Originally published in America by FLYING MODELS this valuable collection of data sheets for aeromodellers provides almost a lifetime's collection of information on all aspects of model flying. Where necessary, facts have been amended to meet the requirements of British enthusiasts but many typical American expressions have been retained where international usage has accepted them.
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1. BUILDING, FLYING & ADJUSTING
ALL-BALSA GLIDERS

BASIC DESIGN:

- ALLOYING ALL CONVENTIONAL GLIDERS ARE VARIATIONS OF THE BASIC GLIDER SHOWN IN THE 3-VIEW. THESE SKETCHES MAY BE APPLIED TO ANY GLIDER.

- FOR Balsa, use Balsa No 6 for all-around performance.

- THICKER Balsa will result in a more rigid structure.

WING CONSTRUCTION:

- THE WING SHOULD BE SHAPED FROM MILD-SOFT Balsa.

- THICKER Balsa will result in a more rigid structure.

- Cuts should be smooth, even, and free from waves.

- IF Balsa is too soft, the wing may be stiffened with blocks of wood.

STAB & RUDDER:

- THE STAB & RUDDER ARE SHAPED TO THE SAME DIMENSIONS AS WING & TAIL SURFACES.

- THE RUDDER IS A SMALLER VERSION OF THE WING AND IS CONSTRUCTED IN THE SAME WAY AS THE WING.

- THE RUDDERS SHOULD BE ATTACHED TO THE TAIL WITH WIRE & SCREW.

- COUNTER-WEIGHTS MAY BE ADDED TO THE RUDDERS TO BALANCE THE GLIDER.

- ADD CLAY WEIGHT TO THE NOSE TO BALANCE THE GLIDER.

- EXPERIMENT WITH FUSELAGE HEIGHT UNTIL YOU ARE SATISFIED WITH THE PERFORMANCE.

WING & TAIL SURFACES:

- THE FUSELAGE BEGINS AT THE NOSE AND SHOULD BE CONSTRUCTED FROM LIGHTWEIGHT MATERIALS.

- THE FUSELAGE SHOULD BE STIFFENED WITH WIRE & SCREW.

- THE TAIL SURFACES SHOULD BE ATTACHED TO THE TAIL WITH WIRE & SCREW.

- COUNTER-WEIGHTS MAY BE ADDED TO THE TAIL SURFACES TO BALANCE THE GLIDER.

FUSELAGE CONSTRUCTION:

- THE FUSELAGE IS MADE OF LIGHTWEIGHT MATERIALS AND SHOULD BE CONSTRUCTED IN THE SAME WAY AS THE WING & TAIL SURFACES.

- THE FUSELAGE SHOULD BE STIFFENED WITH WIRE & SCREW.

- THE TAIL SURFACES SHOULD BE ATTACHED TO THE TAIL WITH WIRE & SCREW.

- COUNTER-WEIGHTS MAY BE ADDED TO THE TAIL SURFACES TO BALANCE THE FUSELAGE.

FINAL ADJUSTMENTS:

- IF DIVING:
  - Do not exceed the limit of the dive.
  - The dive should be controlled with the rudder.

- IF STALLING:
  - The stall should be controlled with the rudder.

- IF TURNING:
  - The turn should be controlled with the rudder.

OPTIONAL LAUNCHING METHODS:

- RIGHT HAND LAUNCH:
  - The glider should be launched from the right hand.

- LEFT HAND LAUNCH:
  - The glider should be launched from the left hand.

CONCLUSION:

This is the end of the first part of the series on building, flying & adjusting all-balsa gliders.
3. CHUCK-GLIDER DESIGN DATA

DESIGN LAYOUT FOR BASIC HAND-LAUNCH GLIDER

**WING SIZE:** Select a span and chord which will give a wing size from 20 to 30 square inches in area. The span should be six to eight times the length of the chord; the approximate thickness of the wing surface, 1/16" to each 1" of chord.

**WING AREA:** To determine the amount of wing area, multiply the span by the chord; then subtract the area removed to make the semi-circular ends of half-circle. The result is the area by the radius; and then by 1.57. An airfoil differs in the area above as recommended, as it will result in achieving results with maximum stability.

**DIHEDRAL:** Dihedral is the angular setting of the wing panels with respect to the horizontal plane of the front view of the model. For simplicity of construction, a V-type dihedral is recommended, as shown above.

**FUSELAGE LENGTH:** The total length of the model from the nose to the trailing edge of the stab or rudder, whichever is further from the nose, should be approximately three-quarters the same length as the wingspan. The maximum fuselage depth should be no more than one-third the wing chord. The maximum fuselage thickness should not exceed one-quarter of the fuselage depth.

**MOMENT ARMS:** The distance between the centerline of the wing and the centerline of the stab is known as the Moment Arm. This should be one and one-half times the length of the fuselage, with the length of both tail and nose moment arms equaling the fuselage length between the center of the fuselage and the centerline of the stabilizer.

**INCIDENCE:** Incidence refers to the angle at which the wing or stab is set with reference to the horizontal reference line of the fuselage side view (see drawing). For a basic hand-launch glider, wing incidence should be 2° to 3°. Stab incidence should be 0° to 1°. If maximum stability is preferred, use the maximum value for wing incidence and the minimum value for stab incidence.

**RUDDER AREA:** Select the values which identify the type of rudder used. For a single rudder, the area should be 4% to 11% of the wing area for a single rudder with tip plates, 10% to 12% for double rudder, and 12% to 15% for V-lipped rudder. The center of gravity is placed between 30% and 40% of the wing area. When the center of gravity is far too forward, the model will dive, and when too far to the rear, the model will stall. If you change the proportions set forth for the correct tail and nose moment arms for this glider, the theoretical center of gravity will be located approximately one-third of the wing chord forward of the trailing edge.

**FUSELAGE LENGTH AND DEPTH:** The fuselage length should be one to one and one-quarter the wing span. The maximum fuselage thickness should be no more than two-thirds of the wing chord.

**ADJUSTING TECHNIQUE:** Add ballast in the form of clay to the nose of the fuselage until a glide is obtained with a slight nose-up tendency. For right-hand launch, the right adjust for a left turn. Begin by wrapping the rudder to the left little at a time until a wide circle is obtained in the glide. Make final adjustments by wrapping right inward wing panel down, or, if recovery is too quick and the model stalls, use right stab panel to delay recovery and tighten turns. In doing so, it may be necessary to remove some clay to compensate for the additional nose-down effect of the stab adjustments.

---

DESIGN LAYOUT FOR CONTEST HAND-LAUNCH GLIDER

**WING SIZE:** Select a span and chord which will give a wing area of from 20 to 30 square inches. This size is preferable if your only previous experience has been with a basic hand-launch glider. Use the same chord-to-span ratio limits as on the basic hand-launch glider. A high span-to-chord ratio is preferable on a contest glider. The thickness ratio remains the same as on the basic hand-launch glider.

**AIRFOIL SHAPE:** There are two types of airfoil shapes which can be used. The first bottom airfoil (A) is recommended as a first design to which an unnumbered section (B) can be added if desired.

**INCIDENCE:** Only a small amount of incidence is recommended with a contest hand-launch glider to assist in maintaining a moderate amount of stability without affecting the altitude obtainable in launching.

**STAB INCIDENCE:** 1° to 1°

**STAB AREA:** The stab should be 30% to 40% of the wing area. If previous experience with a contest hand-launch glider is lacking, or launching ability is moderate, use a stab area which closely approximates the maximum suggested, in conjunction with the minimum suggested for the tail moment arm.

---

POYHEDRAL Polyhedral, as shown, is a form of wing panel arrangement preferable to the V-type designed, except possibly when the span-to-chord ratio is low. In the design shown, polyhedral is used to best advantage for contest flying.
4. SIMPLE SLAB-SIDER BUILDING

STEP I - STUDY PLAN:
- Familiarize yourself with the fuse plan, L/L plan, and determine outline of the basic fuselage prior to construction.
- Note the carry and structure details on the sketch are added later, as on most models.

STEP II - LAYOUT LONGERONS:
- Select wood for the fuse longerons and a good shape. Longerons should be cut and pinned in place of the wood, as shown in this step. Longerons should be fitted and pinned in place of the wood, as shown in this step. Longerons should be fitted and pinned in place.

STEP III - ADD FUSELAGE UPRIGHTS:
- The fuse should be checked for balance by means of a small wheel on the fuse base and by means of a small wheel on the fuse base. Longerons should be fitted and pinned in place of the wood, as shown in this step.

STEP IV - START SECOND SIDE:
- Lay out the longerons for the second side, and fit them in place of the first. Skip then between the pins without removing them.

STEP V - TRIM, SAND, AND SEPARATE:
- Note double uprights for the second side, and fit them in place of the first, to secure alignment.

STEP VI - ALLOW TO DRY THOROUGHLY:
- The fuse should be checked for balance by means of a small wheel on the fuse base and by means of a small wheel on the fuse base. Longerons should be fitted and pinned in place of the wood, as shown in this step.

STEP VII - CEMENT SECOND SIDE IN PLACE:
- Next, apply a drop of cement to each cross-piece, and drop the second side in position. Once again, the fuse aligns to the first side as it develops. The fuse aligns to the first side as it develops.

STEP VIII - NOSE CROSS-Pieces:
- Most longerons taper in toward the nose. As seen in the top view in the extreme right, to simplify this side of the assembly, stretch a rubber band across the nose. The fuse should be checked for balance by means of a small wheel on the fuse base and by means of a small wheel on the fuse base. Longerons should be fitted and pinned in place of the wood, as shown in this step.

STEP IX - CHECKING ALIGNMENT:
- With the alignment complete, the remaining cross-pieces may be inserted.

STEP X - SANDING:
- Give the entire structure a general sanding to remove rough edges, finishing sand, and excess cement.

Construction principles outlined here are applicable to most models using this type fuselage construction.
5. CABIN SLAB-SIDERS

VARIATIONS ON BASIC FUSELAGE STRUCTURE

- **START BY BUILDING UP CLEARER/FORMER ASSEMBLY**
- **TRIM HARDWOOD MOTOR BEARERS TO NOSE CURVE**
- **P/F GAS TYPE**
- **PLYWOOD**
- **PLANKED TOP - CUT OUT TO SUIT MOTOR**
- **LAMINATED NOSE BLOCK**
- **ANTTI-WARP 'W BRACING - ON TOP AND BOTTOM**
- **USE SIMILAR BRACING FOR WINDING**
- **DETACHABLE NOSE BLOCK FOR WINDING**
- **NOTE: HALF-NORMAL WIDTH SPACERS - SINCE TWICE AS MANY ARE NEEDED**
- **RUBBER POWER TYPE**
- **SUITABLE FOR BOTH RUBBER AND GLIDER (INSTEAD OF BLOCK)**

BASIC FUSELAGE CONSTRUCTION
(Glider shown - but similar for rubber and gas)

- **MAKE ASSEMBLY FORMERS FROM STRIP Balsa**
- **BUILD SECOND SIDE OVER FIRST - AND SEPARATE WHEN DRY WITH RAZOR BLADE**
- **BUILD SIDE FRAME - PINNING DOWN LONGERONS, THEN ADDING SHEET PARTS AND SPACERS**
- **JOIN SIDES AT CABIN POSITION WITH THE TWO ASSEMBLY FORMERS**
- **ADD CABIN SPACERS BEFORE JOINING AT NOSE AND TAIL**
- **FULL IN ALL NOSE AND TAIL - THEN ADD ALL REMAINING SPACERS**
- **ADJUST SPACERS AND STRINGERS IN PLACE**
- **CEMENT FORMERS AND STRINGERS IN PLACE**
- **ADD SHEET STAB PLATFORM**
- **CEMENT FORMERS AND STRINGERS IN PLACE**
- **HOLLOW OUT NOSE BLOCK - FOR LEAD WEIGHT**
- **SIDE STRINGER**
- **FIT IN WITH SHEET**
- **WELL CEMENT HERE**
- **DOWELS**
- **CELLULOIDE**
- **THIN CARD**
- **TOWNOSES MOUNT**

-BILL DEAN
6. SHEET & BLOCK FUSELAGES

PROFILE TYPE

1. CUT OUT TO SUIT SIDE-MOUNTED MOTOR
2. LANDING GEAR LOCATION
3. ATTACH SETTING AND CLOTH PATCH
4. FUEL TANK POSITION

GROUNDED TYPE

1. USE MODELING KNIFE TO CUT OUT SHEET BALSA PARTS
2. BLACK TISSUE WINDOWS - DIPPED IN PLACE
3. ATTACH SHEET WING MOUNT
4. DETACHABLE STABILIZER MOUNT

SHEET TYPE

1. CUT OUT SECOND SIDE - USING FIRST AS PATTERN
2. ATTACH NOSE SHEETING AND CUT OUT TO SUIT MOTOR
3. LOCATION SLOTS FOR FORMERS
4. FIN CEMENTED TO DETACHABLE STAB.

BLOCK TYPE

1. CEMENT SIDE PIECES TO BASE
2. FORMERS AND ALIGNMENT
3. ADD MOTOR BEARERS
4. ATTACH 'L.G.' TO PLY FORMER

HOLLOWED BLOCK TYPE

1. SPOT-CEMENT TWO BLOCKS TOGETHER AND CUT OUT SIDE-VIEW OUTLINE
2. SEPARATE BLOCKS - THEN TRACE TOP VIEW OUTLINE ON FLAT INNER FACE OF LOWER BLOCK AND CUT TO SHAPE
3. CARVE AND SAND TO EXTERNAL SHAPE - THEN SEPARATE AND HOLLOW OUT BOTH BLOCKS
4. METHOD IS SELDOM USED FOR FREE-FLIGHT MODELS

TYPICAL SECTION

MARK TRIMMING LINES WITH A BALL POINT PEN

BILL DEAN
7. MAKING STRONGER FUSELAGES

COMMON TROUBLE SPOTS IN CABIN TYPE FUSELAGES:

- Final tab adjustment must be cemented.
- Wrap resistance of this block is key to strength of fuselage.
- Overall, so mounted, is apt to give open top fuselage tissue.
- A stud rest is very important. Studs must be riveted in addition.
- If end grain is not even, a preliminary coat of cement, followed by a second coat, is essential to hold the joint. This is very important.
- Use celluloid of a thickness suitable for the model.
- A hold-down hook must be secured to strengthen structural members.
- A sandwich pattern may be made of two sheets of plywood, with a layer of balsa between them.

GEAR INSTALLATION:

- Piano wire is strongest when it is not bent at all. Necessary bends should be held to a minimum, and made with a great deal of care, to avoid crystallization from too much adjustment.
- Use a heavy gauge piano wire for the model in question.
- Use a heavy enough gauge piano wire for the model in question.
- Sheet metal gear should be bent with a slight radius rather than abruptly.
- Internal damage: panel-load dummy, batteries, receivers and all heavy objects must be braced to withstand crashes without tearing loose.

INTERNAL DAMAGE:

- Panel-load dummy, batteries, receivers and all heavy objects must be braced to withstand crashes without tearing loose.
- Just a bad blow in the glide is enough to send object clear through 6 or 8 sheet paper, as soon as the nose is struck, break & seizure.

MOTOR MOUNTS:

- Beam mounts should be long enough to allow wood to set well cemented in place.
- DO NOT USE TIE WIRE.
9. AIRFOIL PLOTTING

AIRFOIL TERMS—WHAT THEY MEAN:

- Upper Camber: The upper curvature of the airfoil.
- Lower Camber: The lower curvature of the airfoil.
- Under Camber: The reverse curvature of the lower camber.

STATIONS: Positions at which the points for the airfoil curve are plotted.

DATUM LINE: A reference line above and below which the points for the airfoil curve are plotted.

N.A.C.A. CODE BREAKDOWN

N.A.C.A. 6 4 12

NATIONAL ADVISORY COMMITTEE ON AERONAUTICS

SIX POPULAR AIRFOILS

CLARK V

RECOMMENDED FOR FREE FLIGHT GAS, RUBBER, TOWLINE AND U-CONTROL SPORT OR RADIO DESIGNS

GRANT X-8

RECOMMENDED FOR CONTEST FREE FLIGHT GAS, RUBBER, TOWLINE AND U-CONTROL RADIO DESIGN DESIGNS

RAF 32

RECOMMENDED FOR CONTEST FREE FLIGHT GAS, RUBBER AND TOWLINE DESIGNS

DAVIS

RECOMMENDED FOR U-CONTROL, SPORT AND SPEED DESIGNS

N.A.C.A. 6409

RECOMMENDED FOR U-CONTROL, SPORT AND SPEED DESIGNS

N.A.C.A. 2409
10. BASIC WING CONSTRUCTION

**STEP I - STUDY PLAN**
Thoroughly familiarize yourself with the plan before starting construction.

**STEP II - CUT OUT RIBS**
In most kits, ribs are already cut.

**STEP III - NOTCH TRAILING EDGE**
With a router, notch the trailing edge block.

**STEP IV - RIBS**
After notching the block, add each rib in place, pinning as indicated.

**STEP V - LEADING EDGE**
Select straight-grained, warp-free wood for the leading edge. Pin to plane as shown, securing rather than piercing the ribs.

**STEP VI - WING SPARS**
The wing spar is cemented in the spar notches, flush with the top center of the ribs.

**STEP VII - LANDIGRIP**
Center ribs are not installed until step ii.

**STEP VIII - SAND BOTTOM**
Remove all gloss of excess cement, and give bottom of wing panels a general sanding with progressively finer grades of sandpaper.

**STEP IX - PLYWOOD GUSSETS**
Most models, especially those larger than 257, need plywood gussets at the diagonal and poloidal break.

**STEP X - CEMENT GUSSETS**
When cut accurately, the plywood gusset automatically forms proper dihedral when the panels are joined.

**STEP XI - JOIN WING PANELS**
All end seams should be given a preliminary coat of cement before the panels are joined. As soon as the cement has dried sufficiently, invert the center rib.

**STEP XII - PLANKING**
If the wing in question requires planking along the leading edge, first cut its width down to the distance between the leading edge and the spar.

**STEP XIII - CEMENT TO L.E.**
First cement the sheet plywood to the leading edge as shown, and allow to dry for a few hours before going on to step xiv.

**STEP XIV - CEMENT TO SPAR**
Apply cement to the ribs and spar, and pin in place until thoroughly dry.

**STEP XV - PLANK CENTER SECTION**
The top center section of the wing is now planked in much the same manner as the bottom center section. The planking prevents damage from handling and wing rubber, and adds strength.

**STEP XVI - PLANK BOTTOM**
The recess left at the spar end of step xii will now permit the flush mounting of the bottom center section planking.

**STEP XVII - PLANK CENTER**
The recess left at the spar end of step xii will now permit the flush mounting of the bottom center section planking.

**STEP XVIII - WING TIPS**
The most widely used wing tips are those that can be carved from a small block of balsa, because of construction ease. Rough carve it to shape, then trim it and sand to final contour after it is cemented in position.

**STEP XIX - CAPSTRIPS**
Very soft balsa is ideal for capstrips. Capstrip hole the covering above the spar, strengthen the ribs and enhance the appearance.

**STEP XX - CAPSTRIPS**
Very soft balsa is ideal for capstrips. Capstrip the covering above the spar, strengthen the ribs and enhance the appearance.

**STEP XXI - FINAL SANDING**
Apply a thin film of cement over points of maximum stress, such as trailing edge, blends, etc. Sand entire wing, including all covering, using 320 grit. Then fire sandpaper.

CONSTRUCTION TECHNIQUES OUTLINED HERE MAY BE APPLIED TO OTHER WIVES AS WELL.
11. MORE COMPLEX WING BUILDING

BUILDING PREPARATION

SAND SHEET BEFORE CUTTING OUT THE RIBS

MAKE PLY TEMPLATE FOR CUTTING OUT ALL RIBS FOR UNTAPERED INNER PANELS OR CONSTANT CHORD WINGS

LEADING EDGE (L.E.)

REINFORCE L.E. AT BEND WITH SHEET GUSSETS

PLY WOOD

DIHEDRAL BRACES

CENTRE LINE

TAPERED EDGE AND BOTH SPANS OUTBOARD OF THIS RIB

TAPER LEADING EDGE

REINFORCE L.E. HERE

LAYOUT FOR TYPICAL BUILT-UP TYPE WING

INSERT RIBS TO INSURE STRONG JOINT WITH T.E.

V" DIHEDRAL IS USED ON MOST SPORT TYPES

DRAW UP FULL-SIZE PLAN OF WING AND BUILD OVER THE TOP

TRIM TIP TRAILING EDGE % (T.E.)

MARK TIP RIBS ON SHEET - CUT OUT - THEN USE AS PATTERNS FOR DUPLICATES

WHEN SHAPING SPANS AND OTHER PARTS ON TO SHEET, SEE THAT THEIR GREATEST LENGTH FOLLOWS GRAIN

(BUILDING STAGES ARE ON THE NEXT PAGE)

VARIATIONS ON BASIC WING STRUCTURE

BLOCK TIPS

TRIANGULAR SECTION

POLYHEDRAL BREAK

SYMMETRICAL SECTION (STUNT)

"CONTEST" TYPE POLYHEDRAL

PACK UP L.E. AND T.E. DURING CONSTRUCTION

"UNDERCAMBERED" SECTION (CONTEST)

PACK UP L.E. AND T.E. DURING CONSTRUCTION

PACK UP SPAR AND T.E. DURING CONSTRUCTION

earer Spar and T.E. Over Plan - Using Pins to Hold in Place

MATERIAL NEEDS TO BE DISCHARGED AND DRIED BEFORE USING A MOLDING KNIFE

ADD I.E. GUSSETS

SANDWICH BALSA RECTANGLES BETWEEN L.E. AND T.E. RIBS - THEN CARVE RIBS

PACK UP SPAR AND T.E. DURING CONSTRUCTION

PLY END RIBS

GRIND RIBS TO ACCOMMODATE SHEET L.E.

SHEETED L.E.

PINS

RIBS FOR TAPERED WING

JOIN DIHEDRAL BRACES TO SPAN BEFORE CEMENTING THE LATTER IN THE RIB SLOTS

BEFORE APPLYING THE TISSUE COVERS, SAND THE ENTIRE WING AND CHECK FOR WEAK JOINTS

PACK UP COMPLETED WING PANEL, TO PROVIDE CORRECT DIHEDRAL ANGLE

FINISH OFF T.E. ALSO L.E. AND TIPS WITH FINE SANDPAPER

COMPLETE SECOND PANEL IN SAME SEQUENCE AS FIRST - JOINING BY MEANS OF DIHEDRAL BRACES

REINFORCE JOINT WITH TAPE AFTER SHAPING THE T.E.

BASIC WING CONSTRUCTION (SIMILAR FOR STABILIZERS ALSO)

START PANEL BY PLACING L.E. REAR SPAR AND T.E. OVER PLAN - USING PINS TO HOLD IN PLACE

CUT RIB NOTCHES IN TRAILING EDGE WITH MOLDING KNIFE

CHECK THAT ALL RIBS ARE VERTICAL BEFORE CEMENTING

INSTALL HARD BALSA FOR 1/2 X MODELS OR PLY DIHEDRAL BRACES

CHECK THAT WING RESTS FLATLY ON SUPPORT

INSTALL THICKER CENTRE RIB AT ANGLE TO MATCH DIHEDRAL - WITH AID OF ANGLE TEMPLATE

NOTE USE OF PINS

CHECK THAT ALL RIBS ARE VERTICAL BEFORE CEMENTING

1 2 3 4 5 6 7

BEND L.E.

TAPER BOTH SPANS AND L.E. FROM POINT AT WHICH WING OUTLINE TAPERS

ADD TIP PIECES

AD D.I.E. GUSSETS

AD D.I.E.

ADD TIP PIECES

AD D.I.E. GUSSETS

AD D.I.E.

ADD TIP PIECES

AD D.I.E. GUSSETS

AD D.I.E.

ADD TIP PIECES

AD D.I.E. GUSSETS

AD D.I.E.
12. ELLIPTICAL WINGS

CONSTRUCTION OF AN ELLIPTICAL PLANFORM

STEP ONE: Construct rectangle which will enclose proposed elliptical planform (maximum chord and span).

STEP TWO: Divide rectangle into two sections—one third chord for leading edge section and two thirds chord for trailing edge section. This arrangement will produce the most popular form of elliptical planform. Being used however, the sections can be divided equally, reversed or altered in any manner to produce a great many other variations of the elliptical planform.

STEP THREE: Draw two half circle arcs from point of intersection of centerline, tangent (touching) to the leading and trailing edges respectively.

STEP FOUR: Divide half circle arcs into equal units, subdividing last remaining unit.

STEP FIVE: Divide the span of rectangle into the same number of units as that of each half circle arc.

STEP SIX: Connect corresponding unit stations by projecting them until they intersect, producing points on the elliptical planform.

STEP SEVEN: Using French curves connect plotted points to obtain elliptical planform.

CONSTRUCTION OF A PARABOLIC PLANFORM

STEP ONE: Construct rectangle which will enclose proposed parabolic planform (maximum chord and span).

STEP TWO: Divide rectangle into two sections—one third chord for leading edge section and two thirds chord for trailing edge section. Most popular arrangement as in elliptical planform—can also be altered to produce other variations.

STEP THREE: Divide span of rectangle into equal units, subdividing last remaining unit.

STEP FOUR: Divide each section of the chord into half the number of units on the span of rectangle.

STEP FIVE: Connect corresponding unit stations by projecting diagonal lines.

STEP SIX: Using French curves draw in parabolic planform by following the inside pattern obtained from drawing the diagonal lines.

13. STRUCTURAL PROBLEMS

WING STRUCTURAL PROBLEMS:

The general tendency today is to construct a wing from as few pieces as possible. Experienced modelers and model builders know that a minimum of parts, time, and expense are required for maximum strength and minimum cost. There are two main considerations to be taken into account:

1. The size of the parts and the materials used. Balsa is often the material of choice for its light weight and ease of handling. The parts should be cut to size and assembled with care to ensure a smooth and even surface.

2. The size of the parts and the materials used. Balsa is often the material of choice for its light weight and ease of handling. The parts should be cut to size and assembled with care to ensure a smooth and even surface.

AIRFOIL PROBLEMS:

There is no percentage in making a wing that will not hold its shape. The airfoil shape is critical to the overall performance of the wing. It is important to use a high-quality airfoil at the proper angle of attack to ensure maximum lift and minimum drag.

TRAILING EDGE:

Due to the relatively small thickness of the rib-trailing edge butt-join, it should be strengthened as illustrated below.

CHOICE OF BALSAS:

Your model, like the airplane or the man, is only as strong as the weakest piece of wood in it. Nothing but perfect material should be used for wing structural members. Select the strongest, highest-quality balsa available. Use the highest-quality balsa available.

LANDING IMPACT:

A balsa landing will split the wing tips. The idea is to avoid inverted ground contact and to prevent overhang of landing gear. The wing tips will carry the impact of the landing.

VIBRATION:

Vibration is the key in testing the model for proper balance. The model should be balanced at the nose and at the tail. The nose should be balanced at the nose, and the tail at the tail. A nose weight will help balance the model. An engine must be light on the nose. Engine weight must be in the tail. Engine weight must be in the nose. An engine must be light on the tail. Engine weight must be in the nose. Engine weight must be in the tail. A nose weight will help balance the model. An engine must be light on the nose. Engine weight must be in the tail. Engine weight must be in the nose. Engine weight must be in the tail. A nose weight will help balance the model.

WARP-S ALIGNMENT:

An expert may misalign and warp his flying surfaces purposely. The other is caused by the effects of wind, whether smooth or during the test. The wind waves the tail. Fix this with some tape or tie the wing to the model. Warps may be used to cause or to correct any alignment. An expert may misalign and warp his flying surfaces purposely. The other is caused by the effects of wind, whether smooth or during the test. The wind waves the tail. Fix this with some tape or tie the wing to the model. Warps may be used to cause or to correct any alignment.

REPAIRS:

When possible, major repairs are best made at home. Double coat all areas that have been sanded down. Use good cement. When possible, major repairs are best made at home. Double coat all areas that have been sanded down. Use good cement.
14. COVERING & DOPING WINGS

COVERING MATERIALS:
SELECT YOUR COVERING MATERIAL FOR THE JOB WHICH IT MUST DO. FOR THE AVERAGE E-RAIL OR ROCKET MODEL, ANY OF THE STANDARD GRADES OF TISSUE WILL DO NICELY. WHEN ADEQUATE DURABILITY IS DESIRED, USE SILK OR NYLON.

SILKSPAN: WHITE ONLY - APPLY WET OR DRY - CAN BE APPLIED OVER COMPOUND SURFACES.
JAP TISSUE: SCARCE AS HENS TEETH, LIGHT - REQUIRES LESS DOPE - MUST BE APPLIED DRY.
NYLON: SEE TO DESIRED COLOR - VERY DURABLE, BUT MUST BE PULLED VERY TIGHT WHEN WET.
MICROFILM: REFLECTS SPECTRUM, TRANSPARENT, FANTASTICALLY LIGHT - MODERATELY DURABLE.

PREPARATION:
ALL DENTS, PUFFS, EXCESS STOCK, CEMENT, GLASS ETC. MUST BE TRIMMED OR Sanded OFF.
DRAIN GRAIN BY TEARING PART OF TISSUE IMPORTANT.

A WING WITH PLAN VIEW DESIGN MAY BE COVERED MORE EASILY, NEVER WRAP AROUND WINGS IN ONE PIECE.

COVERING DRY:
WHEN COVERING A FLAT BOTTOM WING, IT IS NOT ADVANTAGEOUS TO DOP OVER EACH RIB AND SPAN, AS THIS MIGHT CAUSE UWED SHIRRONG.
IF THE BOTTOM OF YOUR WINGS IS UNDERCAMBERED, APPLY A COAT OF THINNED DOPE TO EACH RIB AND SPAN TO PREVENT THE TISSUE FROM BEING THE COSY SURFACE.
DO NOT USE SILK ON WARGS OR LIGHTWEIGHT STRUCTURES. HEAVILY DOPED SILK HAS BEEN KNOWN TO CAUSE AND SLOW DOWN INSTEAD.
RELY ON COVERED TISSUE OR Dope FOR COLOR ON PRE-FIUGHT MODELS, RATHER THAN EXCESSIVE QUANTITIES OF HEAVY DECORATED DOPES.

COVERING WET:
SLOPE IS APPLIED ON OPEN PAN OF COOL WATER.
FULL, TIGHT AND FREE OF AIR Bubbles, KEEP DAMPENING.
PERM DECAL TO SCAN ONLY. UNTIL IT CAN BE SLID OFF CONTACT PAPER.
WET ABOUT ROOM TEMPERATURE.
STEP THREE: BEFORE APPLYING COLOR TRIAL, MASK OFF AREA TO BE TRIED WITH MASKING TAPE.
NOTE TO PREVENT OR ELIMINATE BLUSHING OF CLEAR AND COLORED Dope IN WARM WEATHER ADD A RETARDER OF THE SAME BRAND AND TYPE ABOUT ONE DROP OF RETARDER FOR EACH OUNCE OF Dope.
STEP FIVE: APPLY TWO TO THREE COATS OF MEDIUM CONSISTENCY COLORED Dope TO MASKED LEADING EDGE SURFACES.
STEP SIX: APPLY DECALS TO SURFACES FOR ADDED APPEAL.
STEP SEVEN: SPRAY LIGHT FILM OF CLEAR DOPE OVER DECALS TO SECURE PERMANENTLY IN PLACE.
15. WING ATTACHMENT METHODS

BASIC WING HOLD-DOWNS:

WING RUNNER FIXING

CABIN MOUNT FIXING

HARD BALSA RUNNERS

RUBBER BANDS

Dowel Pegs

RUBBER BANDS PASS AROUND THE FUSELAGE. THE WING CAN BE SHIFTED FORWARD OR BACK FOR BALANCE.

FIXED WING ASSEMBLY

WING RUNNERS CAN BE TAPERED TO INCLUDE REQUIRED INCIDENCE.

SEVERAL DEGREES OF INCIDENCE GENERALLY BUILT INTO FUSELAGE.

Cement directly to the fuselage.

ALMOST ALWAYS USE HARD BALSA RUNNERS AND SMALL, FREE-FLIGHT MODELS.

WING

SLIT THROUGH FUSELAGE

WIRE PARASOL MOUNT FIXING

Solid pylon variation

WIRE "U" OR DOWEL

SOLID PYLON MOUNT FIXING

WIRE OR TUBING SUPPORTS

SANDPAPER STRIPS

MINIMIZE WING SHIFTING.

WIRE PARASOL

BUILT-UP PYLON MOUNT FIXING

TONGUE PLUG-IN FIXING

Dowel Mounts

SANDPAPER STRIPS

MINIMIZE WING SHIFTING.

HOLD-DOWN RUBBER

FUSELAGE HOLD-DOWN FIXING

SEPARATE RUBBER TO FUSELAGE BOTTOM HOOK.

PLUG-IN WING INSTALLATIONS:

Dowel SPAR PLUG-IN

P.D.G.

SPAR PLUG-IN FIXING

P.D.G.

HARD BALSA SPAR PLUG-IN

PLYWOOD TONGUE COVERED TO ALLOW FOR SWING.

Dowel SPAR PLUG-IN

Rubber Band

P.D.G.

SPAR PLUG-IN FIXING

P.D.G.

TONGUE PLUG-IN FIXING

Rubber Band
16. PROPellers FOR ALL PURPOSES

PROPeller ClAssificationS

GAS MODEL PROP
Made of hardwood or plastic to withstand the high revolutions of an engine available ready for use.

RUBBER MODEL PROP
Generally hand-carved from balsa for sport flying. Lightweight hardwood or plastic props are available in finished form.

INDOOR MODEL PROP
For endurance flying, props are ordinarily built up from strip balsa and covered with Monofilm. Lightweight all-balsa props are generally used for novice or sport flying.

PROPeller FACTS

The purpose of a prop is to convert the energy of the power unit into forward motion (thrust).

The prop blade is the surface which pushes or pulls the model through the air. This prop has two blades.

The distance a prop could move forward in one revolution, if there were no resistance offered by the model, is known as the "theoretical pitch. The actual pitch" is the true distance traveled. Commercial props are listed according to their theoretical pitch.

Check for balance. A poorly balanced prop results in poor performance. It puts a strain on the power unit. Check for balance on a knife edge at a center of the prop. Heavy blade or add finish to light blade, to obtain perfect balance.

For normal right turns use high pitch props to decrease turning radius and low pitch to increase turning radius.

For normal left turns use high pitch props to increase turning radius and low pitch props to decrease turning radius.
17. ENGINE MOUNTINGS

BEAM MOUNTED ENGINE INSTALLATIONS

PLYWOOD- PAN TYPE
PLATE TYPE
NUT- TYPE
BEAM TYPE
 plywood- pan
beam type

FASTEN PLYWOOD UNIT TO HARDWOOD BEAM IN FUSELAGE WITH WOOD RUBBER

FUEL TANK
PLYWOOD NOSE DOUBLER
INVERTED TYPE

SIDE- MOUNTED PROFILE TYPE
SOLDER NUTS TO BOTTOM OF METAL PLATE

CONVERSION TYPE (RADIAL TO BEAM)
BOLT TO FIREWALL
BOLT TO BEAM

METAL OR WOOD
CUT HOLES FOR LIGHTER WEIGHT

PLYWOOD FIREWALL

BOLT TO BEAM
CUT HOLES FOR LIGHTER WEIGHT

METAL- BRACKET TYPE
ALUMINUM BAR STOCK- TURN DOWN AND THREAD END FOR MOUNTING

SIDE- MOUNTED TYPE
ALUMINUM BAR STICK

CAST MAGNESIUM- PAN TYPES
DRILL AND TAP HOLES

MISCELLANEOUS

DRILL AND TAP HOLES

P.D.G.

THE PITCH SHOWN IN THESE TABLES IS THE THEORETICAL PITCH!
18. PLANFORMS IN GENERAL

WING & STAB PLANFORMS

BASIC PLANFORM SHAPES

- RECTANGLE
- TRIANGLE
- ELLIPTICAL
- PARABOLIC
- CIRCLE
- HALF CIRCLE
- QUARTER CIRCLE

GENERAL APPLICATIONS OF BASIC & COMPOSITE PLANFORMS

- FREE FLIGHT GAS MODELS
- CONTROL LINE GAS MODELS
- RUBBER POWERED MODELS
- GLIDER MODELS

NOTE: PLANFORM SHAPES SHOWN FOR THE DIFFERENT MODELS ARE INTENDED TO BE INTERCHANGEABLY, MANY TIMES TO GREAT ADVANTAGE.
19. CONTROL LINE PLANFORMS

FUSELAGE AND RUDDER PLANFORMS

BASIC FUSELAGE CROSS-SECTION SHAPES:

- CIRCLE
- SQUARE
- TRIANGLE
- DIAMOND
- RECTANGLE
- ELLIPSE
- PARABOLA
- HEXAGON
- OCTAGON

GENERAL APPLICATION OF BASIC AND COMPOSITE PLANFORMS

CONTROL LINE

TYPICAL SPEED:

- GAS
- RUBBER
- TOWLINE

TYPICAL STUNT:

- GAS
- RUBBER
- TOWLINE

TYPICAL TEAM RACERS:

- GAS
- RUBBER
- TOWLINE

NOTE: INFORM AND CROSS-SECTION SHAPES SHOWN FOR DIFFERENT TYPES CAN BE USED INTERCHANGEABLY, MANY TIMES TO GREATER ADVANTAGE.
20. USE OF MATERIALS

Sheet Balsa
- Wing ribs
- Leading edges
- Center section
- Cap strips
- Fuselage sides, tops, bottoms

Plywood
- Firewalls
- Speed model stab
- Gussets
- Block balsa
- Windshield
- Wing root fairing
- Wingtips
- Cowlings

Bamboo
- Reed
- Stabilizer outlines
- Wingtip outlines

Winding hook sleeve
- Cockpit combing

Rubber tubing
- Scale tires
- Fuel lines
- Wheel hold-ons

 Expanded Polystyrene
- Floats
- Wingtips
- Decking

Sheet dural
- Motor mounts
- Landing gears

Piano wire
- Skids
- R/C landing gear

Fibre glass
- Beeping up nose section
- Wheel pants
- Shell wingtips
- Cowlings

Sheet acetate
- Canopies
- Windshields
- Windows

Cotton cloth
- Dihedral re-inforcement

Bob Coon
21. FUSELAGE COVERING PROCEDURE

FLAT SURFACES:
(DRY COVERING)
USE A 50-50 MIXTURE AS AN ADHESIVE.

MATERIALS REQUIRED
BRUSHES MATERIALS
SCISSORS RAZOR BLADES
WATER ATOMIZER
SANDPAPER COVERING MATERIALS

COVERING WITH TISSUE PAPER
PRESS OUT ALL WRINKLES FROM TISSUE PAPER WITH WARM IRON.

APPLY ADHESIVE ONLY TO LONGERONS AND DIAGONAL MEMBERS AT EACH END OF FRAME, OF SIDE TO BE COVERED.

TRIM EXCESS WITH RAZOR BLADE.

TOP MUST BE COVERED IN SECTIONS AROUND THE PYLON.

SPRAY COVERING WITH WATER, UNTIL THE COVERING IS COMPLETELY DAMPENED. DO NOT SOAK COVERING!

LARGER MODELS CAN BE COVERED WITH WET SILK, SILKSPAN, OR SKYSAIL, BUT NOT WITH TISSUE BECAUSE IT FALLS APART.

VARIATIONS ON FLAT SURFACE COVERING
COMPLETELY WOOD COVERED FRAMES CAN BE COVERED WITH TISSUE, FOR DURABILITY.

COVERING PROCEDURE FOR FLAT-SIDED FUSELAGE WITH MORE THAN FOUR SIDES IS THE SAME.

FOR ADDED STRENGTH, MODELS CAN BE DOUBLE COVERED, CROSS-GRAIN SECOND LAYER.

COVERING MATERIALS, WHETHER SILK OR TISSUE, IS ESSENTIALLY AS FLAT AS A HAM.

IF IT CANNOT BE ROLLED INTO A TUBULAR SHAPE, IT IS PULLED, OR DRIP, OR DRIP.

RUT-HALF A BALL IS HALF THE PROBLEM.

AND IF WE COVER WITH WET PAPER, THEN THE JOBS WILL BE EASY.

TEAR SHOWS GRAIN DIRECTION.

TOP MUST BE COVERED IN SECTIONS AROUND THE PYLON.

SPRAY COVERING WITH WATER, UNTIL THE COVERING IS COMPLETELY DAMPENED. DO NOT SOAK COVERING!

LARGER MODELS CAN BE COVERED WITH WET SILK, SILKSPAN, OR SKYSAIL, BUT NOT WITH TISSUE BECAUSE IT FALLS APART.

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FOR ADDED STRENGTH, MODELS CAN BE DOUBLE COVERED, CROSS-GRAIN SECOND LAYER. P.D.G.
22. ALL ABOUT DETHERMALISERS

WEIGHT-SHIFTING DETHERMALISERS:

DROP-WEIGHT TYPE
RECOMMENDED FOR HAND-LAUNCH GLIDERS

Cement thread to wingtip opposite normal glide turn up nose.
Turn, attach thread to left wing.

Timer:
False back on timer.

When timer rod hits in, timer falls free and strings.

Rudder:
Able to be set, nut or bolt is fastened to thread.

As soon as timer-spool strikes ground, the unbalanced condition disappears and the model resumes its normal turning direction. This counteracting the spin.

SPIN-TAB TYPE

STABILIZER-DISTURBANCE DETHERMALISERS:

POP-UP TYPE
MOST POPULAR

Wing:
Thread limit stop.

Timer:
Operated pop-up type.

Extension arm.

Pivot tail surfaces with tensioned rubber band fastened to hook on rudder and to dowel or hooks on fuselage sides.

POP-AROUND TYPE

Rudder band, under tension, pulls starboard up and around.

Tinfoil protection.

POP-AROUND TAB ARRANGEMENT DEVELOPED BY BOB BURGESS DIVER SNAP RESPONSE AND EXCELLENT DRAW ACTION CAN BE USE OR TIMER-OPERATED.

FOR FIXED STABS OR SMALL RUBBER-POWERED OR GAS MODELS A FUSE-OPERATED TAB CAN BE USED DEVELOPED BY PHIL DELGADO.

DRONE TYPE
NOT RECOMMENDED FOR LARGE MODELS

CHESTER LANZO DEVELOPED HINGED CABIN AND FUSELAGE DOOR DETHERMALISERS, BOTH OF WHICH ARE TIMER-OPERATED.

LOU ANDREWS DEVELOPED THIS TYPE, WHICH PRODUCES THE SAME EFFECT AS A POP-UP TAIL.

SPLIT-FUSELAGE TYPE

WING-DISTURBANCE DETHERMALISERS:

TIMER-OPERATED WING POP-UP ARRANGEMENT DEVELOPED BY ED SCHLOSSER

REST FOR SMALL GAS, RUBBER-POWERED MODELS, OR TOWING SLIDERS.

POP-UP TYPE

FLAP TYPE

PARACHUTE DETHERMALIZER:

DEVELOPED BY HENRY STRICK

CHUTE SIZE DATA

CHUTE SIZE
A
B
C
D

WING AREA
100 TO 200 SQ. IN.
200 TO 400 SQ. IN.
400 TO 600 SQ. IN.
600 TO 800 SQ. IN.

RUBBER BAND
8
10
12
14

PARACHUTE IS RACED IN FUSELAGE FUSE OR TIMER-OPERATED DOOR OPENS AND PARACHUTE DROPS OUT. CORD IS FASTENED AT TAIL, WHEN IT OPENS IT DRAGS BEHIND MODEL.

TRIPPING DEVICES:

FUSE TYPE

A BURNING FUSE IS THE MOST COMMON TRIPPING DEVICE, HAZARD IS MINIMIZED BY HAVING FUSE REST IN SNUFFER TUBE. A CYLINDER OF DRY ICE CAN BE INSERTED IN SNUFFER TUBE INSTEAD OF BURNING FUSE.

FUSENRG SECURED TO TIMER ARM

RUBBER BAND (EMBEDS TENSION TO HOLD DOWN)

TIMER-ACTIVATED IN SNUFFER TUBE TO HOLD DOWN HOOK, TENSIONED RUBBER BAND RAISES UP.

REMOTE TRIPPING DEVICE DEVELOPED BY JOHN TATONE

Provides tripping leverage.
25. UNDERCARRIAGES & WHEELS

BASIC INFORMATION
- Piano wire is the most widely used material for landing gear struts. This is true for both free-flight and control-line models.
- It can be obtained at hobby shops in sizes up to 1/6" in diameter.

TWO-WHEEL LANDING GEAR
- The standard two-wheel landing gear is by far the most popular in use today. This type of gear may be used on almost all kinds of model planes, either as fixed or retracted construction. It can be mounted either with or without cloverleaf or 'O' notch.

SINGLE-WHEEL GEAR
- This type of gear is used for small-light models.
- Mount in the model the same way as a two-wheel gear.

WING-MOUNTED GEAR
- The wing is bound to the fuselage with heavy fire-lead and cemented in place.
- Wing center section should be reinforced to take landing shocks.

SCALE LANDING GEAR
- Mount in fuselage in the conventional manner.
- Balsa fairing may be added.
- Shock bars made from lighter wire than main gear.
- This type of gear is used where heavy landing shocks are encountered.

FLIGHT TRIM
- Improves the handling for many modelers. If the model is too close to the ground, the model will land and takeoff on one wing. This can be prevented by adjusting the elevator in forward or backward. Adjustments are made by turning the wheel, which is connected to the controls through the hinges.

REEL AND LINES:
- Kinetic wires should be jumpers, not streamlined. They are not safe. Use precaution instead of plugs.

ELEVATOR HINGES:
- The common cloth hinge is easy to make, short lines.
- Dope and glue on flexible edges may crack the cloth. The cloth also leaves a bump effect. Warning: Underside of the tail assembly:
- The interlocking hinge wire is excellent for scale jobs.
26. C/L HANDLES & OPERATION

CONTROL HANDLE DESIGN

A SMALL CONTROL HANDLE IS LESS SENSITIVE BECAUSE THE LINE MOVEMENT IS SMALL.

LARGE CONTROL HANDLES ARE MORE SENSITIVE BECAUSE THERE IS MORE LINE MOVEMENT.

BASIC SYSTEM IN OPERATION

EXAMPLES OF DESIGN

<table>
<thead>
<tr>
<th>Roll</th>
<th>Control Handle</th>
<th>Control Horn</th>
<th>Σ</th>
<th>0</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot;</td>
<td>5 1/2&quot; 3/4&quot;</td>
<td>20&quot; 37&quot;</td>
<td>33&quot;</td>
<td></td>
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<tr>
<td>3&quot;</td>
<td>5 3/4&quot; 2&quot;</td>
<td>20&quot; 34&quot;</td>
<td>36&quot;</td>
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<tr>
<td>3&quot;</td>
<td>5 1/2&quot; 1/2&quot;</td>
<td>20&quot; 30&quot;</td>
<td>41&quot;</td>
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<tr>
<td>2&quot;</td>
<td>5 1/2&quot; 1/2&quot;</td>
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<tr>
<td>2&quot;</td>
<td>5 1/2&quot; 5/8&quot;</td>
<td>20&quot; 44&quot;</td>
<td>40&quot;</td>
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<tr>
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<td>20&quot; 57&quot;</td>
<td>61&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: THE CONTROL SYSTEM SHOULD BE DESIGNED TO PROVIDE THE DEGREE OF ELEVATOR MOTION DESIRED.

THE LENGTH OF THE PUSHROD OR CONTROL LINES DOES NOT AFFECT THE DESIGN OF THE CONTROL SYSTEM, BUT IT HAS INFLUENCE ON ITS OPERATION.

Σ = 20° (MAXIMUM WINDING)

FLAP CONTROL

NOTE: FLAP CONTROL DESIGN IS SIMILAR TO THAT SHOWN FOR ELEVATORS.

ELEVATOR ROD ON INSIDE (SLOWER RATE OF ACCELERATION)

ELEVATOR ROD ON OUTSIDE (FASTER RATE OF ACCELERATION)

ELEVATOR CONTROL HORN ON TOP

ELEVATOR CONTROL HORN ON BOTTOM

WING FLAPS

FLAP CONTROL HORN ON TOP

FLAP HORN LONGER

FLAP HORN SHORTER

ELEVATORS

DESIGN REQUIREMENTS

TO MAINTAIN LINE TENSION:
1. OFFSET PLUGS
2. STAGGER LINES SLIGHTLY REARWARD
3. ADJUST BALLAST TO OPPOSITE WINGTIP
4. OFFSET ENGINE
5. MAKE INBOARD WING LONGER

FLYING WINGS ARE DESIGNED AND HOOKED UP IN THE SAME MANNER AS FLAP AND ELEVATOR CONTROL SYSTEMS.
27. TEAM RACING & SPEED FLYING

GENERAL INFORMATION

A RECORD-BREAKING SPEED WUN IS NOT DUE TO A NIP-UP ENGINE OR SUPER-SECRET HOT FUELS, AS IS GENERALLY BELIEVED. ATTENTION TO DETAIL IN ALL PHASES OF SPEED FLYING IS THE KEY TO SUCCESS. GOOD SPEED FLYING IS THE RESULT OF WELL-THOUGHT-OUT DETAILS CAREFULLY CARRIED OUT & YOU ARE ONLY AS FAST AS THE WEakest Link in That Chain.

These details are as follows:

1. A WELL-CONSTRUCTED PLANE OF ADVANCED DESIGN, NICE OR NOT, IS IMPORTANT.
2. A GLASS-LIKE FUEL-PROOF FINISH.
3. A PROVEN RACING ENGINE WELL TAKEN CARE OF.
4. A RELIABLE, CONSISTENT FUEL.
5. A POOL-PROOF FUEL SYSTEM (TANKS).
6. A SUFFICIENTLY LARGE TESTED PROPELLER.
7. A RELIABLE TAKE-OFF DOLLY FOR LARGE HAND LAUNCH.
8. A SET OF A.M.A. SPECIFICATIONS CONTROL LINES.

CLEANLINESS—THIS APPLIES TO ALL THREE POINTS MADE ABOVE.

KEEP TIGHTLY SADDLED FUEL IN A CLEAN GLASS BOTTLE. STORE YOUR FUEL IN A CLEAN GLASS BOTTLE. LABEL YOUR FUEL.

TYPICAL EFFECTIVE METAL TANK, WELL BUILT, WELL LACQUERED, MADE FROM TIN CAN STOCK.

THERE ARE EXCELLENT NAME BRAND RACING FUELS ON THE MARKET TODAY AS WELL AS A FEW RECOMMEND FOR USE.
28. TANKS & TIMERS

FREE-FLIGHT

STEPPED TANK

TRAP ON ENGINE

SPRING LOADED TANK

RIGGER HOLE IN TANK

ENGINE IS STARTED AND ADJUSTED USING FULL TANK CAPACITY. RELEASE OF TANK ROO AND LAUNCHING ALLOWS A PREDETERMINED ENGINE RUN FROM LOWER FUEL CELL.

HOLLOW INTERNAL TANK

TO ENGINE

ENGINE RUN FROM LOWER CELL IS ADJUSTED BY ADJUSTING Balsa BLOCKS OR LEAD SHOT.

FUEL LINE TO ENGINE

RADAR TANK

CONSISTS OF A COIL OF FUEL LINE. THE LENGTH OF WHICH DETERMINES THE ENGINE RUN. STARTING TANK, FALL OFF FUEL LINE AT LAUNCHING.

STANDARD TYPE P-4 TANK

AVAILABLE COMMERCially IN MANY SIZES. ALSO AVAILABLE FROM TIN-CAN STOCK.

FUEL LINE TO TANK

VENT & FILLER TO TANK

TIMERS TO LIMIT ENGINE RUN

FUEL-TANK DUTY TANK

TO ENGINE

FLEXIBLE FUEL LINE TO ENGINE

CLOCKWORKS TIMER

ARM ACTUATES "DIE" TYPE SHUT-OFF

SWING TIMER

TRAVELING SQUEEZES THE FUEL LINE, SHUTTING OFF THE ENGINE.

SHEET-TANK FUEL TANK

TO EROSION

CONSISTS OF A COIL OF FUEL LINE. THE LENGTH OF WHICH DETERMINES THE ENGINE RUN.

TIMERS AND ACCESSORIES MAY BE BOUGHT TO FIT YOUR MODEL.

RADIO-CONTROL

TYPICAL R.C. TANK

STEADY PRESSURE TANK

MISFIGHTEN TANK

FLEXIBLE PLASTIC TANK

TO FILLER CAP

FUEL REGULATOR

TO ENGINE

WALKER TANK IS ALSO USED IN MANY OTHER CLASSES OF MODELS.

A VARIATION OF THE "CLANK TANK" IS ALSO USED IN R.C. (SEE STUNT TANKER)

HAROLD STEVENSON

CONTROL LINE

STUNT, SPORT & FLYING SCALE

TYPICAL "NEEDLE" TANK

SQUARE TYPE ONE OF THE BEST STUNT TANKS MADE TODAY!

"CLANK TANK"

PICKUP TUBE SHAKES FOR NORMAL OR INVERTED FLYING.

TRUE PRESSURE TANK

PICKUP TUBE SHAKES FOR NORMAL OR INVERTED FLYING.

TYPICAL R.C. AIR SPEED TANK

MAKE FROM TIN-CAN STOCK, WELL GLOSERED

NAVY CARRIER EVENT

TWO-SPEED, TWO NEEDLE-VALVE SET-UP

A STANDARD TANK IS USED WITH THE EXCEPTION THAT TWO PICKUP TUBES ARE EMPLOYED. "TEE."
29. FINISHING & DECORATING

WOOD FINISHING:

MATERIALS REQUIRED

- CLEAR DOPES
- MASKING TAPE
- PYREXALM PRIMER
- WAX
- SOFT CLOTH
- BRUSHES
- U.S.A.F. REGALS
- RUBBING COMPOUND

GENERAL PROCEDURE:

STEP ONE: FUEL-PROOF WIRE OF FUSELAGE WITH CLEAR FUEL-PROOF Dope.

STEP TWO: WHEN BASIC STRUCTURE HAS BEEN COMpletely ASSEMBLED AND SMOOTH-SAND. START EXTERNAL SURFACE FINISHING BY BRUSHING ON TWO TO THREE COATS OF SANDING SEALER; SMOOTH-SAND BETWEEN EACH COAT.

STEP THREE: IF LIGHT WEIGHT, IT IS NOT AN IMPORTANT FACTOR. BRUSH ON TWO COATS OF AUTO-PRIMER. SMOOTH-SAND BETWEEN COAT. THREE TO FOUR COATS OF THICK-CONSISTENCY CLEAR FUEL-PROOF Dope ARE THEN BRUSHED ON.

STEP FOUR: AFTER DOPING, SPRAY ON AT LEAST FOUR COATS OF PLASTIC OR ALUMINUM SPINNER. SPRAY OR BRUSH ON THREE TO FOUR COATS OF CLEAR Dope. ADD ALL SURFACE MARKINGS AND APPLY DECALS TO MODEL. SPRAY LIGHT PROTECTIVE FINE OF CLEAR FUEL-PROOF Dope OVER GLOSSY COATS.

STEP FIVE: MASK OFF AREA TO BE COLORED. TRIMMED AND CLEAR Dope. ONE COAT OF MASKING TAPE TO PREVENT THE FUSELAGE FROM BEING SANDING UNDER SPRAY OR BRUSH ON THREE TO FOUR COATS OF RUBBING COMPOUND. ADD PLASTIC OR ALUMINUM SPINNER.

STEP SIX: ADD ALL SURFACE MARKINGS AND APPLY DECALS TO MODEL. SPRAY LIGHT PROTECTIVE FILM OF CLEAR FUEL-PROOF Dope OVER GLOSSY COATS.

30. SINGLE CHANNEL RADIO CONTROL

WHAT YOU NEED FOR CONTROLLING MODEL PLANES BY RADIO:

1. TRANSMITTERS:

- Whip antenna
- A key is used to open and close the circuit which sends the signal.
- MicrO-SWITCH

2. RECEIVERS:

- Condenser
- Resistor
- Tuning coil
- Condenser
- Resistor
- Tuning coil

3. RELAYS:

- Antenna
- Ground type transmitters are more versatile since they can be used with a wide range of frequencies. They are used in commercial units.

4. ACTUATORS:

- Escapement
- These come in several types and can be used with a wide range of frequencies. They are used in commercial units.
5. CONTROLS:

The movement of the torque tube from right to left is applied to the control surface by one of the control linkages shown above.

6. METERS:

These are necessary to adjust the R/C equipment.

7. BATTERY EQUIPMENT:

These come in various types and sizes and at a wide range of prices. Microwatts offer greater accuracy but are not necessary.

ACCESSORIES:

Wire nut and bolts. Keep a few slide switches on hand. Receivers usually require the double pole-single throw (DPS) type. Single pole double throw (SPDT) type is used in other parts of model, such as the actuator circuit.

BATTERY BOXES ARE A CONVENIENT WAY TO MOUNT SMALL BATTERIES IN A MODEL. THESE ARE AVAILABLE IN VARIOUS TYPES AND SIZES.

MULTI-CORE MUSIC RADIO CONTROL

The difference between single- and multi-channel:

SINGLE-CHANNEL:

The transmitter sends a 27.25 mc carrier wave, which is at radio frequency and cannot be heard by the human ear. The electronic control circuit then regulates the signal.

MULTI-CHANNEL:

A typical three-channel hand-held transmitter sends 27.25 mc carrier waves at radio frequency. The control stick is moved in this manner: see the wiring diagram below for complete details.

TYPICAL TRANSMITTER:

The control stick is moved to the proper position to control the desired channel. Only one tone can be transmitted at a time. The other two tones are ignored.

TYPICAL RECIEVER:

The tones are received, one at a time, and fed into the tone block which passes the appropriate tone to the control circuit. The proper channel is selected by the receiver.

TONE BLOCK:

The tone block is an electrical filtering device in the circuit, and has no moving parts.

BY ROY DAVIES
33. FREE FLIGHT TRIMMING

FORCES AND ADJUSTMENTS:

WASH-OUT:

WASH-IN:

ALIGNMENT:

WARP REMOVAL:

FLOATING AILERON:

C.G. LOCATION:

Your model's c.g. may vary from the c.g. location shown on the kit or magazine plans. Due to slight differences in wood grain, engine weight etc., this is not critical and may be adjusted for.

WASH-OUT:

- Wash out the trailing edge of wing tip
- Wash in the leading edge
- Try freely hinges un-weighted celluloid tab
- In climb it will have very little effect.

FLOATING AILERON:

- Washed an adjustment is required for an e.c.t. only try a freely hinges un-weighted celluloid tab
- In climb it will have very little effect.

WASH-IN:

- Wash in the trailing edge of wing tip
- Wash out the leading edge
- Try freely hinges un-weighted celluloid tab
- In climb it will have very little effect.

ALIGNMENT:

- With motor and starboard servo attached
- Model will tend to turn to the right.

WARP REMOVAL:

- Do not neglect this
- Waps may be removed with steam or hot faucet water, first slightly in opposite direction hold open heat source until it is well set
- Your model structure must be sturdy, or it will not be able to hold an adjustment.

C.G. LOCATION:

- The center of gravity is usually located further back on the chord on pinion types.

WASH-OUT:

- Wash out the trailing edge of wing tip
- Wash in the leading edge
- Try freely hinges un-weighted celluloid tab
- In climb it will have very little effect.

WASH-IN:

- Wash in the trailing edge of wing tip
- Wash out the leading edge
- Try freely hinges un-weighted celluloid tab
- In climb it will have very little effect.

ALIGNMENT:

- With motor and starboard servo attached
- Model will tend to turn to the right.

WARP REMOVAL:

- Do not neglect this
- Waps may be removed with steam or hot faucet water, first slightly in opposite direction hold open heat source until it is well set
- Your model structure must be sturdy, or it will not be able to hold an adjustment.

C.G. LOCATION:

- The center of gravity is usually located further back on the chord on pinion types.

WASH-OUT:

- Wash out the trailing edge of wing tip
- Wash in the leading edge
- Try freely hinges un-weighted celluloid tab
- In climb it will have very little effect.

WASH-IN:

- Wash in the trailing edge of wing tip
- Wash out the leading edge
- Try freely hinges un-weighted celluloid tab
- In climb it will have very little effect.

ALIGNMENT:

- With motor and starboard servo attached
- Model will tend to turn to the right.

WARP REMOVAL:

- Do not neglect this
- Waps may be removed with steam or hot faucet water, first slightly in opposite direction hold open heat source until it is well set
- Your model structure must be sturdy, or it will not be able to hold an adjustment.

C.G. LOCATION:

- The center of gravity is usually located further back on the chord on pinion types.

WASH-OUT:

- Wash out the trailing edge of wing tip
- Wash in the leading edge
- Try freely hinges un-weighted celluloid tab
- In climb it will have very little effect.
34. TROUBLE SHOOTING

(1) STALL
(2) DIVE

THE STALL

FLY LIKE THIS

IF YOUR MODEL STALLS AND RECOVERS GRADUALLY THEN IT IS CORRECTLY TRAINED.

DO NOT FLY LIKE THIS.

THE DIVE

FLY LIKE THIS

NOTE: DO NOT CONFUSE A STALL WITH A DIVE.

IF YOUR MODEL DIVES AND SHOWS NO SIGN OF FALLING OUT THEN IT IS INCORRECTLY TRAINED.

DO NOT FLY LIKE THIS.

STALL ADJUSTMENTS

1. Try one or more of these for glide adjustment:
   - Turn under power:
     - Add weight to tail.
     - Add weight to nose.
     - Looping:
       - Add weight to nose.
       - Looping will move nose to a lower position.
     - Add weight to nose:
       - Looping will move nose to a higher position.
   - Dive adjustments:
     - Tilt stabulator down:
     - Increase weight of wedge as needed.
     - Add weight to tail:
     - Add weight to nose:
     - Looping:
       - Add weight to nose:
       - Looping will move nose to a lower position.

DANGEROUS ADJUSTMENTS:

- Motor cut and glide, or right cut and glide is a little rough, so be careful.
- Model accelerates too much under power, and starts to spin in as motor cut, the glide trim will not act to pull model out, as with an opposite circuit.

TRIMMING GLIDE:

- Test glide model into wind to check incidence and turn characteristics.
- Never interpret the stab as a dive.

STALLING:

- Test glide model into wind with the nose depresed. If a stall is detected, add a thin slice of wood under the trailing edge of wing or tail leading edge. (See Incidence)
- When properly adjusted, your model will be stable in a dive, flying gently into a landing without any tendency to stall.

GLIDE TURN:

- If model, glides straight with slight stall after motor cut, left in left turn or stall. Adjust for proper trim.
- Always remember that wing should be tilted back or nose up.

TURN UNDER POWER:

- Most plywood rudder model to the right, while airplane wants right.
- Wing and gear airplanes try to climb to the left.
- ALWAYS REMEMBER THAT WING SHOULD BE TILTED BACK OR NOSE UP.

LOOPING:

- Add or remove weight, left or right as necessary.
- Angle of attack and incidence.

TRANSITION TO GLIDE:

- As the model changes from power to glide, there is often a slight stall, before it settles into its normal glide. Should it hit the ground, avoid for more stall. In glide and try to get model to roll over. Do glide for maximum lift after the stall.
(3) SPIN

(4) RECOVERY

THE SPIN

SPINS DUE TO INCORRECT WIND DIRECTION AND WIND COMBINATION ARE Destructive THAN TRUE SPIN

TRUE SPIN BELOW FREE-FIIGHT FLIGHT LIMITS PERFORMANCE.

SPIN ADJUSTMENTS

TRY ONE OR MORE OF THESE FOR SPIN ADJUSTMENTS

STABILIZE RECRIEY IS THE RESULT OF SUFFICIENT CONTROLLING THE SPIN OF THE MODEL TO REACH THE END OF TURBULENT AIR IN THE SPIN OR SPIN.

RECOVERY TRANSITION

LOOSING THE MODEL AT THE END OF THE SPIN CAN OCCUR WHEN POWER IS CUT OFF.

A GOOD RECOVERY RESULTS IN A SUDDEN RISE IN ALTITUDE AND MODEL BECOMES Destructive THAN TRUE SPIN.

RECOVERY ADJUSTMENTS

TRY ONE OR MORE OF THESE FOR RECOVERY ADJUSTMENTS

TILT ENGINE OR NOSE DOWNS AND MODEL LOOPS UNDER POWER PREVENTING A GOOD CLIMB AND RECOVERY.

TILT TAB.

ADD A TAB OR WING OR HINGE TO MODEL AT NEW ATTITUDE WITH INCREASED OR DECREASED SPIN IN CLIMB.

RECOVERY ADJUSTMENTS

TRY ONE OR MORE OF THESE FOR RECOVERY ADJUSTMENTS

 سريع تمهل الزادة وتصدرها في الهواء وفتح الرياح بسرعة وتحقيق الخروج من الدعاية وتجنب الارتفاع.

OR:

CUT OR REMOVE WING AND MOUNT NEW WING AT NEW ATTITUDE.

ON MODELS WHICH REFUSE TO RECOVER FROM SPIN ADJUSTMENTS.

SHRINK THE SPIN ADJUSTMENTS.