellner Aircraft Inc. or from other suppliers. Fuel flow sensors must be provided by the builder if not included with their EIS option order. The FloScan 201 or 231 series are OK, but avoid the '415' series due to their limited flow rate.

Now would be a good time to review the related fuel system diagrams and parts lists, and to order the parts.

- **Cabin Heater Preparation?**

Your powerplant provides for a safe and efficient hot-water cabin heater if desired. If you intend to install the optional heater, contact the factory and request an early shipment so you can install the system in your fuselage while you still have easy access. You'll be installing the heater blower/motor, control valve, vents, hoses, fittings, cable, switches and wiring. All of this can be done prior to powerplant installation, and is best done before riveting the top deck skin on. Aside from some tips on basic hose routing and connections and photos of previous installations, the installation of the cabin heating system is an exercise left to the individual builder.

- **Firewall Preparation?**

Before starting the installation, you need to review all systems that would be hard to access once the motor is hung. This may involve installation of some or all of your instruments, rudder controls, brake system, fuel system, cabin heater and fresh air ductwork, etc. You may choose to hang the motor to mark firewall fitting and component locations, then remove the motor to actually drill and cut the various pass-throughs required for cables, wires, tubes, etc. Optionally, you may measure and drill for the various fixtures upfront before hanging the motor. If you are sticking with the advice of this installation guide, this is the preferred method.

The RV kit from Vans includes a firewall with a recessed, rectangular, stainless steel box, originally intended to provide better oil filter access when using a Lycoming motor. Since this is not needed for your motor, some builders have chosen to cover the firewall opening with a flat stainless steel plate. Do not use aluminum here! However, I have found it useful to install the box as called for in the plans. This provides a nice location for mounting components and routing cables. It also saves you the trouble of making a stainless cover plate. If you do choose to install a flat plate, Vans sells a stainless-steel plate for this purpose which would save you a lot of trouble fabricating your own.

This would be a good time to think about how you intend to run wires and tubes through the firewall. Wires are typically bundled and run through a nylon bulkhead fitting. All tubing is to be routed through the firewall using AN bulkhead fittings. Do not simply drill holes and run the tubes through grommets. Over time, a grommet will wear through and cause chaffing of fuel and coolant lines. Do not cut corners in any system that carries critical fluids!

If you are using the factory heater system, the heater should be installed such that the heater core tubes protrude into the engine compartment through the stainless steel firewall. This way the hoses are only in the engine compartment. If you install another type of heater, it is preferred that any hoses which run through the firewall use AN bulkhead fittings instead of rubber grommets.

If you intend to use our factory dual battery tray option, you should obtain this early before cutting holes in your firewall for things like heater hoses. The factory battery tray mounts in the center of the firewall, so plan ahead to avoid conflict with your heater hose and cable openings.

The throttle cable will require a swivel-eye type bulkhead fitting such as Aircraft Spruce's p/n SE961-188B (0.188" diam).

Now would be a good time to check all of the corners of the firewall to be sure they are fully sealed to prevent fumes from entering the cockpit. Use a good fire-resistant sealer and metal tape where applicable. 3M makes a good product called "Fire Barrier Caulk" (3M p/n CP-25). It is available from most contractor and industrial suppliers. It dries flexible just like silicone, with a slightly rough texture and expands as it is heated.

Finally, you might consider spending a few moments with some good metal polish while you still can.