Instructor Handbook/ Pilot Training Program

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This booklet is used as a guide for instructors of Tidewater Radio Control, Inc, and their students. It primarily applies to how to teach beginners to fly R/C. However, there is a large amount of information that is good for all R/C pilots, not just instructors.

Instructors - please read this thoroughly and re-read it every so often so that as a club we maintain consistency in our instruction of student pilots. At the back of this document is a useful set of appendices including a Solo Flight Check List, Field Equipment List and a Mechanics Check List.

Just because you're good at something does not necessarily mean you can teach it. Some of the best fliers freely admit that they do not have the patience to teach beginners. Additionally, teaching requires an ability to see things through the eyes of the beginner, and to modify your discussion accordingly. Not everyone is cut out for this. It is the intention of this text to teach experienced fliers how to teach RC flying. While it will be most useful to beginning instructors and their students, even fliers who have been teaching for some time should find many points helpful.

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SECTION I

INTRODUCTION

Program Objectives

When successfully introducing newcomers to the hobby/sport of aeromodelling or helping intermediate pilots improve their skill level there are various items that need to be considered. Choosing an effective, efficient and experienced instructor is very important.

People vary greatly on their ideas of what makes a good instructor. Some think that good instructors are born and possess a kind of charismatic presence that results in highly motivated learners. This view tends to result in instructors that are more likely to credit their own performance as the key to learning instead of the ability of the learner.

Some believe that instructional ability is something acquired, involving training, discipline, and a good deal of patience. They strive for instructional excellence and assess their effectiveness by how well the learner performs.

Most agree, however, that good instructors share a love for instructing and learning, and that a good instructor must be a learner, and must possess strong motives and a positive attitude toward learning.

There is a tie between effective instruction and effective learning, but instructors only enhance learning. They set up a situation that provides the student with the opportunity to learn. Effective instructors are often those who look for ways of matching individual learning styles to their own instructional style.

In this text, we will show you how you can become an RC flight instructor or enhance your existing skills. While there are many ways you can give back to your club, instructing for a flying season is one of the most rewarding ways.

The objectives of the TRC Pilot Training Program are as follows:

- Promote model aviation
- Retain newcomers to the club
- Maintain a high level of club membership
- Improve Safety
- Achieve a uniform and high-quality standard of instruction
- Ensure enough qualified instructors

There are many ways to teach RC flying, and no two instructors will totally agree on how every concept along the way should be related. The methods shown are rather simplistic, yet they have

been proven over years of instruction and have always worked well. Both students and instructors are encouraged to submit improvements to the club. This helps to ensure that the program evolves to meet the changing needs of our organization.

The goal of the instruction program is to get each student to the point where they can fly safely by themselves. While you may also wish to assist your students with learning aerobatics as well, this text only addresses basic flight. This teaching method consists of **four steps** (or progression levels) a student must achieve to get to the point where they can begin flying on their own. This makes it very easy to teach, since you can organize every technique needed for flying into four basic steps. It also helps you limit the number of things beginners must master as they learn how to fly. While you can eventually mix and match certain techniques described during each step to match your own teaching preferences, we recommend that you thoroughly understand the entire process before you begin changing anything.

Special notes for beginning instructors

Insist on using a buddy box. While experienced instructors may be able to teach without a buddy box, as you begin instructing you will be amazed at how many precarious attitudes beginners will get their aircraft into. Depending on your flying skills, some of these attitudes will not be comfortable to you. It is difficult enough to right a wandering aircraft with the buddy box. Doing so after a transmitter is passed can be much more difficult, especially when the plane is close to the ground, as it is when taking off and landing or hovering.

Experienced instructors can easily help students with the early stages of learning how to fly (steps one and two) without using the buddy box. If we keep the aircraft high enough, the model should never be in danger. However, as the student begins taking off and landing, you must make it very clear that there will be little the instructor can do to save the plane when it gets close to the ground. More than likely the plane will be dumped (and damaged) several times before take offs and landings are mastered. If the student understands this, you can work with them. However, if they show any signals (during steps one and two) that they may blame you for the plane's damage, you should delay teaching them to take off and land until the student accepts this risk.

With the buddy box, you have total control of when you retake control. Conversely, when sharing a transmitter, the student must give you the transmitter before you can retake control. As the student progresses, they may protest when you ask to retake control. They may (incorrectly) feel they are still in total control even though you know better. By the time they finally acknowledge that they are in trouble, it may be too late for you to save the aircraft. Make it very clear at the start that if the student protests when you ask to retake control, that you will stop helping them.

You control the pace. Students tend to get a little anxious. You will eventually develop a feel for when a student has progressed enough to move on to each new step. Until then, take it slow. If in doubt about whether a student is ready to move on, keep on the current step until you are absolutely sure.

Be assertive with your control of the master transmitter. Especially when first starting, be ready to take control of the plane at the first sign of mistakes. While this may frustrate students to some extent, you must be totally comfortable with the control of the aircraft. There may be times, for example, when a student is coming too close to the flight line. They may be flying just fine, but you will have to take control of the plane to avoid the flight line boundary.

Patience is the key. Students will have difficulty with things you (now) find easy. This can be frustrating. If you show your frustration, the student will soon lose confidence. You must constantly encourage beginners, stressing positive accomplishments to build on.

Be on the lookout for new ways to do things. Believe it or not, the best way to thoroughly learn something is to teach it! You will be amazed at how many things you learn from a student's questions. They really force you to think through many things that you may now take for granted. And in order to explain anything, you really have to thoroughly understand it. For questions you can't answer, look for another experienced instructor to help.

Be sure you can fly out of trim aircraft. If you have never taken a new model off by yourself, you shouldn't take a student's model up for the first time. To get ready to fly a model for the first time, practice this. Get your plane in the air and have an instructor intentionally throw off one or more of your plane's trims. Practice getting the trims back to normal while controlling the plane in the air.

Keep their left hand on the stick. Through the first two steps of learning to fly, students will be predominantly using only their right hand. You will eventually notice that they tend to let their left-hand stray away from the left stick. Urge them to keep both hands on the sticks. As they begin landing and taking off (in steps three and four), their left hand will be needed, and it will be easier if they are comfortable with their left hand on the stick. The left stick is also very important to making coordinated turns, and this should be practiced.

Watch for the student's saturation point. We all have a limit to how much new information we can absorb in a given period of time. Keep in mind that your student will be concentrating very hard during practice sessions (especially on their first few flights). There will come a point when they simply cannot take any more without a break. One common symptom of this will be that the student has been doing just fine for about eight to ten minutes of flying. Suddenly, the student starts making mistakes (usually silly mistakes) not normally made. The student may not even understand why they are doing so poorly and begin to get frustrated. As the instructor, you must be able to recognize when the student has had enough. Tell the student they need a break and land the plane.

Two steps forward, one step back. You must remember that your students will have problems along the way to learning how to fly. At times, things you thought your students understood will seem to be difficult again (especially after long non-flying periods). This can be frustrating for instructors, so you'll have to show your patience when faced with this problem. One way to minimize the problem is to do a review of what the student currently knows at the beginning of each flying session. You can review on the ground, reinforcing the student's knowledge as well as begin the practice flying by having the student do seemingly simple maneuvers they already know. This also helps you begin a more complicated (and new) topic on a positive note. However, even with reviews, you must be on the lookout for times when the student needs to take the one step back before they can move forward.

The approach

Section two is devoted to requirements for new students. This chapter includes the most commonly asked RC questions, AMA and club membership rules, a presentation on what makes the best trainer aircraft, a discussion of safety, aircraft assembly and control setup and the basics of engine tuning. While these presentations are, for the most part, directed to the beginner, we urge you to read them to help with your ability to relate these important topics to beginners at the field. You can also copy this information and give it directly to students.

When it comes to teaching, we break teaching RC flying into four basic steps. In any form of teaching, it is good to limit the number of things a student must learn - and RC flying is no exception.

1. **Teaching how to master turns and level flight (and hovering for rotary wing aircraft)**
2. **Teaching how to set and hold headings**
3. **Teaching how to land**
4. **Teaching how to take off**

While this may sound overly simplistic, think about it. To get to the point where you are flying by yourself, every technique you master fits into one of these four steps!

Assumptions

Before taking a student up for the first time, there are several things that must be explained. For example, the student should know the basics of aerodynamics and flight, the stick controls on the transmitter (ailerons, elevator, throttle, and rudder) and the function of each control. The student's aircraft must be checked out by an instructor or check pilot, have had at least one trim flight and be properly configured to operate with the buddy box. These pre-requisites are covered in detail in Section two and appendix C of this manual.

Flying preferences

Instructors tend to teach what they know in the same fashion that they know it. There are several alternatives to almost every important function of flying. Good instructors recognize that their own ways are not the only (and in some cases not the best) ways of doing everything.

How do you handle the left/right problem? Beginners have a common problem when it comes to mastering turning. After entering a turn, they tend to forget which way they are turning and give the wrong aileron to exit the turn (sending the plane deeper into the turn). There are several ways you can help the beginner with this problem. But first, ***establish with the student that right and left commands always refer to the position of the joystick, not the plane.*** This greatly simplifies the learning process for the student.

One teaching aid is to ask the student to turn his body to face the plane's heading. If the student is looking in the same direction as the plane is flying, it will help him remember which way the plane is turning. Another method is to have the student keep repeating (out loud) from the beginning of the turn which way he is moving the stick. A useful rule of thumb for beginners is to instruct them to push the aileron stick in the direction of the low wing when the plane is flying toward them. With any of these methods, the beginner will eventually become comfortable turning and not need the crutch. The preference is to get them to stand in a stationary position when flying and get them to keep saying out loud the direction they are turning.

What throttle setting do you use? Try to keep the throttle setting just high enough for the plane to maintain “hands off” level flight in the air. This ensures smooth docile performance and minimizes the student's natural tendency to over control. It also helps them make level turns. You will eventually need to have the student practice at all throttle settings from idle through full throttle.

How much control surface motion do you want? - Since students have a natural tendency to over control, many instructors like to set up trainers to be very docile, minimizing control surface motion (possibly with dual rates). This means the beginner must move the sticks quite a bit to cause a reaction from the plane. However, the preferred setup is to keep the plane rather responsive for

three reasons. First, the student must eventually learn the precise control motions needed with sensitive control surfaces (on this aircraft or their next one). Second, on windy days minimal control may not be enough to cause sufficient response from the aircraft in certain attitudes. Third, as the instructor, you need the plane to be responsive enough to get out of precarious attitudes.

When do you teach rudder-coordinated turns? It is generally best to teach people to fly without ever manipulating the rudder stick (except for steering on the ground). Most RC aircrafts, and especially trainer planes, turn quite nicely with only a combination of aileron and elevator. While rudder coordinated turns make for nicer looking turns, and rudder is helpful when landing in a crosswind, try to keep turning as simple for beginners to master as possible. The addition of rudder coordinated turns should follow successful completion of the first four steps of instruction.

Final approach, one turn or two? If teaching realistic flying, the RC pilot will make two turns during the final approach. One turn will bring them ninety degrees to the runway and the other will bring them right on the middle of the runway. To simplify this, an alternative is to have students make one (180 degree) sweeping turn during final approach.

What is the wind limitation? Most students can learn more easily on calm days. But since we live in Virginia/North Carolina, if we waited for perfectly calm days, we'd never fly! However, there comes a point when the wind is blowing so hard that it will be impossible for the beginner to control the model. For the student's first ten flights or so, it is recommend limiting your instruction to when the wind is blowing under 10 miles per hour. As the student progresses, let them fly on windier days. Remember that your student has not truly mastered flying until they can fly with winds around 10-15 mph.

Having said this, it is important to ***exercise caution on days when a significant crosswind exists***. High wing trainers with their generous dihedral do not handle crosswinds very well. Although flying is not particularly difficult, the ground handling may be hazardous to the plane's health! The student's first attempts at landings and takeoffs should be restricted to days where the winds are primarily parallel to the runway. Teaching crosswind handling should be reserved for advanced students only. Each instructor will have a different comfort level with handling high wing trainers in a crosswind. If you do not feel comfortable flying under these conditions ask your students to wait for a better day.

SECTION II

PRE-FLIGHT INSTRUCTION

Instructors tend to get the brunt of questions from people just thinking about getting into the hobby. Once someone has begun learning to fly, instructors are bombarded with questions related to all facets of this hobby. Even once a student has learned to fly, if they have questions (especially about aerobatics), they ask an instructor. This section of the program is devoted to handling the most common questions and problems a beginner has. Though as an experienced pilot you already know much of what is presented in this section, this presentation should help you with your ability to relate what you know to beginners. Also, much of this section can be simply copied and given to beginners with questions.

Common RC questions: Most beginners to the hobby tend to have the same set of questions as they enter the RC aircraft hobby. So, we'll begin by giving a summary of these questions and supply brief answers.

How does the radio control system work? - As with any kind of radio, a transmitter (held by the flyer) is used to send signals to the receiver (in the aircraft). Both are powered by (usually rechargeable) batteries. The radio system can have several channels. Each channel is used to control one aircraft function. Servos (one for each channel) are used to cause the actual motion within the aircraft to make control surfaces move.

A good beginner's radio configuration has four channels. These channels control ailerons, elevator, rudder, and throttle. Two sticks (like computer game joysticks) on the transmitter give the pilot command of these four controls. With the most common radio setup mode, the right stick is used to control aileron (left/right) and elevator (up/down). The left stick is used to control rudder (left/right) and throttle (idle through full throttle). Like a computer game joystick, the aileron, elevator, and rudder sticks are spring loaded. When you let go, these sticks spring back to the center (neutral) control position. The throttle stick stays where you place it, from idle to full throttle.

Keep in mind that radio control systems can have more than four channels. Other controls for these channels include retractable landing gear, flaps, and even smoke systems. For now, you should concentrate on the four basic controls. Leave the fancy stuff for when you have mastered the hobby.

Within the aircraft, servos receive signals from the radio's receiver whenever either of the transmitter sticks is moved. The servos respond according to the motions of the transmitter sticks and cause the control surfaces of the aircraft to move in sync with stick movements (through mechanical linkages). Instructors: If an interested person at the flying field has questions about radio systems, be sure to show them on your own aircraft.

Other radio terminology:

Trim controls - It is not possible to perfectly set each servo and control surface prior to a model's first flight. Say for example, the plane tends to climb in a hands-off condition. The elevator trim control will give the flyer the ability to trim in some down elevator without affecting the joystick for the elevator. In essence, trim controls allow the flyer to set the radio so that the plane will fly straight and level with hands off the radio. ALL radios come with trim controls for the four basic channels. It is advisable to perform mechanical adjustments to the control linkages such that the plane flies nearly hands off with all trims set in the neutral position. This is a trial-and-error process that may take several flights. The effort pays off though since trim buttons are easily bumped out of position

inadvertently and it can be difficult to estimate the settings if they aren't close to the neutral position.

This is another reason that beginners should seek help. It is highly unlikely that a new aircraft will behave perfectly with regard to trim settings. A plane that is not trimmed properly can be very difficult to fly (even for an experienced flier). For a beginner, it may be impossible to fly. During the new model's first flight, the instructor will trim your aircraft and advise you on the procedure to mechanically adjust the control linkages to be centrally positioned.

Servo reversing - It is sometimes inconvenient (if not impossible) to mount the servos in a way to properly control the control surface. In many cases, the servo will come out backwards (left aileron comes out to be right aileron, for example). The servo reversing feature allows you to mount the servos in the most convenient manner, and if one or another comes out backwards, the servo reversing switch for that servo (in the transmitter) can be turned on. Servo reversing is a standard feature on most radios sold today.

Dual rates - Though not included on every radio, this feature allows you to change the responsiveness of your aircraft's control surfaces (usually this feature only applies to ailerons and elevator). On high rates, your servos will move full travel, and the plane will be quite responsive. On low rates, your servos may only move about 40-60 percent of their total travels. This is a nice feature for beginners, since you can reduce the responsiveness of the aircraft, making it easier to fly.

Mixing - This feature allows you to have one control automatically invoke another. For example, the radio can be adjusted to automatically give some aileron movement in response to a rudder command (to make for a smoother turn). While this is a nice for feature experienced flyers, it doesn't help beginners learn to fly. Don't go out of your way to find a radio with this feature for your first radio.

Radio styles - **AM** versus **FM-PPM** versus **FM-PCM** versus **Spread Spectrum/DSS/2.4GHz** - Generally speaking, in the past, the most reliable (and most expensive) radio style was FM-PCM (stands for frequency modulation - pulse coded modulation). The next in reliability and price came FM-PPM (frequency modulation – pulse phase modulation). Finally came AM (amplitude modulation). Nearly all aircraft radios today are Spread Spectrum technology or DSS and operate on 2.4GHz. These radios offer crystal free operation with no chance of interference with or from other radios. They are available in multiple price ranges and number of channels.

Trainer system – Commonly referred to as a "buddy box". This feature allows the safest manner of flight instruction. We devote an entire discussion later in this set of questions to the trainer system. Please refer to this information. For now, just remember a beginner should not buy a radio that is not set up to accommodate a buddy box, either via hard wired linkage or wireless linkage.

How many aircraft can fly at a time? – In past, the FCC had allotted 50 frequencies within the 72 MHz band to model aviation. These frequencies are given numbers, ranging from 11 to 60. In theory, this means that fifty planes could be flying at the same time! However, the likelihood of fifty flyers showing up at the same flying field without duplicating frequencies is low. Also, when more than four or five planes are in the air at the same time, it can be quite distracting to the flyers (mid-air collisions, although rare, do happen). For this reason, the TRC normally limits the number of planes that can be in the air at the same time to 4 aircraft, as denoted by the 4 pilot boxes. When there are two or more planes in the air at the same time it is recommended but not a requirement to have a spotter. The role of the spotter is to keep track of other aircraft in the air on behalf of the pilot, paying particular attention to take off and landing activity on the runway.

How long can they fly? - Depending on the size of the engine and the size of the fuel tank, the range of flight time can be from about 10 minutes to well over 20 minutes. One common recommendation for a .40- sized engine is about a six-ounce fuel tank. This will allow about a 10–12-minute flight.

What happens if the engine quits? - Most planes designed for beginners will glide quite well. In the hands of an experienced flier, a plane can be safely landed even if the engine quits. Of course, the altitude and attitude of the aircraft at the time of the engine failure has a lot to do with how difficult it is to safely land the aircraft. The higher the plane, the more time the pilot will have to plan the landing. (Landings without power are called dead-stick landings.)

How far away can the aircraft fly? - The rule of thumb is if you can see it you have control of it! Generally speaking, your radio will have control of the aircraft for distances of more than a mile. The higher the plane, the greater the range.

How fast do they go? - This depends on the style of aircraft as well as the size of the engine. Trainers will fly at speeds of about 20-60 miles per hour, depending on the maneuver. More aerobatic sport planes can reach speeds of well over 90 MPH. Pylon racers and turbine powered aircraft can be designed for speed as fast as 150 MPH or more.

How high can they go? - As high as you can see them. Again, if you can see it, you have control of it! However, the FAA and AMA have limited our maximum altitude to 700 feet. Note: We are within 4 miles of Chesapeake Regional Airport and need to be aware of full scale aircraft. Instructors: be sure to relate any rules related to height and position flying.

Is flying an RC aircraft like flying a full-scale aircraft? - In essence, yes. You'll have the same basic controls a pilot has on a full-scale aircraft. However, full scale pilots that have learned to fly RC aircrafts say there is quite a difference in actual flying technique. They say an RC aircraft responds much faster than a full-scale aircraft. They also say that learning to fly RC can be awkward, since there is no feel for the plane's maneuvers. RC flying requires much more hand/eye coordination since you must respond to what you see.

Is it hard to learn to fly? - This is a tough question to answer. Everyone has a different aptitude level for learning RC. This much is certain. RC flying is hard enough to learn that you will not want to try to learn by yourself. You are not likely to meet anyone who learned by themselves that did not go through several aircraft (or at least several crashes) in the process! Fixing aircraft is not nearly as much fun as flying. If you want to learn to fly with the least number of problems and expense, join the club and work with one of our instructors. He'll flight test and trim your plane, take off and land for you, give you pointers, and stand close by, ready to take control if you get into trouble in the air. While we can't promise that your plane will never crash, you will have a much better chance of keeping your plane in one piece with an instructor than without one.

How long does it take to learn to fly? - Like the previous question, this is tough to answer. It depends upon the student's aptitude. It also depends on how often you practice. The more often you practice the shorter the time it will take to master. You know the saying, "If you don't use it, you lose it!" It truly applies to RC flying. If you only fly once a week, it may take quite a long time. You'll be struggling to remember what was learned in the last session. Some people solo (fly by themselves for an entire flight) in as little as two weeks of practice (every day for several flights). Others make take the whole flying season to learn to fly. Yet others may take more than one flying season. With a good instructor, even the learning stage is fun and rewarding. So this period should seem to go quite quickly, regardless of how long it takes. Note: The availability of Computer based RC model flight simulators offers the opportunity to gain familiarity with the controls in a risk free (and non-weather dependent) environment. The simulator will not completely teach you to fly, but will provide a very

good grounding in the basics.

What is the best size or power type for learning? - Generally speaking, many of the ready to fly electric trainers on the market fall into the smaller aircraft category, while the glow/gas powered trainer models availability typically fall into the mid-sized range. Unfortunately, the smaller the aircraft, the less stable it is (provided it is not equipped with A3X or similar stability systems) and the worse it handles in the wind. Here are the approximate engine sizes as well as the approximate wingspan and weight of several standard classes of glow/gas powered RC aircraft.

Engine	Wingspan	Weight
.049 (1/2-A)	35-40"	1-2 lbs
.20	40-45"	2-3 lbs
.40/.50 (8 cc)	50-55"	4-5 lbs
.60 (10 cc)	60-65"	6-8 lbs
.90 (15 cc)	70-75"	9-10 lbs
1.20 (20/30 cc)	80-85"	10-12 lbs

Keep in mind that all size RC aircrafts perform nicely on calm days. We recommend starting with an aircraft large enough to handle our typical wind conditions. If you are interested in starting with glow/gas, this means a .40 or .60 size airframe. If you chose to start with one of the RTF electric training aircraft you should choose one that will be able to handle our wind conditions.

What's the hardest part of flying? – Take Off and Landing. Your instructor will first teach you how to keep the plane in the air, making simple turns. Then you'll progress to flying figure eight patterns. Once you can keep the plane in the air by yourself without any problems, you'll learn to land. Finally, once you have mastered all other phases of flying, you'll learn how to taxi and take off.

How much wind can there be? - Experienced flyers can fly (sport planes) in winds well over 20 MPH. However, the more wind, the harder (and scarier) it is to fly. Beginners won't want to fly in winds much over 8-10 MPH until they have mastered the first step of learning how to fly. Crosswinds may be particularly difficult for the beginner and your instructor may ask you to wait for a better day.

What about flight simulators? – The flight simulator software available today is very realistic and an excellent investment for beginners. The student can log many times the number of flight hours on the simulator than is possible at the field in a given period of time. This investment is virtually guaranteed to rapidly improve your hand/eye coordination and accelerate your learning curve. The use of this tool may shave weeks or months off the time it would ordinarily take to achieve solo certification.

What makes a good trainer plane? - Here are some qualities that contribute to making a good trainer plane:

High wing design - You'll notice that all trainer recommendations we give are high wing aircrafts. This is the most stable design (even for full-scale aircrafts). Since the body of the fuselage is below the wing, the plane will have a natural tendency to right itself after a turn.

Flat bottom or semi-symmetrical wing - Flat bottom wings are best for stability, which is helpful when learning. However, planes with flat bottom wings are not very maneuverable. Once you do learn to fly, you will eventually want to learn how to do some aerobatics. Flat bottom wing designs perform poorly when it comes to aerobatics. Semi-symmetrical wings have a slight curvature to the bottom of the wing. They are not quite as stable as flat bottom wings, but they do allow moderate aerobatics.

Rugged design - It's almost a guarantee that your first plane will get knocked around quite a bit. You'll want to be sure that it can take some minor bumps and bruises. But be careful here! When a plane is designed to be rugged, it usually sacrifices some of its flying characteristics. There are a number of planes on the market that claim to be almost indestructible, and they almost are, but they sacrifice good flying characteristics to be able to make this claim.

Planes that make good trainers and that we have successfully taught people to fly with: NOTE: Need to update this list to modern times.

- SIG Kadet LT 40 (ARF and Kit)
- Thunder Tiger Trainer 40 (ARF) and Tiger Trainer 60 (ARF)
- Hobbico Superstar 40 (ARF) and Superstar 60 (ARF)
- Avistar (ARF)
- Carl Goldberg Eagle II (ARF and Kit)
- Hangar 9 Solo Series (ARF)
- Hangar 9 Easy Fly .40 (VRTF)
- Great Planes Trainer 40 (Kit)

All these planes are very stable, don't tip stall, can fly very slowly, respond uniformly to controls, and have fairly light wing loading.

Should I build a plane from a kit or buy an ARF (almost ready to fly)? - This is totally up to you. If you enjoy working with your hands, by all means, build your own aircraft. You can save a little money (but not much) and you'll have the satisfaction of flying something you built yourself. Also, you'll have the plans to the aircraft in case you must do some repairs after a crash.

On the other hand, if you don't enjoy building, or you wish to get in the air as quickly as possible, there are several excellent flying ARF aircrafts on the market (some of which we highly recommend). Keep in mind that, even with an ARF, there is still some work to do. While the wing halves, fuselage, and tail section are complete, you do have to final assemble, mount the engine, and install the radio. Most ARFs come with excellent instructions (since they assume beginners are purchasing them), and you can be in the air in about 10-12 hours of building time. The VRTF (virtually ready to fly) designs can be assembled in as little as two hours with no special tools.

Plane and engine size - 40 size trainers offer the best compromise in stable flight and economy. If cost is not a concern, 60 size trainers tend to be substantially more stable than 40 size trainers (especially in higher winds). Difference in total price between a 40 vs 60-size setup is typically less than $100. Electric trainers are also an option for the new pilot; however, these trainers may be limited in what maneuvers they can accomplish will generally result in a pilot qualification for electric only aircraft.

When it comes to engines, you should buy a product with a proven track record of reliability and ease of use. Talk to experienced flyers at your field to get recommendations. OS, Thunder Tiger, SuperTigre, Evolution, Desert Aircraft, RCGF/Stinger, NGH, etc. engines are among the most common name brand engines at our field. All have excellent reputations and most of our experienced pilots will be very familiar with the initial setup and operation.

As far as power, select an engine that is in the middle or top end of the recommended range for the airframe, unless you purchase an electric trainer as most of those will come with the recommended motor and Electronic Speed Control (ESC). As a general rule, it is best to err slightly on the overpowered side. As you begin taking off, a good strong engine makes the procedure much easier. If your plane barely has the power to get off the ground, taking off can be quite a challenge. This extra

power is also very handy when practicing approaches and for gaining altitude fast. Additionally, once you have learned to fly, a good strong engine will be needed for your next (sport) aircraft.

How much do they cost? - This is also a tough question to answer based on the size of the aircraft and how many extras you want to buy. For a .40-sized aircraft, here are some basic guidelines for costs.
Note that this configuration assumes that you wish to keep the cost down

ARF (almost ready to fly) plane:	$110.00
.40 sized engine (medium class):	$80.00
4 Channel FM radio (with cord):	$150.00
Flight box accessories (fuel, etc.):	$60.00
Approximate startup cost:	$400.00

While this may sound expensive, this is a one-time cost. Your radio, engine, and flight box can be used over and over for other aircrafts. Don't forget that you need to join the AMA at a cost of $58 per year (2025 rate). The TRC/AMA pilot instruction program allows students to fly demo flights without joining the AMA for up to sixty (60) days under the supervision of an AMA approved intro-pilot instructor. The student will then be required to join AMA and the club in order to continue flying at the field. The TRC dues are currently $100 per year (adults).

What is the trainer system? (IMPORTANT!!) - Imagine you've just built your aircraft, and you bring it out to the field for the first time. You get together with an instructor, and he test flies your aircraft and trims it out. Now it is going to be your turn. Your instructor takes off again and gets the plane up to a safe altitude and hands you the transmitter. If you're like most beginners, you'll have the plane on its back almost immediately (beginners have the tendency to over-control the plane). Your instructor quickly regains control and rights the aircraft. Then he gives you back control. You get about 3 more seconds of practice before he has to take control again.

This passing back and forth of the transmitter is very cumbersome, error prone, and downright scary. In the beginning, when you are just trying to keep the plane in the air, passing the transmitter will suffice. But as you get better, and you begin to do maneuvers closer to the ground (like takeoffs and landings), you'll want a more fail-safe method of instructor control.

Typically called a buddy box, the trainer system allows you to connect a slave transmitter with the master transmitter via a cable or wireless connection. Once set up properly, the instructor will take the master transmitter and give you the slave transmitter. He'll get the plane in the air and when ready, he'll simply press a button, and you'll have control. If you get into trouble, he releases the button and he has control again. No more passing transmitters. The trainer system will dramatically improve your odds of learning how to fly without crashing even once (especially as you begin taking off and landing).

Unfortunately, you must have both a master and a slave transmitter. Most beginners do not want to buy a second complete radio system just to get the slave transmitter. And most pilots will not let you borrow their transmitters to be used as a slave (the servo reversing switches may have to be changed which can cause major problems when they go back to flying their own aircraft). Fortunately, most modern transmitters are capable of handling a multitude of different models with one transmitter and can be set up as a master or slave transmitter without it affecting any programmed models. One thing to make sure is that the master and slave transmitters are compatible.

Note that not all radios are equipped with the wireless trainer system. Most older 2.4Ghz style radios, for example, do NOT come with this feature and will require a hard-wired connection (cable from master to slave transmitter). ***You should plan on buying a current model Futaba, Hitec or JR transmitter to ensure that your radio will operate with your student's equipment.*** If you prefer to purchase any other brand of radio system, you will have to plan on purchasing your own buddy box and trainer cord as well.

Pre-flight inspections - Beginners to RC flying vary dramatically when it comes to building skills. Some are building their very first flying model and find it quite challenging while others may have built other types of flying models and find it rather easy. The kind of aircraft has a lot to do with how difficult it is to get into flying condition. ARF's tend to be rather easy, requiring little more than final assembly while kits can be much more challenging. Additionally, correctly installing radios and engines can be somewhat difficult, even for ARF aircrafts.

For these reasons, we insist that all beginners have their planes checked for airworthiness prior to starting flight training. Instructors will check for problems that need to be corrected. Common mistakes that must be corrected before the plane can be flown include having servos activate control surfaces in the incorrect directions (easily fixed by using servo reversing), not placing foam rubber around the receiver for padding, not properly gluing wing halves (on ARFs), not correctly gluing hinges, and improper center of gravity point. Keep in mind that these are but a few of the many things that can cause an aircraft to crash, and the instructor must be on the lookout for many more.

Additionally, there may be things an instructor finds that may not cause the aircraft to fail (yet) but should be repaired in the near future. For example, certain control surface hardware (clevises, control horns, and linkages) works better than others. An instructor may be willing to help a beginner today but ask that some things be changed before further help will be given.

Appendix C includes a recommended New Aircraft Check List for new planes. Encourage students to go over the check list with their plane at home before bringing it to the field. This will minimize the amount of time spent at the field going over the plane for the first time. Review the New Aircraft Check List with the student at the beginning of each flying day. In particular, ensure that the engine can be completely stopped by means of the throttle trim or a throttle cut off. Do not allow any plane to be flown that is not airworthy in every regard.

IMPORTANT SAFETY NOTE: Be sure that the buddy box is properly matched to the student's transmitter before each and every flight. We often share buddy boxes among multiple students on any given day and the potential for reversed servo controls and/or misaligned flight trims should be assumed to be present at any time.

SECTION III

STEP ONE: TEACHING TURNS AND LEVEL FLIGHT

The objective is to get the student to a point where they can keep the aircraft in the air with no help from you. Though the plane may still be "flying the student" to some extent at the end of this step, at least they should be to the point that you are not constantly fearing for the aircraft as they fly.

We assume at this point that the training aircraft has had a trim flight, and any necessary control surface adjustments have been made. We also assume that the student has completed the pre- flight instruction section and understands the basics of aerodynamics and flight, including knowledge of the influence each control surface has on the aircraft. Finally, we assume that the student has been taught how to safely start and operate the engine and is familiar with the safety rules of TRC.

The time it takes the student to master step one varies dramatically. Believe it or not, some students do so on their very first flight. But it usually takes longer. Regardless of how long it takes, students should not get the feeling that they are in a race to see how long it takes to master any step of flying.

When it comes to time, many beginners think they should master flying their very first time out. When they don't, or whenever they don't feel they are progressing fast enough, they tend to get down on themselves, especially if another beginner seems to be progressing faster. Part of your job will be to keep them from getting discouraged. Make it clear that everyone picks up the hobby at a different pace. Relate the problems you had when you learned to fly. Be sure they are having fun. (If it's fun, who cares how long it takes?) Tell them if they push too hard, the problems they are having only get worse.

Begin on the ground by explaining the basics of turning. Explain that turning is basically a three-step procedure:

1) Bank with the ailerons,
2) maintain the turn with up elevator
3) level out with the opposite aileron.

Demonstrate turning with hand movements as well as on the stick of the transmitter. Explain that even trainer planes tend to be quite responsive and that only a little motion of stick will be sufficient to maneuver the plane. While the student cannot really get a feel for flying while on the ground, you must prepare them for what to expect in the air. What about the rudder? - If the plane has ailerons, we recommend having the student ignore the rudder when turning for a while. RC aircraft, and especially trainers, turn quite nicely with a simple combination of aileron and elevator. While you may eventually wish to teach the beginner rudder coordinated turns, this tends to substantially complicate the learning process, especially early on. If you intend to teach rudder coordinated turns, wait until the student is well along in step two before you introduce this more complicated turning method.

Demonstrate proper safety practices each time you take the student's plane to the runway. Always perform a final system check with the engine running to ensure that all control surfaces are moving freely and in the proper direction. Before takeoff, advance the throttle briefly to the full position to ensure that the engine is cleared and will not stumble upon acceleration in the takeoff roll.

On the student's first flight, begin by demonstrating a turn. Try to get the plane in an attitude where the student can see both the plane and the transmitter to see the small amount of control you are giving (hold up the transmitter to show them). After entering the turn, stress how important it is to maintain the turn with up elevator. Also demonstrate how a trainer aircraft tends to self-correct, meaning minor aileron corrections may be required to hold the bank angle. Finally demonstrate exiting a turn with opposite aileron control. You may want to demonstrate this in both directions, stressing the three-step nature of turning - bank with aileron - hold the turn with up elevator - straighten with opposite aileron.

The beginner's first few attempts - We're assuming you're using the buddy box. Always announce to the student whenever you give control or retake control of the plane. Begin by getting the plane into a perfect turning position. You'll need to make it as simple as possible for the beginner's first few tries. Begin at a safe altitude by aiming the plane toward one of the near corners of the field (left or right). This way, soon after the student takes control (by your holding the trainer button on the master transmitter), they will immediately begin the turn. Always have them turn the plane in a direction away from the pits (Never teach flying towards the safety fence only parallel to it).

It is quite likely that the beginner will immediately roll the plane over on its back, so be ready for anything as you give them control! Again, you decide when to take over. For the student's first few attempts, you will probably have to retake control soon after you push the trainer button. Don't be afraid of hurting feelings by retaking control! As soon as the student is in trouble and you retake control, right the problem and set the plane up again for another turn.

As the instructor, ***you set the rules for when you retake control***. Early on, tell students that there will be times when they may be in control of the aircraft, yet you may still retake control. The first time has to do with the flight line. If it even appears that the student might eventually cross it and fly over the pits, you must retake control. While it is possible that the student may have been able to continue flying without crossing the flight line, you should not take any chances where safety is concerned, especially on the student's first few flights. Second, ***set an altitude limitation***. While learning how to turn, students tend to lose altitude in each turn they make. When the plane descends past a certain altitude, you should retake control, even though they may be doing rather well (this also gives them the goal of keeping the aircraft above your cut-off point). Third, ***set a distance and maximum altitude limitation***. If the aircraft gets so far away that it becomes difficult to see, you should retake control. If the aircraft approaches our maximum altitude limit, you should retake control. You may also want to set a similar rule based on your own comfort level. Tell the student that if they get the aircraft into an attitude you don't feel comfortable with, you'll retake control. This may not be caused by a problem or mistake on their part; you simply don't want the aircraft to get into an attitude from which you cannot recover!

Though you have explained the three steps to turning on the ground and the student may have seemed to understand quite well, when in the air, the student will probably have problems remembering these three seemingly simple steps. Also, they will not be able to give the correct amount of aileron and elevator to make good turns. For these reasons, you will probably have to talk them through their first few turns. Don't be afraid to talk to the student while they fly (though be careful to stick to the point so as not to get them confused).

Here is an example conversation (though very one-sided) you might have with a student on their first few turning attempts. At this point, you have just set the plane up for the student to make a gradual left turn when you push the trainer button to give the student control of the plane.

> *"OK. I've set you up to make a nice gentle left turn. Give a little left aileron to get the turn started and be ready to bring in up elevator. See that left wingtip drop. That's it. Not too much now or you'll have to give some right. That's it. You'll need some up elevator now. Waited just a little too long to bring in the up. See that nose drop a bit. Hold the turn with the up. Nose is still dropping. You need more up. That's it. Hold the turn until you're heading back toward the runway. Good. Remember, you're turning left. Be ready to straighten with right. OK. Begin to straighten. Not too much now or you'll over-control. Good. Now let's try a right turn..."*

Be careful with how much talking you do. Stick to the main points of the step. In this case, bank with aileron, hold the turn with up, and straighten with opposite aileron. Save any discussions that are not directly related to the subject at hand until the plane is on the ground.

That brings up a good point. After each flight, be sure to review the flight with the student. Stress those areas where progress has been made and be sure to offer praise. For those things the student is having problems with, you now have the student's full attention and can offer advice and constructive criticisms.

One more point about talking to students as they fly. While it's good to talk to help them get comfortable with a new flying technique, you'll want to be sure that the student is not just mimicking your instructions and confirm that the student truly understands the maneuver you are teaching. Once they are following your instructions and turning quite well, keep your mouth shut for a while and just watch them fly. If they continue to do well, they truly understand the maneuver you have been teaching.

If the student is having problems making turns (as most will), concentrate on each step independently. Begin by making sure they can give the correct amount of aileron control to get the desired bank angle. Beginners have the tendency to give too much control, rolling the plane to a very severe bank angle. You'll probably have to keep stressing how little stick control they need to give. Make sure they understand the relationship of bank angle to the plane's tendency to lose altitude. The more bank angle, the more the tendency to lose altitude quickly.

Once they can set the correct bank angle, concentrate on having them maintain the turn with the elevator. Make sure they are making gradual, level turns, neither gaining nor losing altitude (though gaining is always better than losing). Stress the relationship of bank angle to elevator. The more severe the bank angle, the more up elevator required to hold altitude (and the tighter the turn). Also stress that it is important to begin giving up elevator as soon as they see the wingtip begin to drop to the desired bank angle. Beginners tend to wait too long, and the plane loses altitude before entering the turn. This is somewhat difficult to master, because if they pull in up too early, the plane will simply climb (eventually stalling). Beginners also have the tendency of forgetting which way is up. The elevator stick may seem backwards to a person who has never been exposed to any form of flying. Stress that it's just like a full- scale aircraft. Pulling back on the stick makes the plane go up. If they hold the transmitter more horizontally, it may help them remember this.

As they progress further in this step, stress the importance of maintaining the bank angle with aileron control throughout the turn, especially if they're flying a very self-correcting trainer plane with a flat bottom wing and a lot of dihedral or an electric trainer with A3X or similar. Have them practice this

by making full 360-degree turns. Have them fly the plane in a full gradual circle. Even a plane that is not very self-correcting will require minor adjustments of aileron to maintain the correct bank angle. Once they master the 360 turn in one direction, have them practice it in the other. Also, once they can perform one 360-degree turn, have them continue the turn several times, making several 360-degree turns consecutively. This practice forces the beginner to maintain a gradual turn for a long period of time.

Finally, have them concentrate on exiting the turn by applying opposite aileron until the plane is flying level again. The most common problem here is that the beginner forgets which way the plane is turning, and they attempt to straighten by applying the wrong aileron direction to exit. This, of course, sends the plane into an even sharper turn. ***As the instructor, you must be prepared for this mistake every time the beginner ends a turn! The lower to the ground the aircraft is, the more important it is that you be ready.***

There are several things you can do to help the student with this problem. One way (that many experienced fliers do not like) is to have the student physically turn with the plane. If they are facing the same direction as the aircraft, it will be easier to determine which way to exit the turn. Another way is to have the student keep saying (out loud) which way they are turning throughout the turn. They will then know which way to exit the turn. Another common problem for beginners exiting turns is they continue to hold the up elevator too long. This of course, will make the aircraft climb at the end of the turn, and possibly cause a stall. They must practice until they can exit the turn at the same vertical attitude as entered.

Another problem to watch for is the student's tendency to turn much too severely. They bank hard, pull in a lot of up, and level out quickly. While their turns may look quite good, you must force them to turn gradually. When they turn so radically, it will be difficult (if not impossible) for them to come out of the turn on a predictable heading, which will be very important in step two to flying. If the beginner is having problems, it doesn't hurt to point out that turning gradually is the most difficult way to turn. Though they must master gradual turns, once they do, they can look forward to learning the split-S and Immelmann turns, which are much easier turns to perform.

From the very start, be sure that the student practices left and right turns equally. With no intervention from you, most students will fall into the habit of making turns in only one direction. Most beginners tend to favor left turns. Force them to practice turns in both directions. Many students find it more difficult to make right turns. They may complain that the wingtip drops more quickly and more severely (along with the nose of the plane) when making right turns. They also complain that the plane tends to fall further into the turn while holding the turn with up elevator. This is related to how much engine thrust the plane has (possibly too much right thrust). Though some of this tendency can be removed by removing some right thrust, it also makes an excellent time to stress how small corrections must be made with ailerons during each turn. It also makes a good time to have them practice full 360-degree turns in both directions.

What about planes that don't have ailerons? - Though you don't see them as much anymore, there are trainer planes that have only rudder, elevator, and throttle. Believe it or not, these planes fly quite similarly to planes with ailerons. As you apply rudder, the wingtip will still drop. You still hold the turn with up elevator. And you still exit by applying the opposite rudder. You will notice, however, that the nose of rudder-controlled aircrafts tends to drop more severely in turns. Be sure you've practiced flying a rudder- controlled aircraft before you try to help someone for the first time. It takes some getting used to.

Throttle setting - Most model aircrafts are overpowered, including trainers. This means you usually won't need full throttle to keep the plane in the air. As you know, planes tend to be much more

responsive at full throttle. For most of our practice flying, keep the throttle at a setting that ensures docile performance. As the beginner progresses, be sure they can handle the aircraft at any throttle setting.

Wind and turning - Ideally, the wind will be calm during the beginners first few flights. However, do not consider the student competent with this first step until they have flown in wind of at least 8 - 10 miles per hour. They will find that wind presents its own problems to turning smoothly. It will appear that the plane will be sluggish when turning into the wind, while quite responsive when turning in a direction with the wind. This of course, means that different stick control amounts will be necessary with every turn. The best advice is to tell beginners to fly what they see. If they give a little aileron control and the plane does not respond, they simply have to give more. Getting the student used to this idea early is very helpful. As we start slowing the aircraft down for landing practice, this tendency for response to become sluggish will be compounded.

Ballooning tendencies - Many trainers have the tendency to climb with speed, especially trainers with flat bottom wing design. The faster they go, the more they want to climb. While some of this tendency can be overcome with engine downthrust, engine speed is only one factor that influences the plane's speed. As a beginner makes their first few turns, it is likely that the plane will lose altitude. As it loses altitude it picks up speed. When the beginner exits the turn, the plane will have the natural tendency to climb, due to the increased speed. We call this tendency ballooning, since the plane resembles a hot air balloon as it rises for no apparent reason. Be ready to explain this tendency. To avoid it, the beginner must make level turns. If the plane does not lose altitude in a turn, it will not pick up speed, and it will not climb at the completion of the turn.

The beginner will also notice a tendency for ballooning whenever the aircraft is turned into a high wind. To the aircraft, it is just as if airspeed increased by the wind speed. The plane will tend to rise. This can be corrected (to some extent) by applying down elevator as the plane comes into the wind.

Try not to let the student get too bogged down with trying to overcome ballooning. Though it may seem like the plane is doing something wrong, it is just a natural tendency for trainer planes. Try to have them accept the fact that trainers tend to balloon. Tell them that their next aircraft (probably a sportier plane) will not have this tendency. Demonstrate this on your own sport aircraft.

You know they're getting close when - One signal that the student is getting close to the completion of this step is that they begin to complain that the aircraft always seems to climb. Be sure to praise them at this point! They have overcome their tendency to lose altitude in every turn. Now it will be a relatively simple matter of flattening out their turns. They can bank slightly more severely with the aileron or not give quite as much up elevator to hold the turn.

When the plane gets too high, simply have them cut the throttle a few notches and continue flying. Eventually the plane will descend. Once a comfortable altitude is reached, have them increase the throttle a little and concentrate on making more level turns. It is best to have students control the descent of the plane by themselves (instead of retaking control) since it provides an excellent opportunity for the student to practice manipulating the throttle.

When are they finished with this step? - Generally speaking, when the student can keep the aircraft in the air for a whole flight with no coaching from you, they have mastered this step. Be sure, however, that the student can turn left and right equally well. It is quite common that a student becomes much more comfortable with one way or the other and ends up constantly setting up the plane to turn in the comfortable direction. Force them to practice turning in the direction they feel least comfortable with!

SECTION IV

STEP TWO: TEACHING HOW TO SET AND HOLD HEADINGS

The objective is to get the student to the point where they can fly the plane under complete control at all times while in the air.

If the student truly mastered the first step to flying, this step should be relatively easy to master. You can begin stressing the importance of being able to set and hold headings even during step one. As they begin to make level turns (even after their first successful attempt), stress how important it is to come out of the turn in a predictable direction. This will be very important during the setup and final approach for landing!

Setting headings - By setting a heading, we mean the student must be able to exit each turn in a predictable manner. By holding a heading, we mean the student must be able to keep the plane flying in the headed direction (without wandering) for as long a period as required. Again, at the completion of step one, the beginner may be able to keep the plane in the air, but the plane may be flying the pilot to some extent. The beginner may still be reacting to the aircraft instead of making the aircraft react to stick movements.

Explain that the key to setting precise headings is knowing when to begin exiting the turn with the opposite aileron. The smoother and more gradual the turn the easier this will be. At what point opposite aileron must be applied depends on the severity of the turn. The more gradual the turn, the sooner the (equally gradual) opposite aileron is applied, and the easier it is to smoothly exit the turn on the desired heading. As mentioned in part one, beginners tend to turn much too severely, making it very difficult to exit turns precisely.

To practice, begin by making the student fly figure eights. The best pattern consists of left turns on the left side and right turns on the right side. This gives the student practice at setting up landing approaches from both sides of the field. Begin to stress the importance of flying much more precisely. Since we fly on a rectangular shaped flying field, use each corner of the field as the target heading after completion of each turn. The student is told to maintain each turn until the desired heading is reached. They should then execute a ¼ turn to set up a diagonal vector to the next corner. While the first few attempts will not be perfect, this practice forces the beginner to think about exiting the turn at the proper heading very early in the turning process.

Figure eights are excellent for heading setting practice because you (the instructor) can easily monitor the beginner's progress. You will be able to tell if the student is catching on or still having problems. If the student has truly mastered step one and can consistently make smooth level turns, the two most common problems a beginner has at this stage is one, exiting too early, or two, exiting too late. If exiting too early, the student must turn again to eventually get the heading they want. If exiting too late, the student will overshoot the desired heading and have to turn back. Both of these problems lead to over controlling the aircraft. Talking the student through the first few turns can help with each of these problems.

If they have either of these two problems, stress the importance of being able to begin exiting the turn slightly before the desired heading is reached. ***The more gradual the turn, the easier exiting should be.*** By the way, this is the reason we said during step one that you should keep the student from turning too radically. While radical (very severe) turns may be easy for the student to master, when it comes to setting headings, radical turns are very difficult to exit in a predictable manner and

lead to over-controlling.

Free Form Turns - Once the student has mastered figure eights have them practice free form turns. Based on the position of the aircraft at a given time, call the turn you wish them to make. For example, if you say "45 degrees right", expect the student to veer off to the right on a new heading 45 degrees from the start. If you say "180 degrees left", expect a complete turn to the left. This practice forces the beginner to fly the plane in new and different attitudes and commonly turns up trouble spots (attitudes and positions in the sky with which the student is not yet comfortable). We all had trouble spots as we began flying (even some experienced fliers still have some trouble spots). For those areas the beginner has trouble with, give more practice. But at the completion of this practice, the beginner should be able to control the plane in almost any position in the sky!

Trim Settings - This is about the point in the training when you should introduce the student to setting transmitter trims while flying. They have pretty much mastered the ability to keep the plane in the air when the plane is perfectly trimmed. Give the student some practice with an out of trim aircraft. On the slave transmitter, reach over and throw the aileron or elevator trim slightly off center. The beginner will be forced to determine what is wrong and correct the trim problem. Once you have started doing this with a beginner, repeat trim setting practice on the first flight of each practice session.

Holding headings and flying with precision - Once the student has mastered figure eights and free form turns, you must stress the importance of being able to hold a heading. Even the most stable aircrafts tend to wander from set headings based on wind direction and velocity. The student must be able to keep the plane going in each direction. This must be mastered before they will be able to land. (During the final approach, the beginner must be able to hold the plane right on the middle of the runway all the way to the ground!)

For practice, once again begin with the figure eight. They must practice making minor corrections as the plane tends to wander from its desired heading. Stress that the direction and amount of wandering will vary almost every time, based on wind speed, wind direction, and the planes attitude at the completion of the previous turn. They must always be ready to apply these minor corrections to hold headings. The eventual goal of this practice is to make perfectly shaped figure eights with the crossover right in the middle of the flying field. Once mastered, the student can truly fly the aircraft with a great deal of precision.

Next, have the student fly a pattern that takes them right down the middle of the runway (still quite high of course). One way to do this is have them fly a long oval shape with the upwind side of the oval right on the middle of the runway. Have them practice holding the heading on the runway for the entire length of the flying field.

What about throttle settings? - Most of the practice to this point has been at one throttle setting. As stated during step one, most students find it easier to fly with a throttle setting that is just strong enough to keep the plane in the air, making for a docile flying aircraft. However, before progressing to step three, you should direct the student to practice flying the plane at different throttle settings. When they decrease the throttle, the plane will become less responsive, simulating how a slightly under-powered plane will respond just after takeoff. As the throttle is increased, the plane becomes more responsive, simulating how an over-powered plane will behave during takeoff.

A note about rudder-coordinated turns - Most trainers will turn quite nicely without rudder control. In fact, the influence of rudder may make it quite difficult for the beginner to master turning.

They may not even notice any difference if the rudder control surface is small. For this reason, we usually omit rudder- coordinated turns from basic flight training. It is often best to wait until the student has their first sport aircraft when the rudder will have more of an impact on the quality of turning.

When are they finished with this step? - When the beginner has mastered the ability to fly the plane under complete control at all times, when they can fly the aircraft in virtually any attitude, when they have eliminated all of the left/right, up/down mistakes from their system - and when they can set and hold headings, flying with precision - then they are ready to progress to step three, landing the aircraft.

SECTION V

STEP THREE: TEACHING HOW TO LAND

The objective is to get the student to the point where they can make consistent approaches from both directions and land safely. This is a good time to explain to the student the risks associated with learning to land. The plane will be flying very close to the ground and at slow airspeeds. In the event that the student gets the plane into trouble, there may be very little that the instructor can do to save the plane, even on the buddy box.

A note about engine reliability - This step requires a great deal of throttle changing. Before starting this step, it would be wise to confirm that your student's engine will maintain idle, go from idle to full, and in general, perform without stopping or stuttering at all throttle settings.

Are they ready to land? - If all steps to this point have been truly mastered, landing will simply be an extension of what the student already knows. However, if they are having problems with this step, it should be taken as a signal that further practice (especially with step two) is needed.

Teaching slow flight characteristics - Before the beginner can begin learning how to land, they must understand how the plane responds at slower speeds. With the plane rather high, have them reduce the throttle to just above idle and fly the figure eight pattern. Have them take note of how the ailerons respond more sluggishly. Also have them note how, at idle, it is impossible to keep the plane from losing altitude (especially in the turns). Most importantly, have them note how if they try to maintain altitude by pulling back further with up elevator, the plane will eventually stall.

As they continue to lose altitude in their figure eight pattern, eventually have them kick the throttle back up to regain altitude. Have them repeat this several times. Be sure they can still maintain control even at slow speeds (especially holding a heading into the wind). Be sure they know at what point the plane will stall. And be sure they know what tends to happen during a stall. Fortunately, most trainers are very stable in a stall and no radical controls will be required to recover (though you may wish to explain that more aerobatic aircrafts may not be so forgiving when they stall).

In step two, we had the beginner flying with precision. We had them flying right down the middle of the runway (in an oval pattern). The goal was to hold the heading all the way from one end of the field to the other. Now have them repeat this practice (still up high), but this time have them reduce the throttle for each pass down the middle of the runway. Again, be sure they can hold the heading for the length of the field at idle. Have them increase the throttle at the end of each pass. Be sure to make them practice this from each direction.

During the actual approach the beginner must begin letting the plane come closer to the ground. But first have them practice the approach pattern up high. Teach a symmetrical approach pattern. That is, the same basic pattern should be used from either side of the field (left or right). This also makes it quite easy to practice from both directions.

If there is little traffic at the field, and you secure permission from any other flyers, you can use a modified figure eight pattern for teaching approaches. Starting with the plane flying right down the middle of the field from right to left, have the student veer off to the right (at about 45 degrees) shortly after the plane passes by. Have them hold this heading until the plane has made sufficient room to make a left final approach turn. The student will then begin a long sweeping left turn with

the goal being to end the turn with the plane perfectly aligned with the middle of the runway. At this point they cut the throttle to just above idle and hold the heading just until the plane passes by. The student then increases the throttle and veers off to the left (at about 45 degrees). The heading is held until enough room is made for a right approach turn. The student will then begin the long sweeping right turn to line up with the middle of the runway. This is repeated over and over again. As the student gains proficiency, the throttle is cut earlier, and the plane is allowed to come closer to the ground. While all of this may sound a little difficult, if the student has truly mastered setting and holding headings, believe it or not, this is actually rather easy! All we are really adding at this stage is the increase and decrease of the throttle.

SAFETY NOTE: Low level modified Figure Eight patterns should only be flown when there are no other pilots present on the flight line. At all other times, the basic flight pattern rules remain in effect. We don't want to be teaching our students to violate basic club safety rules!

Though it is rather difficult to explain, the student must understand that the nose of the plane must maintain a slightly downward attitude throughout the final approach turn (especially if the throttle is cut). This is how we cause the plane to maintain airspeed as it comes to the ground. The windier it is, the more important this point (and the more severe the downward attitude). While some pilots try to counteract the wind with higher throttle settings, the descent of the aircraft allows much finer control of airspeed than throttle. ***If the nose of the plane balloons up at the end of the final approach turn, the plane will eventually stall.*** It will be impossible to maintain airspeed, and if very close to the ground, could result in disaster. As the student is practicing approaches up high, have them pay particular attention to the nose of the aircraft.

Once the student has progressed to the point where they can consistently align the plane with the runway and bring the plane to within twenty to thirty feet of the ground, they are finally ready to land. Once again, remember that beginners tend to rush this. You must determine when they are ready. If anything, a little more practice than necessary won't hurt. Also, remember to be aligning your master transmitter throttle setting to their transmitter, so you'll be ready to take over at any moment!

Explain to the student that landing (if done right) is really nothing more than letting the aircraft drift to the ground. Done properly, the student will not be having to force down elevator into the approach to get the plane to come down. It will do so naturally because of the low (idle) throttle setting. During the last twenty to thirty foot of decent, the beginner must keep the wingtips nice and level. The student has to be ready with sharp, precise corrections to keep the plane on the center of the runway. The natural tendency of the plane at idle will be to descend, so if the proper heading is maintained, it is a relatively simple matter of waiting until the plane comes to the ground. When the plane drifts down to within about 1-2 feet above the ground, explain that they should gently pull back on the up elevator to cause the plane to flare out. Of course, you should demonstrate the landing procedure prior to having the beginner do it.

A beginner's first few landings tend to be a little rough. Beginners tend to panic when low to the ground. They forget which way to turn, especially if minor aileron corrections are necessary. Tell them to remember that if approaching from the right, right is your friend, meaning if they panic, giving right aileron will take the plane in the direction away from the pits. If approaching from the left, left is your friend. Dumping the plane is always better than flying into the pits.

Practice, practice, practice. Though a beginner's first successful landing is a great confidence builder, do not let him think he has mastered landing just because he has done it once. As with taking off, every landing will be different so be sure to practice landings repeatedly - in several directions and in different wind conditions.

What about dead sticks? - Sooner or later, we all have to land without power. One obvious way to practice this to simply cut throttle and pretend the engine is no longer running. At first, have the plane in a nice approach position so the beginner can land with relative ease. As you continue practicing, get the plane into more precarious conditions when you cut throttle. Even if you just have the student tell you what they would do if the engine quits in a given position may be good enough. In any case, be sure the student is prepared.

SECTION VI

STEP FOUR: TEACHING HOW TO TAKE OFF

The objective is to get students to the point where they can taxi and take off. Remind the student that while practicing takeoffs, the plane will be very close to the ground, and there may be little that the instructor can do to save the plane if he gets into trouble. Make it very clear at this point to the student that proceeding to this next level involves risk.

Setting the plane's ground tracking - Experienced pilots can taxi and take off even if the plane is not perfectly tracking on the ground. In fact, if you've had a hard landing or two during training, it is likely that you may not have realigned the plane's ground tracking for the sake of saving some time. You may have simply held in some corrective rudder (coupled with nose or tail wheel) during the taxi run. However, a beginner will not be able to handle a plane on the ground that does not track straight.

Before you turn the plane over to the student to take off, be sure the plane is tracking straight, and after every hard landing from this point on, be sure to check the tracking before the next takeoff. **This is very important!** In the hands of an inexperienced pilot, a plane that is not ground tracking properly can be very dangerous indeed (especially if the plane veers toward the pits).

One way for the beginner to set tracking (at home) is to let the plane roll down a shallow grade (with the radio on). Many suburban driveways are perfectly graded for this. With the rudder stick neutral, let the plane roll down the grade and watch for left/right tendencies. Be sure to tell the beginner not to adjust for tracking with the rudder's trim (this will, of course, affect flight trim). Adjustments must be made mechanically, within the aircraft.

Taxiing and making the takeoff run can be quite difficult to master. First of all, if they have a four-channel system with rudder attached to steering on the left stick, they will probably find it awkward to precisely use their left hand. They will also find it difficult to control throttle and rudder independently. Begin by making them get comfortable with the left stick without the engine running.

Once they can move one control without the other, explain the plane's ground handling characteristics. You've been doing a lot of taxing with their aircraft to this point, and while different aircrafts can have dramatically different ground handling characteristics (tail dragger vs tricycle gear, for example), you should be able to help them understand how responsive their plane will be on the ground.

Be sure to explain the plane's natural tendency to accelerate quickly as soon as it begins moving. As they develop a feel for what it takes to get the plane moving, they will make the plane move smoother. But first and foremost, be sure they keep the plane moving slowly - be sure to be ready to retake control as soon as the plane gets moving too quickly. As for steering with left and right, it may take quite a bit of practice, since it must be done with the left hand. Also, the same left/right problem they had in the air when the plane is coming toward them may recur.

Take off practice - Once they can handle the plane well on the ground, have them head the plane into the wind and practice some high-speed takeoff runs. Don't let them take off quite yet. As soon as the plane builds up speed, have them cut the throttle. **Remind the student that the engine torque will normally pull the plane to the left.** Force them to see how little rudder it takes to make the plane

respond at high ground speeds. Beginners tend to over control with rudder their first few times, so be ready to retake control at all times (keeping your master transmitter set to idle).

By this point, the student should be quite comfortable with handling the plane on the ground. But you'll still want to make it as easy as possible for his first few takeoffs. Explain that taking off is just a matter of building up flying speed heading into the wind while holding a little right rudder. Once flying speed is reached, he must apply just a small amount of up elevator (though some well-trimmed planes may actually lift off by themselves). Once the plane comes off the ground, the nose will be pointed up slightly and the student can release the up elevator and the right rudder. If the plane is properly trimmed, the plane will continue its gradual climb at full throttle until it reaches a comfortable altitude and can be turned. As the plane rises, the student must be ready to make minor corrections to hold the plane's heading directly into the wind (with aileron and rudder) and to maintain a gradual ascent (with elevator). ***Always have the student make the first turn away from the pit area!*** Once the plane has reached a safe altitude, the throttle can be cut. Beginners tend to be so nervous during the first few takeoffs that they forget to cut the throttle. Of course, you should demonstrate taking off prior to having them do it.

The student will still have to learn how to take the plane off in different directions while standing at the pilot's station. Don't forget, as the student increases throttle for takeoff be sure to increase the master transmitter's throttle setting in the event you must retake control.

Beginners have problems in three areas. First, they have problems holding the plane in the ***proper heading*** with the rudder while the plane is on the ground. This can be very dangerous if the plane wanders off in the direction of the pits. Be sure to let them know that just because they started the takeoff roll does not mean they have to take off. If anything looks wrong or they feel panic for any reason, have them cut the throttle! This is why the high-speed practice runs are so very important. During these runs, the beginner does not expect to take off and will be cutting the throttle every time. With this experience, they will be much more likely to cut the throttle at the first signs of problems during actual takeoff runs.

Second, when taking off in winds over about 5 mph and especially with a crosswind, beginners have trouble holding the ***wingtips level*** after the plane lifts off. Since the plane is not moving very fast at this point, it may respond rather sluggishly. The beginner must be ready with firm, accurate aileron and rudder control. When taking off in any kind of cross wind, be sure to make them predict which way the wind will tend to blow the plane as it lifts off the ground. This way, they will be ready to apply the opposite aileron.

Third, beginners tend to apply ***too much up elevator*** to get the plane off the ground. Or they hold the elevator in too long. Either way, the plane will have the tendency to stall soon after liftoff.

Practice, practice, practice. Many beginners think they have mastered takeoffs with their first successful one, regardless of how scary it was. However, you must stress that each takeoff will be different, and it will take many takeoffs to become fully proficient. Wind direction, wind speed, and rudder sensitivity will make for a few nerve-wracking moments. As soon as the student has successfully taken off, instruct him to relax, fly a full circuit around the field and set up to land. Have the student do it again - and again - and again. If all practice is done on a nice calm day, be sure you are with them the first few times they take off on windy days.

After landing (without killing the engine), have the beginner taxi back, take off, and land again. One excellent way to practice landing (and taking off) is with touch and goes. As they gain proficiency, have them reapply throttle as soon as the plane touches down, performing a true touch and go.

When have they completed this step? - When you are confident that they are in complete control on the ground, when you have seen them make a mistake and know enough to cut the throttle (they recognize when to abort takeoffs), when they can repeat the takeoff roll time and time again regardless of wind conditions, when they can maintain the takeoff heading in a nice gradual climb over and over again - then they are ready to take their solo certification test.

SECTION VII

IMPORTANT THINGS A BEGINNER MUST KNOW

Here we include discussions that beginners need to be aware of as they learn to fly. These presentations are made directly to the beginner, so feel free to copy and distribute this information to your students.

When can I fly by myself? The whole point of RC training is to get the beginner to the point where they no longer need the constant help of an instructor. Once you have successfully completed the pre-flight instruction, the four steps of the training program and have earned your solo certificate you should be ready. You must understand, however, that this training will not by any means transform you into an expert pilot! The practice you receive in training is done with close supervision. In the real world, there will be no instructor there to take control when things go wrong. ***You can quickly and unexpectedly get your plane into rather precarious situations from which you may not recover.*** This knowledge should inspire you to be quite cautious for a while.

A few words on discipline. It is important that students have proper expectations set up front for the approach to flight instruction. Flight training can be very enjoyable and rewarding, for both the student and the instructor. But the instruction must be taken seriously to be effective. Instructors should not simply be babysitters tied to a child by an electronic umbilical cord. The instruction process should proceed from step to step, with each prior step being mastered before moving on to the next. ***The student should not be sidetracked by attempting loops, rolls and other aerobatic maneuvers prior to achieving solo certification status.*** Repetitive practice of the basic training maneuvers will prepare you to react more instinctively when the time comes for aerobatic instruction. The first priority is to develop your skills to become an independent, competent, responsible pilot.

Safety! Safety! Safety! The time we spend at the flying field is intended to be fun, right? From the time we pull into the parking lot until the time we pack up to leave, the only thing on our minds is to enjoy the time away from our troubles. Nobody likes going out to the field only to be bombarded with a bunch of rules and regulations. And of course, no one likes to be yelled at for doing something wrong. We all want to go about the business of having fun.

Unfortunately, our hobby can be a dangerous one. As flyers, we must all treat the hobby with respect and acknowledge the potential for danger. There are numerous times when what one flyer thinks is safe and acceptable will be totally rejected by other flyers on the flight line. We've all heard and seen what happens when a fellow flyer steps out of line. It isn't a pretty sight.

Truly, no intelligent flyer will intentionally do something to cause an accident. It is only when one flyer or another makes an unintentional mistake that accidents can occur. While beginners bear the brunt of the silliest mistakes, even experienced pilots have been guilty of unwittingly breaking safety-related rules. This section contains several safety-related guidelines and explains the reasoning behind each rule so as to enlighten beginners as to why we consider them so very important.

Safety in the pit area - Now let's address the matter of being safe in the pits. While most of these rules may seem to be nothing more than common sense, you'd be surprised at the number of pilots who break these rules.

Hold on to your plane whenever the engine is running - NEVER, repeat NEVER let go of an aircraft with its engine running until it is on the flight line and ready for taxi out. Always keep it under complete control. And ***always treat an aircraft with the engine running as if the radio is going to fail at any moment.*** We highly recommend the use of hold-down devices that ensure that the aircraft cannot move until the flyer is ready to carry it out to the flight line. It is a good idea to place your flight box in front of your aircraft's propeller while starting the engine. If you somehow lose your grip on the plane, the flight box could save someone from serious injury. Always try to position your body to one side of the aircraft while starting and running the engine. ***Do not stand or kneel in front of an aircraft with a moving propeller!***

A propeller rotating at 10,000 to 20,000 RPM carries a great deal of centrifugal force. The most dangerous position to be in near a running engine is directly in line with the prop. A piece of dirt attached to the prop during a hard landing will usually be thrown from the prop. Or, if the propeller is fractured in any way, an injury could occur if the propeller shatters. Once the engine is started, ALWAYS stand behind the aircraft.

NEVER taxi in the pit area. Along the same lines, when you are ready to bring your aircraft out to the flight line, walk it or carry it out. NEVER taxi out to the flight line! In the same manner, after landing, shut down your aircraft and either carry or push your aircraft back to the pit area.

Make needle valve adjustments from behind the aircraft. Once your engine is running, if adjustments must be made to the needle valve, be sure to get yourself into a convenient and safe position from which to make the adjustments. If you are behind the aircraft, you can easily hang on to it with one hand while you adjust the needle valve with the other.

Use a glove, chicken stick, or electric starter. Especially for beginners just getting started with RC, until you really get to know your engine, exercise extra caution when starting your engine. A flooded engine can really bite you if you use your bare finger to start it.

Use a throttle cut off. It should become habit to set up a throttle cut off for either gas/glow powered or electric powered aircraft. At a minimum, for gas/glow powered aircraft, the throttle trim, when set to full minimum, should shut the aircraft down. For electrics, the throttle cut off will not allow the ESC to provide power to the motor until the throttle cut is turned off.

No extended engine run ups or breaking in new engines near the pits. Never run your engine above idle speed in the pits, except for a momentary throttle check. As a courtesy to other flyers, NEVER break in an engine near the pit area. All break-in or lengthy set-up should be done at the outer edges of the fenced areas.

Priorities in flying. Here we list the basic rights of way for the flying field in the order of most importance. These rules apply from the time you enter the flight line until the time you carry your aircraft back to the pit area.

1) **Dead stick landings** - When an aircraft's engine dies, the aircraft is going to come down no matter what. ***The flyer with the dead stick must yell ``DEAD STICK!'' immediately.*** Anyone on the field must know an aircraft is coming down in order to stay out of its way. A flyer with a dead engine has the highest priority. ALL other flyers must give the right of way (including any that have already called their landing). If flying an electric and the battery gives indication that it is low, that pilot has "dead stick" priority.

2) **A person on the field** - Whenever a person goes onto the field to retrieve an aircraft***, they MUST call (very loudly) ``ON THE FIELD!"*** This person has the right to safely retrieve their aircraft. While ANYONE is on the field, no take offs, landings, or low passes are allowed. The only exception to this rule is a dead stick landing. Once the person exits the runway area***, they must alert all flyers with the call ``FIELD'S CLEAR!"*** If you are the person retrieving your plane, be sure to take the shortest route off the field to help others who may wish to land.

3) **A flyer calling a landing** - The first flyer that calls a landing has the right to land. Do not attempt to hurry a takeoff to beat an aircraft that is landing. If your engine stalls, an aircraft will be sitting in the middle of the runway while another aircraft lands!

4) **A flyer ready to take off** - Notice that take offs get the lowest priority. At times a flyer may have to wait for several minutes while other pilots land and retrieve their aircrafts.

Fly in control - Beginners will naturally want to keep trying new things to improve. However, all flyers must fly within their abilities, especially when the field is crowded. Save your new maneuvers for a day when the field is less populated or get an instructor to help.

Call your take offs and landings - The more informed you can keep other pilots, the safer flyer you'll be. Someone may have called a landing without your hearing it. If you call your landing loudly, another flyer will be sure to alert you that someone else has already called their landing. Acknowledge other pilots announced intentions so that they know you have heard them as well.

Be sure you know which way everyone is taking off and landing. Especially on calm days, flyers have a tendency of taking off in both directions. Watch to be sure you know which way everyone is taking off and landing. If in doubt, ask! Whenever there is a crosswind, take offs and landings must be into the prevailing wind direction.

If you need help, DO NOT FLY BY YOURSELF - Beginners have a tendency to prematurely think they are ready to fly by themselves. Maybe you've had one or two solos and are feeling pretty brave. NEVER fly by yourself unless you've had your instructor's OK to do so. Keep in mind that your aircraft is not the only thing at risk!

When in doubt, ask for help! - No matter what the rule, if you do not understand what you should do, ask an experienced flyer for help.

The Basics of Engine Tuning - In this short discussion, we will give the most basic considerations when adjusting on your new engine. While there are many potential problems that can cause similar symptoms, and while each flyer has his own way of doing things, we will do our best to acquaint you with proven ways of handling the most common problems a beginner faces.

A good running engine is a novice flyer's best friend! Nothing is more frustrating than trying to learn how to fly with a poorly performing engine. You can't get much quality stick time if your engine is constantly quitting in the air. And, when you eventually begin setting up for landings, it will be MANDATORY that the engine responds properly. If the engine dies close to the ground, the results can be disastrous.

The biggest cause of a poor running engine has to do with how the fuel tank is mounted in the aircraft. As the instructions that come with your aircraft and engine say, the fuel tank MUST be mounted at the same level as the engine's drive shaft. Ideally, the middle of your fuel tank will be 3/8 inch below

the engine drive shaft when viewed from the side.

Kinks in the fuel line MUST be eliminated. ANY kink or sharp bend will limit fuel draw. Be sure you drill the fuel line holes in the firewall large enough for your fuel lines. If you have to force the fuel line through the hole, the hole is not big enough! Be sure the "clunk'' line within the tank can extend to the bottom of the tank without closing off the clunk. If this line is too long, the clunk hole may be pressed against the back of the tank. Keep the fuel line and muffler line as short as possible so as not to impede fuel flow.

New engines are notorious for going through glow plugs quickly. This is predominantly because new engines are commonly run quite rich to ensure a good break-in. However, as you begin leaning out your new engine to gain performance, the glow plug problem should go away. If it does not, check your head bolts. Loose head bolts will cause also cause premature wear to your glow plug. For gas powered engines, follow the manufacturer's instructions for fuel/oil ratios and engine adjustment and break in.

Your carburetor must be connected to the engine so that no air can leak from the bottom of the carburetor seal. If you remove your carburetor for cleaning, be sure to seal the bottom properly before tightening. Most carburetors have a rubber seal that must be compressed before the carburetor hold down screws can be tightened. In the same way, the crankcase bolts must also be tight, as must be the engine mounting screws.

ALWAYS break in a new engine according to the manufacturers recommended break in procedures Breaking in will ensure that internal engine parts wear into position properly, while not under a great deal of load. While you can break a new engine in while it is mounted to your aircraft, many flyers like to perform the break in procedure on a test stand.

Charging your batteries – Failure to properly charge transmitter and receiver batteries is arguably the most frequent cause of crashes due to mechanical failures (as opposed to pilot error). Make sure you read and follow the manufacturer's instructions on battery charging faithfully and to the letter. Typically, NiCad battery packs should be charged for 24 hours continuously at slow rate for the first charge. The charging unit supplied with your radio is specifically designed to provide this slow charging rate. Thereafter, always charge your batteries for 14 hours continuously at slow rate the night before you intend to fly your plane. Quick field charging is acceptable if performed on the way to the field or upon arrival at the field. ***If you do not have a quick field charger and forget to properly charge your batteries on the night before – do not expect to fly your plane! You will not be allowed to fly if the battery packs are not fully charged.***

Tidewater Radio Control Club has volunteer instructors.

If you need help learning to fly or are interested in being an instructor, please contact the Vice President or any TRC instructor or TRC officer.

Phone numbers available on the TRC application and newsletter or website at www.flytrc.com

Instructors/Special Certifications

Current TRC Instructor, Check Pilots, and Special Certifications:

Alex Gauss – Instructor (Fixed Wing)
Contact – (757) 615-8215
Pete Lewis – Instructor (Fixed Wing)
Contact – (757)541-7262
Frank Rega Jr. – Instructor/Check Pilot (Fixed Wing)
Contact – (757) 286-9074
Frank Rega Sr. – Instructor/Check Pilot (Fixed Wing)
Contact – (757) 620-3865
Russ Schaffer – Instructor/Check Pilot (Fixed Wing)
Contact – (757) 621-8286
TBD – Instructor – (Rotary Wing)
Contact – TBD
TBD – Turbine Waiver Qualifier (Able to sign off Turbine Waivers)
Contact – TBD
TBD – Over 55 Lb signoff (Able to certify aircraft over 55 Lbs in accordance with AMA Policy)
Contact - TBD

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Tidewater Radio Control Club

Student Solo Flight Check List

Student's Name _____ AMA # _____

a. The Pilot shall present this sheet to the instructor during certification for Unlimited Aero Pilot status.

b. This solo certification sheet is to be signed and dated by the instructor upon completion of the individual requirements.

c. When all requirements have been completed, the Pilot may attempt final certification as a Pilot by completing the Solo Flight Check List during ONE flight. Satisfactory discussion of the Field Safety Rules and New Aircraft Checklist may be signed prior to the Solo qualification flight. Upon satisfactory completion of the solo certification test, the instructor will complete the bottom of this form with their signature, date, location of the test, and the signature of one witness.

d. The completed form should then be forwarded to the Club Vice President for issuance of a new membership badge reflecting PILOT status.

e. Person Qualifying must be a current TRC member.

f. Only certified TRC instructors may sign off on any part of this form, except for the witness signature.

Qualification Flight

1. Field Safety Rules. ☐ _____
2. New Aircraft Check List. ☐ _____
3. Assemble and Test Aircraft. ☐ _____
4. Start engine and tune. ☐ _____
5. Perform Flight Maneuvers:
   - A. Start & Taxi ☐ _____
   - B. Take off & Trim Aircraft ☐ _____
     Dual Control ☐ Solo ☐
   - C. Rectangle Pattern (hold altitude & heading) ☐ _____
     Dual Control ☐ Solo ☐
   - D. Stall and Recovery ☐ _____
     Dual Control ☐ Solo ☐
   - E. Stall Turn ☐ _____
     Dual Control ☐ Solo ☐

F. Immelmann Turn ☐ _____
Dual Control ☐ Solo ☐

G. Split "S" ☐ _____
Dual Control ☐ Solo ☐

H. Three Turn Spin and Recovery ☐ _____
Dual Control ☐ Solo ☐

I. Axial Roll ☐ _____
Dual Control ☐ Solo ☐

J. Inverted Flight Around the Pattern ☐ _____
Dual Control ☐ Solo ☐

K. Figure Eight ☐ _____
Dual Control ☐ Solo ☐

L. Go-Round or Aborted Landing ☐ _____
Dual Control ☐ Solo ☐

M. Landing (three consecutive)* ☐ _____
Dual Control ☐ Solo ☐

N. Taxi Back and Shutdown ☐ _____
Dual Control ☐ Solo ☐

I certify that this student is qualified for unsupervised solo flight

_____ _____

INSTRUCTOR DATE

I have witnessed this student successfully complete the unsupervised solo flight

_____ _____

WITNESS/INSTRUCTOR/SAFETY OFFICER DATE

- Must be completed on the same day. Touch and Go landings will count as consecutive landings provided a significant ground roll out is achieved prior to taking off again. (i.e. No bounce and go's)

Instructor:

Observe Student for SAFE operation – was the student aware of wind direction and did the student compensate for it? Was the student aware of the position of the sun and did the student avoid flying into the sun's glare? Was the student aware of other aircraft in the air and other pilots on the flight line? Was the student confident and in control of the aircraft at all times? Instructor shall initial and date the Dual Control and Solo boxes once the student has successfully completed those taskings. Instructor shall sign and date each task on the Qualification Flight once the student has successfully completed those tasks during the Pilot Qualification Flight.

Appendix B Field Equipment

The equipment required to get a trainer off the ground can be very inexpensive. There are a few basic items that will suffice to get a beginner into the air and learning to fly but there are other items that can be added to make the job a lot easier.

MINIMUM EQUIPMENT

NAME	DESCRIPTION
Glow Plug Driver	Clip on battery for supplying power to glow plug
Chicken Stick	Stick used for flipping the prop to start the engine
Fuel	Fuel mixture recommended by engine manufacturer
Fuel Bulb	Rubber bulb used to transfer fuel to model tank
4 - Way Wrench	Combination wrench with sizes to fit glow plug, prop nut, etc.
Tool Box	Any box suitable for carrying the other equipment

These items should cost about $60. This can vary depending on the brand of the items and the place from which the items are purchased. An assortment of screwdrivers, pliers, and allen wrenches may also be needed to perform field maintenance.

OPTIMUM EQUIPMENT

NAME	DESCRIPTION
Starter	Battery powered motor for starting model engine
Glow Plug Connector	Clip on battery connector for supplying power to glow plug
Power Panel	Power distribution panel for distributing power from a field battery to starter, glow plug connector, etc.
Field Battery	Small 12 volt wet or gel cell battery
Fuel	Fuel mixture recommended by engine manufacturer
Fuel Pump	Electric pump used to transfer fuel to model tank
4 - Way Wrench	Combination wrench with sizes to fit glow plug, prop nut, etc.
Field Box	Tool box specifically designed for carrying model field equipment

These items will cost about $200. The cost will vary depending on the brand of the items and the place from which the items are purchased. Field box kits are available for a wide range of prices but can be built from readily available materials. An assortment of screwdrivers, pliers, nut drivers, and allen wrenches is also desirable to perform field maintenance.

Appendix C New Aircraft Check List
Most items on this list should be checked after every flight!

POWER PLANT

1. PROPELLER
- ❑ Propeller nut tight
- ❑ Spinner on tight
- ❑ Propeller balanced

2. ENGINE
- ❑ Hold down bolts tight
- ❑ Head bolts tight
- ❑ Carburetor secure
- ❑ Glow plug tight/spark plug
- ❑ Note: carburetor will be "stroked" during the CONTROL operation.

3. FUEL SYSTEM
- ❑ Lines connected properly
- ❑ Line routing, bends, kinks
- ❑ Tank mounting
- ❑ Clunk free

FUSELAGE

1. CONTROLS
- ❑ Throttle control free
- ❑ Servos mounted securely and tight
- ❑ Servo hardware tight
- ❑ Servo pushrods clear of mechanical interference

2. LANDING GEAR
- ❑ Main Gear and Nose Gear Hardware tight
- ❑ Wheels free and collars tight

3. RECEIVER
- ❑ Check all receiver plugs for proper seating
- ❑ Check antenna routing
- ❑ Check receiver overall crash protection

4. BATTERY AND SWITCH
- ❑ Check switch mounting (opposite muffler side of fuse).
- ❑ Check wire leads for routing and binding and proper hook-up
- ❑ Check battery crash protection
- ❑ Check battery voltage

EMPENNAGE

1. VERTICAL STAB
- ❑ Check all glue joints for rigidity where joined to fuse
- ❑ Check rudder hinges
- ❑ Check rudder control horn
- ❑ Rudder throw will be checked and set under CONTROL OPERATION

2. HORIZONTAL STAB
- ❑ Check all glue joints for rigidity where joined to fuse
- ❑ Check elevator hinges
- ❑ Check elevator control horn
- ❑ Elevator throw will be checked and set under CONTROL OPERATION

WING

1. CONTROL SURFACES
- ❑ Check aileron hinges
- ❑ Check aileron control horns
- ❑ Aileron operation will be checked and set under CONTROL OPERATION 2

2. WING ALIGNMENT
- ❑ Check wings center section joint
- ❑ Check wings for warp

CONTROL OPERATION

1. TRANSMITTER
- ❑ Check for card in frequency slot on transmitter impound before operating transmitter
- ❑ Check transmitter voltage meter for proper operating voltage
- ❑ Check for proper flags on transmitter
- ❑ Set all trim controls on center

2. RUDDER AND NOSE GEAR
- ❑ Check rudder for correct direction (check also nose gear if tricycle gear) (change transmitter switch if necessary)
- ❑ Check for proper throw
- ❑ Check all hardware for tightness (especially nose gear control horn on shaft)

3. ELEVATOR
- ❑ Check for correct direction (change transmitter switch if necessary)
- ❑ Check for proper throw
- ❑ Check all hardware for tightness

4. AILERON

- ❑ Check for correct direction (change transmitter switch if necessary)
- ❑ Check for proper throw
- ❑ Check all hardware for tightness and check aileron control shaft from pushrod connection through trailing edge bearings to connection on aileron. There should be no "slop" in the system.
- ❑ Check for symmetry in neutral position.
- ❑ Check all hardware for tightness

5. THROTTLE

- ❑ Check for correct direction (change transmitter switch if necessary)
- ❑ Check for proper throw. Trim down-carb barrel closed. Trim up-carb open to fast idle. Throttle control off for these checks. Throttle full up-carb barrel full open.
- ❑ Check all hardware for tightness

BUDDY BOX OPERATION

1. TRIM

- ❑ Set all transmitter and buddy box trim to neutral or center position.
- ❑ Ensure that the buddy box power switch is OFF.

2. OPERATION

- ❑ Check buddy box for proper tracking with main transmitter for Rudder, Elevator, Aileron, and Throttle. Correct buddy box as necessary to track with main transmitter.

3. RANGE CHECK

- ❑ Range check transmitter with antenna collapsed and distance of 200 feet.
- ❑ Check also operation of buddy box through transmitter at the range check.

Tidewater Radio Control Club - **TRC FIELD RULES**
(Revised 5-20-2025)

1. TRC sponsored flying site is restricted to member/pilots and guests of members.
   - Guests who desire to fly must meet current AMA requirements including proof of current AMA membership.
   - A guest of a member must be accompanied by that member at all times. Member assumes responsibility for guest compliance.
   - An individual may be guest pilot for a total of three (3) times before TRC membership is required.
2. TRC members will adhere to AMA Safety Regulations, Safety Code and TRC working rules. The use of alcoholic beverages or drugs is prohibited. Abusive or vulgar language is prohibited.
3. It is the responsibility of each member to report violations of the safety regulations or General Field Regulations to the Safety Officer/MAA.
4. All members will carry their TRC and AMA badges while flying at any TRC sponsored site. All TRC badges will include the member's name and AMA number.
5. Student/Non-certified pilots must not fly unassisted. Violation of this rule may result in immediate expulsion from TRC.
6. No flying of any kind will take place when maintenance/upkeep is being performed on the active runway.

PITS AND FLIGHT BOXES

7. Members will pit only in the designated pit area and fly from the designated pilot area.
8. Aircraft shall be positioned in such a manner that they will not endanger any other member or spectator while starting or tuning their aircraft.
9. A maximum of four (4) pilots will be allowed to fly simultaneously, not to exceed one (1) per designated pilot box.
10. Pilots/spotters will ensure landing pattern and runway is clear of model aircraft and people prior to initiating takeoff or landing.
11. Pilots experiencing an emergency will notify other members immediately and will have runway / airspace priority.
12. Pilots/spotter shall announce their intentions to enter runway and again when clear of runway.
13. Pilots will make sure by announcing their intentions that the runway is clear of other model aircraft and people before attempting to land.
14. Pilots will warn all others when experiencing control difficulties.

FLIGHT OPERATIONS

15. Members are prohibited from flying aircraft over non-designated flight areas.
16. Members will not attempt to fly model aircraft without the proper pre-flight checks. Others present shall be notified that a check flight (maiden) is being conducted.
17. Members will maintain control of model aircraft at all times and not fly in such a manner as to endanger fellow members or spectators.

18. Members will take off and land into the prevailing winds as long as this does not require flight over prohibited areas.
19. In the event there is no wind or a dead crosswind, pilots present will decide among themselves which direction is to be used.
20. Helicopter/Multi-Rotor (non-fixed wing) Procedures for Wild Horse Flying Site: Primary flying area is the pad is located on the east of the taxiway/pit area near the Southeast corner of the field. Spotters are highly recommended. Two helicopter/multi rotor may fly at once. Flying from the pad will take place to the South. Helicopter/multi-rotor pilots may fly on main runway as long as pilots are aware. Fixed wing and rotary wing aircraft should not share the same airspace. If helicopter pilots are active, spotters are required for main flight line and helicopter pad.
21. All current AMA National Model Aircraft Safety code requirements must be adhered to at all times unless superseded by a TRC rule.
22. Pilots must have an AMA Card and TRC Membership card at all times.
23. Engines shall not be started until 9:00 a.m. Electric aircraft may be flown earlier.
24. Student pilots must have the assistance of an instructor or rated pilot.
25. The 4-station flight line system must be used. (Maximum four (4) pilots at one time unless permitted during an event by the Contest Director)
26. Pilots shall position aircraft in the grass pit area facing the flight line fence approximately mid-way between the parking lot and the flight line fence, and in line with other aircraft, before starting the engine.
27. Use of restraints is required prior to starting the engine.
28. Engine break in is required to be done at the extreme ends of the pit line (near the entrance to the parking lot or past the equipment shed). The aircraft must be securely tethered or held by an assistant.
29. Pilots with gasoline powered aircraft must have an approved FIRE EXTINGUISHER at their pit location.
30. All LIPO batteries must be contained in a fire-resistant container for charging and must not be charged under the shelter.
31. Aircraft must be held by a second person or secured before starting.
32. Taxiing is not permitted in the Pit area.
33. If more than one aircraft is in the air, unless there is agreement otherwise from **ALL** pilots currently flying aircraft, **ALL** aircraft shall be flown in the same clockwise or counterclockwise pattern (depending on wind direction and indicated by the field arrow).
34. If more than one aircraft is in the air, unless there is agreement otherwise from **ALL** pilots currently flying aircraft, aerobatic maneuvers must be done outside of the pattern and on the far side of the runway centerline.

RECOMMENDATIONS

- A Successful range check should be completed before the first flight of the day for each model.
- Limit flights to 15 Minutes or less. Don't be a "Pilot Box Hog".
- Don't fly alone, use a spotter. Be aware of location of nearest medical help and First Aid kit.
- Remove glow igniter and adjust needle valve from behind aircraft.
- Be considerate in the use of the assembly tables. Don't use them to store aircraft when other pilots are waiting to use them.
- There is no trash deposit at the field. Take home what you bring.
- If you have questions or concerns, please let a member of the Board of Directors or the Safety Marshall know.
- Every member is a field marshal. If you see a violation of these rules let the offender know in a courteous manner…

Remember… WE ARE HERE TO HAVE FUN!!

Glossary of R/C Terms

ABC / Non-Ringed - These letters stand for aluminum, brass and chrome or a composite such as nickel. These engines have an aluminum piston and a chrome or composite coated brass cylinder sleeve which allows them to be more efficient for higher performance. They have no piston ring and rely on a very tight piston/cylinder fit to obtain a piston/cylinder seal. New ABC engines are normally hard to turn over by hand. Because of the tight fit, it is very important that the engine is broken in properly.

Adjustable Travel Volume (ATV) - ATV allows you to preset the maximum travel of a servo to either side from its neutral position. Such settings help tailor control action to suit your flying or driving style.

Adverse Yaw - The tendency of an aircraft to yaw in the opposite direction of the roll. For instance, when right aileron is applied, the aircraft yaws to the left, thus opposing the turn. Adverse yaw is common in trainer type aircrafts having flat bottom wings. It is most noticeable at slow speeds and high angles of attack, such as during takeoffs and when stretching a landing approach. Caused by the unequal drag of the upward and downward deflection of the ailerons, this undesirable trait can be minimized by setting up the ailerons with Differential Throw or by coordinating the turns, using the aileron and rudder controls simultaneously. (See Differential Throw.)

Ailerons - Hinged control surfaces located on the trailing edge of the wing, one on each side, which provide control of the aircraft about the roll axis. The control direction is often confusing to first time modelers. For a right roll or turn, the right-hand aileron is moved upward and the left-hand aileron downward, and vice versa for a left roll or turn.

AMA - The Academy of Model Aeronautics. The official national body for model aviation in the United States. AMA sanctions more than a thousand model competitions throughout the country each year and certifies official model flying records on a national and international level.

Angle of Attack - The angle that the wing penetrates the air. As the angle of attack increases so does lift and drag, up to a point.

ARF - A prefabricated model - Almost Ready to Fly.

Battery Eliminator Circuitry (BEC) - A circuit that eliminates the need for a receiver battery, usually in electric R/C aircrafts.

BB - These letters usually designate a ball-bearing supported crankshaft in an R/C engine. This makes the engine run smoother and last longer.

Buddy Box - Two similar transmitters that are wired together with a "trainer cord." This is most useful when learning to fly -- it's the same as having dual controls. The instructor can take control by using the "trainer switch" on his transmitter.

Boring Holes in the Sky - Having fun flying an R/C aircraft, without any predetermined flight pattern.

CA (Abbreviation for "Cyanoacrylate") - An instant type glue that is available in various viscosity (Thin, Medium, Thick, and Gel). These glues are ideal for the assembly of wood aircrafts and other materials. Note: Most CA glues will attack Styrofoam.

Carburetor - The part of the engine which controls the speed or throttle setting and lean/rich mixture via setting of the needle valve.

CG ("Center of Gravity") - For modeling purposes, this is usually considered -- the point at which the aircraft balances fore to aft. This point is critical in regard to how the aircraft reacts in the air. A tail-heavy plane will be very snappy but generally very unstable and susceptible to more frequent stalls. If the aircraft is nose heavy, it will tend to track better and be less sensitive to control inputs but will generally drop its nose when the throttle is reduced to idle. This makes the plane more difficult to land since it takes more effort to hold the nose up. A nose heavy aircraft will have to come in faster to land safely.

Charge Jack - The plug receptacle of the switch harness into which the charger is plugged to charge the airborne battery. An expanded scale voltmeter (ESV) can also be plugged into it to check battery voltage between flights. It is advisable to mount the charge jack in an accessible area of the fuselage so an ESV can be used without removing the wing.

Charger - Device used to recharge batteries, usually supplied with the radio if NiCd batteries are included.

Chicken Stick - A hand-held stick used to "flip start" a model aircraft engine.

Clunk - A weighted fuel pick-up used in a fuel tank to assure the intake line is always in the fuel.

Dead Stick - A term used to describe unpowered flight (glide) when the engine quits running.

Differential Throw - Ailerons that are set up to deflect more in the upward direction than downward are said to have Differential Throw. The purpose is to counteract Adverse Yaw.

Digital Spread Spectrum (DSS) – a technical term describing the function of 2.4GHz radio equipment, the use of which requires no crystals or frequency monitoring. Use of this equipment ensures no interreference with or from other radio equipment.

Dihedral - The V-shaped bend in the wing. Typically, more dihedral causes more aerodynamic stability in an aircraft, and causes the rudder to control both the roll and yaw axis. This is why some trainers and sailplanes require only 3 channels of radio control--i.e. having no ailerons.

Direct Servo Control (DSC) - This radio feature permits you to check servo operation without broadcasting a radio signal. A cable connects the transmitter to the receiver. Direct servo control is very useful for on-the-ground control checks.

Ding - Minor dent or damage to the structure. Also, a nick in a prop. Dinged props must be replaced.

Down Thrust - Downward angle of the engine relative to the centerline of the aircraft. Down thrust helps overcome the normal climbing tendency of flat bottom wings.

Electric Starter - A hand-held electric motor used for starting a model aircraft engine. Usually powered by a 12-volt battery.

Electronic Speed Control (ESC) - Electronic speed controls replace the mechanical speed control and servo providing enhanced power efficiency and precision in an electric R/C aircraft. In addition, they are lighter which improves the performance of some electric models.

Elevator - Hinged control surface located at the trailing edge of the horizontal stabilizer, which provides control of the aircraft about the pitch axis and causes the aircraft to climb or dive. The correct direction of control is to pull the transmitter elevator control stick back, toward the bottom of the transmitter, to move the elevator upward, which causes the aircraft to climb, and vice versa to dive.

Endpoint Adjustment - This radio feature adjusts the length of servo travel in one direction (a single channel will have adjustments for two endpoints). If your plane rolls faster one way than the other, endpoint adjustments can correct the problem.

Epoxy - A two-part resin/hardener glue that is extremely strong. It is generally available in 6, 15 and 30- minute formulas. Used for critical points in the aircraft where high strength is necessary.

Expanded Scale Voltmeter (ESV) - Device used to read the battery voltage of the on-board battery pack or transmitter battery pack.

Field Charger - A fast battery charger designed to work from a 12-volt power source, such as a car battery.

Flaps - Hinged control surface located at the trailing edge of the wing inboard of the ailerons. The flaps are lowered to produce more aerodynamic lift from the wing, allowing a slower takeoff and landing speed. Flaps are often found on scale models, but usually not on basic trainers.

Flare - The point during the landing approach in which the pilot gives an increased amount of up elevator to smooth the touchdown of the aircraft.

Flight Box - A special box used to hold and transport all equipment used at the flying field.

Flight Pack (or Airborne pack) - All the radio equipment installed in the aircraft, i.e., Receiver, Servos, Battery, and Switch Harness.

Flutter - A phenomenon whereby the elevator or aileron control surface begins to oscillate violently in flight. This can sometimes cause the surface to break away from the aircraft and cause a crash. There are many reasons for this, but the most common are excessive hinge gap or excessive "slop" in the pushrod connections and control horns. If you ever hear a low-pitched buzzing sound, reduce throttle and land immediately.

Four Stroke (Four Cycle) - Although a 4-stroke engine has less power than a 2-stroke engine of comparable size, there are advantages to 4-stroke engines. They do not require a muffler and are often quieter than most 2-strokes are with a muffler. They can swing a bigger prop than the same size 2-stroke engine. This is an asset in the large, slow flying aerobatic and scale models where 4-stroke engines are usually mounted. Lastly, the fuel economy is better.

Frequency Control - The FCC has allowed the 72MHz band to be used for R/C aircraft operations. This band is divided up into many different channels in which you can choose a radio system. You should be aware that certain areas have frequencies in which there is pager interference. This is why it is always a wise move to check with your local hobby shop to find out any channels that may be troublesome in the area you wish to fly.

Frequency Module - A frequency module plugs into the transmitter and enables you to change the channel number your radio broadcasts on.

Fuel Overflow Line (Vent) - The fuel line is either open to atmospheric pressure or attaches to the muffler pressure nipple to pressurize the fuel tank for better fuel flow to the engine. This is the line through which the fuel will overflow when the tank is full.

Fuel Pick Up-Line - The fuel line in the fuel tank through which fuel travels to the carburetor. Typically a flexible tube with a weight or "Clunk" on the end which allows it to follow the fuel with changes in aircraft attitude. This is the line through which the tank is filled.

Fuselage - The body of an aircraft.

Glitch - Momentary radio problem that never happens unless you are over trees or a swamp.

Glow Plug - The heat source for igniting the fuel/air mixture in the engine. When starting the engine, a battery is used to heat the filament. After the engine is running, the battery can be removed. The wire filament inside the plug is kept hot by the "explosions" in the engine's cylinder. (See next heading and "Idle Bar" Plug.)

Glow Plug Clip/Battery - A 1.2-volt battery, which is connected to the glow plug on a model aircraft engine for starting. The battery is removed once the engine is running steadily.

Grease-In - A very smooth, gentle landing without a hint of a bounce.

Hit (or to be hit) - Sudden radio interference which causes your model to fly in an erratic manner. Most often caused by someone turning on a radio that is on your frequency but can be caused by other radio sources miles away.

Horizontal Stabilizer - The horizontal tail surface at the back of the fuselage which provides aerodynamic pitch stability to the aircraft.

Idle Bar Plug - This type of glow plug has a "bar" across the tip to help prevent raw fuel from being splashed onto the glow element. Too much raw fuel will cool the plug and prevent it from igniting the fuel/air mixture. An idle bar is a help in obtaining a low idle speed.

Lateral Balance - The left-right or side-to-side balance of an aircraft. An aircraft that is laterally balanced will track better through loops and other maneuvers.

Leading Edge (LE) - The very front edge of the wing or stabilizer. This is the edge that hits the air first.

Lithium/Polymer batteries (LiPo) – Newer high energy density batteries primarily used for powering electric aircraft. Much care is needed in their charging and maintenance to avoid fires.

Mixing (Coupling) - Two radio control channels can be coupled together so that they move together when only one control channel is activated. Many 1/4 scale models require a combination of aileron and rudder to turn. Mixing does this electronically at the transmitter. V-tailed models, where the two halves of the V-tail must move not only together but independently, are another use of control mixing.

Muffler - A device attached to the exhaust stack of the engine to reduce noise and increase back pressure which helps low speed performance. Note: Most R/C Clubs require the use of mufflers.

Muffler Baffle - A restrictor plate inside the muffler which reduces engine noise. This plate can be removed to increase power, but only if there are no noise restrictions where you fly.

Needle Valve - Adjustment on a carburetor used to set proper fuel/air mixture. Some carburetors have separate needle adjustments for low and high throttle. Typically, turning the needle clockwise (screwing in) leans the mixture (less fuel), and vice versa. However, there are a few exceptions--refer to the engine manufacturer's instructions.

NiCd - Nickel Cadmium battery. Rechargeable batteries which are typically used as power for radio transmitters and receivers.

NiMH - Nickel Metal Hydride battery. A newer type of rechargeable batteries which are typically used as power for radio transmitters and receivers.

Nitro - Nitromethane, a fuel additive that increases a model engine's ability to idle low and improves high- speed performance. Ideal nitro content varies from engine to engine. Refer to the engine manufacturer's instructions for best results. Nitro content in fuel is indicated by the percent of the fuel.

Ni-Starter - A self-contained battery and glow plug clip, used when starting the engine. (See Glow Plug Clip.)

One-Point Landing (or a figure 9) - Synonymous with "stuffing it in." Something we hope you never do.

Peak Charger - A peak charger automatically shuts off when your battery is fully charged. This means longer run times for your vehicle. Peak chargers are nearly foolproof, if you forget to turn it off, the charger does it for you. No more overcharged batteries.

Pitch Axis - The aircraft axis controlled by the elevator. Pitch is illustrated by holding the aircraft at each wingtip. Raising or lowering the nose is the pitch movement. This is how the climb or dive is controlled.

Power Panel - 12-volt distribution panel that provides correct voltage for accessories like glow-plug clips, fuel pumps and electric starters. Usually mounted on a field box and connected to a 12-volt battery.

Programmable or Computer Radios - These high-tech radios are not inexpensive but allow a full set of programmable transmitter features like multiple plane memory, preprogrammed maneuvers (rolls, loops, etc. at the touch of one button) and much more.

Prop Pitch - Props are designated by these two numbers, for instance 10 - 6. The first number is the prop's diameter, (e.g.10"). The second number is the pitch or angle of the blades. The 6 represents the distance the propeller will move forward in one revolution, in this case 6".

Re-Kitting Your Aircraft - Changing your finished model back into a kit, as a result of "stuffing it in" or “Unintentional rapid ground arrival” (AKA as “Gravity Wins”).

Receiver (Rx) - The radio unit in the aircraft which receives the transmitter signal and relays the control signals to the servos.

Roll Axis - The aircraft axis controlled by the ailerons. Roll is illustrated by holding the aircraft by the nose and tail. Dropping either wingtip is the roll movement. This is used to bank or turn the aircraft. Many aircraft are not equipped with ailerons and the Roll and Yaw motions are controlled by the rudder. This is one reason why most trainer aircraft have a larger amount of dihedral.

Rudder - Hinged control surface located at the trailing edge of the vertical stabilizer, which provides control of the aircraft about the Yaw axis and causes the aircraft to Yaw left or right. Left rudder movement causes the aircraft to Yaw left, and right rudder movement causes it to Yaw right.

Servo - The electro-mechanical device which moves the control surfaces or throttle of the aircraft according to commands from the receiver. The part of the radio system that does the physical work inside the aircraft.

Servo Output Arm - The removable arm or wheel which bolts to the output shaft of a servo and connects to the pushrod that operates the respective control surface.

Servo Reversing - This radio feature allows you to install the servos where they can give the best pushrod routing without concern about the direction of servo rotation. When your installation is complete, turn on your radio and check each channel. If a channel operates opposite of its intended direction, a simple flick of a switch corrects the problem.

Shot Down - A "hit" that results in a crash landing. Sometimes caused by radios miles away.

Slop - Unwanted, excessive free movement in a control system. Often caused by a hole in a servo arm or control horn that is too big for the pushrod wire or clevis pin. This condition allows the control surface to move without transmitter stick movement. (See Flutter.)

Solo - Your first totally unassisted flight that results in a successful controlled landing.

Spinner - The nose cone which covers the hub of the propeller.

Sport Aircraft - A model which possesses some attributes of many of the specialty aircrafts and are best for general flying as they are the most versatile and durable.

Stall - What happens when the angle of attack is too great to generate lift regardless of airspeed. (Every airfoil has an angle of attack at which it generates maximum lift -- the airfoil will stall beyond this angle).

Tachometer - An optical sensor designed specifically to count light impulses through a turning propeller and read out the engine RPM.

Tip Stall - The outboard end of one wing (the tip) stops developing lift, causing the plane to roll suddenly in the direction of the stalled wing. This situation is not fun when you are only a few feet off the runway trying to land.

Trainer Aircraft - A model designed to be inherently stable and fly at low speeds, to give first-time modelers time to think and react as they learn to fly.

Trainer System - This effective method of training allows two transmitters to be connected by means of a trainer cord. The instructor can pass control over to the student's transmitter so that he can fly. If the student gets into trouble, the instructor can regain control instantly.

Trailing Edge (TE) - The rearmost edge of the wing or stabilizer.

Transmitter (Tx) - The hand-held radio controller. This is the unit that sends out the commands that you input.

Touch-And-Go - Landing and taking off without a pause.(Intentionally!). Often confused with a good bounce.

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Vertical Fin - The non-moving surface that is perpendicular to the horizontal stabilizer and provides yaw stability. This is the surface to which the rudder attaches.

Washout - An intentional twist in the wing, causing the wing tips to have a lower angle of attack than the wing root. In other words, the trailing edge is higher than the leading edge at the wing tips. Washout helps prevent tip stalls.

Wheel Collar - A small, round retaining device used to keep wheels from sliding off an axle.

Wing - The main lifting surface of an aircraft.

Wing Loading - This is the amount of weight per square foot that has to be overcome to provide lift. It is normally expressed in ounces per square foot. This specification can be easily calculated as follows: If you know the square inches of the wing, simply divide by 144 to obtain square feet. Divide the total weight (in ounces) of the aircraft by the wing area (in square feet). This information is valuable when deciding on which aircraft to build next. Planes with high wing loading numbers must fly faster to stay in the air. These are generally "performance" aircrafts. Conversely, planes with lower numbers do not need as much air flowing around the wing to keep it flying. Gliders and trainer aircrafts fall into this category because slow, efficient flight is desirable.

Wing Root - The centerline of the wing, where the left- and right-wing panels are joined.

Y-Harness - Two servos can be plugged into one channel with a Y-harness. The two servos will then operate simultaneously. It is most often used in areas where the strength of one servo is not adequate or to control two surfaces that are a distance apart but need to move together (e.g. ailerons).

Yaw Axis - The aircraft axis controlled by the rudder. Yaw is illustrated by hanging the aircraft level by a wire located at the center of gravity. Left or right movement of the nose is the Yaw movement.

Z-Bend - A simple Z-shaped bend in the wire end of a pushrod, which may be used to attach the pushrod to a servo output arm.

Z-Bend Pliers - An inexpensive plier type tool used for easily making perfect Z-bends.