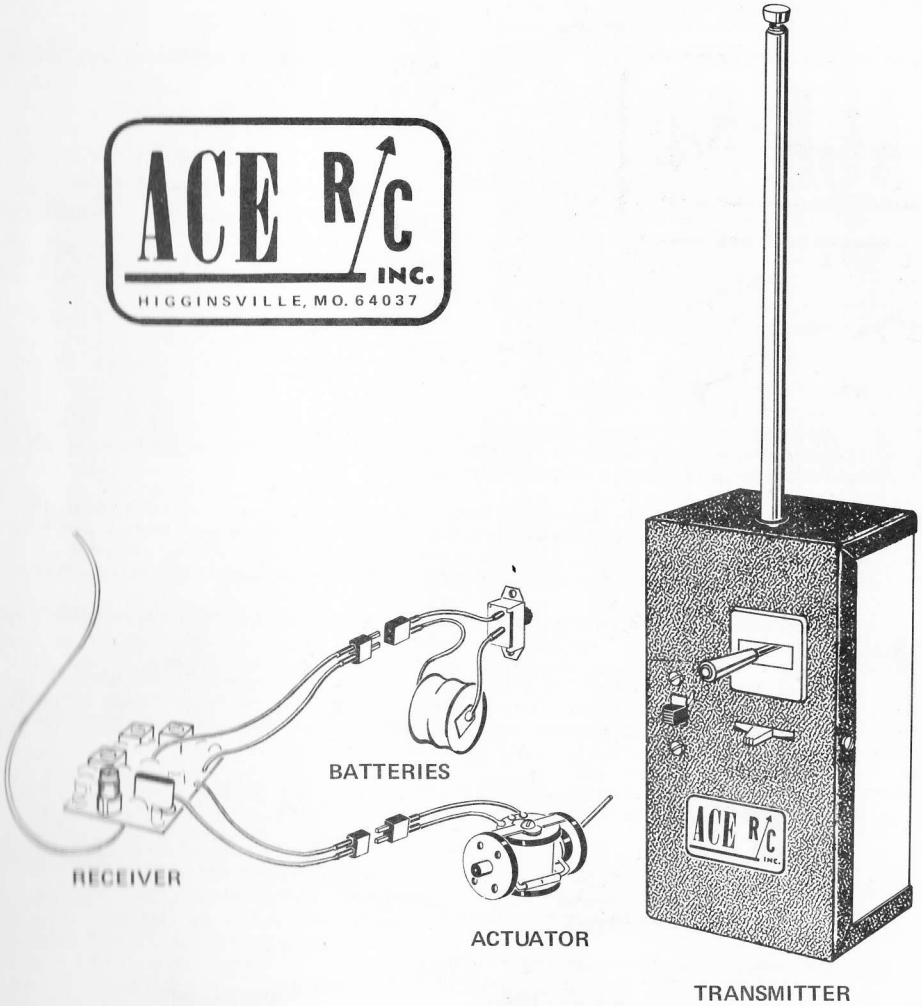
OWNER'S MANUAL

ACE R/C INC.
HIGGINSVILLE, MO. 64037



pulse commander

ACE R/C INC.

PULSE CAPITAL OF THE WORLD!

Phone: 816-584-3238
203 W. 19th St.
HIGGINSVILLE, MO. 64037

Dear Friend:

Congratulations! You have purchased a precision package of Radio Control gear. The Commander pulse proportional is a complete system that can provide you the most fun per dollar of any of the systems available of today.

We urge you to read the instructions thoroughly and carefully before you attempt to do anything. Identify each part of the system, and from the instructions learn what its function is. Then hook up your system on the bench and test it to familiarize yourself with the "wagging" operation of the actuator--this is the secret of the simplicity of pulse proportional.

Then install in a plane which is suitable for pulse and learn to fly, following the instructions included in the manual.

After you become a skilled R-O pilot, you may want to investigate the expandability the Commander package offers you. You can expand in several directions: go to larger actuators, smaller batteries or larger batteries, etc. The versatility is limited only by your imagination and your requirements.

You can add motor control later quite simply with the KRD motor control servo and a factory conversion to pushbutton fast pulse to your transmitter.

Our Handbook-Catalog contains additional information on the rudder only and how to use it more effectively. If you do not have a copy, be sure to check the appropriate blank space on the Warranty Sheet. We will see that you get one after you return this to us. Return Warranty Sheet immediately, please.

We invite your comments and suggestions.

Keep 'em pulsing,

Paul F. Runge

HISTORY AND CONCEPT OF PULSE PROPORTIONAL

There is no doubt about it--this is the day of proportional control. It is a dream come true. Since the early days of remotely controlling a model of a flying machine, modellers have wanted to do it as nearly like the real thing as possible.

For many years, however, this was not to be the case. In its initial stages, model flying was bang-bang stuff. You pushed the button, and the control surface went all the way over and the plane responded all the way. This was true whether it was single channel escapement or multi channel flying with reeds.

Flyers who learned to lean on the control pushbuttons just a bit, then off; then a bit more, then off; then a bit more--in effect were getting proportions of what was built into the system, and they were flying more realistically.

Proportional control--or a system which gave the aircraft just the degree of surface response that the modeller called for by moving the stick in the direction that he wanted that control--was attempted in a variety of ways and with some success. First was early pulse proportional. It won many contests, even some Nats. It had quite a following, particularly among the tinkerers. This was true because you had to take an existing transmitter and modify it by adding a pulser to it. The pulser in the early days consisted of a motor driven switching device which turned the transmitter on and off, and varied the signal of the transmitter as you move the stick. This was a hold over from the systems used in early World War II missiles. Then came electronic pulsers. These used relays to turn the transmitter on and off. This was followed by more sophisticated circuitry which used electronic switching. Always, however, it was a proposition of having to adapt a so called "single channel" transmitter to become a pulse proportional transmitter by adding a pulser. This was a big obstacle, and to many it remained a hurdle, because there was no real assurance of satisfactory operation without a lot of tinkering.

On the receiving end the receiver generally had a relay, and this was coupled to actuators of varying descriptions, some of them magnetic and some of them motor driven. In many cases two sets of batteries had to be used. Eventually electronic switchers such as the Ace AOSK and others of this kind appeared. With the refinement of receiver circuitry, it became possible to operate with less batteries and do away with the always critical adjustment that the receiver relay required to follow and track the pulsing of the transmitter--provided that it was pulsing regularly and evenly!

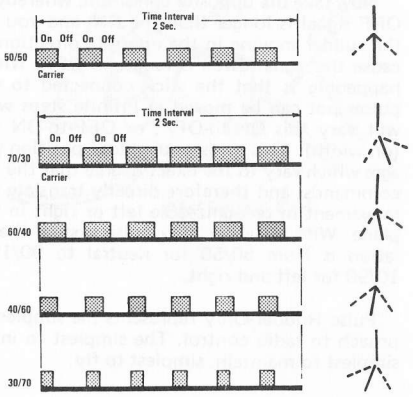
Actuators themselves presented a problem, because until just a few years ago, most of these had to be homebrewed. Some of the commercial ones had several things against them--they were either too heavy, or if light enough, lacked power. It wasn't until Dick Adams invented and patented the Adams Dual Coil Actuator that the full potential of true rudder only pulse proportional control began to move forward.

There remained, however, the haphazard approach in both the transmitter and the receiver, because of the required "add-ons" in order to achieve the sometimes proportional rudder only control.

It wasn't until the Commander series of rudder only pulse units were introduced that we finally came to a wholly integrated and compatible system. The transmitter was designed as a pulse transmitter, and the receiver was designed as a pulse receiver and they were made to work together with the Adams actuator. While it took a while to have the concept catch on, it is this complete match up of the rudder only pulse system in the Commander that has brought rudder only pulse to the forefront of complete and simple reliability.

It is no longer a hodge-podge of an assorted bit of add-ons, it is no longer a series of complex and disheartening adjustments that must continually be made to keep operational; it is no longer a matter of having heavy and cumbersome airborne equipment. The airborne flite pack weights range from 2.5 ounces and up--the lightest weight package systems that are available for any aircraft installation--and they use dependable and reliable nickel cadmium batteries so that you know constantly where you are from a standpoint of having enough battery life left for another flight or not. It offers the same dependability of digital systems.

In pulse proportional control, a tone is sent on and off constantly, fast enough so that the actuating device in the plane is continuously moving from one position to another. Your transmitter and receiver and actuating devices are being constantly commanded by the tones you send.



Now let's look at what is happening. You are sending out tones of equal length of ON to OFF. The rudder during this time, because it is linked to the actuator, responds to the signal and it is alternately going from left to right in direct response to the tones that the pulser-transmitter puts out. As long as the ratio of the width remains equal (50% ON to 50% OFF), you will have the rudder constantly going from left to right equally. Your airplane will read this as a neutral signal, because your airplane is "averaging" the rudder positions. As long as they are equal you have, for flying purposes, a completely neutral rudder, since the plane responds just as if there were no movement of the rudder at all.

At this point it must be mentioned that this is the pulse proportional secret--the tail wagging. It must also be mentioned in the strongest of terms that this tail wagging does not act as a "brake". It does not slow down the flight of the airplane, and does not in any way affect the flight pattern, provided it is happening at a fast enough rate of at least three to four pulses per second. When it is happening at this rate there is no time for the rudder to "catch" hold in the air stream.

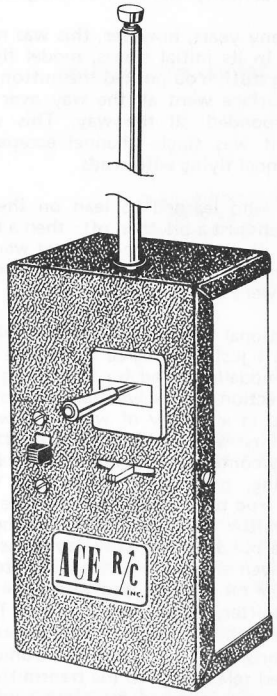
The fact of rudder wagging may disturb some people, but it simply does not bother the airplane and there is really no reason why it should bother you. As a matter of fact, there are some flyers who take comfort in the fact that the rudder is wagging, since they know that the system is performing as it should.

Now let's see what happens to the signal when you begin to vary pulse width from the 50/50 ratio by moving the control stick. If the ON signal pulse is longer than the OFF time, the actuator will go further in the direction caused by the ON signal, before the circuit is reversed with the OFF signal. This means that the rudder will begin to dwell in the ON direction just a bit longer. This short bit longer is enough in a properly trimmed airplane for the airplane to begin to respond in a turn.

Now take the opposite condition, whereby the OFF signal is longer than the ON, and you have the rudder moving in the opposite direction, because the signal dwell is longer in OFF. What is happening is that the stick connected to your pulser pot can be moved in infinite steps which will vary this ON-to-OFF, or OFF-to-ON ratio (or width). This gives you rudder position averages which vary to the exact degree that the stick commands, and therefore directly translate stick movement in recognizeable left or right in your plane. With a rudder only pulse system the variation is from 50/50 for neutral to 90/10 or 10/90 for left and right.

Pulse Rudder-Only represents the simplest approach to radio control. The simplest to install, simplest to maintain, simplest to fly.

All of this with economy and effectiveness along with extremely light weight. It goes where heavier digital equipment can not. It is a whole new ball game!

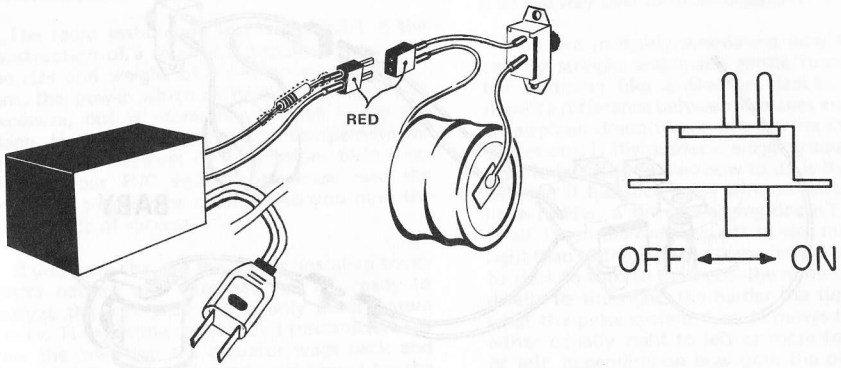


TRANSMITTER OPERATION

To make your transmitter operational all that is required is to purchase and install a Mallory M-1603 9 volt dry battery or equivalent. Make sure the transmitter is OFF when installing the battery (the transmitter is on when the switch slide is toward the top of the case). This battery will provide enough power for 30-50 hours of flying time. If your battery is getting low, the operational range will decrease and neutral will shift, causing erratic operation. To be sure of battery condition obtain a voltmeter and test the battery voltage with the transmitter on. If the battery tests above 7.5 volts, it is okay.

When the battery is installed, secure the back of the case using the two No. 4 self tapping screws provided. Install the antenna by inserting it through the rubber grommet on the top of the case and screwing it in clockwise until tight. Always fly with the antenna fully extended.

There are no adjustments necessary on the Pulse Commander transmitter; it is completely factory tuned and aligned.



BATTERY CHARGING

Before operating the airborne unit, it is necessary to charge the nickel cadmium batteries. The first time you charge them, do so for at least 24 hours--12-16 hours is sufficient for all subsequent charges. Always charge the batteries after every session of flying. If it has been over a week since you've flown, charge the batteries the night before you fly again. Each charge is good for about two hours of actual flying time before needing to recharge.

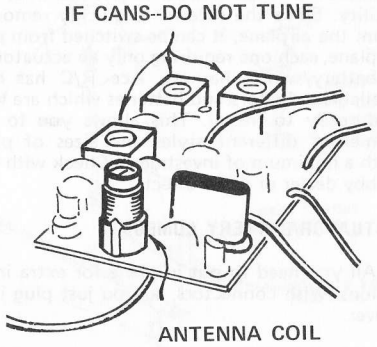
To charge the batteries, first unplug the battery/switch harness from the receiver. IMPORTANT: Notice that the two pin plugs are colored on one side. When plugging them together, make sure that the colors are the same and the color is on the same side. This insures that the correct contacts are made; if they are reversed, damage can occur. Now plug the charger into the battery/switch harness and then connect it to household current. MAKE SURE THE SWITCH IS ON when charging; otherwise the batteries will receive no current.

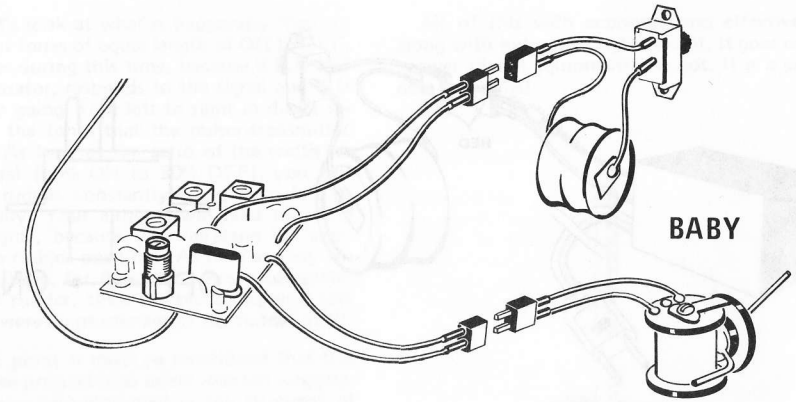
RECEIVER OPERATION

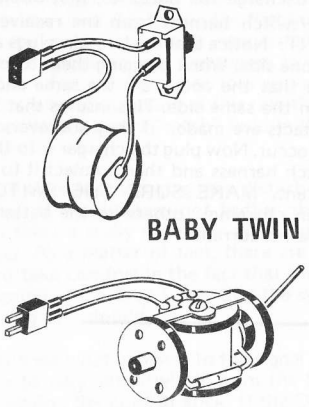
Your Pulse Commander receiver is a superhet circuit which allows you to fly at the same time as others if you are on a different frequency. The frequency is indicated by the color of the flag on the transmitter and the color of the antenna wire and crystal in the receiver. Make sure nobody has a transmitter on with the same frequency as yours before flying.

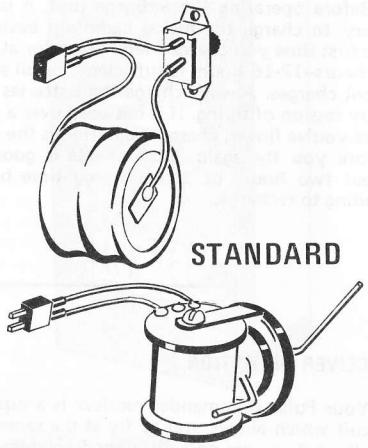
COLOR	FREQUENCY
Brown	26.995 mHz
Red	27.045 mHz
Orange	27.095 mHz
Yellow	27.145 mHz
Green	27.195 mHz

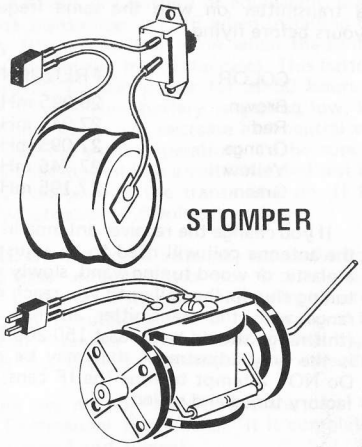
If you change the receiver antenna in any way, the antenna coil will need to be adjusted. Using a plastic or wood tuning wand, slowly rotate the tuning slug in the coil until you reach maximum range with the transmitter antenna collapsed (this range should be at least 150-200 feet). This is the only adjustment that may be necessary. Do NOT attempt to tune the IF cans; they are factory tuned and sealed.











VERSATILITY

Your Pulse Commander airborne radio system is connector wired in order to give maximum versatility. Since the receiver is quickly removable from the airplane, it can be switched from plane to plane, each one requiring only an actuator and a battery/switch harness. Ace R/C has made available actuators and batteries which are wired and ready to install. This allows you to have numerous different styles and sizes of planes with a minimum of investment. Check with your hobby dealer or order direct.

ACTUATOR/BATTERY COMBOS

All you need to put in plane for extra installations. With connectors, so you just plug in receiver.

15K15—Baby/225 ma Batt.	$11.95
15K15T—Baby Twin/225 ma Batt.	$14.95
15K16—Standard/500 ma Batt.	$13.95
15K17—Stomper/500 ma Batt.	$16.95

EXTRA CHARGERS

34K4—Baby Charger (For 225 ma)	$4.95
34K5—Standard Charger (For 500 ma)	$4.95

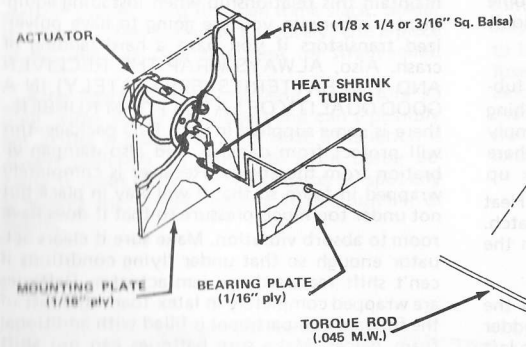
INSTALLATION

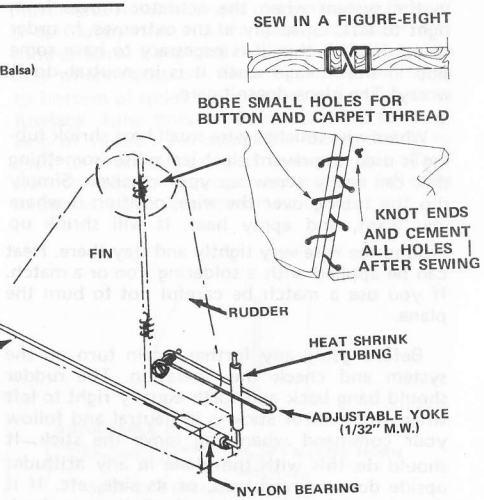
The radio installation is a critical part in the construction of a small R/C airplane. Because of the size and weight of a rudder-only pulse system, the power which controls the rudder isn't excessive, but is more than enough to fly the plane. However, not enough to compensate for errors or carelessness in installation. Before installing your R/C equipment, please read the following suggestions carefully so you have the best chance of success.

If you have charged the nicads, installed transmitter battery and antenna, you are ready to analyze the way your rudder-only pulse system works. Turn on the receiver and transmitter. See how the crank on the actuator wags back and forth? Don't worry! This action is a must for the proper operation of the system. Now as your actuator is wagging back and forth, move the control stick on the transmitter slowly to the left. Notice that the crank on the actuator dwells more and more to one side as you move the stick--when you push the stick all the way over, the crank barely goes to the other side. Moving the stick the opposite direction produces the opposite result, right? Good. That's the whole principle of pulse proportional radio operation. The installation will hook up the rudder so it responds in exactly the same manner. It will wag back and forth vigorously, banging equally from right to left until you move the control stick. Then it will follow your command proportionally—the more you move the stick, the more the rudder will stay to one side or the other until it almost stops at full right or left when the stick is all the way over in those positions.

You are probably wondering how the plane can fly straight and make gentle turns with its tail bumping like a Go Go dancer. Luckily, there's a difference between airplanes and people; an airplane doesn't care whether its tail is wagging or not. If the rudder is wagging equally from right to left all it knows how to do is fly straight. Because it has such a big wing in relation to its little rudder, a bit of wagging doesn't bother it at all. When the rudder starts to wag more to the right than to the left, the plane has no choice but to start to turn to the right--the more the rudder dwells to the right, the harder the turn. This is what the pulse system does. It moves the rudder either equally right to left or more to the right or left, depending on how you, the pilot, move the control stick. So, what we will show is how to hook the rudder up to the actuator so it does exactly what it is supposed to do; and find a place in the airplane for the other stuff such as the receiver, batteries, antenna, and switch.

The first and hardest part of the installation is hooking up the actuator to the rudder. Since the actuator weighs too much it can't be mounted at the tail of the plane where the rudder is, so it has to be connected to the rudder by some form of linkage. Because the actuator and rudder are constantly in motion, this linkage has to be very free and efficient otherwise the power of the actuator is lost. The most efficient method is by use of a torque rod to connect the rudder and actuator. Let's look at the following illustrations:





The actuator is mounted on a 1/16" piece of plywood that is the width and height of the fuselage where the actuator goes (About in the middle of the compartment under the wing). It is fastened to the mounting place by drilling appropriate holes and sewing with "button and carpet" thread or copper wire--don't use steel wire because this will disturb the magnetic field. To secure the actuator mounting plate in the fuselage, rails are made from 1/8 or 1/4 or 3/16" square balsa pieces which are glued to the fuselage side to act as slides or rails so that the plate can be slid in and out for easy removal. Make this a snug fit between the balsa rails and the plywood actuator plate.

The rudder is hinged at two points using heavy thread (button and carpet preferred) sewn in a figure 8 manner and glued. Use glue sparingly so you don't get it on the hinge portion--the rudder should flap easily back and forth with no resistance.

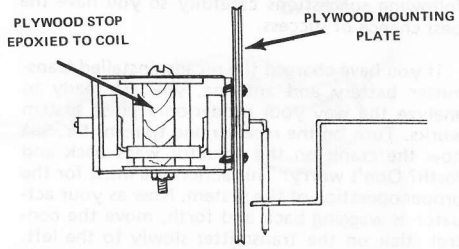
With needle nose pliers the front post of the torque rod is bent (out of .045 music wire) in the manner shown. It passes through two bearings: the front bearing is made of 1/16" plywood with a slightly oversize hole and a piece of nylon tubing is used at the rear. Make sure the torque rod is a straight line from the center of the actuator to the rear, touching nothing but the bearing points--no bind or rub should occur anywhere. It will be necessary in most instances to drill a hole through the rudder post for the torque rod to slide through. With the front plywood bearing loose, the torque rod can be slid in before the rear bend is made. Then when you are absolutely sure you have no binds, the rear bend is made straight up and down when the actuator crank is in the "neutral" or half way between its amount of travel. Then glue the ply bearing plate and make sure it does not shift. Also make sure you get no glue on any bearing points.

A yoke is used to connect the rudder to the torque rod. Paper clip wire or 1/32" music wire works well here. Bend in the manner shown and use a small nut and bolt to fasten it to the rudder; this allows it to be adjustable--move it up and you get more rudder movement, down and you get less. There should be absolutely no bind in the system when the actuator moves from right to left, especially at the extremes. In order to accomplish this, it is necessary to have some slop in the linkage when it is in neutral--don't worry! The plane doesn't care.

Where wire touches wire small heat shrink tubing is used to prevent electrical noise--something that can really screw up your receiver. Simply slip the tubing over the wire, position it where you want, and apply heat. It will shrink up around the wire very tightly and stay there. Heat can be applied with a soldering iron or a match. If you use a match be careful not to burn the plane.

Before going any further, again turn on the system and check the operation. The rudder should bang back and forth equally right to left when the control stick is in neutral and follow your command when you move the stick. It should do this with the plane in any attitude: upside down, straight up, or its side, etc. If it doesn't, you've got bind in the linkage so check your work carefully.

If the rudder still pulses unevenly while the plane is on its side and you are sure there is no bind, a modification to the actuator is recommended. Simply cut a piece of 3/32" plywood 1/4" wide, and long enough to fit snugly against the coil between the plastic discs of the actuator (see illustration). Carefully epoxy this stop to the coil. This restricts the deflection or throw of the actuator, since the torque effect is weakest at the extremes of the actuator travel. The lost throw can be regained by moving the yoke at the rudder upward slightly.

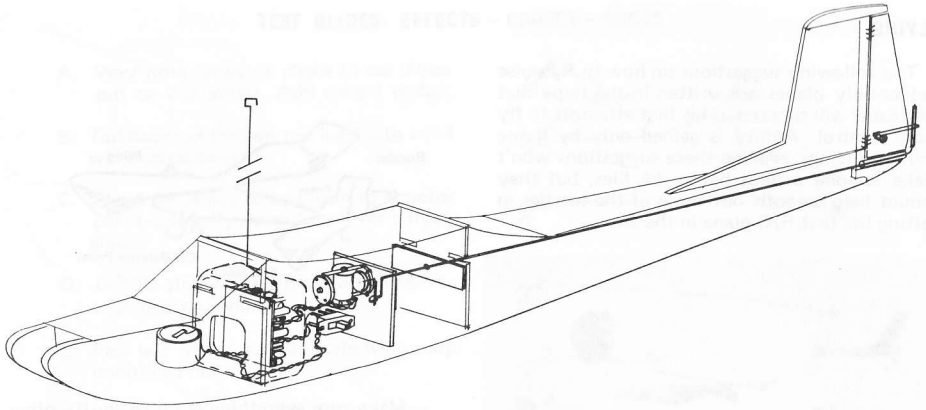


There might be a chance that the rudder follows the command backwards--that is, when you command right, the rudder moves to the left. If so, very carefully unsolder and reverse the brown and blue leads on the outer lugs of the actuator. Resolder carefully and securely. Do not use too much heat or you'll melt the nylon header.

Now it is the time to put the rest of the stuff in the plane. Shown is a typical installation for "Dick's Dream"; same pattern should be followed for other small planes--fine for large ones too.

Notice that the receiver is in front of actuator and batteries are in front of receiver. Always maintain this relationship when installing equipment; otherwise you are going to have pulverized transistors if you have a hard landing or crash. Also, ALWAYS WRAP THE RECEIVER AND THE BATTERIES (SEPARATELY) IN A GOOD QUALITY OF LATEX FOAM RUBBER--there is some supplied in your R/O package--this will protect from damage, and also dampen vibration from the engine. Receiver is completely wrapped in foam so that it will stay in place but not under too much pressure so that it does have room to absorb vibration. Make sure it clears actuator enough so that under flying conditions it can't shift rearward and jam actuator. Batteries are wrapped completely in latex foam--the rest of the forward compartment is filled with additional foam pieces. Make sure batteries can not shift around in your final installation. When checking the balance of your model, you can move batteries forward or backward so that you have the proper balance point. NOTE: Unless you use latex rubber, the receiver crystal is subject to damage and all warranties on the crystal are void.

Mount the switch in a convenient spot on the fuselage side so it is not in anything's way. Cut a rectangular hole and drill two holes in the proper spot - use two 2-56 bolts and nuts to secure the switch. (Switch guard is available).



VIEW SHOWING COMMANDER R/O INSTALLATION IN DICK'S DREAM;

SAME GENERAL IDEA APPLIES TO OTHER AIRCRAFT OF THIS SIZE.

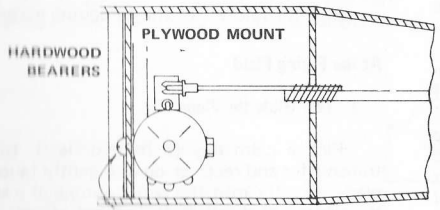
You may run the attached antenna to the rear of the plane on the outside to the top of the rudder or any convenient location. ALWAYS keep the antenna separate from other wires and do not run near any metal object such as the torque rod. If you experience glitching, or are flying in a high interference area, you can eliminate a lot of this by going to a whip antenna. A vertical whip is made out of .020 or 1/32" music wire so that the total length between the receiver and the top of the antenna is the length of the original antenna (24"). Securely mount antenna on fuselage, and cut the original receiver antenna so it runs in straight line between the receiver and the vertical antenna, but do leave some slack. Solder this wire to the music wire securely. Use a piece of slit fuel line over this joint for strain relief.

After installation is complete, make sure all your wires are neatly cabled and can't possibly get in the actuator. A nice, neat installation is always desirable - it seems to work better because it looks better; it is also easier to spot any problems that might happen after a number of flights.

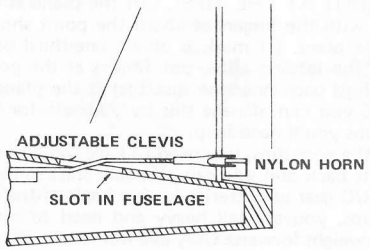
PUSH ROD INSTALLATION

Special installations may require the use of a push rod. It should only be used with dual magnet actuators. The actuator can be mounted the same as with torque rod installation except axis is different. Fasten actuator to plate by using existing nut and bolt on actuator.

With a push rod motion of actuator is carried to rudder by push-pull action. The control horn on rudder converts push-pull to left and right movement. As with torque rod make sure linkage is absolutely free, touching only actuator and control horn. Keep push rod straight with bends only where necessary. Mount control horn close to bottom of rudder so the push rod lies close to fuselage. Line holes in horn up close to hinge axis of rudder. An adjustable clevis should be used to connect push rod to horn. This allows trim for obtaining proper neutral and left-right extremes. Make sure there is no bind.



BOLT TO MOUNT WITH THE EXISTING BOLT ON THE ACTUATOR.



FLYING

The following suggestions on how to fly pulse rudder-only planes are written in the hope that the reader will succeed in his first attempts to fly radio control. Ability is gained only by doing and practicing; reading these suggestions won't make anyone a pilot before he flies, but they should help smooth out some of the hitches in getting the first R/C plane in the air.

A level, firm launch is necessary for a successful flight.

Pre-Flight Checks

At Home

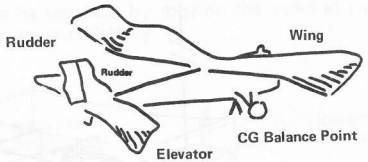
1. Check the airplane:

—For Center of Gravity balance and alignment according to the manufacturer's plans.

—For warps in flying surfaces.

The center of gravity (CG), or balance point, is marked on your plane plans and instructions. Using your forefingers try to balance the plane by holding underneath the wing near the fuselage (NOT AT THE TIPS). Lift the plane at the wing with the fingers at about the point shown on the plans. (If mark is about one-third back from the leading edge, put fingers at the point one-third back near the fuselage) If the plane is small, you can manage this by yourself--for larger jobs you'll need help.

If the nose dips, you need to have some of the weight back and you can probably shift some of the R/C gear or batteries further back. If the tail tip dips, you are tail heavy and need to move some weight forward. Only as a last resort, should you use lead or solder to help balance, since this will add to your total weight. Your center of gravity (CG) or balance point needs to be at the spot marked on the plans before you attempt any glide.



—Make sure everything is up to snuff; otherwise success can come hard! Look the plane over thoroughly for cracks, breaks, loose nuts, binds in control linkages, and any other weak points.

II. Check your radio:

—For proper transmitter battery voltage (check the instructions--on most 9 volt transmitter dry batteries, this should not drop below 7.5 volts--UNDER LOAD; or with transmitter on and operating).

—For freshly charged receiver batteries

—For adequate ground range (usually 75 to 100 feet with the transmitter antenna collapsed).

—For proper response of the rudder to transmitter command (left follows left, and right follows right).

III. Also make sure you have the following accessories:

—A fresh Glo Plug battery

—An extra Glo Plug

—Tools: Screwdriver, pliers, Glo Plug clip, wrenches, fuel pump or bulb, fast-drying cement, pins, etc.

—Clean wiping rags

—Box to hold all of the foregoing accessories.

At the Flying Field

1. Test Glide the Plane

—Pick a calm day (5 mph or less), turn the transmitter and receiver on and gently launch the plane directly into the wind, aiming at a spot on the ground of about 75 ft. in front of you. Check this diagram for what to do. "D" is what to strive for.

TEST GLIDES: EFFECTS – CAUSES – CURES

A. Very nose heavy or check to see if you put on the wing!! Add weight to tail.

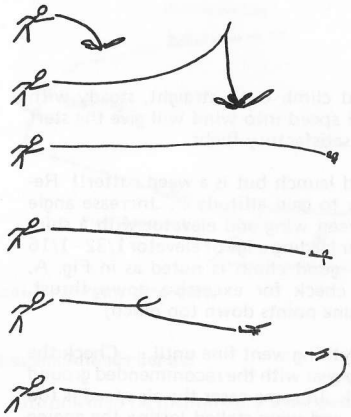
B. Tail heavy or thrown too hard into wind will also cause stall.

C. Slight tail heavy or add shim to elevator panel--generally do not look for a float-glide.

D. GOOD straight fast glide--do all testing with neutral rudder . . .

E. Fast but tricky may indicate wing warp unnoticed before.

F. Some degree of turn--Rudder neutral. . . Elevator not positioned correctly, wing warp or vertical fin not 0° on fuselage--can be trouble.



II. Powered First Flights

—Before attempting this, again check the radio ground range.

—Start the engine and turn the radio transmitter and receiver on, checking for proper rudder action.

—Gently launch the plane directly into the wind, just as you did when gliding it.

—The plane should start a gentle climb straight out. Allow it to get some altitude and gently turn to the right or left by moving the transmitter stick a SLIGHT bit. Do NOT overcontrol!!! This is a common beginner's mistake. Do control in small segments while learning. After awhile you will learn to anticipate what the plane is going to do, so that you can be ready to apply proper corrections. Again, do this in gentle increments of control, never full right or full left, until you have enough skill and confidence to handle a close situation. Continue gentle turns and increase altitude to 200-250 ft. ALWAYS keep the plane UPWIND from you, so that if you do make a wrong move, the wind will blow the plane back toward you. If the plane gets downwind it can go farther and farther away. This can result in a lost airplane.

"B" Flight Toward You

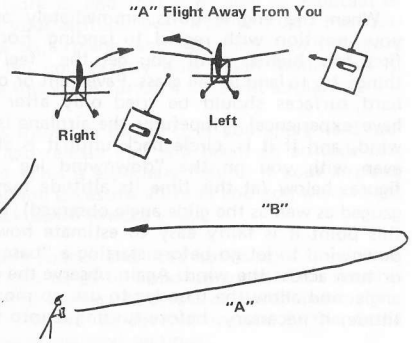
—When the engine quits, judge the glide descent and try to land the airplane close to you. If you are close to the ground, DON'T turn sharply--it is better to have to walk a little ways rather than to pick up the pieces at your feet, because you tried to stretch a glide or turn too short. (More on landings later.)

CHECK THE DIAGRAMS FOR PROBLEMS AND SUGGESTED CURES. READ AND RE-READ. MAKE ANY ADJUSTMENTS JUST A BIT AT A TIME--AND AS A RULE, MAKE ONLY ONE ADJUSTMENT AT A TIME. IN THIS WAY YOU CAN SEE THE RESULTS OF WHAT YOU ARE DOING.

Another important thing to remember is that when the plane is flying away from you, right movement of the stick will make the plane move to the right. However, when the plane is flying toward you, a right command will cause the plane to fly to your left. This is something you must learn and keep firmly in mind. It can be very confusing to a new flyer.

One way of handling this is that when you are flying toward you, you can push the wing up into a turn desired with your stick thumb. This is an easy method of remembering, and will come clearer to you.

"A" Flight Away From You



INITIAL FLIGHTS: EFFECTS – CAUSES – CURES

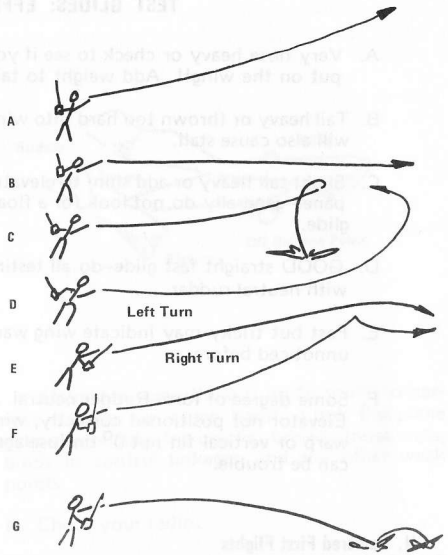
A. Good climb out - straight, steady with good speed into wind will give the start of a satisfactory flight.

B. Good launch but is a weed cutter!! Refuses to gain altitude . . .Increase angle between wing and elevator with a shim under leading edge of elevator 1/32 - 1/16 until good climb is noted as in Fig. A, also check for excessive down thrust. (Engine points down too much)

C. Everything went fine until . . .Check the radio gear with the recommended ground check. In some cases the air speed is too slow and wing stalled letting the engine torque take over---spinning plane to ground.

D. Persistent turn after launch to the left when surfaces have been checked for warps and rudder is neutral; Indicates the engine needs additional RIGHT thrust adjustments. Depending on the plane/motor combination this could be 2° to 5° or 6°, generally 2° is sufficient.

E. Right turn after launch could be too much thrust adjustment, warps, rudder and neutral. Important thing is that rudder control will respond or overcome this condition. Also when you have a difficult time it is still the best policy to spin the plane into the ground before you hurt someone.



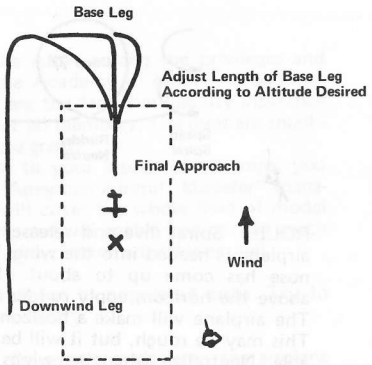
F. The Stall . . .slight or extreme probably has done less for the modeler than any one factor of success. So if the stall did not occur in test gliding, chances are that the motor does not have enough DOWN thrust. Also the initial flight should be of SHORT duration until the flight characteristics are known. There will be some planes that will never calm down. .So hang it up and start a new one.

G. This is a prang . . . . .Check A thru F for help or get a bushel basket and whisk-broom and head for the barn.

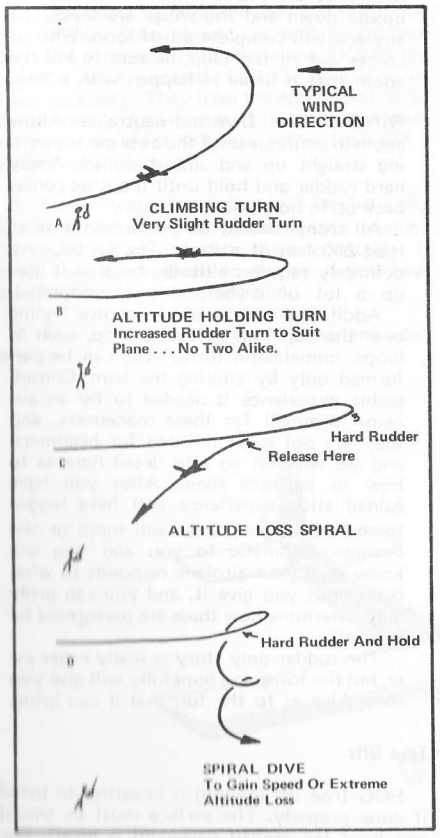
Landings

When the engine quits, immediately assess your position with regard to landing. For the first few flights, until you get the "feel" of things, try to land in tall grass. Pavement or other hard surfaces should be tried only after you have experience! Hopefully the airplane is upwind, and if it is, circle back until it is about even with you on the "downwind leg". See figures below (at this time its altitude may be gauged as well as the glide angle observed). From this point it is fairly easy to estimate how far downwind to let go before starting a "base leg" or turn across the wind. Again observe the glide angle, and allow the base leg to use up more altitude, if necessary, before turning it into your "final approach" directly into the wind. At this point, concentrate on keeping the wings level until touch down. You may have to do some walking the first few times, but gradually you begin to get more accurate in your judgment. Later on, after additional experience, you can learn to play the glide to land just about where you want to. This will involve tight turns and quick reflexes, but the methods will become self apparent as your learning and experience progresses.

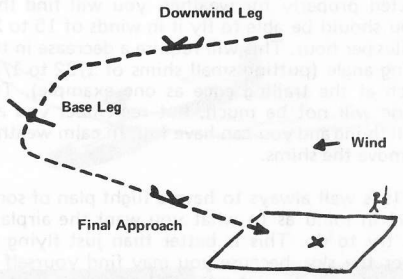
Sometimes it happens that a touch down directly into the wind can not be made due to insufficient altitude for the necessary turns. In this instance, it is better on keeping the wings level and let it go. It is better to walk a ways than to "bust up" your airplane.



LANDING PATTERN TOP VIEW



Study the foregoing four turn and altitude control diagrams. This will simplify rudder only flying for you.



LANDING PATTERN SIDE VIEW

Turns and Altitude Control

Altitude may be lost quickly whenever desired by applying full rudder and holding. The airplane will go into a spiral. See Figure D. You can neutralize the rudder at about 75 to 100 feet of altitude, but be prepared for a zoom and a stall! As soon as the nose starts to come up, apply rudder again, MOMENTARILY, until the nose stops rising. At this point, neutralize the rudder and you are flying again. Timing is critical, and should be attempted only after you have had some experience.

A safer way for beginners is to start circling and to tighten the circle until the airplane loses altitude. Apply MOMENTARY OPPOSITE rudder to stop the turn and level the wings again. Anticipate your airplane. When a change in flight path is signaled, release the command as soon as the airplane starts to visibly respond. It is far better to do a series of short, inadequate, (if taken singly) commands than a long, hard blast that must be counteracted because of over-control.

As you will see from Figure A, if you hold in only a very slight turn and your airplane is trimmed correctly, it will go into a slight climbing turn.

If you increase the rudder turn, you will do as in Figure B, and that is be able to maintain or hold your altitude level. This will vary from airplane to airplane, and no amount of literature can tell you exactly how much rudder this is, since this varies for each different airplane.

As shown in Figure C, if you apply hard rudder and release you will begin an altitude loss spiral. This is especially helpful if your airplane is gaining excessive altitude and you want to get it back down toward you.

Hard rudder and hold builds up a spiral dive, and also helps to build up speed. This speed is essential for any attempts at stunts and maneuvers. This will be covered in some further detail in one of the next sections.

When your plane has been test flown and adjusted properly for weather, you will find that you should be able to fly it in winds of 15 to 20 miles per hour. This will require a decrease in the wing angle (putting small shims of 1/32 to 1/16 inch at the trailing edge as one example). The glide will not be much, but remember you are still flying and you can have fun. In calm weather remove the shims.

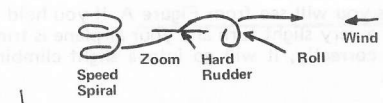
It is well always to have a flight plan of some sort in mind as to what you want the airplane to try to do. This is better than just flying all over the sky, because you may find yourself in a tight squeak, and no real brain command on hand.

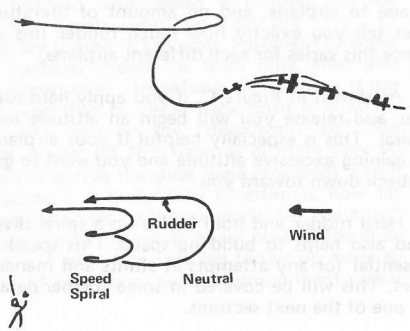
Stunts and Maneuvers

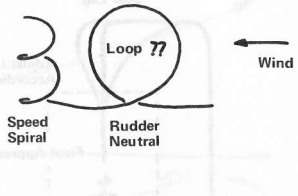
You can perform stunts and we will cover some of them briefly. Quite generally, stunts are a result of building up speed. We've already seen that your plane will climb if adjusted right, and with a small rudder turn will still continue to climb. With a slightly increased amount of rudder turn, your altitude will hold.

If you apply harder amount of rudder you will begin to lose altitude. If you apply hard rudder completely and hold, you will go into a spiral dive. This is used quite effectively to get back down to a flyable altitude or to gain speed for maneuvers and stunts.

A few of the simple stunts which may be performed with your rudder-only airplane are: Roll, Split-S, and Wing Over. All these stunts are begun by entering a one turn spiral dive to build up speed with these maneuvers, effective use is made of the zoom which normally follows the dive.







ROLL: Spiral dive and release when the airplane is headed into the wing. When the nose has come up to about 45 degrees above the horizon, apply rudder and hold. The airplane will make a horizontal spiral. This may be rough, but it will be recognizable. Neutralize when the wings are horizontal and the airplane is right side up.

SPLIT-S: Dive and roll as foregoing, except neutralize the rudder when the airplane is upside down and the wings are level. The airplane will complete a half loop. When it comes out of the loop, be sure to kill the zoom that is liable to happen with a turn.

WING OVER: Dive and neutralize. Allow zoom to continue until the airplane is pointing straight up and almost stalled. Apply hard rudder and hold until the nose comes back up to horizontal.

All stunts should be performed with at least 200 feet of altitude. The Split-S, very definitely requires altitude, because it uses up a lot of it before it is completed.

Additional stunts which involve "going over the top" in an inside loop, such as loops, immelmann turns, etc., can be performed only by altering the trim. Considerable experience is needed to fly an airplane trimmed for these maneuvers, and they are not recommended for beginners, and we will not go into detail here as to how to perform them. After you have gained stick experience and have logged some flight hours, these will more or less become automatic to you and you will know how your airplane responds to what commands you give it, and you can probably determine how these are performed by yourself.

The rudder only story is really never over, but the foregoing hopefully will give you some idea as to the fun that it can bring.

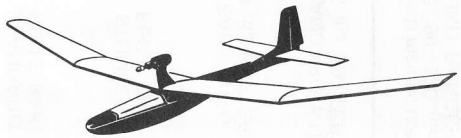
Take Offs

ROG (rise off ground) is beautiful to behold if done properly. The surface must be smooth and hard (an asphalt pavement is ideal). Place the airplane on the surface, pointing it into the wind. When ready, just release (don't push) the airplane. Correct any turning tendencies with GENTLE commands. Easy does it! Once enough speed is reached, the airplane will lift off by itself. Allow it to climb straight out until sufficient altitude is reached before beginning a turn.

Fly Safely

1. Join the AMA--among the privileges and benefits of the Academy of Model Aeronautics membership, are the fact that liability insurance is provided for all members. The dues are small--the benefits are great.

In addition to your insurance coverage, you will receive "American Aircraft Modeler" magazine, which will cover the whole field of model aircraft flying, and will enable you to read much more about radio control activities as well.



2. Avoid flying in populated areas. Try to stick to open country.

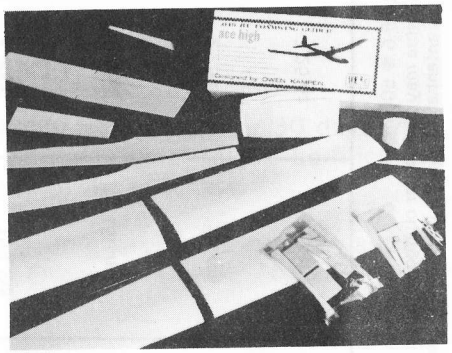
3. Don't fly over crowds--keep the airplane away from people.

4. Don't stunt at low altitudes.

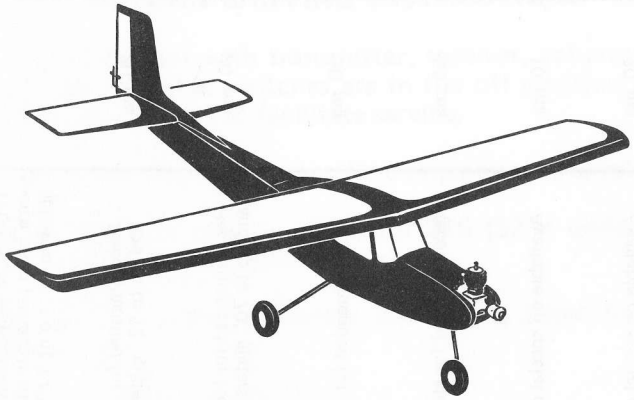
5. Stay away from power lines and telephone lines. If your plane should accidentally become tangled in a power or telephone line, DON'T try to get it back yourself. Call the telephone or power company. They have the equipment to do the job safely. As a matter of fact, most of them will prefer to do it this way rather than risk a law suit over injury.

6. Never fly an airplane that isn't mechanically perfect. Never attempt to fly an airplane in which the radio response is less than acceptable. It won't cure its problems in the air if you have any slight problems on the ground.

7. Don't try to fly in areas of persistent interference.



For glider fans, the Ace High offers maximum enjoyment for a minimum of time and expense.



The Dick's Dream is an ideal rudder only trainer and sport plane.

FCC REGULATIONS

A Citizens Band radio station license is required by the FCC for operation of this unit. This license requires no examination and may be obtained by writing to the Federal Communications Commission, Washington D.C., 20554, and asking for a form 505. This form is then filled out and returned with the proper fee. If you belong to a club that has a license, this is not necessary.

WARRANTY

Your Pulse Commander is completely guaranteed for 30 days from the date of purchase. The enclosed warranty sheet MUST be filled out and returned to Ace R/C within a week of the purchase.

A $2.00 fee is required for units needing service during the warranty period. Please enclose your Money Order or Check. No COD shipments can be made.

SERVICE

After the warranty period, Ace R/C will repair any system for a flat fee of $10, restoring the complete system to original factory specifications and configuration (for up to three years after purchase). The $10 fee includes all labor, parts, and return postage. Please enclose your Money Order or check. No COD's.

RETURN SHIPPING INSTRUCTIONS

1. Send ENTIRE set with transmitter, receiver, actuator, batteries, and charger. Be sure that switches are in the off position. Please have the batteries fully charged to facilitate service.
2. Enclose a note explaining specific complaints; give return address.
3. Enclose Money Order or check for $10 ($2 if under warranty). No COD shipments can be made.
4. Pack the set in a sturdy carton, cushioning it well (wadded newspaper is excellent).
5. Send to: Ace R/C, Inc.
   Service Dept.
   Higginsville, Mo. 64037

SPECIFICATIONS

Item	Total Weight	Total Current Drain	Batteries Used	Charge Rate	Remarks
TRANSMITTER	26 oz.	105 ma at neutral	9 volt dry* Mallory M-1603 or equivalent	*	1200 Hz tone modulated pulse output with fixed pulse rate of 6 pps and variable width ratio of 90/10 and 10/90.
BABY FLITE PAK	2.5 oz.	98 ma	2.4v @ 225 ma NICAD	20 ma	Recommended for .010 - .020 and up to 48" gliders
BABY TWIN FLITE PAK	2.7 oz.	98 ma	2.4v @ 225 ma NICAD	20 ma	Recommended for Hot .010 - .020 and up to 70" gliders
STANDARD FLITE PAK	4.4 oz.	150 ma	2.4v @ 500 ma NICAD	50 ma	Recommended for .049 - .10
STOMPER FLITE PAK	4.8 oz.	150 ma	2.4v @ 500 ma NICAD	50 ma	Recommended for Hot .049 - .23
BABY WITH 100 ma BATTERIES	2.25 oz.	98 ma	2.4v @ 100 ma NICAD	10 ma	Available on special order only
STANDARD WITH 225 ma BATTERIES	3.25 oz.	150 ma	2.4v @ 225 ma NICAD	20 ma	Available on special order only

* Nicads may be used (8.4 v to 9.6 @ 500 ma)
NOTE: 90 - 120 minutes flying time may be had per charge with the stock systems.
GROUND RANGE: Transmitter antenna collapsed - 150 - 200 ft.; extended one mile.