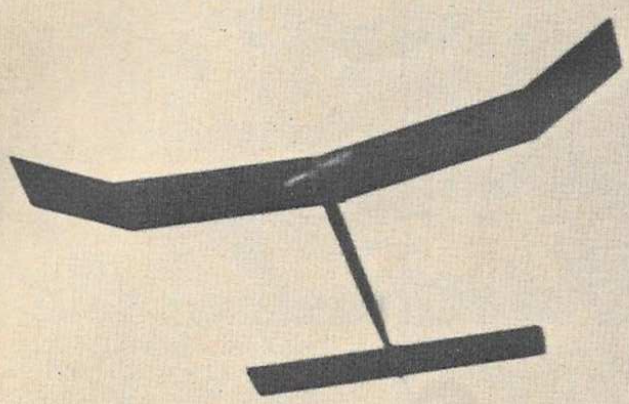
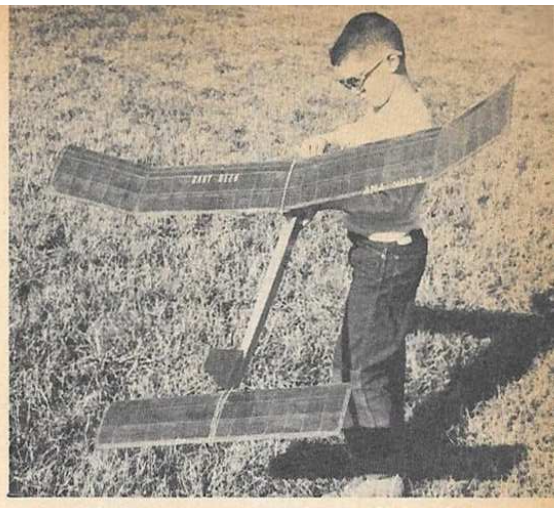
tempest "370"



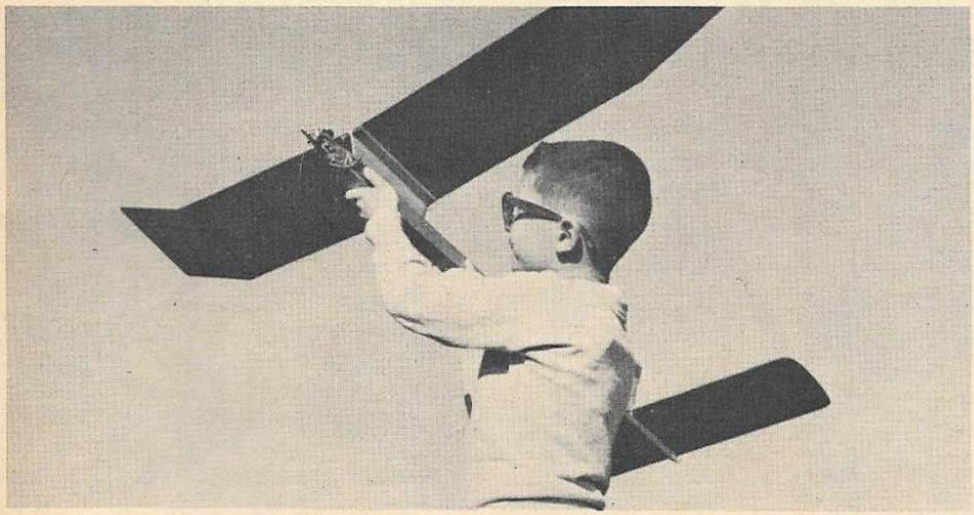
by FRANK HEEB

GOOD ANSWER FOR THE CONTEST-CONSCIOUS JUNIOR WHO IS NOT TOO CERTAIN HE IS READY FOR THE HI-PERFORMANCE OF FREE FLIGHT MODELS.



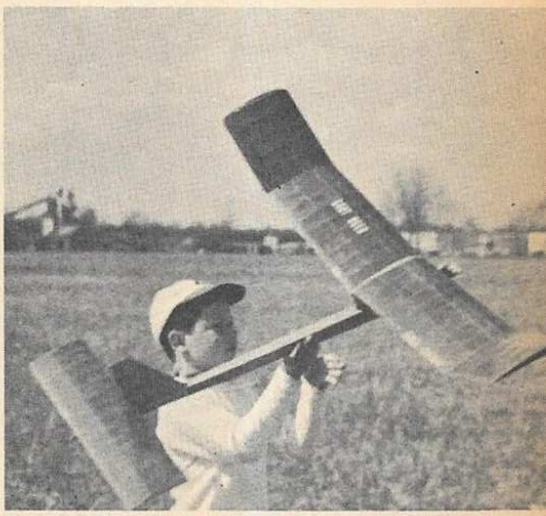
8-year-old Gary getting set for a flight. Just needs the balance of wing rubbers to be ready.

Important that the d/t fuse be properly lighted, can't have any flyaways to spoil it all.



Also important, that the fuel cut-off time be set properly, can't afford an engine over-run.

The way Gary is waiting, would lead you to believe that he has deliberately set it ahead.



Now everything is GO, and just hope it does! Picture at top tells you that all went very well.

EDITOR'S NOTE: *When our author submitted his article, he accompanied it with a letter that should be read by all who are interested in the Junior situation. To us, this represents the best and simplest approach to the Junior, design for him, work with him, accept him and the problem is no longer there. We are taking the liberty of publishing it in toto.*

* * *

►"I have built free-flight contest models since 1940 and won 2 firsts at the Nats; one of my rubber jobs was published in MAN, 7/54. The model presented here is an enlarged and simplified version of a Hornet job built and flown in 1960-61. This design is based on:

Ease of construction, standard sizes of wood, can be built fast.

High strength, low weight. 370 sq. in. wing with 7.2 oz. gross weight.

Simple design, constant chord surfaces, square fuselage, pylon.

Aerodynamically "average," no extremes of aspect ratio, moment arm, dihedral, areas, etc.

Very easy to adjust and fly, large enough to handle T.D. power.

Very good performance, fast spiral climb, extremely good glide.

"All these features can be seen by reviewing the

plans. Although most of the parts are used in the structure, nothing is complex except gluing the parts together. Accurate ribs, made from a template require only assembly to spars and leading and trailing edges with little or no sanding.

"I designed the model about a year ago, and my son, 8 years old at the time, decided to build his with mine. I made metal rib templates, told him what wood to use and "forced" him to use sandpaper more than he wanted to! (This was the only help given to him.) It was his second paper-covered gas model and went together quite easily for him. In fact, the larger size ½ A makes construction easy, since the parts are large enough to be handled.

"I built 2 models along with his one, and they all flew alike. Slight wash-in on the right wing and stab tilt were the only adjustments required.

"This model should appeal to the youngsters starting out and is certainly recommended over the small poor flying .020 model currently designed for beginners. .049 size engines start and run so much better, and such engines in a large easy-to-fly free-flight are a more sensible approach. And if my 8-year-old can build and fly this model, with just a little encouragement and advice, any of the Juniors can.

Pop takes time out to enjoy flying his Tempest. An old free-flight man, our author has always striven for simplicity of design and adjustment and Junior has forced him to do his best.

"As MAN well knows, getting the Juniors started is a problem. The juniors are not replacing the seniors and open; this was very evident at the Nats last year. An easy to build and fly contest model as this one should appeal to the youngsters and help get them started. Thus, I purposely left myself out of the photos."

Tempest 370 is not the ultimate product of a series of contest-winning designs developed during the last several years. Rather, it is the second model of a design that originated in 1961.

After building free-flight models of all sizes and shapes with high and low aspect ratios, thrust lines, CG locations, etc., with medi-

Tempest 370

ocre contest success, I decided to build an "average" contest model. I reviewed drawings of the Ramrod, Spacer, Starduster, Zeek, and other well-known winning designs of the past ten years. The Tempest is the result, its design features from the old winners are readily apparent.

Multispar wing and stab with medium aspect ratio and square tips are used for high strength and rigidity with low weight. Flat bottom sections, C.G. at 85%, low pylon, generous dihedral, and medium length moment arm with 35% stab all contribute to stability. The large B-52 type fin helps the model groove into its natural pattern; I have had models with undersize fins that flew in the direction they were pointed, an indication of marginal stability. I chose the pylon rather than high thrust for lightness, ease of construction and mainly because high thrust really hasn't shown me an advantage over the pylon. This is very evident in the International F. A. I. events; only pylons have ever won, and probably 90% of all finalists fly them.

The first model was Hornet-powered with a 330 sq. in. wing, 8.6 oz. gross weight for the old power loading rules. With no weight restriction and the new

Tempest

Tee Dee .049, the size was increased to 370 sq. inches, structure modified and weight decreased to 7.2 oz. Performance was considerably improved, proving one again that low power loading and low wing loading are the most important design factors of a contest model.

My 8-year-old son, Gary, wanted to build a contest free-flight, so the design and construction were simplified as much as possible. He had built a lot of plastic scale models, a dozen hand-launched gliders, a few small rubber jobs and one Tee Dee .020 free-flight kit. Actually, we found that the Tempest was easier to assemble and cover, due to its large size, than the .020 kit. We also found that flying was easier with the .049 size engine that has better starting and running characteristics than the smaller ones.

Building: Construction is simple and should be easy even for inexperienced builders. I decided to build two models (.049 and .051) while Gary would build one. This worked fine, as he can watch my methods of construction and duplicate them. I cut four fuselage sides, and he used one of them as a template and cut his two. Spars, bulkheads, fin, are made in the same manner. Wing and stab rib templates are cut of sheet aluminum; notches are filed to fit the spars and two small holes drilled so that the templates can be pinned to the sheet for cutting. Templates are also made for the dihedral doublers. A right angle template is used for trailing edge gussets, bulkheads, and other square cuts. We use Sig contest wood. First, build wing and stab. Trailing edge rib notches or gussets may be used; we find gussets easier and quicker. The spar web can be one piece as shown or individual pieces between ribs, but must fit accurately. The tips are ribs at a 45° angle. Cover with Jap tissue and dope. Warp a slight amount of wash-in, or positive incidence, in the right wing.

The fuselage structure is conventional, but here is an easy assembly method: the lower ⅛ sheet bulkheads under the pylon have the grain running horizontally and their top sides are in a straight line parallel to the fuselage top. This assures the correct wing incidence. The upper 1/16" sheet bulkheads have vertical wood grain. Build the entire fuselage less fin and pylon and cover it with tissue. Run a thread from the fire wall center to the tail end, and mark this centerline with pin holes for pylon and vertical fin alignment. Cement vertical fin to fuselage and mount engine unit, timer and stab. Place wing and pylon on fuselage top and accurately locate CG and pylon as shown. Cut the slot for the pylon using a straight edge parallel to centerline. Cut to the ⅛ lower bulkheads, fit the pylon in the fuselage slot and glue in. Use epoxy glue and gauze to attach firewall to the fuselage, also around all metal parts. Clear Hobbypoxy overall adds considerable strength to the tissue in addition to fuelproofing the surfaces. Use two coats on top of three coats of dope.

Flying: With the CG located as shown, 2° angular difference built in, and right stab tilt, model should hand-glide smoothly in a large diameter right circle. If even a trace of left turn shows up, add stab tilt until the model glides right.

No matter how much confidence I have in a model's stability, I like to start power flight cautiously by running the engine fairly fast for five-six seconds with the prop on backward. This will give a general idea of the power pattern and get the model high enough to establish the

glide pattern. Since most modern glow plugs engines simply won't run slow and smooth at a rich needle valve setting, this is the best way to let the engine rev with reduced thrust.

Power flight should be in a right spiral pattern, tyical of a nylon model. The right wing wash-in will always hold the right wing up, therefore, the model should be launched like a hand-launched glider: nose up at a medium angle with right wing down. This puts the model into its natural pattern. If too much wash-in or other warps indicate a left power tendency, force the model right with side-thrust and/or right rudder tab. What to use depends on the glide; if glide is OK use side-thrust, if glide and climb both need more right turn, use rudder. Left tab can be used to open up too tight a right climb. On our three models, very little of these adjustments were required. One of the models had a hotter engine and a little down-thrust, 2 degrees were used to get away from a "stair-stepping" tendency. We found that a thin blade 6-3 prop was the best choice for the Tee Dee engine in this airplane.

Full power flight for a 10-15-second engine run will show a steeper angle and faster climb but same pattern as the first prop reversed flights. Roll-out into the glide will be without dip or loss of altitude. Be sure the stab dethermalizer angle is the same as that shown on the plans. For models with this light wing loading sink very slowly when dethermalized.

Suggestions for working with the Juniors: Don't force a youngster into building a model. Either he has the ambition and skill or he hasn't and should be in some other hobby. Explain that a model this size can't be built in one night or in one week. Emphasize sanding, accuracy of glue joints, alignment of parts, etc. Make him weight conscious by weighing parts frequently and trying to trim wherever possible. Show him that sanding means reduced drag and better flights. Encourage him to do good workmanship, but offer constructive criticism to do better. Provide good tools; sharp razor blades, new sandpaper, good brushes and instructions on how to use these tools. Use good workable wood. Nothing can be more discouraging than to see a youngster suffer while trying to cut ribs from tough grainy wood with a dull razor blade. Help adjust the model and explain how changes of incidence, stab tilt, and rudder tab will affect the flight. Make only one adjustment at a time. Do a lot of test flying so that engine starting, fuse lighting, timer setting and launching comes easy. Good luck!