AUGUST 1969 • 75c

rc Modeler

The Leading Magazine For Radio Control

A few words about me.

I am Electronic Engineer and this is my day job.

From tender age two things attracted my interest and I managed to have them in my life.

The first was electricity and the second the bluesky.

I´ve found the model airplanes hobby in October 1973.

I love the wooden structures from scratch airplanes and boats also.

I started collecting plans, articles, books and anything else that could help the hobby of many years ago and have created a very large personal collection of them.

Since 2004 I became involved with the digitization and restoration of them and started to share the plans from public domain with my fellow modelers.

Now after all this experience I have decided to digitize, to clean and to re publish in digital edition and free of all issues RC Modeler magazine from 1963 to 2005 and others books and magazines.

Certainly this will be a very long, difficult and tedious task but I believe with the help of all of you I will finish it in a short time.

I apologize in advance because my English is poor.
It is not my mother language because I am Greek.
I wish all of you who choose to collect and read this my work good enjoyment and enjoy your buildings.

My name is Elijah Efthimiopoulos. (H.E)
My nickname Hlsat.

My country is Greece, and the my city is Xanthi.

Λίγα λόγια για μένα.

Είμαι Μηχανικός Ηλεκτρονικός και αυτό είναι το αληθινό μου επάγγελμα εργασίας.
Από μικρός δυο πράγματα μου κέντρισαν το ενδιαφέρον και ασχολήθηκα με αυτά.
Πρώτον ο ηλεκτρισμός και δεύτερον το απέραντο γαλάζιο του ουρανού και ο αέρας αυτού.
Το χόμπι του αερομοντελισμού το πρωτογνώρισα τον Οκτώβριο του 1973.
Μου αρέσουν οι ξύλινες κατασκευές αεροπλάνων και σκαφών από το μηδέν.
Ξεκίνησα να συλλέγω σχέδια, άρθρα, βιβλία και ότι άλλο μπορούσε να με βοηθήσει στο χόμπι από τα πολύ παλιά χρόνια.
Έχω δημιουργήσει μια πολύ μεγάλη προσωπική συλλογή από αυτά.
Από το 2004 άρχισα να ασχολούμαι με την ψηφιοποίησης τους, τον καθαρισμό τους αλλά και να τα μοιράζομαι μαζί σας αφού τα δημοσιοποιώ στο διαδίκτυο (όσα από αυτά επιτρέπεται λόγο των πνευματικών δικαιωμάτων τους).
Σήμερα μετά από όλη αυτήν την εμπειρία που έχω αποκτήσει, αποφάσισα να ψηφιοποιήσω, να καθαρίσω και να ξαναδημοσιεύσω σε ψηφιακή έκδοση και ελεύθερα όλα τα τεύχη του περιοδικού RC Modeler από το 1963 μέχρι το 2005 και κάποια άλλα βιβλία και περιοδικά.
Σίγουρα είναι μια πολύ μεγάλη, δύσκολη και επίπονη εργασία αλλά πιστεύω με την βοήθεια όλων σας να την τελειώσω σε ένα καλό αλλά μεγάλο χρονικό διάστημα.
Ζητώ συγγνώμη εκ των προτέρων γιατί τα Αγγλικά μου είναι φτωχά.
Δεν είναι η μητρική μου γλώσσα γιατί είμαι Έλληνας.
Εύχομαι σε όλους εσάς που θα επιλέξετε να τα συλλέξετε και να τα διαβάσετε αυτήν την εργασία μου καλή απόλαυση και καλές κατασκευές.
Το όνομα μου είναι Ηλίας Ευθυμιόπουλος.(H.E)
Το ψευδώνυμο μου Hlsat.
Η χώρα μου η Ελλάδα και η πολη μου η Ξάνθη.

RCBookcase
H.E
* Hlsat *

RCM Magazine Editing and Resampling.

Work Done:

1)Advertisements removed.

2) Plans building plane removed and hyperlinked.

3)Articles building plane removed and hyperlinked.

4)Pages reordered.

5)Topics list added.

Now you can read these great issues and find the plans and building articles on multiple sites on the internet.

All Plans can be found here:

Hlsat Blog RCModeler Free Plans and Articles.

http://www.rcgroups.com/forums/showthread.php?t=2354459

AeroFred Gallery Free Plans.

http://aerofred.com/index.php

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http://pulling-gz.blogspot.gr/?view=flipcard

Vintage & Old-Timer RCM Free Plans.

http://www.rcgroups.com/forums/showthread.php?t=2233857

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Thanks Elijah from Greece.

THIS MONTH

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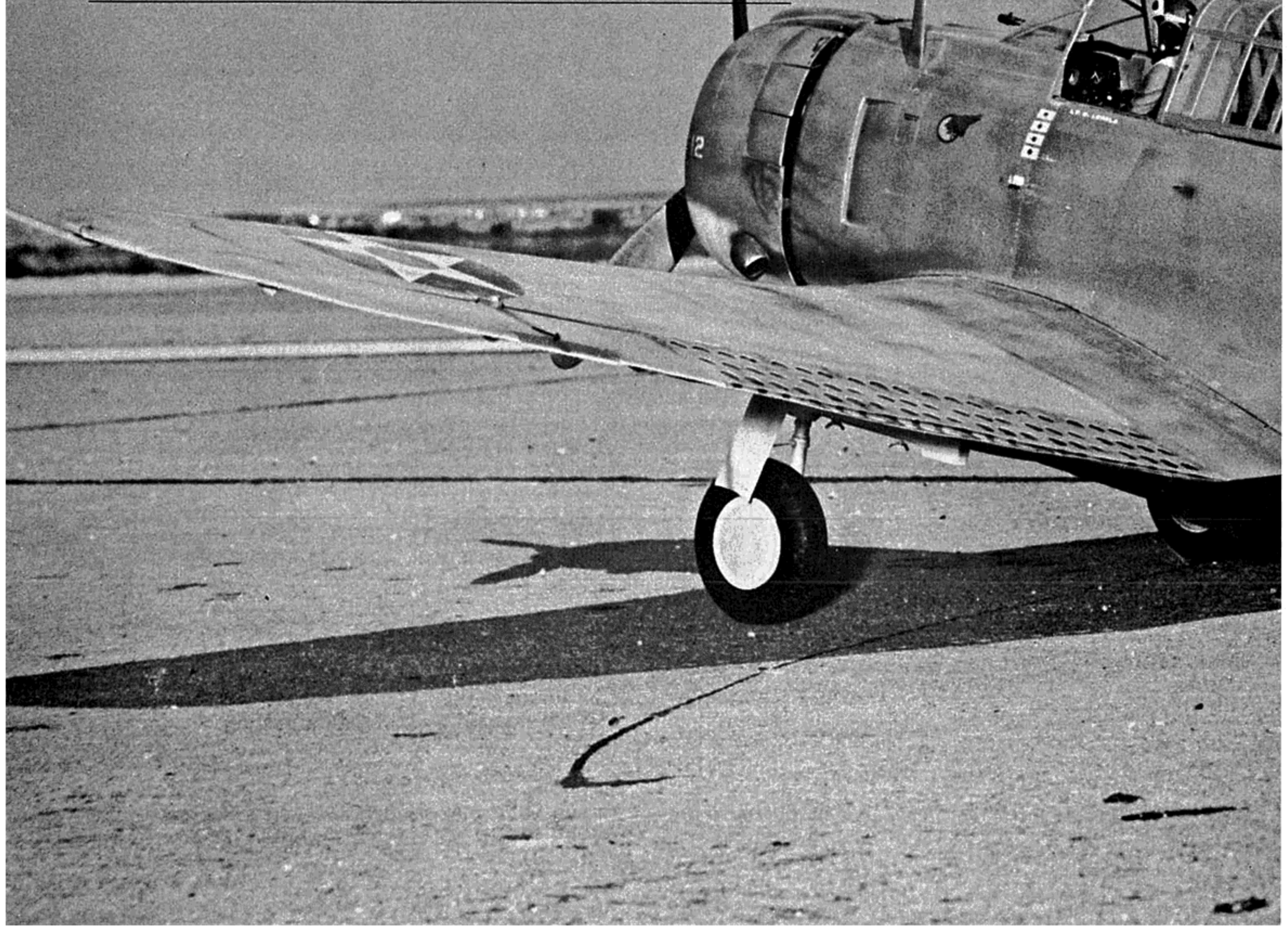
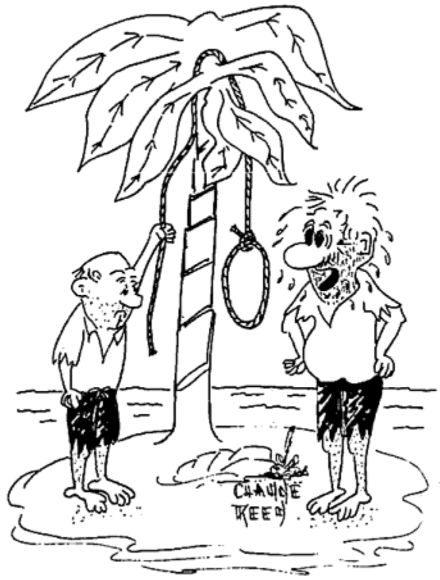


COVER: Ken Willard, RCM Associate Editor, poses with Rhomboid-winged R/C model of Phoenix-Warren S-31 after successful flight. Complete construction article in this issue. **FRONTSPIECE**: Dave Platt's scale model of the SBD "Dauntless" taken by Bill Coons at the Olathe, Kansas 1968 Nationals.

VIEWPOINT

BY DON DEWEY


"Can't you just forget that I ever mentioned 'wind effect' on a model?"

There's one thing about the publishing business:

You can print the most seemingly innocent statement and suddenly find yourself in the center of a many faceted controversy.

Take, for example, the quote from the York Area RC Club Newsletter, authored by Vernon Smith, concerning wind effect on a model aircraft as printed on page 51 of our February 1969 issue. This immediately prompted a letter from Mr. B. K. Dunlevy, a long time modeler as well as a flight instructor, whose rebuttal to our comments appeared on page 4 of the May 1969 issue of RCM.

Since that time, numerous letters have been received on this same subject – all from individuals with impressive credentials and most of whom were at variance with one another. Since this subject of 'wind effect' on a model, or full scale aircraft, seems to be a somewhat controversial subject, we would like to pass these letters on to you. The first is from Major William B. Benshoof, a military RB-66 pilot and a licensed FAA flight instructor at Shaw Air Force Base, So. Carolina:

Dear Don:

I am writing in regard to recent articles concerning wind effects on airplanes, downwind turns, and the resulting crash. I am not trying to be facetious, but you still don't have the complete picture. Mr. Dunlevy got real close in his letter (May RCM) discussing True Air Speed (TAS), radius of turn, load factors, and stall speed. However, he made a technical error using the term TAS in relation to stall speed. The speed at which a particular aircraft will stall is its Indicated Air Speed (IAS). This speed varies with weight and load factor (G forces) but is relatively unaffected by air density. TAS varies with air density and assuming a constant IAS will increase with altitude. The following listing contains a few examples.

IAS	Temp. F	ALT.	TAS
100	100	Sea Level	104.0
100	75	Sea Level	101.5
100	50	Sea Level	99.0
100	100	5000 feet	114.0
100	75	5000 feet	111.0
100	50	5000 feet	109.0

Probably the only time that this would be noticed by an R/C Modeler is if he normally flew off a field located at sea level then traveled to the Mile Hi meet at Denver which is over 5000' high. He would notice his take-off and landing speeds somewhat higher than normal and his maneuvers using up a lot more air space. It is a small point as far as models are concerned; but, in higher performance full-size aircraft, it becomes a very important factor. In fact, some aircraft have a ceiling which is called 'coffin corner'. It usually is about 45,000 to 50,000 feet where structural limitations will not let you go any faster and if you slow down the aircraft will stall.

Now that that issue is thoroughly confused I would like to attempt to clear up, once and for all, why airplanes (full size and models alike) stall and crash during downwind turn close to the ground. Mr. Dunlevy is entirely correct in stating that wind does not affect the flight characteristics of an aircraft once it is airborne. If we do not consider gusts, the machine does not know whether it is going upwind or downwind. It is merely flying in a 'sea of air' which is moving, and the IAS remains the same. As I see it, there are two factors that cause the pilots to crash their airplanes under these circumstances: (1) Vertical Wind Shear, which affects the aircraft like gusts; (2) Radius of turn, which causes the pilot to increase bank angle and consequently the load factor.

Vertical wind shear is a phenomenon whereby the wind velocity changes with altitude. At low altitudes it is caused by ground friction and can become quite extreme on windy days while flying around trees, buildings, and other obstacles. It is not at all uncommon to pick up sudden 10 to 20 mph increases in wind velocity (gusts) while climbing through 50 to 100 feet of altitude. Now, let's take the model which stalls at 13 mph IAS, accelerate it to 20 mph IAS in the climb and turn downwind still climbing. As it approaches a downwind heading it suddenly picks up a 10 mph greater tailwind due to the aforementioned wind shear and SPLAT! DRAT! Now here is what the pilot sees from the ground. His craft climbs out well, starts the turn downwind, then suddenly starts leveling off. He reacts by pulling back on the stick to continue the climb; the aircraft falls off on a wing and spins in. The aircraft did not have time to react to the sudden loss of IAS, and the pilot aggravated the situation by increasing the angle of attack beyond the stall point. If he would have merely let it settle and regain its airspeed, it probably would have recovered itself. Of course the next thing this fellow does, after picking up the pieces, is write a nasty letter to his radio manufacturers, accompanied by a twisted mass of metal and wires which used to be his radio.

The second factor, radius of turn, is caused by the wind and again aggravated by the pilot. Radius of turn varies with changes in speed, whether it be ground speed or speed through the air. Since modelers are generally confined to a small geographic area while flying, I will restrict the discussion to ground speed. Also, since we are generally flying at low altitudes, let's assume IAS and TAS to be the same. If the aforementioned aircraft is flying at 20 mph TAS into the wind of 10 mph, its groundspeed is 10 mph and downwind its groundspeed is 30 mph. Radius of turn is the amount of space it takes to turn an aircraft at a given speed and bank angle. Here is the way it works: If you double the speed the radius of turn quadruples and if you triple it, the radius of turn is nine times greater. Using the above example, the aircraft will take nine times the area to turn going downwind than it does going upwind and vice-versa.

Now let's get back to the downwind turn after take off. As the pilot turns his machine downwind, he notices it isn't turning fast enough to miss the big tree on the field boundary (I think we all have our 'model eating trees'), he rolls into a steeper bank, hauls back on the stick to maintain altitude and "*+$†&@*". What happened? He merely increased the load factor (a la Mr. Dunlevy), which increased the stall speed and stalled the aircraft.

If you put both these factors together, you can readily see why so many people get into trouble on downwind turns after take-off. Also, there is another place where the unwary get into trouble with the wind. On days when the wind is crosswind to the landing strip and you fly your base leg downwind, this old bugaboo of turning radius takes you into the boonies beside the runway. Here is the remedy - take off into the wind and allow your airplane to climb to a safe altitude and accelerate to a safe airspeed before turning downwind. It is more important on windy days than calm days and don't worry about going out of range upwind because, remember, your groundspeed is slower, making your angle of climb greater. Also, when making cross-wind landings, always fly your base leg into the wind when possible. It will keep you from having to bank so steeply to keep out of the boondocks . . .

William B. Benshoof
Major, USAF

Bill's letter was further substantiated by an article on this subject which appeared in the I.P.I.S. Approach, the publication of the USAF Instrument Pilot Instructor School, ATC Randolph AFB, Texas.

The next letter on "wind effect", is from our old friend, a senior pilot with Quantas Air Lines:

Dear Don,

At the risk of belaboring an overworked point, I feel that I must add my say to the letter from B. K. Dunlevy (May '69) on wind effects. . . .

The theory that an airplane's flight characteristics are unaffected by wind is true only if the wind velocity and the aircraft velocity are completely stable (i.e. no change is occurring). The aircraft velocity can approach this condition, but watch an anemometer for a few minutes and see how rarely (if ever) wind direction and speed remains constant. Furthermore, it is generally true that the greater the wind speed, the larger the speed varations.

The effect of this on an aircraft's performance can best be illustrated by quoting figures I have actually experienced in the course of operating Boeing 707's. Perhaps I should add that these effects have only become readily apparent since the advent of the big jets, but the principles hold good for all aircraft, and a number of crashes can be traced to the earlier incomplete understanding of such effects.

Suppose you are on final approach in a 707. The calculated approach speed as determined by weight is 130 knots. (Call it mph if you like — it doesn't affect the argument.) The reported surface wind is straight along the runway at 20 knots, with gusts to 40 knots. At some point on the approach you are in a 40 knot wind area, and you have stabilized your speed at the required 130 knots, and your groundspeed will be 90 knots. Everything looks good, and you think you've got it made. But that wind suddenly dies to 20 knots! In order to maintain airspeed, the groundspeed must increase to 110 knots, and this simply cannot occur as quickly as the wind can die out. So that 20 knots reduction in wind speed appears as an IMMEDIATE reduction of airspeed, and hey presto!; from having it made you are suddenly perilously close to a stall!

To avoid this, current practice is to increase the approach speed by the amount of the gust factor. In the above example, target speed becomes 150 knots, and if the speed does bleed off, it allows time to increase thrust and regain the lost speed without risk.

Now let's look at the reverse situation, where the wind is reasonably constant, but the aircraft velocity changes. (Remember the term 'velocity' includes both speed AND direction.) A pylon racer is on the upwind leg at an airspeed of 100 mph, punching a 20 mph headwind. Groundspeed will be 80 mph. Round the corner - a good pylon turn takes perhaps between one and two seconds. Presto again, we've now got a 20 knot tailwind, and groundspeed must increase to 120 mph, which takes TIME, longer than it took to come round the pylon! So until the lag due to inertial effect is overcome, airspeed MUST DECREASE.

This is additional to the effects described by Mr. Dunlevy, and the moral of the story is clear. Watch those downwind turns!

Regards,
Charles Peake

The next letter on this subject is from Don Dailey, of Leesburg, Virginia, a full scale pilot for the past 24 years and an RC pilot for the past 18 years. The contents of Don's letter were discussed at length with his good friend Mr. David Pearce, a full scale flight instructor as well as an RC pilot for many years, and one of the early presidents of the NVRC. His thoughts on the subject under discussion are in agreement with the following ones from Don:

Dear Don,

Regarding the current discussion of "The Toy Airplane Versus the Wind", shame on you, Mr. Dewey, for backing down! The York Area RC Club Newsletter reprinted in the Feb. '69 RCM IS correct! It lacks only the name of the troublemaker, 'Inertia'.

Mr. Dunlevy, in the May '69 RCM is also correct in the data presented. His conclusions however, deviate from the subject at hand. He has discussed one problem, accelerated stalls, and ignored the other, inertia.

I shall attempt to show by example what happens: A full scale J3 Cub is on final approach at a True Air Speed of 55 mph. A head-on gust of 15 mph occurs causing instantaneous increase in airspeed, forcing it to balloon unless stopped by the pilot. The airplane slows to its original airspeed if the gust is of sufficient duration and no trim changes have been made.

Let us assume this has occurred, now the gust ceases:

1. The airspeed decreases rapidly, in this example, to, or near to stall speed.

2. A definite period of time is required for the aircraft to accelerate to its original airspeed. A considerable amount of altitude can be lost while this takes place. If near the ground prompt application of power may be required.

Now to our models: All have seen the rudder only trainer turn into the wind and balloon. The primary reason is a momentary increase in airspeed. As its inertia is expended, the model slows to its normal airspeed. Likewise, the same model turning downwind will lose altitude until it accelerates to its normal airspeed. I DO NOT here refer to a tight, steeply banked turn leading to a spiral dive, but rather to a gentle, fairly flat turn.

In the above presentation, I have purposely omitted all reference to vertical air currents such as thermal activity, etc., however, these do compound the problems under discussion.

Mr. Dunlevy feels the high powered multi has less of a problem than the low powered trainer. I agree, but not for the same reasons. He states, ". . .they have sufficient thrust to carry them through . . ." Actually their normal airspeed versus stall speed is usually much more favorable than that of the low powered trainer.

Mr. Dunlevy also mentions a sailplane. They are subject to the same laws of physics, including inertia, as any other airplane.

To sum up, as Mr. Dunlevy's data shows: Accelerated stalls can get you, (model or full scale). Never forget however, the basic law of inertia; it will break your model for you, also. . . .

Thank you,
Donald R. Dailey

The next letter is from Martin J. Dietrich of Beaverton, Oregon:

. . . Regarding the question of how much a model airplane knows which way the wind is coming from, let me side with those who 'imagine' that the model really zooms when turned into the wind. Listen to my theory because it explains what others merely try to explain away.

A motor only clouds the basic principles, so let's pick a glider. Its downward path acts like a motor anyway. Let us further assume that the wind is blowing at exactly the model's flying speed. The principles apply to all wind speeds except zero.

Granted, the model is ignorant of the wind direction or its existence as long as we do not turn it, however, the minute we turn it, it knows very well which way the wind is blowing. Here is my theory:

When the model is hovering, facing the wind, it has no kinetic energy and its inertia wants to keep it in one spot. When a model is moving downwind it is full of kinetic energy and nobody can explain this away.

If you turn a hovering model quickly downwind, response to controls is sluggish until it reaches the velocity of the wind plus flying speed. Much altitude will be lost in this process of acquiring the kinetic energy necessary to fly downwind. If the model is turned slowly, the wind has time to blast it from the side, accelerating it downwind quicker, thus minimizing the loss of control and altitude. So, the model knows which way the wind is blowing.

Now the model is flying downwind at a great speed and full of kinetic energy and we turn it into the wind. It will grind to a halt and hover again. Where did the stored-up kinetic energy go? We can't just write it off as a bad trip. I conjecture that if the turn is executed in an efficient manner so as to avoid all unnecessary increase in drag, enough of this kinetic energy will have been redirected from downwind to an upwind direction to cause the model to overshoot the hovering speed.

It will ram into the wind at a speed higher than its own flying speed. Because it was moving downwind at exactly twice its own flying speed and why should it not be possible to have, let's say, 1.2 times the flying speed left after completion of the turn? This definitely means a zoom. If the turn is a good one, the model zooms. If the turn is mediocre, the model might not zoom. If the turn is abrupt, the kinetic energy will not be redirected around a smooth curve upwind and it will pull the model downwind, regardless of which way the model points. The drag will consume the kinetic energy and if the model ends up with less than flying speed it will drop out of the sky. Call it stall, manger or whatever you want. This, of course, has nothing to do with wind. It will happen in calm weather too.

It is one thing to reverse the rotation of the earth and leave model and wind alone, and it is another to reverse the direction of the model and leave the earth and wind alone. The magnitude of kinetic energy in the model has nothing to do with the rotation of the earth. It applies in outer space or on the moon.

If you have not chucked this letter yet, I want to tell you why I could never accept the premise that a circling model does not know which way the wind blows:

Roll a wheel horizontally along the wall and make a dot on the rim of the wheel. This dot is your circling model and the uniform motion of the wheel along the wall is the wind. The dot does not describe a circle. It makes like a pogo stick. When it is closest to the wall it stands still and when it is farthest from the wall it moves fastest. One minute it is full of energy and the next it is dead. Have you ever wondered why the mud flies forward off your bicycle wheel instead of radially away from the center like the spokes point? I have always wondered why it should feel so different walking on a moving escalator. Use a bouncing step like those gorks who lift their heels the instant they set them down. According to those who seem to have won the argument in your magazine, you are not supposed to know the stairs are moving because they do not change speed.

Best regards,
Martin J. Dietrich

The final letter we're reprinting on this subject is from Bob Spaulding of Sheffield Lake, Ohio:

It is not my intention here to criticize any informed readers,but, that 180 degree downwind turn, and crunch, was in all probability, the result of the wind. It is a poor misconception that as soon as you are airborne, you can forget about the wind, and for the inexperienced model flyer, it could cost a lot of time and money.

Most modelers have at one time or another, flown a ship into a tree. If the tree was upwind, it suffered very little damage, but if the tree was downwind, WOW. We would measure this force in foot-pounds of energy. Sir Isaac Newton laid the ground work for us a long time ago. This force is called Kinetic Energy ($MV^2/2$). Our model with a flying speed of 35 mph flying into a 35 mph headwind, has absolutely zero kinetic energy. But, fly it downwind, and it would strike the tree at 70 mph. If our ship weighs 5 pounds, it will hit with a force of 825 foot pounds of energy, very bad news.

It is possible for most R/C models to make a 180 degree turn in 5 seconds. There is no engine with enough power to accelerate a model of 5 pounds to 825 foot pounds (flying speed) in 5 seconds. Add to this the fact that the first half of the turn you are still flying your way into the wind and the result is the loss of altitude.

In full scale aircraft the turn rate is 3 degrees per second, a steep turn (double rate) is 6 degrees. So you see, Don, the 30 seconds required for a steep 180 degree turn gives ample time to gain the needed kinetic force. In addition, the true airspeeds are usually much higher in relation to the prevailing wind.

And so a final warning to the tenderfoot taking off with the trees to his back, in a stiff wind — Don't make that downwind turn until you are higher than they are. And if you find yourself in this trap, try and turn back, for up elevator will only cause your ship to mush and struggle in vain.

Bob Spaulding

And there you have a few representative letters of the correspondence we have received concerning this matter of 'wind effect' on the model. We thought that you would find them interesting. My own personal conclusion is that I will never, never, again fly downwind!

—

Our old friend Dick Hill, of Simul-Logic Systems, Inc., 184 Green Ave., Woodbury, New Jersey 08096, asked us to pass on the following information for the benefit of those RC'ers attending the forthcoming Nationals. Simul-Logic Systems will provide, free of charge, one of their proportional systems for use by any RC competitor should his system, regardless of make, fail during his official flights. Dick feels very strongly that anyone who has gone that far should be given the opportunity to complete the competition. If this modeler then goes on to win he will be given the Simul-Logic system. At the end of each flying day, the modeler will have to return the system or give the plane to the Navy for safe keeping. Since there are only a limited number of systems available for this purpose, Dick states that they may be forced to require the sharing of a system in non-conflicting events, so that no one is forced to sit out the Nationals. Dick, along with the entire staff of RCM, would like to take this opportunity to wish every modeler the very best of luck at the Nationals with the hopes that each and every one enjoys himself at Willow Grove.

—

Speaking of controversy, we hope you've been enjoying the series of Wagger articles — we have had a great deal of favorable comment on this short monthly column, although some of our readers have been somewhat reluctant to argue with a dog! This column, in essence, is a brief editorial on various subjects of interest to RC'ers, and your comments and discussion concerning these editorials are both welcomed and invited. Drop Wagger and Walt (Percy Parkenfarker — Walt's real name) a line and let them know what YOU think. ●

HOW?

By NOEL FALCONER

PART III

We need to gain public acceptance. And one way to start is to put our own house in order, by flying safer, quieter models.

Fair enough. Nobody disagrees. This is what we ought to do. Only, agreeing what to do does not tell us how to do it. How can modelers be induced to build quiet, safe models? The answer is neither obvious nor easy.

Let us look at some 'solutions' that do not work.

Unsupported Persuasion

The easiest action available to us is to tell fliers "Build safe models" and leave it at that. Many sensible modelers will see that this is good advice in their own interest, and will respond. Others, the irresponsibles who cause most of the trouble, will not. As some of the design features that are undesirable from the noise and safety point of view give advantages in competition, simple persuasion will be unfair to the modeler who co-operates and, indeed, will quickly become ineffective for this reason.

Persuasion, education if you like, is important. But if it is to work, it must be backed by rules that make it advantageous - immediately, obviously, personally, individually advantageous - to fly sensibly.

Engine Capacity Limitations

Engine size limitations are not much use. Brilliant engine designers have thwarted every attempt to cut power by any reasonable application of this restriction. Oh, we could specify .049's - but the contest modeler needs power and he is going to get it somehow. Hyper-tuned motors would appear, expensive, short-lived, acutely difficult to handle, and available to the top fliers only. Clearly, this is an unhealthy line of development. If power is to be limited, some method other than capacity restriction must be found.

Good Flying Characteristics

Nothing makes a model safer than good handling characteristics. Now tell me how to legislate to demand this! Light wing loading makes for slower landings that some people think are easier. In a wind the lightly loaded model is buffeted so much that these slow landings become lethal. Wing taper makes tip stalls and flick rolls more likely. Remember the Perigee? Yet a modification to the Perigee so small that it could not be seen, a tiny change in the leading edge radius between root and tip, gave as docile an airplane as could be desired.

No, we cannot make laws to cover the infinite diversity of model design. And if we could, such laws would be entirely unacceptable. An aircraft with impeccable handling and a total lack of vices simply cannot fly any demanding aerobatic schedule. Unless it can be provoked into a tip stall it will not spin; and flick maneuvers must soon figure in our patterns, as they already do in full-size competition.

Minimum Dimension Rules

Racing models are often required to have certain minimum wing areas and fuselage widths and depths. This is effective in racers, where the maximum power is used in any case. The fuselage requirements ensure that the models resemble full-size aircraft sufficiently to be attractive to spectators, which helps in gaining popular support, and when a class of models weighs roughly the same, a minimum wing area keeps landing speeds within reason while imposing the least processing load.

Both the weight and the power of aerobatic multi's vary greatly, so that these simple rules are no longer useful. At the least, the wing area requirement must be replaced by a wing loading rule - which already exists. The international definition of a model aeroplane imposes a loading restriction at an ideal level. (Speed and super-scale models are often in breach of this regulation, so it may be useful to re-state it. The maximum weight of a model is 24.5 ounces for each square foot of 'total projected surface area'. This is the total area of wing plus tail, including flaps, ailerons, elevators and the area covered by the fuselage, but excluding fillets. Ignore the 'projected' unless the tail or some part of the wing has a very large dihedral angle, when you reduce the area of the high-dihedral part by the cosine of the dihedral angle. For example, a V-tail of 100 square inches with a 30 degree dihedral angle counts as only 85 square inches in maximum-weight calculations.)

Rules requiring lighter wing loadings than this do not help safety. The international regulation already ensures sane landing speeds, which a pilot should be able to handle in calm conditions - crashes rarely happen in perfect weather. In gusty winds the heavily loaded model is thrown about much less. I find it easier to land a heavy model dead-stick; the modern clean multi glides so well that positioning is tricky without prop braking, and a steeper glide angle is a real help. (Yes, heavily loaded models do glide more steeply. The fuselage is larger relative to the wing so the total drag is higher and the lift-to-drag ratio and the glide angle suffer.) Overall, if the pilot is reasonably experienced, wing loading has little effect on the likelihood of an accident. The difference lies in the amount of damage caused by a crashing model.

At first sight it seems that the lighter-loaded model must hit less hard. This is not so. The only way to carry the same load of radio at a lighter wing loading is to increase the wing area. A bigger wing means a heavier wing, a more powerful engine and a generally bigger, heavier model. The wing loading and the landing speed are reduced, but the weight is increased considerably.

Impact damage depends mainly on momentum, that is, speed times weight. It works out that the extra weight increases the momentum more than the reduced speeds decrease it, so that it is the heavily-loaded model that hits less hard! If you want to see how this happens, there is a break-down with figures at the end of this article.

Minimum fuselage dimensions add weight and drag. In aerobatics where we can usually increase the engine output, we can hold the performance of an unlimited aircraft by maintaining the same wing loading and decreasing the power loading. This results in a surprisingly large increase in model size and weight, with a consequent increase in momentum and crash damage. Again, the maths are at the end of the article.

Please do not read more into these paragraphs than is intended. They do not say that we must all rush to maximum wing loadings and super-clean models, the airplanes we fly must be tailored to the individual skill, preference and flying conditions of each of us. They say only that requirements for low wing loadings and minimum fuselage dimensions will not make our models safer.

Normal Silencer Rules

Noise complaints are often bogus, excuses for resenting model fliers, but there are also cases of genuine noise nuisance when we are at fault. So fit silencers?

Mufflers are wonderful devices that save both our ears and our flying fields. They are, in a majority of cases, expensive, heavy, draggy, power-draining performance-wreckers and the better they silence, the worse they are in these other respects. Simply saying "Fit one" results more in evasion and bad feeling than in noise reduction.

Holding performance with mufflers has taken us from the medium power .45's of 1965 to the hot .61's we use today. As the silencers that modelers have accepted reduce noise by a factor of only two or three, and the modern .61 is noisier than the old .45's, there is still quite a row on a flying field. And how do you differentiate between a genuine attempt at silencing and a minimum-power-loss rule-evader? Noise nuisance depends so much on weather conditions and subjective opinion that even a noise meter does not help.

We need effective silencers, devices that reduce noise a hundred times. The simple rules tried so far have not led to the use or even the development of anything approaching this standard.

Improved Equipment

Radio gear- already magnificent - is becoming even more reliable and yet lighter. This gives us extra safety.

True. Safety happens to benefit a tiny amount from the eternal all-out rush for performance. Modern models are lighter and hit less hard.

But is safety given its fair share of the advantages from the latest equipment? A Beachcomber or a Candy with a silenced .45 and a 24 ounce radio could just about manage the international schedule, given a good pilot. **This level of performance can be achieved today, with any lightweight radio, using a .19, or even a .15 or smaller, with the newest sets.** Yet we still use .61's in five foot airplanes. They do fly better. The radio weight saving has been traded for extra performance which is **not even necessary.** Any safety bonus is incidental.

And the modern radio is developed for reliability and minimum size and weight equally, rather than for the ultimate in reliability with the others as secondary aims. Improvements could be made if the second approach were adopted. Take a common failure, the loss of a cell of the battery - we abuse our nickel cadmium packs dreadfully and the manufacturer is rarely at fault, but whoever is to blame, flat or dud batteries cause smash-ups. It can be arranged that any drop in battery voltage causes the throttle to close but allows enough use of other functions to control the landing. I know, this would cost a few dollars and increase the weight a little, and the sets would not sell. Which is the reason just waiting for better equipment and the consequent improvement in safety, is not good enough. Positive action to demand safety features in radios, as in models, is essential.

The Overall Situation

Radio control is expanding fast and our safety standards are already inadequate. We need major improvements in our aircraft. Even taking an optimistic view of the measures discussed here, I cannot see how any variation or combination of them can do the job. (If you can, write in, you have no idea how badly we want to know.)

Next month I hope to offer a possible answer, which may suffice at least as a starting point for discussion. It is unconventional - in fact I have a nasty suspicion that a lot of people will find it not just revolutionary but utterly revolting!

Maths

Some surprising things have been said. Proving them needs a lot of figures and percentages, so skip this if you dislike maths.

Take a typical modern multi, 5½ pounds, 550 square inches, 16 ounces per 100 square inches, 16 ounce radio, normal .61 engine. I break down the weight like this:

Power Package:

16 ounce motor, 2 ounce prop and tank, 6 ounce engine mount and nose reinforcement, 5 ounce fuel load (average, mid-flight load). Total 29 ounces.

(I consider that the power package weight is proportional to the power. Not only is a more powerful engine heavier, it needs more fuel and a stronger mounting.)

Radio:

16 ounce radio, 4 ounces mounts, cushioning and so on. Total 20 ounces.

General Structure:

39 ounces.

(This general structure weight of 7 ounces per 100 square inch is fairly constant. Heavily loaded models need extra strength but they are smaller and small models can be built lighter. The two factors balance each other.)

Now we increase the wing area by 100 square inches, without altering the model shape or drag characteristics, and maintaining exactly the same performance as before. The extra structure weight is 7 ounces, and we need 3½ extra ounces of power package to hold the old power loading. Total aircraft weight is now 98½ ounces, loading 15 ounces per 100 square inches, 5.6% down. This reduces landing speed by 2.8%.

There is an interaction between the viscosity (stickiness) and the density of the air that means big models fly better. (The Reynolds Number effect.) Multiply the average chord by the airspeed. If you double this figure, and you are using sensible wing sections at normal model sizes and speeds, you improve the airfoil characteristics by about 10%.

The new model has 9% more wing chord with 2.8% less landing speed so the Reynolds Number is 6.2% better. This gives 0.6% more lift, which translates to a further reduction in landing speed of 0.3%, for a total decrease of 3.1%.

In any given accident the damage depends on the weight of the model multiplied by its speed. The new model is 3.1% slower but 11.8% heavier and it hits 8.7% harder.

It can be argued that lighter wing loadings permit heavier power loadings. Okay, try no increase in power package weight. The bigger model is now 8% heavier and 5.1% slower and it still hits 2.9% harder than the smaller plane.

How about a full-power crash? The landing speed relationships determine relationships for all conditions, but we will do this directly. Model drag characteristics vary as does the lift. The big model has 9% more chord and a 0.9% lower drag factor. Allowing for the extra size, the drag increases by 17.3%; If the power were the same for both models, this extra drag would reduce speeds by 5.8% and the bigger plane would hit 2.2% harder. The 12% extra power in the main workings counteracts some of the extra drag so that speeds are only 1.8% lower, and the big job impacts 10% harder.

Fuselage dimension rules increase weight and drag. This is acceptable in a racer, but an aerobatic ship can increase its size and power to maintain performance, and because of this a small amount of extra weight can increase the violence of an impact very seriously.

Take our 550 square inch model, and suppose that fuselage width and depth rules increase the weight by just 1 ounce and the drag by 1%. Power package weight goes up by 0.3 ounces to counter the extra drag, so we have to carry an extra 1.3 ounces. Now I know this would never be noticed, but in a mathematical comparison we must be strictly correct, and we must add extra area to support this 1.3 ounces. The bigger wing is heavier, yet more power is needed to maintain the power loading, the power package weight increases again so add even more wing - and round and round we go. It works out that those innocent looking increases, 1 ounce and 1% power requirement, demand an increase in model weight of nearly 6 ounces and aggravate the severity of an impact by 6.5%!

Hundreds of similar calculations have been made. They show clearly that the key to reducing the violence of a crash is lightness. Model weight must be minimized while reducing the power to hold the performance at the previous level. It is even worthwhile to buy lightness at the cost of heavy wing loadings.

The maths are clear and correct - but remember always, figures have no sense. There is a case for increasing wing loadings. After you have a lot of skill and experience, and if your flying site is big and smooth. Go, but go carefully! ●

ENGINE CLINIC

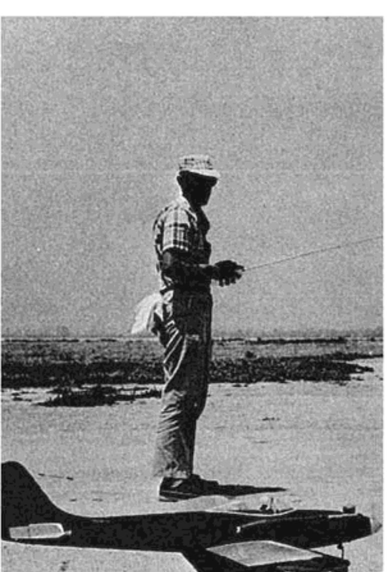
This month we are going to get a little technical and tell you how we arrive at the horsepower ratings for these engines that we use. There seems to be considerable misunderstanding and confusion over these ratings. Several fliers have wanted to know if the engines REALLY develop the power that is claimed. Others have wanted to know why the engines never turn the recommended props at the rpm at which the instruction pamphlets claim they develop their maximum horsepower. Even old D.D. sounded off on this point in one of his editorials several months back. I have been asked many times why an ordinary 1/3 horsepower electric motor, or a 1/2 to 3/4 horsepower lawnmower motor obviously has more power than our .60's with their ratings of one horsepower or more. It all has to do with the rpm at which the engine develops its maximum horsepower and the TORQUE.

First, let's explain how we arrive at these ratings. If you could grab the crankshaft of your engine while it is running and apply a load, the engine itself would want to rotate in the opposite direction. This is called torque. This is the same force that causes your airplane to veer to the left on take off, get off heading in loops, etc. It is caused by the propeller wanting to stand still while the engine and airplane rotates instead. By measuring this torque you can come up with a horsepower reading. There are two ways of measuring this torque: with a dynamometer as used with full sized engines, or with a torque stand. A dynamometer is a mechanical device that can be attached to the crankshaft and a variable load applied to the engine. Some dynamometers are electrical, some hydraulic, and others friction, using a series of clutches. They all do the same thing, apply a load to the engine which, in turn, makes the dynamometer itself want to rotate. This again is torque, and by measuring can be converted to a horsepower reading. Dynamometers for model engine use are a little hard to come by. I know of no commercial ones, and the few that are in use have been hand made. I do not have one myself. If anyone out there in R/C land knows of a good dynamometer that could be used for model engines, or has plans for building one, I would certainly like to hear from you.

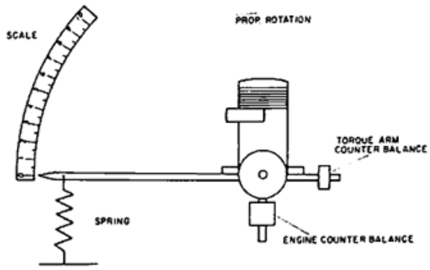
Not having a dynamometer, we have to resort to the torque stand which is very simple and yet very accurate. You could even build one yourself if you are interested. I am not going into construction details in this article as that is not the purpose of this dissertation. If, perhaps, there is enough reader response, we may do this in a later article.

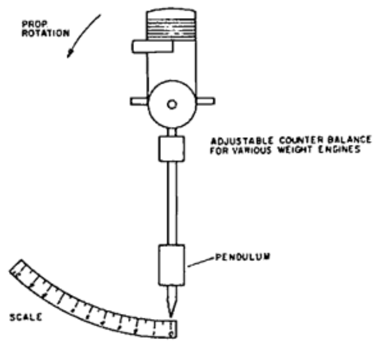
A torque stand is simply a motor mount that is free to rotate about an axis on the same center line as the crankshaft of the engine. With the engine sitting on top of the mount you have to add a counter-balancing weight to the bottom side. Now, if you were to hold the propeller while the engine is running, the engine, itself, would do the rotating. This is the same principle as the rotary engines used in some of your World War I fighter planes, notably the Nieuport. However, we do not want the motor to spin, so we attach an arm straight out from the side of the mount. The end of this is attached to some sort of a scale. There are many ways of doing this. You can rest the arm on an ordinary postage scale, or attach it to any measuring device that is calibrated in ounces. You can attach the arm to a spring and calibrate your own scale. The drawings should help clarify this. My own torque stand uses a weighted arm straight down, or pendulum. I have calibrated a direct reading inch-ounce scale. This type is less susceptible to vibration and engine surges, however, for ease of explanation, we will use the horizontal arm type.

By applying a load to the crankshaft - in this case the propeller - the engine, itself, will want to rotate and give us a reading in ounces on the scale. By multiplying this reading times the length of the arm, we come up with inch-ounces of torque. In other words, if we get an eight ounce



CLARENCE LEE





reading on the scale, and the arm is 12 inches long, we have 96 inch ounces of torque. In order to convert this to horsepower we must also know the rpm of the engine, so this is taken with a tachometer at the same time. We will assume that we have a good .60 that will turn an 11-8 prop at 11,000 revolutions per minute. Then using the equation - Horsepower = torque X rpm/63,025, we can come up with a horsepower reading. We must first convert our inch-ounces to inch-pounds. 96 ounces is 6 pounds, so 6 x 11,000 divided by 63,025 gives us 1.05 brake horsepower. Now this is the horsepower at that particular rpm, but may not be the maximum horsepower of the engine. To find this you will need several readings, both above and below the normal running speed of the engine. Using a .60 as an example, you would run tests with propellers in the following sizes: 13-6, 12-6, 11-6, 10-6, and 9-6. If it were a racing .60 you would want to try several smaller sizes. By taking torque and rpm readings you can plot a torque curve. Then by using the horsepower equation you can plot a horsepower curve. You will then know at what rpm the engine develops its maximum horsepower and torque. The maximum torque will be at a considerably lower rpm than the maximum horsepower. Most of our .60's develop their maximum horsepower above 12,000 rpm and the maximum torque around 8,000 rpm. The following graph was one I plotted a few months back for the new K&B Veco .61 which will give you an idea of what we are talking about.

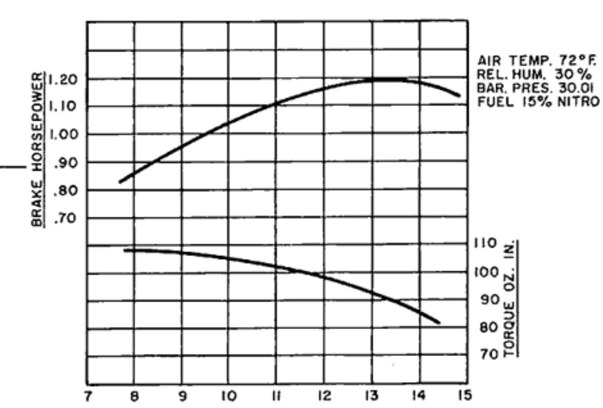
Now, some people might think it would be desirable to run the engine closer to the maximum torque and take advantage of the lugging power. However, to run the engine far below its horsepower peak results in extreme overheating and accelerated wear. So we hit a happy medium and run the engines above the maximum torque, but BELOW the maximum horsepower peak. This, my friends, is why your engines are NOT run at the same speed as that at which the maximum horsepower is developed. When you read in the instruction manual that the engine develops one plus horsepower at 12,000 rpm, it does NOT say that the engine is supposed to turn the recommended propeller at this rpm. You are assuming something that has not been said!! This is a horsepower rating only. DO NOT expect your engine to turn the recommended propeller at this rpm. Except for some of your high speed racing engines used in U-control speed, the maximum horsepower rpm will always be higher than the rpm at which you will run the engine. You will gain more efficiency this way. This can easily be proved in the air. Most of your stunt .60's develop their maximum horsepower in the 12,000 to 13,000 rpm range. This rpm can be reached using an 11-5 or 11-6 propeller. However, in the air, the engine screams like mad but the airplane does not go anywhere. With the 11-7 or 11-8, you get much better performance - RIGHT? You are taking advantage of the higher torque at the lower rpm and swinging more propeller! This is contrary to things you may have read in the past about propping the engine so that it will run at its horsepower peak. When theory and practical application do not coincide, then to heck with theory!

High torque at low rpm is the reason your electric and lawnmower motors appear to have more power than our model engines even though they have a considerably lower horsepower rating. A little 1/3 horsepower electric motor develops almost TWICE the torque as our one horsepower plus model engines, and this torque is developed at the same rpm as the maximum horsepower. (1725 in the case of most electric motors.) It is this torque, at low rpm, that turns the wheels that makes things go, and is of more importance than the maximum horsepower rating. These high horsepower ratings are more useful for advertising purposes than anything else. Some of your racing engines are now developing over two horsepower near 20,000 rpm with little "toothpick" props. However, is this usable horsepower? Only if you can utilize that 20,000 rpm, as in U-control speed.

The automobile industry is a good example of exaggerated horsepower claims to fool the public. A lot of these Detroit barges you are driving are supposed to be sporting engines with 300 or more horsepower. Some of you guys actually believe this. That reading was taken on a test stand with a blueprinted engine. That means every tolerance was brought right to

(continued on page **14**)

K&B VECO .61



HORSEPOWER RATING

CLARENCE LEE

(continued from page 13)

the exact specifications. The engine was tested without the automatic transmission, air conditioner, generator, fan, air cleaner, exhaust manifolds, or mufflers. By the time you add all of these power robbing accessories that it takes to use the engine in the car, you will be lucky to have 160 brake horsepower at the rear wheels. Then if you were to connect the back of your high revving beauty to the back of a 110 horsepower low rpm truck, who do you think would be drug across town? That little low revving HIGH TORQUE truck engine would make those 300 Detroit horses look pretty sick. This, with equal gear ratios, naturally.

A lot of you are probably wondering why we do not port and time the engines to develop their maximum horsepower at a lower rpm closer to the maximum torque. It is just the nature of these small two cycle engines to develop their maximum horsepower at a high rpm. Even when you lug the engine down several thousand rpm below its peak it will put out more power and torque than one designed for a lower rpm. If you were to design the engine to peak at 9,000 or 10,000 rpm, the torque would also be considerably less, and you would end up with less power in the long run.

There is one more way of giving an engine a horsepower rating that I should mention before ending this discussion. It has been used quite often over the years by both model engine manufacturers and Detroit. And that is to read what the competition claims for their engine, and then increase this by 10%. This method started back in the old ignition days. Most of your first engines were rated at 1/5 horsepower. Then someone claimed 1/4. Another outfit would come along and theirs naturally developed 1/3, etc. What do you want to bet that a lot of the manufacturers right now do not have a method of checking the horsepower of their engines, and are using the well known "guesstimation" method.

I have been asked quite often if the Veco .61 would really develop 1.3 horsepower as claimed in the instruction pamphlet. The answer to this is YES and NO. The pamphlet reads 1.3 @ 12,000 rpm. I am afraid the powers at Veco were a little optimistic when they gave the engine this rating. My own prototype would hit the 1.3 horsepower figure, but at almost 14,000 rpm. This particular engine had larger ports with advanced exhaust and bypass timing. The crankshaft closing timing had been advanced 5 degrees and the venturi was considerably larger. This engine was a real powerhouse, but the fuel economy left a little something to be desired! Like nine to ten minutes on twelve ounces! For the sake of economy, and a little better idle, the other prototypes and, eventually, the production engines had more conservative timing. The production engines develop 1.1 horsepower at just a little over 12,000 rpm, and this was the figure I recommended for the instruction pamphlet.

The new K&B Veco .61's are now using the 'no tension' Dykes type ring. These engines are pushing 1.2 horsepower at a little over 13,000 rpm. These readings were taken using Cox blue label fuel which is 15% nitro. I also always do my testing when the temperature is above 70 degrees and the relative humidity below 40%. Cold days or high humidity can cause a considerable drop in power.

—

Well gang, inflation has struck again. By the time that you are reading this article the price of fuels will probably have been increased considerably. Some of your hotter fuels may have even been taken off of the market. This was brought about by a sudden increase in the price of nitromethane. There is only one manufacturer of 'nitro' products, and that is Commercial Solvents. This month (March) all of the fuel manufacturers received a notice that they would no longer be able to purchase nitro methane, or any of the other nitro compounds, direct from Commercial Solvents. A company in Texas now has exclusive distribution rights. The price has been almost doubled. The reason for this change in distribution has not been made too clear and is rather vague at this time. A wild guess on my part would be that this outfit in Texas came up with a big hunk of cash and offered to take the shipping problems and its dangers off of Commercial Solvents' hands.

When the manufacturers cost goes up 50 cents, you can figure your cost will be four to five times this at the retail end. The fuel manufacturers themselves will have to absorb some of the price increase, but even so you are going to feel a pretty good jolt also. Especially with fuels such as Supersonic 1000, Cox red can, Fox Missile Mist, etc., that contain 25% nitro or more. So do not think the fuel manufacturers are just trying to gouge you a little harder and get rich quicker. They had NO choice.

We are not the only ones that are crying. The drag strip boys - especially the fuel cars - use the stuff by the gallon. One run down the strip can cost $30.00 to $40.00, so you think we have it bad??

I have been receiving a lot of inquiries from fliers wanting to know if the old Veco .45 can be updated with the new .50 parts. Only if you have access to a lathe. The piston and sleeve are .030" larger, and the case has to be bored out. If you can manage to get this done, you can change your old .45 into a new .50. You will need a new piston, sleeve, ring, wrist pin, and head. All of the other parts - crankshaft, rod, carburetor linkages, etc., remain the same. If you do attempt the job, be sure you have an accurate holding fixture for the crankcase is reused. The sleeve bore must be directly over, and exactly 90 degrees to, the crankshaft. The bore itself should be .0003" to .0008" larger than the o.d. of the sleeve. If you go any larger, all of your base pressure will leak out the exhaust and you will have a real sick running engine. I know of several fellows who have made the modification and are very happy with the results. Neither I nor K&B will make this modification. The labor involved would not warrant the charge we would have to make. In other words, by the time you bought the necessary parts and paid for the labor, you would be just as well off purchasing a new .50 to begin with.

Since I did the article on fuels a couple of issues ago, I have received several letters asking about the use of Steen C as a lubrication in model fuel. A lot of the go-cart and motorcycle buffs are using it as an oil additive. This is one additive that I forgot to mention in the article.

Many years ago there was an oil on the market called 'Prestone Oil'. This was a true polyoxide oil. Most of the U-control speed fliers used it, and it worked very well. Speeds increased because it was thinner than castor oil and reduced oil drag, and yet still had good film strength. For some reason it was taken off of the market. About this time Steen C came along and word went around that it was a polyoxide oil just like Prestone. This was not true. The first thing that we noticed with Steen C was the tendency to stain your airplane. A white airplane would take on a nice yellow-brown look. It was pretty well dropped for this reason right then, although some of the fellows did keep using it, and some still do, I guess. I have since been told by several reliable sources that Steen C is Ucon oil with a dye and an additional additive formulated by Ucon for Steen. I think I made my feelings clear regarding Ucon oil in the article on fuels. Some people seem to think that Ucon is a polyoxide oil. It is not. Ucon is a Polyalkylene glycol. Exactly what this difference is, I do not know, so if we have any chemical engineers out there, how about firing in a few letters and setting us all straight.

—

The following letter has to do with operating engines in cold weather. So you will wonder what the heck I am talking about this for in the middle of July. No, I haven't gone over the hill! Although you are reading this in July, I am writing the column in the middle of March when a good part of the country is still snowed under. Anyhow, thinking about the cold weather might cool you off a little.

Dear Mr. Lee:

I note that most of the feature editors in R/C Modeler Magazine come from places with warm climates. Here in the northeast all R/C flying in the winter time stops for about four months principally due to the difficulty of starting engines in cold weather.

How about including in one of your articles hints on starting engines at temperatures between 20 and 40°F? There may be people who attempt to fly at temperatures colder than this, but if they do I think they are on their own. Quite frankly, unless you have actually done this even with your very considerable experience I will take your answers with some skepticism. Perhaps there are some more experienced R/C flyers in Canada or the northern part of the United States who have been through this problem and have some suggestions to make.

Very truly yours,
R. M. Smith

Because of Mr. Smith's scepticism of any answer I might give, I forwarded his letter to my old buddy Darrell Yonker who now lives with the Eskimoes and Polar bears up in Anchorage, Alaska. I figured Darrell would be well qualified to answer this letter.

Dear Clarence,

I have read Mr. R. M. Smith's letter with considerable interest. If we had to quit flying up here when the temperature was below 40 degrees we would be grounded most of the year. At our January '69 contest all four entrants flew quite successfully even though the temperature at the time was somewhat less than 10 below. About the only time we can't fly is when we have ice, fog, or a wind. A slight wind at 10 below can make the equivalent temperature for the pilot be, maybe, 40 or 50 below.

Since the average radio will only work for 20 or 30 minutes if it is taken outside at 0 degrees, we normally have to keep our airplanes in a heated vehicle of some kind between flights if we intend to make a day of it. This is perhaps the easiest solution to the whole problem. However, if it is above 20 the radios will probably be OK, so then we run into the starting problems.

Model engine problems are very similar to auto engine problems, and some of the same procedures apply. The compression must be good, for instance, and the engine generally in good condition. The ignition must be in good shape too. That is, as Clarence says, DON'T use a nickel cadmium for starting. I strongly recommend that you use a large 2 volt lead acid cell with a dropping resistor or alternatively 2 nickel cadmiums in series with a dropping resistor. At any rate, the voltage measured **at the glow plug** *must be 1.5 volts.*

The light machine oil which Clarence recommends when storing your engine also helps low temperature starting by increasing the compression. When it is thinned out by the very heavy exhaust prime required for the low temperature starting, it does not cause excess engine drag, but it may make your engine kick back like crazy. I strongly recommend that you wear a leather glove to save wear and tear on your fingers.

For fuel I recommend straight K&B 100 for all seasons. We have not found it necessary or even particularly helpful to use a hot fuel for either running or starting.

You say you have tried all this and your engine still won't start after it's cold soaked? Don't be bashful man, heat it up a little with a propane torch and it will kick right off. Just remember that the propane torch itself may get a little sick if left outside at 10 below. Leave it in the car between flights.

We have found that the extra exhaust prime required in winter makes for an occasional engine fire. It's not a frequent occurrence, but it is something to bear in mind.

One more thing; don't try to use one of those sintered bronze filters in the winter. The fuel viscosity increases enough that the filters will not pass sufficient fuel, at least for a Veco .61.

Most of you warm-weather pilots will think we are crazy up here but if you haven't flown a model off of nice smooth snow, using skis, you have missed one of the most enjoyable moments in RC flying. My sincerest sympathy.

Darrell Yonker

Hi Clarence,

I enjoy your ENGINE CLINIC column very much and rate it OUTSTANDING for interesting subject matter and method of presentation. Since the column is open for questions, I have one that has been bugging me for quite some time. I get so many answers on this that I don't know what to think -

Does the percentage of nitromethane in the fuel have anything to do with the reliability of the engine's idle? Will a better or more reliable idle occur with 15% nitro as opposed to a fuel containing 5% nitro?

For awhile here in San Diego, we were having a 'fuel of the month' fiasco going because one guy claimed his engine idled better with so-and-so's fuel. Another guy says you gotta' have the heat there to begin with to get a good idle, so he uses 15% nitro at least. Another says he tried his engine on homebrew 80-20 with no nitro and it idled just as well as with commercial fuel, although the top end was reduced somewhat.

As to my own experience, I've used homebrew with approximately 5% nitro, Supersonic 100, Testor's, and Duke's Fuel, and I couldn't tell any difference in idle with any of them. There was a slight difference on top end RPM though, and I really mean SLIGHT.

I prefer Testor's fuel mainly because the plane is so easy to clean after flying. This leads to another question which you might add - what kind of lubricant does Testor's fuel have in it which makes it so easy to clean or wipe off the ship after flying?

From my own experience, it would appear that nitro is mainly for top end performance and affects idle very little, but I can't argue these guys out of it. Would you please throw some light on the subject?

Sincerely,
H. E. Woodruff

The addition of 5% nitro will improve the idle, and especially the acceleration over a fuel that contains no nitro at all. I have never found anything over 5% to further improve the reliability of the idle. Additional nitro does improve the top end performance, but not in great jumps as you might expect. The difference between 5% and 15% nitro is only a matter of five or six humdred rpm. Of course, for us guys that do like to move, that five or six hundred rpm DOES make a difference.

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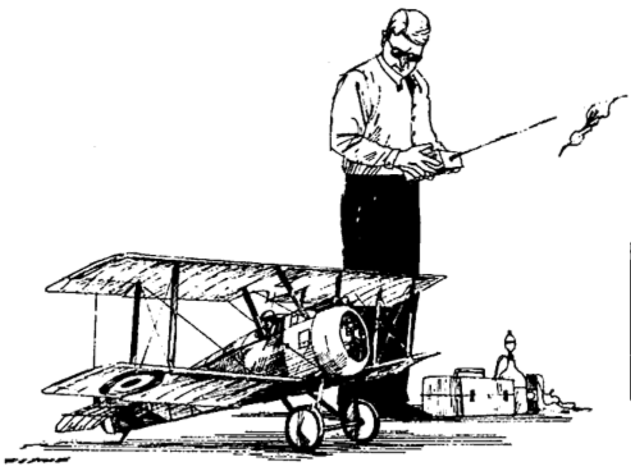

by DAVE PLATT

(Designer — Top Flite Models)

SCALE IN HAND...

Some remarks by my colleague Clarence Lee in his ENGINE CLINIC column a couple of months ago concerning propellers, made me think that I'd like to put in my two cents on the subject too. Clarence was talking about nylon propellers, and if I remember correctly, he expressed the opinion that they are useless except as paint-stirrers – or words to that effect.

This columnist believes that Clarence was less than completely fair to nylon props; we have found that a 7-4 makes a dandy spatula for applying vinyl-spackle to nicks and cracks in balsa!

Except for that, we concur 100% with Clarence, and the idea of screwing one to a machine that will turn it at some 11,000 rpm or better fills us with horror. Not only for the *primary* reason that he mentioned; i.e., safety; but for other reasons as well.

Consider this: *A nylon propeller weighs approximately twice as much as a wood prop of the same size.* With this 100% increase in weight many things happen. First, torque effect is greater. Torque is the force created by the revolving prop trying to turn the model in the opposite direction. Since the model is large and the prop small, this effect is minimal, but enough to make our model turn left noticeably. With a heavier prop this left turn will be tighter and it will be more difficult to find adequate compensating remedies.

Torque, of course, is a *rolling* force; that is, a force revolving the whole model to the left about the fuselage center-line. Normally we compensate for it with right-hand sidethrust, which is a *yawing* force, turning the model about a vertical line through the C.G. This mixed-up compensation is far from the perfect solution, and maybe a good argument could be put up to show that this is the wrong way to compensate for torque. But anyway, it's the usual method and it seems to work all right some of the time.

Certainly, we don't want to complicate the issue by using a heavier prop and achieving, thereby, a greater torque effect to contend with.

Torque is a prime example of the law of physics which states that "For every action there is an equal, and opposite, reaction." Our second point concerns another physical law – Newton's First Law of Motion, which states that: "That which is moving tends to remain moving: that which is still tends to remain still." Here's how it fits what we are doing, and nylon props in particular. Our engines are set up as multi-speed devices. When we are running at full rpm and we chop the throttle, we want the engine to slow down NOW. And vice-versa, when the engine is idling and we push that stick, we want higher rpm right *now* - not later. If we have a heavy prop, in obeyance to Mr. Newton, it will take longer for the engine to find a new rpm because it *resists the change.*

In this respect, heavy spinners are bad, too. But fortunately for us, they aren't as far away from the crankshaft as the prop blades, so the moments are less.

Thirdly, a heavy prop will increase the model's reaction to gyroscopic precession.

Gyra-whosewhat? Hold it: let's explain!

If you take a child's toy gyroscope and, while it is spinning, push it forward – would you believe it will move at 90° to the direction you pushed it? It will! Depending on the direction of rotation, the gyroscope will move to the left or the right, but never straight forward.

We're not going to take up a lot of column space to explain this peculiar phenomenon (in other words, I've forgotten!) but take my word; it's a fact.

How does this affect a model airplane? Like so . . . a model engine/prop can be considered as an extremely powerful vertically-mounted gyroscope. When we turn the model to the LEFT the gyroscopic reaction forces the nose DOWN – and when we turn RIGHT, the nose is pushed UP.

This explains why we have to feed in more UP elevator when turning left, to maintain altitude, than when we turn the model to the right. Probably you didn't notice this before, but next time you go flying see if we're not right!

Finally, let's round off this somewhat light-hearted and self-centered discussion by returning to Clarence's point. So far, we have only been talking about our *own* problems, in trimming models. But how would you feel about yourself IF one sunny Sunday afternoon you drove one blade of a nylon prop through some poor wretched 5 year old child's eye?

The thought of it alone is enough to give you cold shivers. On this sombre note we'll leave you to work it out for yourself. But my suggestion is to say, in a loud, firm voice – "Props for models are made of *WOOD!*"

* * *

Before we get down to our scale hints section this month, let's have a look at some of our queries.

Q. What paint did you use for your SBD? I can't find a fuelproof matte paint in any hobby store in the area.

A. No, you won't. This has been one of our most frequently asked

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queries, and unfortunately there is no cut-and-dried answer to it at present. The paint used on my own models comes from England and for anyone who can get it, the brand name is "Kingston Diamond Eggshell Polyurethane". However, we are actively searching for an equivalent paint and have made some progress – of which more will be said when we have the full information. Meanwhile, the best answer at present is to get from Ace R/C some of their "Camouflage Sheen" which is a clear flatting agent for adding to normal glossy dopes. A 4 oz. bottle costs $1.49. I tried it out, and results appear good: but any tests on paint should be made over a 12 month period if they are to be considered conclusive. One word of warning. So-called "matte" finishes on full-size aircraft are seldom really flat. Some degree of sheen is present, so remember this when mixing the Ace R/C product.

Q. How did you do the rivets on the **Dauntless**?

A. Again, a frequently asked question. The method used was to mark out the rivet lines in soft pencil after the covering and sealing is all done but before any color is added. The rivets are made of white glue, applied with a small hypodermic-type polythene bottle. This little tool is called the *'Hypo-25'* and may be bought from Gaunt Industries, 6217 N. NWHwy, Chicago. Sorry, I forget the cost but it was small – under $3.00, I think. The color dope must then be applied by spray or airbrush, of course, to keep the definition.

Q. Where can I get information on 'Weathering'?

A. Strangely enough, from A.M.A.! Write for the report of the 12th Annual DCRC Symposium, held last May 17-18, where your columnist presented a paper entitled "Adding Realism to the R/C Scale Model".

* * *

North American Aviation 'Flitemasters', an old-established and flourishing Scale club in California, puts out a really excellent monthly newsletter *"Flying Scale News and Views"*. For the very modest sum of $2.00, you can get this news for a year. World-wide circulation proves this a big value. Send to Harold Osborne, 1932 Conejo Lane, Fullerton, California 92633.

* * *

Don't forget the *Chicago Scalemasters* All-Scale Rally on September 14. For R/C, C/L and F/F Scale only, contest (to F.A.I. rules with AMA size and weight limits) or just sport flying for the non-contest types. A nice blacktop square and an early reservation for good weather should guarantee a really interesting family day out. For information, write Bob Talchik, 3851 W. 70th Pl., Chicago, Ill. 60629.

Lest anyone accuse me of unfair publicity for my own club, let me say that *any* club running a Scale event will get equal time – just send me the details *at least* 3 months in advance and I'll give you a plug – OK?

For book fans, a really exciting news item this month. At long last, the companion volume to "United States Military Aircraft Since 1909", a standard modelers' reference work, has arrived! The long wait of some five years has been worth it, and "United States Navy Aircraft Since 1911" is a magnificent volume of some 518 pages, with hundreds of photos and 3 views describing almost every airplane of the Navy from 1911 to the present. Expert authors Gordon Swanborough and Peter M. Bowers have "done it again" with a book that no scale modeler should be without. Price is $12.50.

* * *

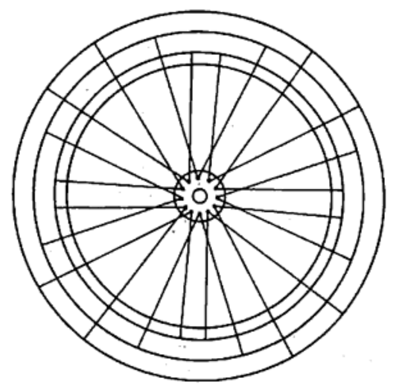
Over to J. Crawford of Hamilton, Ontario, Canada, for his wire wheel method:–

Anyone building W.W. I type aircraft can have wire wheels that make the plane look exceptionally good and which can stand up to some pretty hard landings.

First, cut a strip of shim brass about 1/2" wide and long enough to wrap around a 2½" former (I used a bottle, it cracked a bit when soldering, so a wooden former would be safer), overlap it 1/2" and silver solder (with Staybright) and make sure it's tight. Next, steal a couple of coat hangers from the clothes rack, cut off the hook and straighten, sand them, and wind them around a small diameter former so you have two rings that will encompass your brass ring on its wooden former. These are soldered on the entreme ends of the brass ring. Tack with Staybright and fill around with ordinary solder. No, they won't be too heavy, anyway, most W.W. I types I've seen, need all the nose weight they can get. Now slip the whole rim from the former and sand it smooth all around with emery and steel wool. Now make another in the same fashion. Next, cut out two washers, or if you have washers about a 1/2" in diameter, and drill 12 equally spaced holes with a 1/16" drill. Slip them over a 1/8" I.D. brass tube and silver solder as shown, leaving at least 1/2" protruding on each side. Make two, and clean them up with steel wool.

Now cut a piece of paper 1/4" wide, and long enough to fit EXACTLY around the wheel rim, lay it out flat and mark off 24 equal spaces. Tack cement around the rim, and drill 48 holes with a 1/32" drill as shown. Take a board about 1/2" x 6" x 6", drill a STRAIGHT 1/8" hole in the center, and with the aid of your compass, exactly line up the rim and hold in place with 4 finishing nails with the heads cut off. Fit the extending 1/2" of the hub into the 1/8" hole. Now get a couple of miles of 1/32" piano wire, cut 48 lengths 3" long, and bend a small hook on each one. Fit in the first 4 and solder only at the hub. Carry on spoking as shown until complete.

Now, (this is your last chance) make sure all are lined up, then solder the spokes at the rim. Lift off the wheel, cut off the ends, turn it over, and spoke the other side. Nip off the ends, and run Staybright all around the inside and outside of the rim, and grind down the spoke ends. By this time, I know how you feel, but bear up, there is another one to do yet. I've built 6 successful pairs. Now scrounge some air hose (black, if possible). Cut lengths that will fit the rim, put some soft wire inside, right through and then lead it through again. Put one end in the vise and form it around the rim. Pull the other end with a pair of heavy



NOT TO SCALE
PUT IN SPOKES THE EXTEND TO INSIDE CIRCLE FIRST THEN ADD THOSE THAT EXTEND TO MIDDLE CIRCLE AND FINALLY THOSE TO THE OUTER CIRCLE.

pliers, and when tight, quickly turn the wheel so as to twist the wire together. Four times should do it. Nip off and poke the twisted end inside the tire. A little black rubber cement should hide the joint.

* * *

Last month we promised that we would continue our little "Teach-In" by discussing how to choose a scale subject. For the next few issues, we will give some insight into R/C Scale aerodynamics and how it affects our choice.

This column has received so many letters asking such questions as "how much tail area is needed" – "What about moment arms" – "How much incidence", etc., etc., that it would seem a good idea to take each of these matters, and later, others, and give them a thorough working-over. So, this month, we will see what we can find out about tail (horizontal and vertical stabilizer) area. In all of these discussions we will attempt to place the facts in a readable way to the modeler, holding down, or totally eliminating, formulas and such hard-to-understand junk.

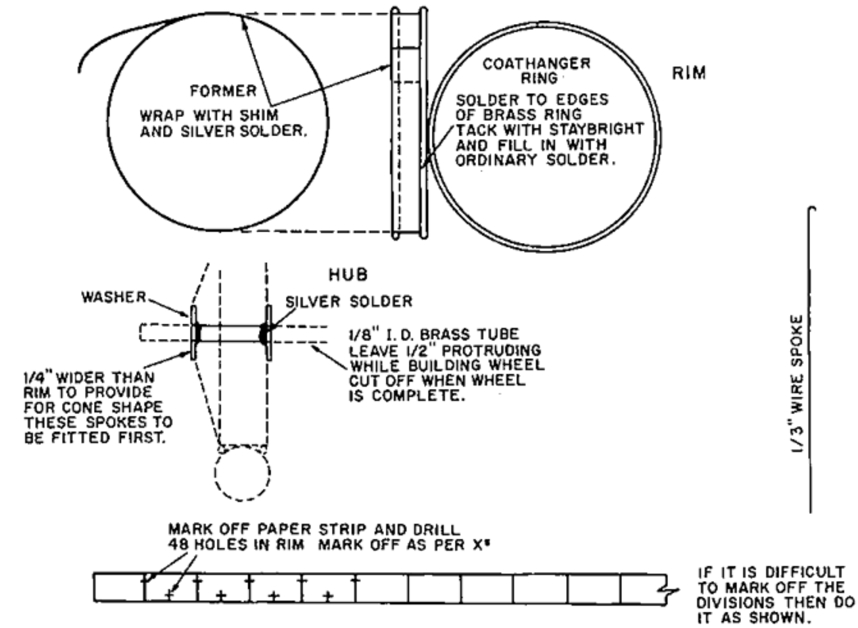
Tail Area

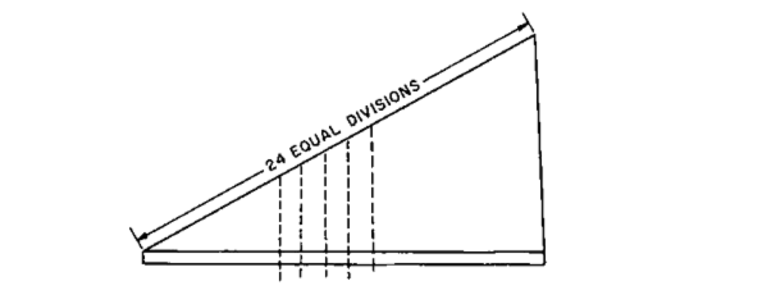
Forgetting, for the moment, vertical tail area, let's concentrate on the horizontal stabilizer. To maintain stability in pitch (up and down) any aircraft needs a horizontal stabilizer. The area required will depend on three basic variables: 1) the amount of maneuverability required, 2) the position of the C.G., and 3) the length of the tail moment arm. Broadly speaking, we can think of this latter as being the distance between the wing and the stab.

Taking these three variables one by one, we find that, in the case of (1), a larger stab is required for more stability, meaning steady flight even in gusty conditions. This is why many bombers, reconnaissance aircraft and trainers have stabs of fair size - between 18% and 25% of the wing area or even bigger. For this type of plane, maneuverability is either not required or is of small importance.

On the other hand, if we need maneuverability as a primary requirement, as in the case of a fighter or an aerobatic aircraft, a smaller stab will be required. The lesser degree of inherent stability will thus enable the pilot to quickly change his flight-path.

Item (2), C.G. Normally, the larger is the stab, the more rearward the C.G. can go, and *vice-versa*. If we have a very small stabilizer, say 10% of the wing area, our C.G. should be placed





LAY OUT PAPER LENGTH DRAW A PERPENDICULAR LINE TO SUCH A HEIGHT THAT A LINE THAT CAN BE MARKED OFF INTO EVEN DIVISIONS IS POSSIBLE. THEN DRAW PERPENDICULAR LINES PARALLEL TO THE FIRST ONE, AND THERE YOU HAVE IT.

around the 25% (of mean chord) mark, measuring from the L.E. of the wing.

The last item, moment arm, works in much the same way. If the tail moment is long (the gap between the wing and tail is large) we need less stab area to dampen the pitch oscillation. This is how those high-performance sailplanes can get away with such incredibly small stablizers, sometimes as small as 5%. They have such long tail moments that the setup is sufficiently stable.

If, however, the moment arm is very short, as in the case of the Curtiss *Helldiver*, the stab must be larger to compensate. The *Helldiver's* stab runs about 27%.

When we are looking for a suitable subject for a Scale R/C model, we need stability primarily, and maneuverability is somewhat less important. We can figure that a stab area of 20% of the wing is plenty, assuming a fairly normal tail moment.

Since we are not designing the airplane ourselves, strictly speaking, but are modelling a ready-designed airplane, we *cannot* add or subtract tail moment. We *can*, however, make the tail a bit bigger if we need to.

Do we need to?

The answer is; normally, *no*. If the plane has 20% tail, we can leave the tail alone as we already said. If it is larger than 20%, we are laughing.

But suppose it is *smaller?* Many lovely subjects have tail areas of about 14-18%. A whole schmeer of fighters fall in this bracket. What then?

This is where we call our old friend the C.G. to our aid. A 14% stabilizer area will be perfectly all right as long as we place the C.G. farther forward than normal – say about 27% for complete safety. An 18% tail can use the C.G. at around 32% or so; the in-between points can be found easily enough.

We have seen a model with 9% stab area fly beautifully by this method, and given a good tail moment.

So we see that, given proportional radio, and some degree of caution, we can get away with all manner of areas which would be a deadly sin for a free flight model. This columnist can remember many scale designs which appeared in the magazines, and as kits, where the stabilizer was increased

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I do not know what Testors uses for a lubricant, but because it wipes off of the airplane so easily, I am guessing it is a synthetic - most likely Ucon. The fuel manufacturers are a little reluctant to divulge their fuel formulas.

Would dynamically balancing the crankshaft do some good? Any idea of the increase in rpm possible? It would, I suppose, reduce vibration in a Fox .59 and other 'long strokers'. Right or wrong?

Bill Aaker
Dallas, Texas

You cannot dynamically balance a single cylinder engine. If it were possible the engine manufacturers would have done so a long time ago. You are dealing with both rotating and reciprocating motion. The crankshaft, itself, could be balanced, but this would not help the up and down motion of the piston. You need another piston on the 'other side'. The crankshaft could be balanced by using just enough counter-weight to offset the crank pin. This would be called static balance. Using an automobile wheel as an example, static balance is finding the heavy side. Dynamic is finding whether it is heavy inside or outside. Dynamic balancing the crankshaft would mean adding or removing weight from some other part of the crank to bring it into balance. Even though this were done, the main vibration problem comes from the up and down motion of the piston. The only thing you can do is attempt to balance this out as best as possible. Generally, an engine will be the smoothest when the crankshaft counter-balance will balance all of the weight of the rod and between 1/4 to 1/3 of the combined weight of the piston and wrist pin. There is no set rule, and it is a matter of trial and error when you design an engine. The old Fox .59 could be smoothed out considerably by adding some extra weight to the counter balance.

Smoothing an engine out will definitely add to the power, but how much of an rpm increase would be rather difficult to say, as it would depend on how badly out of balance the particular engine is. Actually the rpm gain would be very slight at the rpm we run the stunt engines. The largest gain would be in a high speed racing engine, or the .40's used in Formula I.

The Torp .45 has a rear counter-balancing flywheel. You can run the engine both with and without the counter-balancing flywheel, and notice very little change in rpm. However there is a considerable difference in the amount of vibration.

Dear Sir,

I purchased one of your Veco 61's a few months ago and have not used it as yet. Since then, our club passed a rule that all engines have to have mufflers and I would like to know if you thought they would hurt the engine. Some fellows claim they will burn it up even after it is broken in. How would you suggest to breaking in a new engine with a muffler on it.

Would appreciate if you could help me with this problem.

Thank you
Mr. Charles Durso

Any of your high back pressure mufflers will damage an engine even after it is broken-in, especially if the engine is run too lean. We pretty well covered mufflers and the ones I recommend in last month's column. I did not mention anything regarding break-in while using a muffler. If at all possible, the engine should be broken-in WITHOUT a muffler. If you have no other choice, then be sure and run the engine RICH. This means breaking back and forth between a two and four cycle, NOT peaking the engine out on the ground - backing off a click or two - and assuming the engine is rich in the air. Aside from running the engine a little richer and a little longer than you normally would, the break-in procedure is the same as though you were not using a muffler. This was covered in the very first article.

That wraps it up for another month. Keep the letters and suggestions coming in. ●

SCALE IN HAND

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quite unnecessarily and with resultant damage to the appearance and the accuracy of the model. The *Mustang, Spitfire, Tempest, P.47, B-24,* all have had their share of this kind of punishment, when a little more understanding of the *other* remedies would have saved their dignity.

All of this doesn't mean that we are necessarily trying to turn every sport-scale R/C model into a real project. But the fact is, that a small stab takes no longer to make than a large one!

* * *

Next month, we'll go into the question of wing sections and incidence setups. Join us then. ●

CUNNINGHAM ON R/C

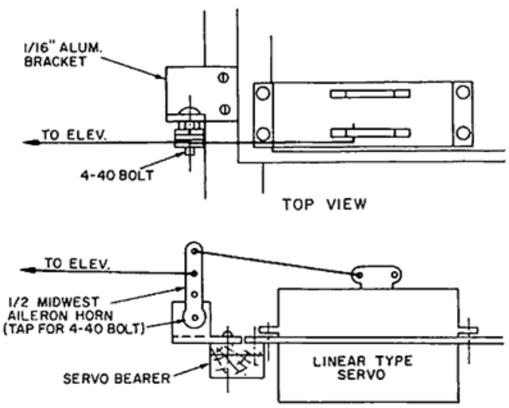
Last month we discussed how to get started in Formula I racing. In this column, we are going to investigate the problems of test flying and racing these fast little craft. This year the interest in racing seems to have taken a big jump upward with meets attracting fifty percent more entrants than the same events did last year. With this increased interest comes the valid realization that safety HAS to be stressed more than ever. Some of the fliers new to the racing game have not done as much practicing as they should have, nor have they subjected their aircraft to a rigorous race course type 'wringing-out'. The results CAN be SERIOUS. It is up to each competitor to practice flying the race course, and up to each contest director to satisfy himself that each entrant and aircraft combination will be able to fly the race safely.

Last month we suggested that you practice the race course with your pattern aircraft in order to become familiar with this type of flying. But, don't be frightened away from the fun of this aspect of the sport by worrying about your inability to fly as well as the 'experts'. Get in the practice while you're building your racer. When you have it completed, THEN start building a second racer while learning the Formula I flying ropes with that first machine. On your first ship, forget the beautiful finish, complete with instrument panel, racing decals, pin-striping, and so on. Keep this one SIMPLE. It's going to take some hard knocks at first, so do everything the easy way. When you have your aircraft completed, the engine broken in, a very short operation with the K&B .40, and the radio gear installed, you're ready to test fly and to trim out your aircraft.

The first step is to check out the balance point. Check this with the fuel tank EMPTY. See if your aircraft balances according to the plans. If not, add weight to the nose to bring the balance point to the correct location. Forward of this location is permissible, but behind, NEVER! A tail heavy racer is to be avoided AT ALL COSTS. If you do need to add weight you can do it in several ways. You can add the extra weight in the form of lead wrapped in foam rubber, or you can borrow a great idea from Bob Lutker and buy some of these screwy looking rubber characters that sell for about a dollar in the dime stores. They are made from rubber similar to the kind you squeeze from a tube of silicone rubber. They weigh about eight ounces each, and you can cut them up into chunks and wedge them into the nose of your ship. Another good source of cheap weight is in the form of fishing sinkers. Flatten them with a hammer, wrap in foam and wedge in place. Any weight that you add must be securely wedged in place so that it won't come loose during flight, causing you unlimited problems.

After your aircraft is properly balanced, check it all over for correct alignment of wings, tail assembly, and engine thrust. Be sure that everything lines up, that you don't have one side of your horizontal stabilizer high, and most of all, that you don't have LEFT thrust in your engine. If you are mounting your engine on its side, and laying it over in the right cheek cowl, and using a Tatone radial mount you may have left thrust. The Tatone mounts have some down thrust built into them. If you lay the engine in the left cheek cowl this down thrust will then become needed right thrust, but if the engine is in the right cowl, you will have left thrust, and this you DON'T need. Check it out and shim in right thrust as necessary.

Next, check your control surfaces and control surface MOVEMENT. With a racer you don't need much. In fact, you hardly need any movement, much less than you are accustomed to with your stunt ship. Lots of rudder movement is okay, and chances are you will need a good bit on take-off, but small elevator and aileron movements are what you are seeking. There is no hard and fast rule for the amount of movement, since it varies from aircraft to aircraft, and with the individual balance points, but start out with a very long elevator horn, and with the pushrod in the outside hole. If your servos have a rotary output, then put the pushrod in the innermost hole. If your servos have only linear output then take the time to install a reducer in your system. (See drawing.) Even if the movement seems slight, fly



ELEVATOR REDUCTION FOR PYLON RACERS

it this way in test flights, and you'll be safer. Ailerons are the same. Use a reduction at the aileron bellcranks, and the last hole in the aileron horn. A lot depends upon the size of the aileron surface, so again, watch what you are doing.

Make sure that your pushrods do not flex, and that you have a straight run between the servo and the elevator horn. That aircraft is going to be moving like gangbusters, and if the elevator surface can flex under a high G load, you've got TROUBLES!

When everything has been checked out to your satisfaction, test run your engine to see that there are no obstructions in the tank or fuel line. Don't let the engine really wind up sitting on the driveway with the cowl on. In the first place, your neighbors will probably lynch you from the nearest swing set, and in the second place, you stand a good chance of burning up your new engine. Cowls don't leave much room for cooling, and really work to any degree of efficiency only when moving through the air at a rapid clip.

Take your racer to the field and enlist some experienced race pilot to help you check it out. If none is available, it's up to you. For your first

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test flights use a 10-6 WOOD PROP rather than a racing prop. You won't be flying as fast, yet the lower pitch prop will give you a margin of safety on takeoff. A high, thin bladed racing prop just won't have the needed pull at low airspeed if you encounter any trouble. Make sure that you have set your throttle so that at low throttle position, the engine will cut out. You can bend the arm of the K&B throttle toward the seat so that you have a greater range of throttle settings on a given servo output. If you can kill the engine at will, you can get out of some tight testing spots, but if that snarling fuel gulper keeps running you may get into a jam that ends up six feet below the ground!

The first take-off is something! It's not bad if you think ahead to what is going to happen, but if you don't, you're in for some large surprises! Racers, both Formula I and Formula II, torque to the left on take-off. It's not like taking-off your Kwik-Fli, or Ugly Stick, with the nose wheel keeping everything going down the runway. A racer, when released for take-off, will turn to the left in the first six feet of take-off run, and it's too late, then, to do anything about it. Hold in about half of right rudder, depending upon how much rudder movement you have. If you have only a modest movement, use all the right rudder available. Have your assistant hold the aircraft with the tail wheel firmly on the ground. Don't let him shove the aircraft upon release, simply let go. IT darn sure doesn't need a shove to get moving, and if the tail wheel is held off of the ground, the rudder WON'T keep it from turning left under torque.

OK, turn her loose! With rudder held in right the racer should start moving down the runway. It may even start to the right, so ease off of right rudder just a little bit. Make every control movement a gentle one. Without touching the elevator the tail should lift as the aircraft gains speed, and in short order will be at flying speed. Lift her off gradually, don't haul back on the stick and zoom up, but move back on the stick and let the nose lift off of the runway and the ship begin a shallow climb out. Let her fly straight out away from you for several hundred feet, gaining altitude all of the time. Note to your assistant if you are having to hold right or left aileron, and up or down elevator so that you can correct it later. By the way, when the wheels leave the ground you can relax the right rudder control. After you have gained experience, you will find that as the ship starts to move ahead and the tail lifts up, you can gradually relax the right rudder so that when the ship breaks into the air you will then be at neutral rudder.

With your aircraft safely in the air, about a hundred feet high, start to make a left turn. Now, you will find out if she is over sensitive to aileron and/or elevator. Bank to the left and pull in up elevator to make a pylon turn. Don't give it full up elevator, just a little bit. If it comes around the turn nice and easy you've got most of your problems licked while on the ground. If she is jumpy when you move the elevator then you have two problems; too much surface movement, and not enough nose weight. Racers are short coupled aircraft and any small change in the moments will reflect a big change in flying characteristics. If everything is going fine, then make several left turns, and let the aircraft fly as if it were flying a pylon course. Don't force any turns, just fly nice and easy. If, on the other hand, you are having troubles, kill the throttle and bring her in for a landing. The aircraft will be much easier to land dead stick than with the engine running.

The landing technique for racers is a science all in itself! These ships are clean, with almost no drag. They will penetrate a good breeze dead stick, and if there is no wind, you may have to shoot them out of the sky. They want to bore on into the air for a long time. The best method for landing seems to be to come over the transmitter about fifty feet high, kill the engine, bank to the left, make a large left circle downwind, turn into the wind and let her glide to a landing. But, make that downwind leg a LONG one. You'll be surprised how far these things will float when you're trying to get them on the ground again.

If you have been successful this far, correct all of the trim settings on your aircraft before trying another test flight. Keep working at the test flights until you get to know your aircraft, and how it will react in any situation. Practice making pylon turns, and, up high, try a pylon turn with full up elevator. If you have too much elevator movement, with full-up you will get a high speed stall. If you are high enough you will have time to cut the throttle and pull out before you hit the ground. If you're not high enough, you will have a bunch of jig saw pieces! But, you NEED to try it. If the ship won't tolerate a full elevator turn without snapping, you must cut down the elevator travel. If you don't, in the heat of a race, you're going to pull full up-elevator and snap that ship right into the ground! It's going to happen on the number 1 pylon; I know, I've done it! What happens is that when you make this turn you are generating a load of about 8 G's. Lift and thrust is very low at this point, and if the turn is too tight, and lift and thrust are not enough to counteract drag and load, then wham! The aircraft stops flying right now. If you're within twenty-five feet of the ground, NOTHING can save you. Check it out up high, it's safer, and you'll find the answer.

With your aircraft checked out and your pylon flying procedures down pat, it's time to enter a race. You probably won't win, but you've got to start sometime, so go on and get your feet wet. You've got to fly the race just as if you have the only aircraft in the sky. If you start worrying about the other ships you will take your attention away from your own and, sure enough, you won't have time to take care of your ship if you can't find it again. Get a good caller and check things with him before you start. If he is new to the racing game too, then you must iron out several things first. Be sure that he knows just what he is to do when calling, and have him watch some of the other callers in other heats. He is responsible for keeping you from making cuts, and for calming you down. If he is more excited than you are, get another caller; you've got enough on your hands WITHOUT him.

For your first heat, you will be paired with from three to four other aircraft. Don't worry about them. When it's time for your heat, take your aircraft, transmitter, priming bottle, extra prop, extra glow plug, wrench, and batteries. Carry them in a small caddy, or keep the prop, plug, and wrench in your pocket. When the signal is given to start your engine, get with it. You have two minutes to get started. If you don't make it in that timy you've lost that heat. Some pilots do a good job of sandbagging the opposition, they purposely fiddle around with their engines making like they are trying to start, but without really working at it. The idea is to have everyone else started and running, so that their engines are overheating while sitting on the ground. Then the sandbagger finally starts, and his engine is fresh, while the others have lost their edge. It's unfair, but done all of the time. Make a clean start and to heck with the sandbaggers; this type of cheating will gradually be eliminated. When your engine is running, get behind it and slightly to the right of your helper.

Keep your eyes on your aircraft, don't watch the flagman once you have told him you are ready. Your caller should watch the flagman and nothing else. When the flag drops for YOUR turn, the helper releases your aircraft, you watch it all of the time and make a good smooth take-off. Be sure your helper remains down low on the ground after the aircraft has been released and until it's safely in the air. He should be grabbing the battery and prime bottle, and getting them out of the way. If he stands up he will block your view of the take-off, and you can't fly if you can't see!

The caller should then take his place at your left shoulder, or right, whichever suits you best, and a little behind. Some fliers like to have the caller work by placing his hand on the pilot's shoulder and calling in his ear. This works well, and keeps the two together. Make the first turn at Pylon No. 1 and come back downwind toward pylon No. 2. Don't cut in too close, but make a nice wide turn around No. 2 and No. 3 pylons. Coming downwind on the leg between No. 1 and No. 2, gain a little altitude. Not much, but some. When you come around No. 3 heading for No. 1, let the ship dive a little into the wind. If you have to climb into the wind you will slow down. Trim the aircraft to dive just a bit, so that you have to hold back stick to fly level. Then, when flying into the wind, you can relax the stick to neutral and let the shallow dive keep you from ballooning in the wind. When you make the turn around No. 1 coming from No. 3, don't pull too tight a turn. Come into No. 1 rather wide and sweep around the turn in a nice shallow bank. I have the tendency to take this turn way too tight, thus killing off all of my speed. The top racing pilots take this turn nice and wide with no speed loss. Try and establish a "groove" to fly in. DON'T wander up and down, but try and stay at the same altitude and at the same speed. If you cut a pylon, don't let it upset you, keep going, someone else may cut one too, or an engine may fail, or the other fliers may get tangled up and crash. Don't give up at any infraction unless you get two cuts. Two cuts give you a zero for that heat, but even if you get two cuts, keep flying, you need the experience.

Always fly one extra lap after you have completed your ten laps in case you have a cut you didn't know about. Make your landing and get ready for your next heat.

Between heats go over your aircraft for anything that might have come loose during the race, or during the landing. Check the prop for any knicks, and be sure that it is tight. Remove the glow plug and see if it is still in good shape, or burned out. If in doubt, replace it with a new one. Fill up the tank, and check the pushrod connections to see if everything is tight. Then wrap a rag around the engine to keep dust out of it and relax until your next heat. It's fun, and NOT hard to do once you get the hang of it. Relaxing that is; the races are something else!

—

Several months ago I passed along a request made to RCM after the MATS Trade Show. That request was to caution fliers against the use of double face tape for holding servos in the aircraft. The request was made by several major radio manufacturers after they had determined that a great amount of radio failure could be traced back to this tape. As soon as that issue hit the stands I received a letter from Herb Abrams of Rand Corp., asking that we take another look at the tape as both he and the 3M people felt that we, or I, were unfairly judging his product. I got on the phone to Don and asked him to contact the source of the original request for verification of their findings.

This was done, and here is the answer. The tape does NOT amplify the vibration as was initially assumed. If used correctly it may not cause any trouble, but, most modelers are NOT using it in a correct manner, and thus, by using the tape are causing themselves radio failure. Modern servos have been designed with the mounting lugs at the middle of the case, near their Center of Gravity. Mounting the servos with strips of tape stuck to the bottom, allows the servo to swing in a large arc, thus, possibly doubling and tripling the vibration on the servo, to say nothing of the possibility of the servos banging into each other, and to the sides of the fuselage. The only correct way to mount the servos with this tape is to mount them against the side of the fuselage with tape applied above and below the line of the mounting lugs. This method eliminates the arc of vibration, and keeps everything from getting torn up. Now, chances are that if you're flying a small aircraft with a .15 or .19, it's not much of a problem how you do it, but flying a .60 ship hour after hour with servos mounted the no-no way, will give you grief. Also, check the tape after each 25 flights or so. The adhesive will generally hold, but the foam has a tendency to become brittle after a time. Be sure when mounting servos on your fuselage sides with foam tape that you give the balsa wood or plywood a coat or two of clear dope.

OK, Rand? OK, Rocket City? ●

SUPER WHIZ KID

By OWEN KAMPEN

Big Brother to the famous Whiz Kid, this version is for .049 through .15; Rudder-only to "Full-house" with ailerons. A host of options include a foam or built-up wing.

When the original Whiz Kid made its appearance in the December 1966 issue of RCM, it started something. In fact, it started many things, but mostly it triggered an unprecedented response by hundreds of modelers who wanted to get into the R/C act simply, economically and with more than the usual assurance of success. They and most of the thousands that built the Midwest kit were not disappointed, and many took the time to express their enthusiasm and report their growing number of successful flights. At our field in Lodi, Wisconsin alone, some dozen models have logged over 2000 flights . . . we stopped counting!

All of this adds up to a large group of fliers who have gained control, confidence and enthusiasm and as a result have stayed with the sport to grow and move on to larger and more complex planes and gear. This is a fact sometimes overlooked by those 'sophisticated' modelers and manufacturers who tend to minimize what they feel is a Mickey Mouse approach. I am still not convinced that the majority of newcomers to the hobby are ready and willing to part with $300 and $400 just to see if R/C is their bag. For that kind of money there are LOTS of alternatives.

Meantime, back at the ranch, most of the Whiz Kid builders didn't get into the discussion; they were too busy flying. I say 'most' because here and there was heard a discouraging word, and the words began to follow a pattern.

In general, the critics evidenced a total disregard for the design limitations of this purposely light, slow .049 single channel trainer. Reasonable weight limits were wildly exceeded with a corresponding lack of performance, while others tried the powerhouse approach, .09 and even .15 size engines were bolted on, upsetting all weight and balance logic. This group wasn't terribly thrilled either. (One notable exception was a .35 powered 5 foot version which responded with all the gentle traits of its little brother.)

A third area of complaint was heard from those who tried to cram a gang of servos into a space designed to hold one small single channel actuator. The 'reasoning' behind this is not clear as a multitude of roomy boxes are available for use with big iron. Perhaps they just liked the quick easy way the W.K. went together, and there IS something to be said for that. Crutch construction for perfect alignment, thicker wood and fewer parts adding up to fast easy building in a minimum of time and space. This, plus the Midwest foam wing and stab for warp free performance and epoxy-quick repairs. The foam wing and stab were, at the time, something of a novelty but, in the months to follow, became an integral part of a growing number of designs by a variety of modelers and manufacturers of ready-to-fly packages. So the original design concept proved out, but perhaps it could be improved so that past objections could be overcome.

A larger, roomier version able to hold a variety of R/C gear and capable of handling larger engines was obvious, but it took the constant urging (nagging) of friend and fellow modeler Frank Baker before the Super Whiz Kid became a reality. Frank's contagious enthusiasm is an awesome thing and I finally ran out of excuses and got cracking.

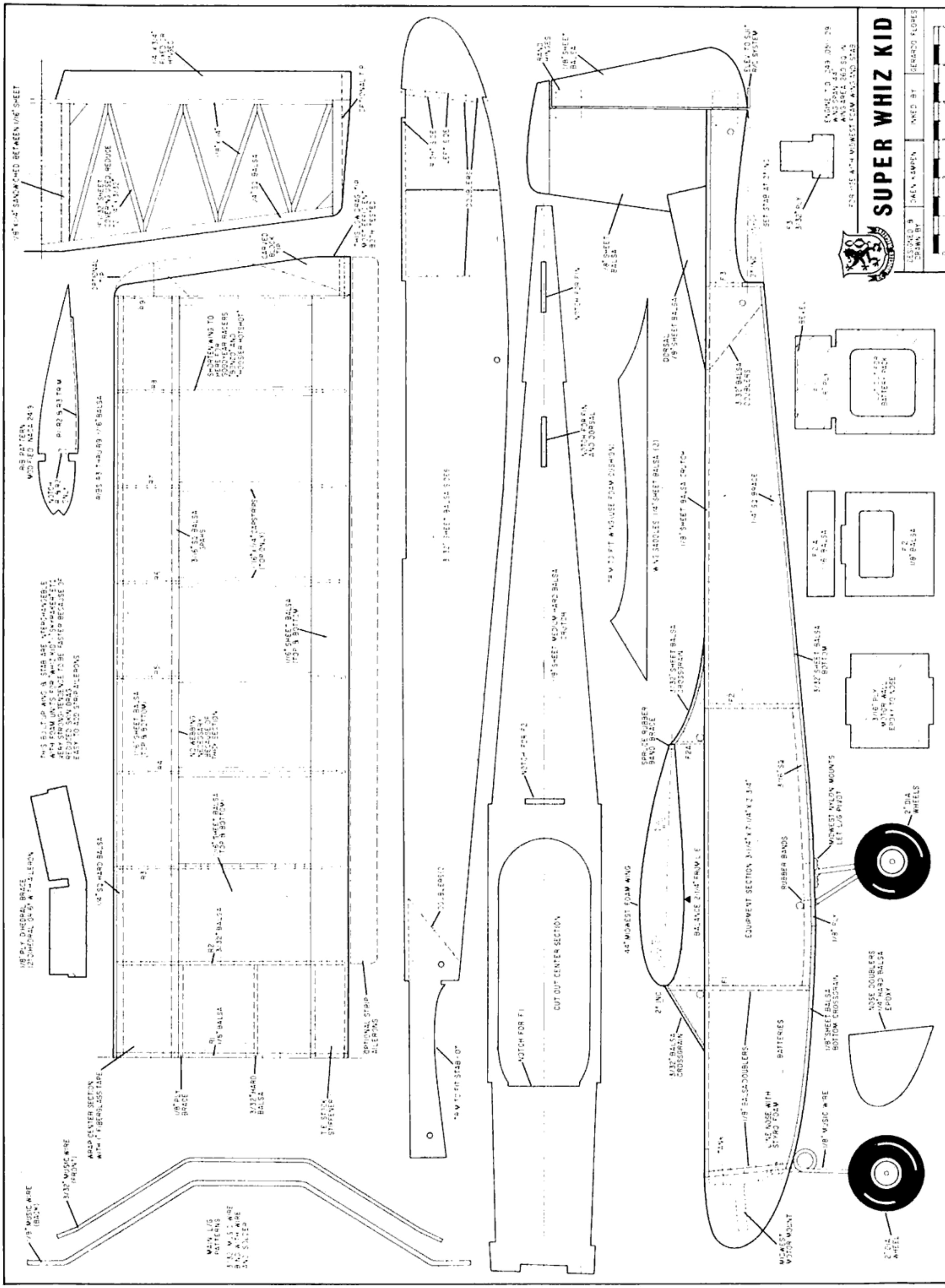
Within a week the new one was flying and it has been flying ever since. For over a year and a half it has served as a basic test bed for a variety of engines and radio systems. Power has ranged from Cox T.D. .049's through .051 and .09's, rudder only, Galloping Ghost and miniature multi proportional. Proof of the Super's capacity to survive all this is evidenced by the photos of the original model on these pages as all were taken at the end of the 1968 flying season after two summers of hard flying. There have been the usual (for me) number of chaotic moments ending in what normally would be disaster but the rugged one keeps coming back for more. A number have been built by other modelers and all have lived up to the original in terms of consistent performance and survivability.

Because of the test bed function of this craft - a few observations will be passed along to give you a better idea of its versatility. All original testing and flying was done using the Cox T.D. .051 engine and the Adams Twin actuator. Performance was great with solid response and 100% reliability. Loops and rolls are a cinch with a nice flat glide on power off landings. Later, a Hallco "103" was installed and flown with excellent results using both the .051 and .09 Cox engines. Here the addition of elevator and motor control gave added dimensions of performance. The Hallco rig is a dandy, beautifully made, and a boon to those who prefer a plug-in, all in one system. Modifications on the transmitter, namely a die-cut plastic plate, prevent stick movement into the corners thus minimizing the rudder-elevator interaction inherent with the Rand GG Actuator. The Hallco unit was also flown using only rudder and motor with the pulse rate increased to about 18 cycles/second to eliminate rudder waggle. The increased rate has no effect on the motor control but is not compatible with elevator use in the single actuator system. A bonus was discovered about this time by Carl Vogt whose curiosity got the best of his pocketbook and he combined a Cox Reed Valve Throttle Assembly with an .049 T.D.

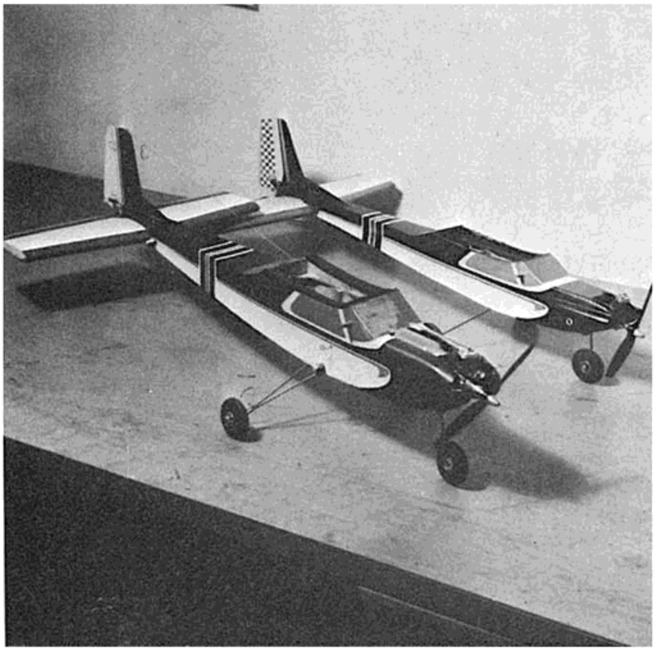
Mr. Cox will probably hate me for this but the unit is too good not to mention. The part number is 2460 and lists currently at $3.98 - a bit less than the .049 Medallion throttle. But here's the deal. For your 4 bucks you get not only a restrictor throttle, but also T.D. glow head, cylinder, piston and con rod. The combination works like a charm, needing only the addition of a small arm on the restrictor to connect to. Exhaust ports can be filed a bit for slightly higher top rpm's, but it is not necessary. It's quite a combination and in all honesty, I like it better than the Medallion rig because it's freer, less prone to binding and far more crash resistant. This combo is shown, if not too clearly, in the photos. Another mod, also shown, is the use of a 2 oz. clunk tank to give more flying time, particularly with the .09 size engine. For greater convenience in frequent fueling, no hatch cover is used.

While I was going the single channel route, friend Roman Bukolt put together another Super Kid and installed his then new Bonner 4RS proportional system on rudder, elevator and motor, powering it all with a Max .10. Flight performance was excellent at the rather startling all up weight of 40 ounces. However, some lessons were learned the hard way. It soon became apparent that there is a limit to the number of G's a foam wing will take, and this can be reached when increased power and weight are combined with abrupt maneuvers. Net result - two folded wings and two trips to the Bonner hospital for major and minor surgery.

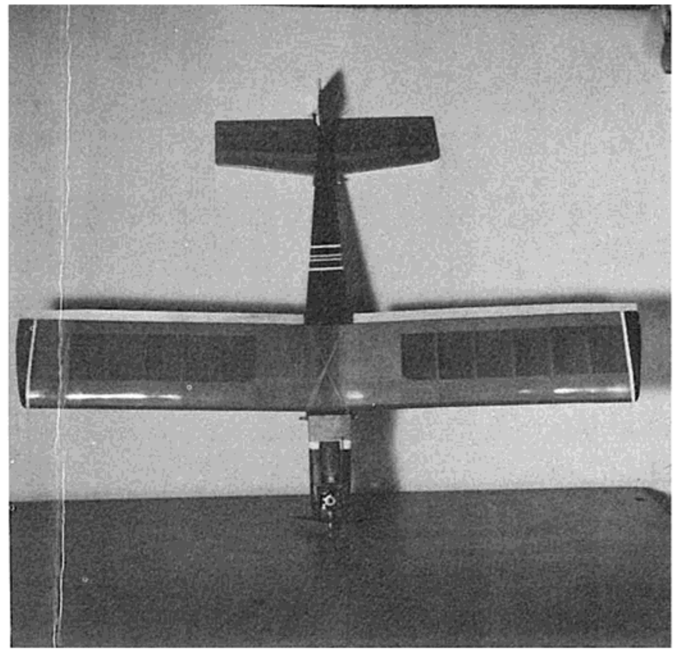
In view of this, an observation: In the past year, a number of ready-to-fly and A-R-F planes utilizing the 44" Midwest foam wing have reached the market. Some of these are quite heavy



FULL SIZE PLANS AVAILABLE – SEE PAGE 71



Comparison of fuselage size to original Whiz Kid. Super Whiz Kid in foreground. Deeper, wider fuselage suitable for G.G. and small digital proportional.



Left: Whiz Kid with Adams twin actuator, Golden Bee .049, rudder only. Right: Hallco 103 REM with Cox reed valve throttle unit, 2.02 tank.

and recommend the use of .10-.15 engines to get them airborne. While under normal flying conditions the combination can be quite satisfactory, a word of caution seems in order. (The foam wing Goodyear racers are less prone to extreme wing flexing because of their reduced span - 36"-38".)

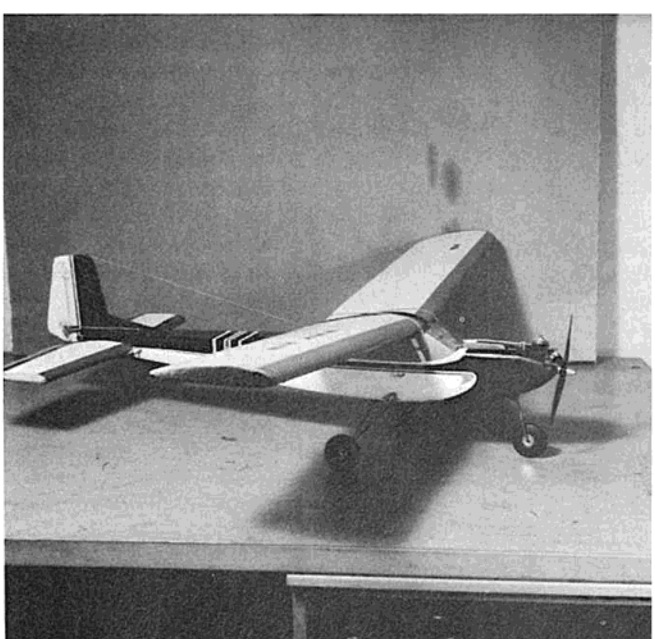
Following his experience, both Roman and I built up constant chord wings using the foam airfoil. Span was reduced to 40" while retaining the same approximate area of the original. They proved to be lighter and stronger than the foam and because of a smoother finish, slightly faster in flight. Plans are shown and this wing is recommended for use when the plane weight exceeds 2¼ pounds and also if ailerons are to be added. This is not intended to knock the reliable foam wings in any way - but merely to acknowledge their limitations.

Roman also did some experimenting with his wing using plug-in wing tips. The raked back variety with a flattened trailing edge appeared to have definite lift advantages as evidenced by take off runs 20% to 30% shorter than with conventional rounded tips. While not conclusive, the tests seem to confirm my belief that this type of tip tends to reduce tip vortices and increase effective span. (Some extensive research is in order here - any volunteers?)

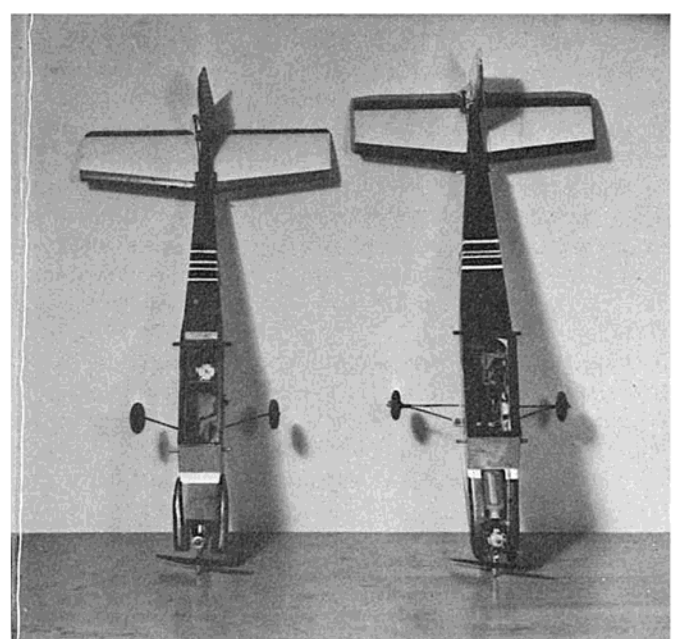
While we're on the subject of wings, I'd like to comment on Ken

*(continued on page **27**)*

Super Whiz Kid with Midwest foam wing and stab.



Super Whiz Kid with built-up 40" wing and strip ailerons.



RCM - Feb 1969) Ken attributes this to the tapered wing and implies that it is a natural characteristic of this kind of wing. If I may take issue with my friend, I'd like to disagree. Having designed and flown close to a dozen Midwest foam wing models, I have yet to experience this phenomenon. In fact, quite the opposite has been true, stall characteristics have been amazingly gentle, a direct result of the large radius leading edge.

Now while it is generally true that tapered wings tend to stall at the tips first, it takes a rather extreme amount of taper in planform and thickness before this really becomes a problem. The foam wing taper is quite modest, the tip being almost 85% of the root chord.

For these reasons I believe the fault lies elsewhere and the elsewhere is in wingloading. All of my designs have been flown with relatively light loadings in the range of 12 to 18 ounces per square foot. Ken doesn't say what the Seafoam weighed in at, but with full propo equipment I'd guess his wing was loaded fairly heavily. Another possibility, untreated foam can absorb water, resulting in unwanted weight acquired during extended flying sessions off water. In any event, better tip design will help solve tip stalls even when heavily loaded, as our tests have shown. Ken is now welcome to equal time.

This digression, in turn, leads to the finishing of foam wings, and after three years of hacking away at the problem some summing up is probably in order.

1. The simplest approach is to do nothing - fly as is. Dirt, oil, and dented leading and trailing edges are the result but if the wing loading is light - the only harm is aesthetic.
2. Seal with 2 coats of clear polyurethane varnish (brush on only) and plastic or Mystic cloth tape on all leading edges. The clear varnish can also be colored with dyes for transparent results. This is my first choice. Don't use spray cans - the solvents melt foam.
3. Testor's SPRAY-PLA enamel will add color but leaves foam texture quite apparent. Most other enamel spray finishes contain solvents dangerous to foam, so when in doubt always test first on a foam drinking cup. Watch out for weight build up. *(Not on the cup. -Ed.)*
4. Contact shelving paper (vinyl), available for about 49 cents a yard. This will stick better if the foam is first sealed with polyurethane varnish. I've gone this route often. The vinyl is resistant to dirt and grease but does not have a gloss finish. It can be easily cleaned and can be spray varnished but NO DOPE!
5. Colored polyurethane enamel is available from Valspar and some other manufacturers - good if you don't get carried away and wind up with too much weight gain. All the varnishes can be wet sanded and waxed for gloss smooth finishes if desired.
6. MonoKote can be used if you are VERY careful. Foam melts at a temperature close to its bonding temperature but it can be done, THOUGH RISKY. A fan type hairdryer has been used with some success.
7. Other methods of sealing and adding a ground coat for smoother sanding have been tried including HobbyPoxy STUFF. This is solvable in alcohol and will not harm foam but can become too heavy if allowed to build up. Use it as a filler only - sand most of it off.
8. Super Solarfilm is excellent and can be easily bonded to the foam with no danger since it requires less heat than MonoKote.
9. Sheeting with balsa and a variety of cardboards have been tried but tend to come out too heavy for low powered jobs. The raw wing weight can vary as much as an ounce or so but for best all around use the range should fall between 7½-8½ ounces when finished. One final comment and we'll move on. It has been my experience that a number of wings have broken as a result of 'prangs' or assisted ground contact, but not for the reasons I thought. While extreme flexing can occur in violent air maneuvers, the ground effect damage I'm referring to is usually the result of hard head-on impacts. (Yes, I have them, too!) Here the fracture appears to be the result of the forward momentum of the wing and it begins at the trailing edge. This is the weakest part of the wing and once it fails, the rest follows. A solution with some fringe benefits has occurred to several of us and I believe this problem can be remedied in the following way:

Using a steel straight edge, cut back the trailing edge to a point where it is 1/4 inch thick. Then white glue, Titebond or epoxy 3/4 inch trailing edge stock in place. This hasn't been tested yet but would prevent trailing edge separation plus giving a cleaner, sharper, more efficient trailing edge plus several square inches of added area. Try it. This about exhausts my foam wing store of knowledge so let's get into some brief construction notes and wrap this up before Spring comes or whatever season is next by the time you read this.

Fuselage

If you haven't tried this method before, you're in for a pleasant surprise as it goes together fast, true and strong and can be assembled on its side, upside down or holding it in your hands. As everything hangs on the crutch, cut this with care using a steel straight edge. Glue formers F1, F2 and F3 in place and then the sides can be added and held in position with tape or pins till dry. Front and tail doublers come next using contact cement. Install all necessary blind nuts for the motor mounts and attach the nose gear (fixed or steerable) to the 3/16" ply motor wall and EPOXY it in place. Add the 1/4" hard sheet wing saddles and cabin front and back. With the addition of the dorsal and fin, it begins to look like an airplane. Save the rudder till all doping is completed. Install the fuel tank - if fixed, or a hatch can be cut out for the removable type. Epoxy the main landing gear plate in place and finish the bottom sheeting. Use strong hard wood under the batteries - even go to 1/16" plywood here if desired - it also keeps the nose wheel from entering the battery compartment. 3/8" hard nose doublers wrap it up and you can dope, MonoKote, spray or HobbyPoxy the finish of your choice. Hold down dowels keep the flying surfaces attached, so include them if you haven't already.

Wing

The built up wing is like all other D-TUBE wings. The airfoil is flat bottomed for most of its length for easy building flat on the board. Use trailing edge stock or balsa strips to shim the leading edge in position. A wing jig is highly recommended if one is available. Titebond is the glue to use and, again, choose the covering of your choice. Mine was colored silk and clear Aero Gloss. Whatever you do - build noble and true and you will be rewarded with one of the most stable, rugged, dependable airframes around.

May the winds of Sunday blow gentle on your wings. ●

SLOPE AND THERMAL SOARING

PART II, by MAJOR O. STENSBOL

Left: Mr. Aasbo and his 'Uranus' glider. A good soarer but slightly heavy for "thermal sniffing". Dee Bee Quadruplex 21 radio.

The other type of RC soarers is the slope soarers. These are designed to fly under the influence of wind-waves created in front of and above a free slope, a hill or a mountain.

A slope soarer should be fairly fast and able to turn quickly, in order to utilize small soaring sites. An example for such a site is shown in fig. 3, and you should notice that this is only one of many possible site profiles you may find useful. You should also notice that the size of such a slope is not that important for efficient soaring. Naturally, a fairly small, light weight soarer of 5-6 ft. can be kept aloft on a much smaller, narrower slope than the 10-12 ft. giant. But as an average, you might say that an open, plain hill with 25-45 degree angle affected by a steady wind between 5 and 20 knots, will enable you to fly all kinds of soarers. While a light weight, fairly slow slope soarer will fly happily at 5-10 knots and be unable to penetrate in winds stronger than that, your heavy weight soarer or your fairly heavy giant, however, must have at least 10 knots to maintain altitude, and maybe 12-15 knots to gain altitude!

Naturally, design, wing section and trim are all important factors in this respect. You may even have a relatively light soarer equipped with laminar flow wings and a zero-zero trim giving you a bag full of whispering lightening! You will be really surprised the first day you take such a design out for the initial flights! Watch out, you keen guys, don't let anybody fool you about this! Flying a soarer is usually very relaxing and a pleasure to watch, but, – and that's important, don't relax the first time you try a laminar design!

Construction wise, a slope soarer should be built according to certain minimum weight/safety factors. You should bear in mind the loads such a soarer must take in those bumpy and windy conditions. Especially when, and if, you put on some extra G's through violent maneuvers to get it down again, or, as a result of your interest for stunt flying, you do your best to break those slender wings!

A slope soarer should be so designed and built, that it can take fast dives, quick loops and snappy rolls, – all in strong winds. This indicates that your soarer should have wings capable of some 5-8 G's. With spruce for all longerons, double spar and sheeted leading edge, such a wing will cope with this load. You should fully realize that your thermal soarer is completely unfit for such flying; never try! And, of course, this is also the reason why you can never combine the requirements for those two soaring planes into one design! And don't let anybody fool you about this. The so-called all around soaring model simply does not exist, it will always be a compromise between widely separated requirements giving such a plane fairly good performance as a sports plane. You will never get those spectacular performances from such a design. Naturally, in very strong thermal or a strong slope wind, you can fly this bird without difficulty. But under marginal conditions you will not be able to stay aloft like the specially designed soarers.

Concerning the now so commonly used glass-fibre, this should be restricted to the nose section of the fuselage and under the belly. Don't make your soarer unnecessarily heavy, it won't pay off. And when you use that glass-fibre, remember the polish! A soaring bird is only efficient when you keep it streamlined and polished. Drag must be reduced to a minimum. Only remedy to help you here is to use dry car wax and a polishing cloth!

Control gear is basically the same as for a thermal soarer, although a fourth servo for trimmable, full span flaps is of great advantage. The ideal setup would then be:

Servo 1 – Rudder and/or ailerons,
Servo 2 – All flying tail,
Servo 3 – Efficient spoilers,
Servo 4 – Trimmable flaps (could be so-called "flaperons;" i.e., combined ailerons and flaps).

As weight is not that very important on a slope soarer, you should stick to power packs of greater capacity than in your thermal soarer. You should preferably have at least enough capacity for 3-4 hours continuous flying.

B. Trimming for Optimal Performance.

The differences between a thermal and a slope soarer should now be fairly well understood. The basic differences in these birds clearly indicates the need for different trimming techniques in each case. First, let's take a quick look at the thermal soarer and how you should trim this for maximum performance. The basic line-up and trimming technique is supposed to be well known among the readers, if not, you'd better start learning with a paper stick model straight away!

If you stick to a conservative design, a model with conventional wing section and lay-out, you should first of all check the CG location. That is most important in order to keep control of your flight! You can't put the CG at a random place and then change the decalage setting until the model apparently behaves according to your expectations. Even if it seems like your model then has got a good glide, you can be sure that this IS NOT the optimal performance according to design and aerodynamics. Therefore, be careful with the CG location; that's the basic rule for every soaring pilot.

Granted your initial trim is OK, you can proceed with the final adjustments. Here, you'll have to get the bird high up in order to observe the flying characteristics. Use a stop watch and check the flying time on a series of flights from equal height. Start your adjustments, but be careful! Only small adjustments in the decalage at a time, and several flights between. Use your notebook and see if any of the executed adjustments did you any good!

A thermal soarer may be trimmed out as a so called "sniffer," i.e., the model will show you when it enters a thermal zone! This technique IS NOT for beginners, it must be confined only to those hard-bred experts who really understand the art of soaring and at the same time have enough piloting experience.

Shortly, a thermal sniffer could be described as a model with the CG so far back that any vertical disturbances of the air masses surrounding the plane, will cause your wings to "wave" at you! Actually, with an aft CG and slightly less decalage, your model is flying on the verge of stall in calm conditions. So, when a thermal arises, this near vertical movement of air around your wings will cause the lead into a stall; i.e., the wings will suddenly start a slow, rolling motion from side to side. Observing this, you must be quick to put your soarer in a circle feeding in enough elevator to keep altitude. Now, if you've really got a "rider," you will soon see your model going upwards like a homesick angel! Don't get too high, however, you may loose sight and even get out

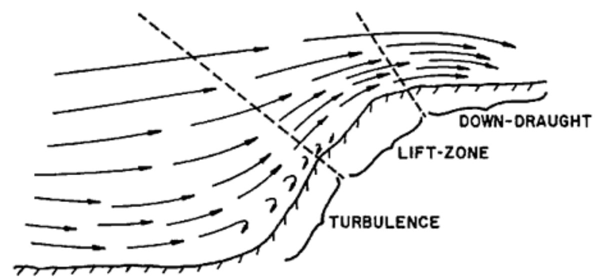


FIG. 3a A GOOD SITE-PROFILE

FIG. 3b DIFFERENT PROFILES

of range. Stop climbing before it is too late, leaving the thermal at safe altitude. Use spoilers and down trim elevator to increase your rate of descent while you simultaneously fly your soarer on a straight course, 200-300 yards. This will almost certainly take you out of the lifting zone and significantly decrease the height you have attained.

A slope soarer should always be flown with the CG at 25-36% of chord from the leading edge. Anything further aft of this area is asking for trouble! CG position will also vary with wind speed and local lift conditions. A fairly weak wind of 5-10 kts. could easily be handled with a CG at 30% of chord, while a strong wind of 25-30 kts. requires the CG forward at 25% in addition to ballast firmly fastened to the fuselage just around CG.

Generally, a forward CG combined with a fairly high decalage is preferable to an aft CG and a small decalage. For a newcomer this is most important in order to survive those intial trimming flights.

C. Flying Technique

For those who have experience from multi type RC birds, there will be quite another feeling to flying an RC soarer. Naturally, it is an advantage to have some sort of RC flying experience before you start up with a real sophisticated soarer. Therefore, to begin with, everybody should train himself with a simple, basic glider before advancing to the high performance soarer. Today, there are several kits available for this purpose, among these are "Snipe," "Dandy" and "Amigo II." Any of these will secure your success provided that all instructions are followed.

The author's daughter, Hilde, and modified 'Dandy'. CAR plus elevator on Grundig 4 radio.

Once again, we have to differentiate between flying a thermal soarer and flying a slope soarer. To fly

(continued on page **32***)*

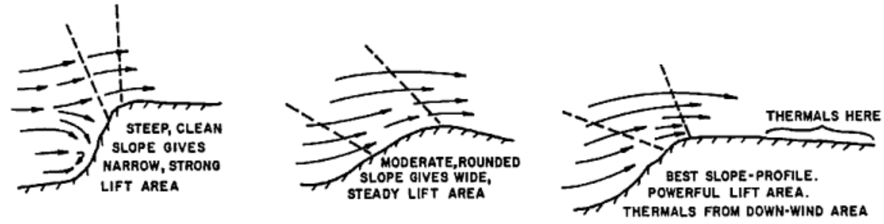


FIG. 3c VARIATIONS IN LIFT

THE AUTHOR PRESENTS AN ACCURATE, BUT SIMPLE, METHOD FOR PRE-COMPUTING THE LONGITUDINAL BALANCE' OF YOUR NEXT DESIGN. ALL YOU NEED IS AN ACCURATE SCALE, AND THE ABILITY TO ADD, SUBTRACT, MULTIPLY AND DIVIDE.

LONGITUDINAL BALANCE

By KEN WOOLSEY

Of the many fine articles which have appeared in this magazine, perhaps no others have been of greater value to the practitioners of this fine hobby, at least in my estimation, than the articles by Chuck Cunningham titled "R/C DESIGN MADE EASY" carried in the January and February issues of this year, and his earlier one many months ago.

As Chuck pointed out, one of the most satisfying aspects of this hobby is the ability of the modeler to lay out his own design, incorporating his own configurations, build it and watch it fly perfectly (or nearly so), on its maiden flight. To the jaded modeler who feels he has reached a degree of competence where there is little room left for continued progress, and whose interest in this hobby might diminish as a result, the tools which Chuck provides in his fine articles offer an entree to a logical "next step" in the design of your own planes, which can be challenging, and even fascinating.

It is the purpose of this article to provide a 'next step' to Chuck's articles: To furnish the modeler with an accurate, but simple method for pre-computing the longitudinal balance of his 'dream boat', after he has laid out a configuration which fills his esthetic needs and is pleasing to his eye.

The only requirements are an accurate scale to weigh accurately each of the components which goes into his model, and the ability to add, subtract, multiply, and divide. I use postal scales, accurate in one ounce increments to a total of ten pounds. It isn't necessary to own your own scales, really. A trip to your supermarket or corner grocery store during a slack period with all your 'goodies', with permission from the store manager, should enable you to come away with the weight of each of your flying components carefully tabulated. Who knows, – you might even end up by getting the store manager 'hooked' on this hobby!

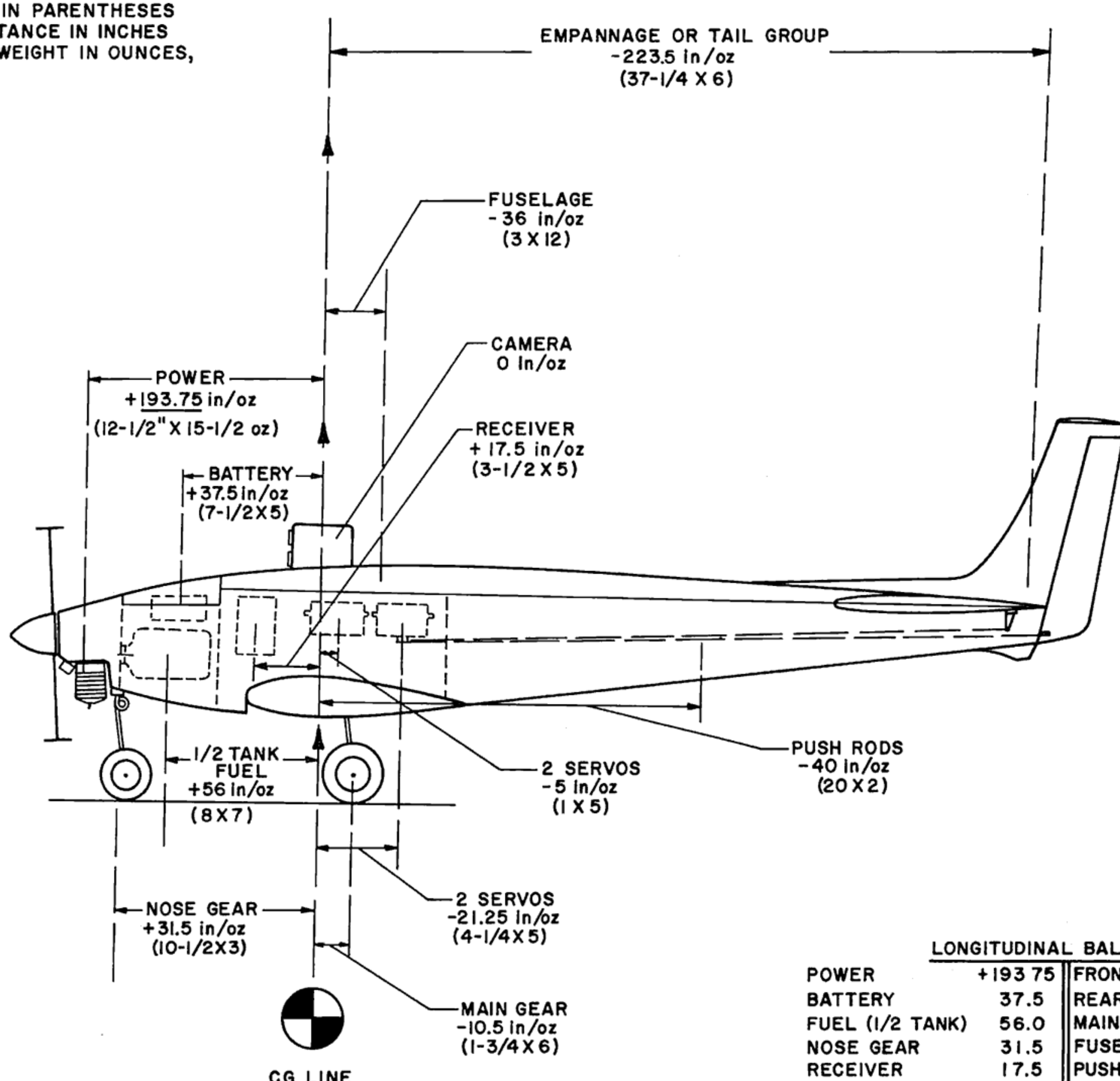
Basically, the method provides that with the location of the center of gravity on your side view within the limits prescribed in Chuck's article, draw in ALL the components starting with the engine, then the prop, spinner, nose gear, fuel tank, flight battery, receiver, servos, pushrods, and main gear. Now carefully measure the distance of each of these components from the center of gravity, using a point on each component which you estimate to be ITS center of gravity. Then, multiply each of the components' distance from the CG by its weight, and you come up with a list of figures which can conveniently be called "inch-ounces". Tabulate all inch-ounce figures forward of the CG as PLUS values, and all figures aft of the CG as MINUS values. When the design is complete, these figures must balance out exactly. To achieve this, move the components, particularly the flight battery, to come up with the desired result.

Now we come to the effect of the wing, fuselage, and tail group on our calculations. We can forget about the wing in almost any configuration as its CG will be so close to the desired over-all CG that any minute variation will be of no consequence. The fuselage requires some consideration, however, and the tail group, or what I like to call the empennage, requires a LOT of consideration. Experience in building has shown that a fuselage such as illustrated in Chuck's article in the February issue, when constructed and balanced without the tail group or any components installed, will have a CG location about three inches aft of the desired CG at completion. The average fuselage of a six to seven pound ship will weigh about twelve ounces bare, so let's use that as a "ball park" figure. So, what have we here in terms of inch-ounces as it affects our longitudinal balance? We have 36 in/oz. MINUS.

Now, let's consider the tail group. Experience has shown that the tail group, including the horizontal stabilizer, elevators, fin, and rudder with horns, hinges and elevator link-up rod will weigh from five to seven ounces for this size ship, depending on how lightly or strongly you like to build. I have found that the average tail group will run to about six ounces. With the long moment-arm of the tail group it is essential that its weight be tabulated

(continued on page 32)

NOTE: FIGURES IN PARENTHESES REPRESENT DISTANCE IN INCHES MULTIPLIED BY WEIGHT IN OUNCES, IN THAT ORDER.



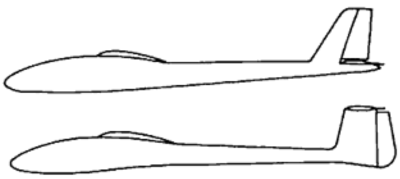
LONGITUDINAL BALANCE DATA

POWER	+193 75	FRONT SERVOS	-5.0
BATTERY	37.5	REAR SERVOS	21.25
FUEL (1/2 TANK)	56.0	MAIN GEAR	10.5
NOSE GEAR	31.5	FUSELAGE	36.0
RECEIVER	17.5	PUSH RODS	40.0
		EMPANNAGE	223.5
	+336.25		-336.25

SCALE 1/8" = 1"

SLOPE & THERMAL SOARING

(continued from page 29)



TYPICAL EUROPEAN LAY-OUT FOR RC-SOARERS
TOP MODEL USUALLY FOR SLOPE-SOARING,
BOTTOM MODEL WIDELY USED FOR THERMAL SOARERS

SIDE VIEW OF MY NEW DESIGN GHOST 7

The author's new Ghost 7 design uses 6 degrees dihedral with 8½ degree forward sweep on wing. Epler 385 airfoil. Stab swept back 20 degrees. C.G. at 38-40% of mean chord.

a slow, rather light weight thermal soarer is very easy and relaxing. The only difficulty you will ever experience with such a plane is how to keep it inside the thermal once you've found this and, secondly, how to get it down again safely if your spoilers prove to be too small! Besides that, thermal flying is probably the easiest to start with for all freshmen to this wonderful hobby. Only remember this simple but rather important rule: Don't overcontrol, let the bird fly mostly on its own. You should only guide it gently in a searching pattern over areas where your instinct and meteorological know-how say that thermals are. This means very gentle use of the stick and careful watch out for any stalling tendencies which naturally could mean you've got a thermal bumper. Once this is accomplished, you should be able to keep inside the lifting area as previously described. You may find it a little tricky to trim your bird out for maximum performance and best rate of climb in such a thermal. However, as this is not that important, due to normally strong thermal effect, you will gain height anyway. From visual observation the center of any lifting area is very difficult to locate. You might, of course, find some circling gulls or other birds indicating the most probable center. But to be really sure, you would have to use some sort of an automatic radio sound device. This could be a small HFTX being able to transmit a variable tone from your plane. Tone variation could easily be accomplished via an airvalve connected to a variable capacitor in a tone generator. If you then arranged this such that the continuously transmitted tone would go up and down according to ascend and descend, you would have a very helpful audio device. With this set-up you should be able to center upon the maximum lifting zone and thus keep inside the thermal for considerably longer periods than without such a device.

Concerning the slope soaring technique, this is, in many ways, difficult to present in a theoretical lesson. Basically, you must understand the elementary physics behind slope soaring and the most characteristic features connected to slope soaring. Once this is understood and you have a decent slope soarer at hand, nothing should stop you from the first trembling flights if wind DOES NOT exceed 10-12 kts! Be careful, all you stick happy newcomers, and always listen to advice from an old experienced and wind dried soaring pilot, that pays off!

The basic pattern for all slope profiles is, of course, the figure of eight parallel to the slope. Hand launch your bird approximately one third downhill from the top, keep it straight ahead for some seconds in order to get safe, initial height, and then slowly turn it left (or right) to fly parallel to the slope. This course will eventually bring you to one end of the slope, where you have to turn 180 degrees. This turn is ALWAYS carried out quite quickly with simultaneous use of rudder/elevator, and always towards the wind. Watch out for any stalling tendencies in such a turn, feed in the necessary elevator trim (down please!) if you have here a certain feeling that your bird falls off the "rails." Flying towards your position, almost overhead and in the other direction will logically bring you to another turnpoint. The same procedure, the same technique and you've accomplished the first figure of eight in the standard slope pattern. Hopefully, there will be many more to come. You alone can make it out, it's all tedious work and a combination of observation, flying technique and careful trimming. Once this is fully appreciated and executed, you've got a new world around you, the wonderful world of slope soaring! ●

LONGITUDINAL BALANCE

(continued from page 30)

accurately, however. After the parts have been completed and before installing, it is well to weigh accurately the complete tail group, with its necessary parts, then add one ounce for the finishing you will put onto that area. I think that you will come up with a weight very close to six ounces. When computed, the inch-ounce value of the tail group will give you your largest figure in the tabulations, due to the long moment arm.

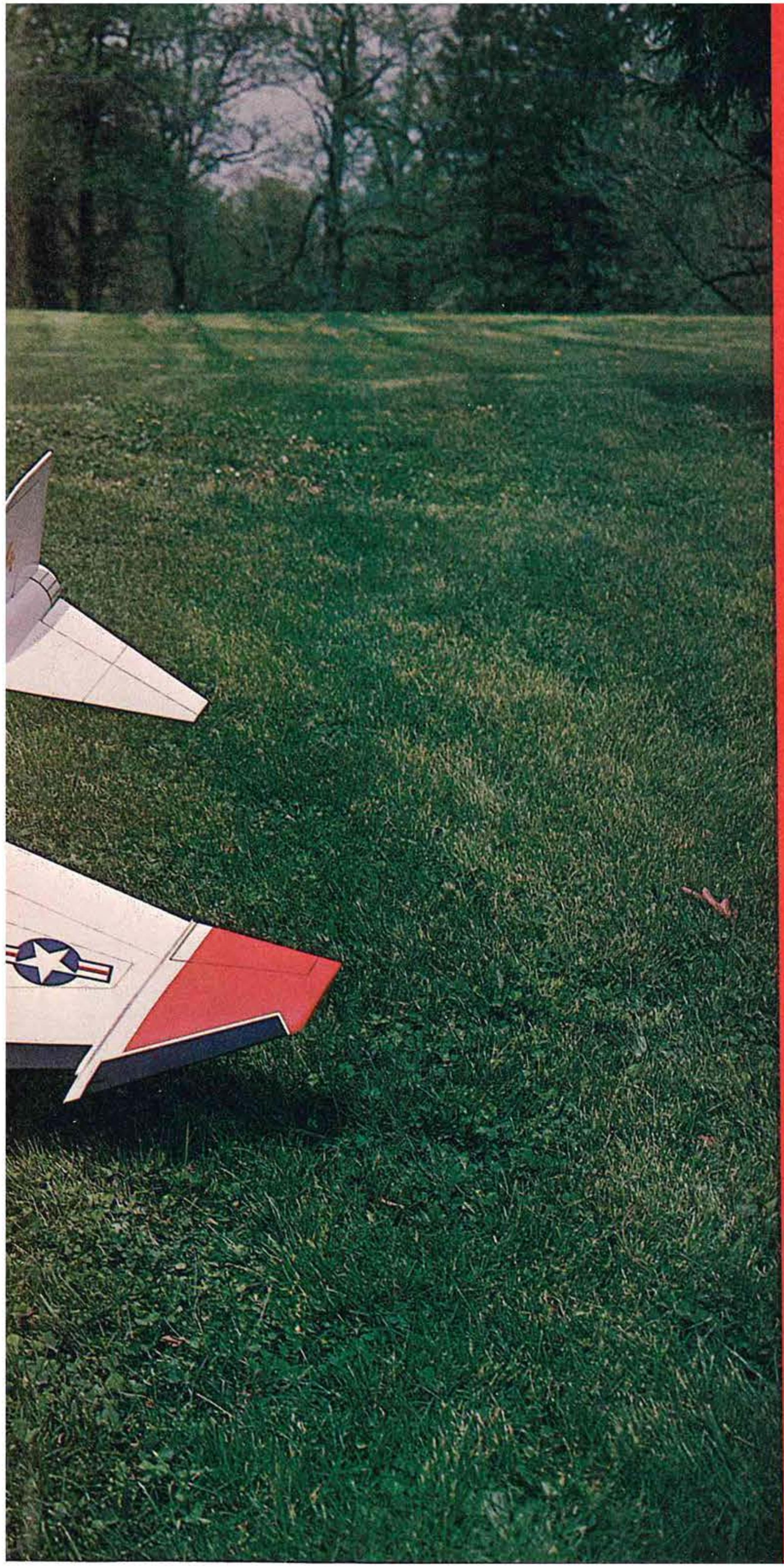
Included in this article are a couple of pictures of a plane which was designed with this method. It is a large ship with a seventy-six inch span, and weighs a little over ten pounds with the camera installed. She is a beautiful flier and a very stable platform for camera work. It will do any of the AMA pattern maneuvers quite well, and even do a fairly respectable snap-roll, as big as it is. With power a bit above idle, it will fly with full-up elevator in a nearly stalled configuration, with positive aileron control. It will fly inverted in the same manner with full-down elevator applied. At the present time it is being flown with the Heathkit unit which I assembled, and a Taipan "60" engine. At this writing, the ship is being prepared to shoot 8mm movies with a battery operated camera, triggered by the fifth servo. About three years ago I shot several rolls of film, some of which turned out fairly well, – especially the backward shots with the camera installed facing aft.

While facing forward, I did have trouble with oil film fogging the lens, but I feel that a muffler with pipe will clear that up. The engine is now mounted inverted to move the exhaust stream farther from the camera. Shooting movies with a set-up like this is a 'fun thing', and some of the shots can be quite spectacular.

A diagrammatic sketch, or side view of a plane similar to this photo ship is shown to illustrate the longitudinal weight and balance computations.

It is hoped that this system of balance computation will be found useful. I have a hunch that some of the pro designers have used this system, or a variation thereof, but I have never seen it published as yet.

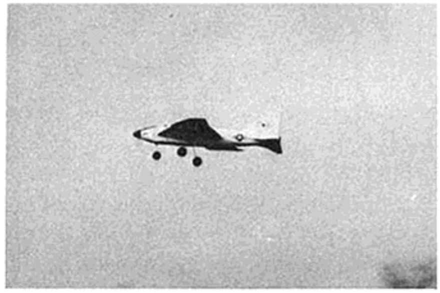
Good luck, and good flying, fellow modelers! ●

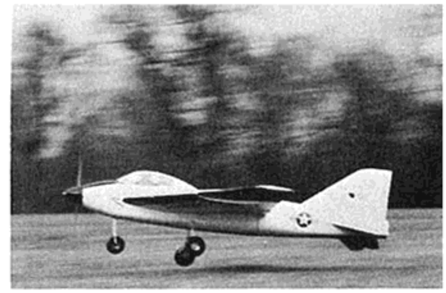


PHANTOM

By EARL WITTE

COLOR PHOTOGRAPHY BY
BOB WANGELIN





INTRODUCTION

Everyone has his hangup. Mine happens to be anything with wings, but in particular, the Phantom jet. It's not hard to get hooked on this beast; in fact, you'll try harder not to. It all started about five years ago. Anytime I was close to Lambert Field, I would stop and watch planes embark and depart. Once in a while, one of these Phantoms would come roaring in fast and loud with its flaps and wasp-like gears extended. When it hits the deck the jet blast deafens your ears and shakes your bones, and if this doesn't make your imagination whirl and your skin tingle – buddy, you're dead!

Back in those days, I was a U-controller. So I decided to build a close-to-scale carrier event type Phantom jet with throttle, flaps, and arresting hook. I tried to gather as much info as possible through magazines, plastic scale models, and actual photos of the plane. I still remember the day when I nonchalantly drove past a couple of McDonnell guards, stopped as close to a Phantom as I could get, and got out of my car and tried to get a photo of it. About that time an excited guard came running up to find out what I was up to. I simply explained that I wanted a couple of photos to construct a model plane. Then he simply explained that I could be a spy, for all he knew. While he was trying to decide whether to shoot me or turn me over to the funny farm, I made good my escape. From then on I stuck to other sources of gathering material!

I was ready to fly my new creation in the summer of '64; and fly it did. I probably would never win any contests, but it really impressed me with its stability and realistic appearance. On low motor, with flaps and hook down, it would fly with about a 25° nose high attitude. Then one day it happened! Somebody was flying a big free flight - no - it was a new fangled radio controlled airplane! I had never thought about, or paid any attention to, R/C until that day. I can't remember the fellow's name. However, he was very patient and he demonstrated his Taurus with a Controlaire tube type reed rig. He was just passing through St. Louis, so I never did get to know him. But I decided right there that it was just a matter of time before I could save enough to get a modern Controlaire transistorized reed set. I have built quite a few R/C kits and had good success with all. When I was able to purchase an Orbit 6-12SS, I realized I could now build my dream plane.

Unfortunately, the Phantom does not lend itself to scale. However, its lines can be captured in semi-scale. My first intention, when I started this plane, was to build a lightweight contest ship. But when I started the plans, I could see the possibilities for something really different - not just another Kwik-Fli (sorry, Phil). I have been building models since I was knee-high to a landing gear, and this was my fifth R/C model. I have spent a lot of time designing the Phantom and tried to put the best of my experience and what I could learn from my fellow R/C friends into it.

After reading some of R/C Modeler's design articles, I decided to use most of the recommendations they came up with. To give the plane good rolling and inverted flight tendencies, I used inline thrust, wing, and elevator alignment. To give the plane good stability and low speed flight characteristics, I used a delta wing design with flaps, stall plates, and dihedral and washout in the wing tips. To give the plane clean flowing lines, all control horns are enclosed. To save weight and time, I use what I call 'hollow ribless wing construction'. For strength and durability, the plane has two coats of Sig epoxy brushed on. These are merely some of the design highlights.

The nervousness generated by getting the Phantom ready for its first flight was only surpassed by my day at the altar, but that's another story. I cleverly shanghaied one of my best friends as test pilot, Charlie Litzau. Now Charlie's a lousy flier, but he does sell some fantastic insurance policies cheap. After several postponements - you know - too much wind, not enough wind, too much sun, not enough rain, etc., we ran out of excuses. But all of our anxieties were unwarranted. This ship bore straight and true down the strip, then lifted beautifully skyward. The Phantom flies magnificently and really shines on rolls and inverted flight. Landings are very realistic with the ship coming in nose high to touchdown. Inspired?? Let's start construction; later on in the article we will discuss flying in more detail.

CONSTRUCTION

I will try not to get too detailed with the construction section. However, I will try to answer questions for the newcomers. Let me say first that the Phantom is very straight-forward and easy to build. Read the plans thoroughly and get a clear mental picture before starting to build. Weight is always a problem so use lightweight contest balsa and watch the amount of epoxy you use. The basic main wing should be constructed first.

Wing

1. Epoxy 1/4" plywood strip doubler to 36" x 3/8" sq. spruce T.E.
2. Cut a 3/16" slice out of 7/8" Sig leading edge stock to accept the 3/16" plywood brace.

3. Cut L.E. 2" longer than shown on plans. (This will be cut off flush later.)
4. Epoxy a 3/16" plywood brace into leading edge.
5. Epoxy a 1/8" balsa strip doubler on the L.E.
6. CAREFULLY and ACCURATELY jig up the L.E. and T.E. Use the 6 hardwood jig blocks shown on the plans. Jig the L.E. and T.E. at tips and middle, then weight down.
7. Epoxy and pin root rib W 1 and tip rib W 2 in place.
8. With an L square, double check alignment.
9. Epoxy S1-spar in place.
10. Glue 1/4" x 3/32" balsa strip from L.E. over S-1 to T.E.
11. Epoxy 3/32" x 3" balsa sheet on L.E. and T.E. only.

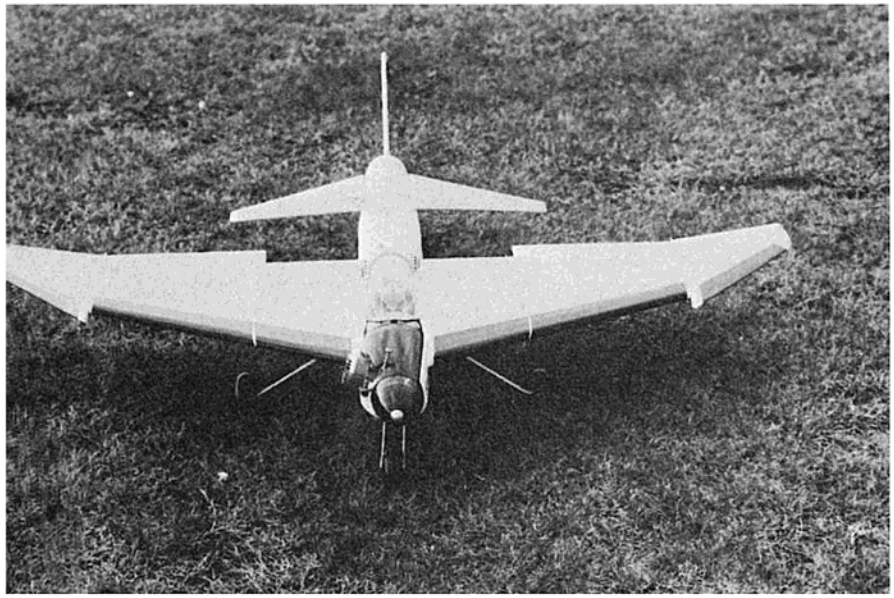
(Note: Use 1/4" x 1" balsa strips and weights to make sheeting lay flat.)

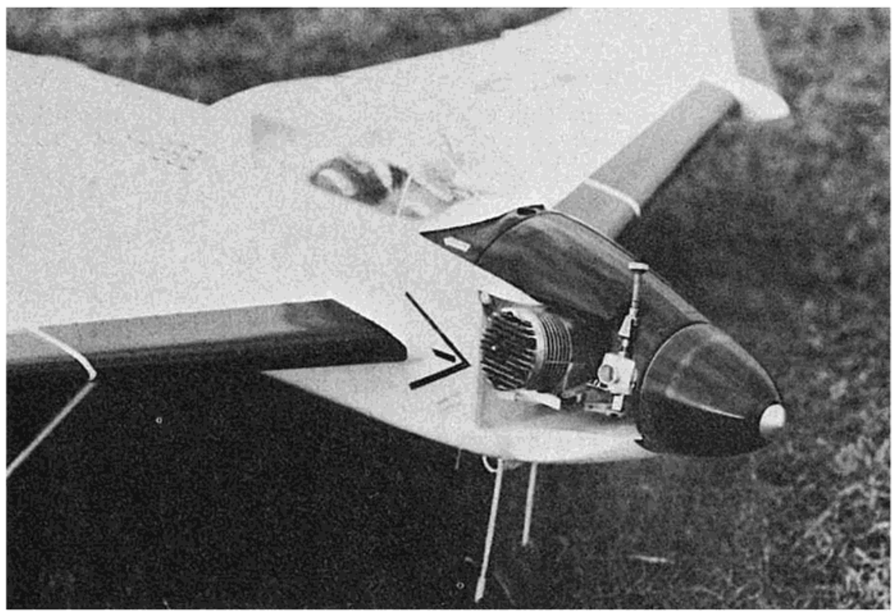
12. Remove wing - turn over and jig up again.
13. Repeat steps No. 10 and No. 11.
14. Complete 3/32" x 3" balsa sheeting top and bottom.
15. Cut off leading edge flush. Sand wing with sanding block. Fill in any holes and cracks with Stuff (HobbyPoxy), follow with 2 coats of Sig epoxy brushed on with an acid brush, and sand thoroughly between coats.

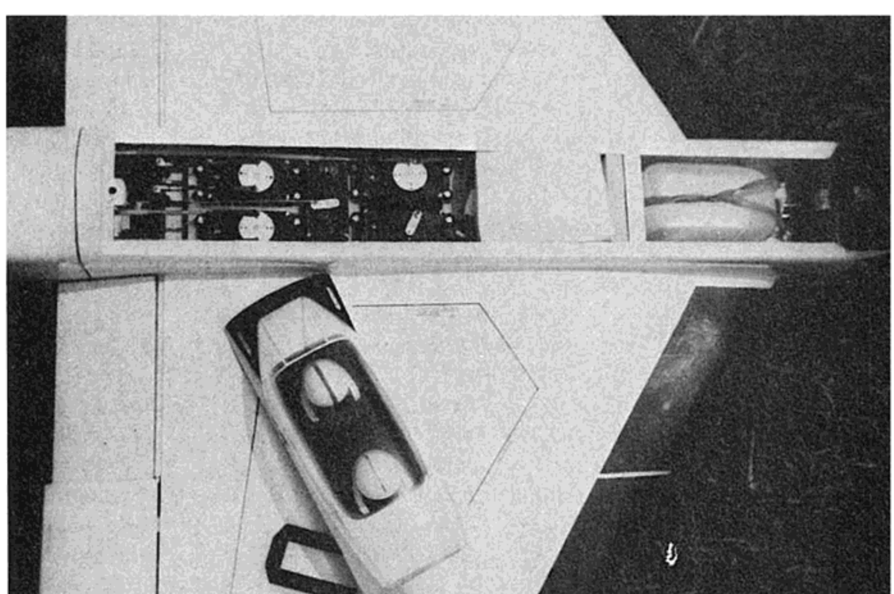
Fuselage

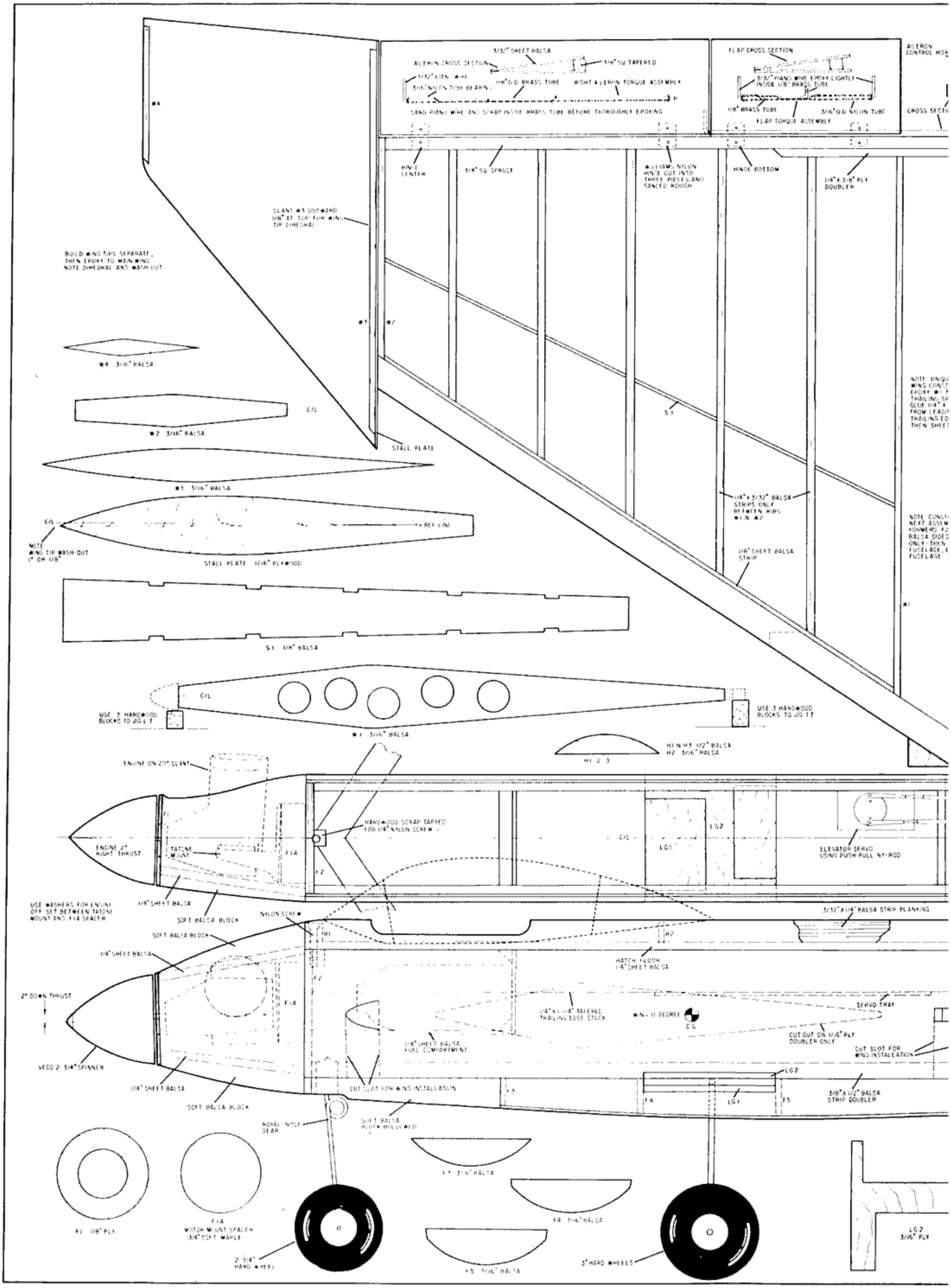
1. Epoxy 1/16" plywood doubler to 3/16" balsa sheet sides.
2. Cut out slots for wing spars - save pieces for later. Cut slots for elevator.
3. Epoxy 1¼" x 1/4" tapered balsa stock doubler in place.
4. Jig fuselage sides upside down.
5. Epoxy F2, F7, and F11 in place.
6. Insert and epoxy wing into fuselage - double check alignment.
7. Assemble main landing gear sandwich.
8. Epoxy 3/8" x 1/2" balsa strip doubler in place.
9. Install nose and main gear.
10. Build up fuel compartment - coat inside with epoxy.
11. Assemble rudder and stabilizer out of 1/4" sheet balsa - use 6" total anhedral in stabilizer. Brush on 2 coats of Sig epoxy.
12. Epoxy stabilizer into fuselage - check alignment.
13. Add hinges, elevator, and control horns to complete elevator assembly.

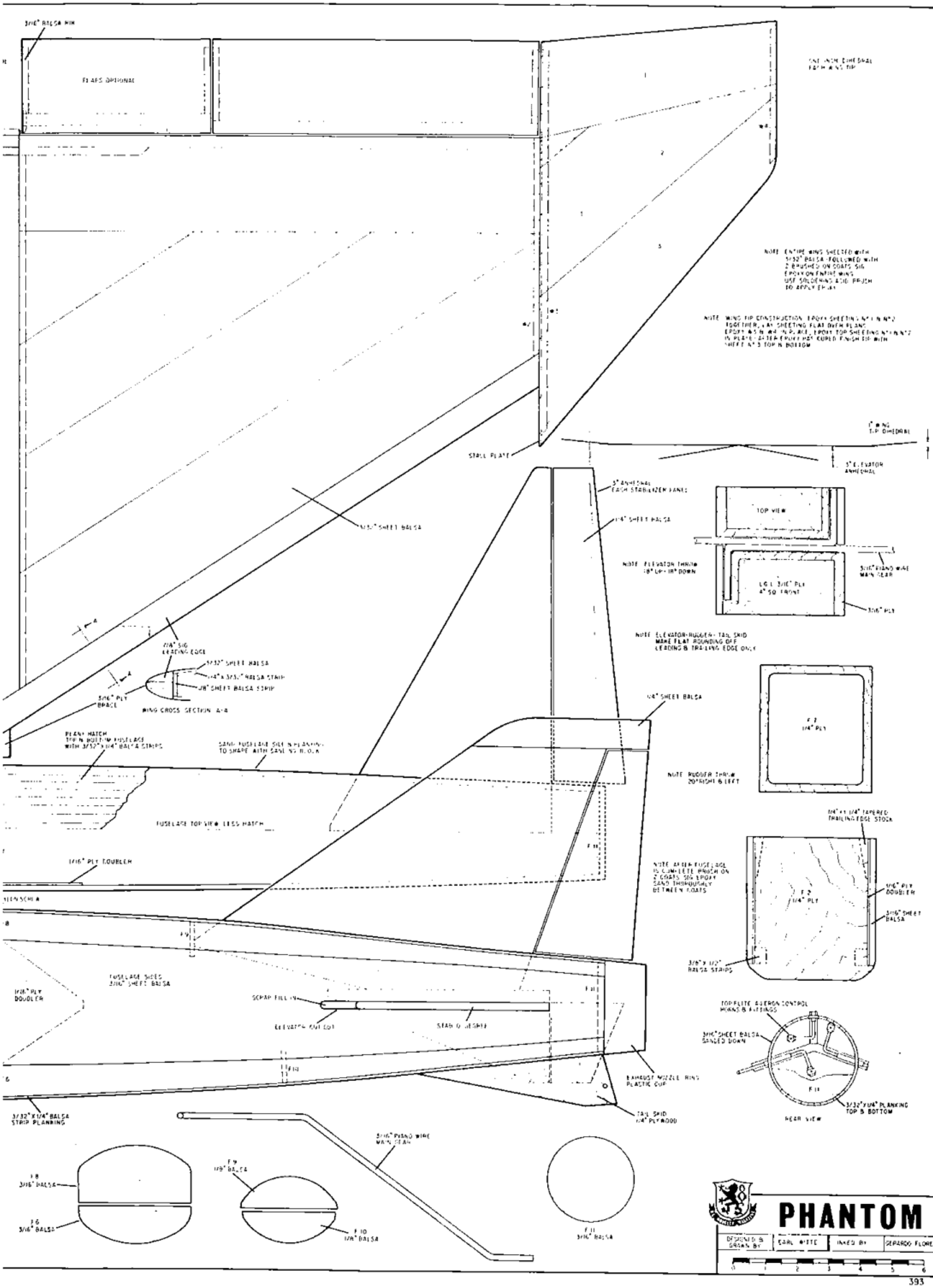
(continued on page 39)








3/32" SHEET BALSA
AILERON CROSS SECTION
3/16" SQ TAPERED
RIGHT AILERON TORQUE ASSEMBLY
SAND PIANO WIRE AND SCRAP INSIDE BRASS TUBE BEFORE THOROUGHLY EPOXING
FLAP CROSS SECTION
1/8" BRASS TUBE
3/16" O.D. NYLON TUBE
FLAP TORQUE ASSEMBLY
HINGE CENTER
3/8" SQ SPRUCE
HINGE BOTTOM
1/4" x 3/8" PLY DOUBLER
SLANT #3 OUTWARD 1/8" AT TOP FOR WING TIP DIHEDRAL
BUILD WING TIPS SEPARATE, THEN EPOXY TO MAIN WING. NOTE DIHEDRAL AND WASH OUT
#4 3/16" BALSA
#2 3/16" BALSA
#3 3/16" BALSA
STALL PLATE
C/L
REF LINE
NOTE WING TIP WASH-OUT 1" OR 1/8"
STALL PLATE 1/16" PLYWOOD
S1 1/8" BALSA
1/4" x 3/32" BALSA STRIPS ONLY BETWEEN RIBS #1 & #2
1/16" SHEET BALSA STRIP
USE 3 HARDWOOD BLOCKS TO JIG T.E.
#1 3/16" BALSA
H1 & H3 1/2" BALSA
H2 3/16" BALSA
H1 2 3
ENGINE ON 20° SLANT
HARDWOOD SCRAP TAPPED FOR 1/4" NYLON SCREW
ENGINE 2° RIGHT THRUST
TATONE MOUNT
F1A
F2
LG1
LG2
ELEVATOR SERVO USING PUSH-PULL NY-ROD
USE WASHERS FOR ENGINE OFF-SET BETWEEN TATONE MOUNT AND F1A SPACER
1/4" SHEET BALSA
SOFT BALSA BLOCK
NYLON SCREW
3/32" x 1/4" BALSA STRIP PLANKING
HATCH FLOOR 1/4" SHEET BALSA
2° DOWN THRUST
1/4" x 1-1/4" TAPERED TRAILING EDGE STOCK
WING 0 DEGREE
C.G.
SERVO TRAY
CUT OUT ON 1/16" PLY DOUBLER ONLY
CUT SLOT FOR WING INSTALLATION
1/8" SHEET BALSA FUEL COMPARTMENT
VECO 2-3/4" SPINNER
CUT SLOT FOR WING INSTALLATION
3/8" x 1/2" BALSA STRIP DOUBLER
ROYAL NOSE GEAR
SOFT BALSA BLOCK HOLLOWED
F3
F4
F5
F3 3/16" BALSA
F4 3/16" BALSA
F5 3/16" BALSA
F1 1/8" PLY
F1A MOTOR MOUNT SPACER 3/4" SOFT MAPLE
2-3/4" HARD WHEEL
3" HARD WHEELS
LG2 3/16" PLY


3/16" BALSA RIB
FLAPS OPTIONAL
ONE INCH DIHEDRAL EACH WING TIP
NOTE: ENTIRE WING SHEETED WITH 3/32" BALSA - FOLLOWED WITH 2 BRUSHED ON COATS SIG EPOXY ON ENTIRE WING. USE SOLDERING ACID BRUSH TO APPLY EPOXY.
STALL PLATE
3/32" SHEET BALSA
1/4" SHEET BALSA
NOTE: ELEVATOR THROW 1/8" UP - 1/8" DOWN
TOP VIEW
3/16" PIANO WIRE MAIN GEAR
3/16" PLY
NOTE: ELEVATOR-RUDDER- TAIL SKID MAKE FLAT ROUNDING OFF LEADING & TRAILING EDGE ONLY
1/4" SHEET BALSA
7/8" SIG LEADING EDGE
3/32" SHEET BALSA
1/8" SHEET BALSA STRIP
3/16" PLY BRACE
WING CROSS SECTION A-A
PLANK HATCH TOP & BOTTOM FUSELAGE WITH 3/32" X 1/4" BALSA STRIPS
FUSELAGE TOP VIEW LESS HATCH
NOTE: RUDDER THROW 20° RIGHT & LEFT
F-7 1/4" PLY
1/16" PLY DOUBLER
F-2 1/4" PLY
1/16" PLY DOUBLER
3/16" SHEET BALSA
3/8" X 1/2" BALSA STRIPS
FUSELAGE SIDES 3/16" SHEET BALSA
1/16" PLY DOUBLER
SCRAP FILL IN
ELEVATOR CUT OUT
STAB 0 DEGREE
EXHAUST NOZZLE RING PLASTIC CUP
TAIL SKID 1/4" PLYWOOD
3/32" X 1/4" BALSA STRIP PLANKING
TOP FLITE AILERON CONTROL HORNS & FITTINGS
3/16" SHEET BALSA SANDED DOWN
3/32" X 1/4" PLANKING TOP & BOTTOM
REAR VIEW
3/16" PIANO WIRE MAIN GEAR
F-8 3/16" BALSA
F-6 3/16" BALSA
F-9 1/8" BALSA
F-10 1/8" BALSA
F-11 3/16" BALSA
PHANTOM
DESIGNED & DRAWN BY
CARL WITTE
INKED BY
GERARDO FLORES
0 1 2 3 4 5 6
393

PHANTOM

(continued from page 36)

14. Epoxy rudder in place - add hinge, rudder, and control horns.
15. Install servo board and hook up Ny-Rods (or pushrods to rudder and elevator).
16. If using flaps, install them now - see plans for flap torque rod details - hinge flaps on bottom.
17. Complete aileron torque rods. Complete ailerons and hinge aileron on center.
18. Hook Ny-Rod to steerable nose gear.
19. Align Tatone mount using washers.
20. Bolt and epoxy motor mounts F1A spacer and F2 together.
21. Install engine in place.
22. Tack glue balsa scraps to F1 - drill hole in center.
23. Use prop nut and screw to motor, this will align for cowl construction.
24. Check for proper clearance between F1 and prop and spinner assembly.
25. Epoxy 1/4" balsa sheets and soft balsa blocks in place.
26. Carve and sand cowl to shape.
27. Install throttle Ny-Rod and fuel lines.
28. Add remaining forms and plank top and bottom fuselage with 1/4" x 3/32" balsa strips - sand to shape with sanding block.
29. Assemble hatch using 1/4" x 4" balsa sheet floor.
30. Glue H1, H2 and H3 in place. Plank with 1/4" x 3/32" balsa strips.
31. Drill holes for nylon screws for hold down.
32. Complete any miscellaneous details, then brush 2 coats of Sig epoxy on the fuselage.

Wing Tips

1. Glue 3/32" balsa sheet No. 1 and No. 2 together - lay directly over plans and epoxy W3 and W4 in place. Tilt W3 slightly for the 1 inch dihedral.
2. Epoxy top sheets No. 1 and No. 2 in place.
3. After all has cured, epoxy sheets No. 3 top and bottom in place.
4. Sand, fill in large holes, and apply 2 coats epoxy.
5. Epoxy stall plate in place, check for 1° washout.
6. Epoxy wingtip to stall plate, check for 1° washout and 1 inch dihedral.

Finishing

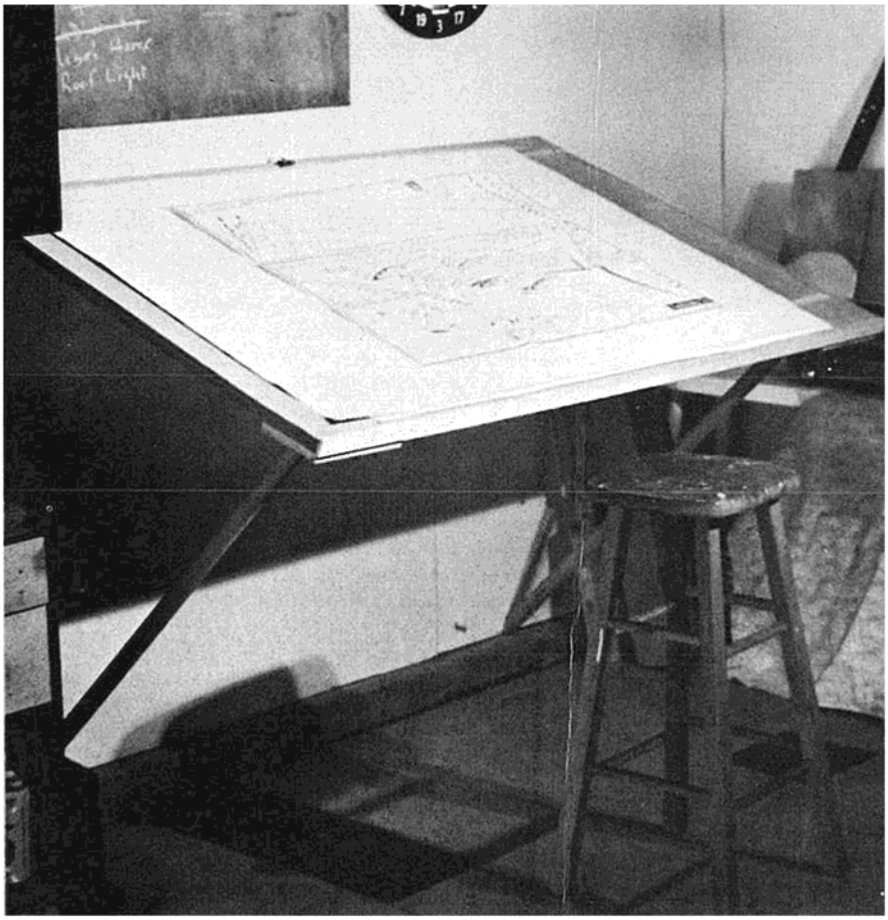
1. Check plane carefully for thin epoxy spots, nicks, etc. Fill in and sand.
2. Since entire plane has 2 coats of epoxy, you are ready to finish now.
3. I finished mine with 2 coats HobbyPoxy white. The first coat is brushed and the second coat sprayed on, then trimmed with Aero Gloss Black and Aero Gloss Dayglow, red and orange mixed.

FLYING

Now that you have your plane beautifully finished and trimmed, you're ready for flying. Or are you? Before going to the field, double check everything, particularly the C.G. and the control linkage for any binds.

Now that you are completely satisfied, find the best pilot around to test fly it for you. He will be much more relaxed and able to respond without as much pressure as you, the builder. Flight characteristics are about the same as any hot multi. Let the ship gather sufficient speed, then ease back on the stick; she should climb in a slight left hand turn. Trim out to straight level flight - steady isn't it? I suggest you don't try the flaps until you are familiar with the plane. Don't use flaps on a gusty day as you will want to land much faster than on a calmer day. Be prepared to use almost full down trim with flaps. With flaps down and trimmed out you will notice a definite slow speed flight improvement. Practice landings using a long approach, since you can line up much better as well as slowing the Phantom down. As you practice, keep coming in slower with a nose high attitude, and soon you will be dropping it in perfectly every time.

The ship will land much slower than you think. However, it will stall eventually, so practice stalls with some altitude. My Phantom uses an Orbit 6-12SS with Enya 60 for power. I have about 100 flights now without a major mishap; this is a good recommendation for equipment and plane. Good luck and good flying. ●



YOU CAN BUILD A DRAWING TABLE

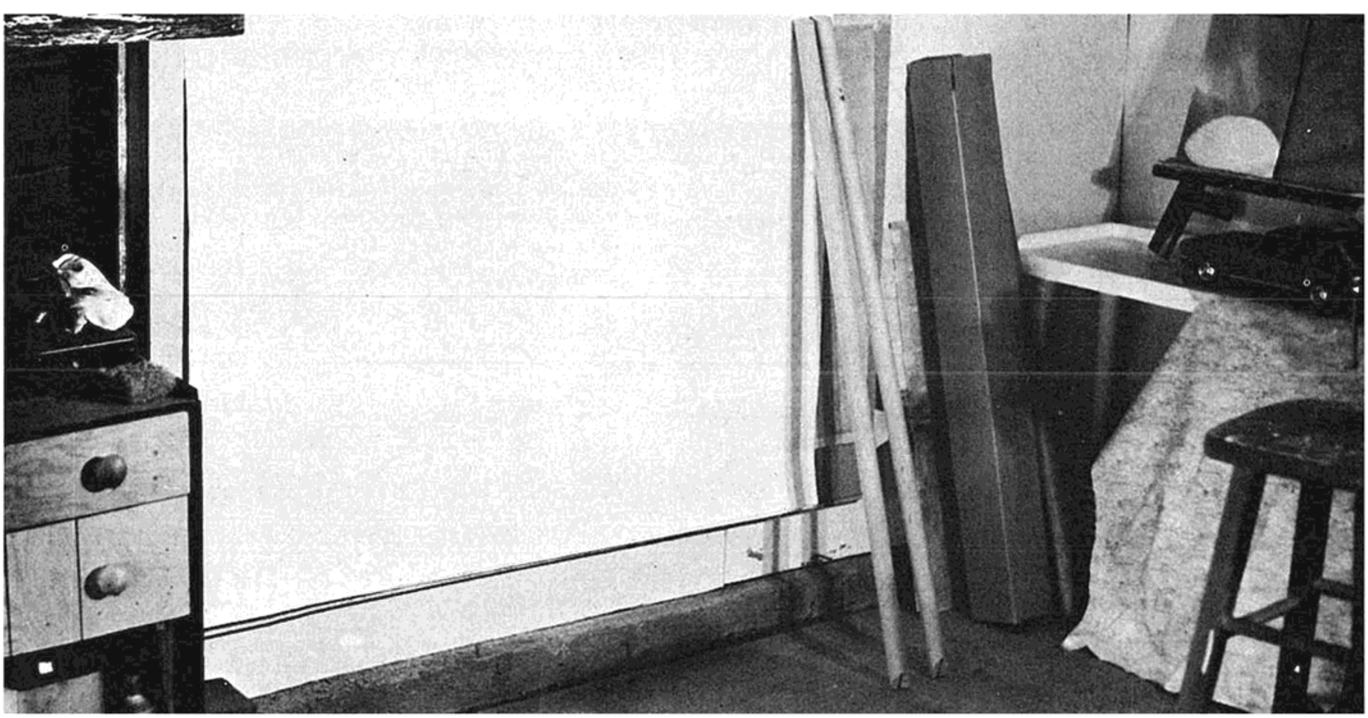
By J. W. HEADLEY

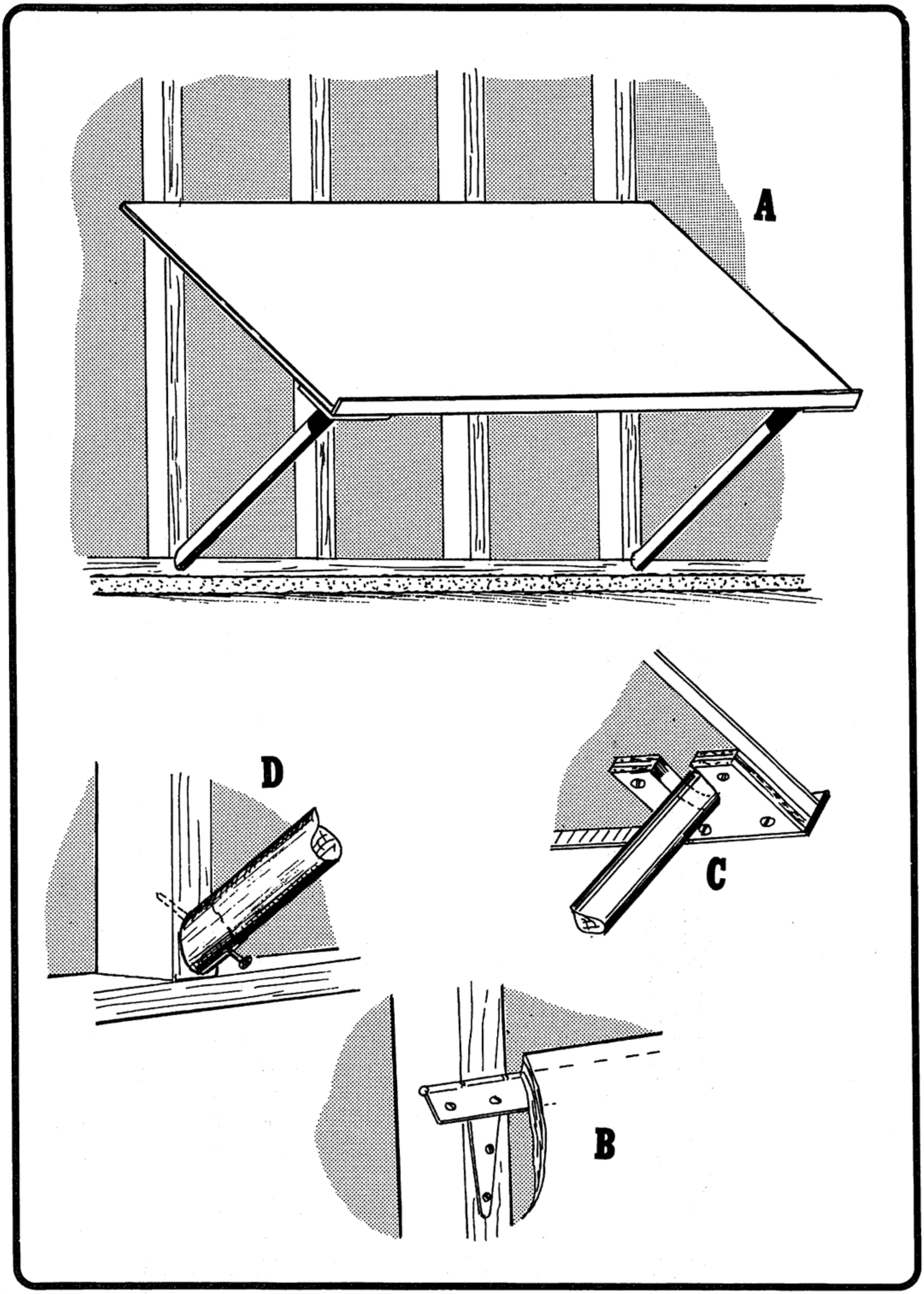
After many years of drawing plans on the kitchen table, the floor, the workbench, and the walls, we finally broke down and built a real live drawing board! As we couldn't find the space for a "drawing office" to go with it, we thought for a while, and then realized that by hinging the board to the garage wall, it would take up very little space when not in use.

Construction is quite simple. Our board, sketch A, was constructed from ¾" plywood, 40" tall by 60" wide (slightly wider than 4 stud spacings), and covered with a sheet of masonite. Nail these together along the top edge, only, so that the masonite will always remain flat. Attach to the garage wall studs with 4" Tee hinges, as per sketch B.

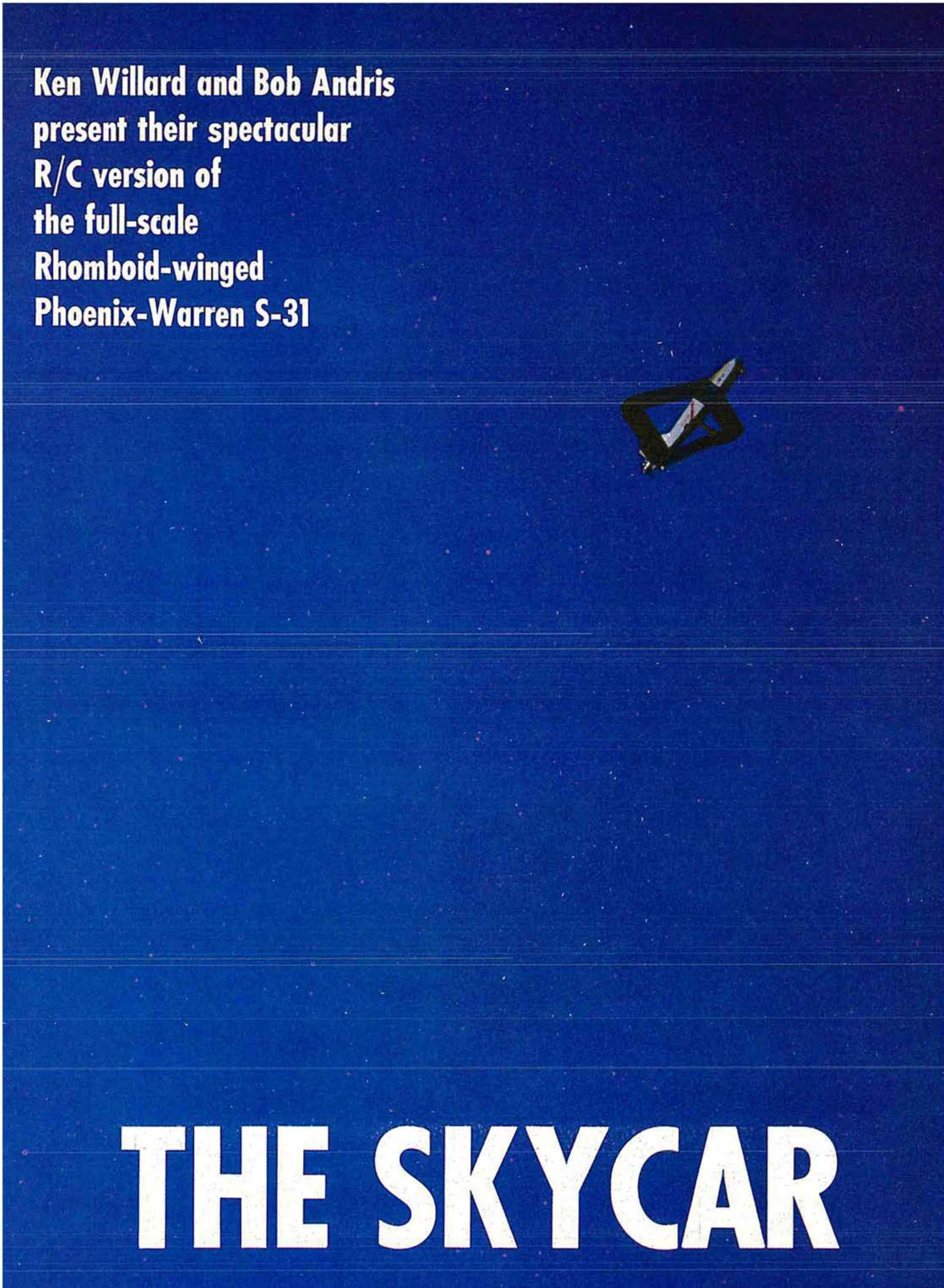
Adjust the height and slope of the board for maximum convenience. (Ours was about 4' from the ground, and the slope is around 30°). A strip of 1½" x ½" wood nailed across the bottom will keep your pencils from falling off. Two 1¼" dowels are used to prop up the board. These fit into 'U' shaped slots, cut into scrap pieces of ¾" ply, then glued and screwed under the board (sketch C). At the wall end they are slotted to fit over two 6" nails partially driven into the bottom of the stud. (Sketch D.) Chamfer the ends of the dowel to suit. Remove the dowels, and the board folds to the wall.

The total cost of this project should be less than $10.00. ●




A
D
C
B

Ken Willard and Bob Andris present their spectacular R/C version of the full-scale Rhomboid-winged Phoenix-Warren S-31



THE SKYCAR

Sometime in 1970, if present plans materialize, a "new" sport airplane will be test flown in England. Known now as the Phoenix-Warren S31, it is a development of a design first conceived by Norman Hall-Warren in 1926! The wing layout was patented by him in 1937, and tests have been made intermittently with free flight and wind tunnel models ever since.

The original concept was for a cabin type plane, with the engine in the rear, which was relatively easy to balance because of the shape of the wing and the location of the Center of Gravity.

You can take your pick of the ways to describe the Warren-Young wing configuration – call it a Rhomboid wing, or a tandem wing with sweptback forward wing and swept-forward rear wing – or a swept back wing with a stab that sweeps forward and meets the wing tip. No matter what you call it, you have to admit that it IS different.

My friend Bob Andris, while searching for an unusual design for RCM's design contest about a year or so ago, picked this design. However, he became embroiled in other projects and let it drop for a while. I became interested and began to rekindle Bob's interest about five months ago, and together we decided to build a radio controlled model of the Skycar.

Bob corresponded with Norman Hall-Warren, who replied and gave us all the specifications necessary to build the model, including permission to publish the design if we found it successful.

So we set about it. Bob built the wing, and I designed a fuselage which would accommodate the radio up front and the engine and fuel tank in the rear. Before getting it underway, though, I built a small glider and experimented with fin size, C.G. location, and developed what appeared to be the best combination.

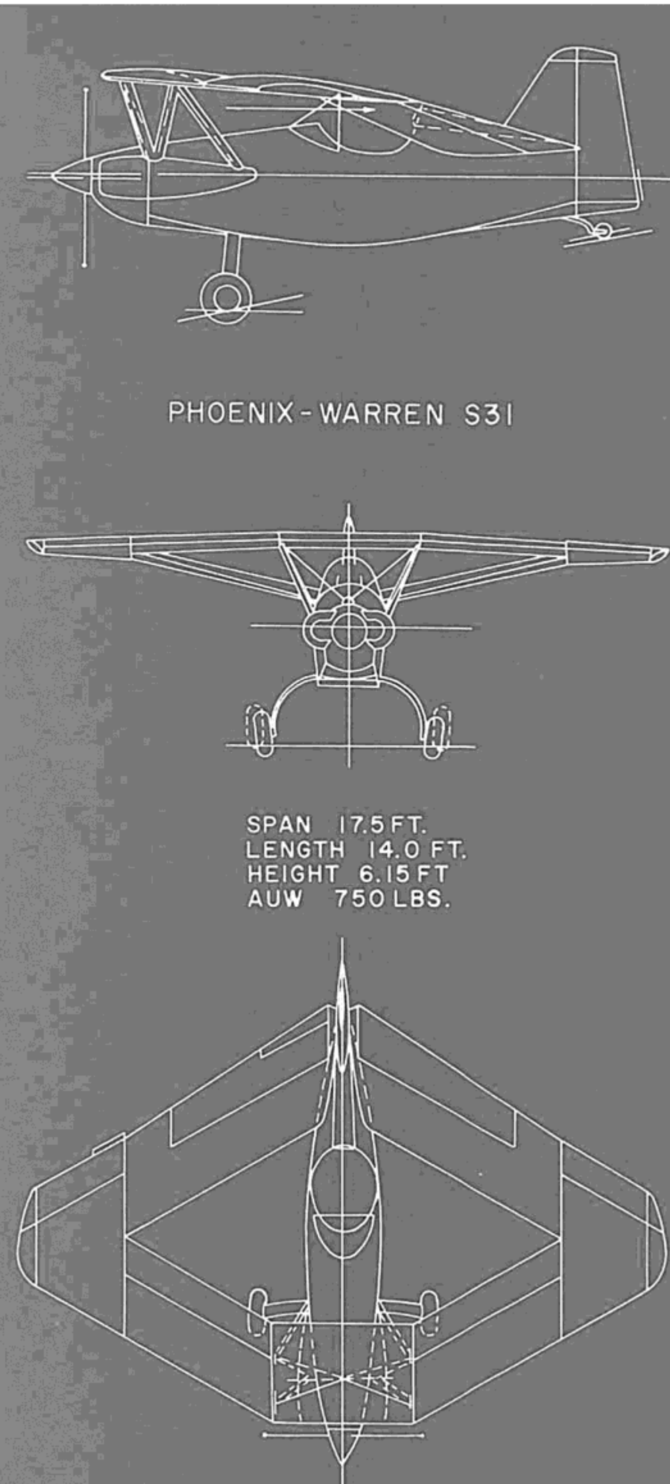
Some of the claims which the inventor of the design makes are that it won't stall, won't spin, and has great stability due to the 'scavenging' effect of the closed wingtip, where the spanwise flow outward on the forward wing is counteracted by the inward flow on the rear wing. It certainly promised to be a very interesting project.

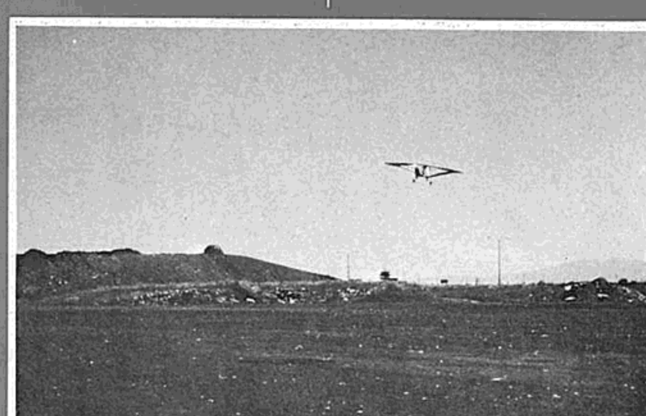
Building the fuselage was a very straightforward job, requiring very little ingenuity, but the wing is **something else!** The twist in the rear wing requires that you make a sort of jig to block the tips so they sweep up to meet the forward wing, and the centersection has to be blocked up at the trailing edge so that you get the six degrees differential to the forward wing incidence. It takes some doing, and you have to be careful that both rear wings have the same twist from root to tip. The photos show how the setup looks.

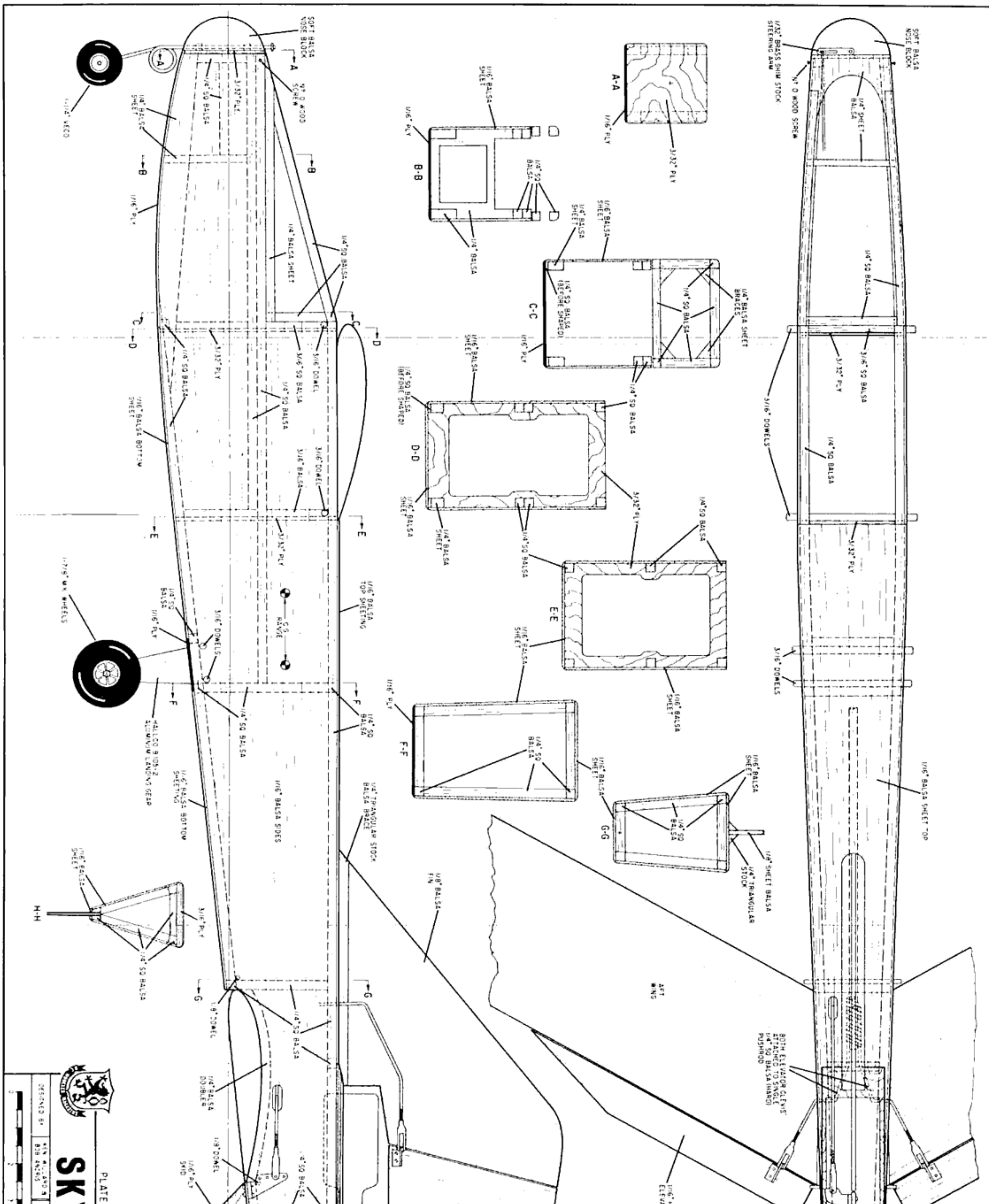
No detailed radio installation is shown on the plans, since it will depend on what type of equipment you have. In our case, we used the Kraft plastic mounting tray, which made a very simple and accessible installation. Note how the forward hatch is hinged so that it swings up for access to the switch which is mounted integrally with the servos on the tray.

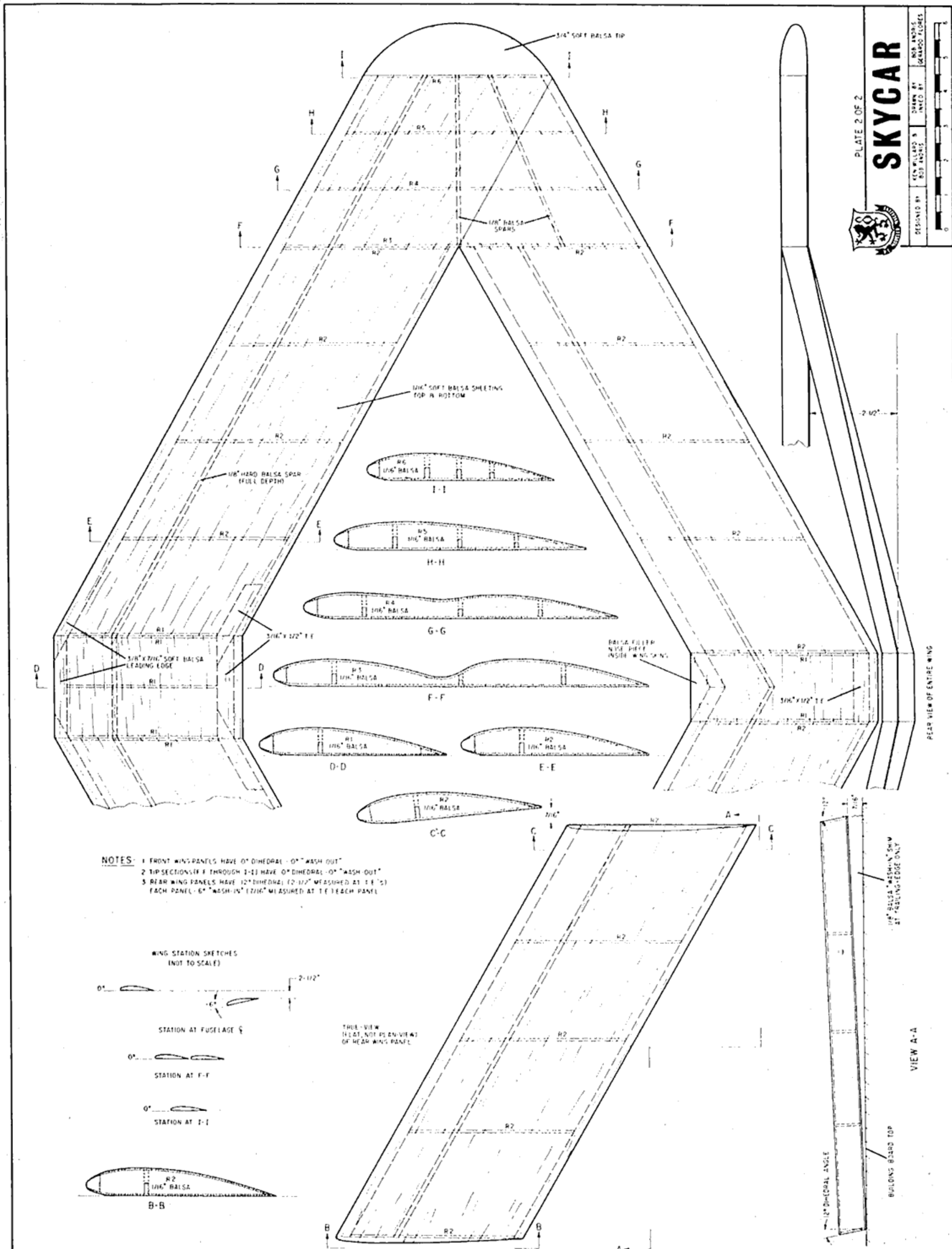
The nose gear was a little tricky, until I found an old Babcock escapement rudder yoke which I soldered to the top of the nose gear wire to use as a steering arm. I found that it worked perfectly, but if you don't have one, you can make an arm, or use one of the commercially available ones. However, none of the commercially available nose gears were of the right size, so I bent my own, using Jim Sunday's handy dandy wire bender.

The plans show the rest of the construction in sufficient detail for the average builder, and frankly, the Skycar is not intended for building by a beginner - even though the flying qualities are amazingly gentle.






SKYCAR
PLATE 1 OF 2


SKYCAR
PLATE 2 OF 2
DESIGNED BY KEN WILLARD & BOB ANDRIS
DRAWN BY BOB ANDRIS
INKED BY GERARDO FLORES
402
3/4" SOFT BALSA TIP
1/8" BALSA SPARS
1/16" SOFT BALSA SHEETING TOP & BOTTOM
1/8" HARD BALSA SPAR (FULL DEPTH)
3/16" X 1/2" T.E.
3/8" X 7/16" SOFT BALSA LEADING EDGE
BALSA FILLER NOSE PIECE INSIDE WING SKINS
REAR VIEW OF ENTIRE WING
2-1/2"
I-I
H-H
G-G
F-F
D-D
E-E
C-C
B-B
NOTES: 1 FRONT WING PANELS HAVE 0° DIHEDRAL - 0° "WASH OUT"
2 TIP SECTIONS (F-F THROUGH I-I) HAVE 0° DIHEDRAL - 0° "WASH-OUT"
3 REAR WING PANELS HAVE 12° DIHEDRAL (2-1/2" MEASURED AT T.E.'S) EACH PANEL - 6° "WASH-IN" (7/16" MEASURED AT T.E.) EACH PANEL
WING STATION SKETCHES (NOT TO SCALE)
STATION AT FUSELAGE ℄
STATION AT F-F
STATION AT I-I
TRUE VIEW (FLAT, NOT PLAN VIEW) OF REAR WING PANEL
1/8" BALSA "WASH-IN" SHIM AT TRAILING EDGE ONLY
12° DIHEDRAL ANGLE
BUILDING BOARD TOP
VIEW A-A

Perhaps the best way to describe the flying qualities is to repeat here the flight report which I forwarded to Norman Hall-Warren at the conclusion of the flight tests. Here's the letter:

Mr. Norman Hall-Warren, Esq.
Sea Cottage
Torcross
Kingsbridge
S. Devon, England

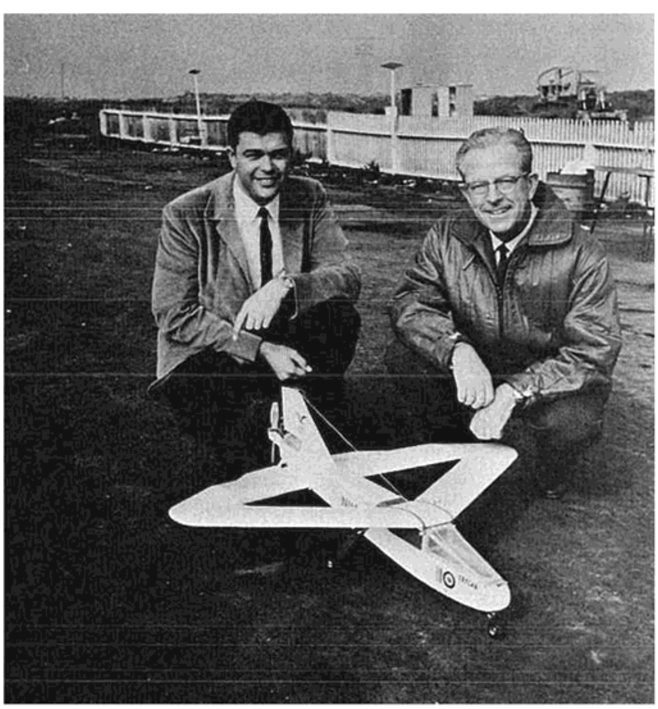
Dear Mr. Hall-Warren:

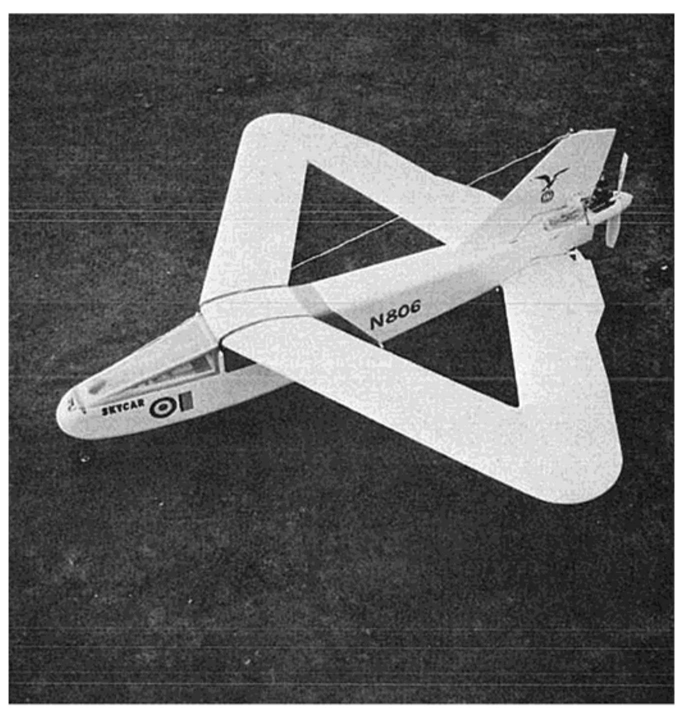
Some little time ago, in 1968, my friend Bob Andris corresponded with you concerning the Warren-Young Skycar. He had planned to build it as a radio controlled model and enter it in R/C Modeler Magazine's design contest. You were kind enough to grant him permission to publish the design, and requested that the results of the flight tests be made known to you when they were completed.

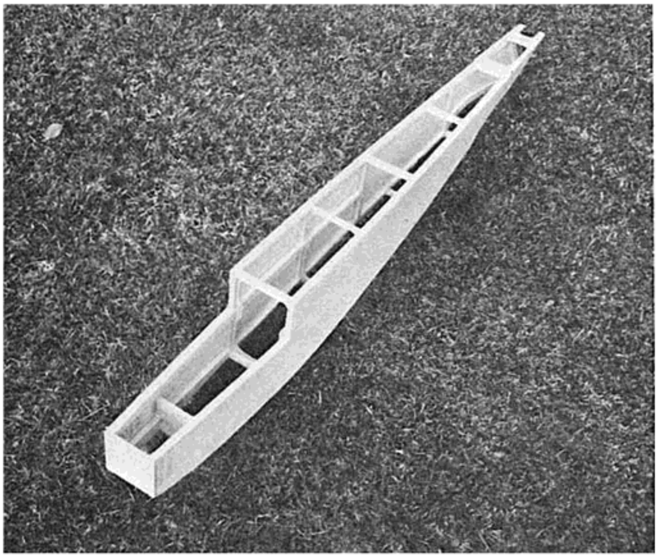
As it so happened, Bob became involved in some other projects, and the design contest went on without his entry. However, he had told me about it, and also gave me copies of the articles in the various British publications, and the typewritten specifications which you had sent to him.

After reading them over, I was greatly intrigued, and asked Bob if he would mind if I undertook the construction of the model. Well, the more I talked with him about it, the more I rekindled his interest. The upshot of it all was that we decided to build it together; he'd build the wing, and I would design and build the fuselage. It would have to be somewhat different from your projected full scale design – with a longer nose in order to get the radio weight well forward and balance the weight of the engine and tank which would be located in the tail.

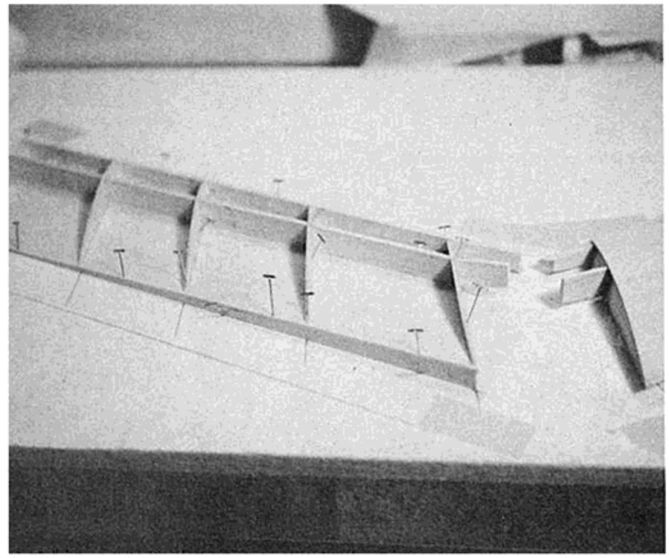
However, in the design of the



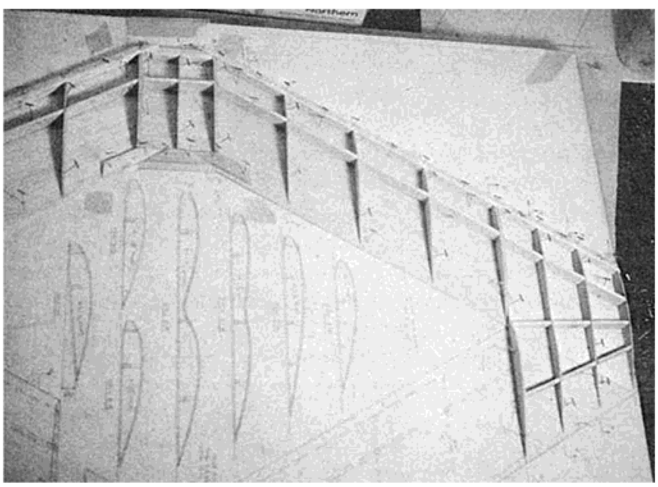




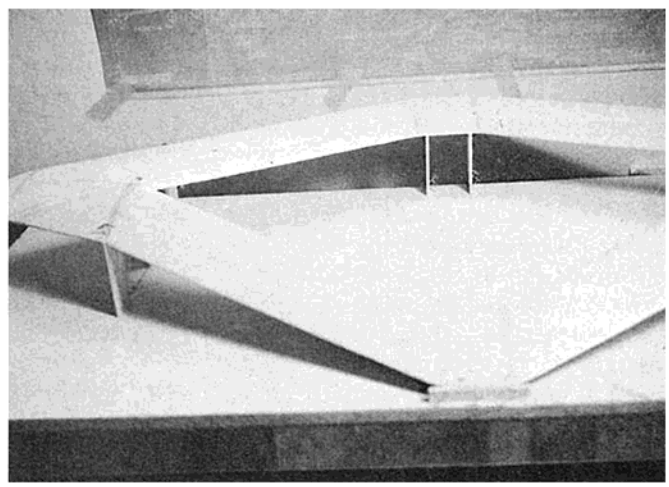
The basic fuselage construction is quite straightforward . . .



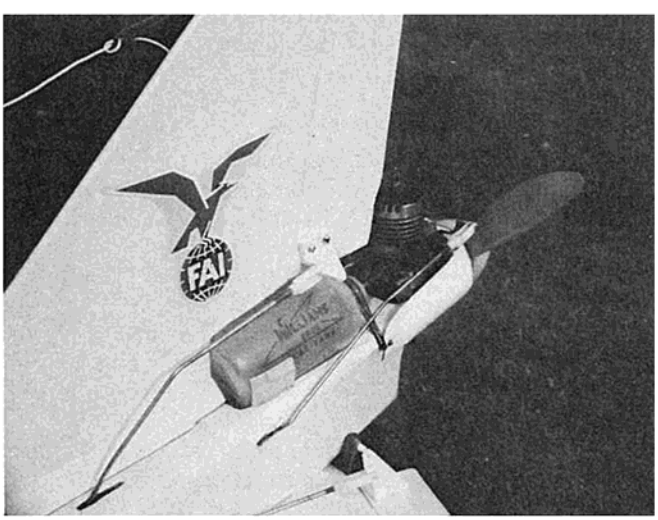
. . . but not so for the "wing"! Photo shows the first sections being constructed.



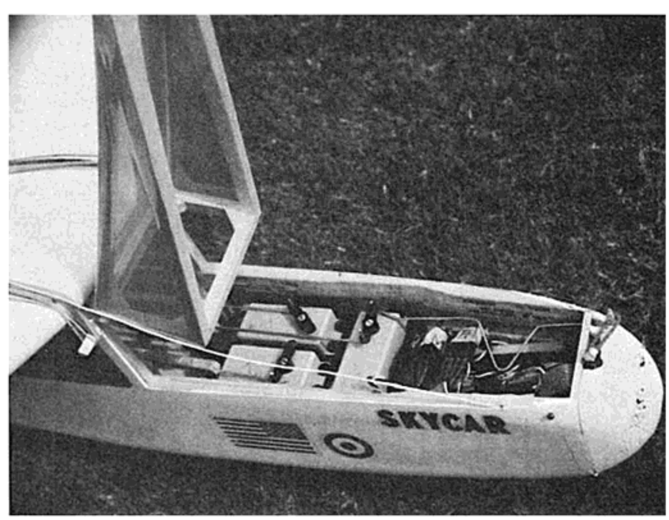
Overall "plan view" of the Rhomboid type wing that characterizes the Skycar.



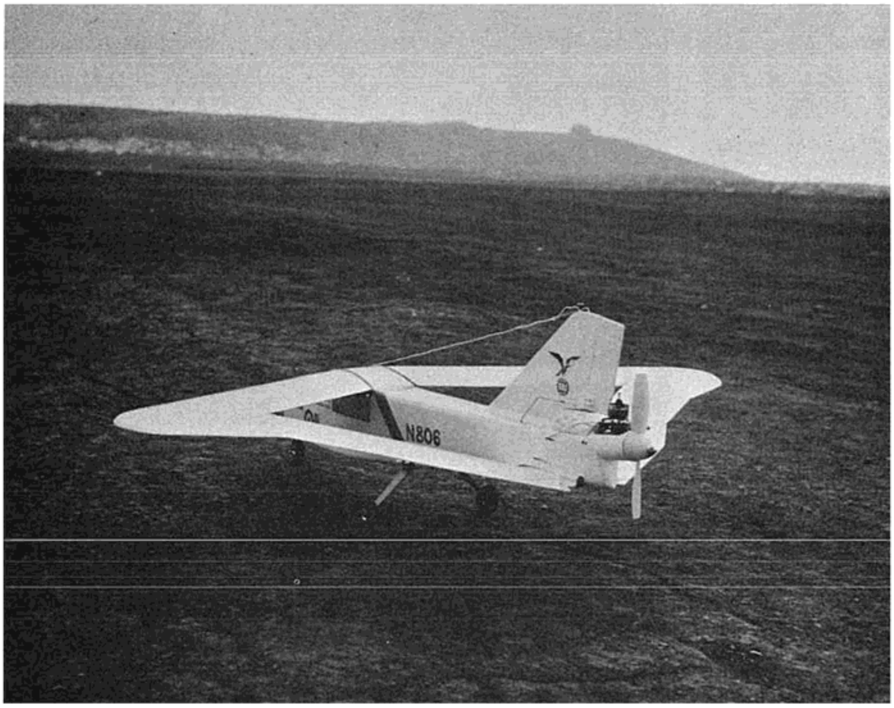
The sheeted wing, jigged to hold the unusual shape.



Aft section of Skycar showing Max .10, fuel tank and rudder, elevator, and throttle linkages.



Radio installation in forward section of model. Note "V" bend in nosegear linkage to protect servo.



isosceles wing, we followed your layout specification very closely. The wing section is an NACA 4415, which is practically flat bottomed, and the sweepback of the forward wing together with the forward sweep of the rear wing is exactly in accordance with your drawings. Also, the forward wing has no dihedral, while the rear wing has the dihedral required to bring the tip up to meet the tip of the forward wing, since the root of the aft wing is below the root of the forward wing per your specifications.

We also maintained the angular settings wherein the root section of the aft wing is at an angle of 6 degrees less than the root of the forward wing – with the aft wing washing in toward the tip until it has the same angle as the forward wing.

We did make one change. You show the wing (forward) as having 7 degrees of incidence, with the aft wing at 1 degree at the root and washing in to 7 degrees at the tip to come into alignment with the tip of the forward wing. The net result, of course, is 6 degrees of decalage at the root, zero decalage at the tips, yielding, for all practical purposes, an average of 3 degrees of decalage - disregarding the spanwise flow components of which you speak in your discussions of the arrangement.

So, although we kept the angular setting of the fore and aft wings exactly as you specified, we decided that we would set the forward wing with the flat bottom right in line with the anticipated line of flight, which would give the wing an effective angle of incidence of about 2½ degrees, and thus the root section of the aft wing would then have an angle of attack of –3½ degrees. These angles are in relation to the thrust line of the engine which was considered to be zero degrees. Our reason for doing this was that you had indicated that your free flight models, under power, tended to climb rapidly, and the more power that was applied, the steeper the climb, with the model going up in a series of gentle, oscillating swoops that, in a normal configuration, would have resulted in a series of stalls. In effect, then, we wound up with a thrust angle 4½ degrees lower than you had, with respect to the wing; in other words, comparatively speaking, we had some "downthrust" compared to your setting.

The design of the fuselage required a longer nose than your design, in order to get the weight distribution without the necessity of ballasting the nose. This longer nose put quite a bit of side area forward of the center of gravity, so the fin was enlarged to offset it. In order to determine how large the fin should be, I made a small glider model and experimented with various sizes, along with various locations of the center of gravity, until the right combination showed up. It is interesting to note that with too small a fin, the model would oscillate to one side, then to the other, but then would seem to glide almost broadside, without returning from the yawed condition, until it fell to the ground.

For simplicity, we had only rudder, elevator, and motor control. Also, as you can see from the photographs, the elevators are at the trailing edge of the aft wing, and are added surfaces rather than cutouts in the wing contour itself. Although it would be interesting to have a model with all the controls which you envision – rudder, elevators, flaps, and ailerons – we were really more interested in the basic aerodynamic characteristics of the layout.

The model has a wingspan of 38½ inches and is 37½ inches long. Chord of the wings is 5.4 inches. All up weight is 2½ pounds. Control is fully proportional, and the power is an O.S. Max .10 glow engine.

Center of gravity of the model is very slightly forward of the position shown on the drawings which you sent. I felt that this would be best from the standpoint of conservatism, and the glide test had already shown that the configuration is quite stable through a considerable range of C.G. movement. Also, at the outset of a flight, the gas tank is full and moves the C.G. back a bit anyway.

So much for the model design and its variations from your layout, which you will agree are very small. Now let's get on to the more interesting and exciting part – the flight tests.

To say I was nervous on the first flight is putting it mildly. Yet, as events turned out, my nervousness was completely unwarranted. Takeoff, climbout, and leveling off were absolutely no different than with a conventional design. For the first flights, I had the controls set at minimum travel, but as I gained confidence I moved the control rod linkages to the inner holes on the control horns so that maximum control surface throw could be achieved.

In normal flight, the Skycar controls just like any other model, with one exception. As you noted in one of your articles, down elevator is "destabilizing" – it seems to be much more effective than up elevator for the same amount of travel. But, once you are aware of it, it is not dangerous. In fact, it lead to something which you may find hard to believe – but it's true. I'll get to it in a minute.

After I became thoroughly familiar with the Skycar's response to the controls, I decided to try some of the usual maneuvers before I began testing it for some of the characteristics which you had claimed it should have – no spin, no stall, full control at high *angles of attack, and steep descent at high angles of attack under full control.*

First I tried a loop: Nothing to it; it looped like every other plane. Next, a roll; the first roll was pretty hairy, because I fed in too much down elevator as the model rolled past the vertical bank, but after a couple of practice rolls I became quite proficient. In fact, to most observers it appeared as though the model had ailerons, the rolls were so true. It rolled in either direction without any problem other than the necessity to be careful about feeding in the down elevator.

Next, inverted flight. This was rather difficult, since every force factor was against any stability in the inverted position, yet so long as care was taken not to let the nose come up too high in the inverted position, it could be flown around inverted. If the nose got up too high, the model would suddenly flip into upright position, and if you didn't correct immediately, the down elevator – which, in the inverted position made the nose go up – would make the model go into a steep dive. But control was positive, and recovery immediate.

Next, an outside loop. So long as ample speed was maintained, the model would do an outside loop without any trouble; if the speed dropped off, however, the model would suddenly fall off as it tried to come up the back side of the outside loop, and for a moment would be out of control. As soon as the nose got down and speed was regained, though, control would quickly return.

This gave me an idea, but I decided to put it off until I had completed making tests of the type you had expressed most interest in having performed. Again, though, it had to do with the unusual effectiveness of the down elevator.

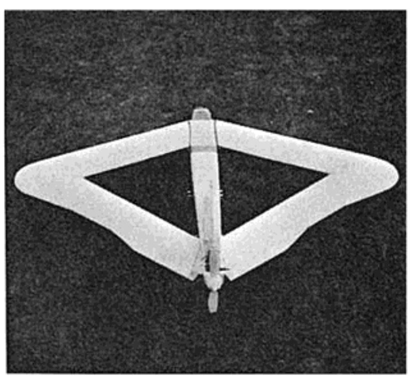
Now it was time to perform the tests of performance at high angles of attack.

First, with the engine at full power, I gradually pulled the nose up, up, and up, until I had full up elevator applied. Holding full up elevator, the model would climb, mush, then climb some more and mush, but never did it fall off on a wing, even though I made turns in both directions. It remained under control at all times. This confirmed your claim.

Second, I tried to spin the model. No matter what I tried, I could not get it to spin, no matter how steeply I put the nose up and applied full rudder just at the point when the model would start to mush.

Next, I tried the power descent at high angle of attack. With the power setting such that the model would descend even though full up elevator was applied, I let it sink to the ground. It was under full control at all times; however, I did note that on a couple of occasions, as it sank to the ground but in an unfavorable spot and I gave it power to go back up, momentarily, when full power was applied, the nose would drop, and then come back up. An interesting reaction, which I can't explain except that with the nose high attitude the engine thereby has an effective downthrust component, which momentarily overcomes the lift until the speed picks up.

Finally, I set the power at a speed which maintained the model at a constant altitude about thirty feet off the ground, with the elevators in the full up position, and did slow flight over the field. It "dragged the field" several times, under complete control in each instance. To land, all that was required was to drop the power and the model would sink to the ground in the nose high attitude.



That just about concluded the flight tests. Everything that you had claimed for the design seemed to be borne out by the performance of this model. But – one thing remained. I had saved this for the last, because I had no idea what might happen.

As I previously mentioned, I confirmed the "destabilizing" effect of the down elevator control. I also noted the momentary period of uncontrollability if, when doing an outside loop, speed was not maintained coming up the back side. So – although I had also confirmed your claim that the model would not spin – at least in a normal, upright spin – I wondered if it would spin inverted.

Since all of the tests were completed, and the model had served the purpose for which it was built, I decided to take a chance. After gaining plenty of altitude, I rolled the model over on its back, then gradually nosed it up inverted, and as it started to fall off, I applied full rudder in the same direction. The result was immediate – a tight, inverted spin. It was so fast that it startled me, and I neutralized the controls immediately. Just as immediately, the model stopped spinning, went into a dive from which recovery was normal.

So, interestingly enough, Mr. Hall-Warren, although the configuration will not spin right side up, it will spin inverted! But since the design was never intended for aerobatics in the first place, I do not consider this feature to be a drawback. It just proves what you said – down elevator, whether applied when the model is upright or inverted, is very 'destabilizing'. But recovery from this destabilizing force is fully as rapid as the displacement which results when the force is applied.

This series of tests of the Skycar was one of the most interesting projects in radio control that I have undertaken. As a by-product, the tremendous interest which the model evokes whenever I fly it is an added reward. I sincerely hope that you will be able to obtain financing for your projected full scale version, which I have every reason to believe will be very successful. Particularly, when you have the added features of flaps and ailerons, the slow speed characteristics should prove outstanding. Also, I doubt if you will have any need for some of the features which you mention, such as twin vertical surfaces, or separate horizontal stabilizer and elevators. The simpler the configuration, the easier and cheaper it will be to build, and in the configuration which I used, control is more than adequate. You'd have to see it to believe it.

We will be publishing the design in R/C Modeler Magazine in the near future, and as soon as the finished drawings are printed, I will send you a set for your files.

Considering the fact that you originated the concept in 1926, had it patented in 1937, and as late as last year were engaged in wind tunnel testing, I would say that the Skycar is a real modern 'oldtimer'. What is the saying? "The old is always new, and the new is always old."

And the Skycar is both.

Sincerely,
Ken Willard

YOU CAN BUILD AN

R/C FIELD BOX

By ED HENRY

(Reprinted from the McDonnell Radio Control Model Airplane Club 'Carrier Wave')

Most of us have flown RC for many years and have never had a field box specifically constructed for our usage. I spent some time researching field boxes for both size and shape as well as a study on what should be carried in them. The goal was to design an easily constructed field box that would take care of the requirements of the average RC flyer. After making notes and observations, here are my recommendations.

All wood parts should be cut on a power saw for accuracy and assembled in the order of the index numbers shown in the illustrations. Assemble the plywood with white glue and 1¼ inch finishing nails. After assembly, drive the nail heads below the surface of the wood with a nail punch, fill the holes with plastic wood, and sand. Fill the holes in the edges of the plywood with plastic wood and sand smooth.

Support block (7) and lid mount (8) are centered from the outside dimensions of the box. Lids (12) are attached to lid mount (8) with 6 each 1½ inch brass hinges (3 per lid). Door (13) is attached to door mount (6) with one continuous hinge. Excellent attachment hardware for lid and door hinges are 4-40 countersunk brass bolts with 4-40 model aircraft blind nuts. Lids (12) do not require latches. Door latch assembly (15) may be substituted with any standard external type latch. Remove all hardware, sand, and spray paint box, door, and lids with 5 coats of enamel. Sand between coats. Folding legs may be added to the box so that the door (13) can be used as a field work bench.

LIST OF PARTS

(1) Dividers (2 ea.) - 11 3/8 x 7½ x 3/8 plywood
(2) Floors (2 ea.) - 17 x 7½ x 3/8 plywood
(3) Ends (2 ea.) - 14½ x 7½ x 3/8 plywood
(4) Back - 17¾ x 14½ x 1/4 plywood
(5) Front Piece - 17¾ x 2¾ x 3/8 plywood
(6) Door Mount - 17¾ x 1 1/8 x 3/8 plywood
(7) Support Block - 4 5/8 x 2 3/8 x 3/4 maple (see Detail A)
(8) Lid Mount - 17¾ x 1 x 1/4 plywood
(9) Gussets (2 ea.) - 1/2 x 1/2 x 1 (glue in place)
(10) Plastic Folding Handle (see Detail A) (available Central Hardware)
(11) Shelf - 4¼ x 7½ x 1/4 plywood
(12) Lids (2 ea.) - 17¾ x 3 17/32 x 1/4 plywood
(13) Door - 17¾ x 10 9/16 x 3/8 plywood
(14) Door Support Chains (2 ea.) 10¾ length (4 ea. 3/8 inch attach screws)
(15) Door Latch Assembly (see Detail B)

Note: Use a good grade of unwarped plywood.

FIELD BOX EQUIPMENT

The following is a list of recommended articles to be carried in a RC field box. The list can be altered to fit the specific needs of each flyer. The equipment listed for Trouble and Limited Field Repair is intended for use during overnight trips away from home base or attending a contest. Also, certain items in the list may be carried as standard operating equipment.

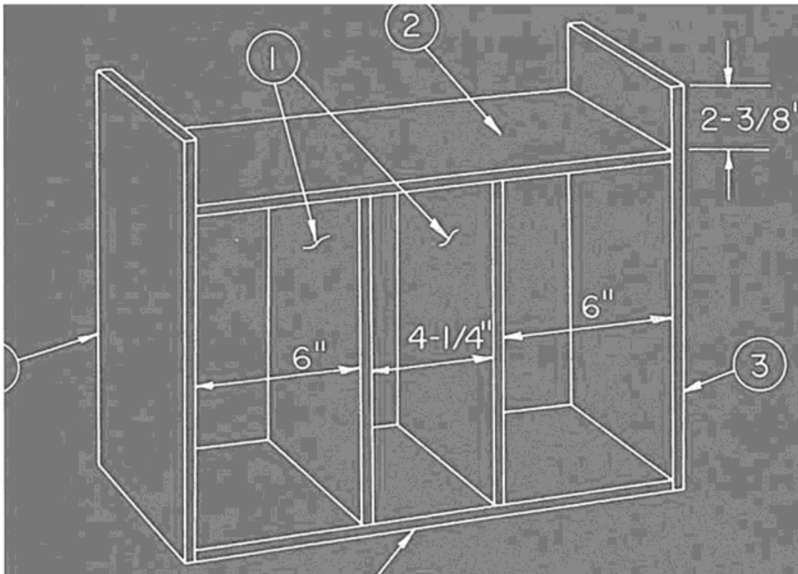
Standard Operating Equipment

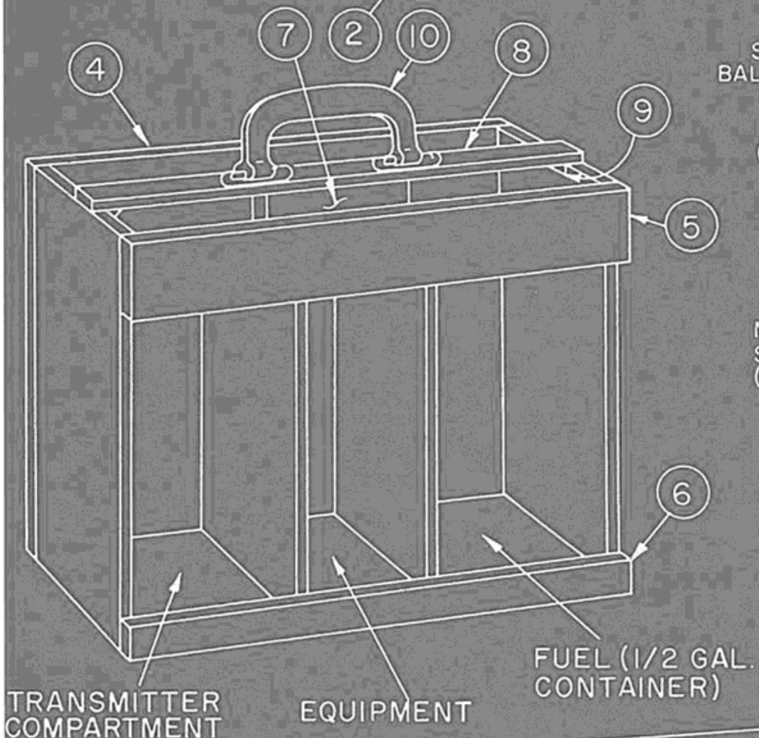
Transmitter
Transmitter Antenna
Starting Battery and Clip Lead
Fuel
Fuel Filling Equipment
Fuel Primer Squirt Bottle
Attachment Rubber Bands or Nylon Screws
Spare Props
Spare Prop Nuts
Prop Nut Wrench
Chicken Finger
Spare Glo Plugs
Glo Plug Wrench
Flight Log Book
Pencil
Spray Cleaner
Package of Handi-Wipes
Mosquito Repellent
Simple First Aid Kit
AMA Rule Book & Membership Card

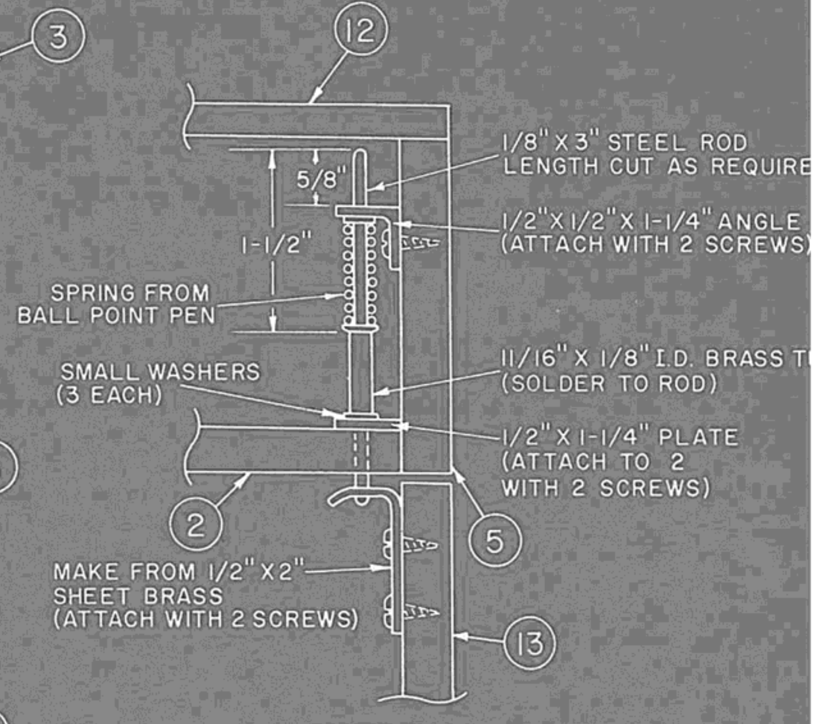
Trouble and Limited Field Repair Equipment

6 in. Standard Screwdriver
4 in. Standard Screwdriver
6 in. Phillips Screwdriver
6 in. Flat File
6 in. Rat Tail File
4 in. Crescent Wrench
Long Nose Pliers
Tweezers
Scissors
Small Awl
Small Ball Peen Hammer (2 oz.)
Yankee Screwdriver with Assorted Drill Bits (or eggbeater type)
12 Volt Soldering Iron
Solder
Assorted Size Insulated Wire
Assorted Size Solid Bare Wire
Plastic Electrical Tape
Double Sided Mounting Tape
Xacto Knife or Pocket Knife
Razor Blades
Field Strength Meter
Multimeter and Test Leads
Battery Charger
Spare Engine Gasket Set
Spare Fuel Filter
Spare Engine Mounting Bolts
Assorted Small Brass Tubing
Fuel Line Tubing
Assorted Linkage Hardware
Straight Pins
Spool of Button Thread
Assorted Small Washers
Assorted Small Sheet Metal Screws
Assorted Small Nuts and Bolts
Assorted Music Wire
Assorted Scrap Balsa
Assorted Scrap Plywood
Small Bottle White Glue
Small Bottle Contact Cement
Scrap Silk or MonoKote
Small Bottle Dope (Clear or Colored)
Dope Brush
Small Bottle Dope Thinner
Small Bottle Cleaning Alcohol
Sandpaper
Spare Hardware Peculiar to your Model

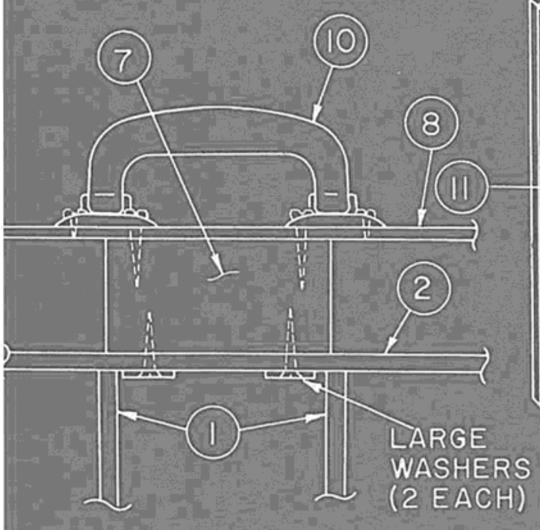
FOLLOW THIS STEP-BY-STEP, NUMBERED CONSTRUCTION SEQUENCE IN BUILDING A FIELD BOX DESIGNED TO MEET YOUR REQUIREMENTS.



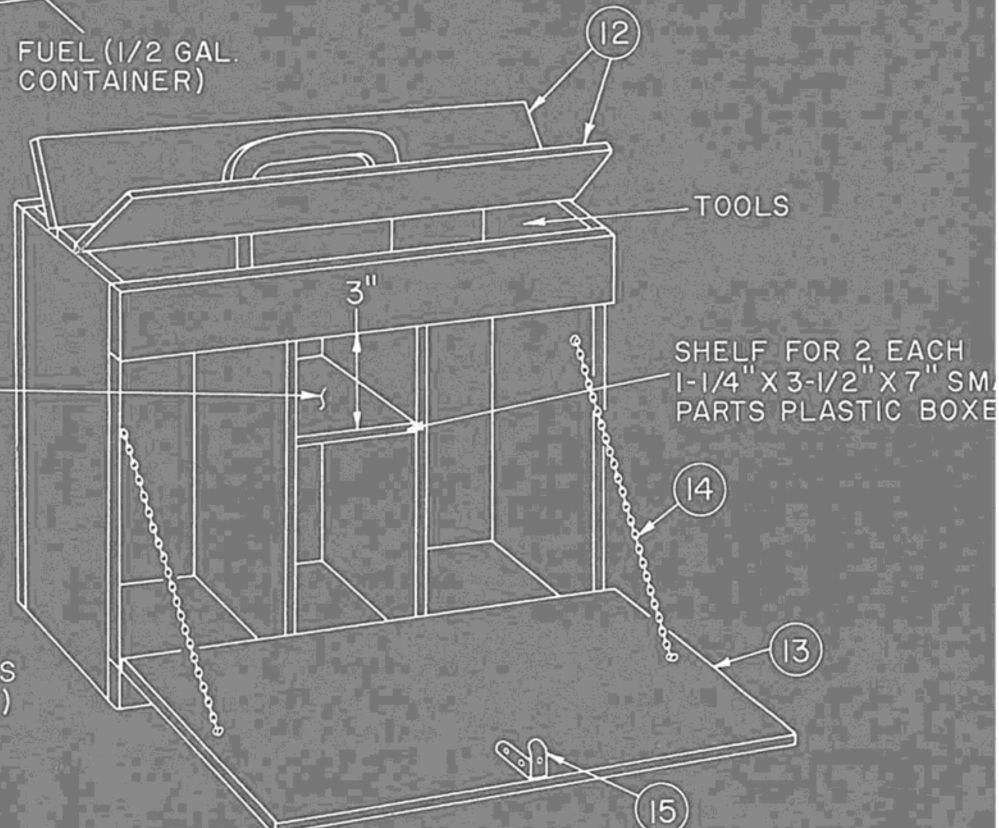




DETAIL B
DOOR LATCH ASSEMBLY



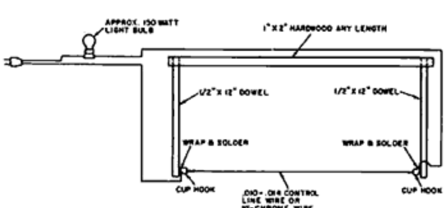
DETAIL A



FOR WHAT IT'S WORTH

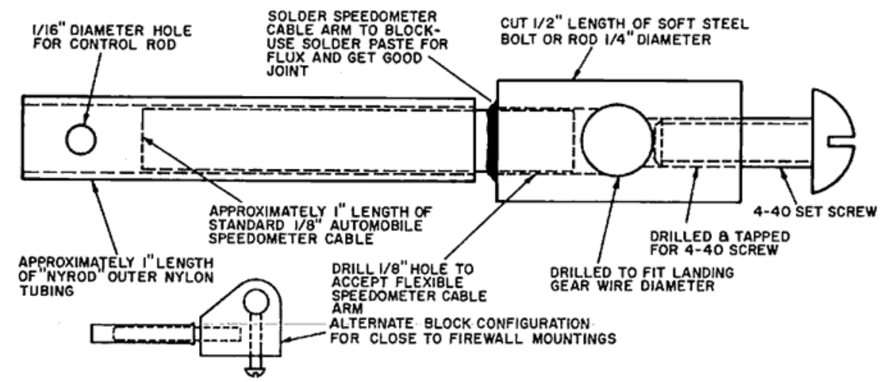
Howard Hupe, Mountain View, California, suggests using butyrate thinner to remove the excess adhesive that squeezes out along the seams on Super MonoKote, as well as that which adheres to the iron. The thinner will not hurt the MonoKote but should be used very sparingly, applied with a clean rag, and wiped dry immediately to avoid softening the adhesive on exposed edges. Do not wipe the iron with thinner until it has cooled sufficiently.

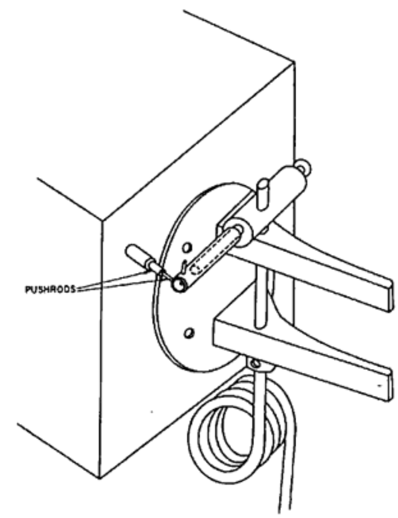
Desiring to cut his own foam wing cores, but not having access to a model train transformer or Nichrome wire, Bill Schultz of Postville, Iowa, used the method shown in the accompanying sketch. With this set-up you must match the light bulb (in series) to the diameter of the cutting wire. Plug it in and if the wire is too hot, replace with a smaller bulb. If the wire is too cool, use a larger bulb. In hooking up the control line wire, bow the dowels together since the wire expands when it is hot and will otherwise sag. The only difficulty encountered with this cutter is that control line wire will "burn off" after about four to six wings. With the bulb resistance you will not get a shock from the cutting wire but keep your hands off since the other end will be hot if the control line wire is removed or broken and the plug is in the outlet.



Wallace Hurley, 2753 Parkside Drive, Fremont, Calif., recommends the use of clear contact adhesive shelving paper for the protection of decals, particularly when used on scale aircraft. Simply cut the pattern about 1/2" larger than the decal and seal with a warm iron. The decal will then last the life of the plane.

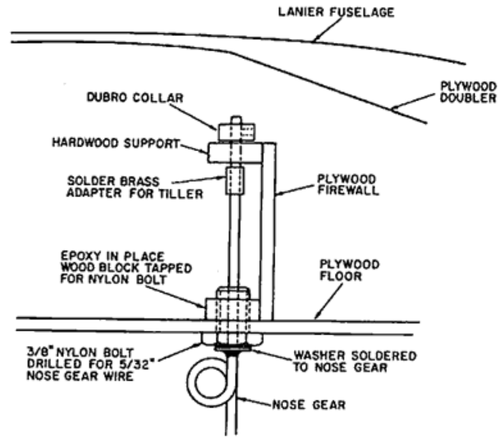
Garth Hess, 881 Emory Ct., Upland, Calif. 91786, uses the following method of linking a steerable nose wheel to the actuating NyRod or pushrod. There are several advantages to this method, including a natural slip joint between the outer NyRod tube and the inner speedometer cable allowing a linear pushrod motion. This prevents binding of the pushrod in a closely coupled system such as the one illustrated. The use of the speedometer cable results in a flexible coupling that provides adequate torque to the nose wheel shaft, yet hard landings or shocks will be absorbed and not change the nose wheel set screw adjustments or strip servo gears. Nose wheel adjustment can easily be accomplished by either readjustment of the set screw or slipping off the NyRod tube (easily done without any other disassembly) and adding or subtracting turns to the threaded NyRod pushrod. The complete link is constructed with readily available materials and requires only cutting, drilling, tapping, and soldering. 4-40 taps are available for approximately 60 cents.





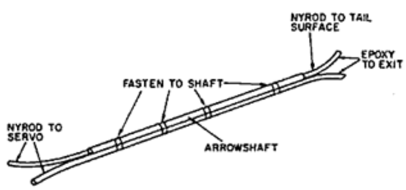
TYPICAL INSTALLATION
FIGURE 1

If you're having problems on hard landings with the set screw coming loose on your nose wheel steering arm, try this idea from Albert F. Niessner, Jr., R.D. No. 1, Box 398, Boalsburg, Pa. 16827. The R/C Craft non-slip nose gear steering arm can be used on Lanier and similar type fuselage installations where the brass anchor block cannot be easily installed because of the inaccessibility of the nose gear. The advantage of Al's method is that a nylon bearing is provided for the nose gear so that it will have better shock-absorbing qualities on those hard landings. A nylon bolt, typically 3/8" in diameter, is drilled through the center so that it fits the 5/32" nose gear wire. A wood block is drilled and tapped to accept the nylon bolt. The nose wheel hole in the fuselage is then enlarged so that the nylon bolt will fit as shown in the figure. The wood block is then epoxied in place. A flat washer is soldered to the nose gear for vertical positioning. The nylon bolt is put in place and the brass anchor block is then soldered in place. This unit is then fitted into the hole in the



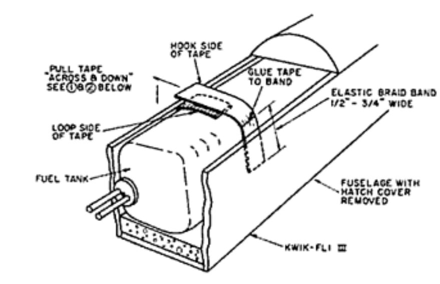
fuselage and the tiller arm put in place on the brass anchor block. The nylon bolt screws into the wood block and the DuBro collar is put in place on the top of the nose gear to hold the latter in position.

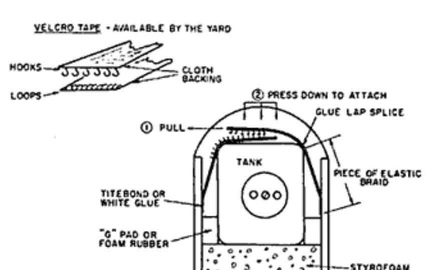
If you're encountering difficulties in installing pushrods in a glider which has a built-up glass fuselage, the rear section of which is very narrow, and you want to use NyRod, try this method by Carl B. Reynolds, 37980 Parkmont Drive, Fremont, Calif. 94536. One piece of arrow shaft, or a straight piece of dowel was used, to which were fastened two pieces of NyRod which were extended approximately three inches longer than the shaft. The NyRod was fastened with glass cloth, but any adhesive could be used, wrapping in at least four locations. The rear NyRod extension is then epoxied in place at the proper pushrod exit location. The front sections of NyRod are extended to what ever distance is required to reach the servo installation. In Carl's glider, the arrow shaft with NyRod's attached was glassed to the wing tongue for a very rigid installation. This method could be used on any model with very little weight increase.



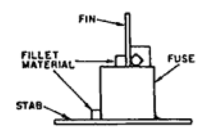
Have you ever had your motor mount holes enlarged so that the engine forever is vibrating loose. The 'Clanking Armor' suggests you take an old toothpaste tube and cut 1/8" strips about 1/2" longer than the screw hole is deep. Place in hole and replace engine with wood screws.

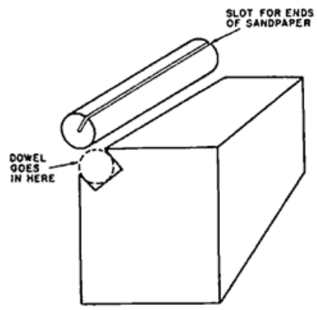
Here is a convenient way to hold down your fuel tank: Use Velcro tape with an elastic braid band glued on one end. Pull on the free end of the tape that has the elastic section on it to the desired tension. Lap the tape over the mating tape and press together firmly. Peel open like a Band-Aid to remove fuel tank and/or battery pack. Velcro tape will work for thousands of cycles and can be purchased at the sewing section of department stores. Idea submitted by John J. Haskin, 8019 S. 116th, Seattle, Washington.





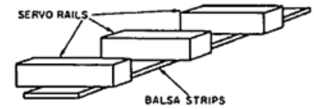
The next time you have to sand a tail fillet, take a piece of pine of the right size and cut a slot similar to the one shown in the illustration (it can also be round or a deep V). Slot a dowel (or a piece of rounded wood that fits your slot) for the ends of your sandpaper. Submitted by John Dillon, 8448 E. Elkhorn Avenue, Selma, Calif. 93662.

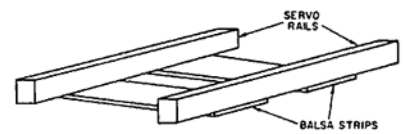


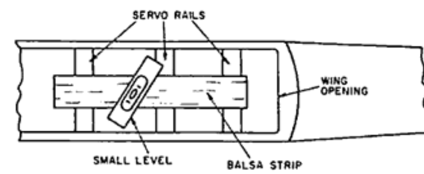


CHOOSE DIMENSIONS TO SUIT

Installing servo mounts in a fibreglass fuselage so that they line up squarely can be a time consuming problem. Here's a fast, accurate solution from Frank Morosky, 164 Dennison Road, Hoffman Estates, Illinois 60172. On rails for longitudinally mounted servos, take a scrap piece of balsa 1/8" or 1/4" thick by 1" wide and mark it for rail locations. After sizing a rail for fuselage fit, spot glue the top side of the rail to its location on the balsa strip. Next, apply adhesive to the rail ends, turn the unit over, and slip into the fuselage, making sure it's the correct location. Take a small level such as used for phonograph turntables and place it on top of the balsa strip. Use the level to make sure the rails are perpendicular to the fuselage sides. For rails on horizontally mounted servos, use two pieces of balsa about an inch apart. After the adhesive has dried, just pull the balsa strips from the rails.

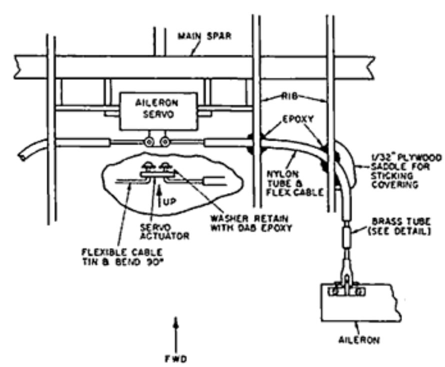


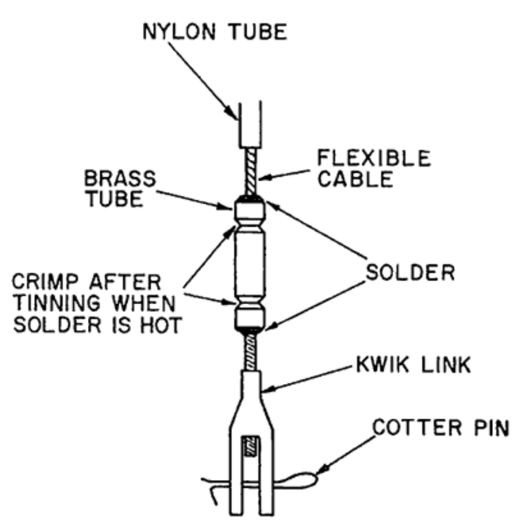




VIEW IN FUSELAGE

Joe Perez, editor of the 'Condenser,' 114 Ranch Valley Drive, San Antonio, Texas 78227, suggests this method of installing internal aileron linkages. This is one of the fastest and easiest methods and has been thoroughly flight tested.





DETAIL

SHOP & FIELD

PRODUCT NEWS

Products News Releases and/or Products for Evaluation should be addressed to . . .

PRODUCTS NEWS EDITOR, R/C Modeler Magazine, P.O. Box 487, Sierra Madre, Calif. 91024

Sterling Models, Sterling Building, Belfield Ave. & Wister Street, Philadelphia, Pa. 19144, sold its interest in Balsa Corporation, who manufactured the Command Master radio equipment, over two years ago, and since that time have had no connections whatsoever with the firm, or the Command Master equipment itself. This fact was published in all of the model magazines many months ago. Sterling has been made aware of, with increasing frequency, the difficulty that the owners of Command Master radio equipment are having in getting their sets serviced and/or repaired. Sterling Models has been in contact with Mr. Milton Miller regarding the repair situation and he advises that even though Balsa Corp. is now out of business, that he would eventually complete all repairs of the equipment he now has in his possession. Due to the extended delays in service, however, Sterling Models has requested the original designer of the Command Master if he would service and repair the equipment and he has advised that he would do so promptly. Therefore, all owners of Command Master radio equipment in need of service or repair should send it to: Dick Jansson, R/C Corp., 6 Pine St., Wellesley Hills, Mass. 02181. Sterling Models deeply regrets that the owners of Command Master equipment have experienced difficulty in this area, however, Balsa Corp. assured them that service and repair would be prompt, when that Company sold its interest in it. We hope that this will alleviate the problem that many of our readers have been having.

Micro Avionics, 530 S. Mountain Avenue, Ontario, Calif. 91762, announces that systems owners will be pleased to learn that three new service centers are now in business and eager to serve. Chuck Waas, Mr. Micro Avionics, announced that none other than Bill Northrop is running the show in the East; Ray Davis, in the South; and Tom Evans in Canada. Westerners will continue to be served from the factory in Ontario, California.

"We're really going all out to provide Quick Time service for our owners and fast deliveries of new systems," said Chuck. Each of the three QT Service Centers is staffed with factory trained personnel and stocked with spare parts and assemblies. New 1969 XL-IC systems are available from all Micro Avionics Service Centers.

Micro Avionics East: Bill Northrop, 56 Holly Lane, Newark, Delaware 19711. Micro Avionics South: Ray Davis, 4 Avondale Road, Avondale Estates, Georgia 30002. Micro Avionics Canada: Tom Evans, Tyg-Aire Enterprises, 13122 129th Street, Edmonton 44, Alberta, Canada.

The Harco Company, 290 Thompson Avenue, Oceanside, N.Y. 11572, has announced that it has two additional kits now in production. Noted for their Javelin Mark I Advanced Trainer, the two new kits are the Fury Mark II, and the full scale Waco Meteor. Both kits are complete with pre-cut and sanded parts, styrofoam wings, all balsa sheeting, hardware, landing gears, full size plans, and many extra parts that usually have to be purchased separately. The Fury, "the everything machine", is a high speed pattern ship engineered for the Class C Expert. Designed for the new AMA maneuvers or extremely high performance in pylon, this ship builds quickly, and contains only the finest selected materials. The recommended power is a .61 engine. Price is $44.95. The Waco Meteor is a beautiful 2"=1' semi-scale airplane. The appearance and flying ability are causing raves wherever it is shown. With the new interest in sport scale, this airplane will be a contest winner. A most complete kit that is sure to satisfy the most discriminating scale builder and a real pattern type flyer. Again, the recommended power is a .61 engine. The price on this kit is $59.95. Contact Harco or see your local dealer.

Quick-N-Easy Products, P.O. Box 441, Wausau, Wisconsin 54401, has released a complete paint spraying unit designed for the model builder. Called the Speedy Sprayer, the complete kit includes a small, compact compressor less than seven inches long with reliable "oil-less" piston operation. An internal mixed spray gun handles all light-weight spray materials. The unit has a convenient 16 oz. capacity. The Speedy Sprayer includes the spray gun, hose, and compressor, and is priced at $29.95. (West Coast $31.50.) The compressor is available separately, and is absolutely ideal for operating air brushes. Price of this unit alone, is $23.95. Order direct from Quick-N-Easy Products. Each unit is shipped postpaid. Dealer inquiries are invited. Also available from Quick-N-Easy Products is the much talked about TopCotE, a polyester film covering material that is applied with heat and can be doped or painted. This material is strong and easy to apply, weighing less than 1/4 oz. per sq. ft. TopCotE has a specially treated surface that will accept dope, lacquer, or epoxy paints, the material will not wrinkle on plank surfaces and works easily around compound curves. Available direct, the price for a 26" x 60" roll is $3.95, or $6.95 for a 26" x 120" roll.

Tatone Products, 4719 Mission Street, San Francisco, Calif. 94112, has seen to it that their friends will no longer be called 'dirty old men'. For those flyers using mufflers, Tatone has produced an exhaust extension called Exhaust Off, an extremely lightweight, flexible plastic tubing that will fit all Peace Pipe mufflers and just about all other brands as well. This unit is easily attached to the muffler tail pipe with a special heat resistant rubber tube and can be cut or formed to any desired shape to route the exhaust away from the plane. If the full 12" tubing length is used, a nylon clamp is supplied to anchor the end of

the extension to the fuselage. If you wish to run the extension all of the way to the tail, simply add on extra pieces and connect together with the rubber tubing supplied. This sure makes flying a pleasure! Boat and car owners will also appreciate the easy exhaust-free maintenance. Exhaust Off is now available in three sizes: 5/16" diameter, 3/8" diameter, and 1/2" diameter. The rubber connector, nylon clamp, and screw are included. Prices are: 5/16" - 98c; 3/8" - $1.25; 1/2" - $1.35. Available at all dealers or order direct. Tested, approved, and recommended by RCM.

Finishing Touch Products announces the addition of solid color fluorescent decals to their line. These 17" x 22" sheets are available in the four DayGlo colors, orange, red, green and yellow, and are marked on the back with a one inch layout grid to facilitate the transfer of designs, or scaling up or down. Detailed instructions are given for using these decals on the back of each sheet. Like the other Finishing Touch flying model decals, the fluorescent sheets are double coated with clear nitro-cellulose lacquer for fuel resistance, are dope-proof and double adhesive. They have a high gloss finish. Retail price, $2.98. **Finishing Touch Products, 5940 E. Paisano, El Paso, Texas 79925.**

Marc Products, P.O. Box 1052, Glendale, Arizona 85301, has produced its first scale fiberglass-wood kit. The Ryan STA (PT-20) at 2.2 inch scale, has a wing span of 66 inches. Featuring wood wing and tail assembly kit with fiberglass fuselage, cowl and wheel pants. Full size plans include three views. Price is $59.95.

Duke Fox, owner of **Fox Manufacturing Co., 5305 Towson Avenue, Fort Smith, Ark., 72901,** has announced the addition of Meyer Gutman to the staff as chief test pilot.

Meyer's responsibility is to field test and refine all Fox products, and also to be official demonstrator whenever the opportunity presents itself.

Meyer is well qualified. For ninteen years he has been building model airplanes. Born in Havre de Grace, Maryland, Meyer was encouraged to start his career early by his mother, who, herself, was a model builder. In 1965-66, while in the service in central Germany, he did a great deal of flying with the Fox 59. Since he joined the Fox staff, Meyer has been concentrating on the Fox 36RC engine which, he comments, has tremendous power, plus beautiful throttle control.

During 1968, Meyer distinguished himself again and again in model airplane competitions. He won a first place in open pylon racing in Wichita, Kansas, with a Fox 59 - the same engine he used while in the service. In Class C Expert, he won first places at Des Moines, Iowa and at Tulsa, Oklahoma, and a third place at Wichita, Kansas. In an FAI Flyoff at St. Louis, Meyer took a third place. Also in 1968, Meyer was an official lap counter at the National Model Airplane Championship in radio control pylon racing at Olathe, Kansas.

R/C Engineering, manufacturer of world famous G-Pad the space age material designed to absorb shock of the most severe nature, announces they are moving to larger plant facilities. The new address as of August 1969 will be **R/C Engineering, 356 West Roma, Phoenix, Arizona 85013.** These new accommodations will enable them to continue giving the finest service for all digital radio equipment. R/C Engineering fully quarantees all service which is performed according to factory supplied technical data.

"Blast it, Wagger!" exclaimed Walt as he slammed his flight box down on the shack floor. "I was out at the club field for **three** hours today and only got to fly twice! Every clown and his brother is on 27.045, it seems. I've seen shorter waiting lines in front of the topless pizza parlor!"

Wagger strummed three more bars of soul music on the guitar and then gazed at his master through his amber colored shades. "Like cool, oh Boss," he intoned. "What do you propose, man?"

Walt groaned. "A hip Bassett, yet. Will you knock it off and get down to business? And take off that stupid Beatle moustache before you choke on it."

"Oh, is that what's making me sneeze?" sniffed Wagger. "Frankly, I'd forgotten I had the darn thing on. Well, they keep saying we have to understand the Juniors so I thought I'd get 'with it'. Well, no matter; that darn E string was giving me a sore footpad anyway. Back to the frequency problem; how about changing crystals in your radio to get on a less crowded spot?"

"If I did," retorted Walt, "Percy Parkenfarker (the club klutz) would be on that same frequency with his rig and you **know** he has to test all morning. There's only one solution: radio manufacturers will have to make their crystals accessible so that we can **change** crystals in the transmitter and receiver **right on the field**! Voila! No overcrowding! They've been doing this very same thing in European rigs for a couple of years. Hey, I'm going to write Phil Kraft right away and tell him to get on the ball. Think how grateful he'll be!"

"Now wait a minute, fat boss," cautioned Wagger. "I think we had better look at this matter realistically. I, for one, don't like flying with somebody else and **certainly** not with four or five. Our current frequencies permit up to fifteen, and if this ever occurred, I can see only chaos. Most of us have had mid-air collisions and they are happening more often all the time. A good friend of mine (who seems to carry a little black cloud over his head) has had five 'mid-airs' in the last year. Maybe his peripheral vision isn't too good, but has yours been checked lately either?"

"Come on, bone-doggler," chided Walt. "The more frequencies available at the field, the less chance of someone else crowding in on you. Besides, you could set up the same frequency control that we always use."

"Yeah, frequency control," snorted Wagger. "At contests, maybe, but you know our control for Sunday sport flying stinks! Can you imagine the chaos if everyone is switching crystals back and forth and forgetting to change flags?

"Let me add another consideration, Walt," grunted Wagger as he planted one paw on his moustache in a vain attempt to pull the stickum loose. "The oscillator circuit on 27 mHz is fairly broad, so switching .005 crystals could probably be done at minimum expense. (What's ten bucks a channel?) However, on 72 mHz you are going to have to use .001 crystals. You might just send off a couple of letters and find out what **that** is going to do with the beer budget. In addition, I'll bet you're going to start to have sideband splatter and inter-set interference that will drive **everybody** nuts! Who'll get the blame? The radio manufacturer, naturally. How much are you going to ask of the manufacturer, anyway, before you drive him out of business?"

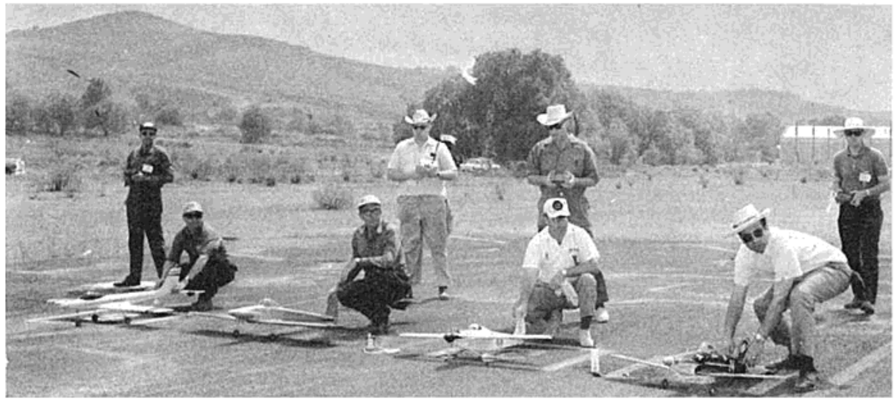
"Nuts," snorted Walt. "The manufacturer is here to serve **me**, and I want changeable crystals. Let **him** work out the details."

WHAT DO *YOU* THINK?

Drop a card or a letter to

WAGGER, c/o
R/C MODELER MAGAZINE,
P. O. Box 487, Sierra Madre
California 91024

JERRY KLEINBURG



Pylon finalists ready for 'payoff' heat in Mexico City. L to R, Elizondo, Sabine, Pearce, and Killeen. Sabine won with 'Pokey', Killeen second by cut pylon.

WORLD ROUNDUP

World tours are popular - so let's take an RC trip around the globe . . .

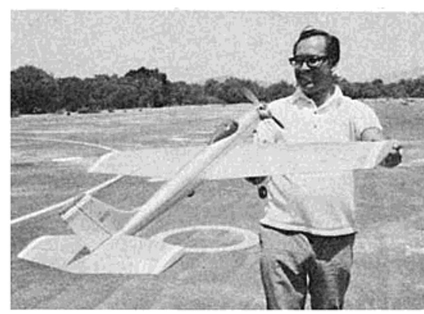
**MEXICO. Mexico's FAI Internats team slots were decided from the results of the 1969 Mexico City AMRC meet, which turned out to be the biggest RC affair ever held in Mexico. AMRC's President, Roberto Guzman, gathered the most points to get the No. 1 team slot during the 5 contest marathon that started in Mexico City last year and, as covered here; saw meets in Monterrey, Guadalajara, and Puebla before the last exciting stanza was played out where it all began - at 'Pistas Paraiso', the 7500 foot high flying site of the Mexico City club. Elias Villegas, Salo Feiner, and Feliciano Prat also won the honor to represent Mexico in Bremen this year. Prat will be the team's manager. As an extra treat, Dr. Alejandro Elizondo, Mexico's leading scale officionado, was named to accompany the team and will compete in the associated scale contest to be staged in conjunction with the World RC Aerobatic Championships in late July.

A larger-than-ever group from the U.S. - 22 in all - also came south to enjoy the flying and a Mexican holiday. The sights, food, and fun disappointed no one and neither did the flying. U.S. RC pilots, as they've done each year at the annual Mexico City contest, also took the top places in the events featured this year. It was Dan Carey of Ft. Worth, flying his neat and efficient Enya powered

Dan Carey watches as Bob Pearce shares his victory 'swig' in Mexico City. Ft. Worth pair enjoyed Mexican holiday, Dan 1st in Pattern by 30 points.

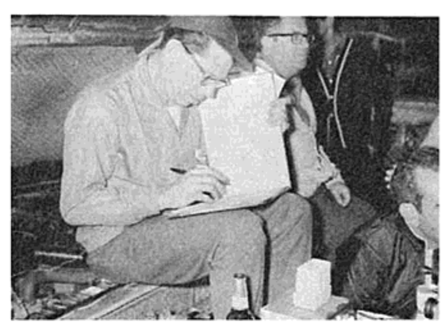
Great pylon idea seen at Mexico City. Counters easily seen by fliers and spectators. Reduces confusion, controversy.

Hernan Didot calls for Jerry Krause during Mexico City heat. Smooth-running Perry equipped VECO in III Perfection brought smiles. So did good working Logictrol.



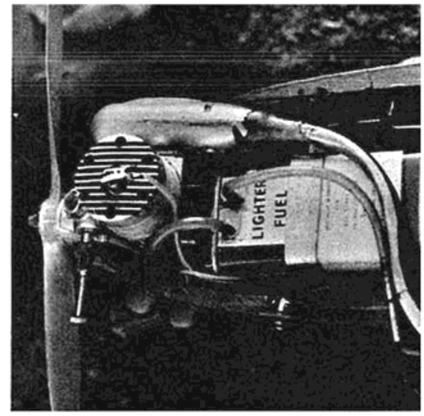
Luis Brunner and Mini-Twister. Under 3 lbs., 42", K&B 40 with reworked carb to vary fuel flow. Kraft KP-10 completes speedy plane.

U.S. fliers enjoyed South-of-the-Border outing. L to R, Bruce Lund, Jack Sabine, Bob Pearce, Dan Carey, Jerry Krause, George Killeen, and Hernan Didot. Missing were Bob and Dick Dunham, Cliff Rausin, Max Dechter.



AMRC Secretary, Paco Gallegos, organized 5 contest series to select Mexican FAI Internats team for 1969 Championships in Bremen. Dedicated service. Another outstanding official, Enrique Velasco in background.

Westland Widgeon, 60" effort by Tommy Shortt of the Shankill Model Flying Club. OS 50 and 10 chan. reeds. SMFC field is site of Blue Max filming in Ireland.



A 'cure' for a nose heavy condition. Johnnie Carroll claims 'lighter' fuel solved problem in Tommy Shortt's Widgeon. Weight reduction helped too.

(continued from page 47)

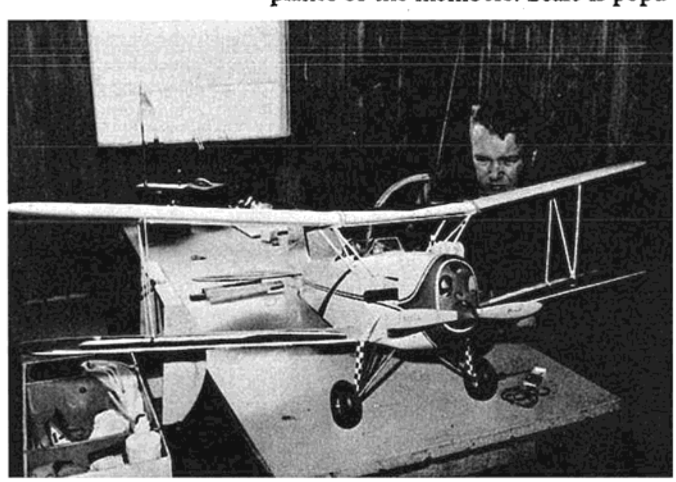
Thunderbird version of the New Orleanian, who outpaced the field in FAI Pattern by a big 30 points. And Jack Sabine, from Mobile, repeated last year's performance in the rough 20 lap Pylon circus. Jack now has 2/3 ownership of the 3 foot silver Cyclone trophy that he will be striving for permanent possession of next year. Other winners in Pylon were George Killeen (who lost out in the final heat by a whisker despite a cut pylon), Dr. Bob Pearce, and Dr. Elizondo. The high altitude took its usual toll of racers and Jack Sabine's winning combination of a steady-running .40 K/B and a trim 600 sq. in. racer (an RCM featured 'Pokey') appears to be a tough one to beat in the thin air at 7500 feet.

Judging for this important Pattern contest was done by a panel of specially selected RC'ers to assure even evaluation as well as area representation. Judging standards have always been high as evidenced by remarkably level score profiles during previous contests in this series. The final 1969 affair showed that even this record was surpassed, reflecting credit on the following judges: Jose Barrios - Guadalajara; Jorge Tabuada - Monterrey; Rafael Padilla - Mexico City; Jaime Carbo - Puebla; and Bruce Lund - U.S. Contest Director was Tony Covarrubious. A great deal of credit for the success of the contest series is due to the diligent work of Paco Gallegos, the permanent secretary of the Mexican Modeling Association. The team selected is a strong well-practiced group which should do well at their first Internats. We have a feeling they'll be out to WIN it for Paco.

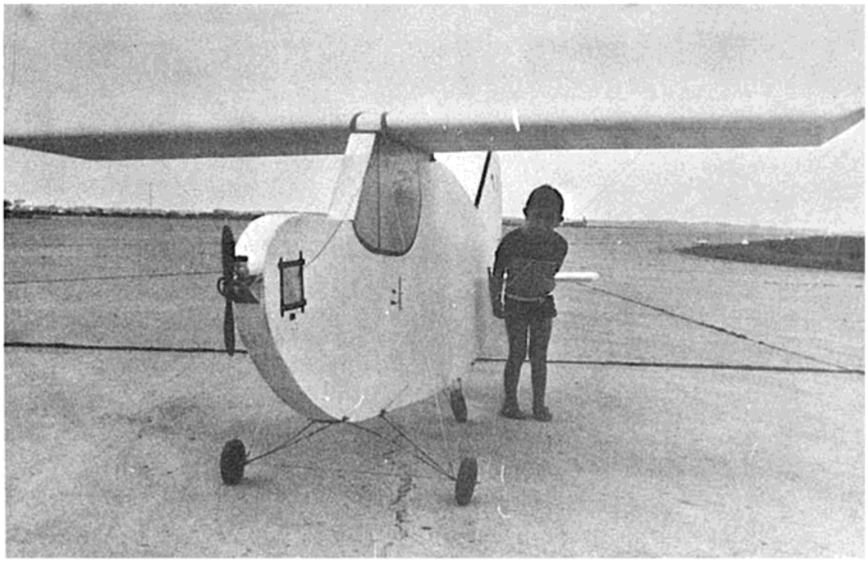
**IRELAND. Flying fields in Ireland are green, Johnnie Carroll of Dublin claims, due to the reason that "it is always about to rain, raining or just finished raining." Despite the drawback - and incidents like having an unthrottled single channel model with a full tank just launched when a rainstorm hits - Irish RC'ers are on the increase as they are in many other countries. Clubs in Dublin and Shankill are growing and the members are flying well-done planes regularly. Scale and scale-like are favorites.

**DENMARK. KFK, the Copenhagen Model Club, celebrated its 10th birthday this year and marked the occasion by printing up a slick paper information booklet giving the history of the club and explaining RC for the reader, a neat combination of looking back and forward at the same time. Consequently, the club looks forward to steady growth and activity for the next decade. Erik Andersen is the present club manager. American propo equipment is favored in the planes of the members. Scale is popu-

Erik Andersen, Copenhagen RC Club manager, readies his Crusader lined up with models of other club members. Micro propo popular. Mufflers needed.



Well done Great Lakes Trainer by KFK member J. P. Jensen. Copenhagen club strong on scale, heavy ships. Jensen is airline captain in SAS.



Yes, Jr., it's real. The 'Unbelievable Mammoth' by Maj. F. Plessier and members of the Storks Circus, leading French RC club. Spans 124". Merco 61.

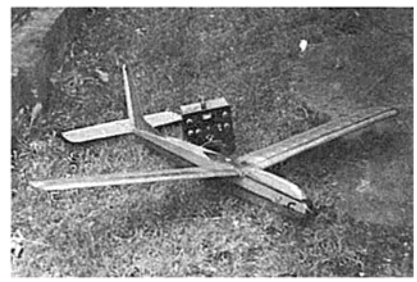
lar, with aerobatic fans on the increase.

**FRANCE. It's been mentioned before, but here is additional information about Maj. Francis Plessier's 'Unbelievable Mammoth' which was the sensation of the annual Storks Circus last year. Readers looking back to page 83 of the January 1969 RCM will find a picture of Major Plessier with the associated builders, Delcloo and Werler. The really remarkable aspect of a project of this nature is the possibility of someone simultaneously doing the same, or very nearly the same. Referring back to RCM of June 1968, on page 75, there's a picture from Arizona of Wincel Pouge's 'Optical Illusion' that although a mite larger, couldn't be any 'twin-ier'. The Maj. Plessier's French effort spans 10'-4" with a chord of 24", or 26-2/3 sq. feet! The Mammoth weighs in at only 15 lbs. giving it a 9 oz. wing loading for the Merco 61 to work with. A Graupner Varioton radio with Variomatic servos is used to control the 'bird', only rudder and elevator are necessary, Plessier found (through the use of a 1/3 scale model - of the model!). Plessier concludes, "We have a stock of old rat eaten balsa wood at the club and we will prepare something for 1969, either a biplane - using the 10' wing as the lower and smaller one - or a whole family of these models. Actually, I think that a half size model (5'-2") would be a nice model for sport flying, and still be quite impressive with a fuselage 20 inches high!"

**LUXEMBURG. Dudelange, Luxemburg - or Luxembourg, as you wish - was the scene of considerable RC action where the Dudelange Modellschaufliegen club had its annual meet. Jack Albrecht reports that the Graupner team, sporting identical MK III Kwik Fli's and headed by Junk Werner, were very impressive as they demonstrated the capabilities of their retracting gear equipped ships and the new Graupner propo radio gear. The retracting gears were by Kato and the OS Max 60 engines reflected more of the Japanese tie-in with Graupner. OS has an arrangement with Graupner to manufacture the new Wankel radial pistonless engine that has seen much speculation over the last few years. A flight demonstration of the engine was made at the 1967 Internats in Corsica and now the manufacturers feel the wear and sealing problems are solved and the engine is being readied for sale. The Luxemburg contest reflected the European approach to a 'fun' contest and consisted of an event requiring ROG, 3 rolls, Top Hat, and landing; a Limbo event allowing 5 passes upright and two inverted and 3 more to break a balloon. The Limbo is barless, having two 5 foot poles to mark the threshold and visual means used to determine if the planes passed under the required height.

Kwik-Fli III's of the Graupner team seen at Dudelange, Luxembourg meet. Junk Werner heads group. Ships are equipped with retracting gear, OS Max 60's.

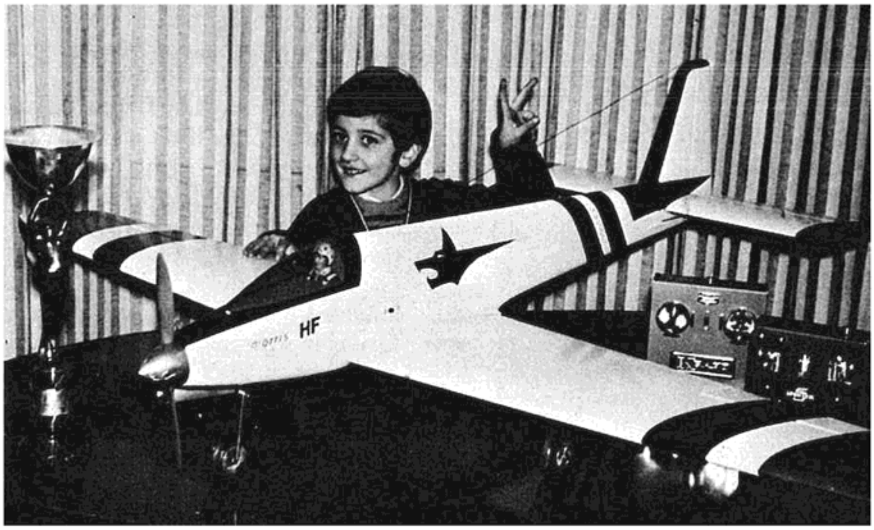
**CZECHOSLOVAKIA. RC gliding interest continues to grow in Czechoslovakia. The latest design is one offered by Josef Brada and intended to fill the middle size range. Fitting in with the trend toward smaller gliders, Brada's design spans 5'-3" and weighs only 2½ lbs. despite the use of Orbit reeds and Transmite servos. Plans or kits are available from Josef whose address is: Jablonec n/Nis, No. 381, Czechoslovakia.



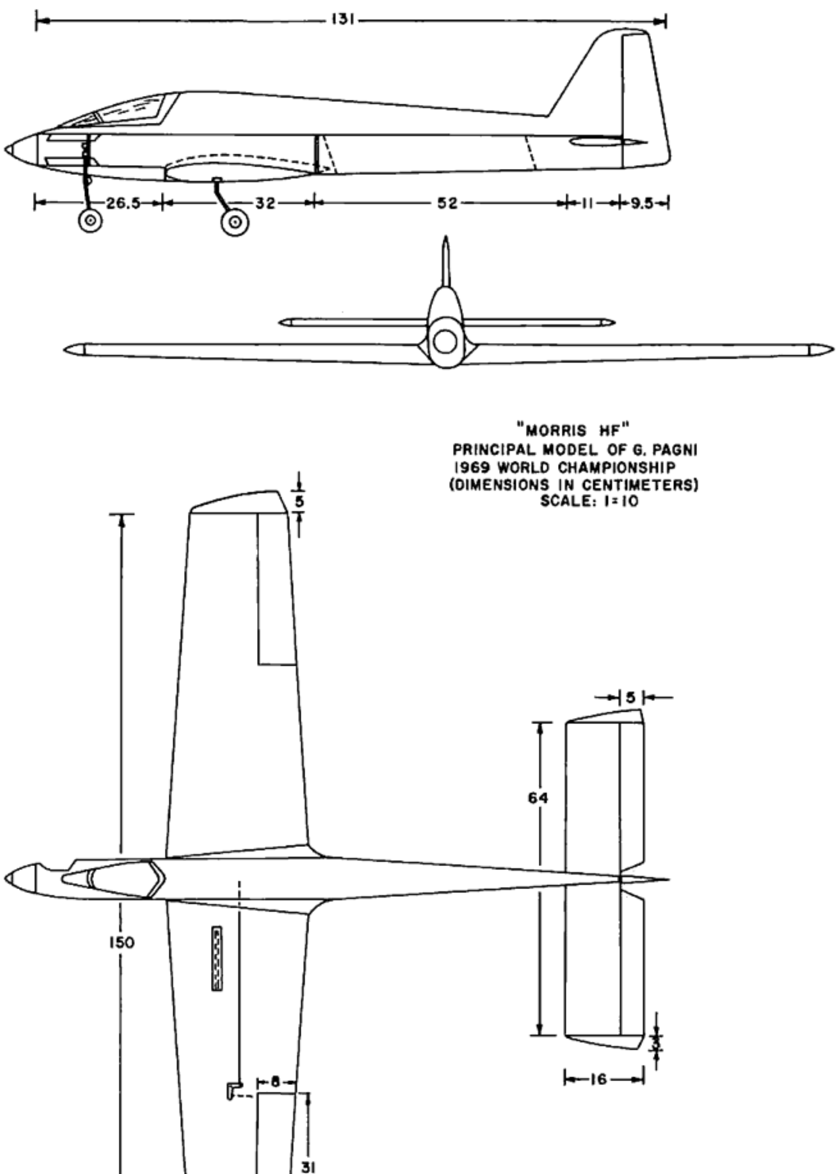
Slope soarer by J. Brada of Czechoslovakia. Spans 5'-3" and weighs 2½ lbs. Orbit reeds and Transmite servos control efficient bird. Plans available.

**ITALY. Internats team selections were also of prime concern to Italian RC pilots during thy early months of this year. Late qualifications often handicap a team when new planes or techniques are required. (For this reason, U.S. teams take a full year to prepare, and up till now have used the time to good advantage and brought home World Champion honors from every Internats.) Despite the late selection problem - or perhaps because of it - a strong Italian team emerged at the Cremona meet held in that Northern city in April. The No. 1 team spot was won by Graziano Pagni, a name familiar to regular readers here. The rest of the team is composed of Reda, Reineri, and Guglieminetti, all of whom were on the team for the last Internats in Corsica. Guglielmo Reda showed his flying consistency by also winning the Italian RC Championship in 1968, a fact to keep in mind in assessing the merits and experience of the team.

The Cremona exercize called for 5 scored flights, three flights flown with the No. 1 model and the other two with the reserve model - all of which were obvious requirements to offset the late selection handicap. Pagni's



Morris with Morris. Five year old son of Graziano Pagni gives the high sign for his namesake. Pagni, No. 1 Italian FAI team member for 1969 Internats.



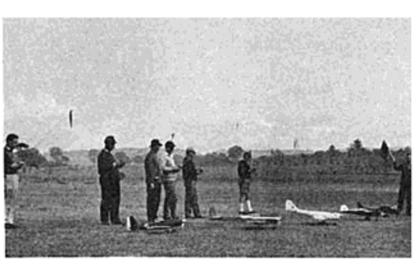
model is his 'Morris HF', named after his 5 year old son and the 'HF' designating the high fuselage version. The ship features a 14% symmetrical root section on the 63" tapered wing which ends with a 16% symmetrical section. The model weighs 7 lbs. in anticipation of the wind conditions expected in Germany for the Internats. A Super Tiger 60HF with a Kavan carburetor and MiniVox muffler and 11x8 Top Flite prop provide power for the bird which uses a Logictrol III radio. Pagni's reserve ship is his 'Baby Morris', a scaled down version also powered with a ST 60 housed in the fiberglass fuselage. This one also weighs in at 7 lbs. and is equipped with a 4 channel Kraft G/M. Assisting Pagni at Cremona was Leopoldo Pergher who hopes to bring good fortune to Pagni and the Italian team again at the World Championships.

**RHODESIA. From Roger Stern and the Southern Cross Hobby Shop in Salisbury, we have a rundown on the RC activity of the Mashonaland Model Club. Thirty-one members, flying current world favorites and using the latest radio gear, make up the largest section of the club which also includes all other aeromodelling activity. Flying is done from a 'Y' shaped concrete runway on a virtually obstructionless field near the city. As with many clubs, grass mowing appears to be a major 'problem'. As experience grows, so is the contest activity, with monthly contests being planned for 1969. Leading fliers include: Bernard Onslow, John Brown, Rich Brand, Eric Bell, Dennis Hunt, Darryl Bernstein, and Barrie York. Rich Brand represented the club's RC prowess at the recent South African Nationals, results of which have yet to arrive. An air show was held for the Salisbury public in May which consisted of two shows of about two hours each. In addition to

From Rhodesia, Rich Brand (kneeling left) and members of the RC Section of the Mashonaland Model Club show latest planes & equipment. Throttles all closed. Brand 1969 S. Africa internats team member.

his other RC chores, Roger is the editor of the club's fine newsletter, The PROP SHAFT, and ended a recent issue thusly: "As a closing note, I'm glad we do the FAI (pattern) schedule here. Have you seen the new type (1969) maneuvers in the new AMA schedule? Must try them sometime . . ."

**AUSTRALIA. Scale activity appears to be on the increase in the Sydney area with ships ranging from a Bristol Scout to a twin Rossi powered P-38. Chuck Peake, who fills in his time as a Quantas captain between RC sessions, (remember his ducted fan articles?) sends details of their '20 ft. Scale' competition that's spurring scale builders into competition. Based upon the concept of scale being representative of the prototype seen at 20', added points are earned for overall quality of building, surface finish, scale details, and general attractiveness. Flying stresses scale performance, with maneuvers limited to those within the capabilities of the full size plane. A winner is named for each 'section' - that is, Appearance, Quality, Flying - with each plane entered being limited to only one prize. On other RC fronts, Bill Marden set a new Australian duration record for gliders with an 11 hr. 8 min. flight. The magnitude of the record effort is judged from the old record of 3½ hours previously set by Tom Heggarty. With the launch at 6:31 AM, Bill tried for the Southern Hemisphere record of 12 hours set in South Africa, but the gusty weather (at times up to 45 mph) brought on the rain and Bill was forced to land as the rain came in torrents. Radio was the Australian Silvertone propo controlling rudder, elevator and ailerons. Bob Young of Silvertone provided a special 4 amp-hour receiver battery pack weighing 24 oz. Two transmitters were used with each having 10 hour battery capacity. The flight was finished on the second box. With this experience as a guide, Bill has in mind the world record and feels 17 hours may be possible despite lack of the twilight advantage afforded Northern Hemisphere fliers.



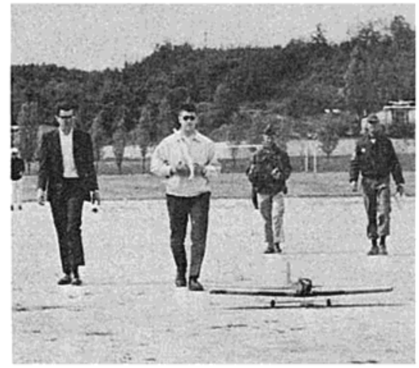
Spicy Aeolus by Bill Aldridge of Nae Nae, New Zealand. 5 lbs. with Digitrio and Max 40. Very maneuverable, spins with precision.

**NEW ZEALAND. Bill Aldridge sends word that RC'ers in his neighborhood prefer the 45 mile drive to Hood Aerodrome at Masterton rather than the 30 mile trip to Paraparaumu Airport where flying is somewhat restricted by the traffic of the 'big' aircraft. The Traffic Controller at Paraparaumu keeps giving priority to commercial traffic! Despite the handicap, some RC'ers persist, leaving Bill to his quieter Masterton sanctuary, free of non-RCing Traffic Controllers.

**VIETNAM. Despite the ravages of war, South Vietnamese RC'ers continue to devote themselves to the development and expansion of the hobby/sport. This was demonstrated by the recent all Vietnamese meet between the RC fliers of Saigon and Dalat near Dalat on March 16th. Termed an 'exhibition', seven models were flown in demonstrations of pattern and combat. Louis Michel, a Franco-Vietnamese, was considered to be the 'best' flyer and N. H. Nghia, the Chairman of the Vietnamese Model Club, showed great skill using reed equipment. This is the first year for the Dalat Airclub whose Chairman is Mr. Nhon. Nguyen-Quang-Ru, Manager of Light & Model Airplane Service of Vietnam, relays the information that about 3000 spectators enjoyed the Dalat show which was flown at the top of a flat 3000 foot high hill during a bright mild day. We hope the Vietnam RC'ers soon may have many such days.

Louis Michel and his fellow Vietnamese RC'ers prepare for a 'combat' exhibit during Saigon-Dalat meet. 3000 spectators enjoyed South Vietnam outing.

**KOREA. Language didn't seem to be any barrier for Lt. Al Lowenstein and other RC'ers during the 5th Annual Republic of Korea-U.S. Model meet. And the contests are a relaxed informal affair where everyone - including judges - pitch in to help contestants. With a number of beginners at the meet, this helped in the 'nerves' department and despite limited resources, RC is growing among Koreans.



Taxi action during 5th ROK-U.S. meet in Korea. Lt. Al Lowenstein at the controls of his Kwik-Fli II while helper, SP/4 Fear looks pleased with Al's 2nd place win.

**HAWAII. From Kailua, Bob Barnes of the Hawaii RC Club writes that his Kraft propo gear has been rendering flawless performance. Reflecting his Kraft predisposition, Bob has in the air a Kwik-Fli II and a Flea-Fli, while on the building board is a Kwik-Fli III which Bob says looks the 'best so far'. Ready-to-fly planes are also popular in the Islands as they are elsewhere. Bob, a Navy pilot during WW II, just completed 23 years with Hawaiian Airlines and is a captain of one of their DC-9's. The Hawaii RC Club continues to gain strength and reflect RC's growth. Capt. Jan Sakert, whose planes have graced RCM's pages, is a club alumnus. Navy and Marine personnel continue to play a big role in the club's activity.

Hawaiian planes are scaling down too. Commander Chuck Carpenter, USN, and his OS 40 powered Quick Silver from RCM plans. Wind a weather factor in Hawaii.

**CANADA. Canadian Internats hopes are riding on their team of Ron Chapman, Harold Tom and Warren Hitchcox. While Ron's name is familiar to most contest types, Warren is still building his reputation. That buildup got a big boost as reported here in the May column during the last Toronto meet where Warren won two big firsts; Scale AND Class D, the Canadian version of AMA C Expert. Perhaps the momentum will carry over to Bremen. Both Ron and Warren look forward to the Canadian RC Nationals to be held August 16 and 17 (23-24, alternate dates) at a location yet to be set by MAAC.

Warren Hitchcox, Canadian Internats team member, and his RC fleet during Toronto meet. Inverted Tempest 1st in Scale, the Firebird original 1st in Expert Pattern. CRC propo.

**U.S.A. Liveliest RC event of 1969 promises to be seen in Georgia where a combined effort of the Cobbs Co. RC Club and the RC Industry Assn. is under way to stage the 1st Annual Southern RC Trade Show in conjunction with the RCIA Masters Invitational Tournament! Usually, either event is considered a major undertaking, but Len Purdy, who will CD the Masters, and Joel Harper, the Trade Show director, are working enthusiastically to produce an RC extravaganza that'll be remembered a long time. The combined show and meet will be held September 13 and 14, with the trade show set for the VERY plush Marriot in Atlanta and the Masters to be flown at the flying site of the Cobb Co. Club in nearby Marietta.

CCRC is an 80 member organization that's been actively operating for the last 8 years and has an ideal flying field sporting a 300 foot asphalt runway centered in a Bermuda lawn 150' x 450' complete with taxiways to each end of the runway; a fine place for the Masters meet which will be limited to RC spectators in addition to the fliers. The meet schedule will include Class C Expert, Sport Pylon, and Limbo. Pylon and Limbo will be open competition while pattern will be by invitation to some 30 fliers selected on a national basis who have accumulated the most contest win points between the 5th of April and August 17th of this year in AMA chartered club contests. Points will be "earned" in Class C Expert events at these affairs with the number of points depending upon the number of contestants registered in the event. 1st place will win 50% of the 'Contest Points', 2nd, 30% and 3rd, 20%. For example, if you win first place in a local AMA chartered club sanctioned meet that has 12 contestants in Class C Expert event, 6 points will be earned. 2nd place would get 3.6 points, 3rd, 2.4. Contest Directors are being asked to cooperate in the compilation process by sending contest results to the Executive Secretary of the RCIA, Ara Palmer, at Briarwood Road, Oakwood, Ga. 30566.

Motel accommodations are available right at the trade show site in the Marriot Motel, where the 'Hall of Nations' with its 27,500 square feet of exhibit space will be filled by RCIA members showing their latest wares. The downtown location of the show makes possible the biggest turnout ever for a trade show. With the contest hours set so as to compliment the Trade Show hours, ample opportunity will exist to see both affairs to best advantage. For Trade Show poop, drop a line to Joel Harper at 900 Piedmont Circle, NE, Marietta, Ga. 30060, or call (404) 428-5396.

**CALIFORNIA. From Dick Franco and the So. Alameda Co. RC'ers, we read of a further example of RC ingenuity: *"Ever see a sailplane with a splint? Ron Brown and Bob Johnson have. Seems as though our two erstwhile sailplaners were in the midst of some active maneuvers when Ron and Bob tried to occupy one hunk of sky with two sailplanes. Bob's sailplane came out second best with a cracked fuselage. This might have grounded some of our less inventive minds, but not Bob! He wasn't about to be left out of the fun. Seizing a piece of redwood fence post, he split off a splint and fastened it to the broken fuselage with rubber bands! How well it flew is immaterial, the important part is the Yankee ingenuity . . . necessity triumphs again!"*

**ILLINOIS. From Chicago-land, Clark Macomber sends details of the new club organized to promote all phases of scale flying. It's called the Chicago Scalemasters and RCM Contributing Editor, Dave Platt, is the 1969 Chairman. Bob Talchik and Clark are other club officers. Membership is open to ALL scale fans and meetings take place in Club Room E of the Austin Town HALL LOCATED AT Central and Lake Streets in Chicago the 4th Friday of each month. Clark's address: 922 Oak St., Winnetka. Drop him a line, or give him a call to get acquainted with the club's activities.

From George Ens, writing in the FOREST CITY FLIAR which is edited by Vic Gianelli, comes a dandy way of handling the warp problem: **"Warps in large balsa surfaces - that is, rudder, fin, elevators - may be prevented by embedding round toothpicks as follows: Drill a 3/32" hole into the leading and/or trailing edge; apply epoxy or white glue; insert toothpick and fill with favorite filler. If the surfaces are thinner than 3/16", a 1/16" hole may be drilled and flat toothpicks used. This approach is easier than inlaying plywood or balsa at different angles, and makes for easier finishing."** ●

大元

BIG ONE

By LEON KRISILOFF

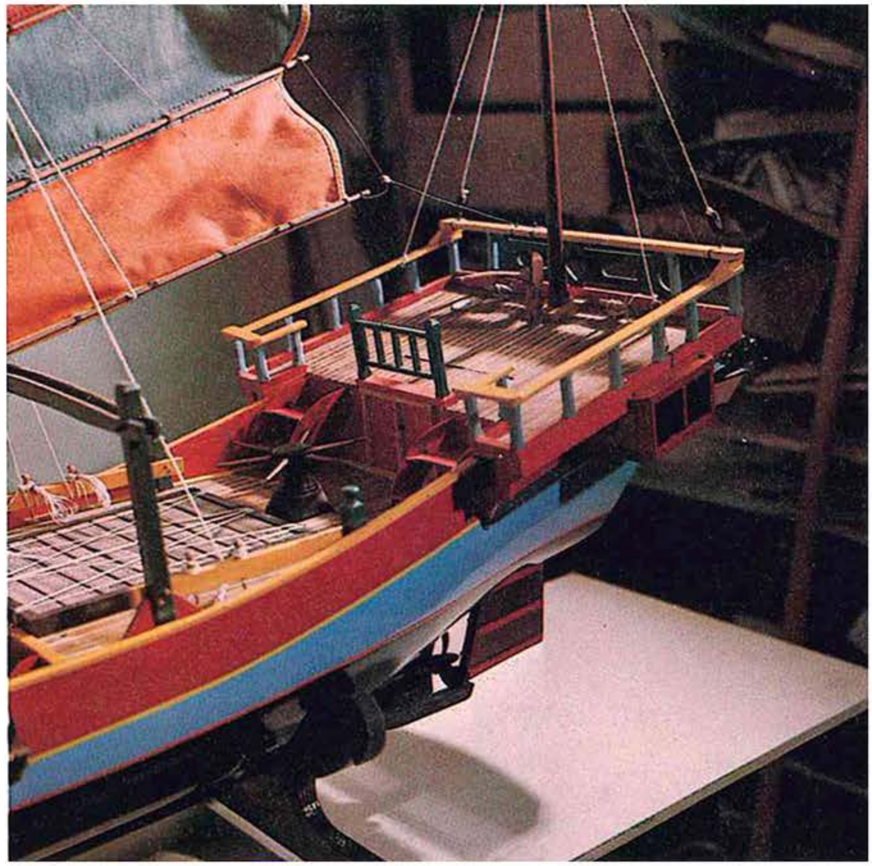
FROM KRISS HOBBY HAVEN AND FIBO CRAFT MODELS COMES THIS BEAUTIFUL, SEMI-SCALE ½″ TO 1′-0″ CHINESE JUNK FOR R/C AND ELECTRIC DRIVE.

The 'Big One' came about because I saw some beautifully colored embroidery in a friend's house. The photos are the results of my efforts. After seeing the 'Big One' in the water and operating, I thought that others would like to build this model. In addition, I thought that building a junk would be an easy job, but as I looked for information I found very little. The final lines for the 'Big One' were lofted from the scant information found, and a plastic model, with the help of a Chinese friend who supplied most of the detail.

Their history is interesting, what there is of it. There is no record of junks until Marco Polo wrote about them in 1298. Neither did I find any mention of them in reference to Chinese history. Polo described a junk that was flat bottomed, pontoon shaped, with several heavy wooden transverse sections, the deck being built above the pontoon with high bulwarks covering it. They retained their pontoon shape for many centuries. They had five masts fitted with lugsails made from woven bamboo mats, and the junks used on the rivers of China, today, still maintain this basic shape. About the middle of the 1800's, under the influence of European merchantmen, the ocean-going junk hull shape began to change. There finally emerged the basic shape of our 'Big One'. The basic lugsail retained the shape they had centuries ago, although today they are made of cloth. Engines were finally installed in the middle 1930's and were used to go up-stream. There are still thousands of these junks in use in China and the Far East.

Finally, I had the plans completed and I built the 'Big One'. (Building instructions follow later on in the article.) The 'Big One' was placed in a child's wading pool and trimmed for operation. Two 6 volt wet cells were used for motor (Pittman 12 volt) power. By shifting them in the hull, I obtained the proper floating trim, which is with the decks level. The batteries were secured by building a 1/4" balsa frame within which rubber bands were used to hold the batteries in place. To get the model down to the proper waterline requires five pounds of lead! The ballast is glued as low in the hull as possible.

I installed a single channel R/C unit under the front hatch with switches in the side deck. The rudder linkage was kept to a minimum length by placing the rudder servo on a platform between frames No. 8 and No. 9. The R/C equipment was placed so that the trim was not upset. Finally, I was ready for the actual operating test.

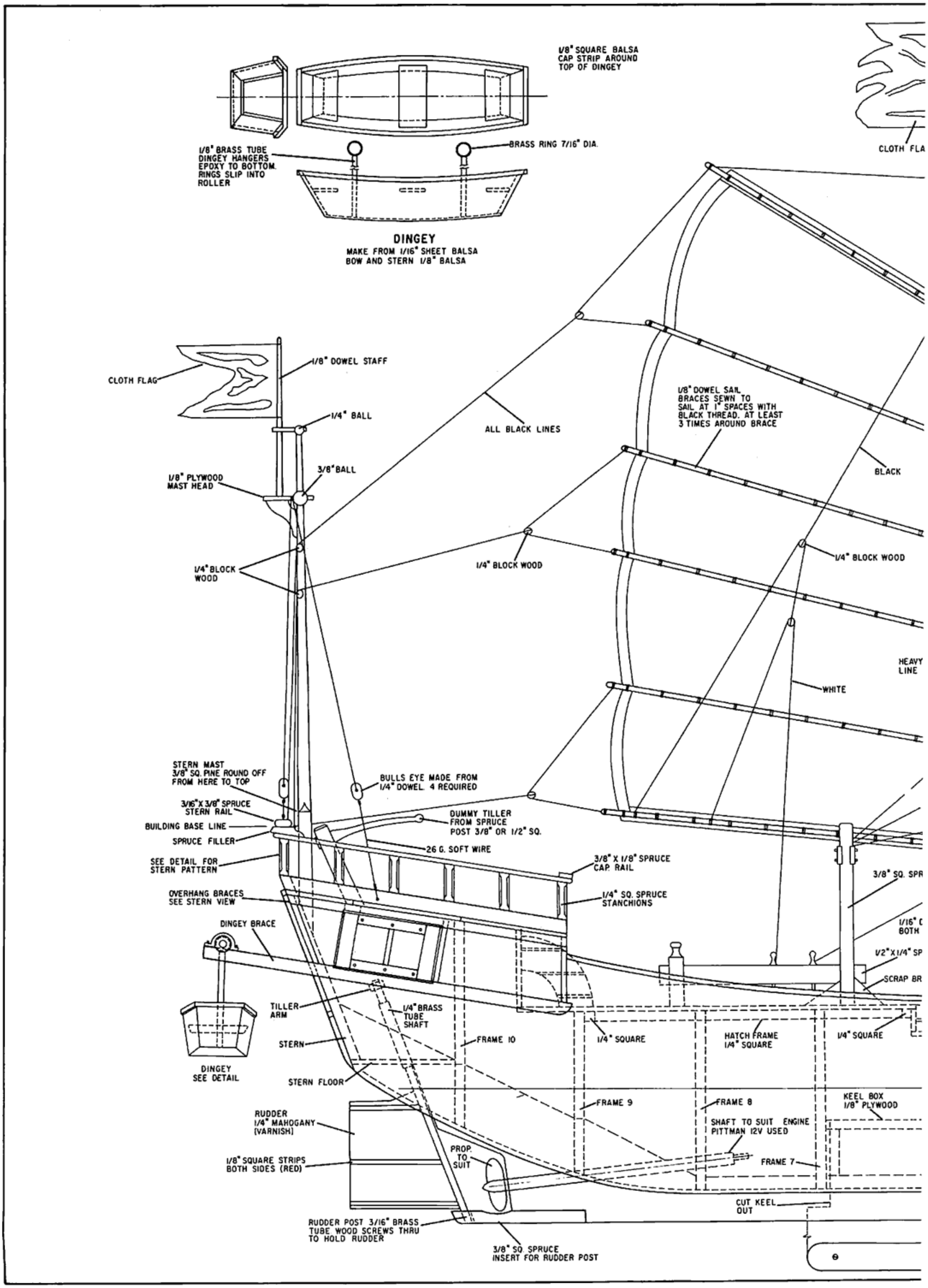


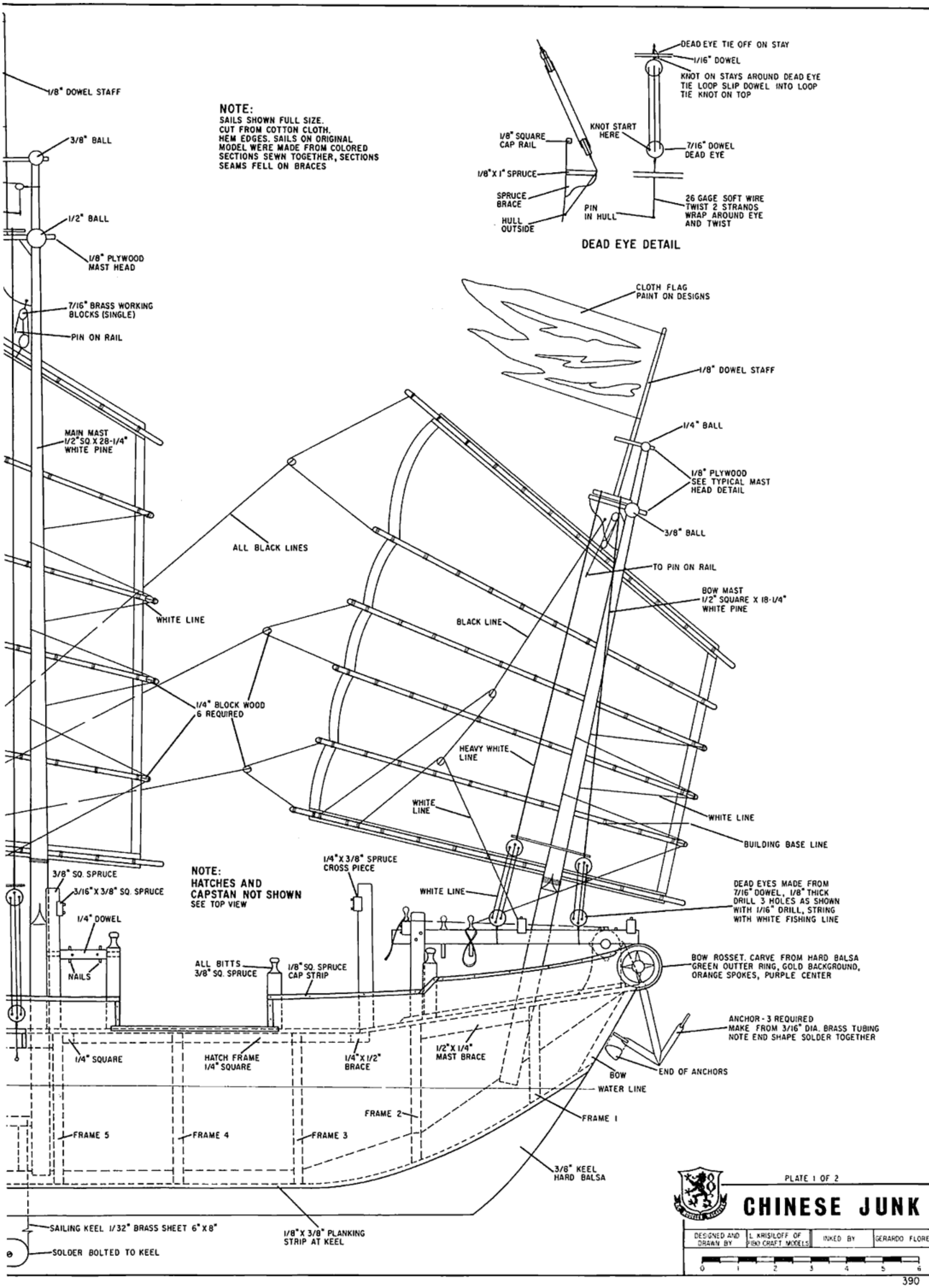
At the lake, I took the 'Big One' out of the car, and after answering a million questions from the people around the lake, I finally got her into the water. I flicked on the switches, and instant disaster was upon my 'Big One'! A stiff breeze came up, filled the sails, and she almost turned over! This was a hair-raising experience to say the least! The reason for this action did not occur to me. I tried again when the breeze let up. The same thing happened, and then it struck me - too much sail and not enough hull in the water. Back to the drawing board I went. How do you add more bottom area or weight to a finished model? More lead in the hull would bring the waterline down, but this would not solve the problem. A sailing keel could be added, and that was the answer.

I went back to the lake on the week-end, took the 'Big One' out of the car, answered the same questions from the people around the lake, flicked on the switches, and put her into the water. This time I held on. She seemed more stable so I got up enough nerve and let go. The keel worked, and she heeled over only slightly when the breeze filled the sails. Now, I had it made, if she answered to the rudder. I hit the transmitter button and she came around to the right with the sails following. So far so good, and now for left, and again that beautiful junk came about with the sails following. The batteries lasted about 45 minutes and gave out. I tried sailing the 'Big One' without the motor, and that turned out to be quite a job. I have to say that the 'Big One' requires the motor for really good operation. It has been run several times since then, at times in a really stiff breeze, with great success. With the sails lowered and the keel out, she handles like any other power boat. She really turned out to be a beautiful model and well worth the trouble to build. I am sure that multi-channel equipment can be installed for rudder, motor and sails. I have not tried it because my multi set is tied up in another model. The following deals with the construction of the 'Big One'.

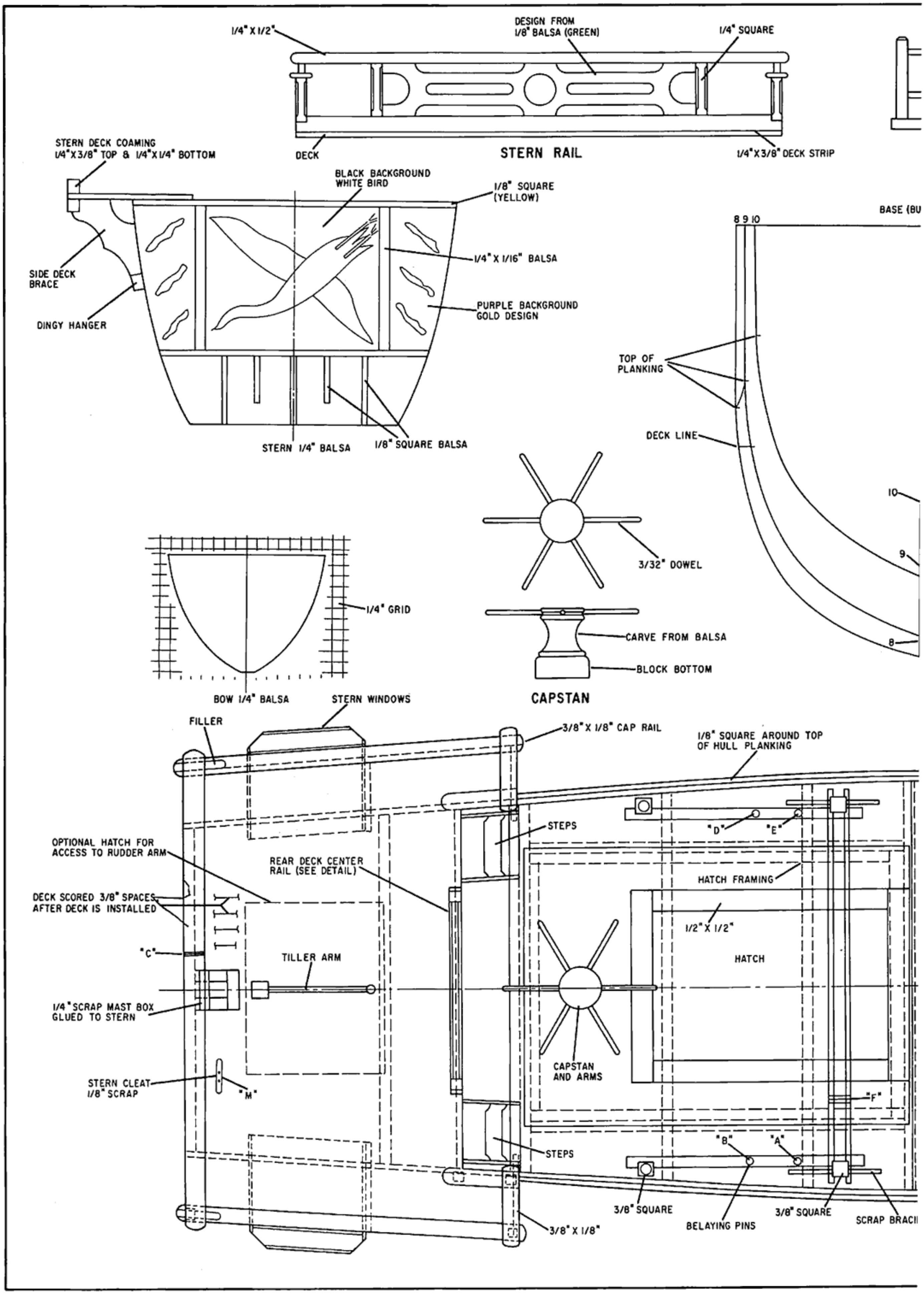
Hull Construction

The hull is built upside down on a jig of pine 3/4" x 4" x 37". Get a piece of sugar pine and it can be used to make the masts after the hull is finished. The centerline and frame positions are marked off on the jig, measured from the plans. A small 'x' will help you remember on which side the frames are placed.

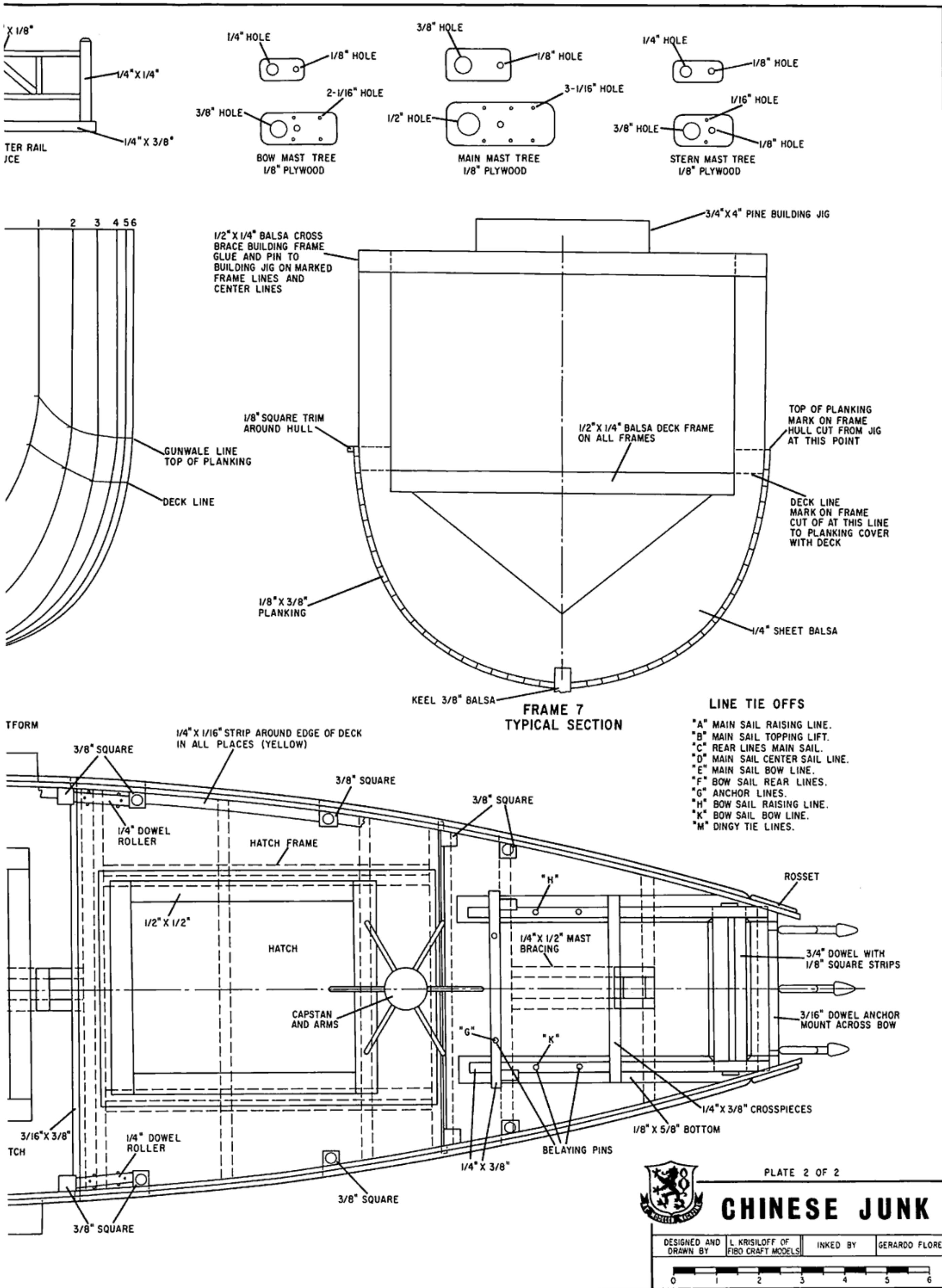

1/8" SQUARE BALSA CAP STRIP AROUND TOP OF DINGEY
1/8" BRASS TUBE DINGEY HANGERS EPOXY TO BOTTOM. RINGS SLIP INTO ROLLER
BRASS RING 7/16" DIA.
DINGEY
MAKE FROM 1/16" SHEET BALSA BOW AND STERN 1/8" BALSA
CLOTH FLA
CLOTH FLAG
1/8" DOWEL STAFF
1/4" BALL
ALL BLACK LINES
1/8" DOWEL SAIL BRACES SEWN TO SAIL AT 1" SPACES WITH BLACK THREAD. AT LEAST 3 TIMES AROUND BRACE
BLACK
3/8" BALL
1/8" PLYWOOD MAST HEAD
1/4" BLOCK WOOD
1/4" BLOCK WOOD
1/4" BLOCK WOOD
HEAVY LINE
WHITE
STERN MAST 3/8" SQ. PINE ROUND OFF FROM HERE TO TOP
BULLS EYE MADE FROM 1/4" DOWEL 4 REQUIRED
3/16" X 3/8" SPRUCE STERN RAIL
DUMMY TILLER FROM SPRUCE POST 3/8" OR 1/2" SQ.
BUILDING BASE LINE
SPRUCE FILLER
26 G. SOFT WIRE
SEE DETAIL FOR STERN PATTERN
3/8" X 1/8" SPRUCE CAP RAIL
3/8" SQ. SPR
OVERHANG BRACES SEE STERN VIEW
1/4" SQ. SPRUCE STANCHIONS
DINGEY BRACE
1/16" BOTH
1/2" X 1/4" SP
SCRAP BR
TILLER ARM
1/4" BRASS TUBE SHAFT
STERN
FRAME 10
1/4" SQUARE
HATCH FRAME 1/4" SQUARE
1/4" SQUARE
DINGEY SEE DETAIL
STERN FLOOR
FRAME 9
FRAME 8
KEEL BOX 1/8" PLYWOOD
RUDDER 1/4" MAHOGANY (VARNISH)
SHAFT TO SUIT ENGINE PITTMAN 12V USED
1/8" SQUARE STRIPS BOTH SIDES (RED)
PROP. TO SUIT
FRAME 7
CUT KEEL OUT
RUDDER POST 3/16" BRASS TUBE WOOD SCREWS THRU TO HOLD RUDDER
3/8" SQ. SPRUCE INSERT FOR RUDDER POST



1/8" DOWEL STAFF
3/8" BALL
1/2" BALL
1/8" PLYWOOD MAST HEAD
7/16" BRASS WORKING BLOCKS (SINGLE)
PIN ON RAIL
MAIN MAST 1/2" SQ. X 28-1/4" WHITE PINE
NOTE:
SAILS SHOWN FULL SIZE.
CUT FROM COTTON CLOTH.
HEM EDGES. SAILS ON ORIGINAL MODEL WERE MADE FROM COLORED SECTIONS SEWN TOGETHER, SECTIONS SEAMS FELL ON BRACES
DEAD EYE TIE OFF ON STAY
1/16" DOWEL
KNOT ON STAYS AROUND DEAD EYE TIE LOOP SLIP DOWEL INTO LOOP TIE KNOT ON TOP
KNOT START HERE
1/8" SQUARE CAP RAIL
7/16" DOWEL DEAD EYE
1/8" X 1" SPRUCE
SPRUCE BRACE
PIN IN HULL
HULL OUTSIDE
26 GAGE SOFT WIRE TWIST 2 STRANDS WRAP AROUND EYE AND TWIST
DEAD EYE DETAIL
CLOTH FLAG PAINT ON DESIGNS
1/8" DOWEL STAFF
1/4" BALL
1/8" PLYWOOD SEE TYPICAL MAST HEAD DETAIL
3/8" BALL
ALL BLACK LINES
TO PIN ON RAIL
BOW MAST 1/2" SQUARE X 18-1/4" WHITE PINE
WHITE LINE
BLACK LINE
1/4" BLOCK WOOD 6 REQUIRED
HEAVY WHITE LINE
WHITE LINE
WHITE LINE
BUILDING BASE LINE
1/4" X 3/8" SPRUCE CROSS PIECE
3/8" SQ. SPRUCE
3/16" X 3/8" SQ. SPRUCE
NOTE:
HATCHES AND CAPSTAN NOT SHOWN
SEE TOP VIEW
WHITE LINE
DEAD EYES MADE FROM 7/16" DOWEL, 1/8" THICK DRILL 3 HOLES AS SHOWN WITH 1/16" DRILL, STRING WITH WHITE FISHING LINE
1/4" DOWEL
NAILS
ALL BITTS 3/8" SQ. SPRUCE
1/8" SQ. SPRUCE CAP STRIP
BOW ROSSET. CARVE FROM HARD BALSA GREEN OUTTER RING, GOLD BACKGROUND, ORANGE SPOKES, PURPLE CENTER
ANCHOR - 3 REQUIRED MAKE FROM 3/16" DIA. BRASS TUBING NOTE END SHAPE SOLDER TOGETHER
1/4" SQUARE
HATCH FRAME 1/4" SQUARE
1/4" X 1/2" BRACE
1/2" X 1/4" MAST BRACE
END OF ANCHORS
BOW
WATER LINE
FRAME 2
FRAME 1
FRAME 5
FRAME 4
FRAME 3
3/8" KEEL HARD BALSA
SAILING KEEL 1/32" BRASS SHEET 6" X 8"
SOLDER BOLTED TO KEEL
1/8" X 3/8" PLANKING STRIP AT KEEL
PLATE 1 OF 2
CHINESE JUNK
DESIGNED AND DRAWN BY
L. KRISILOFF OF FIBO CRAFT MODELS
INKED BY
GERARDO FLORES
0 1 2 3 4 5 6
390



1/4" X 1/2"
DESIGN FROM 1/8" BALSA (GREEN)
1/4" SQUARE
DECK
STERN RAIL
1/4" X 3/8" DECK STRIP
STERN DECK COAMING 1/4" X 3/8" TOP & 1/4" X 1/4" BOTTOM
BLACK BACKGROUND WHITE BIRD
1/8" SQUARE (YELLOW)
SIDE DECK BRACE
DINGY HANGER
1/4" X 1/16" BALSA
PURPLE BACKGROUND GOLD DESIGN
STERN 1/4" BALSA
1/8" SQUARE BALSA
BASE (BU
8 9 10
TOP OF PLANKING
DECK LINE
10
9
8
3/32" DOWEL
1/4" GRID
CARVE FROM BALSA
BLOCK BOTTOM
BOW 1/4" BALSA
STERN WINDOWS
CAPSTAN
FILLER
3/8" X 1/8" CAP RAIL
1/8" SQUARE AROUND TOP OF HULL PLANKING
STEPS
"D"
"E"
OPTIONAL HATCH FOR ACCESS TO RUDDER ARM
REAR DECK CENTER RAIL (SEE DETAIL)
HATCH FRAMING
DECK SCORED 3/8" SPACES AFTER DECK IS INSTALLED
1/2" X 1/2"
"C"
TILLER ARM
HATCH
1/4" SCRAP MAST BOX GLUED TO STERN
CAPSTAN AND ARMS
STERN CLEAT 1/8" SCRAP
"M"
"F"
"B"
"A"
STEPS
3/8" SQUARE
BELAYING PINS
3/8" SQUARE
SCRAP BRACI
3/8" X 1/8"


X 1/8"
1/4" X 1/4"
1/4" X 3/8"
TER RAIL
ICE
1/4" HOLE
1/8" HOLE
3/8" HOLE
2-1/16" HOLE
BOW MAST TREE
1/8" PLYWOOD
3/8" HOLE
1/8" HOLE
1/2" HOLE
3-1/16" HOLE
MAIN MAST TREE
1/8" PLYWOOD
1/4" HOLE
1/8" HOLE
1/16" HOLE
3/8" HOLE
1/8" HOLE
STERN MAST TREE
1/8" PLYWOOD
1 2 3 4 5 6
GUNWALE LINE
TOP OF PLANKING
DECK LINE
3/4" X 4" PINE BUILDING JIG
1/2" X 1/4" BALSA CROSS BRACE BUILDING FRAME GLUE AND PIN TO BUILDING JIG ON MARKED FRAME LINES AND CENTER LINES
1/8" SQUARE TRIM AROUND HULL
1/2" X 1/4" BALSA DECK FRAME ON ALL FRAMES
TOP OF PLANKING MARK ON FRAME HULL CUT FROM JIG AT THIS POINT
DECK LINE MARK ON FRAME CUT OF AT THIS LINE TO PLANKING COVER WITH DECK
1/8" X 3/8" PLANKING
1/4" SHEET BALSA
KEEL 3/8" BALSA
FRAME 7
TYPICAL SECTION
LINE TIE OFFS
"A" MAIN SAIL RAISING LINE.
"B" MAIN SAIL TOPPING LIFT.
"C" REAR LINES MAIN SAIL.
"D" MAIN SAIL CENTER SAIL LINE.
"E" MAIN SAIL BOW LINE.
"F" BOW SAIL REAR LINES.
"G" ANCHOR LINES.
"H" BOW SAIL RAISING LINE.
"K" BOW SAIL BOW LINE.
"M" DINGY TIE LINES.
TFORM
3/8" SQUARE
1/4" X 1/16" STRIP AROUND EDGE OF DECK IN ALL PLACES (YELLOW)
3/8" SQUARE
3/8" SQUARE
1/4" DOWEL ROLLER
HATCH FRAME
1/2" X 1/2"
HATCH
"H"
1/4" X 1/2" MAST BRACING
ROSSET
3/4" DOWEL WITH 1/8" SQUARE STRIPS
CAPSTAN AND ARMS
"G"
"K"
3/16" DOWEL ANCHOR MOUNT ACROSS BOW
1/4" X 3/8" CROSSPIECES
1/8" X 5/8" BOTTOM
3/16" X 3/8"
TCH
1/4" DOWEL ROLLER
BELAYING PINS
1/4" X 3/8"
3/8" SQUARE
3/8" SQUARE
PLATE 2 OF 2
CHINESE JUNK
DESIGNED AND DRAWN BY
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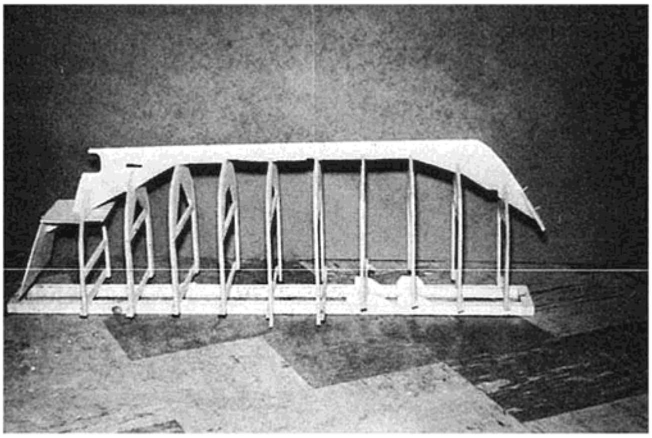
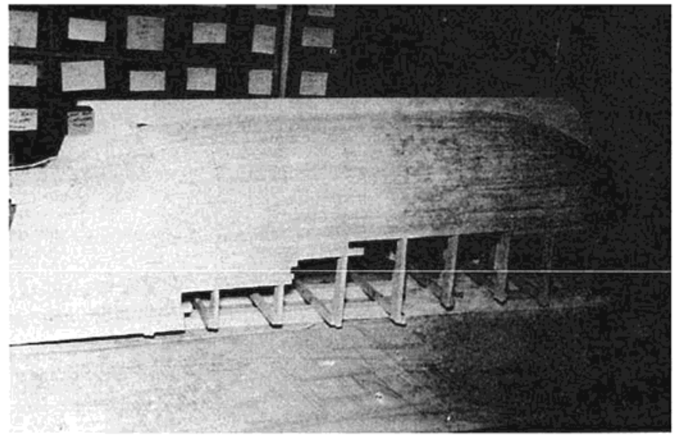
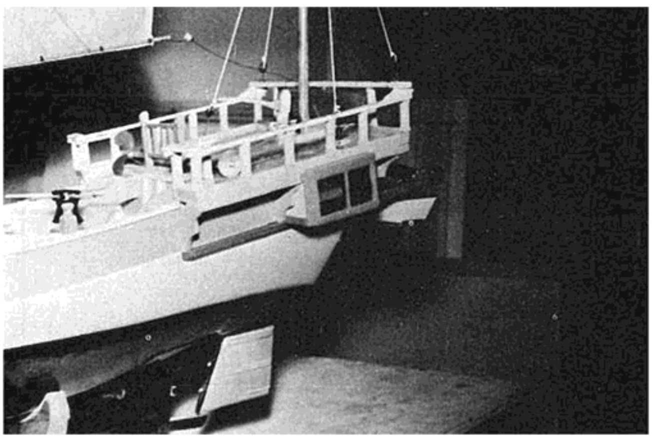
390



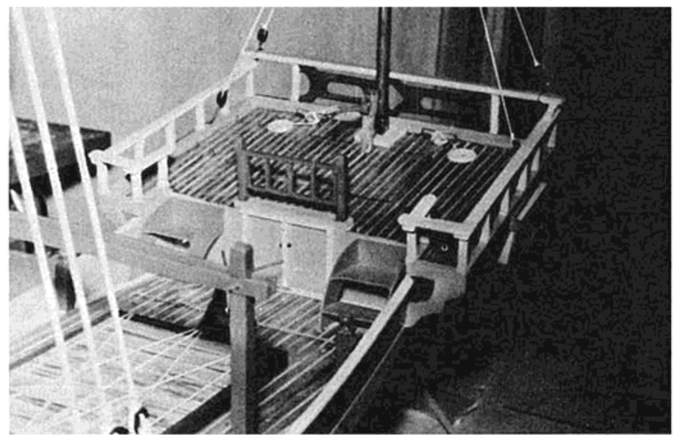
Hull framing on the 'Big One'.



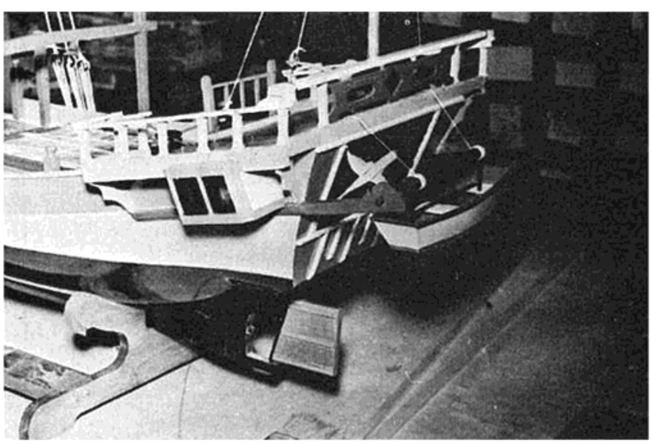
Hull planking partially completed.



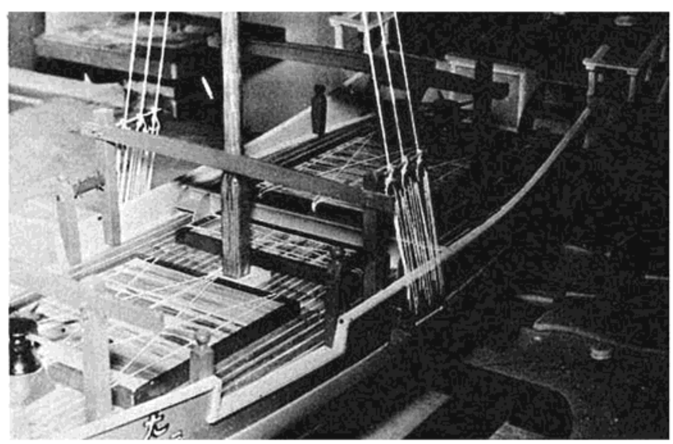
Stern view showing railing and windows.



A view of the stern deck detail.



Stern view showing stern design and dinghy.



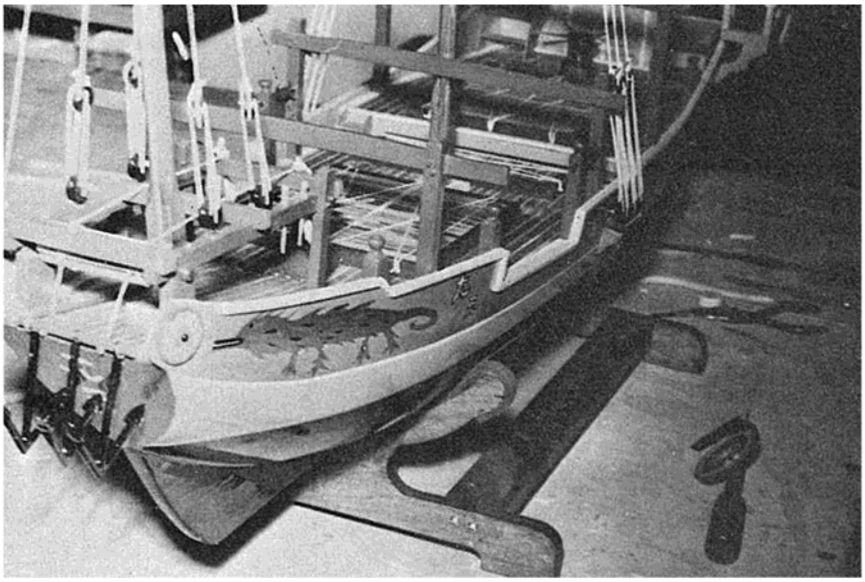
Midship view of gantries and main mast rigging.

With the jig prepared, the hull frames can be cut from 1/4" hard balsa sheet. There are ten frames, with the plan showing frame No. 1 as a typical section. The 1/4" x 1/2" balsa deck braces are glued into the frames. The 1/4" x 1/2" crossbraces are glued and pinned to the tops of the frames. The frames are made in halves, and glued together along the centerline. A 1/8" balsa gusset can be glued over the joint for additional strength.

Erect the frames in place on the jig. Use pins and glue to hold in place on the jig. Cut the keel from 3/8" hard balsa sheet (two pieces glued together to make the required width). Slip the keel into notches in the frames. This should pull the frames into alignment. Check one frame to be sure that it is perpendicular to the jig, and the rest should follow. Cut the bow and stern from 1/4" hard sheet balsa and glue in place on the keel. Cut the stern floor from 1/8" sheet balsa and glue in place to the stern and frame No. 10. Re-glue all joints.

Hold a strip of balsa along the frames and bevel them so that the strip lays flat on each frame. The bevel will be the sharpest at the bow and least at the stern and mid-ships.

Planking is accomplished with



Bow view showing bow mast, gantry, and rigging. Note bow design.

1/8" x 3/8" x 36" medium balsa strips. Start at the keel and work around the hull. Bevel the edge of the strips to insure that they fit tight together. Work the planking uniformly on both sides of the hull to lessen any distortion. If you wish to do a really professional job, there should be the same number of planks on each frame. To do this, divide frame No. 7 into 3/8" spaces, count the number of spaces, and divide the other frames into the same number of spaces. The width of the spacing will vary on each frame, and the planking strips are tapered to cover these spaces. This is really not required because the hull is painted, and this beautiful planking job will be covered. I random planked the hull until it was completely covered. Be sure that you plank up to the line shown on the typical section.

With the planking complete, cut the hull from the jig at the top of the planking. The frames are cut down to the top of the planking line. Use a strip of balsa to flare a smooth line between these points and trim off the excess wood. Cut this line with care because it becomes the top of the hull. Cut the frames down to the deck braces, being careful not to break off the free standing planking. Sand the inside smooth.

The bow deck brace is glued in place 1¼" behind frame No. 2 and extends across the hull, constructed from 1/4" x 1/2" balsa with the 1/2" side up. The brace is at the same level as frame No. 3. The mid-ships step is cut from 1/8" balsa sheet and is glued across the hull. Position 1/2" behind frame No. 6, 1/8" above frame No. 6 and even with top of frame No. 7. The stern step is cut from 1/8" sheet, glued across the hull 1-3/8" behind frame No. 9. The bottom is 1/8" above frame No. 9 and the top is flush with the strip layed across frame No. 10 and the stern.

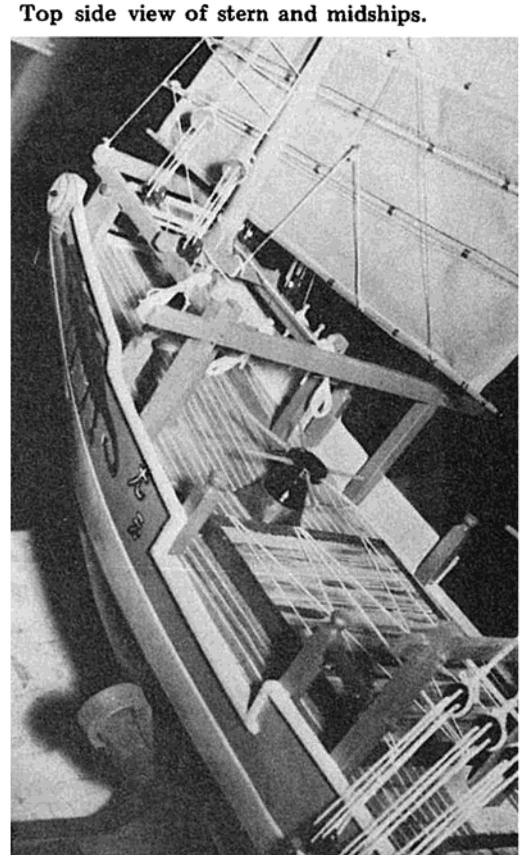
The mast bracing should be set into the hull at this time. The bow mast is located at frame No. 1. Use a 1/4" x 1/2" strip glued between frames No. 1 and No. 2, leaving a 1/2" space between the two braces. A small crosspiece is glued between the braces to form a 1/2" square box. The main mast is located 1/8" behind frame No. 5. Again, using 1/4" x 1/2" strip, glue between frames No. 6 and No. 7 with 1/2" spacing between them. Glue in the crosspiece. The stern mast requires a 1/4" sheet balsa box glued to the stern. Make a box to accept a 3/8" square mast and glue to the stern on the centerline flush with the deck.

There are two hatches in the deck that allow easy access to the equipment installed in the hull. The front hatch extends from the bow brace to frame No. 5. Notch the deck braces for 1/4" square balsa located 2-3/8" each side of centerline. Glue in a 1/4" strip. The stern hatch extends from the mid-ships step to frame No. 9. Notch the deck brace for a 1/4" square balsa strip 3-1/8" both sides of center. Glue in the 1/4" square strip. Also glue a 1/4" square strip across the mid-ship's step top.

The troublesome sailing keel is installed at this point. The keel, itself, is made from a 6" x 8" piece of 18 gauge sheet metal or a piece of 1/32" brass. Cut a piece of bar solder in half and bolt it to the 6" side of the keel with two 4-40 bolts. Place the writing on the solder toward the keel. Place the solder on something solid and tap the ends closed. File the ends round. The keel sits in the hull in a box much like a centerboard. The box is made from two pieces of 1/8" x 2½" x 5" plywood. Paint one side of the plywood with two coats of varnish. Sandwich the brass between the plywood and cut the brass to fit the plywood. Drill holes for 4-40 bolts 3/4" from the side and top. Glue a 1/4" square spruce strip around the top and sides. The ends of the box are 1/8" plywood glued to the 1/4" square strips around the box. The latter is set into the hull on top of the keel behind the main mast. Cut out frame No. 6 to accept the box, then glue the box in place, using plenty of adhesive. Cut a slot in the bottom of the balsa keel so that the metal keel can be slipped into the keel box. (I installed the keel only when I intended sailing the model.)

The deck can be cut from 1/8" sheet balsa and glued in place. The bow deck was made in two pieces and joined along the centerline. Lay a 1/8" sheet parallel to the centerline and mark off the curve of the side planking. Trim off the excess, and glue in

Top side view of stern and midships.



place. The side decks are made in the same manner, and slipped under the mid-ship's step. Fill in the deck between the side pieces and cut out the mast hole. The stern deck has a 1½" overhang on the sides. Flare deck frame No. 10 and stern so that deck lays flat, then glue in place. If you wish to have a hatch for access to the rudder arm, cut the stern deck out between frame No. 10 about 2" toward the stern, and approximately 4" wide. This will be a sheet hatch with no bracing, therefore be sure that it fits tightly. Glue 1/4" x 1/2" strip half under the deck around the opening. This will keep the hatch from falling into the hull.

Hatches are made slightly differently in order to insure a good fit. Cut two pieces of 1/8" x 2" balsa sheet to fit into the hatch opening and glue to the center deck frames along the centerline. At the edge of the opening (next to the deck hatch frames) notch the deck frames for 1/4" square balsa strip. Glue the strip into the notch along the length of the hatch. Do not glue to the brace on the deck. Cut the hatch out between the two 1/4" strips. Cover the rest of the hatch with 1/8" sheet. Hatches are held in place in the hull with four small wood screws placed in the corners. The deck is scored with a sharp awl, starting at the centerline and working out at 3/8" spacing. Stain the deck with walnut oil stain, wiping off to prevent the stain from penetrating and becoming dark. Apply three coats of clear varnish. Pre-paint three pieces of 1/16" x 1/4" x 36" spruce strips, (yellow) and glue to the deck along the edge at the side planking.

If you wish to power the model, install a Pittman 12 volt motor. The motor sits over frame No. 7. The shaft hole is made with a sharpened piece of 1/4" brass tubing, twisted through the keel. The shaft I used was made from 1/8" piano wire sheathed in a 1/4" tube with ends bushed with brass tubing to form bearings. Slip the tube into the hull and glue in place. Align the motor with scrap balsa. The propeller used was a 1-3/8" diameter nylon manufactured by Sterling Models.

The rudder tube is set into the stern floor. Make the hole in the floor and keel in the same manner as the propeller shaft hole was made. Glue in a 1/4" tube, and brace with 1/4" scrap balsa. The rudder is made from 1/4" x 3" x 3¼" mahogany. Screw the rudder to a piece of 3/16" brass tube and slip into 1/4" tube in the stern floor. The bottom of the rudder shaft is secured to the keel in a 3/8" x 3/8" x 4" piece of spruce set into the keel.

In preparation for painting, I strongly recommend that you fiberglass the entire outer surface of the hull. This will take care of sealing the wood and give you a hard, strong surface for the paint. If you do not fiberglass the hull, apply at least 12 coats of sanding sealer and sand smooth. I used Testors' spray paint on the entire model. The hull bottom is black to the waterline, light blue from the waterline to the deck line, and red above to the top of the hull. The colors were separated with 1/8" orange striping tape. (Apply two coats of clear varnish to prevent peeling.) The stern design was made from white decal paper and the dragon on the bow from gold decal paper with the 'dragon fire' painted on. You can use your own colors.

The masts are made from sugar pine (the jig). The ball was carved on the masts and not added on. All carving is done with a sharp knife and sandpaper. The bow mast dimensions are 1/2" x 1/2" x 18½" with a square bottom. The rounding of the mast starts 5½" from the bottom. The main mast is 1/2" x 1/2" x 28", with rounding starting 7" from the bottom. The stern mast is 3/8" x 3/8" x 14", with rounding starting 3½" from the bottom. The mast trees and braces are shown on the plan. Cut from 1/8" plywood and glue to the balls on the mast. The masts are stained walnut, as was the deck. Apply three coats of clear varnish. The trees are painted red. The flagstaffs on the masts are made from 1/8" dowel.

DECK DETAILS: The bow gantry was made from 1/4" x 3/8" spruce uprights and crosspieces. The bottom mount is 1/8" x 5/8" spruce. The bow roller is made from 3/4" dowel with the ends cut down to 3/8" diameter. The roller cleats are 1/8" square spruce. The gantry is painted green with brown roller and yellow cleats. Locate as shown on plan. The main mast gantry is 3/8" x 1/4" x 4" (uprights) and 3/16" x 3/8" x 10" spruce (crossbraces). The joints are glued and pegged with 1/16" dowel. The roller was made from 1/4" dowel with ends cut down to 1/8" diameter. The adjoining bitt is made from 3/8" square spruce. Drill a 1/8" hole in the bitt and upright to take the roller. The bitt and gantry are green, the roller brown. Locate from plans and glue to deck and bulwarks. All bitts are made from 3/8" square spruce with tops shaped as shown. Paint green and glue to hull and bulwarks as shown on plan. The stern gantry and bitt are made from 3/8" square spruce uprights and 1/8" x 3/8" crosspieces. The lower belaying pin rack is made from 1/4" x 1/2" x 5½" spruce. The gantry and bitt are green, the rack yellow. Belaying pins are carved from 3/16" dowel as shown. These were left natural. Drill holes in the rack and bow gantry and insert the belaying pins.

The steps are made from 1/16" sheet balsa. Paint red and glue in place. Around the edge of the stern deck glue a piece of 1/4" x 3/8" spruce, with 1/4" on deck. Glue a 1/4" square piece to the underside of the edge. Paint this coaming orange. Paint two pieces of 1/4" x 3/8" x 10" spruce, blue and glue to the outside of the hull (measure from plan) for dinghy hangers. Make the dinghy roller from 3/8" dowel, cutting the ends down to 1/4" diameter. The roller keepers are made from 1/4" scrap spruce. The roller is painted brown. Slip the dinghy hangers on the roller and mount the roller in the brace with keepers.

The stern windows are made from 1/8" balsa. The sides are cut to fit the hull. Cut the top and bottom so that they overhang the deck by 3/8". Assemble a piece of celluloid for the window with 1/16" strip frame. Paint the frames red, the window body yellow, and glue to the hull. The deck braces are made from 1/8" spruce, painted orange, and glued to the hull and deck overhang.

The stern rail is made from 1/4" square spruce stanchions, the corners cut on a small bevel. The cap rails are 1/8" x 3/8" spruce. The stanchions are glued to the stern deck coaming and the cap rails to the top of the stanchions. Stanchions are light blue and the cap rail is yellow. The stern part of this rail is made separately (see detail) and glued to the deck. The stern center deck rail is made and glued to the deck.

The mast coamings are made from 1/8" x 1/4" spruce, painted yellow and glued around the mast hole on the deck.

The dinghy was built on a backbone cut from 3/16" sheet balsa. Cut the bow and stern and a center section from 1/8" balsa and pin to the backbone. The sides are from 1/16" sheet balsa, glued to the bow and stern. Trim the sides to the shape of the bottom of the backbone and glue on 1/16" sheet balsa with the grain running across the hull. When the glue is dry, remove the backbone and midsection. The trim is 1/8" square balsa. The dinghy is brown, the seats yellow. The dinghy hanger is made from 1/8" brass tubing epoxied to the bottom. Solder a 1/4" brass ring to the top of the hanger and slip onto the roller at the stern. Mount the roller in keepers.

Anchors are made from 3/16" diameter brass tubing soldered together. Solder a 1/4" diameter brass ring on top of the anchor, then solder spade ends in place. Paint the anchors (3) flat black. Slip the rings onto a 1/4" dowel and paint brown. Glue the dowel between the side planking at the bow.

Cargo deck hatches are made from 1/2" x 1/2" balsa outside framing. Cover the center of the frame with 1/8" sheet, 1/8" below the top edge of the frame. Heavy white cord is used with ends cut down to 1/8" diameter. The adjoining bitt is made from 3/8" square spruce. Drill a 1/8" hole in the bitt and upright to take the roller. The bitt and gantry are green, the roller brown. Locate from plans and glue to deck and bulwarks. All bitts are made from 3/8" square spruce with tops shaped as shown. Paint green and glue to hull and bulwarks as shown on plan. The stern gantry and bitt are made from 3/8" square spruce uprights and 1/8" x 3/8" crosspieces. The lower belaying pin rack is made from 1/4" x 1/2" x 5½" spruce. The gantry and bitt are green, the rack yellow. Belaying pins are carved from 3/16" dowel as shown. These were left natural. Drill holes in the rack and bow gantry and insert the belaying pins.

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Anchors are made from 3/16" diameter brass tubing soldered together. Solder a 1/4" diameter brass ring on top of the anchor, then solder spade ends in place. Paint the anchors (3) flat black. Slip the rings onto a 1/4" dowel and paint brown. Glue the dowel between the side planking at the bow.

Cargo deck hatches are made from 1/2" x 1/2" balsa outside framing. Cover the center of the frame with 1/8" sheet, 1/8" below the top edge of the frame. Heavy white cord is used for lashing and is secured to the sides with large pins. The outer frame is painted bark brown, the center cover wood tan with brown streaks.

Capstans are carved from balsa block. The arms are 3/32" dowel pieces passed through holes drilled in the capstan. They are painted black. If you can find metal ones, use them, and consider yourself lucky!

The sails are made from cotton drip dry cloth. Sails shown are full size. Main and bow sails are made in the same way. Make a cardboard pattern and transfer to the cloth. Tape the edge with a bias tape. The sail braces are 1/8" dowel sewn to the sails at 1" intervals. Pass the thread around the brace at least three times. The sails shown on the model in the article were made from different colored cloth sewn together on the braces. This type of sail is a bit more trouble to make but sure looks good on the junk. Get your wife to sew them, if you can.

The rigging usually presents the most trouble. I have tried to be as specific as possible without getting too wordy. You will require 20 dead eyes made from 7/16" dowel cut into 1/8" thick slices. These pieces are drilled with three 1/16" holes in a triangle pattern. Cut a groove around the dead eye on the 1/8" edge. Also required are four bull's eyes. These are made from 1/4" dowel 5/8" long. Cut the dowel flat on the top and bottom to 3/16", and taper down the ends. Drill a 1/16" hole at one end, cut a groove around the bull's eye on the 5/8" sides. Paint dead eyes and bull's eyes black.

Slip the main mast into the hole in the deck and secure to the keel. On the edge of the dead eye (6) double wrap a piece of 26 gauge soft wire and twist off, leaving a 2" free end. On six other dead eyes, tie a heavy white fishing line in the grooves and tie off tightly. Use a lighter white fishing line and string the dead eyes together as shown on the plan. Allow about 3-5/8" between the dead eyes. Tie a loose knot around the stay line. The wire ends of the dead eyes are spaced along the spreader (3 each side) and secured to a large pin placed 1" below the spreader. Push the pin into the hull and glue from the inside. The stay lines are passed through the holes in the mast tree and pulled tight. They are tied off with a good knot. Check the mast position. The line ends that string the dead eyes are untied and pulled tight, evening out the dead eye spacing. Tie this line off around the stay lines. Make an additional loop and pass a piece of 1/16" dowel through the loop and tie off tightly. This is repeated at the mast tree using a 3/32" dowel.

The bow mast is slipped into the hole in the deck and secured to the keel. The dead eyes are strung (4 each) in the same way as the ones for the main mast were done. They are secured to the mast tree in the same manner. The lower ends of the dead eyes (wire) are secured around the bow gantry.

The stern mast is slipped into the deck box. Around the bull's eyes wrap (twice) 26 gauge soft wire and twist tightly, leaving a 2" free end. In the hole in the bull's eye, tie a piece of heavy white cord. Drill a 1/16" hole in the stern coaming 2½" from the stern. Push the wire through and twist off. The other wires are twisted around the stern rail. Secure the stay lines to the mast tree.

Sail working rigging are the lines that raise and lower the sails. This is accomplished with working metal blocks. Two blocks are used on each mast (5/16" diameter). Tie one block to the top brace on the sail. The other block is secured to the mast tree brace with 26 gauge soft wire. String the block with heavy white cord. The bow sail line is tied off at the belaying pin on the bow gantry. The main sail line is tied off on the belaying pin rack at the side. The lower brace of the sails are tied off directly to the mast with heavy white cord, passed around the mast several times.

Tacking rigging (lines at front, back and center of the sails) are used to set the sails. 1/4" wooden blocks (single) were used on this rigging (19 are required). The bow sail front rigging blocks are tied to the sail braces. White cord is tied to the brace and passed around the mast and through the blocks. This line is tied off on a belaying pin at the bow gantry. The center rigging is shown on the plan. This line is secured to the center brace on the bow gantry. Read the sail lines - the blocks are tied to the bracing ends with the blocks in the center of the line and free to slide. The lines tied to the blocks are tied off on the midships gantry.

The main mast tacking rigging is accomplished in the same manner as the bow lines. The front lines that are wrapped around the mast and brought through the blocks are tied off on the side belaying pin rack. The center rigging is shown on the plan. The rear rigging lines are passed through blocks that are tied to the stern mast and tied off at the stern rail.

The anchor rigging uses heavy white cord. Tie the cord to the dowel at the bow, looping the cord around the bow roller, and tie off on the belaying pins at the rear of the bow gantry.

The dinghy rigging is accomplished by wrapping heavy white cord around the roller six times and then tying it off. These lines are passed over the stern coaming and tied to cleats on stern deck. A few loops draped around the belaying pins also add a nice effect.

That's it – wasn't too bad, was it?

Greece City Xanthi by Night

Old City Xanthi Street

Old City Xanthi House

Xanthi Central Square

Xanthi Lake Vistonida

Xanthi River Nestos

Xanthi Old House M.Xatzidakis

RCBookcase

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