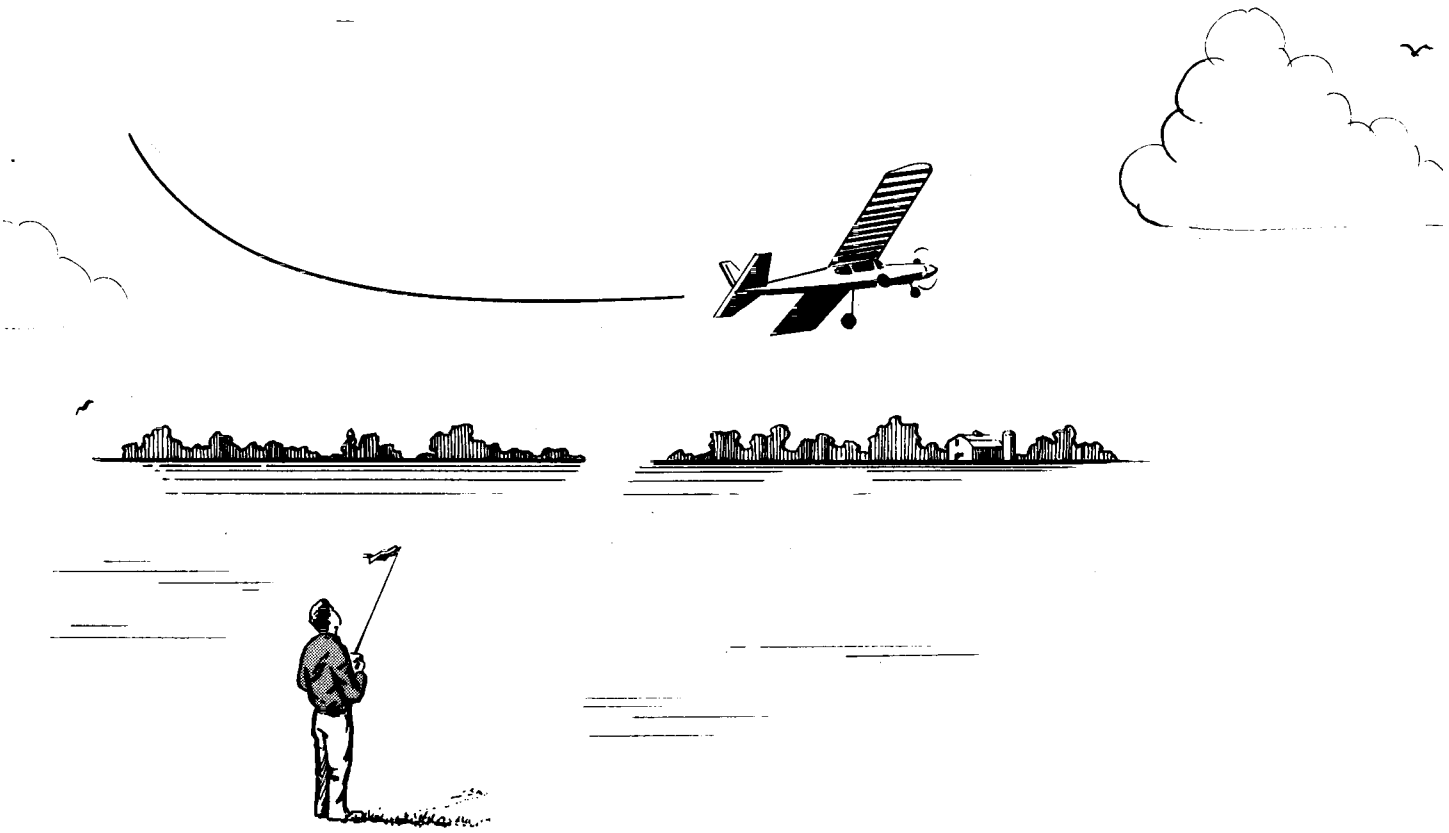
GENERAL INFORMATION BOOKLET



This book contains general information on RC building and flying which is common to all Carl Goldberg kits. It is intended as a supplement to the kit instruction booklet and the plans for the specific aircraft you are building. In many cases, the generic information contained in this book will give general guidelines, so that you will have a basic knowledge of the subject. However, when building your model, it is important that you follow the specific instructions for any equipment or materials (such as the radio, engine, or covering) that you are using.

Carl Goldberg Products has attempted to present the enclosed material as accurately as possible and to remind the reader of the importance of safety when building and flying model airplanes. However, the company does not intend that this book be all-inclusive and assumes no liability for any errors and omissions in the information presented herein. **It is the modeler's responsibility to seek specific guidance** from hobby shops, local flying clubs, the Academy of Model Aeronatics (5151 Memorial Drive, Muncie, IN 47302, 1-800-435-9262), and specific manufacturers regarding the safe use of the products involved in RC flying.

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GLOSSARY OF MODELING TERMS

ARF: Almost Ready to Fly
AILERON: the control surface on the wing that rolls the plane
AIRFOIL: the shape of the wing as seen from the end
ANGLE OF ATTACK: the angle at which the wing meets the air flow
BEVEL: to sand to an angle shape
BURR: the rough edges on a piece of wood or metal after it is cut
CAP STRIP: a thin strip glued to the edges of the ribs to shape the wing
CONTROL HORN: a device attached to each control surface to provide an attachment point for the pushrod
COWL (COWLING): the nose section of the fuselage that encloses the engine
DECALAGE: the difference between the incidence of the wing and stabilizer
DIHEDRAL: the inward angle of the wings, as seen from the front
ELEVATOR: the moveable part of the horizontal tail, which controls pitch
EMPENNAGE: the tail of the plan
FIN: the fixed vertical part of the tail
FIREWALL: the hard wooden former at the front of the fuselage, to which the engine is mounted
FORMER: a piece which shapes the fuselage; and to which the sides of the fuselage are attached.
GUSSET: a small triangular piece glued into a corner to strengthen it
INCIDENCE: the angle of the wing or the tail in relation to the thrustline
LAMINATE: to glue two thin sheets of material together to form a thick sheet
LEADING EDGE (L.E.): the edge of the wing that first meets the airflow
LONGERON: a stringer that runs the length of the fuselage
OUTPUT ARM: the piece that attaches to the servo and connects it to the pushrod
PITCH: an up and down movement of the nose of the plane, which is controlled by the elevator
PROTOTYPE: the full scale airplane from which the model design was taken
PUSHROD: the long, stiff dowel or plastic piece that connects the servo with the control horn
RTF: Ready to Fly
RIB: the airfoil-shaped piece that connects the leading edge, spars and trailing edge of the wing together and holds them in shape
RETRACTS: devices for extending and retracting the wheels on command
ROLL: tilting of the plane as viewed from the front, controlled by the ailerons
RUDDER: the moveable vertical tail of the plane, which controls yaw
SERVO: the part of the airborne radio system that moves the control surfaces
SHEAR WEB: wood sheeting that connects the top and bottom spars to stiffen the wing
SHIM: a thin piece of wood inserted between two other pieces to improve their fit
SPAR: a wooden stick running lengthwise through the wing that serves as its backbone
SPINNER: the rounded cone that fits over the propeller hub
STABILIZER (STAB): the fixed horizontal part of the tail
STALL: a situation in which the plane is flying too slowly to move sufficient air across the wing to produce lift
STRINGER: a long piece of wood attached to the formers to shape the fuselage
THRUSTLINE: a line drawn from the center of the propeller hub straight through the airplane
TORQUE: a rolling tendency caused by the spinning propeller
TRAILING EDGE (T.E.): the edge of the wing that faces the rear of the plane
TRIM: small adjustments made to the control surfaces to cause the plane to fly straight and level by itself
WASHIN: a twist in the wing that makes the trailing edge lower than normal
WASHOUT: a twist in the wing that makes the trailing edge higher than normal
WING SADDLE: the shaped part of the fuselage in which the wing rests
WHEEL COLLAR: a metal ring that holds the wheel on the axle
YAW: a right-to-left movement of the nose, controlled by the rudder

ADHESIVES & GLUING TECHNIQUES

Today, most model builders achieve fast assembly using CA (cyanoacrylate adhesive), also known as "super glue". CA glues can be used for all most all of the building of the parts when no alignment of parts are required. However, there are times, such as when you are installing the stabilizer and fin on the fuselage, when you may want more set-up time for careful alignment and positioning. That's a good time to use an EPOXY glue. Occasionally, you also will want to use a thin CA, which "wicks" into the surrounding areas. Aliphatic resin glue or similar water-based glues can also be used, but they will add to the assembly time because they dry so much more slowly than CA glue.

WARNING

Never use watery THIN type CA glue for gluing plywood and hardwood parts. Thin CA's do not adequately bond these areas.

Medium CA is strongly recommended for most model building tasks because, when pressed into a very thin layer, it sets almost instantly. After the initial bond, CA glue continues to strengthen. However, because of CA's quick set-up, you must be careful to read instructions thoroughly, as you will have only seconds for positioning of parts. Be sure to trial fit parts together before gluing.

CA glue is used in two general ways. One is to apply the CA to one part and then press the two parts to be glued together. Or, you can position parts in contact and then run the CA glue into the joint. As it seeps into the joint, it will leave a slight reinforcing fillet. If you don't see a slight fillet, the CA has soaked into the wood edges and a second coat is needed.

CA glue sets up a bit slower with plywood and other harder woods, so hold such parts together a little longer than you would for balsa. Corner fillets take even longer to dry because there is a thick layer. To speed up such slow drying joints, use a CA accelerator to speed up the drying time. An accelator bridges greater gaps, speeds up slow bonds, and provides strong glue joint fillets.

Epoxy glues come in two parts which need to be mixed before using. When buying epoxy, check to see how long the glue takes to set. We recommend either a 6 minute epoxy or a 20 minute epoxy. Disposable wood strips, cotton swabs, cheap stiff bristle brushes or acid brushes from auto stores make good applicators. Because epoxy is so thick, it is easy to apply too much. Use sparingly, especially when assembling the fin, stabilizer, and wings.

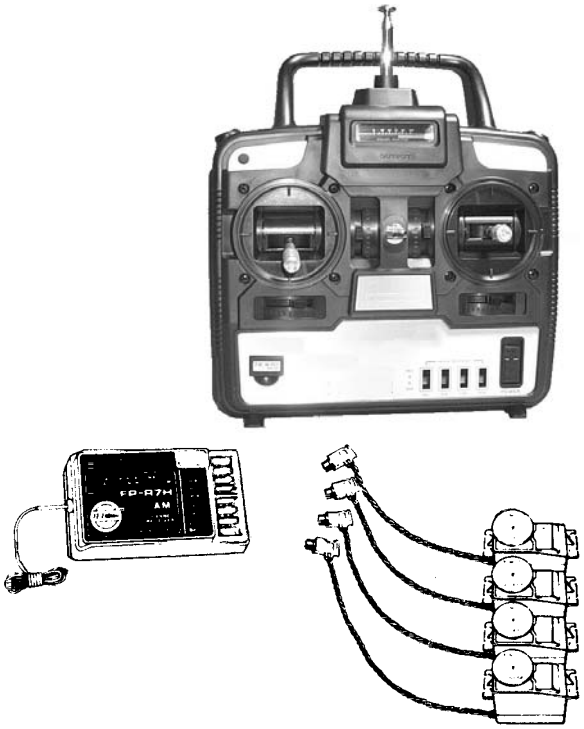
CAUTION

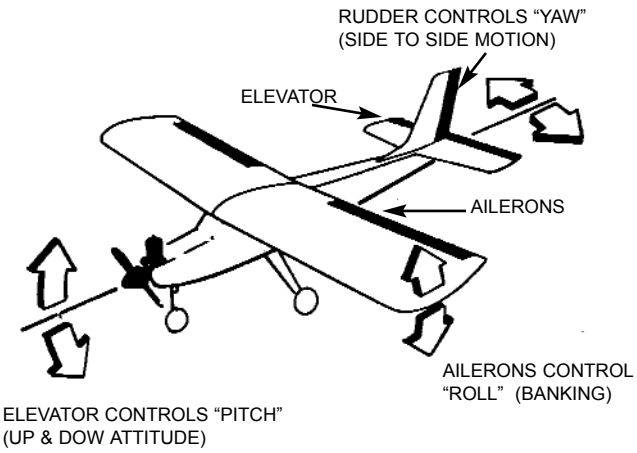
Some people may experience an allergic reaction when exposed to fumes from CA glue or epoxy. As with paints, thinners, and solvents, it is always important to use glues only where there is adequate ventilation to carry fumes away. A fan is recommended.

Also, special care must be taken when using CA, as it will bond skin as well as other surfaces.some CA also sella desolve to help remove hardened glue from fingers and softens glued joints for repositioning. Before using any CA, carefully read all label precautions. When using CA, protective eye-wear and care in keeping the glue away from the face is highly recommended. If CA does happen to get into the eye, hold lid open and flush with water only. Seek immediate medical attention.

In addition to CAs and epoxies, there are certain times when other types of glues are useful. Aliphatic resin is often used when slower set-up times are desireable, or when CA will damage the material being glued.

RADIO SELECTION AND CARE





There are many fine radio systems on the market. Your local hobby dealer and club members are good sources of information on equipment and its suitability for various projects. It is recommended that you speak to them before making a final choice.

IMPORTANT: When selecting a radio, remember that there are many radio frequencies available, but not all of these frequencies can be used legally to operate model airplanes. To be in compliance with FCC regulations, be sure to tell your dealer that you want a radio with a "Model Airplane" frequency.

Most model airplanes are designed to use a four-channel radio. In flight, the model is controlled primarily by using the ailerons and the elevator (see drawing). One radio channel controls the aileron, which is the primary turn control. It rolls, or "banks" the model. Another channel operates the elevator, which controls the pitch (climbing, level flight, and descent). The third channel is for the engine throttle and controls the engine speed. A fourth channel is used for rudder, which assists the ailerons in turning the aircraft. The new R/C flyer probably will use the rudder only for steering the model on the ground. Advanced flyers frequently use six-channel radios.

Radios are battery powered with rechargeable nickel-cadmium batteries (ni-cads). Such sets come equipped with a recharging unit. All of the radio systems now available feature "servo reversing" switches which allow the pilot to reverse the response of the servo. This feature simplifies installation. Other radios come with a variety of sophisticated features, such as dual rates, exponential and control mixing, etc. These features are typically used by more advanced flyers.

Today's RC systems are very well engineered and constructed. However, they will remain only as good as the way in which they are USED. Always follow the rules of proper usage and all manufacturer's instructions for your particular piece of equipment.

TRANSMITTERS: Keep your transmitter clean and free from fuel residue and dirt. Battery condition and RF output should be monitored, and the system should be aligned and tuned annually. Do not transport under vibration (such as on the floor of a car) without cushioning.

RECEIVERS: Receivers must be vibration free. When installing in the aircraft, wrap them in a minimum of ¼" soft foam rubber (not plastic foam). Keep well clear of all cables and batteries. Tune annually (or as recommended by the manufacturer), as indicated below under "Check-Ups."

SERVOS: Servos are vibration prone. Be sure to mount them with grommet shock mounts in servo trays which are also shock mounted. Also be sure to keep them clean. If the neutral position "drifts," this is a sign of change which should not be ignored; find out WHY before flying again.

BATTERIES: Nicads also can suffer from vibration, so they too should be wrapped in soft foam rubber before installing. Check their condition periodically by measuring the voltage with a volt meter or battery tester. Charge the batteries before EVERY flying session. When not used for a period of time (such as during the winter months) the batteries should be charged every 30 days. Never store batteries in a discharged condition.

PUSHRODS: Obviously, pushrods should be installed to operate freely, so that they place no load on the servo. Using a servo's power to move a tight rod or

heavy surface by force increases the battery drain, shortens the electronic life, and can cause neutralizing problems. In addition, it is important the pushrods do not flex or vibrate. Any vibration is transferred directly to the servo, and its gear, motor, and pot. To avoid flexing and vibration, use guides and fairleads on the rods.

CONNECTORS: In using connectors, never pull on the wires to disconnect; grasp the plugs instead. Clean them by dunking in a solvent, such as dope thinner. Tape the connectors together when installing and make sure there is no strain on the cables.

CHECK-UPS: A full check-up by the factory or an authorized service center should be done AT LEAST ONCE A YEAR, as well as any time something unusual occurs during usage. A malfunction or "glitch" is the first sign of an impending failure; it should not be ignored. The checkup should include tuning and alignment of the system, as well as battery testing.

ENGINE & PROP SELECTION

ENGINES

Selection of an engine for your model will depend on many factors, such as size and type of the aircraft, your flying skills, and, certainly, your pocketbook. It is best that you consult a knowledgeable local hobby dealer for advice in the selection process.

Manufacturers generally recommend an engine size-range for their products. The numbers in the range, such as.35 to .45, refer to the amount of space the piston moves through inside the cylinder of the engine. This space is called displacement; larger displacement generally means more power. If you live in a hot climate, or your flying field is approximately 3,000 feet or more above sea level, you probably should select an engine at the high end of the range.

It is important to stay within the manufacturer's recommended range, as failure to do so is likely to lead to less than satisfactory performance and may well lead to failure of the aircraft. Manufacturers design and test their models for specific engine sizes. Therefore, the aircraft is unlikely to withstand the stresses created above this range. Many a modeler has watched all his hours of work and many dollars worth of hardware head earthward because he did not heed this warning: **DO NOT OVER POWER YOUR MODEL!** Doing so will automatically void the manufacturer's warrantY**.**

Typically, size recommendations are for both a 2-cycle or a 4-cycle engine. A 2-cycle engine has more raw power because it has faster RPMs on the propeller. A 4-cycle engine swings a bigger prop and therefore creates more pull. It is also quieter. 4-cycle engines are generally preferred for high performance, mor aerobatic planes. However, if flying a tri-gear plane, a 2-cycle should be used. The expense of an engine is usually related to its efficiency. Some engines of similar cubic inch displacements are-more powerful than others. Check with a dealer or an experienced flyer to learn about the specific attributes of the engine you are considering.

If selecting a more sophisticated engine, you may go with the lower recommended range However, if purchasing a more basic engine, it is probably best to select something in the higher recommended range. If you are a relatively new RC pilot, it's probably a good idea to select an engine that is popular at the flying field, so that if you have any engine problems, other modelers will be familiar with the engine and be able to help.

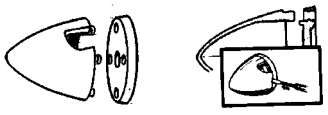
REMEMBER: DO NOT OVER-POWER THE AIRCRAFT!

PROPELLER AND SPINNER

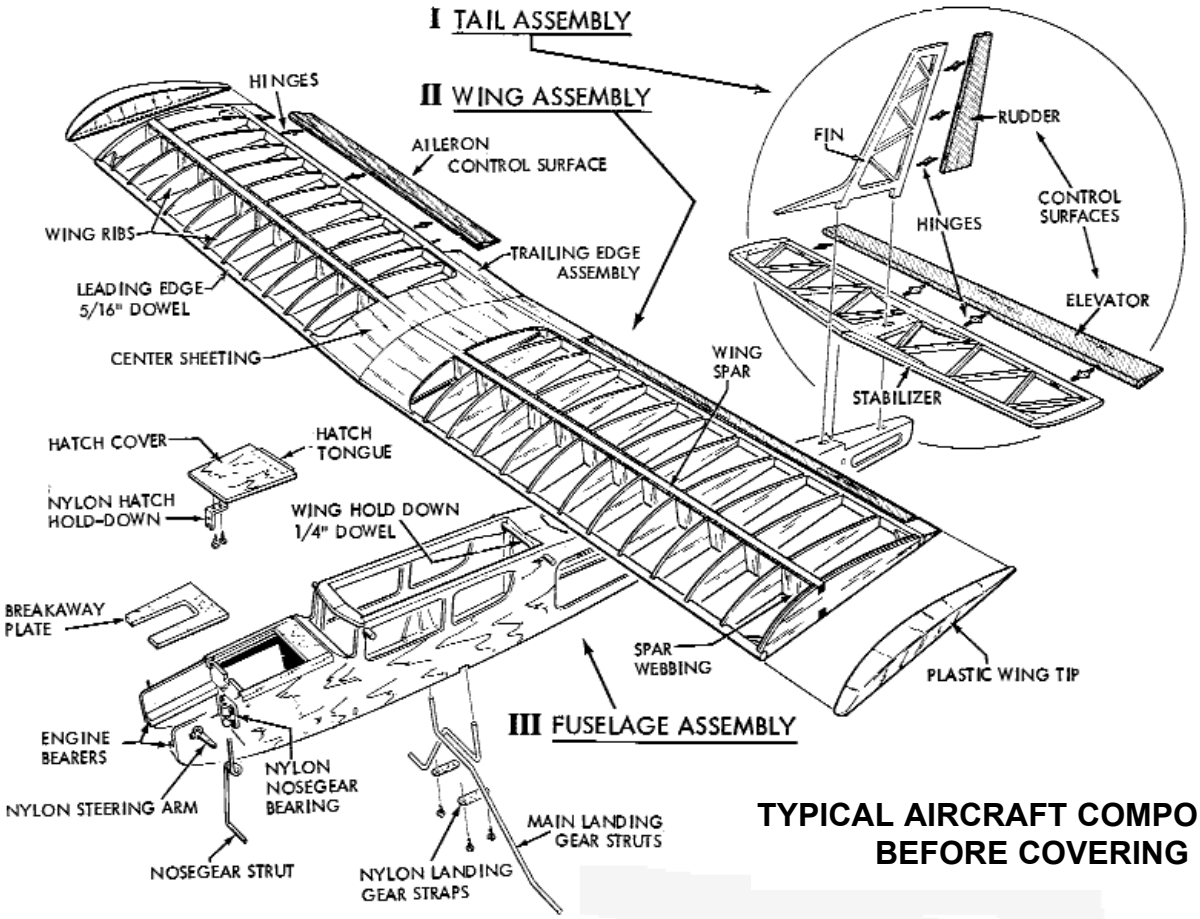
The propeller size must be matched to the engine. For example, a .35 may use a 9" diameter prop while a .45 can use a 10" prop. Follow the engine manufacturer's recommendation for correct propeller sizes or speak to a knowlegeable dealer. It's wise to buy a few spare props, as everyone breaks them occasionally, and particularly often when learning to fly.

Balancing your propeller helps to protect your radio from the damaging effects of vibration. There are good, easy to use prop balancers on the market. We recommend sanding the heavy blade on the curved face, out near the tip, rather than on the flat face. Try to maintain the normal airfoil curvature. Avoid scratches which may cause the prop to break. **Never carve or cut a prop near the hub for any reason** (such as to fit a spinner).

It is equally important to get a correctly sized spinner. The CGM 4-pin spinner is a rugged precision-molded spinner which does not require any special mounting nuts or screws. **Although a spinner helps reduce the chance of injury from a rotating prop, extreme caution always must be used when the engine is running.**



TYPICAL AIRCRAFT COMPONENTS



TYPICAL AIRCRAFT COMPONENTS BEFORE COVERING

COVERING

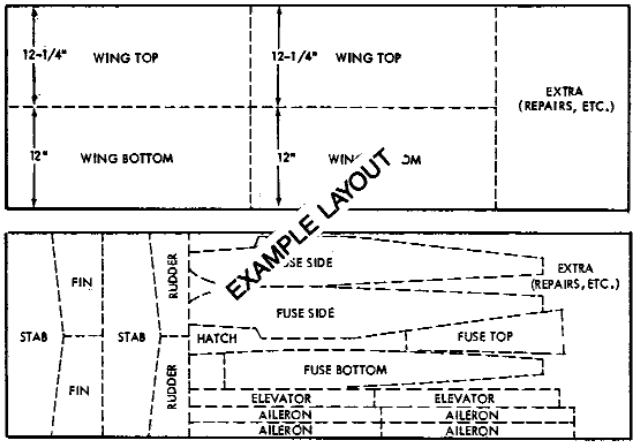
INTRODUCTION

There are several ways to cover the frame of a model airplane. Years ago, the open framework of most airplanes was covered with a combination of tissue (or silk) and dope; the solid structures were painted. Today, most models are covered with polyester films that resemble either a painted finish or a fabric finish. These films are easy to apply and actually increase the strength of the aircraft. The following instructions describe the general procedure for covering a model. However, it is important to carefully read the instruction that come with the film, as different products are applied in somewhat different ways.

PREPARATION

Any irregularities in the wood surface will show on the covering, so a good covering job MUST be preceded by careful sanding, filling of nicks and dents (we recommend *JET* Model Mate™ balsa filler), and then more sanding. For the final sanding, use fine sandpaper (240-320 grade) and a sanding block.

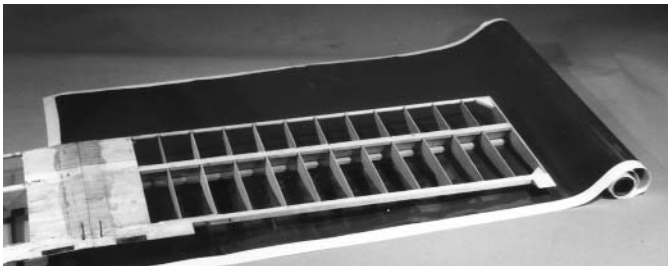
COVERING THE MODEL



IMPORTANT: Before starting, it's a good idea to do a lay out of the covering pieces you will need to cut from the covering rolls, so that you make efficient use of your material. You can draw patterns on UltraCote's paper backing. **BE SURE TO LEAVE EXTRA MATERIAL** (1½" to several inches) around all pieces, so you will have plenty of covering to go around the edges of each section.

Generally, one first covers the wing, then the tail, and finally the fuselage. Other small parts (such as the hatch) are covered separately.

Set the covering iron to the proper temperature. Test it by laying a small strip of covering over a scrap piece of balsa and firmly pressing with the iron. Make sure the iron is hot enough to activate the adhesive, but not so hot that it burns the covering.

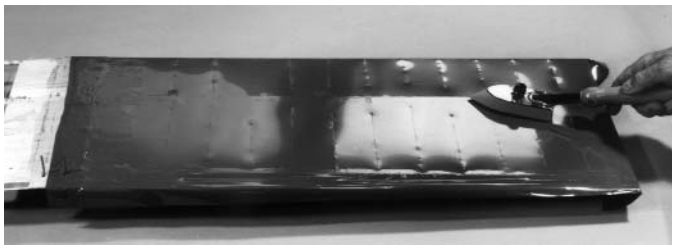


COVERING THE WING

Using a fresh model knife blade or razor blade, cut a piece of covering material at least 1" larger than one-half of the inboard wing bottom panel.

Remove the protective backing paper and lay the covering over the **bottom** of the wing, making sure there is enough excess material for wrap-around at the L.E., T.E., and wing tip.

HINT: Leave a minimum of 3" excess at the wing tip.



When using iron on films, work from the center out and tack to the ribs, sheeting, and other wood surfaces, using medium heat. Gently rub the covering with a soft cloth to help set it in place.

Press the covering around the edges. Press the covering around the edges, again rubbing with a cloth and making sure to apply enough pressure to work the adhesive into the wood.

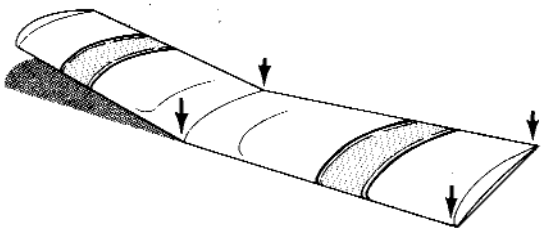
For inside corners, follow the instruction that come with your covering, as different materials may require slightly different techniques.

Using your iron (or a special covering "heat gun,") set at relatively high heat, shrink the covering tight. Neatly trim off any surplus.

Following the same procedure, cover the remainder of the wing bottom and then cover the wing top. Be sure to overlap all seams at least ¼". Remember that there must be sufficient overlap to allow for the shrinkage when high heat is applied.

Cover the ailerons in the same manner, beginning with the top and then covering the bottom, and overlapping the seams.

IMPORTANT: Once the aileron sections have been covered, and while the hinge locations are still fresh in your memory, IMMEDIATELY slit the covering to open up the hinge slots. (Refer to the plan for help in locating the hinge slots.)



TRUING THE WING

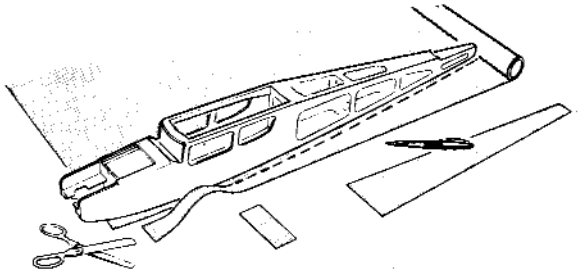
IMPORTANT: After the wing has been covered, you must check to make sure it is free of warps. **This is a very critical step and should not be rushed or omitted.**

Set one half of the wing on a flat surface to detect warp. To counter any warp, twist panel slightly in the direction opposite to the warp and hold this position while gliding the iron over the covering to re-tension the structure. Repeat process until the panel is true.

Follow the same procedure with the other half of the wing.

COVERING THE TAIL

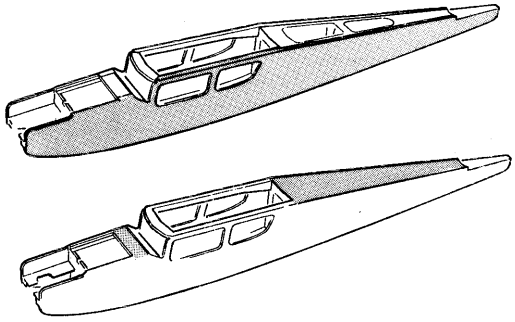
Following the same procedure as with the wing, cover the stabilizer, the elevator, the fin, and the rudder. The component pieces should each be covered separately, before assembly.Then, the covering should be carefully removed from the areas to be glued, so that a strong WOOD-SURFACE-TO-WOOD-SURFACE adhesion is achieved. After covering over the hinge holes, immediately go back and slit the covering to open the holes where the hinges will be installed.



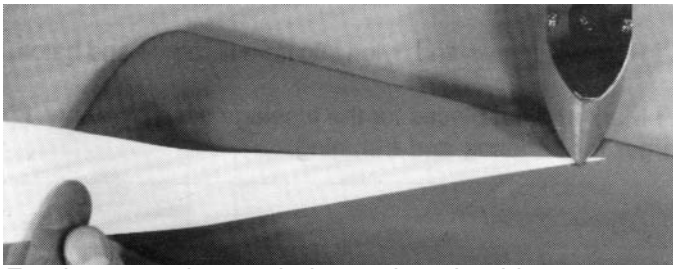
For added realism, the cabin interior may be painted now, before the pieces are covered. Use UltraPaint or even auto primer.

Cut pieces of covering for the fuse bottom, sides, and top.

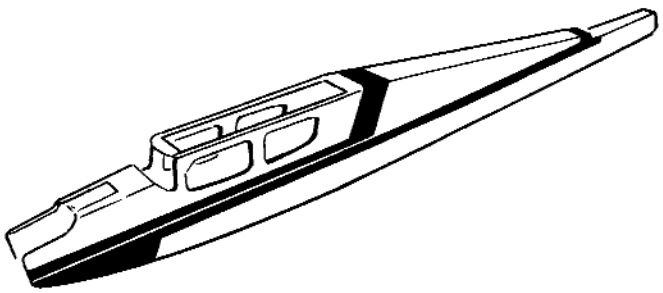
Apply covering to the bottom first, wrapping and sealing around the edges. If necessary, slit the corners for a smooth appearance.



Apply covering to the sides next, and then to the top. Make sure to overlap seams at least ¼", so that when high heat is applied, the shrinking will not create a gap.



For best results, a darker color should go over a lighter one. Smaller designs should be positioned and tacked in place at one end. Then, work the iron down the rest of the design, smoothing out the design as you go. Larger designs (such as sunbursts) should be positioned and the widest end tacked down first. Then, working towards the narrow end, iron the design down.



PAINTING ON POLYESTER FILM

Epoxy or modeling-grade polyurethane paints are recommended for painting on film. To assure good paint adhesion, the covering should be washed with soap and water, or alcohol, to remove all surface greaseand oil. Then, dry thoroughly. You may also wish to dull the surface to be painted by gently rubbing it with 000 steel wool. Use vinyl tape to mask the area, so that the paint stays where you want it.

We recommend using a fuel proof paint, which is designed to coordinate with your colors. Always spray very light coats of paint, and allow paint to thoroughly dry before adding another coat or removing the mask. Remember, LIGHT COATS! Excess paint can add unnecessary weight to your aircraft prevent the paint from curing!

IMPORTANT! TIPS FOR MAINTAINING THE FINISH

Raw fuel and engine oil residue, if allowed to puddle or remain on any surface, will cause the finish to deteriorate. This may cause loosening of the covering and striping, peeling paint, etc. Wiping down the model after each flight will help maintain your plane's finish for years.

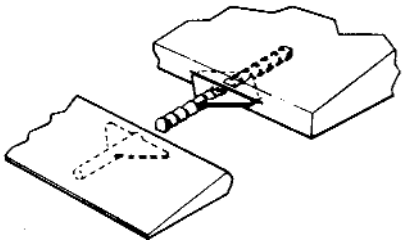
Engine exhaust can also affect striping and other details. Careful application of CA along the edges will hold them down securely.

HINGE INSTALLATION

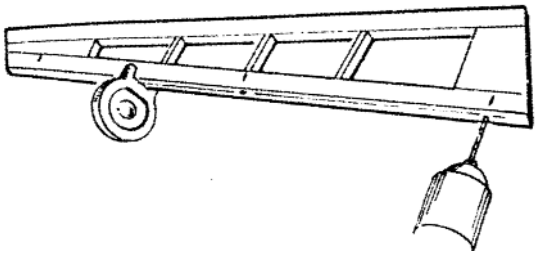
IMPORTANT! Read and follow hinging instructions carefully. Failure to firmly install hinges can lead loss of control and a crash! Periodically check control surfaces to make sure the bond is secure.

The following instructions are for the two types of hinges commonly used in Carl Goldberg products aircraft.

PINNED HINGE INSTALLATION

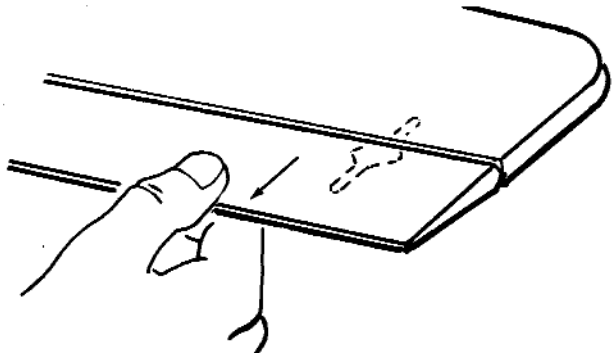


The general procedure is to first insert and glue the hinge into the major part, such as the wing, stab, or fin. Then attach the control surface (aileron, elevator, or rudder).

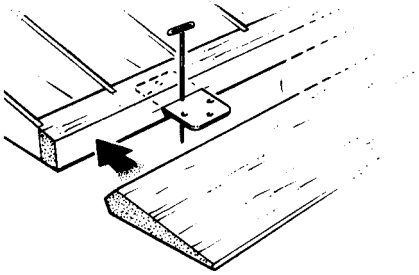


Using a CGM centerline tool, scribe a hinge line at all locations shown on the plan. Drill a 1/8" hole, at the presribed depth, at each hinge location. Then slot the hole along the centerline, to provide for the hinge flange. Test the fit of the hinge in the slot before gluing. The control surfaces should fit tightly together.

IMPORTANT: Because this type of hinge installation requires time for insertion and adjustment, a quick setting glue such as CA is not recommended. Instead, use epoxy, aliphatic resin, or similar slow-setting glue.



After allowing the hinged surface to dry thoroughly. tug hard at each hinge location to make sure each hinge is glued securely in place.



JET HINGE INSTALLATION

Using the centerline marker, mark the hinge location. Then, using a hobby knife, cut a slot for the hinge. The slot should be approximately ½" deep - enough to accommodate half the hinge and wide enough for ease of insertion.

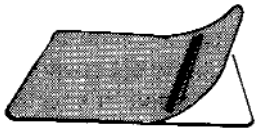
After all slots have been cut, place a pin in the middle of the hinge. Insert the hinge into the main surface until the pin touches the edge. Do this for each hinge location.

Take the control surface and slide the other half of the hinge into the matching slot. Holding the hinged surfaces together, make sure that the pieces are aligned at both ends and that full deflection is possible. When satisfied with the fit, hold the hinged surfaces tightly together and apply a 3 or 4 drops of thin CA to the exposed center of the hinge. The CA will quickly wick through the entire hinge.

Keeping the control surfaces in place, turn the assembly over and apply 3-4 drops of glue to the underside of the hinge.

Allow the glue to cure for at least 10 minutes before flexing the control surface and testing to make sure that each hinge is securely glue in place. Work the control surface up and down to remove any stiffness you may feel.

DECAL APPLICATION



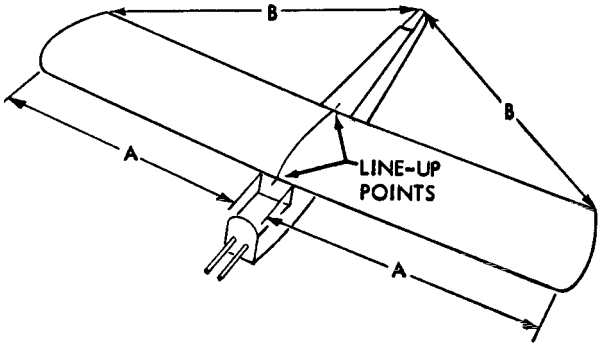
CGP kits contain peel and stick decals that are very easy to apply.

Clean the model surfaces thoroughly before apply decals.

Cut the decal sheet into sections, as needed. Fold the decal in half, front to rear. Then open at the fold and lay the decal out flat. The protective backing will bubble away from the decal at the fold location.Using a scissors, cut the backing along the bubble, removing about a 1" wide strip of backing. Carefully position the decal on the model and, working from the center out, rub the decal down while peeling off the backing. stick in

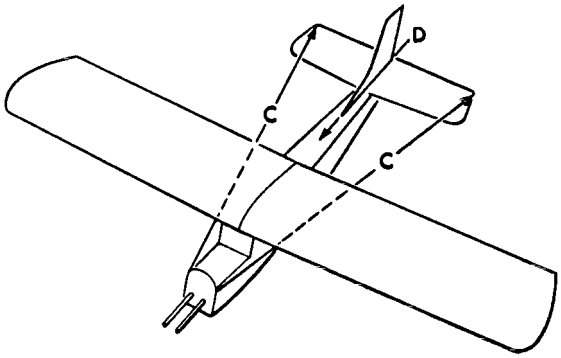
It is also possible to make custom decals, using UltraTrim™. Special cutting machines, such as the Stika®, hooked up to computers, allow one to create almost any design for application on the model.

ALIGNMENT



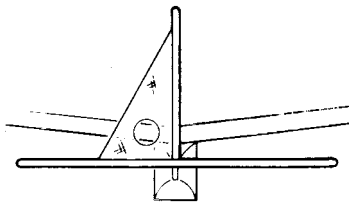
Temporarily mount the wing on the fuse. Use rubber bands or whatever method will keep the wing steady and in place. Measure carefully, as shown above, from the fuselage sides out to the wing tips ("A" arrows) to be sure the wing is centered. Then measure from the wing tips to the back end of the fuselage ("B" arrows) to make sure the wing is square with the fuse.

Using masking tape or a washable marking pen, mark the wing center at the leading and trailing edges. Mark the top of the fuselage at the wing centerpoint.

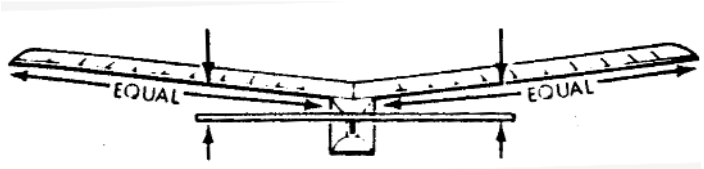


Using no glue, and with the control horn pointing down, trial fit the stab onto the fuse, adjusting it as needed to line up with the wing. Measure from the

stab tips to the fuse front ("C" arrows) to make sure the stab is square with the fuse.



Using a 90º triangle, check the alignment of the fin to the stab, as shown.



View the model from the rear, as shown, to see if the stab is level, with respect to the wing. If not, cut paper strips about ¼ x 1" and shim under the low side until the stab is level.

When satisfied with the fit, draw match-up lines on both the stab and the fuse to show the correct location of the stab on the fuselage.

NOTE: When actually ready to mount the wing and stab assembly, be sure you have removed covering from the areas where you will glue, so that you achieve a strong wood-to-wood bond.

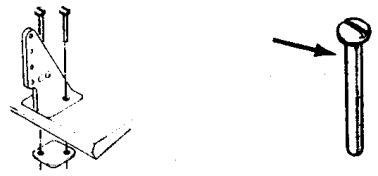
CONTROL HORN & PUSHROD INSTALLATION

CONTROL HORN

Since each aircraft is different, the following instructions may need to be adapted somewhat for the kit you are building. Refer to the plan to determine the location of all control horns.

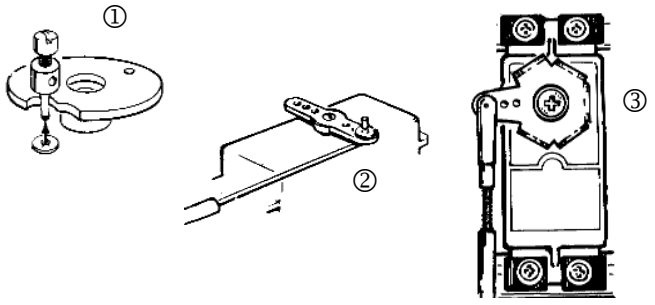
These are general instructions for how to connect the control surfaces to the servos.

1. Tack cement a control horn at each of the required locations on all control surfaces, i.e.the ailerons, rudder, and elevator.



2. Drill through the holes in the horn and, using the screws provided, mount the nut plate on the other side, as shown. If necessary, trim the screws flush with the nut plate.
3. Remove the covering from the pushrod exit holes on both the wings and the fuselage.
4. Working from the radio compartment to the rear, feed the pushrod (or cable) through the fuselage (or wing) and out the exit hole. You may wish to use a loop of string or wire to pull the threaded end up through the hole.
5. If the kit has nylon exit guides, slide the guide over the end of the pushrod and glue the guide into the exit hole at each exit location.

6. Holding the pushrod wire with a pliers, twist a snap link onto the threaded end. The rod should show in the center of the link, as illustrated above. Connect to the rudder horn.

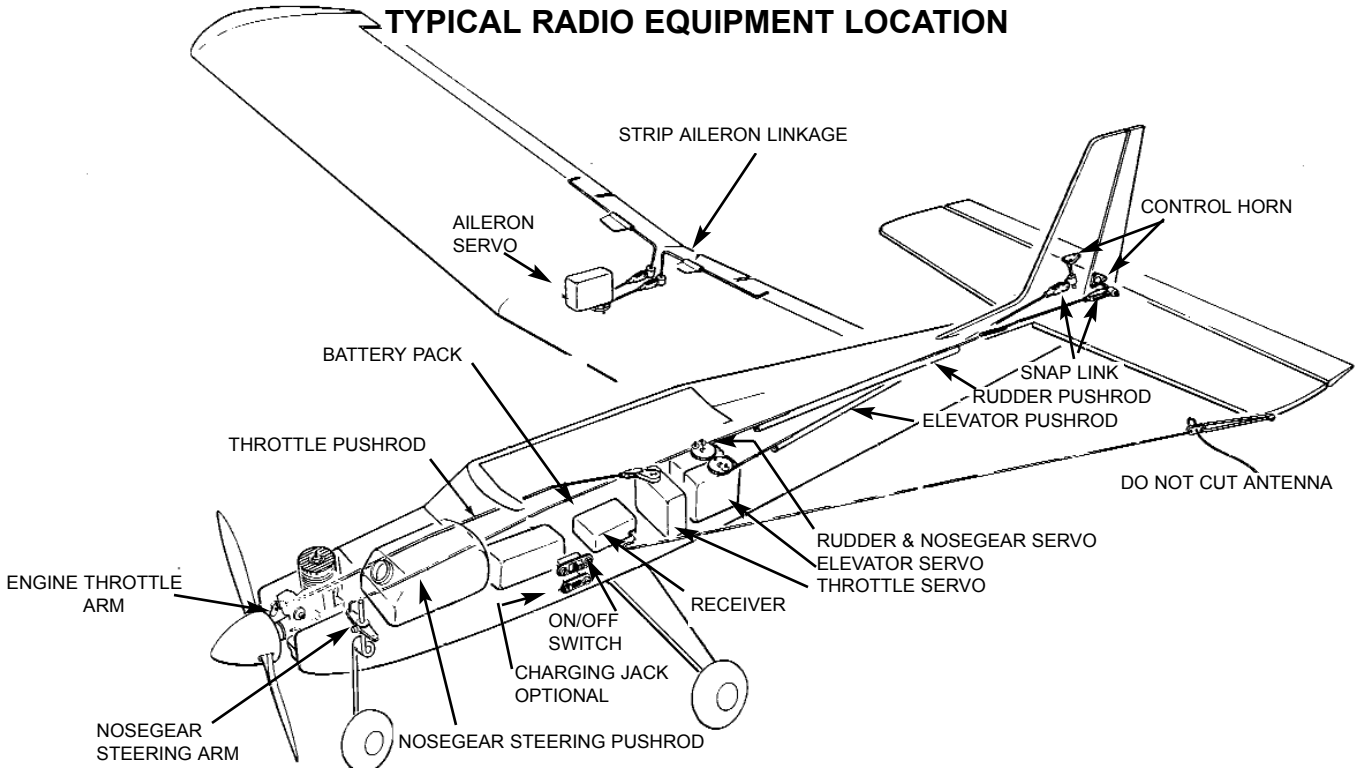


PUSHROD

There are several ways to connect a pushrod to the servo arm. Refer to your plan for the specific method to use for each servo/pushrod connection.

1. Insert the end of the pushrod through a pushrod connector.
2. Center both the servo arm and the control service. Make a mark where the pushrod needs to bend upward through the servo arm hole. Bend and cut the wire and then fasten it to the servo arm with a snap nut.
3. Thread a snap link onto the end of the pushrod and then connect it to the servo arm.

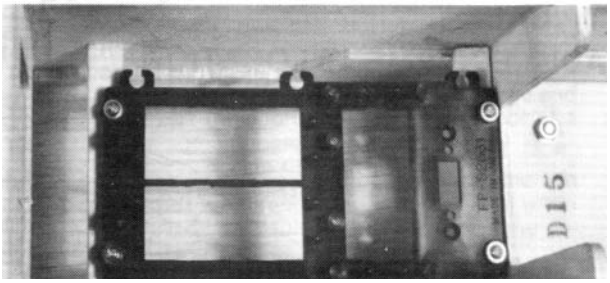
RADIO INSTALLATION AND SET-UP



IMPORTANT! The above illustration is a guide. Depending on your engine and R/C gear, your arrangement may be slightly different. **Thoroughly read the instructions that came with your radio before starting the radio installation.**

Before the radio is installed, the following steps should be complete.

1. Model is fully covered and painted (where necessary)
2. Control surfaces are hinged in place
3. Tail assembly is glued firmly to the fuselage
4. Engine is mounted, and the muffler is installed
5. Propeller and spinner are installed
6. Fuel tank is installed with supports to hold it level
7. Stab and rudder pushrods are installed
8. Landing gear and wheels are installed



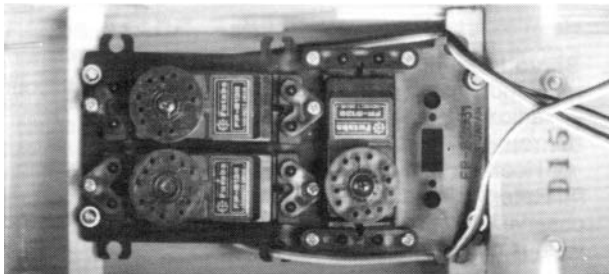
SERVO ARRANGEMENT

A servo tray (often furnished with or radio or in the kit) makes it easier to mount the servos. The most common arrangement is a 2+1, although 3-abreast is also sometimes used. If a tray is not used at all, the 3-abreast arrangement, with servos mounted directly on wood rails, is best.

For the 2+1 arrangement, place the throttle servo in the forward position, so the output wheel is on the same side as the engine throttle arm.

The rudder servo should be one the side opposite to the throttle servo, so it can drive the nosegear steering arm in a nearly straight line.

The elevator servo occupies the remaining rear position in the 2+1 configuration, or the center position in the 3-abreast arrangement.



SERVO IDENTIFICATION

Make sure batteries are fully charged. Then hook up the radio and try operation. Observe which servo wheels move when the stick is moved for various controls. Mark each servo and plug (with tape on which you can write) to indicate rudder (“R”), elevator (“E”), throttle (“T”), and aileron (“A”). If your receiver doesn’t have a plug for each servo, apply a piece of tape nearby.

Mount the control horns according to the instructions in your kit. Then, hook up all of the pushrods to the servo arms.

Identify the ON and OFF positions for the radio switch. The preferred ON position is forward.

SERVO MOVEMENTS

As mentioned in the introductory section of this book, today's radio systems with "servo reversing" simplify radio installation. With a non-reversing system, each pushrod must match its corresponding servo's rotation. With "servo reversing," pushrods can be hooked up to either side of the servo's output wheel, and after checking the control response, a servo responding in the wrong direction is easily switched to the correct action. See your radio manufacturer's instructions for more detailed information.

The following procedure will help you set up and fine tune your radio system.

First, remove all servo arms and wheels.

Throttle servo

1. Turn on the transmitter (Tx) and receiver (Rx).

2. Move the left stick of your Tx all the way up to the top of its movement. This stick should have a ratchet feel to it and will stay in any position, up or down, in which it is placed. In addition, move the trim tab, located to the right of the throttle stick, all the way to the top of its movement.

3. Move the throttle pushrod until the engine carburetor is open all the way.

4. Remount the servo arm back on the throttle servo, but do not put the screw back in the center of the arm at this time.

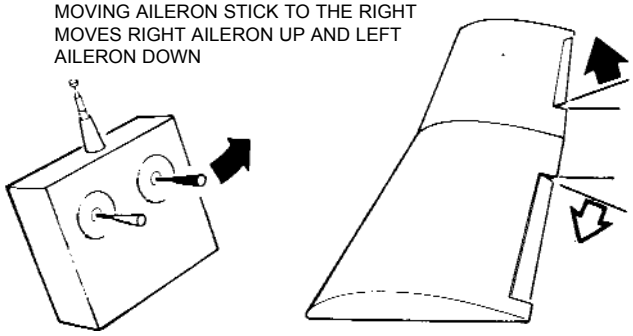
5. Move the transmitter throttle stick all the way to the bottom of its movement and observe the opening in the carburetor. The opening should be 1/16" to 1/8". If, on the other hand, the carburetor is full open, find the radio's servo reversing switch (see radio instructions) and switch it.

   If the servo is moving in the right direction, but the movement is not enough, change where the pushrod is mounted on the servo arm so that the amount of movement that the pushrod gets from the servo is more or less. The farther out from the center of the arm that the pushrod is mounted, the greater the movement. For example, if the carburetor opening was greater than 1/8" when the throttle stick was all the way down, the pushrod needs to be mounted further out on the servo arm; if the opening was less than 1/16", the pushrod needs to be further in on the servo arm.

   In addition, most engines have two holes on the throttle arm, where the pushrod is hooked up to the carburetor. The farthest out hole gives the least movement when the pushrod is moved.

6. When the carburetor is opening correctly, move the trim tab all the way down to the bottom of its movement. The carburetor open should be completely closed. This safety feature allows the running motor to be turned off.

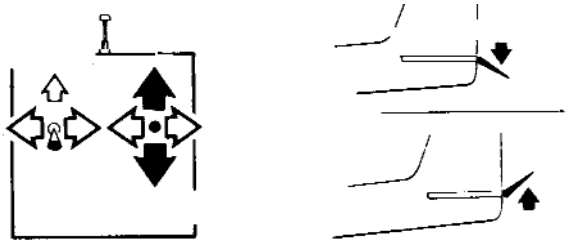
MOVING AILERON STICK TO THE RIGHT MOVES RIGHT AILERON UP AND LEFT AILERON DOWN



Aileron

Move the aileron stick to the right and observe whether or not the right aileron moves up. If not, change the servo connection until it responds correctly and mark the location.

MOVING ELEVATOR STICK UP MOVES ELEVATOR DOWN (MODEL DESCENDS). MOVING STICK DOWN BRINGS ELEVATOR UP (MODEL CLIMBS).



Elevator & Rudder

Move the elevator stick up and determine where the elevator pushrod must be attached to the elevator servo to pull the elevator down. Mark the servo.

Then, move the rudder stick to the right and, again, determine the correct connection to give right rudder and nosegear steering. Mark the location on the servo wheel.

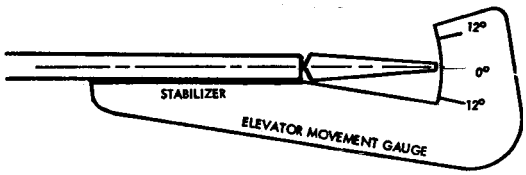
SETTING CONTROL SURFACES

All pushrods must move freely, without binding. Adjust, if necessary, to ensure smooth operation. When setting control travel, take care that no servo is hooked to a control in a way that prevents the servo wheel from moving through its complete range of rotation. For example, if the throttle servo "buzzes" when moved to "full throttle," this indicates the servo still has movement left, but it is jammed against the engine's full throttle limit position. **??** This can damage the servo and drain the battery, leading to loss of control and a crash.

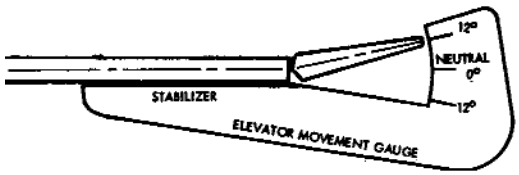
To correct the problem, mvoe the throttle lever on the Tx to cycle the throttle from idle to full power. Minor adjustments then can be made

The control surfaces are set by measuring the up and down movement. Many CGP kits contain templates to aid in this process. If no gauges are provided, you may make your own, or measure the movement with other commercially available devices.

For first flights, it is always recommended that you set controls for gentle response, regardless of your piloting skills. Later, as you become more familiar with the flight characteristics of the airplane, you can increase the throws as you prefer..



To set the elevator throw, set the transmitter elevator trim tab in the center and adjust the elevator mini-snap until the elevator trailing edge is in the neutral (centered) position, as shown above



Move the Tx elevator stick full up and full down. The elevator should move to match the template angles, up and down.

With the rudder trim tab set at center, adjust the mini-snap until the rudder T.E. is centered with the fin. The nose wheel should point straigt ahead.

Then, move the rudder stick full right and left, making sure the rudder movements match the prescribed angles. The nosewheel should move only very slightly, as it doesn't take much to steer on the ground.

Follow the same procedure in setting the aileron throws. Begin with the ailerons centered and then make sure they move up and down to the recommended degree.

BATTERY INSTALLATION

NOTE: Batteries must always be fully charged when flying.

Wrap the battery in 1/2" very soft foam rubber, in order to cushion it from vibration and shock. Use rubber bands or tape to hold the foam around the battery. It is also a good idea to place both the battery and the receiver in individual plastic bags to protect them from fuel and oil.

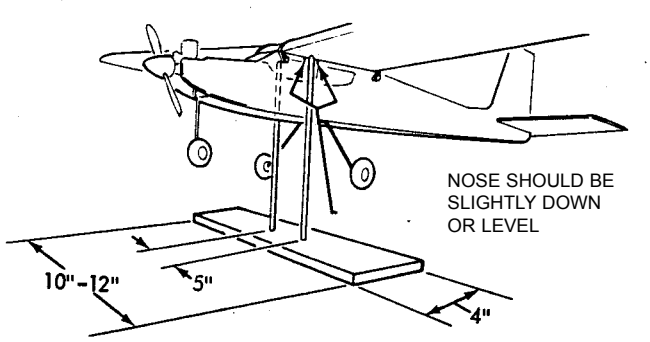
Position the battery in the fuse, holding it in place with additional foam rubber.

Do not cut the antenna wire attached to the receiver. Wrap the Rx carefully in foam, just as was done with the battery.

Reconnect all cables so the R/C system is operational. Be sure that each servo is plugged into its respective Rx terminal.

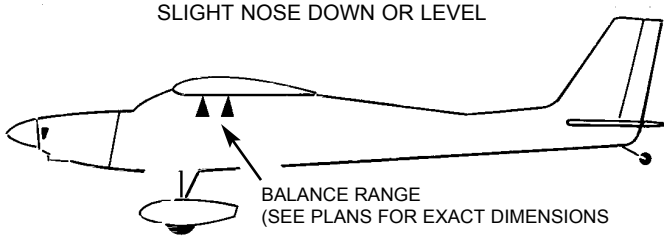
BALANCING

IMPORTANT: NEVER NEGLECT THIS STEP WITH ANY AIRPLANE. If you try to fly a plane with the balance point behind the recommended range, you run the risk of having an unstable aircraft and the strong likelihood of a crash. **TAKE THE TIME TO PROPERLY BALANCE YOUR MODEL!**



Place the fully assembled aircraft on a model balancing stand, as shown above. You can make this simple set-up with a couple of ¼" dowels with rounded tops, spaced 5" apart. Alternatively, lift the model under the wing near the fuse by your finger tips. (You may wish to get help from a friend if using the latter method.

CORRECT BALANCE
SLIGHT NOSE DOWN OR LEVEL



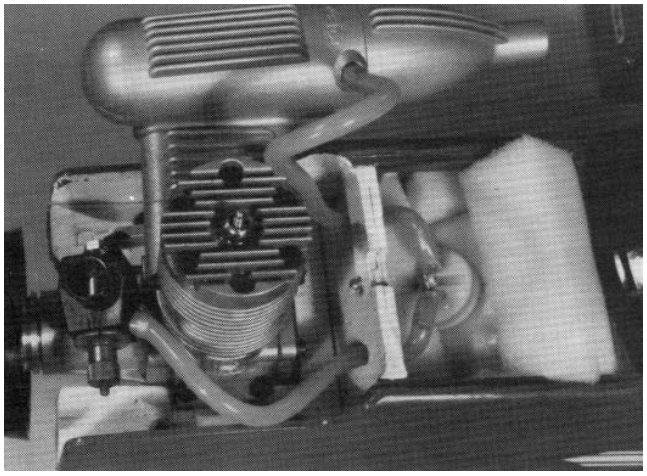
Referring to the recommended balance range for your model, move the position of the plane on the balance stand until the model is level or the nose slightly down.

If the is tail heavy, shift the R/C equipment away from the heavy end of the model and recheck until the model will balance within the acceptable range.

If shifting the R/C gear still doesn't balance the model, add weight to the far end of the nose or tail, respectively, until the model is correctly balanced. The least weight is needed when added as far back or forward as possible. Fasten the weight permanently in place.

ENGINE SET-UP

IMPORTANT! Do not attempt to fly your model until the engine runs dependably. It should idle without stopping and the transition though all engine speeds should be smooth.



FUEL SYSTEM

Assemble the fuel tank per the manufacturer's instructions. Then, referring to the plan, install the fuel tank and fuel lines. Support the bottom of the tank with foam rubber.

Attach the fuel line (leading from the "clunk" weight inside the tank) to the engine carburetor. This is the line used for fueling. Simply slip the line off the engin, fill the tank, and re-connect the line to the engine.

NOTE: If your muffler is equipped with a fuel-line type fitting, this can be used to "pressure feed" fuel to the engine for smoother and more reliable running. If using this option, the vent line is connected to the muffler fitting.

WARNING

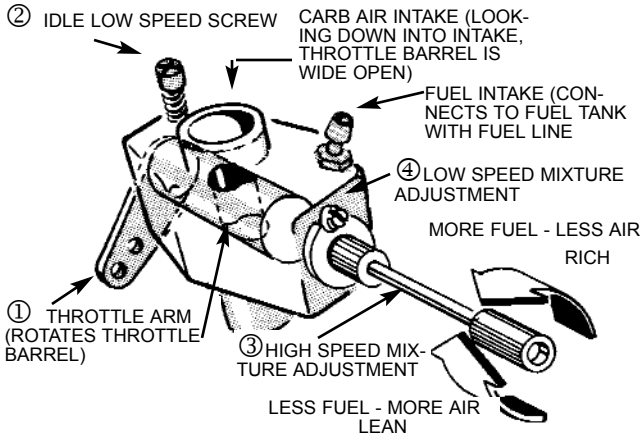
Read BEFORE Starting Engine

A turning propeller can cause serious injury, such as deep cuts. Avoid wearing loose clothing (such as baggie shirts or neckties) or jewelry which could be caught by or could fall into the spinning propeller. Children and spectators should be kept away from a running engine. No one should stand in line with the propeller. A broken propeller blade becomes a bullet and can seriously hurt someone.

ENGINE ADJUSTMENT

The following information is intended as a general guide to engine adjustment. ALWAYS FOLLOW THE INSTRUCTIONS THAT COME WITH YOUR ENGINE. Remember, engine performance will improve as the engine "breaks in." Also, your engine will perform somewhat differently in flight than it does on the test stand. Therefore, it is wise to consult with an experienced flier before adjusting your engine.

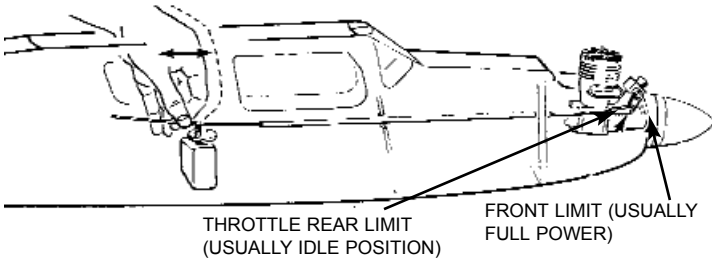
There are four basic adjustments which contribute to making your engine run well. First, familiarize yourself with the engine drawing, locating the following four parts:



1. Throttle "barrel" opening. The rotating cylinder inside the carburetor is called the "throttle barrel." It has a hole in the middle to admit air. By rotating the barrel, the throttle can be "wide open" or completely "closed."
2. Idle/Slow Speed/Stop screw. This screw allows you to set how much the barrel can close.
3. High Speed Mixer or Needle Valve. This control regulates the mixture of fuel and air at high engine speeds.
4. Low Speed Mixer. This control regulates the fuel/air mixture at idle engine speed.

SETTING THROTTLE (engine not running)

Start with the transmitter throttle stick full open and trim full high. Then, keeping the trim on high, move the throttle stick full low. A 1/8" throttle opening should be visible. Moving the trim full down should fully close the barrel. If any adjustment is needed for proper range of throttle movement, determine the best combination of hole positions for the servo wheel and the throttle arm.



STARTING THE ENGINE

To start the engine, first open the throttle 1/4 to 1/8. Prime with 4-6 drops of fuel in the carburetor. Attach the glow plug and flip the prop counter-clockwise until the engine starts. Alternatively, use an electric starter to spin the prop.

When the engine fires, if it speeds up and dies, this indicates the engine is running too “lean” (too little fuel). Turn the high speed needle valve 1/2 turn out, to add more fuel.

If the engine sputters amd dies, spitting raw fuel out the exhaust, this indicates the engine is running too “rich” (too much fuel).

Continue to adjust the High Speed Needle Valve until the engine will run continuously, but a little on the rich side.

IDLE/CUT OFF ADJUSTMENTS

It is recommended that you adjust the idle stop screw to allow the throttle to just fully close. This will enable you to shut off the engine on command when the throttle trim is moved full down.

HIGH SPEED MIXTURE ADJUSTMENT

Temperature, humidity, fuel blend, etc. are all among the variables that affect mixture. When the fuel line is restricted, the engine RPM increases. The goal is to achieve the optimum RPM. Therefore, adjustments should be made in very small increments. Starting with the fuel line closed down, turn the high speed needle valve approximately 2 1/2-3 turns. Run the engine at high speed and then go back to idle. Adjust gradually, going back and forth until a good general setting is made. Remember that the RPM goes up when the aircraft is released. Also, if the engine is running too lean, it will die in flight.

Next, slowly open the throttle fully and again adjust the needle valve amost to peak power, but a bit less and on the rich side. One way to test the setting is to pinch the fuel supply line shut. The engine RPM should increase slightly just before it dies.

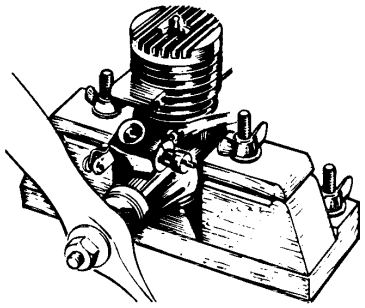
Once an engine is properly set, you should only have to touch the carb by giving a click or two on high speed (needle valve) for fine tuning.

SLOW SPEED MIXTURE ADJUSTMENT

Most engines are “broken in” at the factory, prior to shipment. Therefore, it is quite likely that your engine will require little or no slow speed adjustment.

If adjustment is necessary, try the following procedure. Reduce the engine throttle to idle speed and, if the engine idles, wait ten seconds and then hit full throttle. If the engine speeds up very quickly and then dies, it is running too lean. If it sputters, hesitates, and dies, it is too rich.

Final adjustments should be a bit on the lean side to give the best transition. Once Slow Speed is set, it may never again need adjusting.

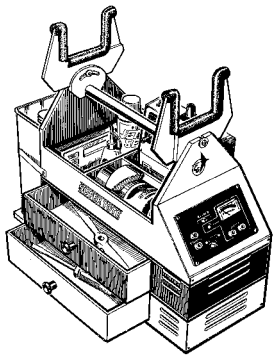


BREAKING IN THE ENGINE

Although most engines have been run at the factory, prior to shipment, it is sometimes necessary to do additional “breaking in” to assure a smooth, dependable engine. Usually, this consists of running the engine with a “rich” fuel mixture and at lower RPMs until all the moving parts get to know each other better. Break-in can be done with the engine in the model or securely clampled in place in a CGP Engine Test Stand or similar mount. Refer to your engine’s operating manual for the recommended break-in procedure and follow it carefully.

FLYING YOUR MODEL

Flying R/C is both fun and challenging. As with other portions of this book, the following section is meant to introduce you to the basics. Read carefully before taking your model out to the field and attempting first flights. And remember, becoming an R/C pilot takes time and patience, but the rewards are well worth the effort.



FIELD EQUIPMENT

The following equipment will be needed at the flying field to start your engine, make adjustments, and clean your model after flying.

FLIGHT BOX: Something sturdy in which to carry your equipment. CGP's SuperTote or Mini Tote are economical, easy to build, and pack lots of utility into little space. They hold fuel, transmitter, starter and battery, as well as many tools, in a balanced load that is easy to carry.

STARTING BATTERY AND GLO-PLUG CLIP: A 1-1/2 volt battery is required to heat your engine's glow-plug for starting. Wires connect the glow-plug clip to the battery. Because engine starting draws a lot of electric power from the battery, rechargeable ni-cad batteries are recommended. Although they cost more initially, they are more economical in the long run than frequently replacing dry-cell batteries.

FUEL: For best engine performance, use the fuel recommended by your engine's manufacturer. 2 and 4-cycle engines require different fuel blends. Ask your dealer to recommend a good quality 5-10% Nitro fuel.

FUEL PUMP: Needed to transfer fuel from the fuel can to the model's fuel tank. A simple squeeze-type bulb will do for small tanks, whereas manual crank or electric pumps fill larger tanks more quickly.

FUEL LINE: Have about 3 feet of silicone fuel line to make connections between the fuel pump, the fuel can, and the model's fuel tank.

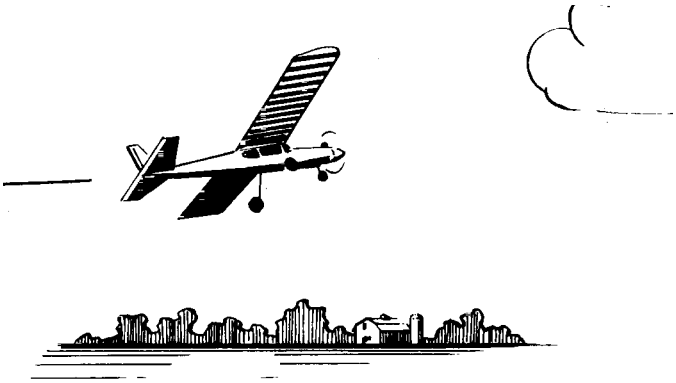
EXTRA PROPS & SPINNER: Experienced fliers always have a few spares on hand, so the flying session doesn't have to end prematurely due to a broken propeller.

Refer to the following checklist before leaving for the field.

Equipment Checklist

- ❑ Flight batteries, fully charged
- ❑ Radio transmitter
- ❑ Fresh 1 ½ volt starting battery & glo- plug clip
- ❑ Fuel bulb or pump
- ❑ Tools for tightening any parts that can vibrate and loosen
- ❑ Paper toweling for clean up
- ❑ Extra #64 rubber bands
- ❑ Extra props and an extra spinner
- ❑ Prop wrench

WHERE TO FLY

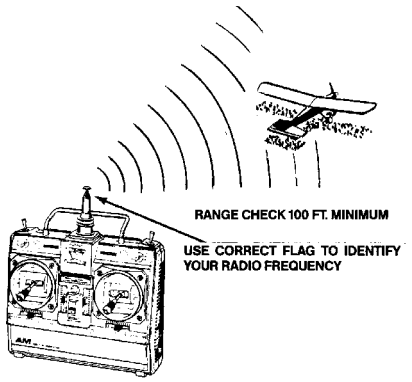


Fly only in areas sanctioned for R/C and known to be free of radio interference. Ask your hobby dealer or other modelers if there is an R/C flying field that is used by a local R/C club. This is the ideal place to fly. If you don't know of an R/C club nearby, contact the Academy of Model Aeronautics (AMA), at the address on the front of this booklet, for information on a club in your area. Remember: R/C flying fields need to have rules to help prevent accidents, so ask about them before you turn on any of your equipment! **DO NOT TEST your transmitter in the parking lot or anywhere nearby until you are sure no one else is using your radio frequency. This could cause another flyer to crash and make you very unpopular!**

If there is no club or other R/C flying site available, locate a square area (preferably a grassy field), at least **four or five football fields long**, which is free of power lines, trees, poles, houses, busy streets and other obstructions. It must be at least three miles away from any areas where other R/C models, such as boats or cars, are operated. It should also have a relatively smooth surface, as it will take practice to learn precision landings. If you find a suitable location, turn your receiver on for 2 or 3 minutes to check that no one in the vicinity is operating an R/C device which could affect your receiver and cause your plane to crash.

LEARNING TO FLY

Your chances of success are enormously increased if you have an instructor. Learning to fly is harder than it looks, and a mistake can seriously damage or destroy your model. Even full-scale pilots have problems learning to fly models because it's different-they're not in the cockpit. It's worth real effort to find someone to teach you. Many clubs have authorized instructors and there are even some R/C flight schools. Ask your dealer, or even check on the Internet to see if there is someone who can help. **Only if there is no other way should you attempt to learn on your own.**



CHECK YOUR EQUIPMENT

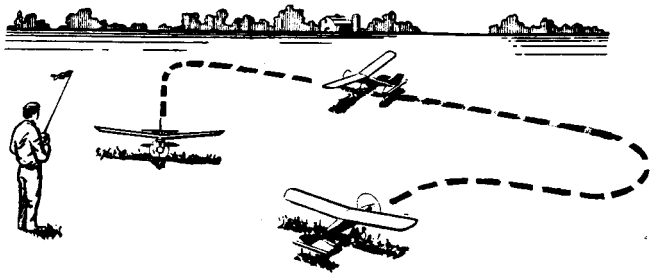
Prior to going to the flying field, with radio batteries fully charged, turn on both receiver (Rx) and transmitter (Tx) and actuate all controls many times until you are satisfied with all functions.

Before beginning each day's flying, make a range check of your equipment in accordance with the manufacturer's instructions. In general, with transmitter antenna collapsed to 6"-8", you should have an at least 100 foot range on the ground. To check this, turn on both the transmitter and the receiver switches, set the model heading away from you, and walk away while transmitting signals to move the control surfaces. Watch to see that no signals are missed until you are at least 100 feet away. Only if the equipment works perfectly should any flights be attempted. Again, **be careful to not use your transmitter when anyone else at the field is flying or testing on the same frequency!**

After the range check, stand behind the model and make sure the control responses are correct. Moving the control stick to the right should give right rudder (on a 3-channel set-up) or the right aileron should go up (on a 4-channel set-up). Moving the stick back or down on the Tx should move the elevator up, and vice versa.

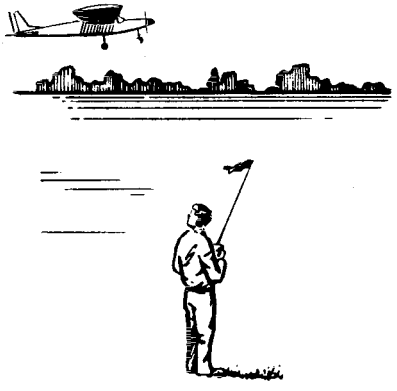
Check also to see that your nose wheel turns to the right when you give right rudder. Your throttle should open to permit full power when the stick or tab is moved forward or up. Finally, make sure that everything on your aircraft is neatly and firmly in place-motor fastened down, servos snugged down, receiver and battery wrapped in foam rubber, tank properly supported, etc. Prop and spinner must be tight. The receiver antenna must be extended, not coiled up inside the model. Nothing should be loose, or unfinished, or unchecked.

With everything ready, the engine should be started and run for at least a tank or two at no more than moderate speed. While the engine is running, make sure the control surfaces do not jitter or move until you command them and that the throttle also responds properly to your command.



GROUND STEERING PRACTICE

For a couple of hours, practice taxiing the model around at low speed. This is a very helpful step in making you feel more at ease in controlling the model. Do not rush it. Use a parking lot rather than a street where you are likely to run into a curb and damage your model. Practice taxiing in light breezes or when the air is calm; as strong or gusty winds can catch a wing and flip your plane over. Apply minimum throttle that just keeps the model moving at a walking pace. With the rudder stick and rudder trim in neutral position, the model should move straight ahead. If it constantly turns left or right, the nose wheel is not pointing straight forward and should be adjusted by loosening the steering arm.

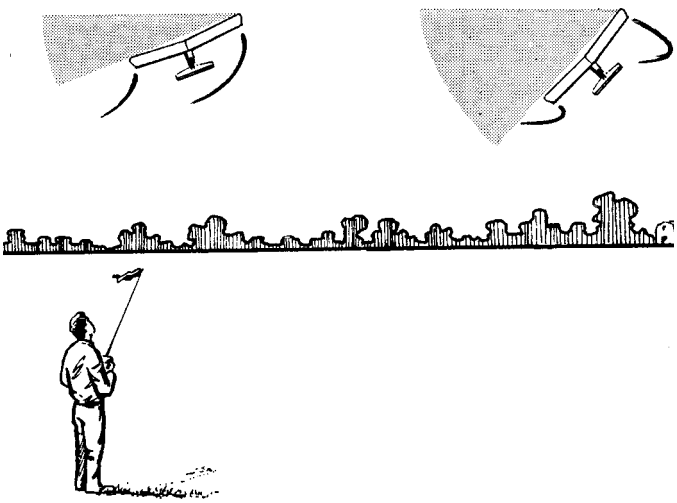


While learning to fly, you may feel more comfortable looking over your shoulder (with your body in the same direction as the model) as the plane comes toward you.

When the plane is pointing at you, the steering will seem "reversed." When you give right rudder, the plane turns to your left-but the model actually is turning to its right. With practice, you will become accustomed to this. When the model comes toward you,

simply push the stick left or right, in whichever direction the ship is turning. Another helpful technique is shown in the above drawing. "Head-on disorientation" is dangerous in the air, where things can happen pretty quickly. Before flying, it is wise to spend some time familiarizing yourself with orientation by operating the controls, with the plane set on a table, while you view it from different positions. The more familiar you become with the behavior of the model as you control it on the ground, the better prepared you will be for flying. After taxi runs are completed, thoroughly examine the model and tighten any loose screws, etc. Checking your aircraft after each and every flight is an important habit to form, as loosened parts are the frequent cause of crashes.

First flights should be made on a day that is not very windy or gusty. There should be very few people or other distractions around; you will need to concentrate. Your success doesn't depend on following the instructions here to perfection, but you should have a flight sequence in mind. Think ahead of the model; don't chase it around the sky, always one thought and one control command behind it.



GENERAL FLIGHT TECHNIQUES

In flying, it is very important to make all your control movements slow and measured. Rapid movements tend to throw the model out of control. Try to make all turns gentle, not tilting (banking) the wing very much. If you increase the bank, making the turn steeper, there will be a corresponding weight increase and reduction of lift. Therefore, when you bank your plane, it will start to descend. To maintain altitude in a turn, add enough back stick (up elevator) to hold the nose "up" through the turn.

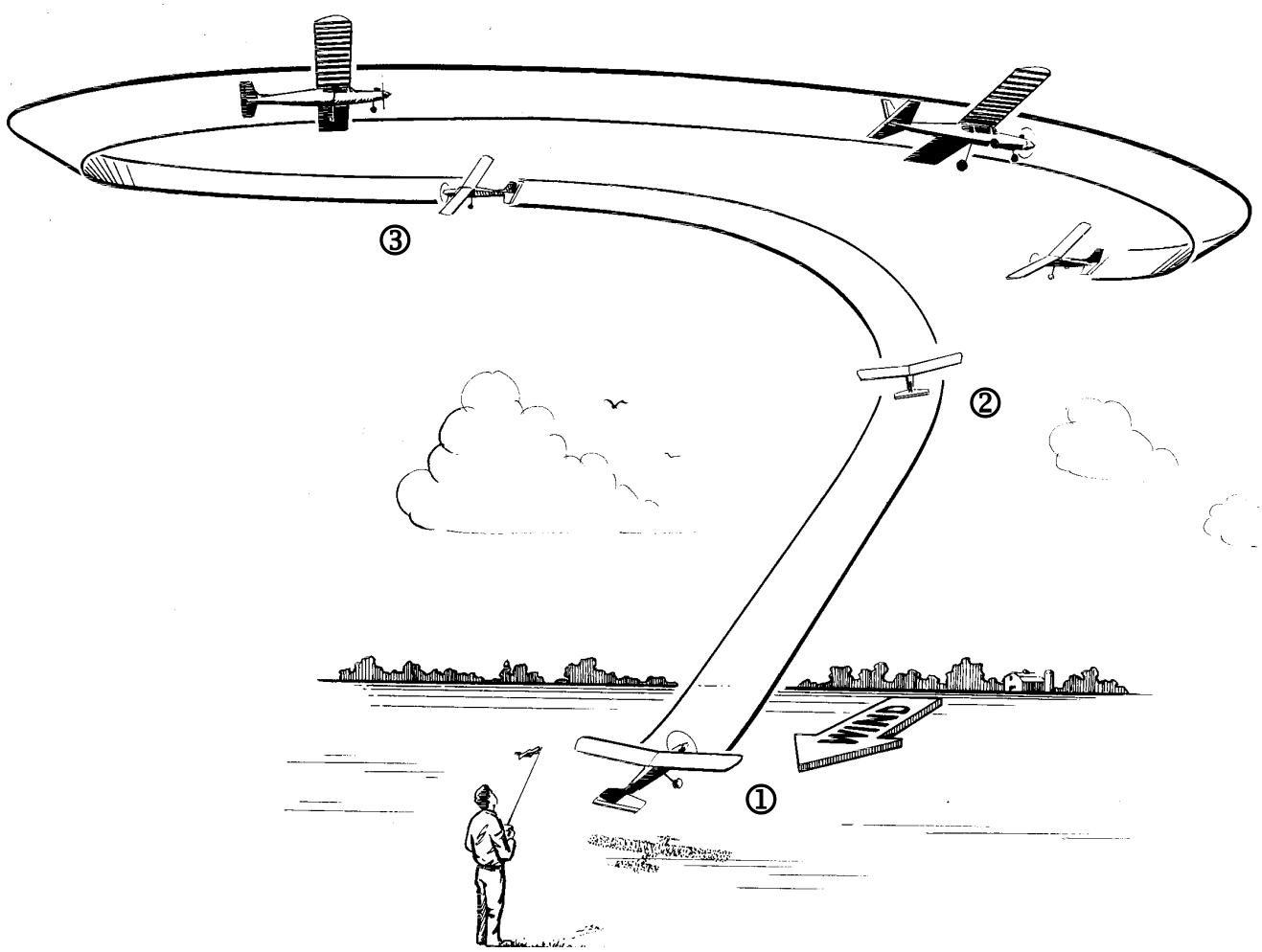
FIRST FLIGHT

There is no way to fully explain the principals of flight and the techniques of flying in a few pages. Entire books have been written about apparently simple subjects, such as the shape of the wing. Furthermore, there is no substitute for an experienced R/C flight instructor. The following information is not intended to replace your instructor, but to help give you understanding of basic flight concepts and techniques.

As stated earlier, choose a day on which there is little or no wind and the flying field is relatively quiet.

One of the most important, yet sometimes forgotten pre-flight checks is to always make sure the wing is securely banded to the fuselage. Use at least seven #64 rubber bands on each side of the wing.

Plan to make your first flight a short one. You will be surprised how exhausting beginning flights can be. Plan to spend no more than 2-3 minutes in the air the first few times you fly.



NOW THAT YOU'RE READY...

It is important to have a total flight plan in mind. Look at the flying sketches here to get an idea of the take-off direction and space you will need when flying at your field.

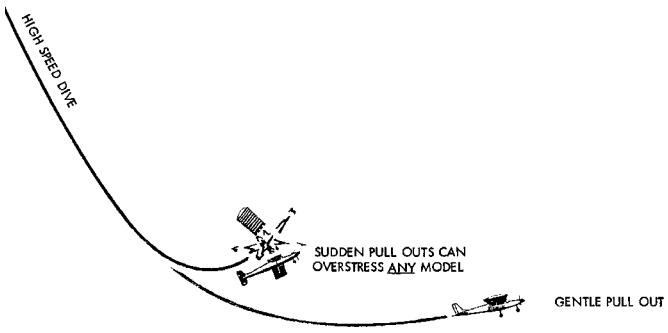
1. Start your engine. Point the model directly into the wind and advance the throttle smoothly, steering on the ground with rudder. The plane will gain speed rapidly.

   Remembering to operate the controls smoothly, add slight back stick pressure, if necessary, to keep the model from descending. When it is about 100 feet away from you, it will start to gently climb. Be patient; let it climb slowly, as a steep climb will cause it to stall. Most crashes are due to moving the controls too much, so be slow and gentle on the controls during "climb out" and throughout the flight. Over-controlling tends to throw the plane out of control and wastes power. Just keep the model flying in a gentle 5° to 10° climb into the wind. Keep the wings level until you have reached an altitude of about 150 feet.

2. Patiently allow the model to slowly climb to 150-200 feet, adding just a touch of left or right aileron stick pressure until the model begins a very shallow turn in the direction you want to go.

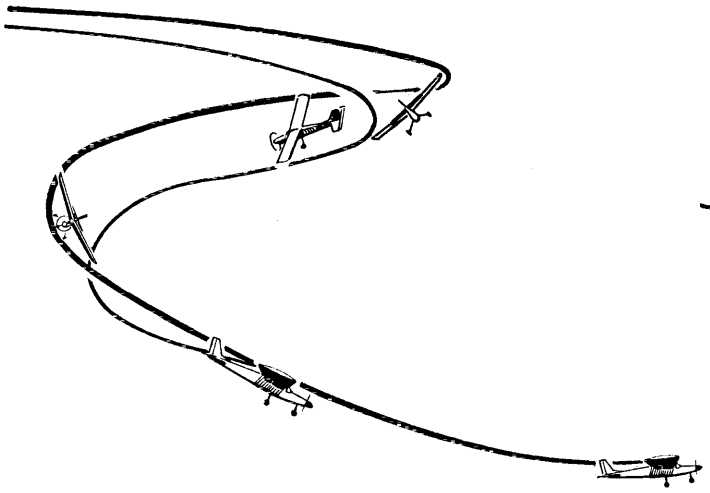
3. Try to maintain this shallow turn. Do not let the turn get too steep. The wind will tend to blow your plane further downwind. Try to keep it upwind at all times prior to your landing approach. It is more difficult to fly a model when it is downwind, and if a mistake is made, the model will end up further away, making it harder to fly back to the field. To compensate for wind, continue making upwind turns shallow, but make downwind turns a little steeper.

The following drawings illustrate some of the problems that may occur in flight, as well as the proper corrective maneuvers.



OVER-STRESSING THE AIRFRAME. Abrupt changes, such as may occur in a high speed dive, can stress ANY airplane, even those designed for aerobatic competition. If you find yourself in a steep, high-speed

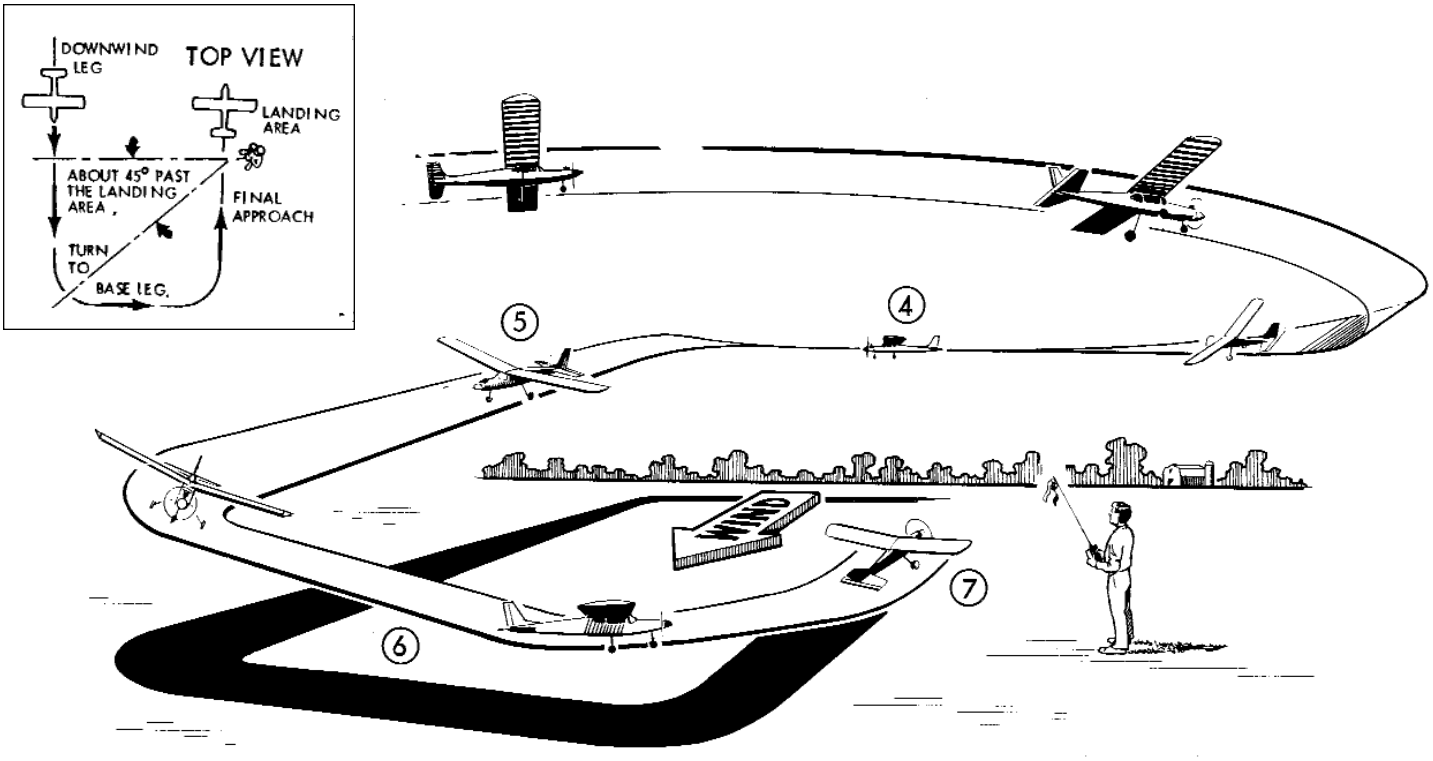
dive, immediately level the wings and gently pull the stick back (add up elevator) to recover.



SPIRALS. As explained earlier, when the bank angle increases, up elevator (back-stick) must be added to keep the plane flying level. If the bank becomes too steep, the model will spiral downward at an increasing rate of speed. Trying to “pull” the aircraft out of the spiral by pulling back on the elevator only makes things worse. This sequence of events happens very quickly and can panic new pilots into flying the model right into the ground! So commit this correction to memory:

To get out of the spiral, level the wings and then pull SMOOTHLY and GENTLY out of the dive.

STALLS. Your model’s movement through the air keeps it flying. If you fly too slowly, there is a point where it will stop flying and fall out of the sky. This is called a stall. When the nose drops, the plane will gain some speed. Give it a little more power as you gently give the plane up elevator to bring the plane nose level with the horizon.



FLYING A PATTERN

At most flying fields, models fly in a rectangular path around the runway. This is called the "pattern." The most important reason for flying the pattern is that, as the model flies in different directions in the wind, the pilot will be better prepared for landing conditions when the flight ends. Full-scale aircraft fly a landing pattern for this same reason. Another important reason for flying the pattern is to organize the take-off and landing traffic, reducing confusion. The "traffic" pattern consists of PATTERN ENTRY, DOWNWIND LEG, BASE LEG, AND FINAL APPROACH & LANDING.

When you have reached an altitude of 150-200 feet, add just a touch of left or right stick until the model begins a very shallow turn. Try to maintain this shal-

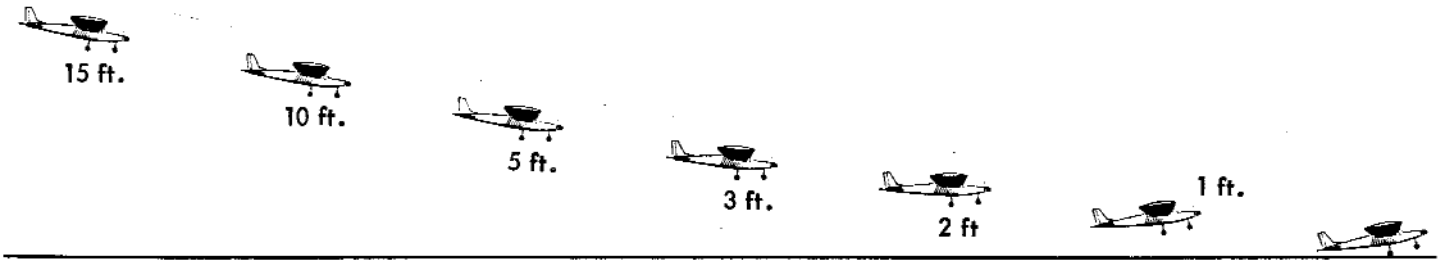
low turn, keeping it gentle, and not tilting (banking) the wings very much. If you increase the bank, making the turn steeper, there will be a corresponding weight increase and reduction of lift.

Therefore, your plane will start to descend. To maintain altitude in a turn, you will have to add enough back stick (up elevator) to hold the nose up through the turn.

Plan to enter the pattern upwind at about 150 feet altitude. Make the Downwind Leg far enough away to allow for gentle turns to Base Leg and Final Approach.

Avoid tight "panic" turns, particularly when landing.

The wind will tend to blow your plane and pattern further downwind. Try to keep it flying upwind at all times prior to your landing approach. It is more difficult to fly a model when it is downwind, and if a mistake is made, the model will end up even further away, making it more difficult to fly back to the field. To compensate for wind, continue making your upwind turns shallow, but make your downwind (with the wind) turns a little steeper.



LANDING

For your first landings, don't be concerned about trying to land in a particular spot. Just land safely, without damage to your model. At first, concentrate on flying in wide circles, as shown, and then simply glide down straight into the wind.

With a 2-channel system, when the battery begins to run out, the model will start a gradual descent. Continue circling and start calculating how much longer the model will glide. After imagining how much glide you have, you can start planning ahead for landing.

For 3-channels, if you have a helper, he can time your flight and tell when you have about four minutes of flight time. If you turn the motor off at that point, there will be one or two minutes of battery power left.

With the power off and the plane gliding downward, plan your approach for landing. When the model is about 45º downwind of the landing area, turn to Base Leg. Continue your descent, letting the model slowly lose more altitude. (If you are not happy with the approach, turn the power back on, climb out, and set up for another pass.) Remember, "a good approach is a good landing." Don't rush it.

For your FINAL APPROACH & LANDING, make a gentle turn to point the model in the direction of the landing area. Keep the nose of the plane slightly down, so you don't stall. Steer the plane into the wind as it glides, keeping the wing level. Let the model settle in toward the ground and land. Just before the model touches down, you can add just a bit of back stick (up elevator) to "flare" and soften the landing.

Walk over to your plane and turn off the receiver first, and then the transmitter. Congratulations! You've just completed your first flight.

GROUND TAKE-OFFS

As you gain flying experience and confidence, you will want to try to take off from the grass or runway. First, point the model directly into the wind. Switch the motor on and gently steer the model straight with rudder as the model gains speed rapidly. After it rolls about 50-75 feet, add slight back stick) up elevator) pressure, so that the model rises smoothly from the ground. Only hold as much back stick as necessary to keep the plane in a 5º to 10º gentle climb. If you try to pull the model up too steeply, it may slow down and then stall and crash.

SETTING ADJUSTMENTS

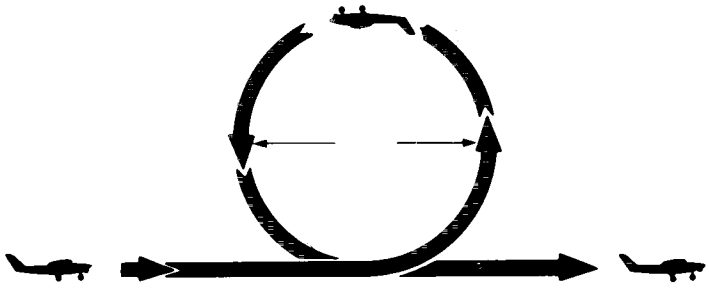
As you get used to the controls, you probably will notice the model turning somewhat, or climbing or descending, without any stick pressure on your part. These tendencies can be corrected in the air by moving the trim tabs on the Tx. After landing, the setting of the rudder or elevator should be similarly adjusted as best you can by means of the clevises. This, in turn, permits the Tx trim tabs to be re-centered. Further flights will show if more adjustment is required. A severely out-of-trim condition (caused by a warped wing, for example) might not be correctable using the above trim techniques. In that case, taking the model home and straightening the warp with heat is necessary.

AEROBATICS

TOUCH AND GO

The Touch and Go combines three flying maneuvers mastered when learning to fly: the final leg of the Traffic Pattern Approach, the Landing, and the Ground Take-off. Key features that must be perfected are making sure to put the plane down on the runway with enough room left to allow for a smooth take-off and gradual climb out, and making the transition from touch down to takeoff while the plane is still rolling.Basically, the maneuver is accomplished in this way.

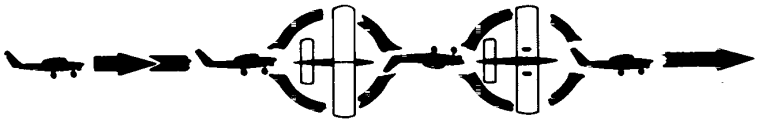
1. Start with the plane flying into the wind about 200 feet from where you are standing and at an altitude of about 25 feet. The engine is throttled down to idle, so that the plane gradually sinks toward the runway at a slightly nose-dowon attitude.
2. As the plane reaches an altitude of about 6 feet, add a little up elevator, so that the glide path levels off in preparation for the flare out and final touchdown.
3. Give additional up elevator for the flare out. When the plalne touches down, it slows to approximately 1/4 the flight speed.
4. Without stopping, gradually open the throttle for takeoff, applying rudder as needed to conter the effects of torque.
5. Apply up elevator to break the ground and hold the setting for climb out.
6. Use ailerons, as necessary, to keep the wings level. Use rudder to keep the plane on the heading.



INSIDE LOOP

This is frequently the first “stunt” a relatively new pilot attempts.

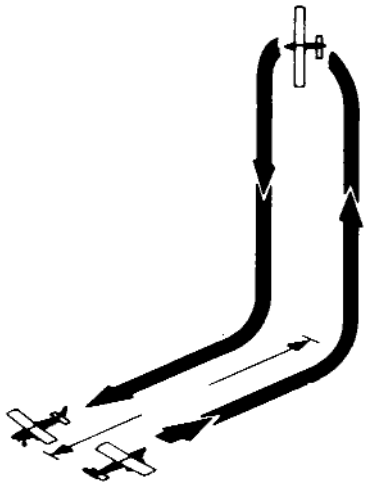
1. The maneuver starts with the model flying straight and level, into the wind. Then, up elevator is applied to take the model straight up into smooth round loop. The plane should not fall off to either the right or the left and the speed should be constant throughout the loop.
2. As the plane reaches the top of the loop, ease off of up elevator and allow the plane to fly inverted and level.
3. To begin the descent, add up elevator.
4. To obtain a more precise loop, throttle down to idle as the plane descends.
5. As the model approaches the starting point of the loop, ease off of up elevator.
6. Complete the maneuver by flying 50 feet straight and level at the entry altitude.



HORIZONTAL ROLL

Before starting on this maneuver, there are some important things to keep in mind. First, and perhaps most important, **when the plane is inverted, the elevator works backwards.** When the plane rolls through the inverted position, you give **down elevator** to keep the plane’s nose up. This is very important, so think about it and commit it to memory. Also, fly at an altitude that will give you a good margin for error, since you’ll probably end up in a 30-degree dive on your first tries. Finally, practice with the plane in front of you, rather than over your head, and with the sun behind you.

1. Begin by flying straight and level downwind and at full throttle.
2. Give full left aileron.
3. When the plane is inverted, continuing to hold the left aileron, give quick **DOWN** elevator and then release.
4. When the plane returns to right-side up, release the aileron.
5. Fly out 50 feet, straight and level, at the entry altitude.

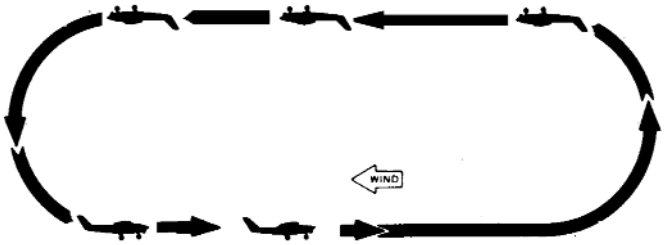


STALL TURN

The Stall Turn, or Hammerhead, is a smooth, pretty maneuver. Getting the plane into a vertical climb and applying rudder at the proper time is what the Stall turn is all about. If you apply rudder too soon, you'll only wag your tail. Apply it too late and the plane will simply stall out and fall off.

So the first goal is to achieve a truly vertical climb. Then, recognize that second or two just before the plane stops moving, while there is still enough air moving over the rudder, and apply rudder. That gets the tail moving, so that it **???** will continue to coast around while the plane stalls out. **???**

1. Fly straight and level at full throttle, until the plane is about 100 feet past center you.
2. Give the plane full up elevator, pulling it into a sharp vertical climb.
3. Near the top of the climb, thottle the engine down, so that the model slows, as if it has run out of gas. Just as it seems there is no more ability to climb, apply left (or right) rudder. This will cause the plane to pivot 180º on its left (or right) wing tip, and head straight down. The aim is to keep it under control the entire way.
4. When the plane returns to the entry altitude, apply up elevator to bring the place back to level flight.
5. Open the throttle and fly out, straight and level, 50 feet in the opposite direction from the entry.



INVERTED FLIGHT

An easy way to learn inverted flight is through a "stretched" loop. Basically, one flies to the top of an inside loop, and when the plane is inverted, practice flying it level. When ready to stop, just finish the loop and bring the plane toward you.

1. Flying into the wind, with the plane about 200 feet downwind of the spot where you are standing, begin the loop.
2. As the plane passes in front of you, give it up elevator to begin the "up side" of the loop.
3. When the model nears the top, ease off of the up elevator and put in some down elevator. Hold just enough down elevator to keep the plane level. It should be flying away from you, inverted. If the plane banks either left or right, use the ailerons to straighten it out. Aileron response is the same, whether the plane is flying inverted or right-side-up.
4. If the plane loses altitude while inverted, put in more **down** elevator. If it climbs, because you are giving it too much down elevator, ease off a bit.
5. After the plane has flown inverted for a few seconds, reduce throttle and finish the loop. Ease off the down elevator and pull up elevator. The plane should dive down to complete the loop and level flight toward you.

Practice flying inverted for just a few seconds at first and then increase the length. As you feel more comfortable, you may wish to try getting into inverted flight from a half roll to the left or right. This is accomplished by bringing the plane up to a safe altitude and then begin the maneuver by pulling into a 30º degree climb for more insurance.