Single Stick Pusher

OLD TIMER Model of the Month

Designed by: Harry Edsall

Drawn by: Al Patterson

Text by: Phil Bernhardt

How many pushers, single or twin, have you seen at the last few Old Timer rubber contests you've been to? I thought so. Except for pusher-only events, such as the one recently held by the SCAMPS (see the Dec. '78 "Plug Sparks" column), these types of models are rarely flown in competition. The general feeling seems to be that pushers just can't hack it when pitted against the tractor type ships.

Which is just so much foof, as far as I'm concerned. My first O.T. rubber ship, built about 10 years ago, was a twin pusher from plans published in some obscure 1929 model airplane book. It was the type of model that would bring tears to the eyes of any hard-core O.T. purist . . . non-free-wheeling props, single-surface wing, bamboo ribs and wing tips, and exposed motors. The thing flew exceptionally well, and had I been able to keep one long enough, I probably would have done well in competition. But the models (I built a total of five) had a habit of flying away; at least three are lying in the badlands of Taft, slowly bio-degrading into nothing.

Single pushers are excellent performers also. The one we are presenting this month was designed by Harry Edsall, of Springfield, Ohio, and was published in the August 1933 issue of *Universal*

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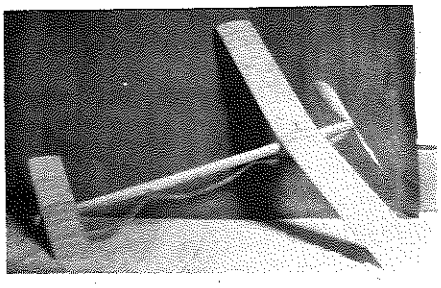
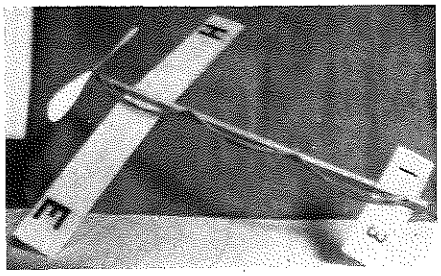
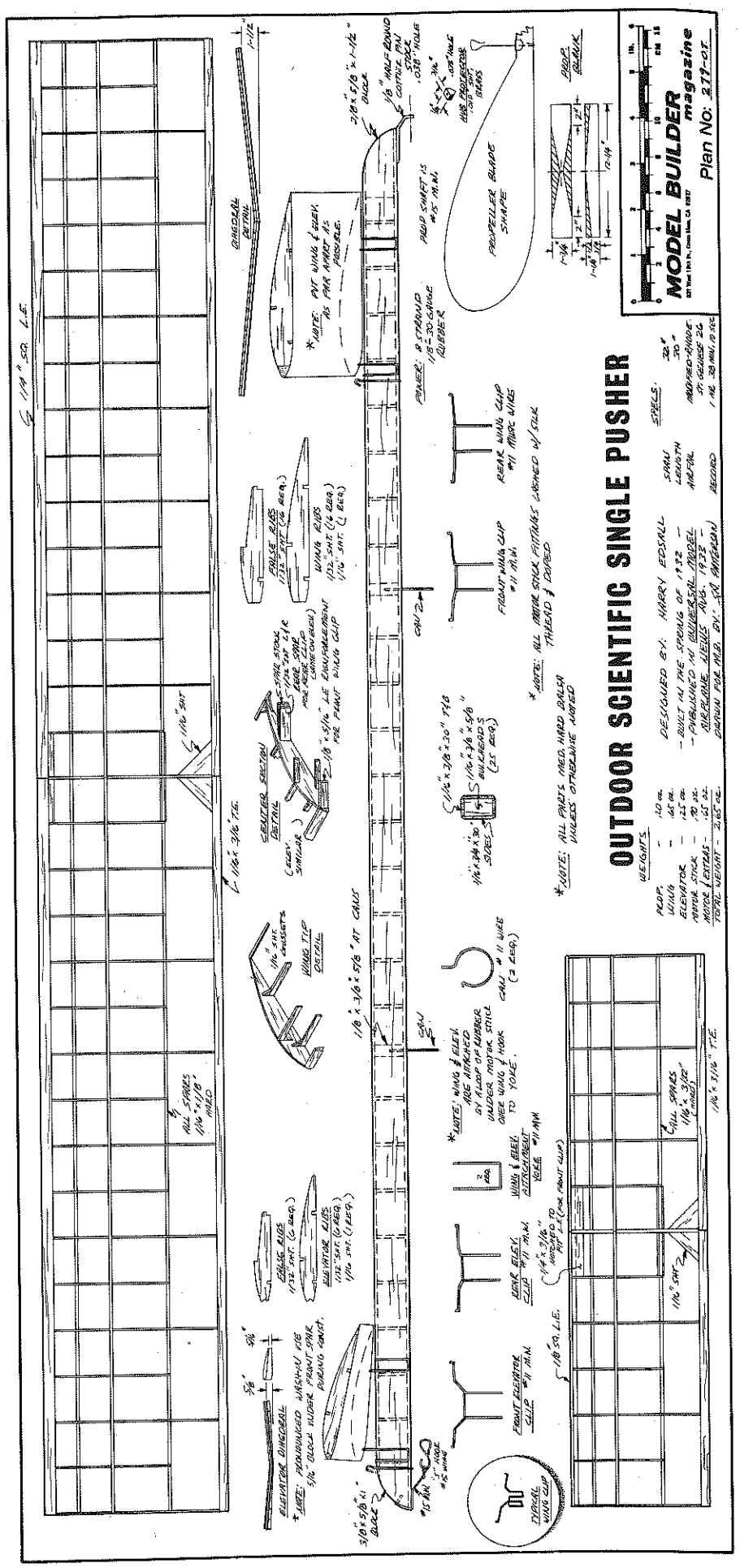




These are the same photos that appeared in the original 1932 article in M.A.N.



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by the crankcase pressure of the engine. Crankcase pressure is a result of the displacement of the engine. When the piston is at top dead center, the case pressure is one factor. When the piston comes down, it compresses the gas in the case equal to the amount of displacement. Normal engine design yields about 3 lbs. of base pressure. The problem is that the 3 lbs. is practically constant, no matter what the rpm may be. Thus, if you need an increase of fuel pressure, this system cannot provide it. If we use a fuel flow adjustment (needle valve in our case) which is set on the ground, the only way the fuel flow can be increased is by increasing the pressure. With a set amount of pressure available and a fixed adjustment for fuel flow, we have a problem when more fuel is needed. While Terry did not have a specific answer to the problem, he was good enough to confirm my own findings. Apparently, a number of modelers in his area, from various aspects of modeling other than Pylon racing, have seen the problem, even though to a lesser degree than I had. This confirmed my feeling that it was a problem which is affecting us all, and if an answer could be found, we all would benefit from it.

Terry indicates that some work has been done with carburetor venturi design, resulting in some improvement. The reasoning behind this is that the airflow through the carburetor is linear to the rpm of the engine. If a venturi can be produced which will provide a lower pressure than a normal type does, then this amounts to the same thing as increasing the pressure on the other side of the needle valve. Probably, experimenting with the shape of the venturi can be of some advantage in this respect, however, experience indicates that any *real* gain can only be had by reducing the size of the venturi opening (throat). Inasmuch as the power of our engine is directly related to the amount of fuel mixture it can absorb in each revolution, keeping the largest size venturi possible is most important. Apparently, the best that can be had from this approach is a compromise, and a compromise is never the final answer. . .

For my part, I can say that I found a "fix" which worked quite well and allowed me to continue my experiments, which were with propellers. However, the in-flight mixture control which I resorted to is not the cure needed. We need a system which *automatically* feeds the needed amount of fuel, no matter what the rpm may be. Terry provided some ideas, confirmed that the problem is widespread, and opened the door to any others out there who may have some ideas. They certainly are welcome!

A final request before closing this month. It probably is much too important to be winding up as the tail end of this column, but better here than not at all! The AMA of the U.S.A. and the MAAC of Canada have initiated a program to update and enliven FAI Pylon racing. A considerable amount of effort and work is being put into the program, with the hopes of adding to our pylon racing sport. The goal is to increase this racing activity with a resulting World Championship and all the prestige that goes with it. This can only add to the image of *all* pylon racing. It is fortunate that as things now are, this event can revert back to scratch and become something much different than it has been. It is admitted that the event has not been popular in the past, but there is also no reason why it could not be a premier racing event. What apparently is needed is an event which would be attractive to a great majority of R/C'ers. We need to know what type of a racing event would be most attractive to a large number of modelers. Any ideas which you may have in regard to the FAI Pylon event would be greatly appreciated and can be directed to me. •

to preserve the precision fit between the crankshaft and crankshaft bearing. Nothing will ruin this bearing quicker then an out-of-balance prop. Choose a prop of low pitch that will allow your engine to really turn up *without* putting a strain on it.

Continued next month. •

R/C Forum . . . *Continued from page 25*

Other than what is the difference between types of batteries, the question most often heard is how to use the Ni-Cd batteries to get the most from them. There are some simple guidelines which, if followed, will provide as good a performance as can be expected, without using a very sophisticated procedure. Let's list such a simple procedure.

CHECKING THE CONDITION OF NI-CDS

Pusher . . . . . . *Continued from page 44*

Model Airplane News, under the title "Build this Pusher that Goes Places". The title refers to the fact that on June 17, 1932, Harry's model set an official N.A.A. Outdoor Scientific Single Pusher record of 1 hour, 38 minutes and 10 seconds, and covered a distance of better than 8 miles. That's pretty darn good for *any* model!

Besides being an interesting change of pace, this little ship could do well in today's O.T. rubber events. Or, if you really want to shake up the troops, modify the design slightly and fly it in the P-30 event that is rapidly becoming popular. The wing would have to be shortened by one false rib bay on each tip to get it down to the 30-inch maximum allowed, and the fuselage would have to be shortened an inch or so, so that the total length, including the prop, does not exceed 30 inches. Also required are a stock 9-1/2-inch free-wheeling plastic prop and no more than 10 grams of rubber. Keep in mind that if

you make these changes, the model will no longer be legal for Old Timer competition.

As is the case with many O.T. models, no balance point was shown on the original plans. So, to get an approximate starting point, we used the formula on p. 20 of Frank Zaic's 1935-36 Yearbook, and came up with a balance point 4-1/4 inches forward of the l.e. of the wing. From there on, you're on your own.

If you build one of these models, be sure and let us know how it flies, and if possible, send us a photo! •

Instructor . . . . *Continued from page 11*

the tip speed too high in flight, resulting in extremely high in-flight noise as well as too high a vibration level. In this case, a 15x5 or 14x6 is the better choice to keep the tip speed down.

Propeller efficiency is a subject we haven't touched upon and this is as good a place as any to insert it, as it will play a large part in proper propeller selection. Generally speaking, a large propeller turned at lower speed is more efficient than a smaller propeller turned at high speed. I have been told by many engineering types that in most cases, the highest efficiency is obtained at around 600 feet/second tip speed. This would mean that an 11-inch prop should be turning at around 12,000 rpm in the air for maximum efficiency. Also, it is commonly said that a wider blade prop will be more efficient than a narrow blade prop of the same pitch, due to Reynolds Number, so the problem becomes very complex. The problems we are beginning to face with our higher speed engines are similar to the problems faced by the turboprop engines, and the solution may be the same: small-diameter multi-bladed props with wide blades.

The present solution to this problem for our large models has been the belt drive system, which works because the efficiency loss in the reduction unit is less than the efficiency gain of the larger propeller. The long term solution to this problem may be in engine design. Quite likely, increasing the stroke and decreasing the bore to bring the peak of the horsepower curve down to a lower rpm to enable us to use more efficient propellers will occur in the future, especially in larger engines.

While on the subject of propellers, some important safety tips are in order.

First, never use a prop with a crack or chip in it; second, use only a good reamer to change the hole size to avoid cracking the prop (the Fox 2 and 4 step reamers are ideal for this); third, don't throw anything into the prop to stop the engine; and fourth, wear some type of eye protection when running any engine. I also highly recommend the exclusive use of hardwood props. Plastic or nylon props (non-glass filled) of over 10-inch diameter should never be used, and no plastic or nylon propeller should ever be used on a high-performance engine larger than 1/2A.

Well, enough kibitizing on propellers. I guess I'd better answer those letters.

Dear Dave: With my limited experience in pattern, I was wondering if the direction of roll in the four-point and slow rolls makes any difference. Does engine torque play a factor? Should I just do it the way it feels most comfortable? Stephen Morinoto.

Dear Stephen: This is a difficult question to answer with any authority, but I'll give you my ideas on the subject. Many full-scale aerobatic pilots as well as aeronautical engineers have told me that rolling left (with the torque) is better, as it requires less control surface throw for the same roll rate, which results in fewer problems with slowing down while rolling. A few top pattern fliers have been proponents of always rolling toward the judges (roll right when going left to right and roll left when going right to left), as they feel this looks better to the judges, while some others roll in one direction for the slow roll and point rolls and in the other direction for the three rolls to take advantage of using more roll rate in one direction than the other. Now that all the above theory is out of the way, I'll tell you that I always roll right, as it is the most comfortable for me, and I've always scored well on rolling maneuvers, so you can draw your own conclusions.

Dear Dave: In your column in **Model Builder** *you have given several trimming tips and all are helpful, but for the novice beginner, where does one start? Could you give a step-by-step trimming method, explaining what each should do, what to look for when it is not correct, and how the next trimming step can interact with the previous one?*

I think there are many novices who just don't realize how difficult it is to trim for straight and level flight (normal and inverted).

Also, the novice doesn't seem to realize the importance of takeoff and landing maneuvers and they seem to practice more on the flying maneuvers.

I suggest that a trimming plan, step by step, perhaps one step each month with explanation, would make good material

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