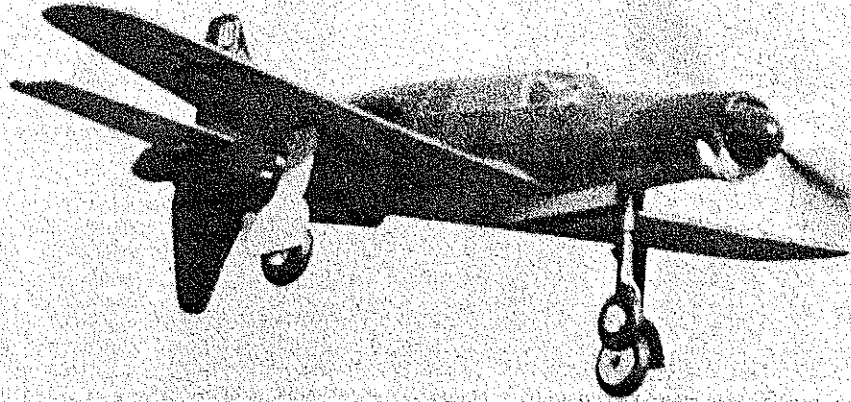


Dornier Arrow



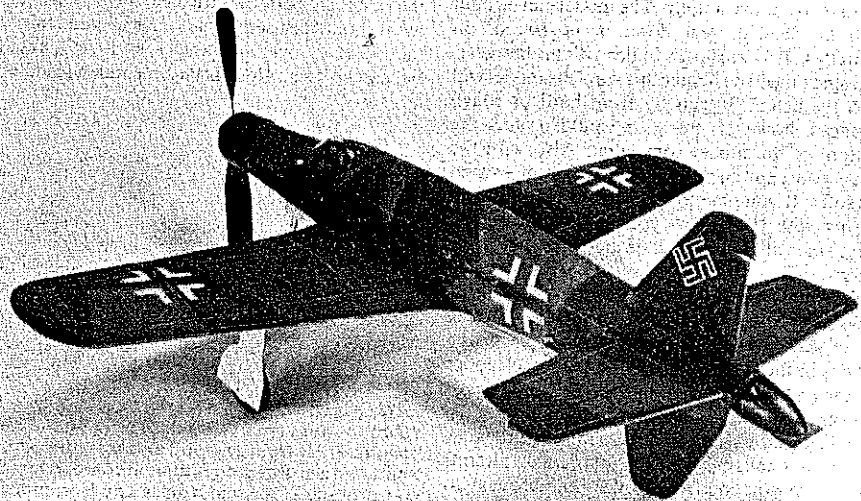
With two motors driving push-pull props, the Do 335 A-O seems to fly forever.

● Don Srull

THE Dornier Do 335 was at the same time one of the most unorthodox and one of the highest performance piston-engine fighters to come out of World War II. Due to its novel tandem engine arrangement, it had little more frontal area than a single-engine aircraft. The low drag that resulted, along with two powerful engines, gave the peculiar looking aircraft remarkable speed and acceleration. The "Pfeil" (Arrow in English) was also innovative in several other respects. It was the first German fighter to employ a tricycle landing gear, and it was the first to be equipped with an ejection seat.

The idea for the Do 335 took shape in 1937 when Dr. Claude Dornier took out a patent on a tandem-engined high-speed aircraft design. The novel aircraft design incorporated cruciform tail surfaces and a long drive shaft which drove the rear propeller from a centrally located rear engine. To prove the practicality of the long drive shaft, Dr. Dornier had a small 22-foot wingspan test aircraft built. Known as the Goppinger Go9, the test vehicle had a cruciform tail, a single 80-hp motor buried in the fuselage below the shoulder wing, and a long drive shaft turning a rear mounted, four-blade pusher propeller. Flight tests confirmed the remarkable efficiency and practicality of the design, as well as the reliability of the long drive shaft. The Go9 had a respectable speed of 137 mph.

In 1942 Dornier was given the go-ahead on an unorthodox push-pull fighter-bomber design proposal. It was late in 1943 when the prototype made its first test flight. The huge aircraft's capabilities and versatility were immediately recognized and a heavy day-fighter version, and a specialized two-seat night-fighter version were



When it comes to wicked looking fighters and challenging subjects, Dornier's push-pull takes the cake but marvelous performance for only an 18-in. rubber job—exhilarating, duration right on. In this flight shot, only the front propeller is operative; insert shows both props in place.

built and tested.

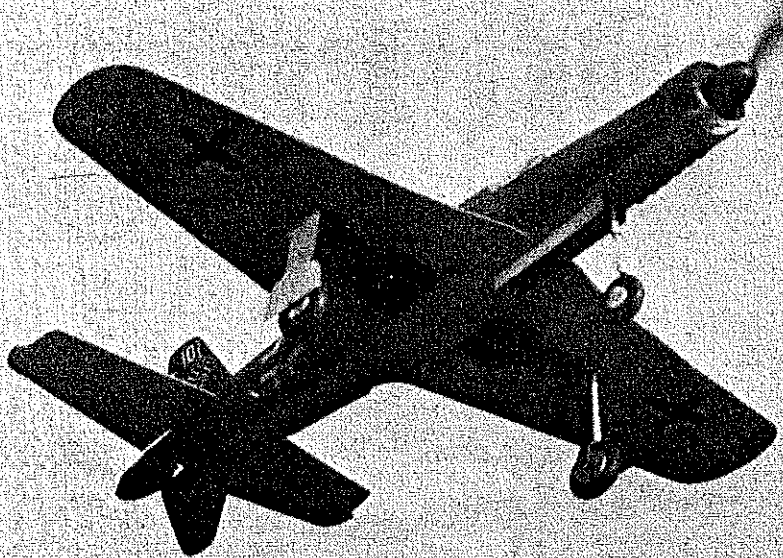
In spite of the new fighter's great potential, the Arrow never reached operational status before the war ended. It did come close, however. Between 35 and 40 Do 335s were built, including 21 production prototypes which went through field service tests.

The Do 335, or "Anteater" as some of its pilots referred to it, had truly awesome performance. A large aircraft of over 44-ft. span and length, it weighed over 20,000 pounds. Its two Daimler Benz 603E-1 engines developed a total of 3,600 hp at takeoff, and gave the giant a top speed of about 475 mph. Even more amazing was the fact that the rear engine alone could propel the Arrow at a speed of 350 mph! Armament varied, but usually included one 30mm cannon and two 15mm guns in the nose, plus two 30mm cannons in the wings. An internal bomb bay and wing pylons could accommodate a variety of bomb stores or auxiliary fuel tanks.

The Dornier 335 has been used very little as a

subject for scale modeling, even though its moments and general arrangement lend themselves well to both free-flight and radio control models. The unusual push-pull engine arrangement probably steers most modelers clear. I first tested the Arrow's possibilities as a rubber-powered profile model. It not only proved to be a workable arrangement, but seemed to have good flying potential and more than adequate stability.

The model presented here has a span and length of 18 inches, and is modeled after the single seat, pre-production fighter bomber A-O version. As an aside, the only surviving Do 335 is an A-O model and is owned by the Smithsonian. It was recently restored by the Dornier Company in Germany, and is currently on temporary display in the Deutsches Museum in Munich, Germany. It is scheduled to return to the Aerospace Museum in Washington, D.C. in 1983. If you would like your model to duplicate this particular aircraft, simply use the tail number "102" instead of the "107" you see on my



Climbing out, many goodie details show clearly—landing legs, simulated wheel wells, exhaust stacks and the distinctive round nose—no, it is not a cowl for radial engine.

model.

Before starting the Arrow you have several options to choose among. The model can be built with the landing gear down or up (on or off actually). It is easier to build without the gear, and since it will be lighter this way, the model will also fly better. If you fly from hard or rough surfaces, however, the gear would protect the bottom of the model somewhat. Also with the gear, you can enjoy those beautiful unassisted takeoffs. If you plan to enter AMA rubber scale events with the Arrow you will also need the gear, since all flights must be made R.O.G. (rise-off-ground).

The other choice you have has to do with the motor/propeller combination. There are three basic ways to go: the simplest is to power the model in the conventional way with one rubber motor and a single prop in the nose or the rear; the other prop in this case is left off. This is the simplest and easiest arrangement, but foregoes the real challenge of this particular aircraft subject. If you choose to power both props, you can use either a single rubber motor or a rubber

motor for each prop. For general sport flying I would recommend the use of a single motor. For the best flight performance the two motor arrangement should be used. In this case winding the two motors and preventing tangles is a bit of a hassle, but can be done with a little care and the help of a



Ye editor gets checked out on holding the odd beastie—first from one end and then the other. Right hand is grasping rubber motor peg for the rear propeller. We can assure you it is stable.

flying buddy.

Construction: Construction is conventional in most respects. Carefully select straight grained, medium to lightweight balsa to keep the weight down to a minimum. The flying capability of the model will depend on its weight.

Fuselage construction is the usual half-shell method. After cutting the formers from light weight balsa, laminate the top and bottom profile keels from two strips of 1/16 square balsa strips glued with white glue, and pinned in place over the plans. Next, glue in the half formers, keeping them 90 degrees to the workboard. While the side is in place laminate the side keel piece from two strips of 1/16 square, again using white glue. Constructing the keels in this manner is much easier and produces much stronger keels than the usual practice of cutting them from 1/16 sheet balsa.

Add the 1/16 sq. stringers and the upper wing support strip. When this is all dry, lift the completed half shell from the building board and add the other side formers and 1/16 sq. stringers, making sure the fuselage remains absolutely straight. Build up the nose cowl, sheet with 1/32 and glue to the front of the fuselage.

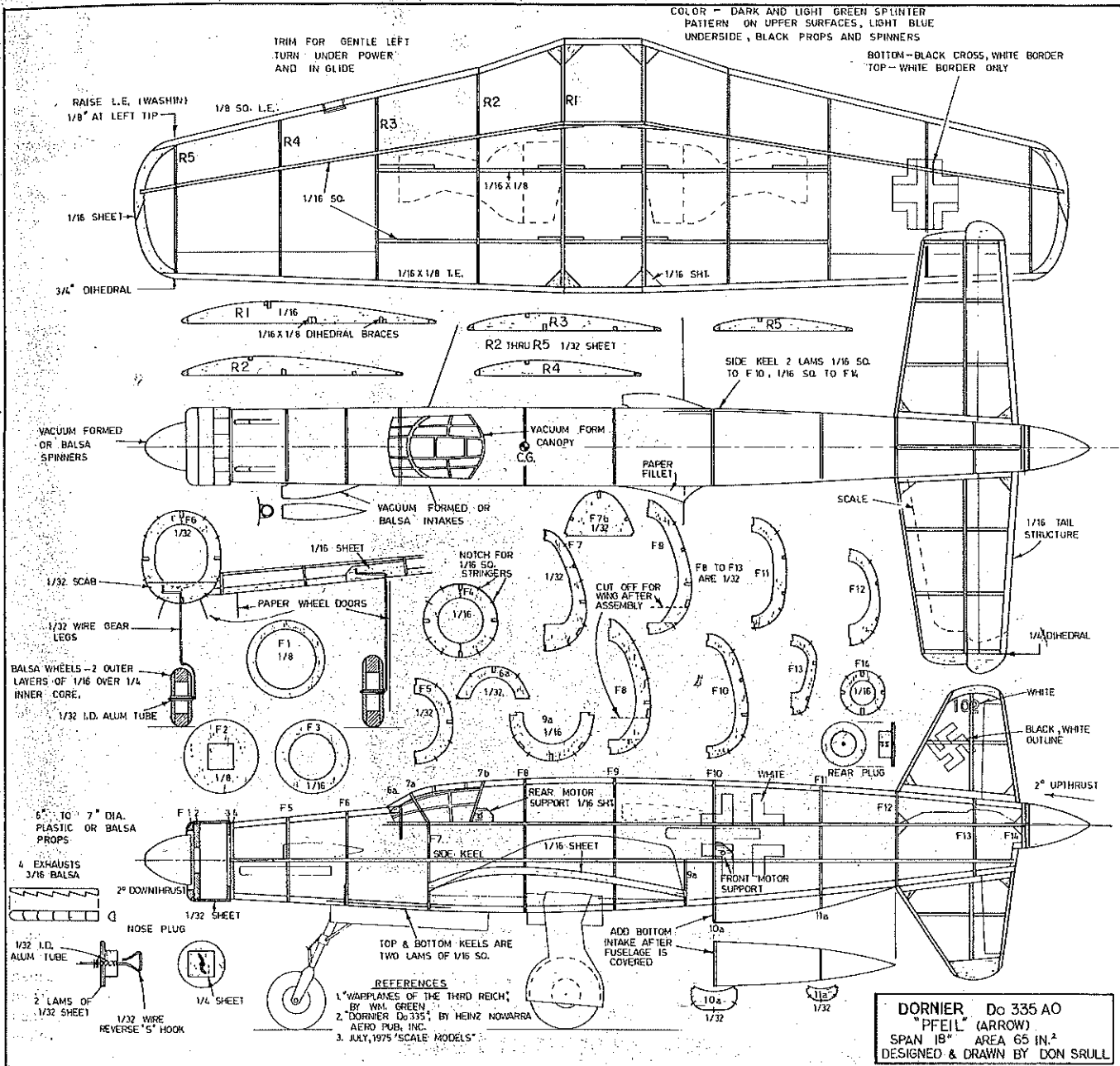
Cut out the ribs and build the wing per the plans. After the dihedral has been added and the spar joiners are in place, carve and sand the wing cradle in the fuselage until the wing fits accurately. Fit and carve a balsa canopy block to use as a form for the vacuum-formed canopy. Also carve an air intake from balsa and make two of these on your Vacu-Form. The two spinners are similarly constructed. If you do not have access to a small Vacu-Form, the canopy can be made up from a number of flat pieces of thin acetate sheet, and the scoops and spinners can be carved from balsa. If a landing gear is to be used, bend the legs from 1/32 piano wire and cement well to the nose and wing spar positions. Light weight wheels can be built up from soft 1/16 and 1/4 balsa as shown on the plans.

Finally, the tail surfaces are built from firm 1/16 balsa.

Covering and finishing: Sand the entire airframe smooth and make sure all glue joints are sound. Cover all surfaces with light weight Japanese tissue. The fuselage will require a number of strips between stringers to avoid wrinkles. If you have mastered the wet tissue covering method, this can speed up the fuselage covering job considerably. Lightly spray the tissue and pin the



Ah, the joy of it all, as research and development pays off in long circling flight. Holding for launching and releasing two props is a mite delicate, though text makes it easy. In both these pictures both props are working. Very fast, the real aircraft could do 350 mph on one engine.

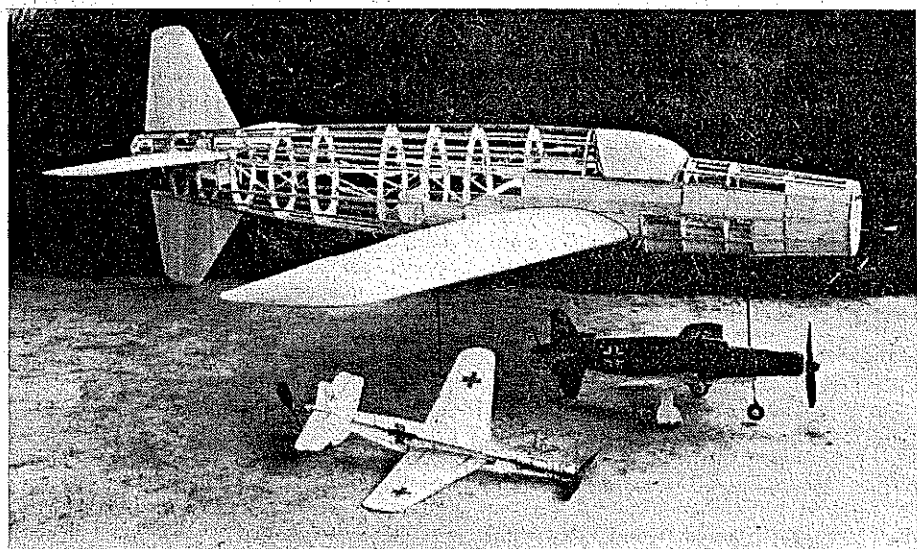


wing and the tail pieces down while they are drying to minimize warping. Give each component two or three light coats of thin, low shrink dope (such as Sig Litecoat).

The model can now be assembled, making sure that all parts are straight and lined up properly, per the plan. You can now add the formers and stringers below the wing well and build up the large scoop on the bottom rear of the fuselage. Cover these areas, water shrink and dope as described above. Carefully glue on the air scoops and the four balsa exhaust stack pieces. If the landing gear is down, build up the gear legs with balsa and tape to represent the large steel struts and oleos.

Color spray the model with an air brush if possible. Hand brushing adds a considerable amount of weight and doesn't look as good. You can use model dope, Floquil railroad enamel, or one of the water-based model acrylic paints such as Poly-S. I used Floquil paints and found that Coach Green and Pullman Green were reasonable approximations to the light and dark green colors respectively. The light blue-gray underside can be painted with a 50-50 mix of Reefer Gray and Sky Blue. Whatever you use,

Continued on page 122



The author makes foam profiles with motorstick to test unusual configurations before he goes to three dimensions. Using two props, this profile can be put out of sight on power. Finished ship stands behind it, while monster in background is scale RC with two 40s, since finished. Equipped with retracts and authentic war colors, it is a formidable piece of flying machinery.

DYNATHRUST PROPS, INC.

GET MORE THRUST FOR YOUR BIGGIE!

WITH EFFICIENT, DURABLE, GLASS
FILLED PROPS FROM:

DYNATHRUST

Designed in conjunction with Dave Platt

Now Direct sales prices
include shipping:

18 - 6, 18 - 8: \$8.00,

20-8, 20-10: \$10.00

15 - 6: \$5.00

16 inchers coming soon!

2541 NE 11th Ct, Pompano Beach, FL 33062
Phone: (305) 941-9119

DYNATHRUST PROPS, INC.

BROWN CO-2 ENGINES
ENGINES ARE IN STOCK, NEW CHARGER
AND 5 SIZES OF TANKS, BROWN ENGINES

COMPLETE CATALOG \$1.00

HARD TO FIND ACCESSORIES, KITS, AND
PLANS FOR RUBBER POWERED MODELS

PHONE (714) 469-8675



Peck-Polymers

BOX-2498-AM LA MESA, CALIF. 92041



the event, a brainchild of Walt Mooney of the San Diego Scale Staffel, is the 14 gram minimum weight, which foils the ultra-light crowd and gives us normal builders a chance! The event is catching on fast, and times are already in the 90 second range with Dick Baxter's "fuselage-on-the-side" design at the Navy/Marine Armory in Los Angeles. Bill Hannan and Warren Shipp immediately whipped out semi-scale General Aristocrats and proceeded to wow the crowd with some magnificent flights at the San Carlos Gym BW Meet in May. Watch this class for big things, especially as the planes can also fly in the Embryo Endurance event outdoors!

Thanks for the cards, letters and photos, gang!

Bill Warner, 423-C San Vicente Blvd., Santa Monica, CA 90402.

Dornier/Sruil

continued from page 53

put on the minimum possible to keep the weight down. First spray the light blue undersurfaces, next the lighter green upper pattern and last the darker green upper pattern. Refer to the photos of the model (or better still the references called out on the plan) for the splinter camouflage pattern used on the Do 335. Mask and spray the markings and glue on the canopy. As a final touch the major structural panel lines can be drawn on with a drafting pen.

Make up the front and rear props and nose plugs. Two 7-in. Slick-Streak plastic props can be used if two rubber motors are employed. In this case, notch the spinners and glue them to the props after the wire hooks have been attached. Make sure that the rear prop is put on backwards: that is, with the concave surface of the blades facing to the rear. If a single rubber motor and two props are used, the rear propeller will have to be a left-handed prop, carved or formed from balsa. Make the blade size and the pitch about the same as the right-hand-front prop. If a single prop and motor are used a 7 to 8-in. plastic prop will do fine.

Flying: Make sure the model balances as shown. Ballast as necessary to get the C.G. right. Check for warps or out of line surfaces. The vertical fin should have a very slight (about 1/16") left turn.

and the left wing panel should have about 1/8" washin, i.e. the leading edge at the tip should be raised about 1/8". Correct any warps or misalignment before test flying.

For test purposes put in a 16-in. long loop (or loops) of 1/8 rubber. Before winding make sure there is about 2 degrees downthrust in both props. For the rear prop this means that the shaft is actually pointing to the top of the fuselage. Next, put in about 150 turns in the motors. Remember to wind the rear prop motor in the proper direction! Launching is a little bit tricky because of that darn lower fin and the rear prop. I have found that the easiest and most reliable way to launch the Arrow is to grasp it by both spinners—the front in the left hand and the rear in the right. Release the front prop first and then gently push the model forward with the right hand. A few practice launches will get it right.

Under low power the model should descend in a long powered glide with a very slight left turn. Adjust the tail surfaces until you get this flight path; do not change the thrust setting or the C.G. at this point. Now begin to add about 100 to 150 turns after each successful flight. Once you get beyond about 500 turns, use thrust adjustments only to get a smooth, slow climb and cruise to the left followed by a slow descent also to the left.

If built and adjusted as described, I am sure you will be pleased with the looks and flying ability of this offbeat German fighter. A scaled up version of about 24-in. span could have spectacular flight performance, and would be large enough to carry additional scale details and finish. Who will be the first to try?

ParaCraft/Hux

continued from page 65

around underneath and then completely over the top for the world's first ParaCraft loop—backwards!

It settled somewhat unceremoniously about five feet from the trees. It was clear the "thing" needed an elevator to adjust the pitch angle so I could level the pod and pull against headwinds. And it was clear that my skill at the throttle had to be like that of a helicopter pilot.

That evening I attached an old elevator to the side of the rudder and re-rigged the chute for a better angle of flight. The next weekend I took the "Beast" to the flying site to show the skeptics it would really fly. After getting through the usual, "What is it?" "Where are the wings?" "Does it really fly?"; I set out to show them.

I guess I had to refresh my memory of how to ease the model into flight because I overpowered the takeoff and did the first ParaCraft figure 9, over the top of the chute and straight in. I gave a camera to Leonard Smith and asked him to record the event. He got the figure 9 beautifully. I'm not sure if the skeptics were feeling kind-hearted to help as they did, or if they wanted to watch this fool run up and down the field, trying to prod an unseemly rack of wood towing a banner into the air, but their holding the pieces together for that eternal 5 minutes waiting for the epoxy to set was appreciated.

The next takeoff was more careful and I made myself aware that the throttle had to be handled with care. I was asked what all the squatting, leaning, and running during the takeoff was for. Did the body English really help? I had to explain it as an attempt to keep an eye on the delicately poised fuselage which could easily be blocked from view by the chute.

The next six flights made believers of them all. Touch-and-go, figure eights, hovering, climbing for altitude, all proved the craft was controllable in spite of its very slow flight and unseemly steep angle. There was plenty of improvement to be

made but the prototype was a veteran. One problem that proved amusing was the accumulation of grass and stones inside the chute pockets, it even curtailed some flights until it was shaken out.

I called Dr. Nicolaidis to tell of the success achieved after seeing his article and to say that I admired someone who would actually sit in a ParaCraft during prototype test. If he had as many crack-ups during test as mine had, he would have broken a record for broken bones. Wonder if there's a record for broken props? He congratulated me on succeeding with only a photo to go by and asked to see some photos of my craft.

Since the second ParaCraft was less than attractive, I decided to construct a third model that would not detract from the beauty of the chute. The third version was designed as a break-away unit so it could survive my training and further test to trim the strange angle of flight to something less precarious. I hope to achieve a level of performance that will allow it to be used in the air shows. It's definitely unusual to watch, but the show team said they wanted the "Praying Mantis" kept away from the 1/2 A models. It might eat them!

Wings & Wheels Museum

continued from page 68

The automobile displays parallel aircraft developments and include such classic pieces as a World War I ambulance, a 1930 Duesenberg and a 1934 Packard, each valued in excess of \$250,000.

The aircraft displays feature many of the first transports used by major airlines. The sister ship to Amelia Earhart's Lockheed Electra is also on display along with a German Heinkel I-11 bomber from the Battle of Britain, and the last flying Boeing 247-D, the world's first modern airliner.

Guests also have an opportunity to experience some of the sensations of flight in the "To Fly" Theatre. A special effects motion picture shown on a giant screen with surrounding stereo sound, visually transports the audience out of the theatre and into the pilot's seat of balloons, biplanes, jets and spacecraft. The film was produced for Wings and Wheels by Conoco, Inc. The Sentry Post Theatre shows a variety of historic films on aircraft and automobile development. The attraction also houses a gallery of aviation art, a large restoration complex, research facilities and offices for the Civil Air Patrol and the Experimental Aircraft Association.

Wings and Wheels is located on Florida Road South on the west runway of Orlando International Airport. The admission is \$5.50 for adults and \$2.75 for children 6-12, with children under six years of age admitted free. The admission price is a tax-deductible contribution used for operating expenses and new exhibits. Wings and Wheels is open daily. Visitors should allow at least two hours for a Wings and Wheels adventure.

FF Champs/Haught

continued from page 21

air for some keen competition, particularly in B Pylon where the Zippers, Alerts and Rangers battled it out to sort out the top five from the 13 entered. No one maxed out but times were good considering 5-minute maxes on a 25-second run. R.O.G. Old-Timer Class A events seemed to have the lowest entry, partially due to the scarcity of original engines in this size. Converted glow engines are available but this doesn't seem to boost interest in the class. Perhaps some of you engine builders should take note and produce a