Is BIGGER BETTER? Does a more powerful engine always improve the airplane? . . . any airplane? Which engine would be the "best one" for your project? What are your options?

You should explore these as well as quite a few other questions before you finalize your own specifications and plunk down a lot of money for an engine that may not fit your needs.

Because engine availability, at any given time, is so unpredictable, it is never too early in a project to start thinking about your engine requirements. Such a determination is an especially important one because a good engine will gobble up approximately 1/3 of the total cost of your project.

ARE YOU SURE YOU'LL NEED AN ENGINE?

An engine is a major expenditure and it is one that should not be rushed into until you are absolutely, positively sure you will be needing an engine in the first place. Here is what I mean.

As most of you know, an airplane project, traditionally, begins with the construction of the tail surfaces. This is logical because in doing so you will have ample time to become thoroughly acquainted with the type of construction you will be using to build the wings and the rest of the airplane.

Successfully completing the tail surfaces could be ample proof of your determination and stick-to-it-iveness . . . but will you be able to persevere until you bring to completion what may well be the longest project you ever attempted?

Since tail surfaces ordinarily represent but a relatively modest cash investment, this first stage of construction can be considered to be a shakedown period. During this time, any disenchanted builder could elect to abandon his project, should he make that decision . . . and a number of builders do just that, citing some very compelling reasons for doing so. Have any of these ever crossed your mind?

"I found the design was not what I really expected it to be and I am no longer interested in it."

"I really can't spare the time for building an airplane."

"I found that I lack the patience to develop my skills (much less learn new ones) for building an (all-metal/composite/wood or tube and fabric - pick one) airplane."

"Building from 'scratch' involves too much work and takes too long. Besides, I can't afford the cost of a kit project . . . not without depriving my family of the little luxuries they deserve."

"My wife told me, 'Either that airplane goes or I go'."

And so it goes.

WHAT'S YOUR OWN VERDICT?

I'll bet most of us can cite more reasons and excuses for giving up a project than anyone else can possibly dream up for continuing one. Unfortunately, it is a situation some of us might have to face someday.

Terminating a project is never an easy decision to make but, in the long run, for some builders at any rate it might be in the best interest of all concerned to do so if the slightest doubt about continuing a project exists.

Cheer up . . . if your workmanship has been adequate, and you do feel compelled to abandon the project, you can always sell it and your special tools to recoup some of the costs. Then, with a clear conscience you can charge the rest off to education and recreation.

But more likely you ARE enjoying the project and are satisfied that your work is structurally sound. Not only that, you are probably just as eager to continue as most builders are at this stage - and you would NEVER entertain the idea of giving up your project.

With that somber discourse out of the
way, let's square off and face that next big decision you will have to make sooner or later, namely determining which engine you think you want for your airplane.

This, too, is a difficult determination to make because of the large number of options you and you alone control.

**WHAT ENGINE DOES THE DESIGNER RECOMMEND?**

Each aircraft design is developed around certain engine options. A good clue as to the engine best suited for your project might be ascertained from the engine the designer installed in his prototype. In addition, his literature will undoubtedly stipulate the horsepower range the aircraft was designed to safely accommodate.

Some builders are bad about ignoring the designer's horsepower limitations and often go ahead on their own and install a much larger engine - with or without the designer's approval - hoping to achieve superior performance. To avoid this, they should consult the designer's literature pertaining to the engine they wish to install, and elect to install a larger engine only if the designer recommends it.

This can be a dangerous thing to do. Why? I'll try to tell you why by citing a few worst case scenarios as examples.

It is unlikely that your aircraft's structure was designed to handle engines much heavier and more powerful than those few recommended.

Anyone building from a kit quickly learns that any small modification you make seems to compound problems and affect other parts. For instance, if you elect to install a larger engine you will find that the furnished cowling will not fit it without major surgery. The exhaust system, too, may have to be modified.

Be advised that engines more powerful than those specified by the designer will produce higher thrust and torque loads than those the structure was designed to handle safely. To avoid exceeding the gross weight and G loads specified, such an engine should be derated with mechanical control stops.

In addition, substituting a heavier engine will upset the design weight and balance calculations, and may force you to reduce or eliminate the baggage allowance. Furthermore, you might have to redesign and build a shorter engine mount and maybe add ballast (that's dead weight, son). Carrying this line of thinking further, a larger more powerful engine will require a larger propeller. To accommodate that increased propeller diameter, longer landing gear legs may have to be built in order to assure a safe ground clearance for the propeller.

And that is not all. A more powerful engine will ordinarily cost more, initially, and will gulp down more fuel. Therefore, unless you also increase the aircraft's fuel capacity somehow, the aircraft's flight duration will be definitely reduced.

Increasing the fuel capacity can solve that problem but creates another. You will be adding still more structural and fuel weight. Consequently, although the aircraft's range may be increased with the added fuel capacity, the overall performance may suffer because your payload will be reduced and/or your gross weight will be increased beyond its design limit.

Here's still another glitch. Although an increase in horsepower generally produces a shorter take-off, and a better climb, don't think for a minute that the attendant increase in top speed will be something phenomenal. It won't be. The reason, of course, is well known.

Doubling the horsepower will not double the top speed . . . far from it. The boost in top speed is often disappointing and seldom does a builder see anything over a 25% increase . . . and that would be with the fuel flowing through the engine like a stream of water flushing down the toilet.

Consider this observation for the overkill. Most of the more powerful engines are high compression engines and have to be fed that expensive 100 octane low lead aircraft fuel. That means you may not be able to use auto fuel in your airplane . . . and you know what that will do for your fuel costs when you are burning over 10 gph.

A WORD ABOUT ENGINE MOUNTS

Some builders have the mistaken idea that they can elect to use either a conical mount or a dynafocal mount with the engine they acquire. This is not true. The engine you get can only take one kind of a shock mount, no matter what your personal preference may be.

If you are a kit builder, you will have to decide which type of engine mount to order with your kit. If, for example, you specify the conical mount, then your engine search will have to be limited to those engines designed to take a conical mount. Or, in other words, if you already have an engine, order the mount to fit it. Otherwise, select the mount type (dynafocal or conical) you want, and look for an engine to fit the mount.

A dynafocal mount is considered to be the superior type of shock mount. Its large rubber discs cushion engine vibrations better than do the smaller cone shaped rubbers of a conical mount.

However, don't assume that a conical mount is something to avoid. Far from it. Anyway, I doubt if most pilots can tell what kind of engine shock mount is in-
PLANNING TO USE A CONSTANT SPEED PROPELLER?

A new fixed pitch non-certified ("homebuilt") wood propeller may be obtained for approximately $500.

A fixed pitch certified metal prop will cost, roughly, $2000 new. Unfortunately though, most high performance homebuilts, using engines of 150-180 hp, require propellers having a much higher pitch than those available for commercially produced aircraft. You would, therefore, have to buy a metal propeller and have it repitched...if you can find a propeller shop willing to work on an experimental propeller.

Constant speed propellers (Hamilton, etc.) cost approximately $3000 to $5000, depending on your source.

In addition to the high price tag for a controllable propeller, there are also other negative aspects. In the first place, the engine you expect to use with a controllable prop must:

1. Have a hollow crankshaft...unless you intend to use an electric propeller or some other propeller control system.

2. Have provision for a propeller governor.

If the engine can meet both of those requirements it can accommodate a standard constant speed propeller...but be prepared to cope with the extra weight. That propeller, with its governor installed, will weigh around 60 pounds. (Fixed pitch wood props weigh less than 20.) So, as in the case with a larger engine, you will be confronted with an increase in the aircraft's empty weight, and a new weight and balance problem.

WHAT ABOUT AUTO ENGINE CONVERSIONS?

Except for the perky little VW conversions, the more powerful auto engine conversions (130-180 hp) are still a rarity on the average airport. Someday when you see three or more airplanes of the same type equipped with the same kind of auto engine conversion parked side-by-side, you will know that auto conversions have arrived and are becoming a serious alternative to the somewhat stodgier aircraft engines. However, that day is not yet close at hand.

A new 150 hp aircraft engine (Lycoming) does cost more than a custom built new auto conversion of similar power. However, the aircraft engine is a certified engine with a proven track record. Your new auto conversion will carry no such assurance, and it will be strictly experimental in the literal sense of the word. This is especially true when it is built up by a non-expert engine mechanic with a limited number of precision tools at his disposal.
The relatively few homebuilts flying with the more powerful auto engine conversions are most likely to be found installed in biplanes and in larger aircraft with wing areas that can handle the extra weight.

Letting it all hang out might be O.K. for this old Pietenpol, but that concept is unacceptable for a high performance modern design. However, tightly fitted cowlings make it very difficult to locate the large radiator effectively.

On the other hand, a good used aircraft engine will cost less than a new auto conversion and yet that older, mid-time aircraft engine can be expected to accumulate more hours than the auto conversion before it will have to be overhauled.

For example, I understand that the reduction unit alone can cost about $2600 for a 6 cylinder auto conversion. Then, there are other costs you must absorb in addition to the cost of a new or low mileage basic engine core. Some of the build-up costs include but, naturally, are by no means limited to a radiator, hoses, carburetor, starter, ignition system, special hardware and machine shop work. Add these items all together and I'm afraid the costs could approach the cost of a newly overhauled aircraft engine.

So far nothing has been said about an auto engine's biggest drawback - WEIGHT. Weight for the power produced.

Because the auto engine conversions (Ford/Chevrolet/Oldsmobile, etc.) make bulkier and heavier installations than most comparable aircraft engines, they cannot be readily squeezed into the average homebuilts.

In general, you can figure that an auto engine conversion will weigh approximately 50-75 pounds more than an aircraft engine of similar power (125 hp to 200 hp range). Some of the weight claims made for the auto engine conversions may fail to include the weight of the radiator, coolant, hoses and sometimes an accessory or two.

What counts is the all-inclusive flying weight of the installation ... and that generally will be significantly heavier than an ordinary aircraft engine.

As a result, the few homebuilts flying with an auto engine conversion on board are usually found in biplanes and in designs with larger wing areas ... say, over 100 sq. ft.

Many years ago, way back in the early 1930s, Model A auto engines were being installed in Pietenpols. Later, Corvair conversions were also tried in the venerable aircraft. Both of these engines were comparatively heavy for the power produced. However, the installations were fairly practical because the Pietenpol had a rather large wing area and the slow turning engine swinging a large diameter prop was positioned close to the wing.

You probably have noticed that the newer Pietenpols, using the lighter aircraft engines, have had their fuselages and engine mounts extended for weight and balance reasons to compensate for the absence of the original heavier engines.

Conversely, replacing a light VW or Rotax type engine with a heavier aircraft engine of similar power is also a potential trip for the builder.

Many builders still distrust the VW's and the efficient 2 cycle engines and try, instead, to squeeze a typically larger and heavier 65 hp or 85 hp aircraft engine into what generally happens to be a very small engine compartment space.

This, of course, has a drastic effect on the weight and balance if not handled properly and, of course, requires drastic cowling modification to enclose the bulkier aircraft engine. Examples I have in mind are the attempts to re-engine Sonerais, Dragonflys, Quickies, PL-4s and similar small sport planes.

PROOF OF THE PUDDING

Year after year the annual CAFE 400 efficiency runs prove that the aircraft with the bigger engines are not necessarily the fastest and most efficient.

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