1932

FLYING and glider MANUAL

BUILD and FLY

CONTENTS

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DOUGLAS BOLFE

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THE PIETENPOL - FORD MOTOR CONVERSION

By B. H. Pietenpol

According to letters received by the editors, interest in the conversion of the Model A Ford motor as applied to my little ship has been mighty hot. I'm using Part IV of this series to give you the motor dope. Here it is — all of it.

The Ford motor makes an ideal power plant. It is rugged and very reliable. It is comparatively low speed, and can be serviced anywhere the ship may be forced down. And it is cheap enough to be easy to buy. The whole motor, brand new, costs but little more than a hundred bucks, and when converted as shown in this article will develop a good 38-40 hp, which is enough to fly two people in the Air Camper monoplane, the design of which I have just finished giving to you cloud hoppers in the first three parts of this article.

At the flywheel end of the motor you will note that there are no changes to be made. The flange to which the fly wheel fastens is left as is. Against it is fastened a length of Model T axle, the end of which goes into the differential. This is held in place with 7/16 in. bolts which are double fastened. By this I mean that the two flange faces are held together with nuts threaded onto the bolts, and that the ends of the 7/16 in. bolts are left to run out so as to be long enough to allow the retaining plate for the propeller to be placed over them and fastened and cotter-keyed on.

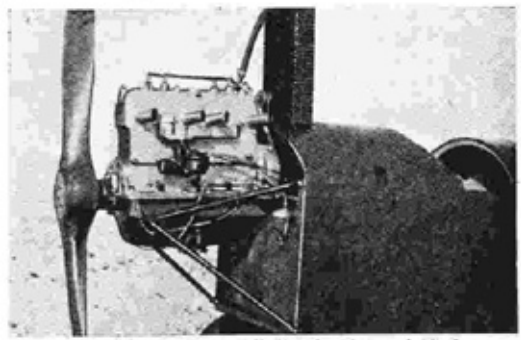
You will find the axle will not be thick enough to fill out the hub of the standard Lawrence 28 war surplus prop which is used with this motor, so a wood turned birch bushing will have to be made and fitted tightly over so that the propeller is on center. Then a 16 gauge retaining plate is made and the prop is on the motor for good. Yet it is readily demountable.

We have used this prop installation for a long time and it has yet to fail us. I believe it to be far more rugged than is necessary.

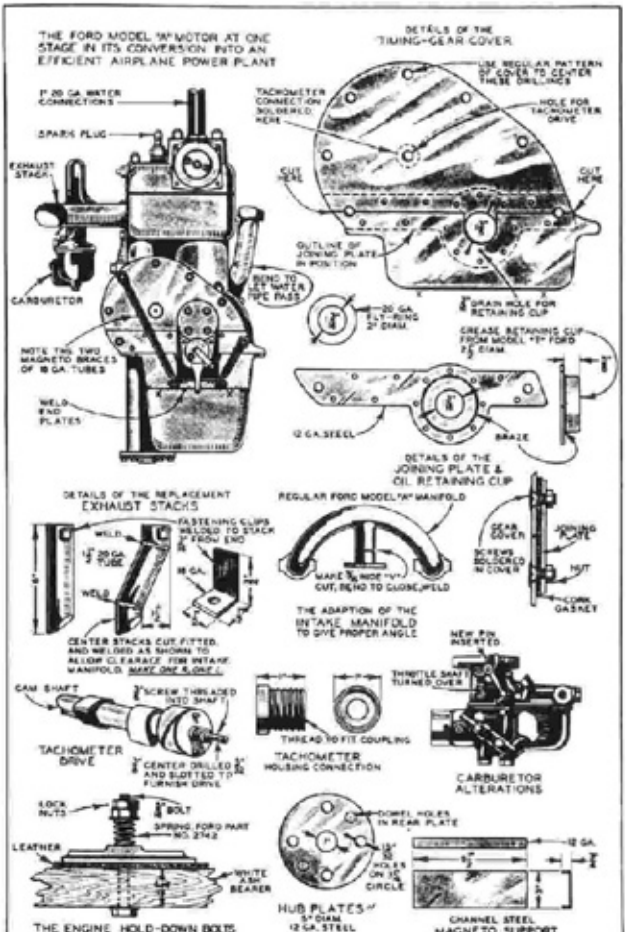
The crank case will have to have some work done on it to revamp the oiling system. A feed pipe from the oil pump will have to be let into the forward crankshaft bushing. The face of the crank web takes all the thrust, and since it is designed for all of the clutch and de-clutch loads of the husky Ford car, we have found that a thrust joint or bearing is a waste of time and money, as the bearing as it stands will thoroughly take care of all of the prop thrust loads. We ran one of our ships 240 hours and found slightly less than 1/64 in. wear at the bearing. Which proves that it will handle the comparatively light load very nicely.

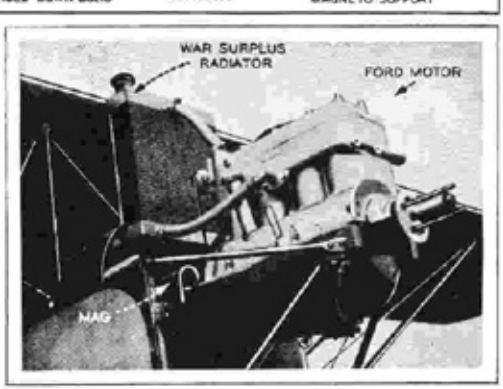
The center bearing, you will note from the middle view on opposite page, is fed from the same oil pump take-off. To the right of the figure is shown the method of drilling the bearing casting and tapping the pipe into the journal.

The splash pan is rebuilt. You will find that a welded apron up front is needed. This catches the drip from the front bearing. Also the pressure line from the fuel pump is run forward and exhausted on the apron under No. 4 cylinder, which in the case of an airplane installation becomes No. 1 cylinder and will so be called in order from this point on. Cylinders Nos. 2, 3, 4 have oil dams built in the pan so that there is assured a supply of oil at all times. The ordinary indentations in the Ford pan allow the oil to travel toward the tail of the ship too fast, and the front crankpin bearings do not get the splash



View of left side of motor installed in the Pietenpol Air Camper. Note the location of the radiator and the individual exhaust stacks.





The manner in which the Ford Model A engine is installed. No conversion is required—no thrust bearings. A mag is mounted on the end of the fan pulley.

feed they need if these are left out.

Off in the right hand corner a chip can be dog-eared off the corner of the pan to allow for the surplus to drip back into the lower base. The edge must be bent up ½ in. to allow a good reserve of oil to be carried in the splash.

The method of leading the pipes through the base is made very clear by the drawing, as it shows how the brass nipples are brazed into the crank wall and how the pipes are led from this point to the places where you want the oil to be delivered.

The regular cover plate of cast iron on the valve chamber is too heavy and you will have to make a 20 gauge plate to replace it. This *saves* several precious pounds of weight and is better looking as well as being tighter.

The intake manifold is rebuilt to be shorter. There is a tendency on the part of the intake to frost up, and the shorter you make the intake pipe the better performance you will have. Also there is need to get the carburetor outside and away from interference with the motor bed, so the change is imperative. By removing the carburetor, and the manifold, and sawing out a 3/16 in. slot in the back side of the neck, the carburetor is made to be level and is automatically made to clear the cowling.

Welded, the installation can be made and will prove highly serviceable. You see, I have found by experiment the amount of cut needed to get the carburetor level when the ship is flying level.

There is only one detail of the oiling system as yet left unexplained. That is the need for an oil ring to be soldered around the aft end of the crankshaft.

The drawing shows how this is put in. It is necessary to use this device to keep the motor from throwing oil all over the magneto, which would soon short.

The water pump must be shortened 1¾ in. to place the water pump pulley in line with the pulley on the crankshaft. The regular Ford pulley is used, and the regular Ford belt. We have found

that they are perfectly satisfactory.

The method by which a fabric universal joint is built into the end of the crankshaft is shown in the drawings in diagramatic form. It can be altered to suit the magneto you use.

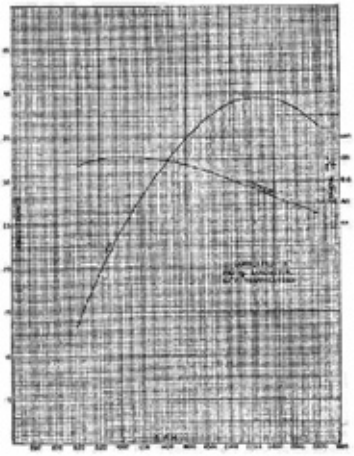
Also the bracket I show is made to fit the type of magneto we used. We found that the reliability of the magneto and the extra weight saved, together with the added ease in starting, was well worth the extra cost involved in getting a war surplus magneto and fitting it on. There is a snap to that old magneto spark that gives the motor extra heart when you have about 5,000 feet of alty and the road gets bumpy.

You will note that a light water outlet to the radiator is to be made. This can be made out of light sheet metal of about 20 gauge and should have an uptake long enough to allow a good hose clamp connection to be made.

With the oil system changed according to the drawings, which is an absurdly simple operation when you come to look at a Ford motor and realize how close it already is to being an airplane power plant, and with the magneto and the water and carburetor alterations made, there is very little left to do to make the motor a complete airplane plant except the fitting of stacks and the fitting of controls.

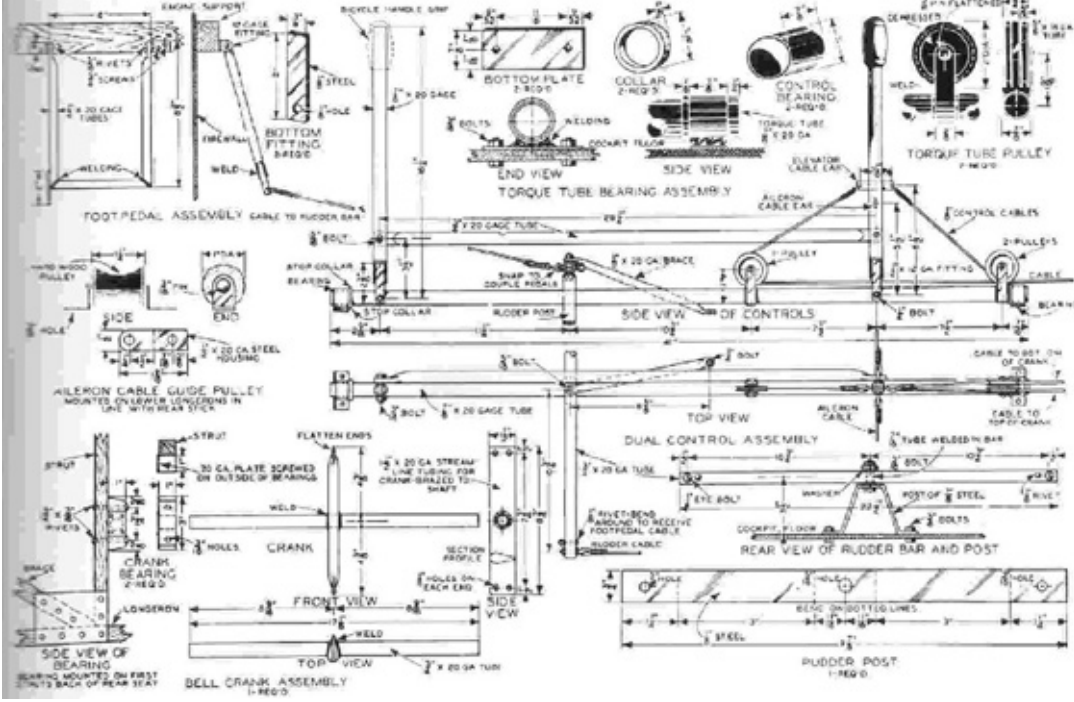
The end plates for the crankshaft and for the cam gears are very simple and are shown in complete detail. They are cut out of 16 or 18 gauge plates and their cutting and fabricating can be done from cardboard patterns made direct from the motor. The method of making the cup for the oil ring previously mentioned can plainly be seen also.

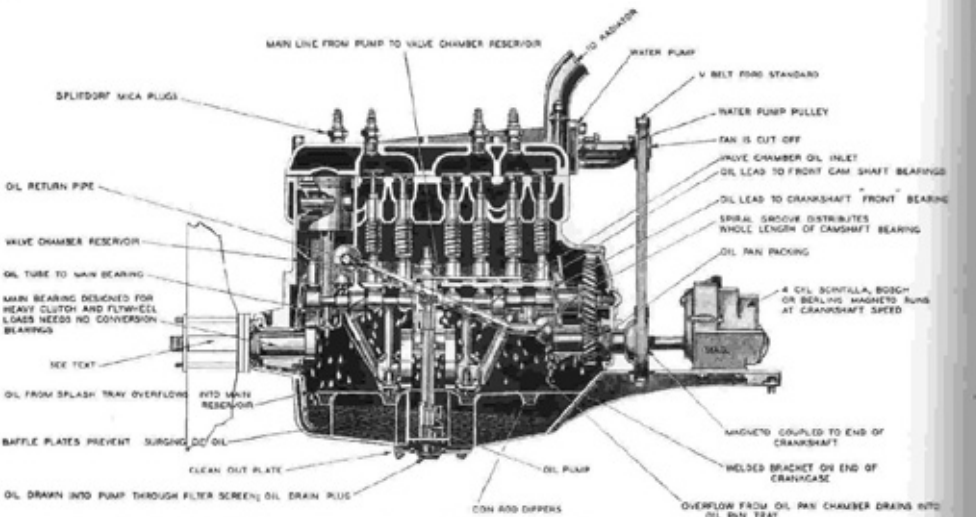
The method of making the tachometer fitting and putting it to the end of the camshaft is simple. A ⅜ in. hole is drilled in the center of the camshaft and the 5/32 in. center-drilled rod for



Graph of the power curve of the Ford Model A motor conversion; 1600 rpm's deliver 35 hp.

Here's the drawing showing all the details of the ship's control system.





This is a sectional drawing of the Ford Model A engine as it is built for automobile use. The prop and the magneto mounting have been drawn in to show where they fit. Compare this illustration with other drawings in this article and you can visualize how little needs to be done to convert the Ford auto motor to airplane use. Designer Pietenpol recommends 1600 rpm as the best speed to run the motor; the engine develops about 35 hp at this rate.

the tach drive is fitted in.

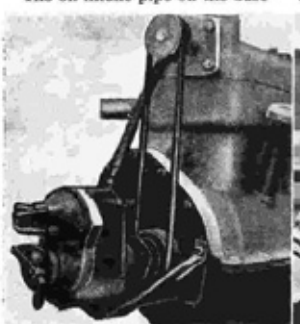
The dimensions for the exhaust stacks are shown in the drawing. They are made of 20 gauge tube and have tabs welded on them to keep them in place under the hold-down bolts.

Dimensions for the hub plates of 12 gauge cold rolled steel are shown in full.

The oil intake pipe on the base will have to have a slight bend made in it to allow the water pipe to pass.

The radiator is a half section of a war surplus MF flying boat radiator. I can supply you with these if you cannot get them from any local supply house.

There is also being run with this article the full size cross sectional view of the Ford motor as it is used in an automobile. The parts used in the car are left in the drawing, with the exception of the magneto mounting, and the prop is shown in phantom drawing to prove to you how very little needs to be done to the Ford motor to make it an airplane engine. By comparing this drawing with the other two full page illustrations, you will be able to see



Here is the magneto installation, showing the special bracket welded and bolted to motor.

Oiling system of Model A motor must be changed for use on airplane.

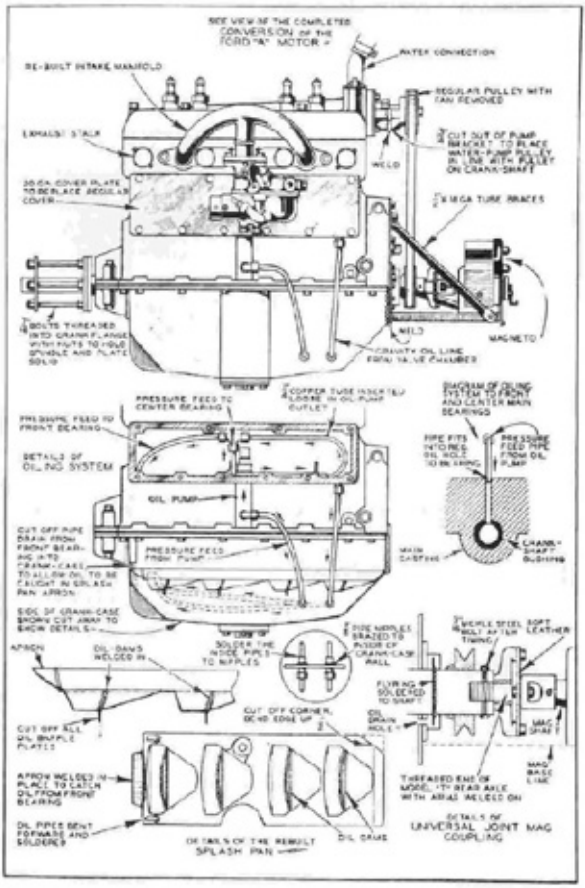
what little difference there is between this engine and the so-called converted one, which really is not converted at all — just "adapted."

I also append the power chart for the motor, which will show you airplane design fans what you can expect from the motor if you use it as I have here. If you want to design your own ship this curve will show you what power you can expect and what the revs will have to be. Note that at 1,600 revs there is plenty of "soup" left in the old gal yet. And there will have been very little falling off in torque at these rpm's. That is why I chose 1,600 as being the best revs to run the motor at.

In use, treat the engine like you would any other airplane engine. Don't take off with a cold motor, and watch your mixture and your motor temperatures very closely. A remote temperature gauge should be used and the motor ought to be run between 140 and 160 deg. Fahrenheit.

And that just about covers all that need be said about the Pietenpol Motor Conversion, simple as it is.

You'll find the engine simple and dependable — one easy to repair, and capable of carrying you and your crate thousands of miles. •••



The business end of Allen Rudolph's Air Camper.

Tomorrow's home-builder gives the Pietenpol a once over.