

Top, close-up of tank, modified engine and landing gear detail. Above, simple modification of Cox "D" handle, drill holes, lace through.

Above top, before and after of standard 290 backplate. Use knife to trim excess plastic. Above, modified 290 engine with 1/32" short steel brackets.

► To the best of my knowledge, here is the first 1/2 A control line plane designed especially for the Cox "290" .049 engine. It is not only an excellent trainer, but it is the least expensive 1/2 A Proto plane (semi-profile) that a Junior can build and expect decent performance from.

So what's with this 290 jazz? Actually, it is an outgrowth of the Cox 190 engine, designed in 1961 for their Shinn plastic ready-to-fly plane. Today, the 290 is the replacement engine for all the Cox ready-to-fly planes that require an engine without the tank being an integral part of the engine.

At first glance, you will notice that the crankcase and cylinder look like the ones used on the famous Babe Bee. Well, you are right—almost that is. However, the 290 cylinder has two bypass grooves—thus making it more powerful than the Babe Bee. And with the Tee Dee .049 "trumpet" glow head (part #1702) you have more power than a Medallion .049, and almost the power of the Space Hopper .049. Check Chart #1 for comparative RPM's of these engines.

There were several different production versions of the 190 series engine. The first one used one bypass groove in the cylinder and was used in the Bendix Racer, P-51 Mustang, Super Cub, and the L-4 Grasshopper.

It was found that additional power was required for a few of the heavier ready-to-fly planes such as the Stuka, Helldiver, A-25 and the T-28 Advanced Trainer. All of the engines in these planes use two bypass grooves for the cylinder porting and the power is noticeably improved. The standard 290 en-

CHART #1		
COX .049 ENGINE	ENGINE	COMPARISON TESTS
	GLow HEAD	RPM
Medallion .049	302-1	14,750
Medallion .049	*1702	15,500
290 (Stuka)	302-1	15,000
290 (Stuka)	*1702	16,000
Space Hopper	302-1	16,500
Space Hopper	*1702	17,250

All tests were made with the same Cox 6-3 prop and Thimble-Drome Racing Fuel.

Weather conditions: Temperature—70°; Humidity—38%.

\* 1702—High compression glow head is standard equipment on Tee Dee .049 engine.

gine is equipped with a low compression head—like a Babe Bee.

The type of needle valves used has changed several times. The first ones were solid brass with a tension spring and washer. For some time many needle valves were a two piece affair with a yellow poly propylene extension molded over the brass thread portion. No spring was supplied with that set-up, since a slit was cut in the threaded area and filled with nylon. It worked fairly well, but after several flights would not hold a setting. The latest version is a one piece brass needle valve with a spring (no washer this time). A longer brass needle valve is used in the A-25 and T-28, but is hollowed out for lightness. 'Nuff said about the needle valves. . .

Biggest distinguishing mark of the 290 engine is the all-plastic backplate

and carburetor housing. A regular Babe Bee reed (and reed retainer ring) is used for fuel admission into the crankcase. Hence, the engine will run in either direction—a great asset as will be pointed out later on.

The big disadvantage (for any modeler) of this type of backplate mounting was that it would only fit into a Cox ready-to-fly plane. Once the plane was crashed beyond repair, it was of no further value to the individual unless he spent a little over three dollars to get a conventional Babe Bee fuel tank assembly. Needless to say, not very many went to this extra trouble and expense. Probably the majority of these engines are still in a desk drawer or possibly have been given away.

Every year, several hundred thousand of these engines are produced and sold in Cox plastic planes. The source to a modeler is virtually unlimited. For many years, this 290 engine sold for \$3.49 and just recently went up to \$4.49. Yet, in spite of the very reasonable price, it never did gain modeler acceptance for two reasons: Most modelers were not aware of its power potential; and even if they were, there was no real obvious way of mounting it in their particular plane.

Because of these reasons, the "290 Special" was designed and built to see what could be expected (performance wise) of this engine with a relatively simple mounting bracket. As you can see in the picture, the "excess" plastic was cut off the backplate and two symmetrical brackets are used to hold the two brackets to the backplate and four #3 x 3/8 long wood screws hold the (Continued on page 42)

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### 290—Special

(Continued from page 13)

"bracketized" engine to the basswood or hardwood mounting plate on the front of the plane (see plans).

Both of the engine brackets are symmetrical. But it may be necessary to elongate the wood screw holes for final alignment. Naturally, for best results, the engine should not be pointing up or down. A small T-square laid on the bottom of the wing can be used to quickly check the alignment with the propeller.

With this type of mounting, the frontal drag is comparable to that of a side mounted Tee Dee .049. Plus, it has an additional advantage as the needle valve is considerably further away from the propeller as compared to the Tee Dee version. Less chance of "nicked knuckles" this way. . . .

On the 290, the needle valve assembly is considerably more trouble free than a Tee Dee, as a simple spray bar with one hole is used to meter the fuel. The Tee Dee metering system involves 3 small holes in the venturi and they can get clogged quite easily and cause hard starting or, if it clogs during a flight, will cause a lean run.

For ease of operation in this particular plane, the needle valve was placed on the inside of the circle to minimize breakage or bending in the event of a crash or nose-over landing.

Very little work is involved in cutting the excess plastic off the backplate. Some of the earlier 290 type engines used a plastic material that was "milky" in color, but it had the same dimensions as the red ones. And for a short time (around 1963) several thousand 290 engines were made with an aluminum backplate. These were the ones that were used in the Spook stunt plane (all plastic kit). Here again, these were made to similar dimensions as the red plastic ones.

Therefore, it doesn't make any difference which backplate you use. They are all basically the same, except for the two different length needle valves. Here, we would suggest using the short ones, as the thread area will last longer.

Very little need be said about the construction of this plane. Only a few areas may need additional explanations.

First, the Veco tank forms a major portion of the strength of the front of the plane and should be securely glued into position. Before placing the tank into the plane, it is recommended that the two air vent tubes be removed and "capped" and a new single air vent be installed for best performance.

This new air vent is made from annealed 3/32 O.D. brass tubing. If you have never annealed brass tubing before, it merely means passing it through a flame until it gets red hot—then letting it cool off. After it is cooled, you can bend it as shown on the drawing AFTER it is soldered into the tank. Be sure to file a 45-degree bevel on the end of the tube before soldering it into the tank (see sketch or plans).

The reason for this type of air venting is two-fold. It not only gives a consistent peak engine run, but it also prevents raw fuel from splattering all over the plane when the engine is running.

Filling the tank can be accomplished in two ways. One way is to transfer the fuel into the air vent tube and hold the plane "nose down." With this method the needle valve must be open a few turns to let air in the tank escape during the filling process. When the tank is full, you will hear a "hiss" in the needle valve body.

The other way is to disconnect the fuel line from the engine and fill through the fuel pick-up tube. Now, you will have to hold the outside front corner of the tank high. When the tank is full, it will squirt out the air vent tube.

Engine should be peaked out before releasing plane with this type of venting.

The landing gear wire is recessed into a ¼ thick basswood piece just in front of the tank. Use a #11 Exacto blade to cut this groove area. Then the front firewall is glued onto the front of this piece. Make sure the wood grain direction on the two pieces agrees with the plans.

If the plane is to be used for a trainer, you may leave off the rear brace as a bouncy landing is not objectionable. But if the plane is to be used for ½A proto, the brace wire is recommended as it will prevent vibration at higher speeds. Vibration will rob the engine of power—and, consequently, slow the plane down.

The long elevator horn and reworked perfect bellcrank assure a less sensitive control system—a must for two-line flyers. Even a Cox plastic control handle can be reworked into a very fine adjustable handle. If you use string lines, be sure they do not stretch under tension. If they do, the handle adjustment will change during the flight. Although steel lines are more expensive, they are by far best. But more care must be exercised in handling them.

For added strength, the entire plane can be covered with either silk or Silkspan, and then given several coats of fuelproof dope or epoxy paint.

If you want to put a really fuelproof finish on in a hurry, by all means use a new covering material called "MonoKote." This is a pressure sensitive material that is applied directly to the wood and bonded with the aid of heat from an ordinary clothes iron. This covering material is available in several colors and is in plentiful supply.

Chart #2 shows the results of actual flight tests. All flights were made within a thirty (30) minute period of time. The control handle was in the pylon within the first lap on every flight to assure accurate proto speeds.

The same standard 290 engine was used in all the flights. However, the glow head used was a #1702 "trumpet" type—High compression. Fuel used was stock Thimble-Drome Racing Fuel.

Weather conditions were as follows:

Temperature:	75°-78°
Humidity:	46%-42%
Wind:	0 to 5 MPH
Altitude:	90 feet above sea level.

CHART #2

Five different propellers gave the following speeds:

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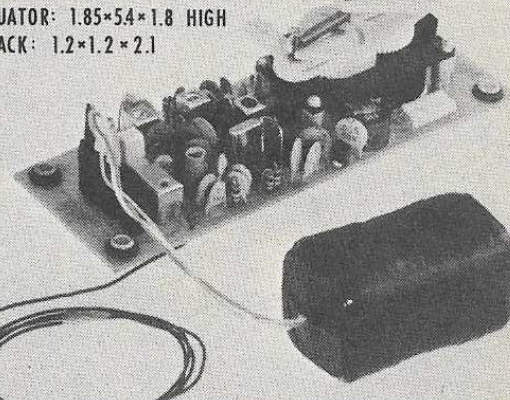
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Duty B105-2	.050 x 1.1 x 2.5	8.7	6-32	1.7 to 2.7	3.25
Models: B105-3	.060 x 1.2 x 3	10.3	8-32	2.7 to 3.5	3.55
B105-4	.080 x 1.5 x 3.2	12.8	8-32	3.5 to 4.5	3.95
B105-5	.100 x 2 x 3.5	15.0	8-32	4.5 to 6.0	4.25
Heavy B106-3	.080 x 1.2 x 3	10.3	8-32	3.5 to 4.5	3.80
Duty B106-4	.100 x 1.5 x 3.2	12.8	8-32	4.5 to 6.0	4.25
Models: B106-5	.125 x 2 x 3.5	15.0	8-32	6.0 to 8.0	4.75

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5-4 Cox (plastic)	54.42	56.12
5-4 Grish (wood)	54.85	58.15

One slight modification had to be made on the tank venting. After the first lap the engine started to run slightly rich—indicating one of two things. Either the fuel was too cold (not enough nitro) or too much air pressure was being rammed into tank, forcing more fuel into the engine than the needle valve called for.

Rather than change the fuel, a short piece of 1/16 O.D. aluminum tubing was pushed into the single tank vent. This decreased the amount of air pressure going into the tank and the engine held the setting perfectly from then on.

The reverse pitch prop aspect cannot be overemphasized, especially for beginners. By running the engine "backwards" with this type of prop, the torque rolls the plane away from the flying and keeps the lines tight from the moment the plane is released—'til the engine quits.

The lighter an airplane is, the more important it is for the counterclockwise flyer to use a reverse pitch prop. And the higher the pitch angle, the stronger the torque force becomes. It's a shame more kit manufacturers don't recommend the use of this type of propeller; and it would be of great benefit to every type of 1/2A control-line plane flown—including those flown with Mono-Line control.

As was mentioned earlier, the 290 engine will run in either direction, which makes it a natural for the reverse pitch prop. As a matter of fact, any engine that uses the reed type fuel admission principle will run

in either direction. For any Cox reed type engine, a spring starter is highly recommended to assure that the engine will start in the right direction the first time. Cox makes a special "left hand" spring for the 290 which is part No. 338.

Cox also makes a left hand crank shaft for their Tee Dee .049 engine, part #1705-L, and it sells for the same price as the regular crankshaft.

Therefore, there is no real reason why you, as a 1/2A flyer, shouldn't give this reverse pitch prop principle a try. Any good hobby shop already has the propellers and starter springs available.

This entire airplane can be built for less than ten dollars—and this includes the price of a new 290 engine. If you already have the engine, cost will only be around five dollars.

So let's dig through that ole junk box and see if you can't come up with a Cox 290 engine. It has a lot of miles left in it when you make this simple conversion bracket.

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