Introduction to Radio Control Planes

Welcome to the world of radio controlled model airplanes. This certainly must be one of the most exciting and enjoyable hobbies in existence, encompassing so many different interests. What other hobby involves you with aerodynamics, woodworking, composite materials, electronics, mechanics, small motors, drafting, artistry, fresh air and the outdoors, and club activities, practically all at the same time!

If you have not already seen an R/C aircraft in action, head to the local club field when there is some activity, meet some of the fliers and get to enjoy it first hand. Once you see it, you'll be hooked!

The first thing one must realize about a radio controlled model aircraft is that it is not a toy. The model is a real aircraft which flies and operates by the same principles as its full scale counterpart. The only difference is size and weight. Models fly at anywhere between 20 and 150 MPH with the average trainer being between 40 and 60 MPH! These are not slow vehicles, nor can they be flown in a normal backyard. They require space! And just like their bigger brothers, they require a learned skill to be controlled properly. It is not simply a matter of pushing a button to take off, another to land, etc.

Most people find that after they have become acquainted with the hobby, they realize it is a bit more complex than they may have first believed. It is more than just boys playing with their toys! By the same token, the challenge of learning the new skills required makes the hobby that much more enjoyable and satisfying. It is not a hobby with which one easily gets bored!

How Do I Get Started?

There are two steps you should take to get you flying the fastest and most enjoyable way. The first is to get involved with the local club or group of people that fly in your area. Their experience and help will be invaluable to you in both building your aircraft and learning to fly. The second is

to outfit yourself with a good trainer aircraft for your first plane. This is not the time in your modelling career to build and fly that P-51 Mustang you've been fantasizing about.

What Will I Need?

The following is a description of the items you will require to start flying radio controlled model aircraft.

The Plane — As mentioned above, you should select a model that is designed specifically for training the new pilot. Typically these aircraft will have a high wing design, simple sturdy construction, excellent plans and instructions, and be easy to fly.

Perhaps the decision to make with regard to your first model is whether you want to build a complete kit or just do some simple assembly with an "Almost-Ready-to-Fly" or ARF model. An ARF model will usually have the bulk of the construction completed and it will even be covered. Usually the only assembly to be done is joining the wing halves, adding the tail surfaces, mounting the radio system, engine and landing gear, and connecting the control surfaces.

The building of a complete kit is more involved, and certainly takes more time, but on the same token, it is usually more satisfying to those so inclined. Also, when you build your own model from a box of wood and plastic parts, you become more familiar with aircraft construction and if the day comes when you have to do some repair work, you may find it much easier having done the building in the first place.

Another consideration when choosing your first plane is how many control functions or channels (one radio channel, not to be confused with frequency, for each function) you wish to use. Trainer aircraft are available in both three channel and four channel configurations. Most aircraft fly with four functions, these being the Rudder, Elevator, Throttle, and Ailerons. Trainers, however, can also fly without the use of ailerons. A greater dihedral (angle of the wings from the horizontal) on these trainers makes them more stable and can also produce gentle turns using rudder only. Usually a three channel model flies more slowly and is easier to fly than one with four functions and a flatter wing. Four channel models can usually handle the wind a bit better, however. Check with your local instructor to see which type of model he recommends and is more comfortable teaching with. If you are learning on your own (which we strongly do not recommend), you should have a much better chance with a three channel model than a four.

There are generally a number of additional items that will be necessary when building a kit. Most kits supply the airframe of the model and do not contain such things as the radio system, the

engine, wheels, covering material, and items related to the engine such as fuel tank, fuel tubing, propeller, spinner, etc. ARF models usually contain most items except radio, engine and propeller. We have tried to compile a list of additional items necessary for completing many of the kits we carry and these are listed with the kit as described in the catalog. A discussion of many of these accessories may be found at the end of this section.

The Radio — Along with your aircraft, you will need a radio to control it. Most aircraft radio systems are of four or more channel capability and come with just about everything you need including the rechargeable battery packs. Refer to our Introduction to Radio Systems section for more information on this.

One thing you may want to look for when buying your first radio is "buddy box" capability. The "buddy box" is where two radio transmitters may be connected together through a cable, the instructor holding one and the student holding the other. The student can have control over the model as long as the instructor holds a trainer switch on his transmitter. If the student gets into trouble, the instructor releases the switch and regains full control of the model. This can greatly decrease the learning time and also be good insurance against accidents with the novice pilot. Check with the local club or instructor to see if they have "buddy box" capability and if so, you may wish to purchase a compatible radio system.

The Engine — To power your first model, with the exception of a glider, you will require an engine. The most common type of engine for model aircraft is the glow engine. Electric motors and gas motors are also used but are not as common in trainer aircraft. For more information on engines refer to our Introduction to engines.

Tools and Adhesives — Whether you're building a complete kit or just assembling an ARF model you will almost certainly need a few basic tools and some adhesives. The most common tools used in building include a modelling knife (such as the X-Acto #1 Knife), T-pins (for holding parts over your full-size plans), a small razor plane, a fine razor saw, small screw drivers, pliers, etc. A sealing iron will be needed to apply covering to the completed airframe. A drill with standard size bits can come in very handy as well. Other, more expensive tools such as a Dremel Moto Tool are also of benefit to the modeller but are not absolutely necessary to the beginner.

There are a variety of adhesives that are currently used in building models and you will need some of these for completion of your project. The most commonly used adhesive today is the cyanoacrylate (similar to the famous "Crazy Glues"). These are now specially formulated for working with wood in various thicknesses and setting speeds.

The thin cyano is the fastest curing (usually 3 to 5 seconds!) and is best suited to balsa wood where the joint is good fitting and has a solid contact surface. The parts should be joined first and then the thin cyano applied to the joint. The glue will wick into the joint and form a solid bond.

The thicker or "gap-filling" cyano is great for general purpose building where balsa, spruce or lite plywood is involved. Apply the adhesive to the parts and then join. Drying time is in the order of 5 to 10 seconds.

The thickest cyano, also referred to "slow-setting" can be used like the "gap-filling" cyano where slightly longer cure times might be desired. Drying is in the order of 30 seconds to a minute.

All of these cyanoacrylates may be cured more quickly with the aid of an accelerator or "kicker" which is sprayed onto the joint after gluing.

Another family of adhesives which is very popular in constructing models is Epoxy. This is a two part adhesive which is mixed and then applied to the surface to be bonded. Epoxy is especially useful when working with foam parts as it will not attack the styrofoam. Epoxies are very strong and many kits recommend it specifically for certain parts of the construction.

Field Equipment — There will also be a few basic items needed for airplane support at the field when you are actually ready to fly your model. First you will need fuel (usually sold by the gallon jug) and a way of getting it from the container into the fuel tank. This could be as simple as a bulb fuel pump, a handpump, or as elaborate as a battery powered electric fuel pump.

The second basic necessity is power for your glow plug. As described in our technical reference on engines, a glow engine needs to have current run through its glow plug before it can start running. This must be supplied by a 1.2 to 1.5 volt battery or by an adjustable circuit called a glow driver, frequently found on power panels.

Additional field support items should include a prop/glow plug wrench, a "chicken-stick" for flip starting your engine, a few basic tools, etc.

Once into the hobby, most modellers will go with field support consisting of the following: A flight box to hold everything; a power panel; a 12 volt battery to power the power panel; a charger to charge the 12 volt battery; a glow plug clip to apply power to the glow plug from the power panel; an electric fuel pump which can be operated from the power panel; fuel line, filters, and cap fittings for the fuel container to connect to the pump and the fuel tank; a 12 volt electric starter which can be powered from the power panel; a 4-way glow plug/prop wrench; miscellaneous tools; spare glow plugs; and spare propellers.

The level of field support you choose initially will usually depend on how much you want to spend right away.

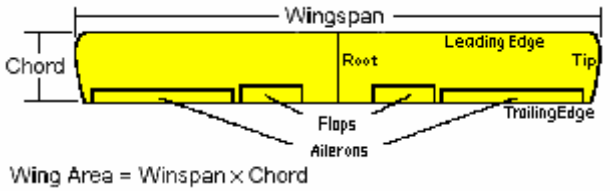
Terms to be Familiar With . . .

The following are some terms used in regard to model aircraft that you may not as yet be familiar with:

Fuselage — The fuselage is the body part of the aircraft which holds the passengers, cargo, or in the case of an R/C aircraft, the radio system.

Wing — The wing of the aircraft is the large horizontal surface which produces the lift and allows the craft to fly. Wing placement may be on the upper part of the fuselage known as a high wing

plane. This is more common on trainer type aircraft as a high wing model is more stable due to the pendulum effect of the fuselage. A wing mounted on the bottom of the fuselage is referred to as a low-wing aircraft and is more suitable for aerobatic type aircraft as stability is more neutral and manoeuvres such as rolls and loops are more easily done.



Wing Tip — The very outer end of a wing.

Wingspan — The Wingspan of an aircraft is the length of the wing as measured from wing tip to wing tip.

Wing Chord — The Wing Chord of an aircraft is distance from the front or "leading edge" of a wing to the back or "trailing edge".

Wing Area — The Wing Area is the total surface area of the wing of the aircraft, usually calculated by the wingspan times 7the wing chord, although more complex calculations are used on unconventional wing plans.

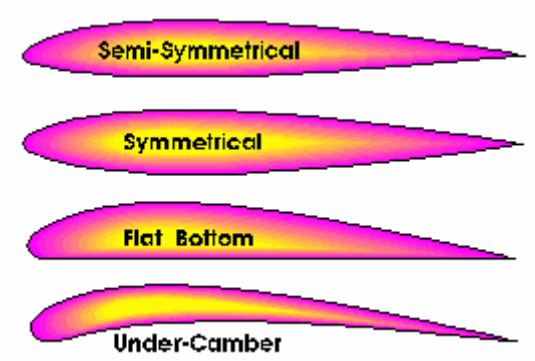
Airfoil — The Airfoil is the shape of the cross section of the wing. The front of the airfoil is the leading edge and is usually a rounded section. The back of the airfoil is the trailing edge and usually tapers to nearly a point. The distance between the two is the wing chord. The top surface of the airfoil is usually always curved to allow smooth airflow and produce lift.

Flat Bottom — A Flat Bottom Wing is when the lower surface of the wing is primarily flat between the leading and trailing edges. This type of wing has high lift and is common on trainer type aircraft.

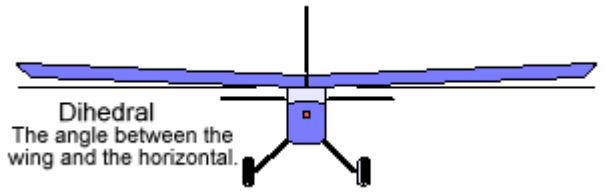
Symmetrical — A Symmetrical Wing airfoil is curved on the bottom to the same degree as it is on the top. If a line was drawn from the center of the leading edge to the center of the trailing edge the upper and lower halves of the airfoil would be symmetrical. This is ideal for aerobatic aircraft and most lift is created by the angle of incidence of the wing to the flight path.

Semi-symmetrical — A Semi-symmetrical Wing airfoil has a curved bottom section but to a lesser degree than a symmetrical section. It is a compromise between the flat bottom and the symmetrical wing. This is a very popular airfoil on sport type aircraft.

Under-camber — An Under-camber airfoil has the lower surface of the wing curved inwardly almost parallel to the upper surface. This type of airfoil produces a great deal of lift but is not common in R/C models.



Dihedral — The Dihedral of a wing is the V-shape the wing makes or the angle between the wing and the horizontal. Usually the greater the dihedral angle the more stable the aircraft will be (to a point!) and is common in trainer type aircraft. A flat wing with little or no dihedral is less stable and more suited to aerobatics.



Control Surface — A moveable surface, attached to the airframe of an aircraft, which controls the direction of the aircraft.

Pitch — The pitch refers to the angle of the aircraft in the up or down direction.

Roll — The roll refers to the rotation of the aircraft around it's centerline (one wing up and one wing down).

Yaw — The yaw refers to the angle of the aircraft in the side to side direction.

Stabilizer — The Stabilizer is the fixed horizontal surface at the rear of an aircraft. It provides pitch stability for the aircraft.

Elevator — The Elevator is the horizontal moveable control surface at the tail of the model connected to the stabilizer. It controls direction in pitch.

Fin — The Fin, also known as the "vertical stabilizer", is the fixed vertical surface at the rear of an aircraft. It provides yaw stability for the aircraft.

Rudder — The Rudder is the moveable control surface at the tail of the model connected to the fin. It controls direction in yaw.

V-Tail — A V-Tail is a special tail surface configuration where the horizontal stabilizers and elevators are mounted at an angle between 30 and 45 degrees in a V-shape and the vertical fin is eliminated entirely. The stabilizers provide stability in both pitch and yaw while the moveable surfaces provide directional control in both pitch and yaw.

Aileron — An Aileron is a moveable surface on trailing edge of the wing which provides directional control of the roll of the aircraft. A Strip Aileron is an aileron that is narrow and usually takes up the entire, or most of the trailing edge of a wing. A Barn-door Aileron is wider and takes up a smaller portion of the trailing edge towards the wing tip.

Flap — The Flap is a control surface found on some aircraft, usually located on the inboard trailing edge of each wing. Flaps may be lowered to increase the lift of the aircraft by simulating an under-camber airfoil.

Spoiler — A Spoiler is a control surface more commonly found on gliders and jet aircraft which is used to slow down the aircraft and decrease lift. They are rarely found on conventional aircraft. They may be mounted on either the top or bottom of the center portion of the wings.

Center of Gravity — The Center of Gravity is the position in the aircraft where if a point was placed, the plane would balance. The "C of G" should usually found along the centerline of the aircraft at a distance approximately 1/3 of the way behind the leading edge of the wing.

Landing Gear — The landing gear of the aircraft refers to the support between the wheels and the wing or fuselage. It is usually is formed from metal, wire or a nylon/fiberglass combination.

Under-Carriage — Another name for landing gear.

Tricycle Landing Gear — Tricycle refers to the landing gear configuration where there is a single steerable nosewheel mounted in front of the center of gravity, and a set of main landing gear with two wheels positioned just behind the center of gravity. This type of landing gear is usually a little easier to use when learning.

Tail Dragger — This refers to the landing gear configuration where the main landing gear with two wheels is placed forward of the center of gravity and one small wheel, called a "tail wheel", is mounted under the tail of the aircraft.

Accessories . . .

As mentioned earlier, there are usually a number of additional items or accessories that will be required to complete your aircraft that may not come with the kit. Also, some modelers prefer one brand or style of accessory over another and chose to replace some stock kit items with their own preference. Here are some of the common items which might fit into these categories:

Covering — The covering of an aircraft is the skin which is applied to the airframe, closing it in. On R/C aircraft it is commonly a fabric or plastic film which is heat applied with an iron. Plastic covering, once applied, gives a durable, shiny finish and requires no further treatment. Fabric covering usually requires a layer of paint to finish it and make it resistant to the exhaust of the engine. Covering materials come on a roll and in many different colors and may be cut to ruff shape before being ironed onto the airframe.

Pushrods — The pushrods are part of the control linkage which connects the servo part of the radio system to the control surfaces of the aircraft. Pushrods may consist of a firm piece of balsa or fiberglass rod with threaded wire and clevises fastened to both ends, or they may be the flexible type and take the form of a wire or one plastic tube running inside another with the ability to turn around corners.

Flex Cable — A flex cable is a special type of pushrod which is very flexible and can bend around corners even more easily than a flexible pushrod. These are generally made with a metal cable running inside a plastic tube and are popular in controlling the engine throttle.

Control Horn — The control horn is small bracket mounted on a control surface to transfer the movement of the pushrod to the control surface.

Clevis — The clevis is a small fastener at the end of a pushrod, usually made from nylon or metal, which connects the pushrod to the control horn. Clevises may frequently be refered to as links.

Hinges — The hinges are used to connect the moveable control surfaces of the aircraft to the fixed surfaces and allow smooth easy movement. They may take several forms including hinge points, pinned hinges, "living" hinges, etc

Pushrod Connectors — The pushrod connector is another means by which a pushrod may be connected to a servo. The connector is mounted onto a servo arm and the pushrod wire is secured by means of a set screw.

Foam Rubber — Foam rubber is used to wrap the radio receiver and receiver battery pack in the plane so that they will be isolated from the vibration of the running engine.

Wing Seating Tape — Wing seating tape is mounted on the fuselage wing saddle where the removeable wing fits and isolates the wing from vibration as well as to form a seal to keep exhaust gases from entering the structure.

Wheel Collars — Wheel Collars are small metal collars fastened with a set screw to the axle of an aircraft on either side of the wheel. This prevents the wheel from coming off the axle or rubbing against the landing gear.

Wheels — The wheels for an aircraft come in several styles including treaded, non-treaded, scale tread, air-filled, and super lightweight. Most brands of wheels are available in sizes from 1.75" to 6" in 1/4" increments.

Spinner — The spinner is the cone shaped object mounted to the engine prop shaft on the nose of the aircraft. The spinner may be made from plastic or aluminum and functions primarily to improve looks and aerodynamics.

Engine Mount — Some aircraft use wooden rails to which the engine is mounted while others require a shaped nylon or aluminum mount. The wooden rail type would usually be included in a kit while the molded type may or may not be, depending upon the kit. It is possile to get mounts specifically for a particular engine although or many generic type mounts are avaialable to fit certain engine size ranges. See our Introduction to Engines for more information on engine mounts.

Fuel Tank, Tubing & Filters — Most kits will not include a fuel tank and related tubing. These are available in various sizes and should be selected according to the size of the aircraft and engine.

Engine Accessories — When purchasing an engine for your plane, there will be a few items required that usually don't come with the engine or the plane. These include the propeller and glow plug. See the Introduction to Engines section of this catalog for more information on these items. A muffler is usually included with the engine when you buy it, however, there might be the

odd engine that does not include the muffler or some aircraft that are better suited to special shape mufflers, particularly in scale planes.