MIDDLE POINT R/C FLYERS

(Tennessee's Only Gold Leader Club)

Student Flight Training Guide

Introduction: It is the intent of MPRCF to provide you with the best and safest flight training possible. In keeping with that goal, let's consider some safety rules first. A copy of the club SAFETY AND FLIGHT RULES is included in this handbook. Safety is becoming more of an issue every year with the Academy of Model Aeronautics (AMA). Increasing cost of insurance has driven this issue. A current AMA charter is a prerequisite for maintaining our flying field. If there is any doubt about any of these rules, please take time to discuss them with your instructor. Before we go any further, you need to have a clear understanding of one of our policies regarding Frequency Control. . If you inadvertently turn on your transmitter when someone else has the frequency, and it causes their airplane to crash…you just bought that model for whatever the owner says its value is!!! The dollar cost of such a goof-up notwithstanding, there is a very serious safety issue at risk if that crash or incident caused harm or financial loss to someone else. Frequency control and discipline is serious business and carelessness is not tolerated. It's OK to go home and forget to take your card off the board, we all do that at one time or another. But to turn your radio on without first securing the frequency….Major No-No!

There is one other policy that should be considered and it takes the form of a disclaimer. There are no guarantees in this business. Your instructor will always do his best when flying with you, but he is in no way responsible or accountable for the condition of your airplane; before, during or after the flight. If something causes a crash, the only guarantee is that he will do his best to prevent it from happening. To minimize this risk, you should purchase a radio system that has a trainer or "buddy-box" capability. The club maintains these units for most radio systems and they greatly enhance the learning process and at the same time reduce the likelihood of a mishap. It's very cumbersome to pass the transmitter back and forth as is necessary in the early phases of training. The buddy-box is even more important as you progress into takeoff and landings. Without a buddy-box, there comes a point where the instructor cannot possibly take command of the situation before an unplanned meeting with the earth occurs.

The AMA maintains as excellent web site for beginners in RC modeling. Visit them at www.masportaviator.com. You'll be glad you did. Remember, AMA and MPRCF membership is required to fly at our field.

R/C flight simulators are available from several sources. They are a great tool for learning R/C flying, both as a beginner and for more advanced styles of flying.

The following pages contain information that you need in order to start flying. These include model preparation and some basic aerodynamics and terms/definitions.

Following these topics is the training syllabus that will be used for your flight training. Your Training Record is located on the last page of this manual

It's great having you as a new member. Welcome aboard and let's get started!

Basic Definitions

The definitions listed below have been simplified and might not pass inspection by an aeronautical engineer. They are accurate however, for our applications in RC modeling. They include terms that will be used during your RC experience. Please take some time to become familiar with them.

Airspeed: The speed of a model passing through the air. It is not the speed of a model passing over the ground. If there is any wind present, these speeds will be different. This is the speed the model "feels", not the speed that you "see". (See Ground Speed).

Aileron: The control surface in the wings that causes the model to roll left and right. The two ailerons move in opposite directions. When the left aileron is up, the right one will be down.

Airfoil: The shape of a cross section of the wing. If you cut a wing in half, the part now exposed is the cross section. The shape of the airfoil allows the wing to generate a lifting force, which in turn is what allows an airplane to fly. There are thousands of different airfoils, depending on the desired characteristics of the airplane. Basically they are categorized as flat-bottomed, symmetrical, and semi-symmetrical. Flat bottom airfoils are common on trainers and provide the greatest lift and the most stability.

Angle of Attack: The angular difference between the wing and air passing over the wing. An airplane will fly in a nose-up attitude at slow speeds, resulting in some degree of "positive" angle of attack.

Base Leg: Of the four legs in a traffic pattern, the base leg is the leg that follows the downwind leg and precedes the final approach leg.

Center of Gravity (CG): This is the point (place) at which an aircraft is physically balanced. The CG is indicated on your plans as either in plain language, i.e., "2 inches behind the leading edge of the wing" or by the symbol O. It is extremely important that your aircraft is balanced, fuselage level, at the recommended CG.

Crosswind Leg: The crosswind leg is a traffic pattern leg that follows final approach/upwind leg and precedes the downwind leg.

Dihedral: A term for the angular difference in the left and right wings, when viewed from head-on. The dihedral angle provides banking stability. It facilitates the wings returning to level flight any time a bank angle occurs. It also causes the airplane to bank when a yawing movement of the airplane occurs, such as when the rudder is moved to one side. Some models, particularly sailplanes (gliders) have more than one angle between wings. These are called Polyhedral wings.

Downwind Leg: The leg of a traffic pattern that is parallel to the final approach/upwind leg.

Drag: One of the four forces acting on an airplane in flight. Drag is a force pulling backwards during flight. It is caused by the resistance created when moving an airplane through the air. When an aircraft is maintaining a constant speed, the effects of drag and thrust are equal.

Drift: The influence of the wind on a models' path over the ground. If surface wind is coming from the left, the model will tend to drift downwind to the right.

Elevator: The control surface mounted on the horizontal stabilizer that controls pitch. When the elevator moves up, a downward force is exerted in the rear of the airplane, with a resultant increase in pitch (or nose up) attitude.

Flaps: A device located on the inboard trailing edge of a wing that increases the lift produced by the wing. The increase in lift is primarily due to the effective change in the contour (camber) of the upper surface of the wing. Flaps also create extra drag, enabling a steeper final approach without an increase in airspeed. Flaps are seen primarily on scale models.

Go Around: To discontinue a landing approach by adding full power, raising the nose and climbing out straight ahead. Sometimes called a rejected landing, missed approach, or overshoot. **The most important maneuver you can learn.**

Gravity: If you don't know what gravity is, then maybe you should forget flying and take up photography instead. For the purposes of flight training, gravity is the opposite of lift. When an aircraft is in level flight, the force of gravity is exactly balanced with the force of lift.

Ground Speed: The speed of the model over the ground. If there is no wind present, the speed will be equal to the airspeed. If the model is flying in the same direction as the wind, the ground speed will be equal to the airspeed plus the speed of the wind.

Horizontal Stabilizer: The little "wing" thing in the back of the airplane that the elevators are attached to. The horizontal stabilizer always has a slight downward force present and serves the purpose of providing pitch stability. As speed changes, so does the downward force, thus the airplane will adjust pitch automatically in an effort to maintain the same downward force.

Lift: The force acting on an aircraft in flight that counters the pull of gravity. Lift is provide by the wing and is the result of airflow over the airfoil contour of the wing. Because there is more surface area on the top of the wing, air molecules passing over the upper surface are forced to move faster that those passing below. The faster movement results in a lower air density on the top than on the bottom of the wing. The greater density on the bottom results in an upward pushing force that is called "lift". Some lift is also generated due to the angle of attack of the wing. When this occurs, an upward force is also present due to the deflection of the air striking the lower surface of the wing.

P Factor: Because a propeller is actually a rotating wing that includes an airfoil, it is also influenced by angle of attack. When the aircraft is flying in a nose high attitude, the propeller blade that is descending is striking the air at a greater angle of attack than the rising blade. In our models, this imbalance of thrust results in a tendency to yaw to the left. Many models are designed so that the engine is pointed slightly to the right to counteract this characteristic. Also present as a result of a spinning propeller, is some cork-screw airflow along the fuselage and the vertical stabilizer that also causes a left turn force. A common misnomer for these forces is the term "torque".

Pitch: An aircraft moves in three axis's, pitch, roll and yaw. Pitch is the movement of the nose up or down, and is changed primarily by use of the elevator.

Propeller: The thing attached to the front of the engine that cuts your fingers when you attempt to disconnect the glow plug. Propeller sizes are expressed in terms of diameter and pitch. An 11x 8 propeller has an 11 inch diameter and with each rotation, would travel forward 8 inches if it performed at 100% efficiency.

Roll: The axis that an airplane moves on when banking. Roll control is provided by the ailerons.

Rudder: The flight control attached to the vertical stabilizer. The rudder controls the side to side yaw motions of the aircraft.

Stall: A condition wherein the wing no longer provides lift. As an aircraft is slowed down in level flight, a greater angle of attack is necessary to maintain altitude. As the aircraft is slowed further, an even greater angle of attack is required. As this angle is continually increased, there will be a point with every airfoil that the air will no longer be able to follow the contour of the wing surface, and will separate from the surface. When this happens, a stall occurs, with the airplane nose dropping automatically in an effort to regain flying speed. It should be noted that the stall is the result of excessive angle of attack and not necessarily too slow an airspeed. If sufficient elevator (pitch) is introduced, even at cruising speeds, a stall will occur. This is called a high speed stall.

Stable Approach: A term that is getting a great deal of attention in full sized aviation. A stable approach is flying the aircraft in such a way that a minimum of adjustments are made during the final approach. The airplane is maintaining alignment with the runway centerline and is in a constant, gentle descent angle to the runway. The airspeed is managed is such a way as to require minimum adjustments. In RC models, you might imagine a billboard-sized window approximately 100 yards from the runway and located 50' in the air. A stabilized approach would be flying through this window with minimum changes to pitch, roll, track, and speed all the way to the runway. A stable approach is the first step in making a good landing.

Thrust: One of the forces acting on an aircraft in flight. Thrust is the propulsion forward provided by the propeller. It is countered by drag. If the airplane is accelerating, then thrust exceeds drag.

Traffic Pattern: A rectangular shaped maneuver that is used to allow an orderly flow of aircraft when landing, or approaches to landing are being flown. RC models use the same type pattern as full sized aircraft.

Trim: The capability to offset conditions present in an aircraft that require constant control inputs. In a model, this is accomplished by using the trim levers on the transmitter. The trim levers electronically adjust the center (neutral) point of the control servo selected. If an airplane has a constant tendency to turn to the right with no input, (hands off), then left trim on either the rudder or ailerons will counter this condition and allow hands-off flying. This is desirable.

Up Wind Leg: The traffic pattern leg that is aligned with the runway. It is the same leg as the final approach but has application when a pattern is being flown without landing.

Vertical Stabilizer: The tail surface that extends vertically. It includes the rudder and provides stability in the yaw axis.

Wash Out: A twist in the wing that results in less angle of attack at the tip than the root of the wing. Wash out is desirable in that it causes the center section of a wing to stall prior to the tip. This allows aileron effectiveness at slow speeds and provides extra stability as well. Wash In is the opposite and is undesirable. The usual practice with models that have a film covering is to twist the wing a little more than desired, and then shrink the resulting wrinkles. Through trial and error, you can eliminate any warps and fine tune the models' handling qualities at the same time.

Wing Area: A value that expresses the total surface of a wing. It is the distance of the chord (measured from the leading edge to the trailing edge) times the span (measured from one wing tip to the other). This value is normally expressed in 'square inches'. A model with a chord of 10" and a span of 60" would have a wing area of 600 sq."

Wing Loading: A term that indicates the lifting force required of a wing surface. It is the product of dividing the total wing area by the aircraft weight. It is expressed as either ounces per square foot, or pounds per square foot. A lighter aircraft has a lower wing loading.

Yaw: The axis that passes vertically through the airplane CG and results in side to side movement. The yaw axis is controlled by the rudder

Aerodynamics 101

There are a couple of areas that are a mystery to most beginners. They are, Pitch Stability, and Airspeed vs. Altitude control. Let's take a closer look.

Aerodynamics is a fascinating science, and our models today are almost miraculous in the way they perform. Especially when we consider that the Wright brothers build their first glider without having a clue as to how they were going to get it to turn, to the designs we see today that are highly aerobatic and yet retain the ability to maintain straight and level flight with no inputs from the pilot. Your trainer is designed to have **Positive Stability**. That means, if the model is disturbed in pitch, roll, or yaw, it will eventually return itself to straight and level flight. If you stall the model and then let go of the sticks, the model will eventually regain flying speed on its own and return to level flight. If you roll it into a bank, in time it will return to wings level flight.

Why does this happen? One of the most difficult things to understand is the relationship between airspeed/power and altitude/pitch. Your model is designed to fly at a constant speed. Once it attains that speed, it will do its best to maintain that speed. How does it do this, how does it know? Here's where the genius of our forefathers shows. There is a built-in angular difference between the angle of attack of the wing and that of the horizontal stabilizer. This difference is such that there is always a downward force placed on the horizontal stab. When the power (thrust) is increased, the model attempts to accelerate. But, when it increases speed only a smidgen, the downward force also increases. The result is that the rear of the model is displaced down just a bit, causing a slight increase in pitch. It's sort of like having cruise control on when going up a hill. The bottom line is this; increasing power (thrust) will not cause in increase in speed, but will instead cause an increase in pitch. If you want to climb the model to a higher altitude, just increase the throttle. Again, think of driving a car. If you have the cruise control turned off and you are approaching a steep hill, you must add some throttle in order to maintain the speed.

The opposite is also true. If your retard the throttle some, the downward force is reduced and the tail will raise up a bit. This causes the nose to lower. Again the model is trying to resume and maintain that designed speed.

So how do I get the thing to fly faster? You can resist the tendency to climb by holding some down elevator control or, simply using the elevator trim tab. Increase the throttle until the plane is flying at the speed you want and then trim it out to a hands-off condition. What you really did with the trim was to effectively decrease the angle of attack the stab previously had. The downward force it had previously at 45 mph is now the same at 55. The model will now try to maintain 55 mph. Like I said, it's almost magical.

Of course, the same thing is true when you want to slow the aircraft and still maintain altitude. You effectively change the angle of the stab through the use of the elevator trim. Reduce the power, resist the tendency to descend and re-trim the elevator to "hands off".

Now that you have locked that concept in your mind, I have to confess something. I lied! The model does not try to maintain speed, but it tries to maintain the same lift that is was designed/trimmed for. I started out by using the term "speed" because that is easier for us to grasp.

But the truth is, it tries to maintain a constant lift. I could have stayed with the "speed" example except for one other area that you should understand that will help you in learning to fly.

Early in your flight training, you will notice that the airplane does not want to maintain altitude during turns. It's trimmed up and maintains altitude perfectly well when going straight and level, and then when you turn, the nose goes down and you lose altitude. After three or four of these turns, your instructor takes over and climbs back to the three-mistake altitude and you try again. Why does it do this? This is why I confessed that it isn't speed but lift that the airplane is trying to maintain.

Here's a new term. **Projected Wing Area**. Think of this as the area of a shadow the wing makes at high noon. If the model is perfectly level, the component of lift is vertical and the shadow is essentially the same as the physical measurements of the wing. Now if we place the model in a steep bank, the shadow is only about half of what it was when level. The component is no longer vertical and it is the same as if we sawed off the outer halves of the wing. In other words, when we are in a bank, the lift available from the wing is less than in level flight. The built-in stability of the design is such that the airplane will drop its' nose in order to speed up and regain the desired lift. You also have the ability to increase the lift necessary. Simply increase the angle of attack of the wing by adding some up elevator.

If you don't compensate for this and allow the model to descend, another problem rears its' ugly head. When you roll out of the descending turn, and the model has accelerated to a higher speed, it will immediately start climbing. It's only doing what it was designed to do.

One last bit on airplane design. Earlier in this section we learned that the airplane will return from a banked condition to level flight. When flying your trainer, if you enter a turn with 15-20 degrees of bank, after turning about 180 degrees you will notice that the model is nearly back to wings level again. This is a function of the dihedral in the wing. The wing on the inside of the turn is more horizontal than the wing on the outside. Again the Projected Wing Area feature comes into play. The wing that is more level will over-ride the banking condition and try to return to straight and level. It will continue to rise until the forces of both wings are equal. Your trainer also has some pendulum stability in that the wing is mounted high on the fuselage. Next time you are at an airport, notice the difference in the dihedral of a high wing Cessna to that of a low wing Piper Cherokee. The increase in dihedral in the Cherokee has to make up for the lack of pendulum effect in the low mounted wing.

Two more subjects and then we're done with aerodynamics. You will probably notice when your trainer is flying directly away from you, and you enter a turn, that the nose might swing out away from the turn a slight amount. This is due to a term called **Adverse Yaw**. A byproduct of lift is drag. When the outside aileron goes down, it effectively changes the camber of the wing to produce more lift. When it does this, it also causes more drag, hence the outward yawing. Add to this, the opposite aileron going up, decreases lift and drag at the same time. Is this a problem? Not really, but knowing it helps you understand things a little better. Full size aircraft as well as many models rig the control surfaces to help eliminate the problem. They are set up so that the aileron going up moves much further than the one going down. As much as a 3:1 ratio. This can be accomplished through electronic mixing and/or mechanical adjustments. Ask your instructor how it's done. The issue of adverse yaw also introduces a thing called "coordinated turns". In full size aircraft, there is an instrument much like a carpenters level (bubble level) that will indicate any yawing that is taking place during a turn. If the plane is skidding or slipping, the ball will be displaced out of center. Pushing the appropriate rudder will center the ball and result in a coordinated turn. Even with asymmetrical aileron rigging, they still need some coordination with rudder and aileron. Of course our models don't have such an instrument, but in time you will be able to tell if the nose is swinging out some and will be able to apply a little rudder with the turn.

The last thing we'll learn about is **Tip Stall**. Hang around the field long enough and you will see somebody's airplane bite the dust for this very thing. It happens more often in models that have a high wing loading, but can grab a trainer as well especially in windy, gusty conditions. We know by now that when the aileron goes down, more lift is generated on that wing. It happens as a result of both an effective increase in the camber of the airfoil as well as an increase in the angle of attack. You will recall that a stall occurs when the angle of attack is sufficient to allow airflow separation over the wing. Here's the scenario: You have a model that's a tad heavy or you are flying in gusty conditions, maybe both. You let the model get too slow, or the wind suddenly drops a bit and you are about to learn a hard lesson. To continue, one wing drops a bit and you do the instinctive thing, you put in some aileron. When you do this, you are moving the 'stalling' wing's aileron down. This effectively increases the angle of attack to the point that the wing completely stalls. The wing you wanted to raise suddenly drops like a rock! Murphy's Law says that this will not happen at altitude, but normally three feet off the ground. The good news is that in these conditions, the rudder works like a champ and will raise the wing with no ill after effects. After you have soloed and are practicing on your own, it's a good time to get used to using the rudder for turns as well. If the wing has any dihedral at all, it will respond to rudder inputs. Another good thing about the rudder is this, as we slow a plane toward stalling speed, the first control that is lost is the ailerons, followed by elevator. The rudder will remain effective, even in a stall.

By understanding some of the design characteristics of your trainer aircraft, you can easily see what the intent is in the design of more complex aircraft. Things like mid-wing or low wing designs, symmetrical airfoils, larger control surfaces, etc. all contribute to the performance of the design. It has been stated that all aircraft designs are a compromise of some sort. What works well for one purpose will cause problems for another. There are many more facets to aerodynamics and lots more terms to learn. We've only introduced a few of them here, but I hope that I have influenced you to learn more about what makes our aircraft perform the way they do. I can tell you one thing for sure, most experienced RC pilots know more about why their airplanes fly the way they do, than the typical Private Pilot!

Orientation

This topic gets its own special place in this handbook. It's the thing that causes more confusion and frustration than anything else when learning to fly RC. We are going to meet this monster, and with some helpful hints, we will conquer him.

The problem is that when the airplane is flying toward you, the controls APPEAR to be reversed. You think you need to turn left, you give it some left aileron, and the blasted thing turns right instead. The controls aren't reversed, you are! If we could mentally place ourselves in the cockpit, we would always turn in the proper direction. There are some people that swear they do this. It's possible they are telling the truth. Most new pilots need to work themselves through this issue. Here are some things that help.

Simulators: There are several R/C Flight Simulators available and they are the best thing for flight training since the buddy box. We have seen new pilots learn more and solo quicker using these devices. They are a big help especially when mastering the controls of flying the plane toward you head-on. The down side is the unrealistic influence of wind and more importantly, the field of vision and depth perceptions are not anywhere near reality flying. After you have soloed, they are great for learning aerobatic maneuvers and also for hiding from the wife during chore time. Get one; you'll be glad you did!

Taxiing: Once your model is assembled and ready to go, try taxiing it around in your drive way, a parking lot or school yard. This is a good idea for several reasons. The first and most important is that we start to get acquainted with the model and the radio system. You are getting proficiency at starting the engine, adjusting the mixtures (follow the instructions) and are giving the engine some run-in time. This is a great time to make any adjustment that is needed to the nose wheel steering. The model should track straight on a level surface. You will see right away the issue of reversal when it taxis toward you and you will start to train yourself to correct the problem. The down side to this technique is that you are training your left thumb instead of the right, but more so is the fact that when you are flying, you will subconsciously make corrections based on a bank angle. This of course isn't going to happen on the ground in a parking lot. It's still not a bad idea.

Use a Friend: Put the wings on, and turn on the radio. Show your volunteer the ailerons and explain how they cause the model to bank. Now, have them walk around the yard carrying the model. They should bank the model toward the aileron that goes up, and hold that bank when you neutralize the control. At the same time, they will then be walking in a circle toward the low wing. When you move the aileron to level the model, they again bank the model toward the "up" aileron. This sounds a bit silly, but it works. You can actually drive them anywhere you want. Practice a traffic pattern. Even get creative and throw in the elevator control as well. This is one of those rare occasions when teenagers are an asset.

Daydream: Not really, but the more you think about this challenge, the faster you learn. It doesn't hurt to mentally visualize the model coming toward you from various angles, and then moving the transmitter stick accordingly. Watch other models in the pattern and think which way to go.

Rule of "Thumb": This seems to work well for most beginners. Continually tell yourself to move the stick toward the low wing. Or perhaps even better, move the stick toward the wing tip you want to raise. The latter works in a bank or level flight.

One thing that works in your favor is the fact that your trainer is not very responsive to control inputs. If you can force yourself to try to be gentle and smooth on the controls, when you move the stick the wrong way, you will instantly see the error and correct in the opposite direction.

I have frequently said that every new pilot has about 5000 wrong moves to get out of their system. You will find that suddenly the problem goes away and it all becomes second nature.

Model Preparation

Before you start gluing parts together and certainly before you take your new pride and joy to the field, there are some things that need attention. You have probably bought an ARF type model. These are a good value product, especially when you factor in the time spent building and the fact that they usually include all of the hardware necessary to complete the model. There are some possible pitfalls regarding the hardware and accessories that come with many of these models. U.S. companies such as Dubro and SIG provide us with excellent quality accessories. Often this same type quality is missing in the typical "Taiwan Terror" that you just bought. Frequently the instruction manual with this type model is lacking in detail or is difficult to understand.

A couple of areas to watch out for would include:

Control Hinges: For entry level modeling, it's hard to beat the CA type hinge. These are a composite of plastic material with a fibrous material bonded to each side. The surface will readily accept THIN CA glue. For installation, merely make a slot on both edges of area to be hinged with a #11 blade. Place the hinge in the slots and secure it with the CA glue. Be careful to keep the hinge centered. Often there is a dissimilar hardness of the wood in the two surfaces allowing the hinge to move further in the softer material. This can be avoided by pressing a straight pin into one of the surfaces to hold the hinge centered until you have glued the thing in place. Using the rudder for example, you would make three slots in both the rudder and the vertical stabilizer, one each near the ends of the surface and one in the center. Pin those that are in the rudder and press the whole thing into the vertical stab. Now, move the rudder as far as in will go to one side (20 –30 degrees) and apply CA to the exposed side. Reverse the surface to CA the other side. Job Done. It might make some slight cracking noises at first. Wiggle it back and forth until it moves freely. There will be some slight stiffness in the hinge, but it is acceptable.

Clevises: A clevis is the device that screws onto the threaded rod that moves a control surface. It allows fine tuning (rigging) adjustments to the control surface. The clevis should be at the end of the rod that attaches to the control horn, and not at the servo end. Use your own judgment as to the suitability of the hardware that came with the kit. It's very important that these clevises do not open up or come loose during flight. There should be some type of keeper device to prevent this. At the very least, cut a piece of fuel line about 3/16" long and press it over the clevis ends. This will prevent the clevis from coming open.

Nose Wheel Steering: The fallacy here is that the steering is almost always too sensitive. There is no reason to have the model turn in a tight circle when taxiing. If the model can make a 180 degree turn, using half the runway width, that's great. More importantly, a sensitive nose wheel will give you fits when it comes time to begin training in takeoffs. During a takeoff, the rudder is an effective control as soon as the engine is at half throttle or more. Adjust the linkage for the most insensitive throws possible. The push rod should be as close the servo output shaft as possible, and as far out on the steering arm as you can get it. You should examine the accessory servo wheels that came with the radio in order to determine which one will have a hole closest to the output shaft. Before you try to fly, and with the rudder trim centered, push the model on a level surface and adjust the steering clevis so that it travels in a straight line. Once you have the rudder trimmed for flight, readjust the clevis for straight ahead steering.

E-Z Connectors: These are a connector that is pressed into a servo arm, with a hole drilled through the device for the pushrod. The pushrod is then held secure with a small set-screw in the top of the connector. You might think that the kit manufacturer was thinking of you when they included this easy to use device, but they're not! They have just set you up to buy another model. These accessories are a crash waiting to happen. The problem is; they have a tendency to loosen up and when this happens, the push rod slips on the servo wheel. That means that the model becomes so out of trim that it's no longer flyable. These devices can be used some-what safely if you file a flat spot on the pushrod where the screw comes in contact. Then use some thread locking compound to hold it. It is much better to attach the pushrod using a Z-Bend in the wire, or better yet, silver solder a solder clevis to the end. Hobby shops carry an unthreaded clevis in 2-56 and 4-40 sizes just for this application. And while speaking of filing flat spots, it's a good idea to file the surface of the landing gear wires (axles) where the wheel collars are attached. Filing a flat spot provides more surface area for the set-screw to grip. This really makes a difference. Securing the wheel collars is your option, the airplane will probable survive a landing with one wheel missing, but it certainly won't with the elevator locked full down.

Control Throws: Follow the instructions regarding the amount of travel on all the controls. When you begin this phase, try to attain the travel specifications by using mechanical adjustments rather than electronic servo travel, i.e., end-point adjustments. For instance, if the instructions specify the elevator to move up ¾ inch and with the stick fully back, and you have 1 " instead, move the pushrod clevis out further from the elevator. This will result in less travel. You can also move the pushrod in closer at the servo arm. If you need to remove the servo arm from the servo, you will notice that it is held in place with a small Phillips head screw or bolt. Don't forget to reinstall this screw when you are finished. It will take about three flights for the arm to come off. Allowing the servo to travel as much as possible has many advantages, especially in more complex aircraft later on. You probably won't be able to tell a difference on a trainer, but this is a good habit to establish for those later models. Make sure the controls move in the PROPER direction. Pull back on the stick and the elevator should go up, move the stick left and the left aileron should go up (the right one down). The throttle should be set so that full travel forward allows the carburetor throttle barrel to be fully open, and a reliable idle when the stick is full aft. This adjustment should be made with the throttle trim setting some where between the mid-point and full up. With the throttle and trim lever fully aft, the engine should stop running.

Wing Placement: In all likelihood your model uses rubber bands to hold the wing in place. This is a time proven design feature on most trainers and allows a minimum of structural integrity compromise during less than desirable landings ☺. As to placement of rubber bands, most old timers agree to use at least 4 on each side, front to back, followed by two more x-ing left to right. Front to back will hold the wing down better due to the leverage present and the last two help keep the other 8 in place. Don't try to reuse the rubber bands. When they are subjected to exhaust residue, they lose their strength. If you are cheap like most pilots are, you can immerse them in kitty litter when you go home. If you don't have a cat, or you're willing to spend some extra bucks, just throw them in the trash can at the end of the day. Please don't just slice them off with a knife and watch the pieces fly all over the pit area! One last point regarding wing mounting, when you use rubber bands, it's likely the wing will not be placed at the exact same position on the fuselage ever time. This will result in an out-of –trim condition after takeoff, due to more area on one side than the other. A good idea is to mark a reference point on the wing and fuselage. You can use stripping tape, or if you made the model yourself, some little pointy scrap of covering material. Align the marks each time and you won't have any trim issues to deal with. Keep it simple!!

Balance: The kit instructions included information regarding the balance point (center of gravity) (CG) of the model. This is vitally important. The instructions may indicate a point expressed in inches from the wing leading edge, or by the CG symbol (which looks like a circle with a plus sign in the center, with opposite quadrants shaded). An old axiom is that "nose heavy airplanes fly poorly, tail heavy airplanes fly once". In order to verify the balance point of your model, simply lift the model up by supporting it at the location shown in the instructions. For a trainer, this can be done by placing your index finger tips under the wing, near the fuselage, and on each side of the model. The model should assume a level attitude. The nose should not be up or down in any degree from level. If an adjustment is called for, the best remedy is to relocate the battery. If this won't get it, then move the receiver as well. This check should be made without any fuel in the tank. Don't forget to wrap the receiver and battery pack with foam rubber. The model should be completely finished prior to checking the CG. The servos in place, engine/muffler installed, fuel line, prop, spinner, tank, wheels, collars, you get the idea. Decals might be your only option.

Buddy-Box: Here's an accident waiting to happen! We all agree that using a buddy box is by far the best way to learn to fly, but here's a golden opportunity for Murphy's Law to rear its ugly head. There is a good chance that later in your training, your instructor will ask you to set up the buddy box while he is busy doing something else. Understand first, that the box has adjustments just as your transmitter does. And since it's club property, it's probable that you were not the person using it last. Therefore, there is a very good chance that one or more channels are REVERSED. Plus, it's an absolute that the trims will need to be reset. This process will possibly take three hands, but with your transmitter turned on, activate the trainer switch and verify the buddy box moves the flight controls in the proper direction. Use the buddy box servo reversing feature to correct any problems. Then while cycling the trainer switch on and off, watch each control surface to see if they have any movement. If they move a little bit, (and you can hear the servo move as well) it's a clue that the buddy box trims will require adjustment. Adjust the trims until there is no movement from one to the other. Don't forget to check the throttle channel as well, especially for proper direction!

Landing Gear: When you model is new, the gear is nice and straight. After a few firm "arrivals" there is a tendency for the gear to become bend and distorted. A gear that is bent is not your friend! When it becomes splayed out, the aircraft no longer sits at the angle of attack that the designer intended. This can affect landings and takeoffs. More important is the fact that the wheels will probably be canted outward, i.e., tow-out. We all know that the front end in an automobile has just a tad of toe-in. This causes the car to track down the road in a straight line. It also causes the steering to try to return to centered when we are in a turn. Tow-out is just the opposite. A sprung gear will exaggerate any turns the model makes when on the ground. Do your self a favor and keep an eye on the condition of the landing gear. The wheels should always point straight ahead or slightly inward. With your trainer, it's a simple matter to take the gear off, put it in a vise and bend it back straight. Also, it's common to see a wheel develop slop or wearing in the axles. This wobbling can be corrected be inserting a small piece of brass tubing into the axle hole. The hobby shops sell brass tubing that has an ID that matches the axle. Simply drill out the wheel to accommodate the brass tubing. A wobbling wheel is just as bad as having toe-out.

Turn Control: Most trainers we see today utilize 4 channels of operation. In this case, the aileron control is on the right stick and the rudder control on the left. There are some aircraft that use only three channels and are limited to rudder-only for turning. This is common with entry level gliders and park flyers. If this is the case with your model, then it is recommended that you attach the rudder servo lead to the aileron channel in the receiver. This allows you to train your right thumb for primary control, as you will have later when flying aircraft equipped with ailerons. **Please note that all references to turn controls used in this manual are made for aileron equipped aircraft. In a trainer, it isn't really important how it was designed, either rudder-only or with ailerons. They fly great either way. However, it is important to train your thumbs the right way!**

Electric Power: Or E-Flite. This is something that is gaining popularity more every day. As with all models, but even more so with electric, the receiver should always "hear" its transmitter. In other words, turn the transmitter on before the receiver and the receiver off before the transmitter. Remember, the electric motor will start as a result of a radio signal, (or lack thereof) not from flipping the prop. Also, please read and fully understand the manufacturer's instructions for charging the flight batteries. Li-po's especially can be hazardous if mishandled.

Finally: Above all, don't be afraid to ask questions. Nowhere is it written that you have to build this thing all by yourself. If there is something you're not sure of, ask for help! Bring your pride and joy out to the field and we will explain what you need to do. You're one of us now, and we are here to help you. Someday soon, you will be the guy helping a newcomer. It's our tradition.

Flight Training

Thumbs, Neck Strap, Transmitter Tray, or Hold the Thing in a Death Grip:
There are basically two different styles used in flying RC models. One is to operate the sticks with your thumbs placed on top of the sticks. The other is to hold the sticks between your thumb and index finger. While the latter is proven to allow more precise control inputs, it requires some form of assistance holding the transmitter. This is either with a neck strap or by using a transmitter tray. The serious guys use a tray. Most of us use our thumbs. If you use your thumbs only, you can easily hold the transmitter in your hands at the same time. The text in this manual is simplified to only refer to "thumbs". Your choice!

There are two different stick configurations used in RC. The most popular system is called Mode 2. With this setup, the right stick serves the same function as the control stick in an airplane, left and right controls aileron, forward and back controls elevator. Of course, the rudder is on the left stick and like the right stick, is spring loaded to neutral. Forward and back on the left stick is throttle. It isn't spring loaded and stays where you put it. This is the system that most of us use and will be the system that you will likely learn on.

Care and Feeding of Your Instructor: There are a gazillion things in life that call for lessons and training. We have to pay for them all, except for learning how to fly RC. I don't know how this started, but it is an accepted tradition through out the hobby. I'm glad that it is. However, it doesn't hurt to observe some basic courtesy when dealing with your instructor. Remember that he is giving his time to you, and it's time he just might rather spend flying his own models. At the least, be on time and prompt when you have arranged for some lessons. It doesn't hurt to treat him to a Coke or a bottle of water sometime. Remember, he's saving you a bundle by preventing a few dozen crashes!

Vision: There aren't many activities we participate in that require more hand-eye coordination than flying RC models. Do you need corrective lenses for distant vision? Can you remember the last time your vision was checked? Having the best possible distant vision will help you immensely, particularly in the early phases of training when we tend to fly further away than necessary. And for what its worth, most flyers use a good grade of sun glasses when they fly.

Phases: All flight training will be conducted using a "Phase" approach. This insures a building block style of learning. Each phase requires attaining certain basic skills that will help you move to advanced skills and maneuvers in the next phase. Each phase of training will be signed off by your instructor. This becomes a record of your training and will assist you if you need to use the services of more than one instructor. In this booklet, each phase will describe the goals and objectives to be attained. Also included will be a description of the maneuvers to be accomplished as well as some common errors that will be realized. Every instructor is a little bit different. They are all highly qualified. They will follow this format with you, but, they are also at liberty to throw in anything else they feel is appropriate. This may very well include some beginning aerobatic maneuvers. Stay flexible and expect the unexpected.