DE HAVILLAND 103

HORNET

Look — no wheels! RCM presents a budget version of De Havilland's spectacular Hornet twin engined fighter. The ultimate project for the schoolyard scale fan.

Designed by Gordon E. Whitehead

Photographs by Dick Spreadbury

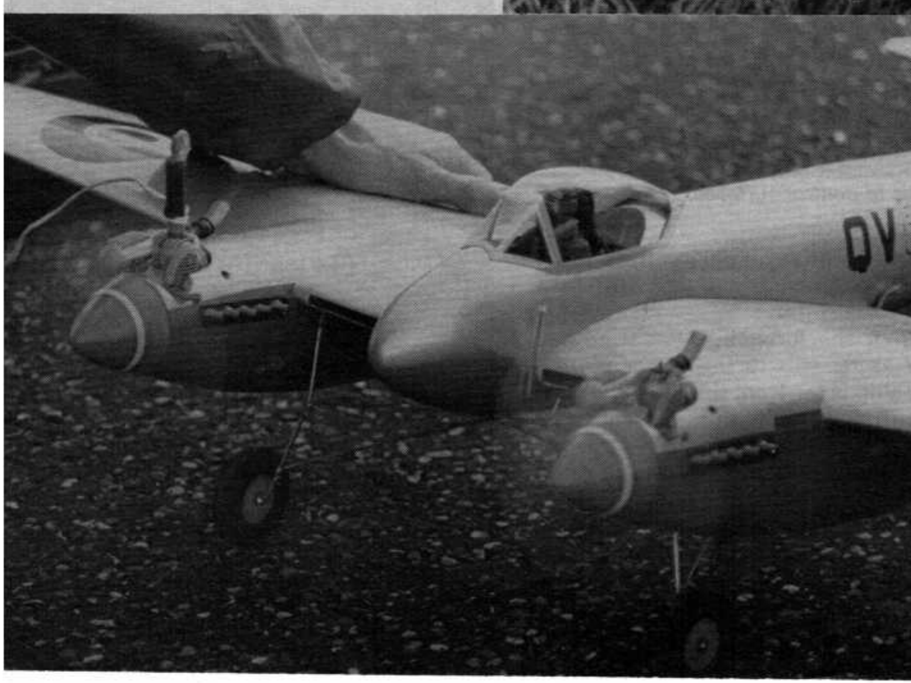
The DH Hornet was the RAF's fastest ever piston engined airplane, with a top speed of 472 mph. Conceived in 1943 as a long range fighter for the Pacific Theatre, it arrived just too late for WW II but was eventually to earn its keep in the close air support role against Malayan terrorists. A Sea Hornet was developed for the Royal Navy, and three of these were flown at the 1948 International Air Exposition in New York where they gave a flying demonstration which included loops with first one, then both engines feathered. The last Hornets in front line service were retired in 1955, but, unfortunately, all the survivors were scrapped.

I must admit that this model was made for as much as an experiment as for the fact that the Hornet has always been one of my favorites. Having flown a few hand launched belly-landed WW II single engine ships, one fact that I noted is the vulnerability of these models in a less than perfect landing. If the ground is bumpy, or if you have to land such a model cross wind or downwind, the result is often a cartwheel as one wing catches the ground and flips the model.

However, the wide-set nacelles of a twin are ideally placed to prevent the wing tips ever getting near the ground, and the Hornet is more ideal than most in this respect. It is fair to say that the experiment has been worthwhile. You can set this model down on a grass strip at frighteningly high speeds, say 40 mph at a guess, and the nacelles act like wide tracked landing skids, bringing her to rest quickly, stably and safely, though somewhat tempestuously if the ground is none too smooth.

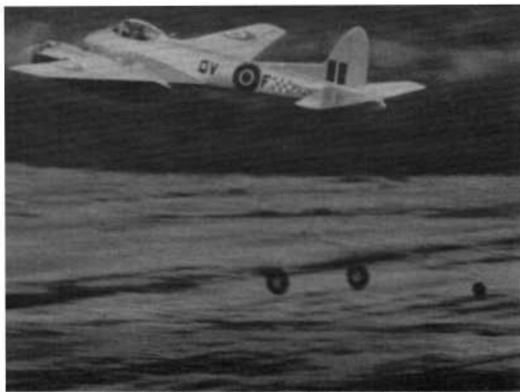
So much for the landings. What about the take-off? Well, initially I used the dolly exclusively and the method proved reliable. Set up as indicated on the plans, she'll lift herself smoothly into the air when operating from paved runway, but needs slight up-stick from grass. However, these days it is all hand launch. There's just enough fuselage beneath the wing for a good hand-hold below the C.G., and the twin set-up means that your launching hand doesn't get oil spattered. A firm heave-ho and she's on her way.

Right. So we've found that we don't need a landing gear. Just how practical are two cheap and cheerful .10s for a twin? How well do they throttle and stay in sync? The answer here is that the engines aren't a perfect pair, and they don't always stay in sync; getting them to throttle from idle to full chat and back exactly

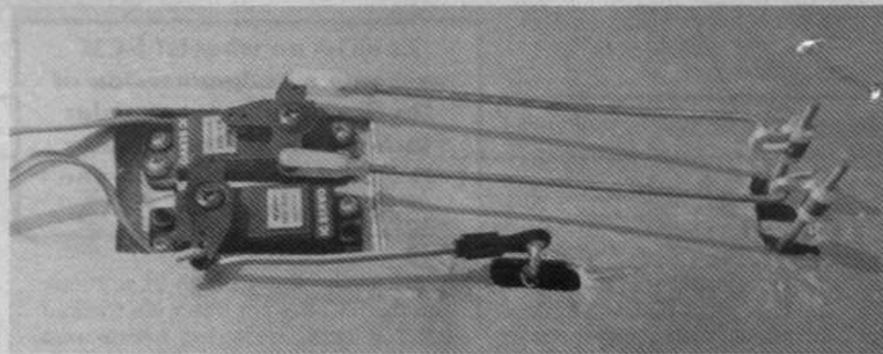


ABOVE: Prototype with O.S. .10s installed. Note muffler extensions to blow exhaust away from wing.
LEFT: Hornet rests on its dolly. This is used when a smooth runway is available.

in unison is just not possible. Fortunately, neither of the last two points matter. As long as both engines can be made to slow down to a fast idle without stalling, and to pick up to full throttle without cutting out, then you're in business. As a matter of interest, one of my .10s will open up from idle instantaneously, while the other takes three or four seconds to come up to full rpm's. One engine will out turn the other on the ground by about 500 revs, but, once in the air, the slow engine unloads more than the

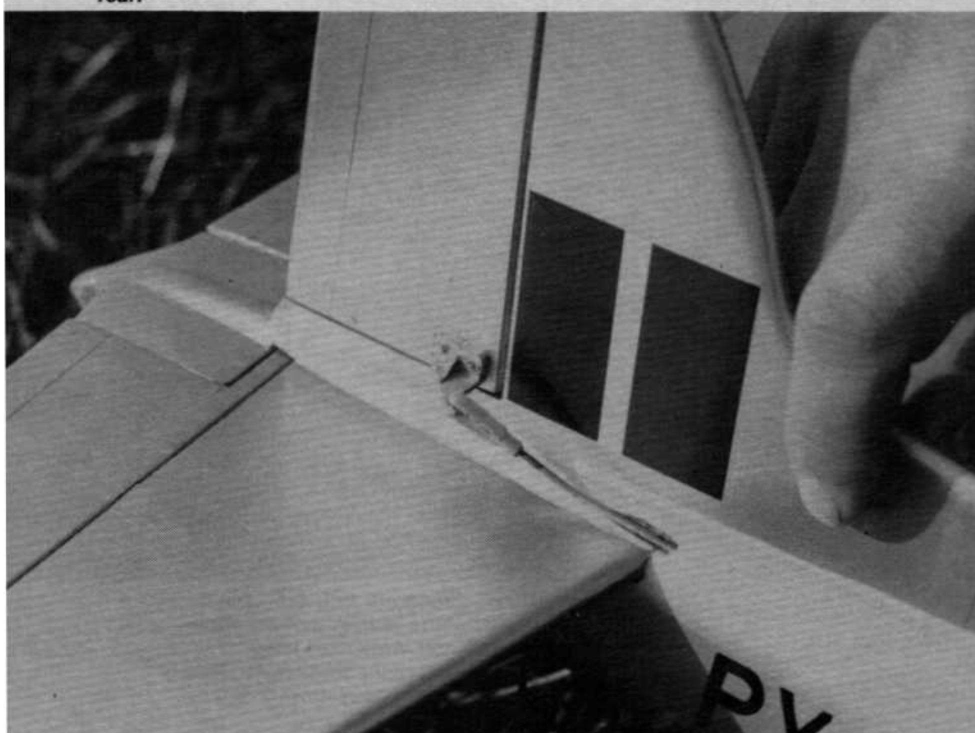


Hornet is airborne after separation from wheel dolly.



Aileron and throttle servos mounted in wing. Both operate torque rods with the throttle having pushrods at outer ends of torque rod.

Equipment layout with battery pack and receiver in nose and rudder/elevator servos at rear.



Tail assembly photos show simple straight linkage to control surfaces.

DEHAVILLAND 103 HORNET

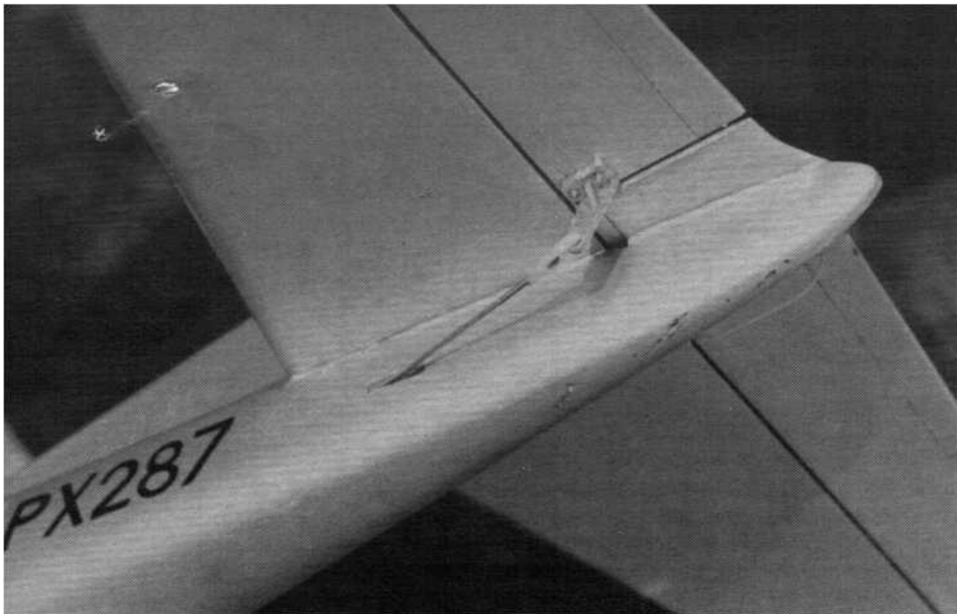
Designed By:
Gordon E. Whitehead
TYPE AIRCRAFT
Twin Engine Sport Scale
WINGSPAN
45 Inches
WING CHORD
8 Inches (Avg.)
TOTAL WING AREA
360 Sq. In.
WING LOCATION
Shoulder Wing
AIRFOIL
Flat Bottom
WING PLANFORM
Doubler Taper
DIHEDRAL EACH TIP
1¾ Inch
O.A. FUSELAGE LENGTH
36 Inches
RADIO COMPARTMENT SIZE
(L) 12" x (W) 2½" x (H) 1½"
STABILIZER SPAN
21½ Inches
STABILIZER CHORD (incl. elev.)
4⅜ Inches (Avg.)
STABILIZER AREA
93 Sq. In.
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top Of Fuselage
VERTICAL FIN HEIGHT
6¼ Inches
VERTICAL FIN WIDTH (inc. rud.)
4½" (Avg.)
REC. ENGINE SIZE
.10
FUEL TANK SIZE
2 Oz. Each
LANDING GEAR
None
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rud., Elev., Ail. Throt.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa, Ply
Wing	Balsa, Ply & Spruce
Empennage	Balsa
Wt. Ready To Fly	**60 Oz.**
Wing Loading	**24 Oz. Sq. Ft.**

fast one and they become more or less in sync. When you pull the model vertical, one engine will often slow more than the other, and sometimes in loops one engine slows, but picks up on the dive out. When one engine stops, all you need to do is throttle back on the live one to about 1/3 throttle and then use the residual thrust to help the ship to glide into position for a landing. The nacelles are too wide set for comfortable flight on one engine, though I have experimented with single engined flight and will talk about that later.

From the foregoing, you'll gather that as regards to the power plants, this ship is far from the ideal that the uninitiated might think essential in terms of throttling and engine-out capability. But, believe me, it **does not matter!** You can buy two of these engines for about the same price as one .20 --- you can build a fabulous



Another view of tail assembly showing simple straight linkage to control surfaces.

looking twin for very little outlay, and you can have a ball. So let's build.

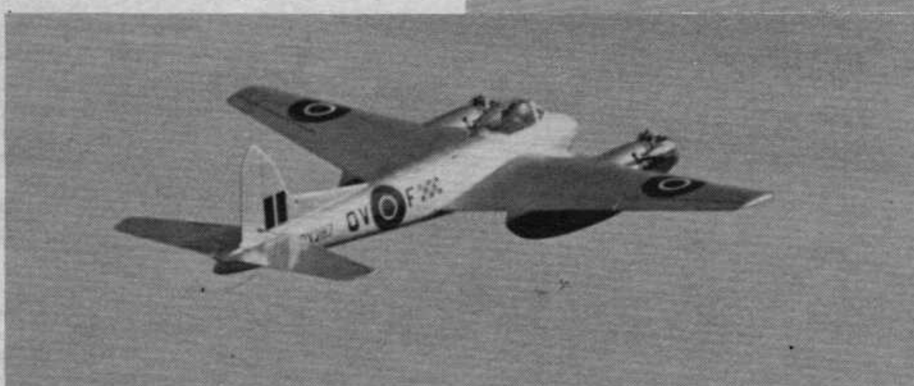
CONSTRUCTION

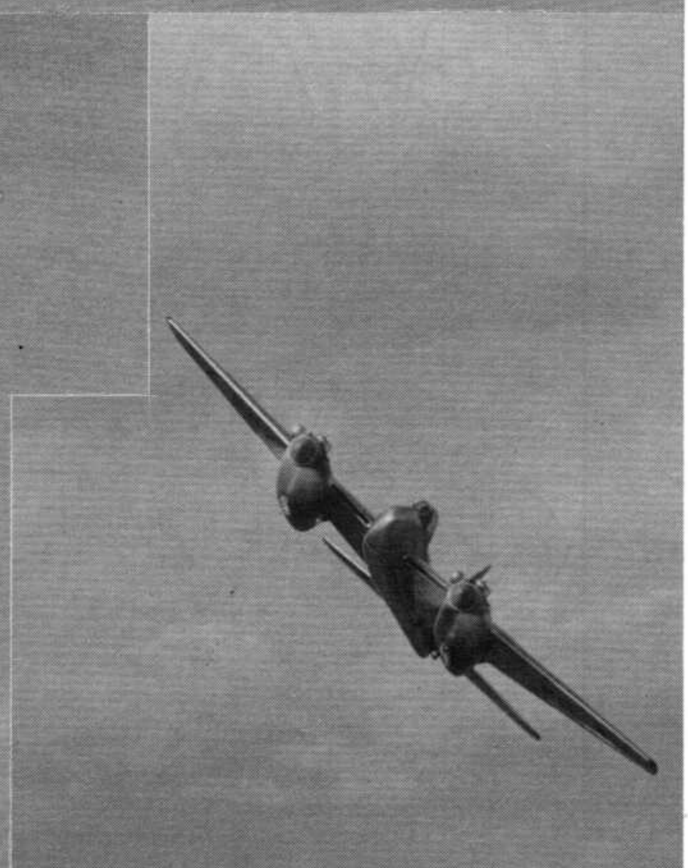
Wings:

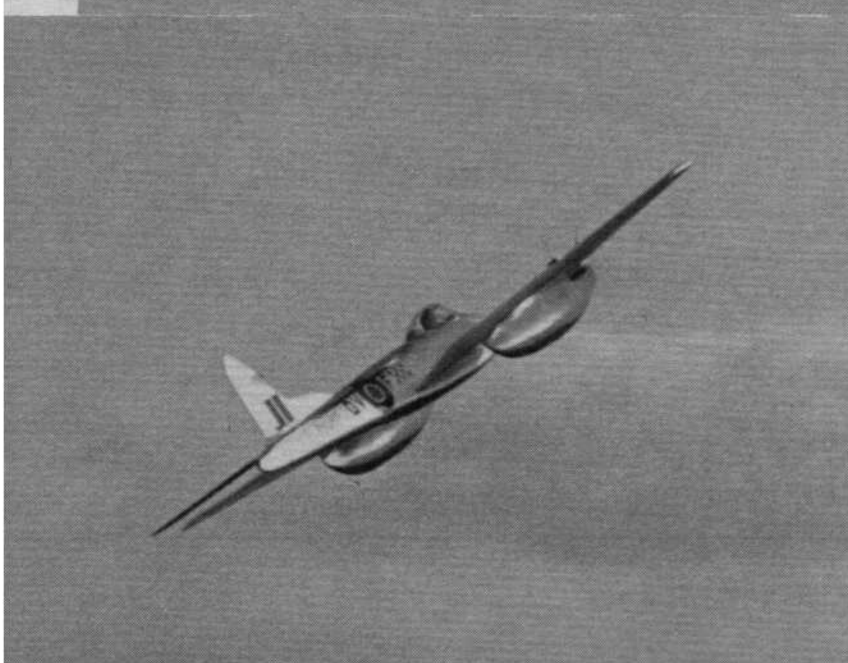
Make up four wing skins from 1/16" sheet. Sand the outer surfaces and then assemble the LE, ribs, spars torque rods, throttle snakes, etc., on each bottom skin. Join these assemblies with 1¾" dihedral per panel and set one panel on the board shimmed with the required washout. Glue and pin the upper skin in place and set aside to dry. Repeat for the other panel, subsequently reinforcing the root joint with gauze and glue. Add the tip blocks, sand the wings to final section, and separate and hinge the ailerons.

Nacelles:

When assembling the nacelles, note that they are right and left handed. I employed two soldered tin plate tanks, as clunk bottles won't fit. A disadvantage is no prolonged inverted flight, but I don't care. You can't shape the cowl top or add the nacelle top sheeting until each nacelle is in place on the wing, so just shape the nacelle







The Hornet is very impressive when airborne and has lively performance even on one engine.

undersides for now. I don't recommend inverting the engines. The muffler will still project and believe me (and my club mates), you don't notice the heads or mufflers once she's in flight.

Fuselage:

After constructing the basic pre-curved sides, dampen the sides to make sure they pin easily to the formers. In particular the nose sheet will need wetting and holding to F1 with rubber bands while the glue sets. Once the fuselage is assembled, with top decks and bottom sheet in place, carve and sand to match the cross sections. Build the fuselage from light stock, as it only has to hold the wing and tail apart. Most of the weight a fuselage usually carries is in the nacelles on this ship.

Empennage:

Use light wood for the tail group, which goes together in no time using CA glue.

Finishing:

The wings were nylon covered and doped, and finished with two coats of sanding sealer sanded down. The nacelles were then epoxied in place, their top decks added and shaped and the nacelles covered with nylon and again made smooth with sanding sealer. The fuselage and tail surfaces had heavy weight tissue doped on, finished with two coats of sealer.

After the fuselage is sanded smooth, cut away the under fairing and check the fit of the wing. Tape sandpaper over the wing root and shift the fuselage from side to side until the wing aperture is a perfect fit on the root. Then fit the wing peg and bolt. Trim the under fairing to fit the wing while the latter is bolted to the fuselage. Glue the under fairing to the wing, then remove the wing and face off the gaps at each end of the under fairing with scrap sheet. Now attach the tail feathers and do all the hinging, painting, radio fitting, etc. The prototype used silver auto spray, with Tamiya acrylic XF 8 flat blue for the nacelles. Roundels were transfers, and codes and serials were hand painted, as was the checkerboard. A sprayed coat of thinned clear epoxy fuelproofer completed the job. Radio gear is JR, using micro servos but with a 500 mA battery pack in the nose cone.

If you have nowhere to take-off, forget the dolly and make a wooden cradle for starting.

Pre-Flight Preparation:

Get the C.G. right, set up control throws, and adjust engine low throttle so that with the TX throttle stick pulled back and the trim fully forward, the engines idle fast and reliably. When you pull the trim back, both engines should stop, not necessarily together, but they should stop. Adjust each engine individually for top revs, making sure that neither starves when the model is held with its nose in a vertical position. I drilled the mufflers for pressure taps which connect to the tank overflow vent, and I fill the tank through the engine fuel line. The muffler pressure helps to steady the engine revs in all attitudes. When synchronizing the engines, always richen the fast engine; never lean the slow one or it will balk in climbs and quit prematurely part way through a flight.

First Flights:

If you're hand launching, with both engines at peak rpm, just push her off into the wind with the nose slightly down — rather like launching a slope soarer. Using the dolly on a runway, she'll ROG herself; from grass you'll have to use a little elevator stick to get her off. Once in the air, climb out steadily and adjust the trims for stable flight. When you're happy with the trim, try a few maneuvers. For the first few flights, however, always make sure that when one engine cuts, you throttle the other fully back and head for a landing. Don't experiment with single engine flight at this early stage. Although the Hornet is predictable on one engine so that you have no need to be scared when one quits, she will not climb with one engine out, and neither is she particularly nice to fly with one engine gone, and the other still putting out maximum power. So right now let common sense prevail — if one engine goes, throttle back on the other and glide into land, cutting the live engine just before touch down if you wish.

The landing speed is not particularly fast and is about average for a sport pattern ship.

Maneuvers:

Besides performing the standard figures such as loops, rolls, Cuban 8s, etc., I've practiced a few other variations which are really satisfying with the Hornet.

After practicing slow rolls — the ten second duration type — you'll find that 8, 12 and 16 point rolls are a gas. For slow rolls, this ship does need coordinated rudder and elevator input to maintain a level attitude throughout the roll. The twin nacelles provide a useful amount of side area in the knife-edge attitude, so the rudder throw required is not very large — indeed too much top rudder applied during roll entry stops the roll altogether. An engine tip is worthwhile here. On a few occasions I've had one or both engines stop while half-way through a super slow roll, caused by the fixed fuel pick up starving the engine with the model inverted. To reduce the incidence of this problem, make the carb feed lines at least 5" long, curled up inside the nacelles.

A looping maneuver which looks attractive when done by this ship is the knife-edge loop. Start as for a normal loop, but 1/4-roll when she's pointing upwards, go over the top in knife-edge, then 1/4-roll back to normal on the way down. This makes a nice change. As for doing snap rolls, it is quite hard to do only one snap roll with this ship, as you will usually overrun to 1½ or 2. Similarly, prepare to exit from a spin two turns in advance. It is simply the large mass of the nacelles placed well out along the wings which makes her reluctant to stop autorotating. The generous washout kills all snap roll tendencies.

A straight hammerhead with this ship is not outstanding. However, a variation you can try is the Zurabatic Cartwheel. This maneuver was invented by Jan Zurabowski who was a Gloster Meteor test pilot and who used to demonstrate this trick in the Meteor at air shows. He first tried it out using the Hornet. He would pull up vertical as for a hammerhead, then when almost stopped, he'd throttle back on one engine. The plane would start as for a normal hammerhead but would swing clean through vertical, down and up the other side, to complete 1½ turns of a cartwheel, before recovering in a positive spin. With this model, to get the differential power required for the figure you'll have to stop one engine, either by readjusting the slow running setting of one for a cut, or only partial fill one tank. Either way make sure you have a good reserve of height when the chosen motor stops. Then, dive for speed with the remaining engine on full bore, pull up vertical and throttle back to 1/3 revs. Use opposite rudder against thrust induced yaw. Then when she's just about stopped going up, open the throttle and fling the rudder over to help her around. She sure does what I described above, including the positive spin. However, the positive spin is actually in the inverted position! Hmm. Remember, only try this one pretty high up as that inverted positive spin (known properly as an inverted **flat** spin) takes about six turns to stop — after you've throttled back of course, otherwise it'll never stop. Since the ship has now only one live engine, start thinking about the landing.

One maneuver which never struck me as being particularly attractive with other planes, but which seems to suit the Hornet, is the Chandelle. I think it is the characteristic sound of two engines in harmony which does it for the Hornet while the ship is clawing for height around the last part of the climbing turn.

Single Engined Flight:

Earlier I promised to say something about flying this ship on one engine. Basically, if an engine cuts unintentionally, your reaction depends upon what the model is doing at the time. If it's low and slow, throttle back to about 1/3 revs on the remaining engine, keep her slightly nose down, and guide her into position for a landing. You can turn either way, so don't be over cautious about turning towards the dead engine as she turns easier that way, and this can be an advantage. If you're in a loop or roll, finish your maneuver and carry on as above. If the model is high up, you can experiment.

There isn't enough power to keep going for long on one engine, so if you try to maintain height or climb, the ship will slow down. You can trim against yaw with rudder and lift the powerless wing with aileron. But she'll still slow down. Eventually the nose will begin to rise as speed falls off, and despite having full down elevator applied, the nose will rise to about 45° above horizontal, she'll stall, and the live engine will then pull her over into a spin; whereupon you throttle back, release the sticks and in a turn or two she'll stop spinning. You must experiment as just described so that you'll be familiar with events when an engine cuts. Your confidence will grow when you observe that when one engine dies you don't get instant doomsville. There's plenty of time to react by chopping the live motor even if you don't immediately notice that one engine has gone.

Instead of proceeding as above (again provided the model has plenty of height), throttle the live engine to about 2/3 revs and lower the nose slightly. Then play with full throttle. You'll find that as long as you can keep its speed up, the model will fly normally with slight aileron correction required and slight rudder off-set, you'll also find that you can turn her right or left. However, as soon as speed begins to fall and the live engine seems set to take over with too much yaw, throttle back and glide in for a landing.

Conclusion:

Despite the fact that you can put a lot of interest into a flight with this model, I do have a suspicion that a touch more power could be an advantage on occasion, even though not all the time. It may be that a pair of .15s might be a bonus, especially since at present she's only good for one vertical roll when I'd rather she'd do two before running out of steam going upwards. The extra power might even lead to vice-less single engined flight,

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smooth. All other maneuvers such as Cuban Eights, etc., are easy to do. The P-51 tracks like it was on rails. This was an enjoyable project for us from start to finish. Before we forget, set your flight controls at 5/16" up and down ailerons, 3/8" up and down elevator, rudder 1½" in each direction, and 1¼" flap travel. If your model weighs about the same as ours, it should fly the same.

Conclusion:

The only thing Royal could do to improve this kit would be to add decals and as of this printing, this has been done. This kit offers a good solid value for your money. If you want to fly a scale model this would be a good place to start after flying and building the standard sport fliers. □

TOURNAMENT OF CHAMPIONS
continued from page 74/70

Steve Nelson were supported by a prominent international panel of judges that included Geoff Franklin, Henry Haigh, Dave Lane, Isao Matsui, Travis McGinnis, Gordon Price, La Mar Steen, Bill Thomas, Bob Upton, and William "Buck" Weaver.

A special thanks to the contest support personnel: Phil Rumbold, Betty Stream, Suzi Stream, Susan Nelson, Bill Payne, Larry Lowe, Larry and Dee Kosta, Chuck Rigsby, Pat Godfrey and Jack Albrecht.

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Enough praise cannot be extended to Mel Larson, Vice President Marketing and Public Relations, and his Circus Circus staff, true professionals in their field.

And, finally, there is Mr. William G. Bennett, Chairman of the Board, Circus Circus Enterprises, Inc., the person who has made it all possible over the past ten years. To this modeler, aviator, and friend, thanks, Bill. □

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by helping to maintain airspeed. However, as the ship doesn't need full throttle all the time to look good I've not thought it worth the expense to go to .15s just yet.

The Hornet could open a whole new era in schoolyard scale. Without retracts, etc., an engine-out situation is no cause for alarm as all you have to think about is where you're going to land the model, not when to extend the gear or how much damage you might do to the underside. So if you thought that you would never afford a twin, then think again. You've just read about the twin that anyone with four channel gear can afford! □

THERE'S A KLUNK IN MY SOUP
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Glitch, frequency, servo, rails and so forth.

But, there is always someone at your elbow to explain terms, help fly, assist in clean-up and somebody always has the inevitable bottle of Hot Stuff, which, I'm sure, is completely capable of gluing together the Brooklyn Bridge.

When there is a crash, there is a moment of hushed silence and people start to ask about your "next plane." Everyone has the same passion and naturally assumes that if you can't fix this one you will build a new one.

Sure there are times when I can't see the top of my 8 foot table. Sometimes I'm sure I'll lose my husband in the roll of MonoKote and he will be forever stuck to a fuselage with Hot Stuff, but it all works out and since we are both in this hobby, enjoying every phase of it, we are together and happy. My neighbors may not know what I mean, but my husband knows full well that someday he may really hear me say, "There's a klunk in my soup." □