Common RC Questions and Answers
On
RC Flight and Flight Instruction

This material is intended to answer some of the most common questions and problems a beginning RC flyer has. We encourage you, as a current or prospective club member, to take advantage of our instruction program, which provides instruction at our field on Tuesday and Thursday evenings from approx 5 pm until dark (weather permitting) from April through October of each flying season. If you have any additional questions regarding instruction, please contact Bob Badger: Ph: 317-888-4169; or rwbcom@comcast.net

This publication does mention some brand names and actual models, but keep in mind this is done for the sole purpose of offering comparisons. We are not endorsing nor criticizing any of the products mentioned. There are numerous radios, airplane kits, ARFs, engines, and flying accessories of excellent quality. In fact, you really have to go out of your way to find a poor product in this hobby.

Is it hard to learn to fly?

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. Teaching one's self may cost you several airplanes (or at least several crashes) in the process! Fixing airplanes is not nearly as much fun as flying. If you want to learn to fly with the fewest problems, 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 with the help of a "buddy-box," be ready to take control if you get into trouble in the air. While we can't promise your instructor 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?

This depends upon the student's aptitude. It also depends on how much time you practice. The more often you practice, the shorter the time it will take to master the skills. 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. We have seen people solo (fly by themselves for several consecutive flights) 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.

How many airplanes can fly at a time at a single location?

The FCC has allotted over 50 frequencies to model aircraft using 72 MHz radios. These frequencies are given numbers, ranging from about 11 to 60. In theory, this means that over fifty planes could be flying at the same time using these radios! *Note: If one flyer turns a 72 MHz transmitter on when another on the same frequency is flying, the pilot of the plane in the air will loose control of the plane. This is why most clubs use some form of frequency control.* However, more recent 2.4 GHz radio systems do not interfere with other transmitters using this or the 72 MHz system. In practical application at a flying site, when more than six or seven planes are in the air at the same time, it can be

quite distracting to the flyers (mid-air collisions do happen). For this reason, our club limits the number of planes that can be in the air at the same time to 5 airplanes.

Your Instructor will go over the rules of frequency control in detail. Be sure you understand how the procedure works!

How long can a plane 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 Glow-fuel engine is about a six-ounce fuel tank. This will allow about a 10-12 minute flight. Most common Electric-powered aircraft will fly for this time duration or less.

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 airplane at the time of the engine failure has a lot to do with how difficult it is to safely land the airplane. The higher the plane, the more time the flier will have to plan the landing. (Landings without power are called dead-stick landings.)

How far away can the airplane 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 airplane for up to 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 airplane as well as the size of the engine. Trainers will fly at speeds of about 20-40 miles per hour, depending on the maneuver. More aerobatic sport planes can reach speeds of well over 90 MPH. Aircraft designed for speed can go as fast as 150 MPH.

How high can they go?

Planes will fly as high as you can see them. Again, if you can see it, you have control of it! However, flying fields that are located in close proximity to airports usually have some height limitations. Instructors: be sure to relate any rules related to height and position flying.

Is flying an RC airplane like flying a real (full scale) airplane?

In essence, yes. You'll have the same basic controls a full-scale pilot has of a real airplane. However, full-scale pilots frequently relate that an RC airplane responds much faster than a real airplane. They also say that learning to fly RC can be awkward, since there is no feel for the planes maneuvers. RC flying requires much more hand/eye coordination since you must respond to what you see.

What's the hardest part of flying?

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 take-off. Finally, once you have mastered all other phases of flying, you'll learn how to land.

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 less enjoyable) it is to fly. Beginners shouldn't fly in winds much over 5 MPH until they have mastered the first step of learning how to fly.

What is the best size plane and engine for learning?

Generally speaking, the smaller the airplane, the less expensive it will be. Unfortunately, the smaller the airplane, the less stable it is and the worse it handles in the wind. Keep in mind that all size RC airplanes perform nicely on calm days. We recommend starting with an airplane large enough to handle the wind you get.

Here are the approximate engine sizes as well as the approximate wingspan and weight of several standard classes of RC airplane: **Engine/ Wingspan/ Weight**			
.049 (1/2-A) 35-40" 1-2 lbs.	20 40-45" 2-3 lbs.	40 50-55" 4-5 lbs.	60 60-65" 6-8 lbs.

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We recommend starting with a plane in the .40 engine size class. It will be large enough to easily get off the ground and fly nicely in some wind. If cost is prohibitive, .20 sizes are good too, but wind will be more of a problem.

How does the radio control system work?

As with any kind of radio, a transmitter (hand-held remote control) is used to send signals to the receiver (in the airplane). Rechargeable batteries power both the transmitter and receiver. The radio system can have several channels. Each channel is used to control one airplane function. Servos (one for each channel) are used to cause the actual motion within the airplane 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 flier control 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 middle of the control. The throttle stick stays where you place it, from idle to full throttle.

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 airplane, servos respond to signals from the radio's receiver whenever either of the transmitter sticks is moved. The servos change position according to the motions of the transmitter

sticks and cause the control surfaces of the airplane to move in sync with stick movements (through mechanical linkages).

Radio Terminology

Trim controls - It is not possible to perfectly set each servo and control surface. 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.

Setting correct trim is another reason that beginners should seek help. It is highly unlikely that a new airplane 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 will be impossible to fly. During your new plane's first flight, the instructor will trim your airplane, causing the centered or neutral position of each channel to be correctly positioned for ease of flight.

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 feature servo reversing 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 almost all radios sold today.

Dual rates - Though not included on every radio, this feature allows you to change the responsiveness of your airplane'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 your airplane, making it easier to fly.

Mixing - This feature allows you to have one control automatically invoke another. For example, as you give left aileron, the radio can be adjusted to automatically give some right rudder (to make for a smoother turn). While this is a nice for feature for 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 versus PCM - Generally speaking, the most reliable (and most expensive) radio style is PCM (stands for pulse coded modulation). Next in reliability and price comes FM (frequency modulation). Finally comes AM (amplitude modulation). Though almost all of these radio styles are highly reliable, we recommend that beginners purchase an FM radio.

Trainer system - 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 without the trainer system!

How much does equipment cost?
This is also a tough question to answer based on the size of the airplane and how many extras you want to buy. For a .40-sized airplane, 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:	$100 - 150
.40 sized engine (medium class):	$80.00 -100
4 Channel FM radio (with cord):	$160.00
Flight box accessories (fuel, etc.):	$70.00
Approximate startup cost:	**$400 − 500**

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 airplanes. Don't forget that you need to join the AMA, and pay your club dues.

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 airplanes. This is the most stable design (even for full scale airplanes). Since the body of the fuselage is below the wing, the plane will nave 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.

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 airplane. 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 airplane in case you have to 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 airplanes 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 mount 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.

Another nice thing about ARF airplanes is that most come with almost everything you need to complete the plane. Hardware like clevises, engine mounting screws, wheels, fuel tank, wheel retainers, control horns, nose cone spinner, and sometimes even glue are included right in the box. While the quality of these components may not match those you buy separately, at least you won't have to make a lot of trips to the hobby shop!

What is the trainer system?

Imagine you've just built your airplane and you bring it out to the field for the first time. You get together with an instructor and he test flies your airplane 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 your 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 grabs the transmitter back from you and rights the plane. Then he gives you back the transmitter. You get about 3 more seconds of practice before he has to grab the transmitter again.

This passing back and forth of the transmitter is very cumbersome, error prone, and downright scary. In the beginning, when your 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 take- offs and landings), you'll want a more fail-safe method of instructor control.

Sometimes called a “buddy box”, the trainer system allows you to connect a slave transmitter with the master transmitter with a cable. 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).

Our instructors have a limited number of buddy-box setups for instruction use with the most common brands of radio gear. These may require re-trimming as they are moved from student to student, and there is no guarantee a box will be available for your brand of equipment. You can buy your own slave transmitters and a buddy-cord that work with your radio, and this will ensure you are ready for flight assistance whenever an instructor is available.

What Makes The Best Trainer Airplane?

There is a lot of controversy related to what truly makes a good trainer. As you talk to people at the field and read ads & articles in model magazines, everyone seems to have a different idea as to what makes the best trainer. Of course, the companies trying to sell trainers will always slant their sales information in a way that sounds right for everyone. In this publication we will discuss the three most important attributes for trainer type airplanes.

Wing configuration - The most popular trainers are of high wing design. The high wing gives the most stability for flying. Since the major portion of the airplane's weight is below the wing, high wing airplanes have excellent self-correcting characteristics.

There are three types of wings used for trainers, the flat bottom wing (as is used on Hobbico Flightstar 40, Great Planes PT-40, and Midwest Aerostar), the semi-symmetrical wing (as is used on the Hobbico Avistar), and the fully symmetrical wing (used on the Great Planes Trainer 40). The wing configuration has a great deal to do with ease of flying, wind penetration, and aerobatic capabilities.

Generally speaking, planes with flat bottom wings are easiest to fly. With even a small amount of dihedral (the amount of angle in the middle of the wing), they tend to be very self-correcting. However, on windy days, difficulty of flying increases due to the fact that they do not penetrate the wind very well. You will also notice a great deal of ballooning (the tendency for a plane to gain altitude when speed is increased) with flat bottom wings. Also, planes with flat bottom wings tend to have limited aerobatic capabilities.

Planes with semi-symmetrical wings, while they sacrifice some in the way of self-correcting characteristics, remain amazingly stable. With them you gain in wind penetration characteristics, reduce the tendency for ballooning, and increase your potential for aerobatics once you have learned the basics of flight. (This is my wing style of choice for trainers).

High wing planes with fully symmetrical wings tend to be much more aerobatic. As long as you limit the movement of control surfaces, they can also make excellent trainers, and in the hands of an experienced pilot, can perform almost every maneuver in the book!

The *dihedral* also has a great deal to do with the plane's stability and self-correcting characteristics. Generally speaking, the more the dihedral, the greater tendency the plane will have to self-correct. However, on windier days, excess dihedral will keep the plane from penetrating the wind nicely. It is difficult to fly planes with excess dihedral directly into the wind. The plane will have the constant tendency to turn in the direction the wind is blowing (with the wind).

Weight versus rugged design - Of course your first airplane will have to take quite a bit of abuse. Especially when you start landing on your own, you'll need a plane that can withstand the bumps and bruises associated with your first few attempts. Some of the balsa ARFs, while they are very light and have excellent flight characteristics, are a little on the weak side.

Avoid the heavy weight airplanes that sacrifice desirable flight characteristics. If you purchase an ARF, look for balsa construction to keep the weight down. However, be ready to reinforce the nose area as you begin learning how to land.

Plane and engine size – In glow-fuel powered models, 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).

When it comes to engines, buy something with a proven track record of reliability. Talk to experienced flyers at your field to get recommendations. OS Max tends to have the best reputation in this regard. While you can get more power for the money with other engines, you don't want to be spending your precious flying time fine-tuning your temperamental engine. Also, as you begin learning how to land, you will want a good reliable response from idle to midrange (for practice approaches).

As far as power, we recommend if anything, that you keep the plane 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. In this regard, *ball-bearing* engines tend to have more power and better carburetors than less expensive *sleeve-bearing* engines. These are generally 10 –20% more expensive, but in our experience it is money well spent. 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 reliable engine can be moved to your next (sport) airplane.

Electric-powered ARF’s usually come with motor and speed control. They can be purchased with a dedicated radio and servos, or in semi-kit form where you can use a radio and servos of your choice.

Pre-flight inspections

Beginners to RC flying vary dramatically when it comes to building skills. Some of you will be building your 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 airplane 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 mounting radios and engines can be somewhat difficult, even for ARF airplanes.

For these reasons, we urge beginners to have their planes checked for air-worthiness. 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 airplane to crash, and the instructor must be on the lookout for many more.

Credit:

This material was extracted from a publication authored by Mike Lynch of the Citrus County RC Club and edited for the use of flyers new to the hobby by Bob Badger of Indy RC South