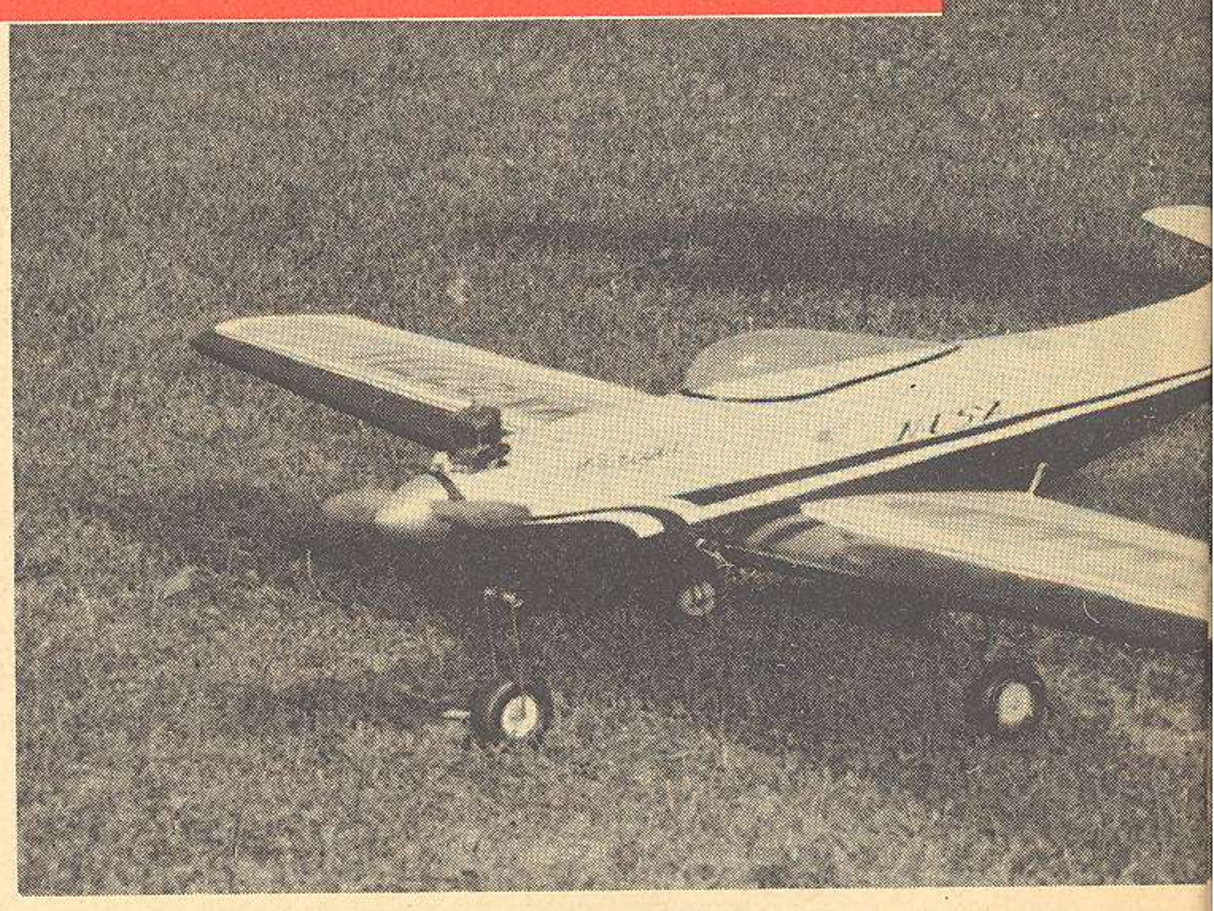
Brett clan of St. Clair Shores, Mich.: Above, from left, Sheryl, 13, Mrs. Helen Brett, and Kathy, 14. The gals hold Apogee, Nimbus, Perigee. At right, Tom & Perigee.



JOINT WINNER AND
WORLD CHAMP

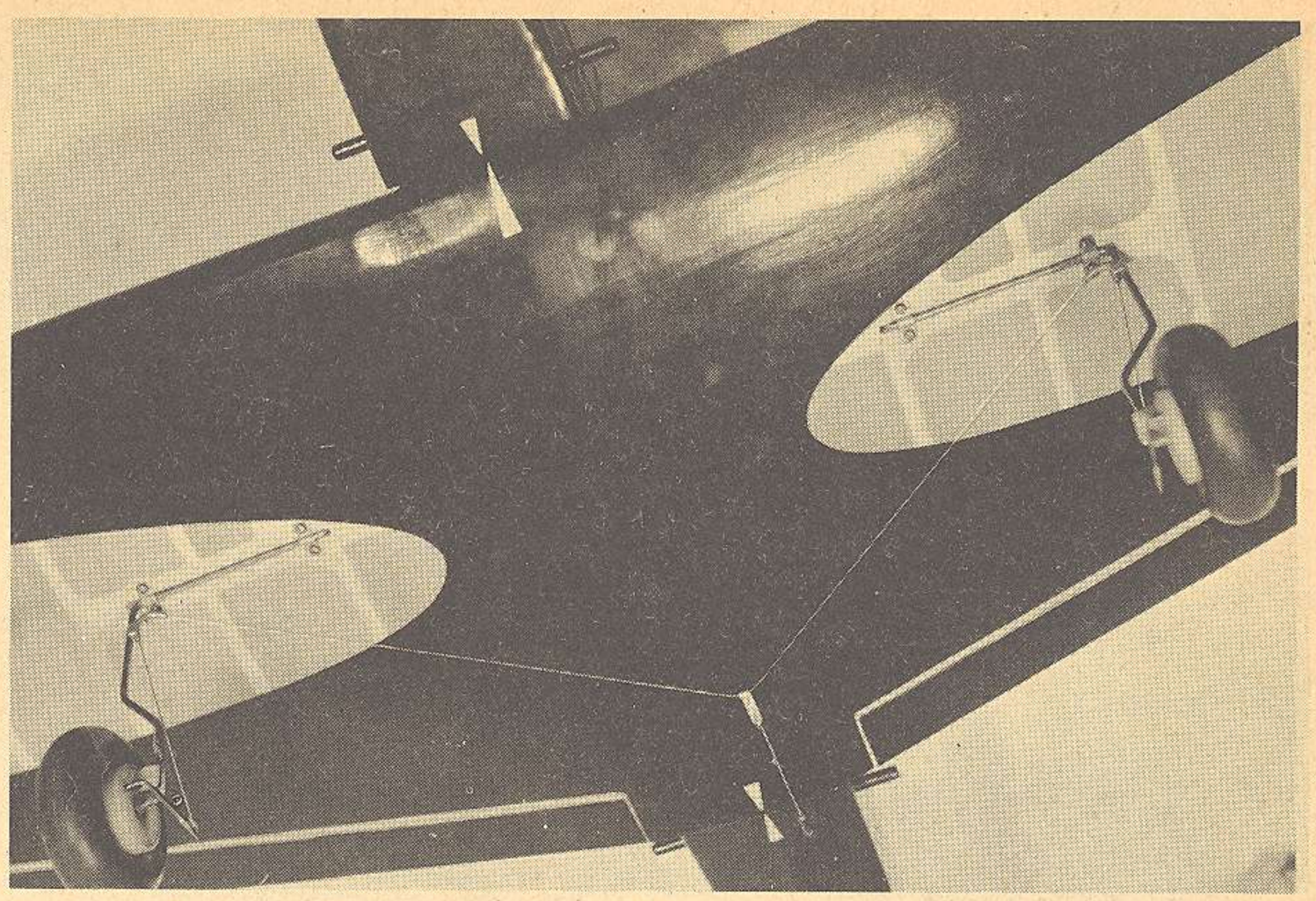
PERIGEE

By TOM H. BRETT

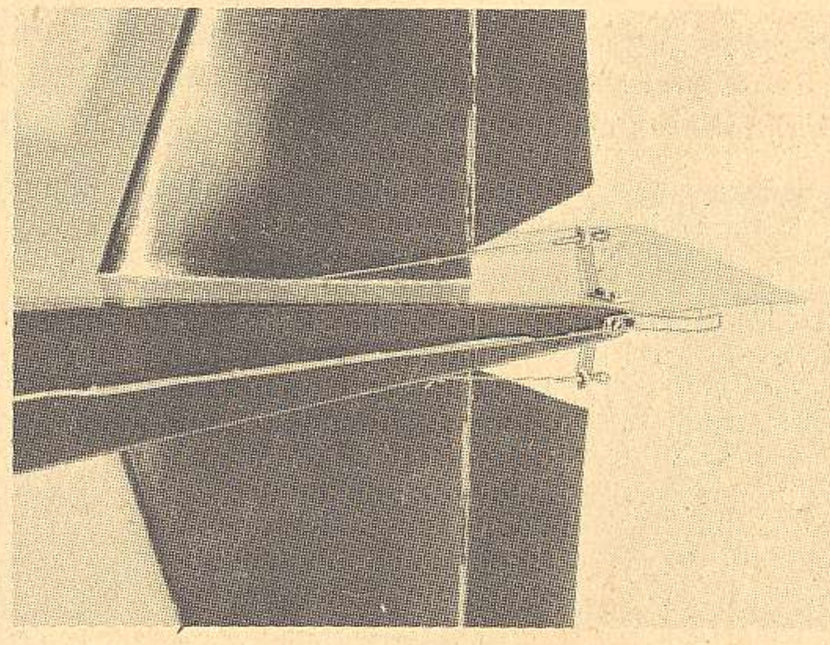
■ After winning a place on America's 1962 F.A.I. R/C team at the Philadelphia Nats in 1961, I had the same feeling you might experience under the same circumstances. I was very pleased and proud of the honor, yet simultaneously began to sense all of the work ahead. We were told the event would take place sometime in the summer of '62, and that Team expenses of transportation from the East Coast to overseas, as well as the billeting and meals during the competition period would be the concern of A.M.A. An older, more knowing individual explained that I should have some sweet young thing to share the hardships of such a venture in unknown lands. This sounded logical, so I decided to take the sweetest young thing I have met . . . my wife, Helen.

While bathing in the honor of the situation I prepared an article for *American Modeler,* which appeared in its June 1962 issue, on "Nimbus," the multi model flown in Philadelphia. At that time Nimbus seemed a natural for the F.A.I. since it was smooth, steady and a reliable performer. As time passed and the Fall neared its end, flying

Brett with magnificent shipping box constructed by fellow Radio Club of Detroit member Roy Sanderson. John Duchon painted, helped with innards.

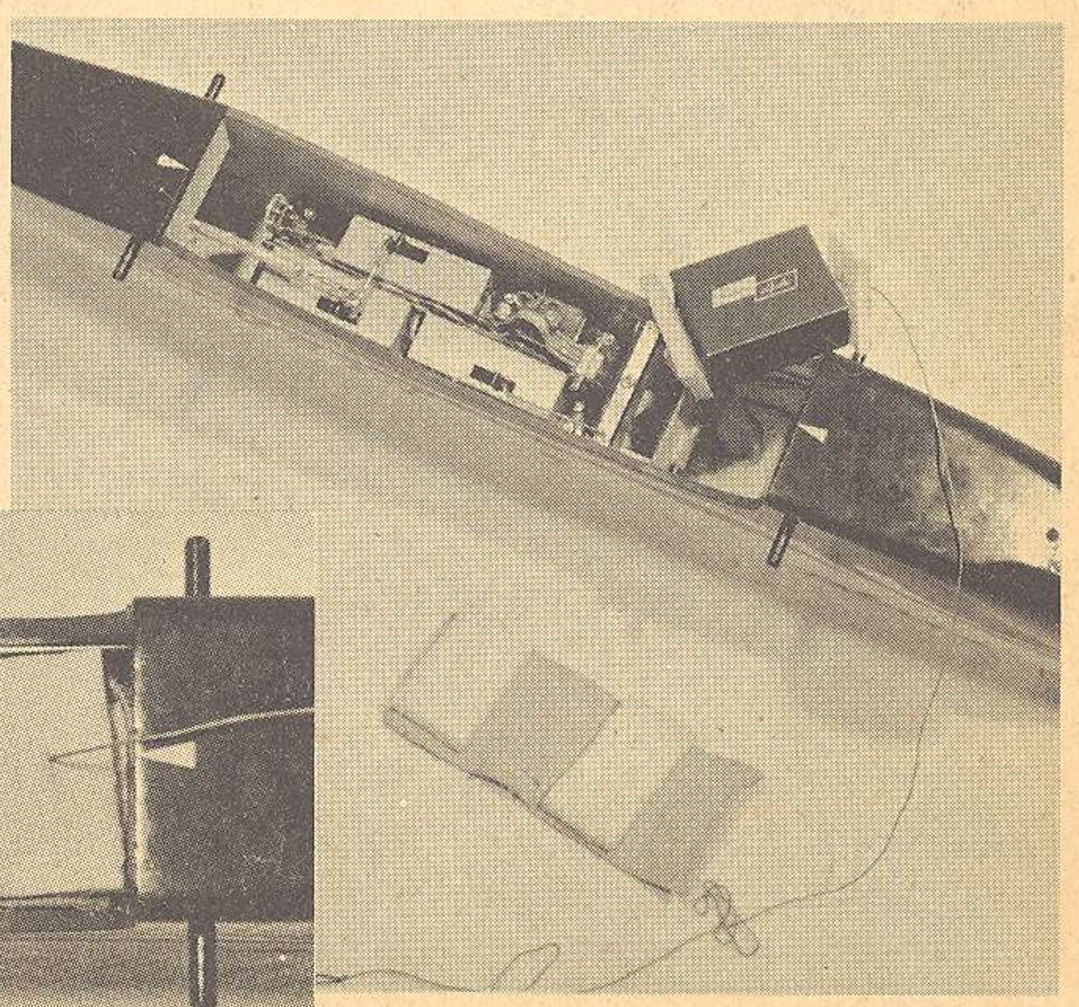


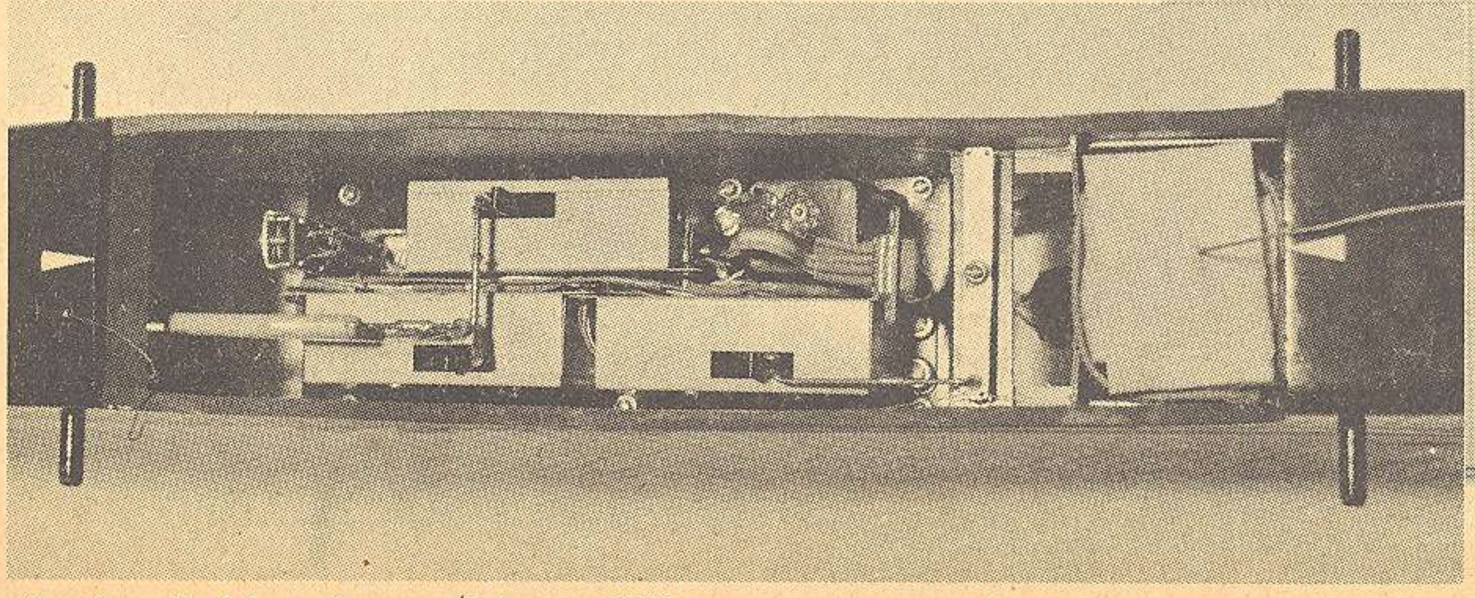
Brake mechanism on Perigee is evidence of Brett's outstanding craftsmanship. He is automotive body engineer employed in Fisher Body division of General Motors.



Rudder hook-up for Perigee and Apogee shown in photo. For his newest plane Tom shrank Nimbus, made many changes not easily spotted by eye. For instance, fin area was increased proportionally, also rudder area and "throw". He also sloped rudder hinge angle more to provide for more reliable spin entry.

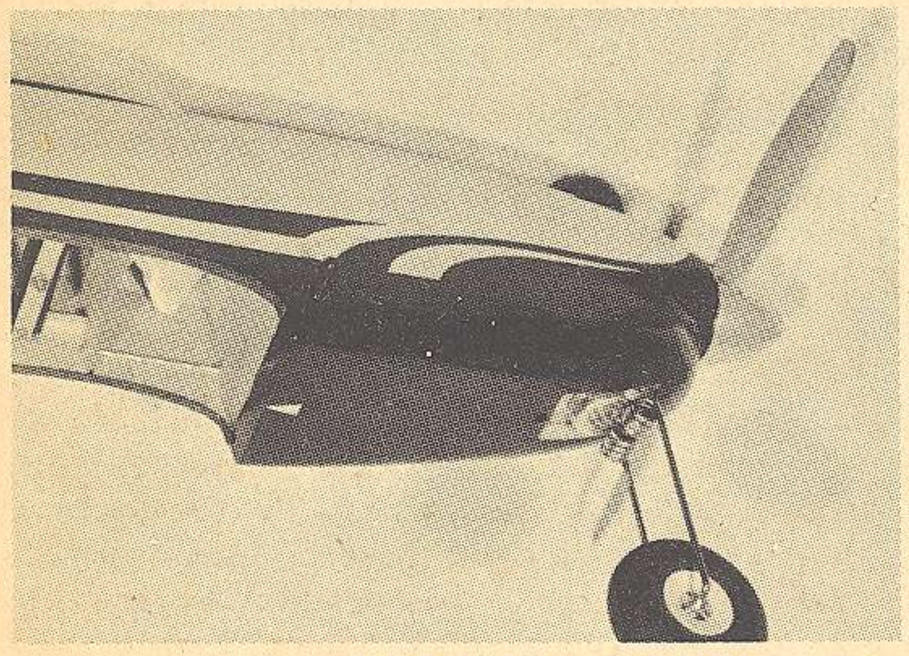
Radio installation is illustrated quite well in these two photos. Brett had to make major changes in equipment just before he left for England as one of America's R/C representatives because his stateside Citizen's Band rig would have been "illegal" in good ole Blighty. See TB's extensive earlier article (June '62 A.M.) for some very informative, fascinating data on radioplane research.

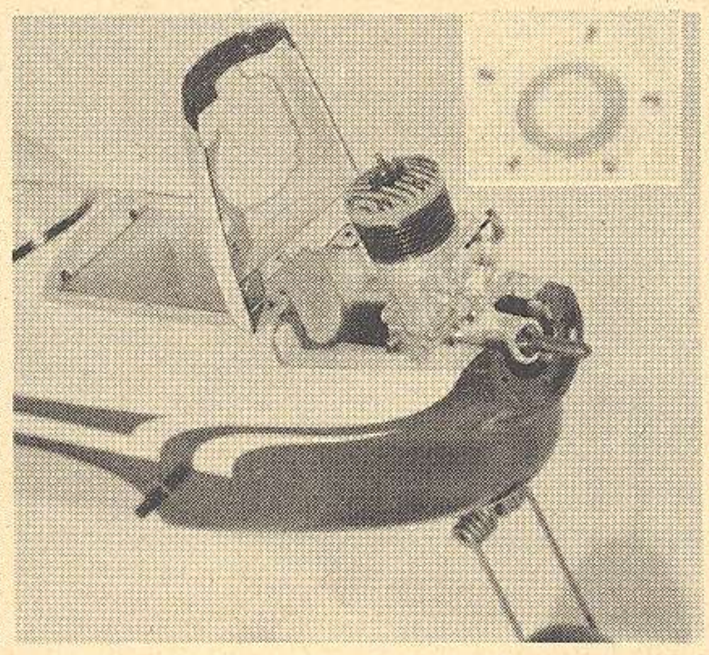


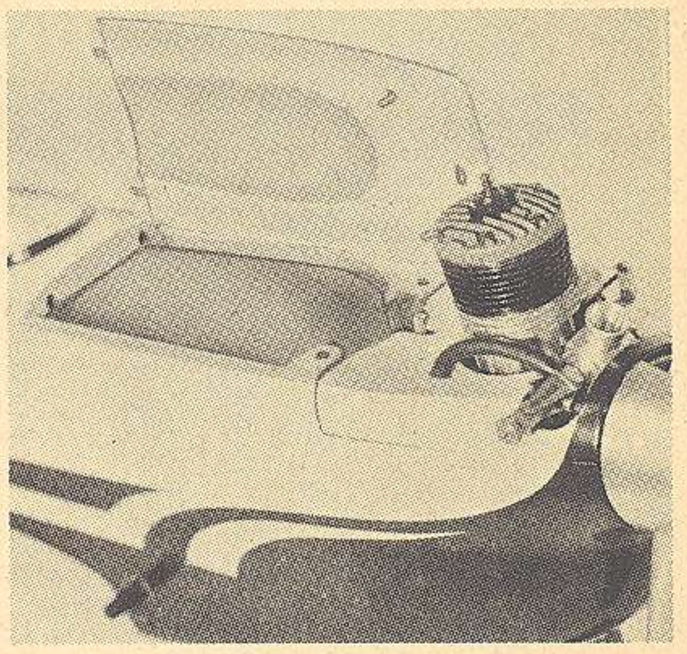


BRETT'S WORLD CHAMPION PERIGEE

Tom brings Perigee in for landing at end of its tie-breaking flight to conclude 1962 International F.A.I. R/C meet.

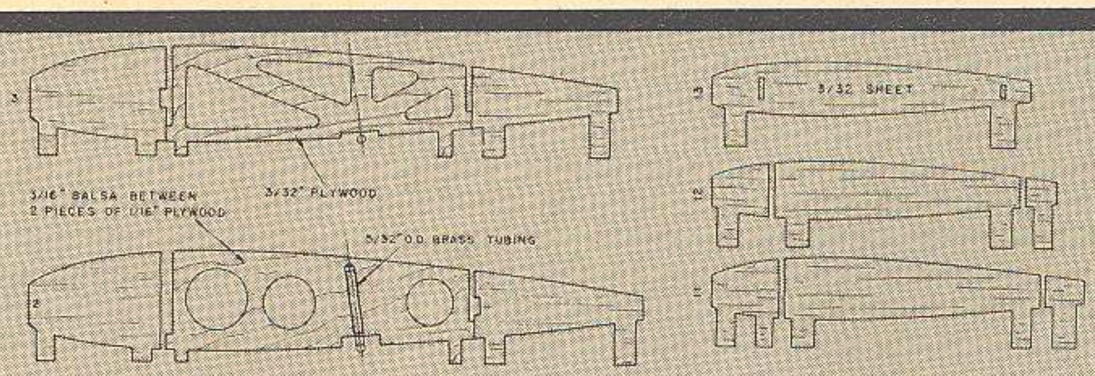


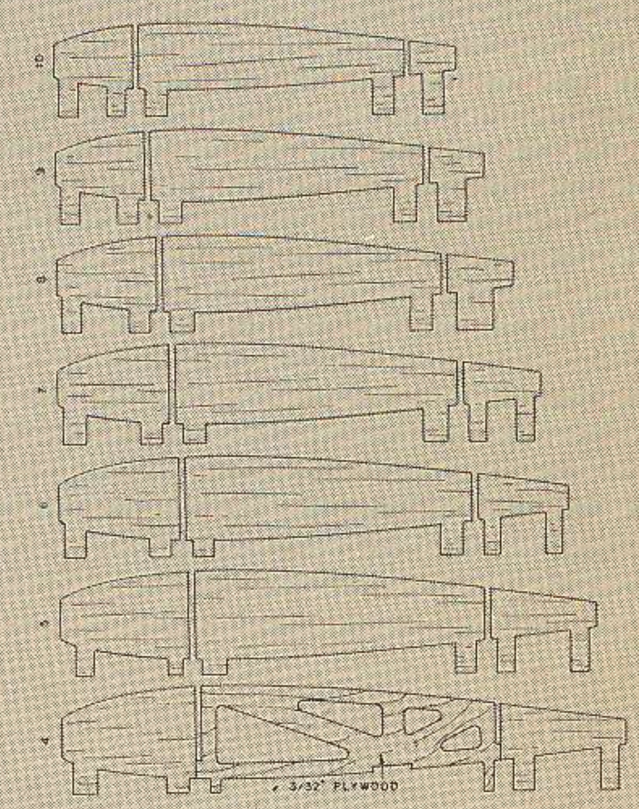


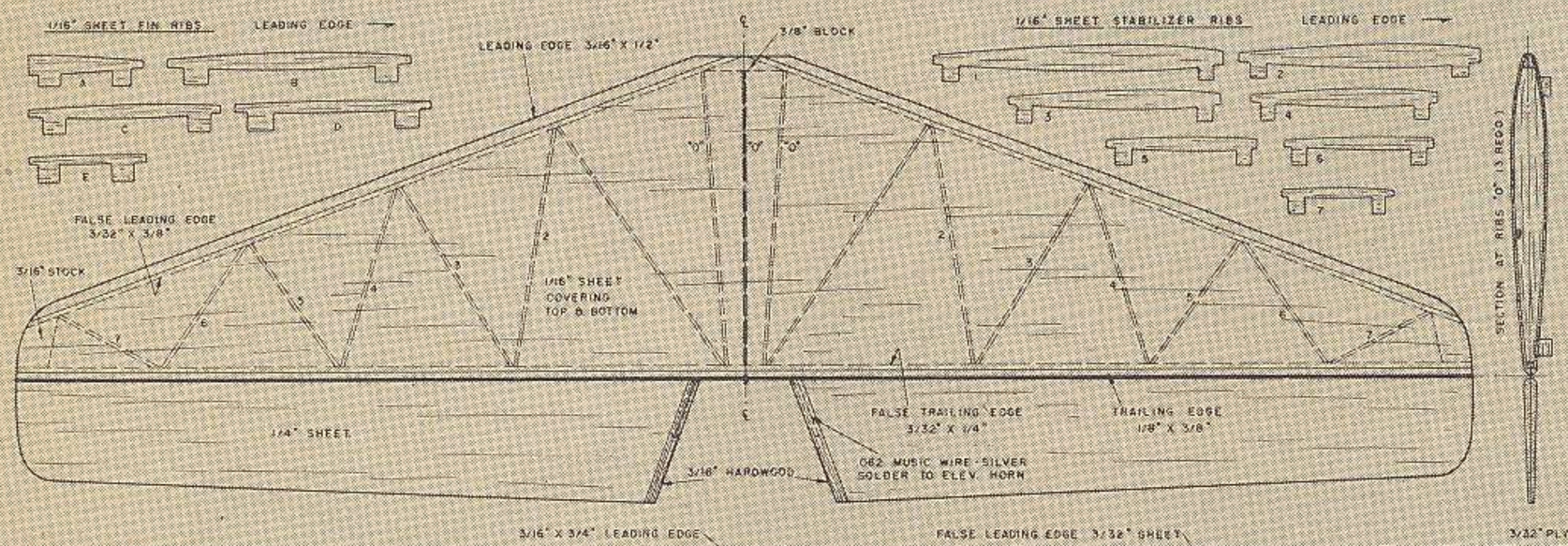


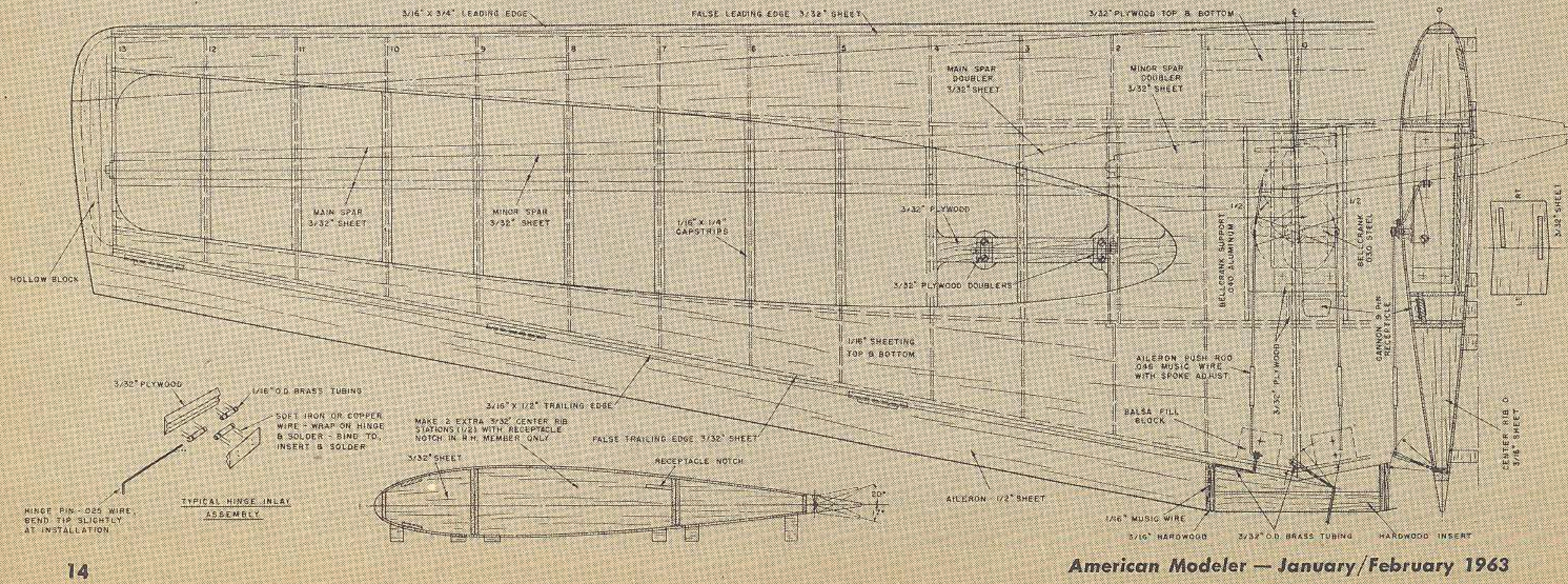
From left, above: Details of nose gear mounting and equipment with wing removed. Cowl and its hold-down ring are detailed in sketch on pg. 16. Power department with plastic bottle fuel tank in place. Latter is 8-oz capacity Veco "clunk". Harold deBolt's concern is kitting Perigee, expects to have 'em available by year's end.

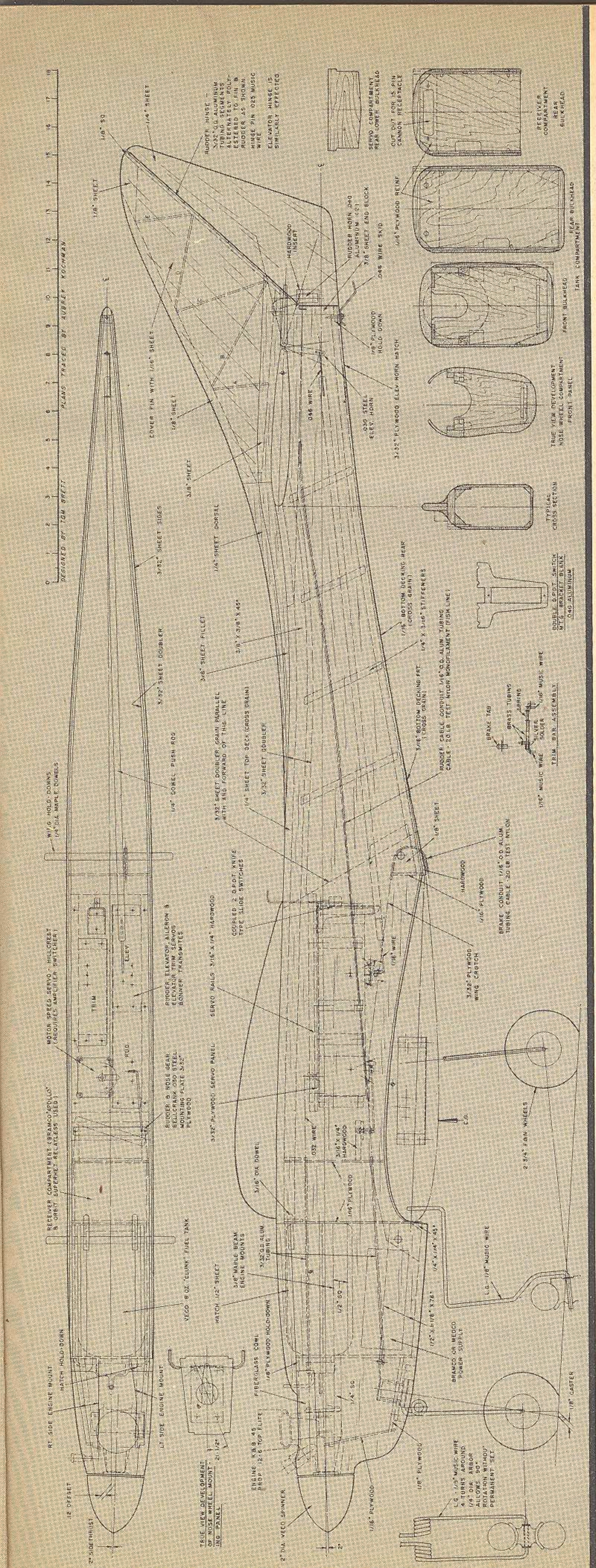
FULL SIZE working drawings are part of Hobby Helpers' Group Plan #163. Brett's "Nimbus-II" is available on Hobby Helpers earlier Group Plan #662 (85¢).











sessions turned into evaluation hops for Nimbus, looking at her from the standpoint of F.A.I. requirements. By November I had received a list of the competition maneuvers, which included vertical eights and vertical rolls. Putting Nimbus through these, I began to realize that more power and a lighter plane would be desirable.

We had been told we should have two planes to back our venture, and since a second plane still had to be built, I began scanning the plans to see where weight could be cut out. As I sketched over the prints, knocking out parts, reducing and revising construction and hardware, I soon saw that a smaller ship would help to zero in my target. After still more sketching I decided on a complete new design, lightness being the keynote.

New relayless equipment could be utilized, saving about a half pound in the installation alone. Per usual my first step was to round up all the equipment I planned to use, and make full size drawings for juggling component placement. As to the plane size, I hoped to be able to fly at about 22-oz per sq. ft. If I could build a ship to weigh about 5.5-lb a wing area of about 570 sq. in. should do it. This then became my guide.

Utilizing the Nimbus theories discussed in A.M. and some new gimmicks, the new ship emerged. Some of the peculiarities of this design that I believe are novel, at least in R/C modeling, are worth mentioning. To eliminate a clumsy and bulky bellcrank and pushrod hook-up for rudder, I adopted a nylon cable type drive. A single bellcrank, operated by the rudder servo would drive a pair of nylon monofilament lines through conduits on each body side for nosewheel steerage, as well as rudder.

Rather than having a "T" arm on the nose gear assembly, I planned a single arm coming straight back from the gear like a tiller, to properly couple rudder direction. A single piece of nylon would start from one of the two rudder horns and run thru aluminum conduit down the side of the fuse to the bellcrank. Looping it around one end of the crank several times, so as not to slip, it would continue thru another section of conduit to the nose wheel comparment. As the conduit enters the gear compartment, it must take a 90° bend on about a ⅜" radius. This routes the nylon cable into the tiller arm of the nose wheel. Then several loops around the tiller and on through the conduit on the opposite side of the body. Routing on back to the rudder horn on the other side would be managed in the same manner, in reverse. This method is sure to knock weight out of the nosewheel and rudder linkage. Adjustment of nosewheel centering could be accomplished at the servo arm and compensated for at the rudder horns. There I would use #3-48 bolts with the heads cut off and holes drilled in their places for attaching the nylon. These would operate through the rudder horn for adjustment. By tightening or loosening a nut and lock nut on the back side of these screws the rudder could be zeroed in. It really works, nylon having practically no drag through the conduits, even when making a 90° bend.

The same elevator trim bar set-up as in Nimbus I and II, was employed, for I feel it is one of the best means devised for trimming with Bonner servos. It consists of a trim bar, a segment of 3/32 O.D. brass tubing floating over two pieces of 1/16 wire, one attached to the elevator servo and the other to the trim. It is held against the elevator servo by a small compression spring. At a point about 20 to 25% from the elevator to the trim servo a 3/32 O.D. piece of tubing is soldered at right angles to this trim bar, through which the elevator push rod engages. The resultant assembly provides bind-free action easily adjusted by moving entire trim bar against trim servo compressing spring. This disengages 1/16 wire attached to elevator servo arm making it free to screw in or out. Adjustment made, trim bar is released to slide over the

wire and is aagin held against the elevator servo arm by the spring pressure. Adjusting process requires less time to perform than to read about it. There are lots more complicated, less effective ways of doing the same thing. It is hoped this little tip will help some modeler with his problem.

The beam-of-constant-strength wing construction was again used, with box section spars. This gives a wing the maximum possible strength with the least amount of wood. The wings on these F.A.I. ships, less landing gear and servo, weighed only 8-oz prior to silking.

Full span strip ailerons are used again, these offer all good and no bad characteristics, in building as well as flying. The wing was also modified somewhat in regards to airfoil and plan form. The F.A.I. flight sequence had the inverted figure 8 as well as inverted flight, which indicated that thought be given to inverted handling. I am not yet ready to accept the theory that symmetrical airfoils are good in all flight attitudes, but I do believe that they are better in the inverted maneuvers.

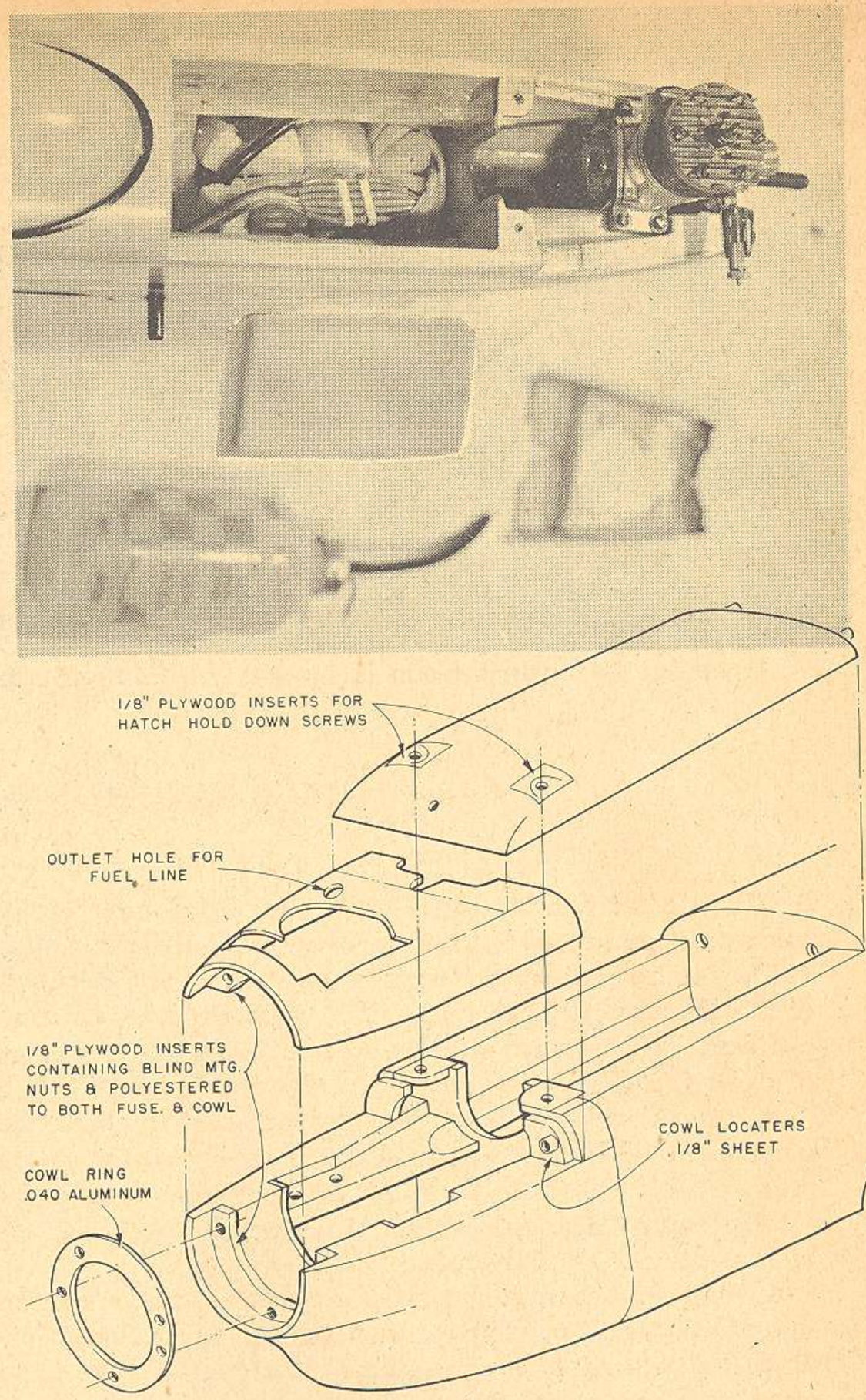
I decided on a section having 55% of the total thickness above the chord line and 45% below, thus approaching symmetrical. As a comparison, the 2415 airfoil is 60-40. I wanted to retain a 15% thick wing in order to stay within a stalling incidence range of the 2415 shape. I did, however, hope to reduce the abruptness of the stall, since these panels do maintain lift to relatively high incidence angles. However, when stall does occur it was rather sharp and complete. Two things that tend to modify this tendency are a blunting of the leading edge and the forward shifting of the point of maximum thickness. My point of maximum thickness moved about 3% ahead of the 2415 and the nose shape was rounded as much as possible without complicating a uniform curve rate change for both top and bottom surfaces.

"Apogee" and "Perigee" have no tendency to drop a tip regardless of speed, yet drop gently into a positive spin when completely stalled and full rudder is applied. It is not necessary to have any up-kicker device to spin, nor is it necessary to add up trim above normal flying requirements to reliably execute the spin maneuver. The wing plan form was modified, in that the percent of taper was increased from 54 to 60. This was done to further stabilize approaches in gusty weather, a feature that proved itself in actual performance.

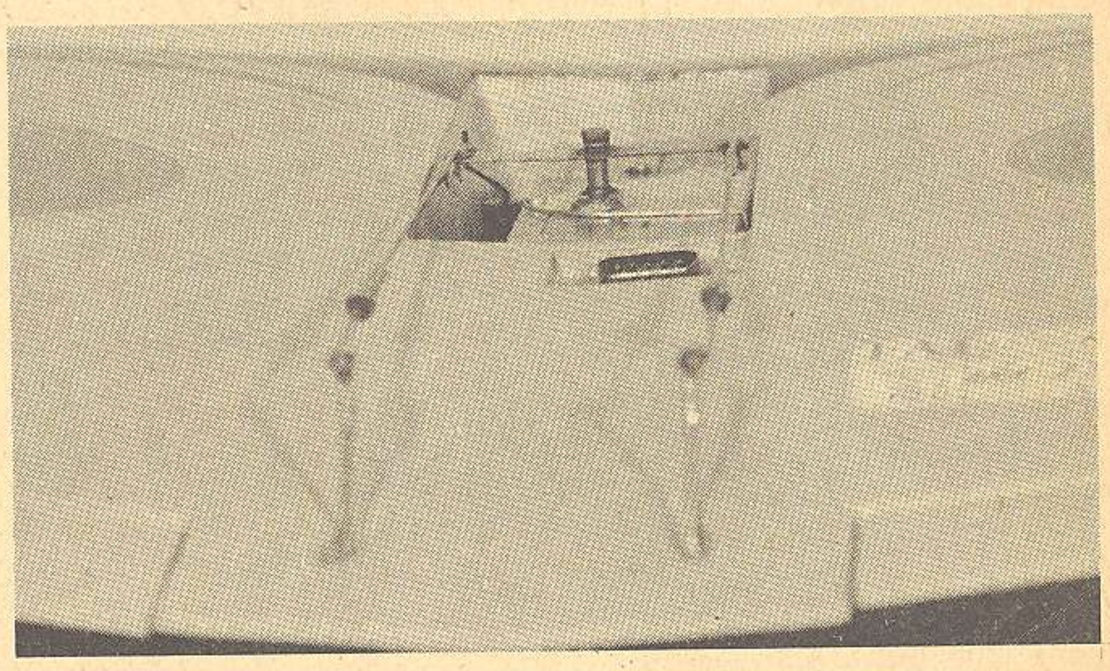
In keeping with the lightness theme, I gave up completely sheeting the wing. Adding the four rather large pieces of dope-absorbing wood did not seem to be worth whatever advantages they might have offered. I also decided to sheet all panels with 1/16 balsa instead of 3/32, relying on the skin stressing of the silk for the major portion of the wing strength.

I might mention, upon evaluating the wing strength from the mathematical approach, the weakest section of the whole panel would be directly over the main spar at the center station. This is caused by the joint in the sheeting and spars along with the fact that the servo compartment cut-out terminates here. Computations show that this area must have fiberglass reinforcement if the effects of maximum bending moments and structural reliefs are to be offset. For any readers planning to build this wing, I strongly recommend that you amply glass this area since my figures show that the wing at this location might fail under the strain of outside loops. This is the only area of the wing to require this treatment. An adequate fiberglass application to this spot brings the strength factor of the entire wing to a value that will withstand square outside loops 'til the cows come home.

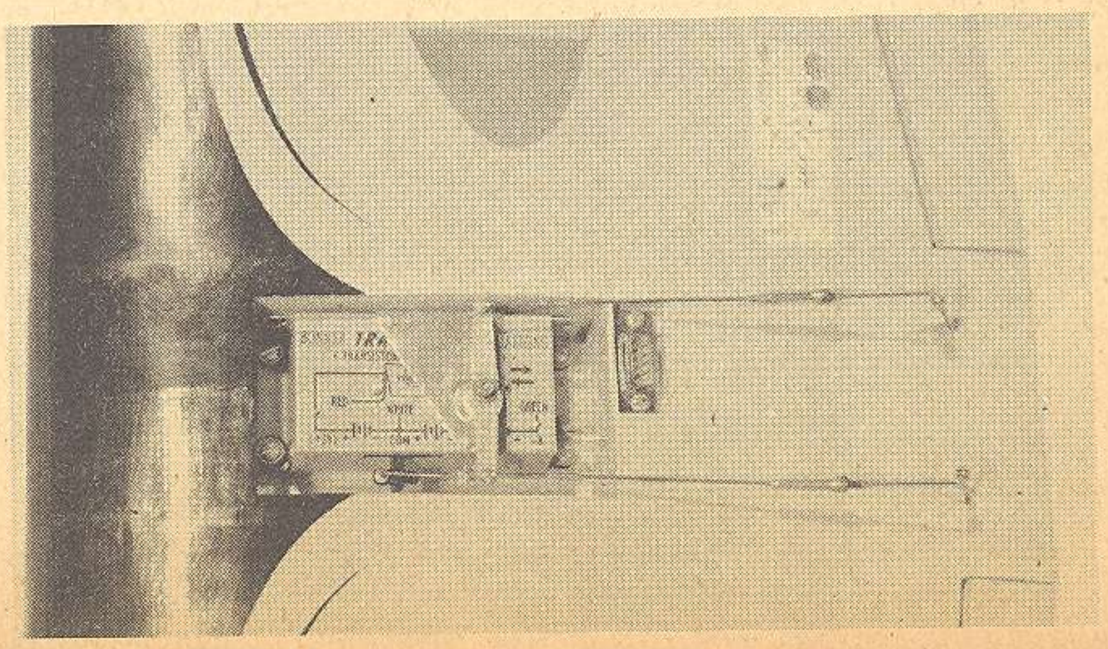
(*Continued on page* 84)



Top: Electrical power supply and fuel compartment. Above: Details of aluminum cowl ring, hatch and cowling.



Aileron servo set-up (above, below). Think of crashing such a gorgeous contraption—but that's just what TB did!



Perigee

(*Continued from page* 16)

Basically, the rest of the design follows in styling very close to that of Nimbus II, scaled down. The fin area was increased slightly to obtain some added yaw stability that seemed to show up occasionally in Nimbus. Rudder area and throw were increased; we sloped the rudder hinge angle more for more reliable spin entries. The body was shortened some to save weight, but the coupling proportions of Nimbus were retained by tapering rearward the stab leading edge, as well as tapering forward the wing trailing edge. Thought here was to separate the center of pressures of both surfaces as much as possible.

figured that I could completely outfit two ships and have a third standby airframe. So wood was cut for three wings. By Christmas one wing was nearly completed for Apogee. As building advanced I saw that I would have time to assemble only one airplane completely if I intended to have a display at the Toledo Mid-Winter Conference. I finished Apogee the night before the Conference and took the only break in what eventually turned out to be a continuous string of "crash" building programs.

The Saturday following the Conference was selected for the first flight by Apogee. This proved to be catastrophic! It was a clear, bright, windy day, March 3rd. The crisp air was not too cold and we considered the 30° a relief after earlier near 0° days. Snow completely covered the club flying field, topping a crust of ice hard enough to almost support a man, but at this time of year it seemed no better conditions could be expected for flying. Customary pre-flight of batteries, equipment and a final range check of the new Bramco Apollo receiver and transmitter was made, then the wing snugged into placed. The old reliable K&B .45 was fired up, wide open throttle vibration checks made, a few taxi passes made, and the zero hour arrived.

With some difficulty due to the steady wind and the glazed condition of the field Nimbus Apogee taxied to the leeward end of the field and swung into the wind. The surfaces glistened in the sun as they moved in perfect response to the final checking impulses. High speed motor—full bore—here she comes. Once moving into the wind Apogee seemed perfectly poised, anxious to leap into the air the moment she could break free. Speed up, I hit the elevator switch one poke, she broke off easily, but immediately began to settle. Another up and she rose on a steady angle. Her left wing panel began to droop as she climbed overhead toward Helen's shiny new Pontiac, making a gradual left climbing turn. Now, a poke of right aileron . . . nothing, another . . . nothing, another long pulse . . . still nothing . . . too late!

In less than 10 seconds Apogee had sped from a normal take-off into a sweeping arc to explode on the ice, shooting parts in all directions A quick field check showed the receiver operated perfectly. The servo panel flung 100′ across the ice, was bent up some and had a couple broken output arms. After straightening later they proved to operate perfectly also. Assessment of the airframe damage showed the wing to be in repairable condition. But the forward portion of the center section through the spar into the servo compartment was gone. The left tip from 3 rib stations outboard was shredded, as well as the left aileron. The type of wing construction used seems to fracture in such a way that only the spot directly in contact at impact breaks. Other than the center section and left tip, the wing was in original condition. The body was another story. I suspect somewhere particles are still floating around. All but the empannage literally disintegrated. Fortunately engine and all hardware could be salvaged.

At this point I gave up the idea of a third reserve airframe and studied the calendar thru moist eyes searching for time for completing even a second.

The small airframe, when powered with a large engine, would undoubtedly have torque problems to a greater degree than I had encountered before, so rather than incorporate ridiculous quantities of side thrust I combined ⅛″ offset with 2° side thrust to compensate for about 7-lb per h.p. of power loading.

I had decided that although the design would still carry the Nimbus moniker, I would have to distinguish between the two new identical F.A.I. models. I chose the major axis of an orbit, Apogee, and the minor axis, Perigee. Nimbus Apogee was the first to be built. Nimbus Perigee, the second made, was flown in F.A.I. competition.

Well, my winter's work awaited. The designs were completed just prior to Thanksgiving, then construction got under way. Hardware was first—3 sets. I

On that fateful Saturday repairs began. Five weeks later Apogee again rested on the end of the runway ready for the go signal. Since no cause for the first failure could be found I was not a little nervous and apprehensive. After a prayerful pause and a quick mental check through—much like a golfer getting ready to putt—Apogee was once again on her way. The story this time was different. As she rose out the ailerons reacted and though she had a strong left pull everything was under full control.

So the second plane, Perigee, was assembled. Weekday nights and Saturdays were spent building, Sundays were devoted to practicing both AMA and F.A.I. maneuvers with Apogee.

Along about the middle of May I discovered that the trusted Bramco Apollo and flew off beautifully without a hitch. To this day I have never had to trim her. That first flight was dead flat and level. Inside and outside loops needed no correction. Apogee, on the other hand has a wing warp resulting from the repair job, but she can be flown thru maneuvers with correction. I had felt from the first that Perigee was the better of the two ships. Both are identical in every respect, yet there is a definite difference beween them, proving what we all knew right along, no two planes can be built exactly alike.

Thoughts now had to be focused on a shipping box for transporting Apogee and Perigee to England. Fellow club member Roy Sanderson, a finish carpenter, produced a beautiful shipping box, for which I am most appreciative. This box was such a quality cabinet that I shipping . . . a frantic phone call to Johnny Brodbeck at K&B assured me of quick repairs to my engines. Airmailed to California, before the next week-end I had both engines back in the Nimbus Twins. All Saturday and Sunday was spent studying running characterists and running in the engines. By Sunday night I felt once again that all was in order. Monday and Tuesday nites were spent feverishly packing planes, parts and equipment. On Wednesday, August 1, the box was picked up for its Air Freight trip to the East Coast.

As soon as the box departed I began to worry about all the many other things involved . . . but as I brought each one up Helen would say, "It's all taken care of." She made plans and decisions with the dexterity of a travel agent that

I was flying on 6 meters would be verboten in England, since 52.5-mc is smack dead on Europe's broadcast band. This set off a panic search for a Bramco outfit tuned to the Citizen Band frequency, a legal R/C channel in Europe. Normally no problem, now, of course, problems cascaded. C.B. frequencies are so crowded in the Detroit area it is difficult to fly superregen equipment. This made it practically impossible to check out such an outfit before going to England. At this point I purchased an additional set of the new Orbit superhet 10, with the all transistorized Tx. This outfit was checked out in both Apogee and Perigee. All plugs and wiring were identical between the Bramco and Orbit installations so they could be switched. Things seemed to be shaping up.

On July 1 Perigee donned her wings considered making a crate to protect it—but then that's kinda like putting slip covers over slip covers, isn't it? Another friend, John Duchon, helped fabricate cradles for holding the planes inside and then painted it inside and out.

Plans for the trip neared completion. Hotel arrangements in England were confirmed, transportation for Helen was reserved, passports obtained, shots taken, converter for charger located, flight orders for the team transportation and model boxes were set, everything seemed complete. Then—I blew a piston in the engine of Perigee! Almost simultaneously Apogee's mill refused to idle and began spitting fuel. (I guess 3,000 hours is about all a guy can get out of an engine these days—don't build 'em like they used to!) Only one more week-end before the planes had to be packed for was overwhelming. Now that I think terists and breaking in the engines. By grass this past year?

Many people have wondered about my feelings when I found that a "fly-off" was required between Harry Brooks and myself to establish a winner. Harry had flown the two highest scores of the meet, finishing his last performance early Sunday morning. Since it didn't seem at all likely that anyone would be able to exceed his score, his supporters were pretty sure he would be the winner.

Numbness had pretty well taken me in hand, yet I had no time after my last flight on Sunday to experience a letdown. Strange as it sounds, the first thought that passed through my mind when I found that my score topped Harry's was one of guilt. Knowing that we were all out to win still didn't lessen

that feeling of responsibility for Harry's disappointment. I hated to face him. But typically he was one of the first to shake my hand after the flight, demonstrating the sportsmanship so typical of the splendid modeling competition spirit engendered by hotly-contested meets which are well run and properly planned.

Equipment and planes at this competition reflected mucho American influence, U.S. radios and servos ran ahead of all others in numbers. Airplane designs didn't seem to vary too greatly; all but a few were low wing, tricycle gear configurations. Yet there was a good bit of interest in Apogee and Perigee. They were the smallest entries and seemed the greatest departure from the conventional. Many modelers inquired about plans for the design, which I must admit was flattering.

For those interested in a production version, deBolt Model Engineering will kit the design so it should it be available by January. We have decided to call the kit Perigee, since Nimbus is known as my design of last year, and Apogee was not actually flown in Europe, although she was there ready to stand-on.

In the next *American Modeler* (Ed. note—March/April issue on sale Feb. 7) I'll cover some of our observations on European planes and their R/C flyers.

Capers

(*Continued from page* 24)

taker. Incidentally if you start getting shocked, quickly fly low and ground yourself by touching the lines. Insulation merely allows a large charge to build up and *then* Pow!

Back to electrocution—any wooden poles with 3 large wires carry high voltage. Be safe, stay away from any and all of them. Flying is not important enough to die on accounta . . . as some of your peers have. Play it safely; we prefer live readers.

6-Minute Barrier Approaches. Like the "Sonic Barrier," the 4-minute mile and 100-mph on a surf board, the Rat Racers have their own 6-minute (100-mph average) barrier to crack. Be an "odds figurer"—what targets do we shoot at?

Since the take-off lap usually takes 5-sec, we have 15 seconds soaked up in 3 laps. The fastest you could get a ship on the ground for pit stops is about 2 seconds, if she quits ½ lap from pit crew and you break the glide quickly, "hitting" the crew at about 20-mph. This we've done. Then give the crew 5 seconds for each refueling. There went 29 seconds. Your total must be 360 seconds.

Hokay, schport . . . leaves 330 seconds of high speed running for 136 laps. Speed 106 mph. This is your "Target Speed." Anything slower, no chance. Conversely, anything over 106 IF you don't sacrifice pit stops is gravy. We have assumed clocking from take-off, not a LeMans start.

Another statistic based on a 10 second 100 yard dash: pit crew speed is 20.5-mph max, more like 15-mph or 22-ft/sec. If he must run ½ lap on 75 ft radius he'll take 11 seconds. Pilots, learn to spot your landings, they're money in the poke. So, finally, rather than soup your engine, work on sharp pit work and fast re-starts, spot landings and consistent non-erratic flying.

THEN soup your engine and let us know when, where and what with you hurdled the 6 minute barrier.