# MODEL AIRPLANE NEWS

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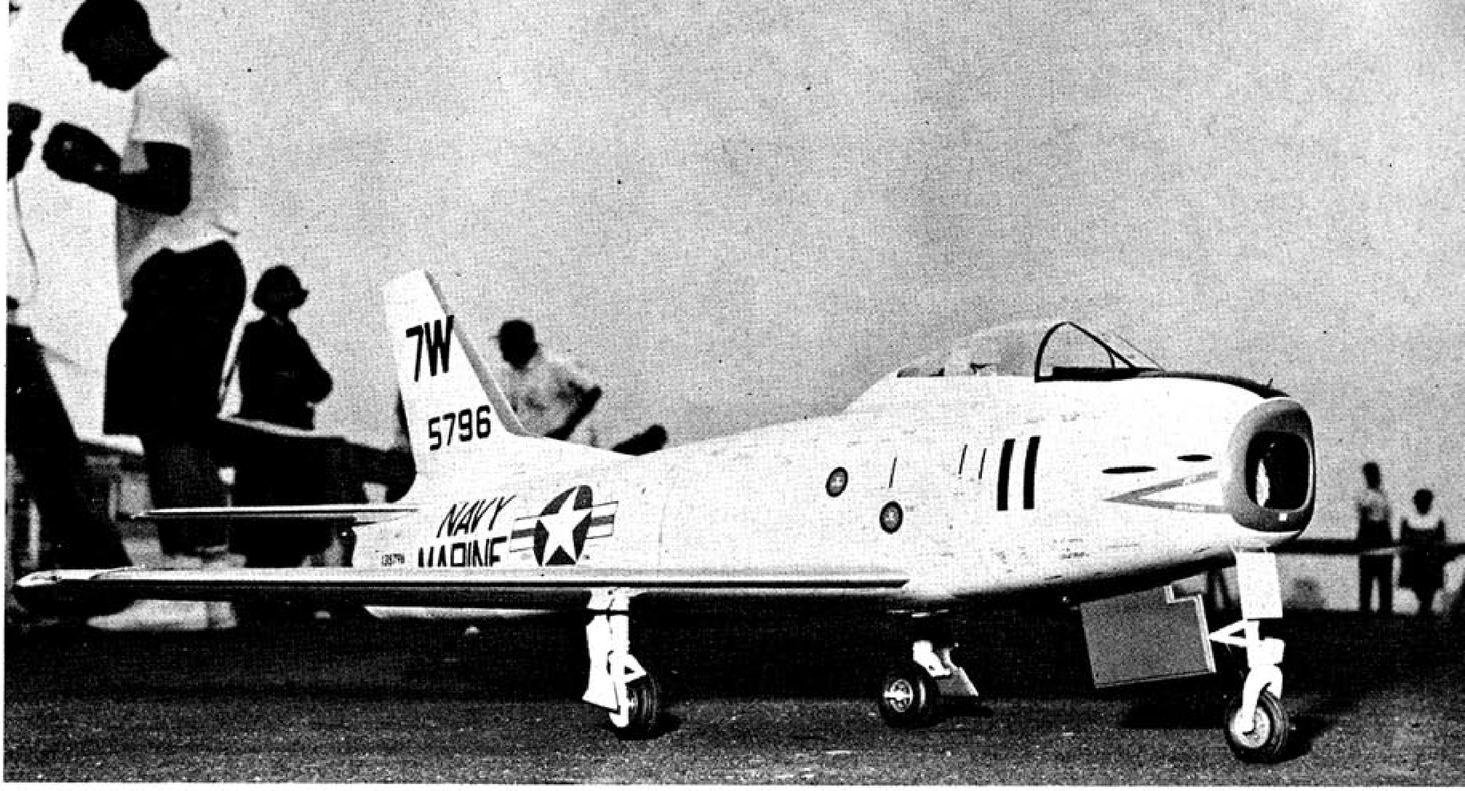
- WORLD FAMOUS ENGINE EXPERT REPORT ON 25 YEARS OF ENGINE FUELS.
- FREE FLIGHT SCALE BY WEST COAST'S TOP DESIGNER, ENGINE/RUBBER.
- ENGINE REVIEW LATEST .45 FOR R/C.

IN THIS ISSUE THE COMPLETE PLANS AND DATA TO BUILD THE EXCELLENT FJ-3 SCALE CONTROL-LINE WINNER SHOWN IN OUR COVER PHOTO.



MODEL AIRPLANE NEWS HAS THE LARGEST PAID CIRCULATION OF ANY MODEL AVIATION MAGAZINE

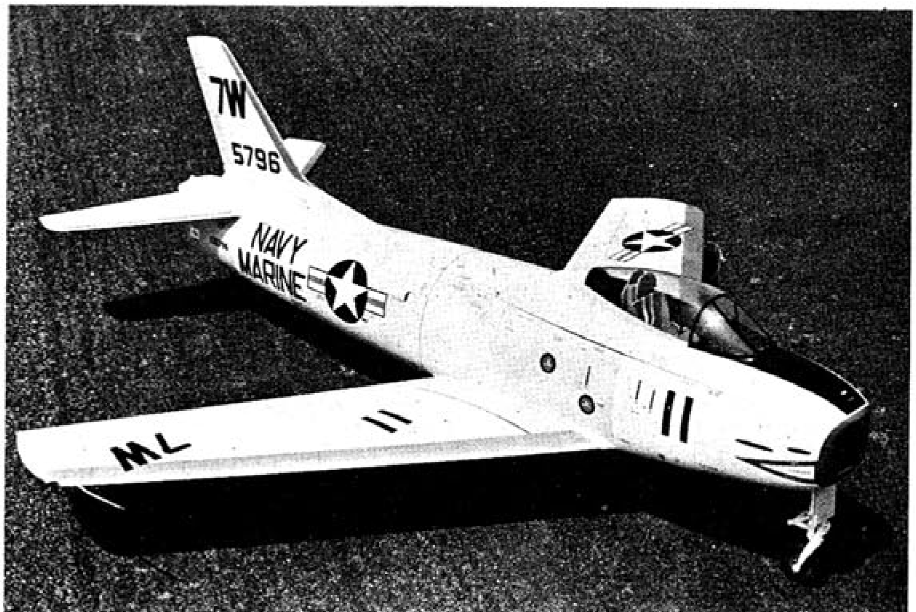



Powered by a Dynajet jet engine the Fury's (approx.) 8 pounds is adequately handled for good high speed flight on line lengths of 60 ft. or more.

# FJ-3 Fury

by JOSEPH COLES

NAVY'S TOP CARRIER FIGHTER TOP CONTROL-LINE SCALE MODEL FOR '61—WINNER OF OPEN SCALE AT THE NATS ALSO WINNER OF THE TESTOR BEST FINISH AWARD AS WELL AS MANY OTHER AWARDS FOR THE YEAR.




Reference to the color photo on the cover will show how our author faithfully reproduced the color scheme as used for the full scale aircraft. Scale detail from info supplied by manufacturer.

► Powered by a Wright J65 Sapphire turbojet engine, giving it a speed in the "high subsonic" range, the FJ-3 is a slightly heavier and larger airplane than the USAF "Sabres" from which it was developed. This airplane also sports a power boost controlled "all flying" tail in which the entire horizontal surface is operated for better control at high speeds.

The FJ-3 lends itself quite well in the 1 inch equals 1 foot scale to which the model is built with only two deviations from scale. The first, is a conventional elevator system rather than the "all flying" tail. Second, the tail end of the model had to be enlarged slightly to accommodate the Dynajet engine and to provide adequate cooling space for it.

Before proceeding with the construction of the model, it is essential that careful study be made of the plans. Although most of the construction is purely conventional, there are a few points that should be clarified and I suggest here, along with a study of the plans, that you read the article through to acquaint yourself with the construction steps.

FUSELAGE JIG – The fuselage is constructed on an alignment jig familiar to most of us. A board ¾" x 6" x 39" is used for the base of the jig with blocks 4" x 6" x ¾" nailed to it. These blocks are located on the base in positions that correspond with the former locations in the fuselage. Mark a center line on the top of each block, this will correspond to the center line of the fuselage when viewed from the top.

*(Continued on next page)*

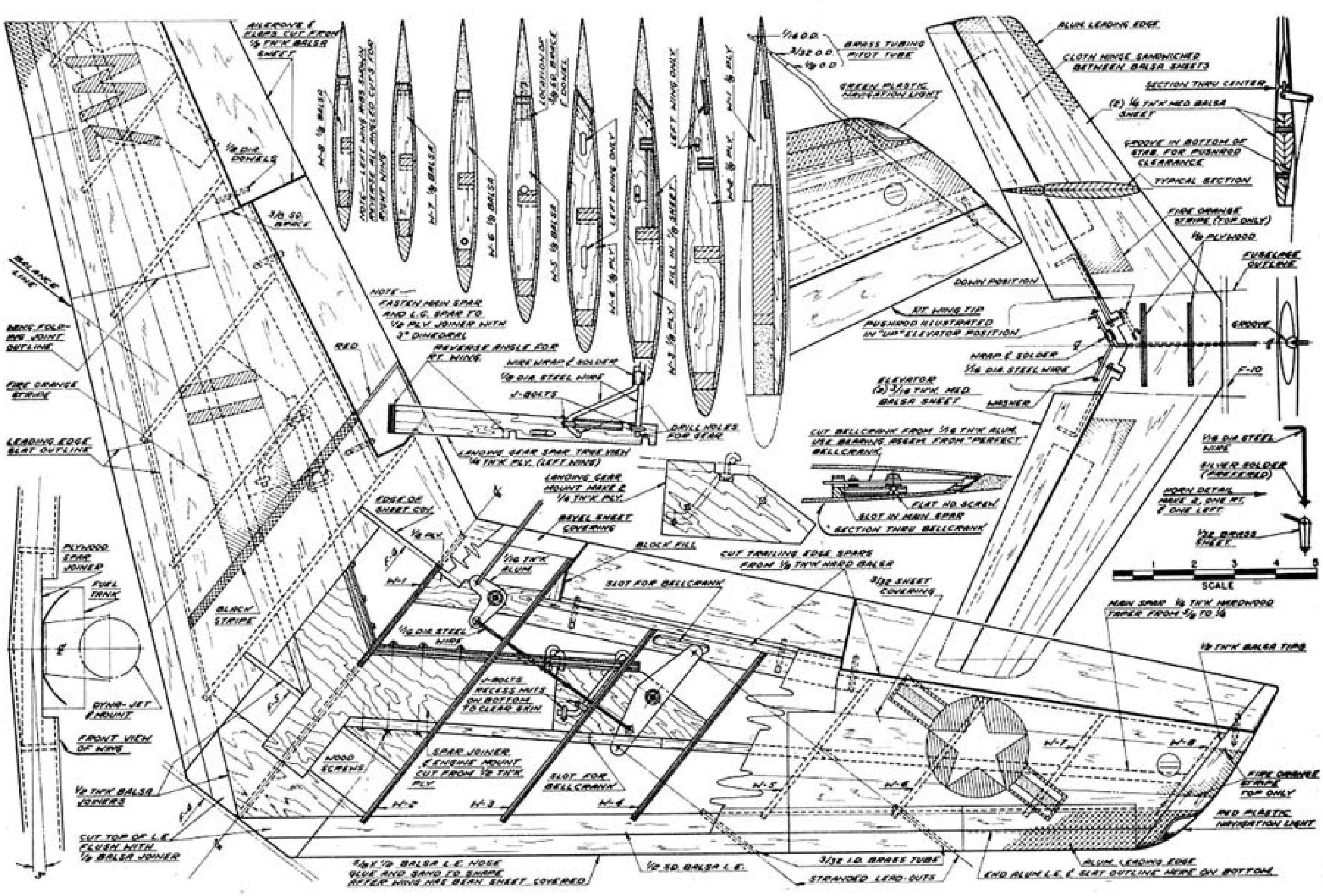
## FJ-3 Fury . . . continued

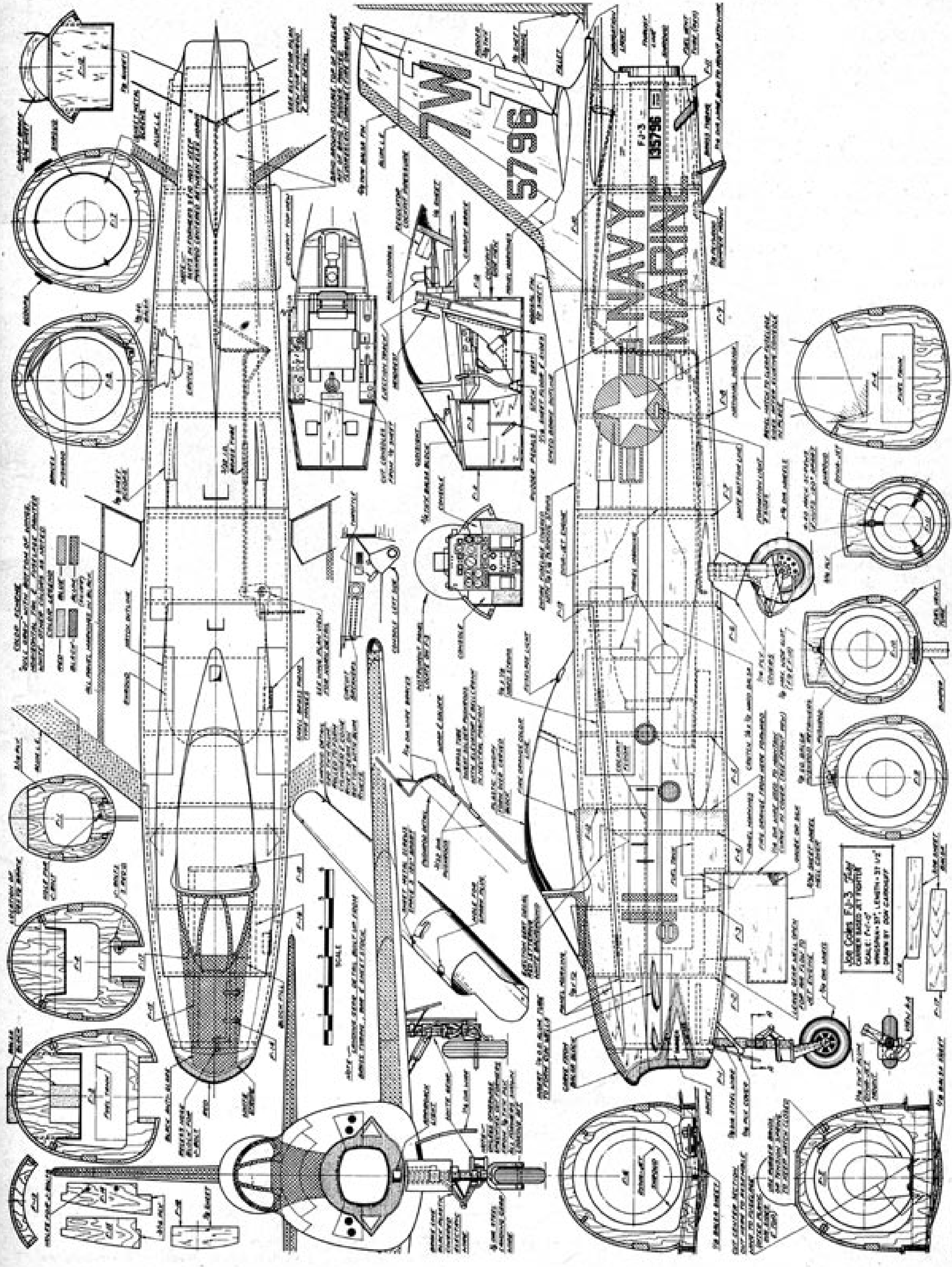
FUSELAGE – The construction is begun by fastening each former to its respective block, making certain the vertical center line of the former coincides with the center line mark on the upright jig blocks. The bottoms of the crutch notch, which are cut out in all the formers, should be located even with the top of the upright blocks. With the formers now all properly located, add the ½" x ¼" crutch strips on each side and the ¼" x ⅛" hatch edging. Use very hard balsa for the hatch edging as the hinges will be mounted to them. The tops of formers F-2, 3, 5 and formers 12 and 13 are now added. Glue the ½" x ⅛" brace in its proper location on former F-2, (this is used to support the top nose block). Plank the entire area above the crutch with the exception of the top just above the horizontal tail assembly from F-9 aft. This will be covered with sheet after the stab and elevator are added. Use ⅛" x ¼" or ⅛" x ⅜" planking strips. Add the top nose block and roughly carve to shape. Before proceeding further with the fuselage, the wing will have to be constructed.

WING – Building a swept-back wing entails much patience as it is difficult to/keep proper alignment and warp-free construction while building.

To start, cut spar joiner from ½" plywood, this is also used as a mount for the jet engine. The main spar and landing gear spars are fastened to the plywood joiners with glue and wood screws. Note that the spars are assembled at a 3 degree dihedral angle. A 3 degree template cut from cardboard can be used as a guide here. When laying out and cutting the ribs and landing gear spar, be sure to cut right and left hand units (all angled cuts made for right wing panels must be reversed for the left.) The main landing gear is former from (*Continued on page* 36)


Only deviation from actual scale is the conventional elevator in place of the flying tail and enlarging the tail to accommodate the Dynajet tail pipe and provide additional cooling for the hot pipe. Artype transfers available at most art stores can be used instead of preparing the screen prints and decals as indicated by the author.






FULL SIZE PLANS AVAILABLE. SEE PAGE 57.

not obtain amyl-nitrate for "European-type" diesel fuels, it is a fact that this material is actually marketed in the U.S. by the Ethyl Corporation under the name D. B.36). About the time that amyl nitrate and nitrite began to be used in European diesel fuels, castor-oil also started to replace mineral oils as the basic lubricant in contest type fuels.

One thing that needs emphasizing in regard to diesel fuels, in view of some of the optimistic claims that have been made over the years, is that, basically, there is very little difference in power outputs obtainable with various diesel fuels developed over the past dozen years. From time to time, articles have been published in the European model magazines. Some authors, claiming an intimate knowledge of fuel chemistry, have sought to prove that such-and-such a fuel formula will give superior performance. Those whose job it is to test engines, and contest modelers who use them, can prove otherwise. An assumption commonly made by the "experts" is that a fuel of high calorific value is the prime requirement and, for this reason, it has been stated that the mixture should contain as much as possible of the basic hydrocarbon fuel base—usually kerosene or premium grade (gas oil) diesel fuel—and as little as possible of ether, since kerosene and gas-oil have a calorific value about 25 percent higher than ether—which, it is alleged, is included only to aid starting. In actual fact, if any slight increase in performance is to be obtained by juggling with the constituent proportions, it is invariably found that this is realized with an increase, rather than a decrease, in the ether content. The value of increasing the ether content beyond the minimum quantity required for starting is that, like alcohol in glow fuels, the ether has a marked cooling effect and in modern high speed contest diesels it may be found that a high ether content fuel will maintain high output whereas a fuel of low ether content will result in loss of power due to overheating. The same two fuels used in an older type, slower-revving, engine, however, may show no detectable difference in performance.

For those who wish to mix their own diesel fuel, a good formula is 40 percent ether, 25 percent castor-oil, 35 percent kerosene, to which is added 3 percent amyl-nitrate. With a well broken-in ball-bearing type motor, the castor-oil content can be quite safely reduced to 20 percent. An alternative to amyl-nitrate is, as we have mentioned, amyl-nitrite, but this is less effective and may react on some castor-oils during storage and cause coagulation and the formulation of waxy deposits. A better alternative, and one which is closely similar to amyl-nitrate as a cetane improver, is isopropyl-nitrate.

*Modern Glow Fuels*

All commercial glow fuels consist, basically, of methanol, castor-oil and a nitro-paraffin—usually nitro-methane but occasionally 2-nitropropane. A standard type glow fuel may contain no more than 5 percent nitromethane, 25 percent castor-oil and the rest methanol. In a contest fuel, the nitro content may be increased to 30 percent, or even higher, and the fuel will be more costly. In between these are intermediate grades, sometimes claimed to be contest fuels, containing anything from 7 to 20 percent nitro.

Most modern engines put out all the power that the average modeler needs, on standard type fuels, and the use of a fuel with a low or moderate nitromethane content is definitely advised with all engines for the first few hours of their life, unless otherwise specified by the engine manufacturer. As a rule, the smallest engines, such as the Half-A's, will take a hotter (i.e. higher nitro content) fuel, when new, than, say, the .29's and .35's.

For contest work of course, nitromethane fuels can offer big dividends. This has been exploited by many modelers and, in an effort to extract the last ounce of power, nitro percentages have been boosted as high as 70.

One of the difficulties which arise with efforts to introduce large quantities of nitro into methanol/castor mixes, is the immiscibility of nitromethane with castor-oil. Normally up to 50 percent nitromethane can be mixed with a solution of castor-oil and methanol. If more than 50 percent is desired, it is necessary either to introduce a stabilizer into the mixture, of which nitro-benzene is the most commonly used, or to replace all or part of the castor-oil with a polyoxide synthetic lubricant, such as Ucon LB.525 or LB.625 produced by the Union Carbide Company.

The past quarter-century has certainly seen some big developments in fuels and it would be no exaggeration to say that some of the more exotic brews are capable of doubling the horsepower output obtainable on the old white-gas/SAE.70 mixes. At the moment, the FAI regulation straight methanol/castor formula applies only to international class speed and even if it should be extended to take in other World Championship events, such as FAI free-flight, we believe that development of other fuels will continue. In Great Britain, for example, a considerable amount of experiment has been going on in Class B team racing fuels and in 1961, aided by such materials as isopropyl-alcohol, benzyl-alcohol and benzene, leading contestants have succeeded in boosting laps to the point where only two pit stops are necessary for the 10 miles and times cut to around the 6:40 mark.

In this article we have endeavored to sketch the outline of model engine fuel development since the earliest days of the quantity-produced model gas engine. Obviously, it is impossible to cover the whole subject in the length of a single article and we have not, therefore, spent too much time on descriptions of individual formulations. For beginner and expert alike, there are some very good fuels on the market, but if you are intending to blend your own mixes we would, (unless you have specialized knowledge of fuel chemistry) advise sticking to the recognized materials and basic formulations. Remember, when handling these materials, that practically all constituents are extremely inflammable, that many are highly toxic and that the vapors of some, such as amyl-nitrite, have a strong cardiac reaction.

We make no apology for repeating the warning: don't expose fuel near naked lights and don't inhale fumes.

## FJ-3 Fury

(*Continued from page* 12)

⅛" diameter steel wire and fastened to the landing gear spar with J-bolts. Add the ¼" plywood landing gear plates and the two remaining J-bolts that fasten the gear to this plate. It is necessary to counterbore about 3/32" deep on the bottom of the plates to recess the J-bolt nuts. Any protruding length of the J-bolts that will not clear the sheet skin should be ground off. Add the ribs, ½" balsa leading edge joiners, leading and trailing edge. Note that the leading edge is made up from two pieces, the ½" x "⅝ leading edge nose is not added until the wing has been sheet-covered. Install the bellcrank and horn, these units are cut from 1/16" thick aluminum with

(*Continued on page* 38)

## FJ-3 Fury

(*Continued from page 36*)

the bearing taken from "Perfect" or "Veco" bellcranks. Flat head screws are used in mounting both cranks. The wings are now covered with 3/32" thick balsa sheet. Add the leading edge nose and tips. Note that the sheet covering in the center (top only) is cut and notched to suit formers F-5 and F-6. It might be worthwhile to check the position of these formers against your wing as you proceed in its construction. The ailerons and flaps are cut from ½" sheet, these can be added permanently now or assembled after these units and wing have been painted. The latter procedure will give a more scale-like effect. The fuselage can now be removed from its jig and the wing joined to it. It will be necessary to cut-out the bottom center section of former F-5 to accommodate the plywood spar joiner.

With the wing in place, install the pushrod, this is built from 3/32" diameter wire with 1/16" diameter wire braces. The pushrod is built in 2 sections with a 3/32 I.D. brass tube joining them, this tube is temporarily tack soldered in place so you can check the movement of the control unit and rod. A word of caution, it is absolutely essential that this pushrod, when viewed from above at the aft end of the fuselage move back and forth on the fuselage center line. The grooves in F-9 and F-10 when cut no wider than ⅛" will allow this type of action. If the pushrod is allowed to move from side to side at this end the split elevators will not move evenly with respect to each other.

Add the nose wheel-well siding and gear mount. The edges of these units should be sanded to the contour of the forward formers to allow the planking strips to lay evenly. Form the forward nose gear from ⅛" diameter steel wire and attach with three J-bolts. The bottom half of the fuselage from the crutch down can now be planked.

TAIL SURFACES—The stabilizer and elevators are built from two layers each of ¼" and 3/16" balsa sheet respectively with the hinge material sandwiched between them. Placing the hinge inside provides for better surfaces when applying your finish. The fin and rudder are simply cut from sheet, carved and sanded to the section illustrated.

Before adding the stabilizer and elevator, cut-out the hatch to allow access to the pushrod with the stab and elevator joined to the fuselage assembly and the pushrod connected to the bellhorns. Adjust the controls by locking the bellcrank in neutral, heat the brass tube connecting the pushrod sections until the solder flows. Raise or lower the elevators to neutral and hold in this position until the solder solidifies. Complete the sheet covering above the stab and cement the fin in place.

The dummy cockpit is added to the hatch. Note that the left console (when viewed from the front) is beveled to clear the hatch edging.

The canopy is made by carving a balsa mold to the required shape. Plexiglass heated to 350 degrees is held on a platform with a hole cut in it the shape of the top view of the canopy. The balsa mold is pushed into this hole and held there until the plexiglass has hardened. Trim off excess material and glue in place.

The hinges are now fastened to the fuselage and when dry fastened to the hatch. A rubber band hooked on the inside of the hatch to the inside of the fuselage will be sufficient to hold it in place.

As heat is a problem with enclosed jet engines, it is necessary to provide an aluminum baffle around the engine.

This is formed of 20 thousandths aluminum. It is made in two sections held together with sheet metal screws. The two sections will make it easier to put it through the hatch opening. The engine is positioned by means of 3 bolts in the rear of the baffle tube. They serve to center the engine in the tube as well as center the whole assembly in the rear opening of the fuselage.

The front of the engine is held by means of a yoke squeezed into the first cooling fin of the engine. This is held to the fuselage by means of 2 screws which in turn passes through the baffle into the plywood spar joiner.

It must be noted at this time that it is necessary that there be air space around the entire baffle except at the point where it is mounted on the spar joiner.

The model is now ready for painting.

After care is taken to remove any humps and rough spots, the model is given several coats of clear nitrate dope. (As the model uses only gasoline for fuel, fuel proof dope is not required.) This insures good sealing of all pores in the wood and leaves the entire wood surface uniform in hardness which helps in getting smooth contours in the final sanding. Upon completion of this to your satisfaction, the model is sprayed with several coats of autoprimer, wet sanded until all wood grain and glue joints are filled. Repetition of this operation will improve the end result.

The model is spray-painted with nitrate dope and lacquer.

The white is applied first over the entire model. The gray is added to the top except for the areas which will be covered with florescent paint. This is left white. We would suggest that you experiment with the florescent paint before applying it to your model. We had great difficulty in spraying this material to give us the desired results.

The silver paint is applied where indicated. Three coats of clear dope are sprayed over the silver and florescent paint and the entire model is polished with automotive rubbing compound.

The larger markings are cut from colored decal sheets. The small inspection plate stencils were copied from the original plane, set in type, photo-reduced to the proper size and screen-printed.

The lines indicating the wing slots, fuselage break, etc., are put on with an inking pen using thinned dope and a little retarder to help it flow better.

*Flying*

The model should balance a little noseheavy at the forward leadout.

In taking off, the model should be allowed to run on the ground until sufficient speed is obtained to allow it to become airborne on its own.

Yanking it off the ground without sufficient speed will result in a power stall from which you will be unable to recover. Jets differ from conventional prop jobs in that they do not have the prop wash passing over the tail to aid in the take-off. Jets depend on ground speed to accomplish this.