

ARF

A prefabricated model - Almost Ready to Fly

Auto-rotation

A maneuver to land in the case of engine failure; the momentum of the rotor blades can be just enough to slow the heli down just before landing.

ATV

An adjustment on many transmitters that allows you to adjust the maximum throw of a servo. This is used to avoid binding. See binding.

Ball Link

Connections that allow for adjusting controls using a ball on one end, and a link that "snaps" onto the ball on the other.

Backlash

Describes the play in the meshing of two gears. Too much backlash and the gears could slip or break the teeth, too little backlash could cause excess wear and tear. The common rule is the thickness of two sheets of paper for the right amount of backlash.

Bell and Hiller

A control system commonly used for r/c helicopters that allow the pitch of the blades to change depending on where they are in their rotation with the aid of paddles to take a substantial load off the control system. Bell is the control system that involves the swash-plate and linkages to adjust the pitch and Hiller is the part that uses a fly-bar or paddle to make the cyclic more responsive.

Binding

A bad condition where the control adjustments cannot move as far as the maximum servo travel. This puts extremely high torque on the servo constantly and can ruin a servo with time.

Boom Strike

A devastating event when a landing is hard enough that the momentum of the rotor blades bends them down to the point that one of them makes contact with the boom. This generally destroys the blade, boom, control wire, and tail drive system. This is also one of the most common events experienced by new pilots who overreacted and pushed the heli into the ground.

Brain Fade

A mental condition where the person flying the heli, suddenly forgets which way to move the controls, or which control to move at all. This can happen for no apparent reason, even when you think you're comfortable at flying.

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

CA Glue

A form of "super glue" commonly used in model building, don't use it on foam.

CCPM

Cyclic-Collective-Pitch-Mixing, CCPM mounts the servos push-rods directly to the swash plate at 120 degree increments, like an equilateral triangle. With these three servos the swash plate can be tilted in any direction, and when they all move in the same direction the swash plate can be raised and lowered. All the mixing is done electronically by the transmitter, which means you MUST have a ccpm compatible transmitter.

CG ("Center of Gravity")

For modeling purposes, this is usually considered -- the point at which the airplane balances fore to aft. This point is critical in regards to how the airplane reacts in the air. A tail-heavy plane will be very snappy but generally very unstable and susceptible to more frequent stalls. If the airplane 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 airplane will have to come in faster to land safely.

Channels

There are two types of "channels" when talking about R/C. One is the channel the Tx transmits on, the other is how many control surfaces a Tx can control.

Clunk

A weighted fuel pick-up used in a fuel tank.

Clutch

R/C helicopters use a clutch so that the engine can idle without the rotor blades spinning. Usually they use clutch shoes which when spinning spread out and rub against the clutch drum causing it to rotate and spin the gears.

Centrifugal Force

The imaginary pulling force the helicopter applies to the blades while they're spinning.

Collective (Variable Pitch)

Describes the control which adjusts the pitch of the rotor blades; causing the heli to ascend or descend without the need to change the rotor RPMs. This is usually the up and down movement of the left stick on the Tx. Having the ability to do this means you can use the momentum of the blades when spinning to do an auto-rotation if the engine dies and gives quicker response time as well.

Cyclic

Describes the controls which adjust the horizontal attitude of the helicopter, as in roll left-right and pitch forward and backward. Both of these movements are controlled by the right stick.

Dead Stick

The term is more common with R/C airplanes (because you have enough time to say dead stick), but it's a term that describes an emergency landing due to a power loss when the engine quits.

Dialed In

The term used to describe when you're power / cyclic / tail rotor mixing is set up just right, so that when you add power / cyclic the mixing adds / removes tail rotor thrust to maintain the exact same heading without needing input from the pilot. Usually, you must spend quite some time making the mixing more or less sensitive via trial and error, by rapidly adding and removing power / collective. All heading hold gyro's are already "dialed in" by nature, all that needs to be done is to adjust the sensitivity so the tail does not wag / act sluggish. All mechanical and non hh piezo gyro's will need to be dialed in manually by tweaking the mixing on the Tx. Heavy cyclic inputs also affect the torque on the helicopter and must be mixed w with the tail if that is possible on the Tx you are using. Again, this is already taken care of with a heading hold gyro and only applies to standard mechanical and piezo gyros.

Dis-symmetry of Lift

Describes how the advancing side of the rotor disk is moving faster and thus produces more lift than the retreating side. This causes the helicopter to bank in forward flight and is dampened by flapping blades.

Drag

The force that air pushes back onto a moving object when resisting it's movement.

Dual Rates

A feature of some Tx models which allows a person to flip a switch to make the controls more or less sensitive.

Elevator

This is another airplane term, but is easier than saying "cyclic forward / back." The elevator is what pitches the plane forward or back, to dive or climb, but does not really exist on a helicopter.

ESC

Electronic Speed Controller. An electronic device that takes the power from the battery pack and the signal from the receiver and measures a certain amount of power to the motor.

Exponential

A feature of some Tx models that allows a person to program in different control sensitivities depending on the position of the stick. Usually, this means the further the stick movement, the faster the controls. This allows the middle area of the controls to be less sensitive, but also allows full servo travel on the outer limits of the controls.

Failsafe

A feature of some Tx and Rx models that support PCM. Failsafe is used so that the servos go to a predefined position if the signal is lost. In an airplane this can be to go to a low idle while putting the plane in a gentle turn, but in a helicopter it is not as useful since helicopters are naturally unstable there is no predefined setting to prevent a crash.

Feathering Shaft

A rod which helps support the rotor blades and give them more ridged strength. A flapping head has two feathering shafts (one for each blade) and a sea-saw head has one feathering shaft (running the span of the head)

FFF

An abbreviation for Fast Forward Flight. Usually in excess of 50 MPH, or near the maximum speed of the helicopter.

Fixed Pitch

A term that describes a helicopter with no collective adjustments. This means that you control the height strictly with the rpm's of the rotor blades. These are easier to maintain, stronger, and simpler to build but lack major features of the collective (variable pitch) type. For one: you can NOT do auto-rotations with these helicopters and the "vertical control" is much less responsive than the collective of a "standard" heli.

Flapping

A type of rotor head where the two rotor blades are not connected directly through the feathering shaft (a thick wire), each blade can move somewhat independently of the other resulting in smoother control of the helicopter and to some degree the feel of a .60 size heli.

Flare

Mostly used when talking about airplanes and landing. To flare is when you're about to land and pull up just before touchdown and hold until you run out of enough airspeed to fly any more and the airplane sets itself on the ground. With helicopters this is usually referring to the end of an auto-rotation where you start to add positive pitch back in the blades to slow down your decent. Flare too late and you slam into the ground. Flare too soon and all the energy in the rotor-blades will be used up before you land causing the helicopter to drop like a rock and again, slam into the ground.

Gasser

The slang term which describes a R/C heli that has a motor which runs on gasoline.

Governor

A device used to automatically hold the rotor RPM constant. Used in conjunction with idle-up modes. This device is not needed, but aids when flying 3D.

Ground Effect

Described as an increase of performance within 1/2 rotor-span of the ground. Which means, near the ground your blades produce more lift.

Ground Resonance

This describes the phenomena that can make a helicopter shake itself to bits on the ground, even when it is perfectly balanced in the air. This is more common in seesaw type heads which aren't as dampened as flapping heads, and is also more common on pavement or hard surfaces which don't absorb vibrations.

Gain

Usually a term associated with gyros, it describes the sensitivity of the gyro. Too much gain causes the tail to wag back and forth, while too little gain won't hold the tail steady.

Glow Fuel

The special kind of fuel R/C vehicles typically use. It contains a good portion of nitromethane and other chemicals.

Glow Heater

A device you connect to the glow plug on an engine which heats the coil element so that the fuel can ignite and the engine can start.

Glow Plug

A plug that looks like a small spark plug, but has a wire coil in it which stays hot enough once the engine is running to ignite the next combustion cycle, and keep the motor running.

Gyro

A device used to help stabilize the yaw of a helicopter. They come in three forms right now. Mechanical, Piezoelectric, and Piezoelectric with heading hold. Mechanical gyros use a real spinning disk inside a small enclosure and help resist the yaw due to the torque of the main rotor blades by adjusting the tail rotor pitch. Piezoelectric gyros do the same thing, but are more accurate / responsive. See Heading Hold for the third type.

Gyroscopic Precession

A physical property of a spinning object too complicated to explain, but to put it simply, is the same reason when you're holding a spinning bicycle tire and you try to turn it, it banks and when you try to bank the wheel, it turns. The rotor blades act the same way, so then when you want to pitch the helicopter forward, the force that the blades must apply would make it seem like it should bank left.

Header Tank

A small fuel tank connected between the main tank and the engine. Its purpose is to capture air bubbles / foam that would otherwise be going into the carburetor. This extra fuel tank is mostly used by 3D fliers due to the nature of their flights. This small tank can also be used to see when you're about to run out of gas, if you can't see your main fuel tank while the canopy is on.

Heading Hold (HH) or Heading Lock

A feature mode of some gyros that stands out by its property to hold the heading of a helicopter and resist the tendency to weather-vane. Once trimmed, the tail needs very little input to hold a directional heading, even in high cross-wind conditions.

Heli Transmitter

A transmitter with special features for flying helicopters, the most important of which is mixing. Most heli's need at least 5 channels to fly. Computer Heli Remotes allow you to program advanced and custom mixing rates for various flying styles. Computer remotes also let you store multiple "models" so you can save all your programming to memory for multiple aircraft.

Hot Start

The ability for the engine to start itself (without the glow-warmer) if you turn the start shaft after the engine has been running a while. This is because the engine is so hot the heater is not needed to cause ignition. This is also dangerous because it can catch you off guard and send your blades into a frenzy.

Hovering

The process of flying, while not going anywhere.

Hydraulic Lock

A condition where the cylinder has filled with fuel and can not complete a rotation. Forcing the cylinder to rotate if you try and start the engine can ruin the connecting rod. You remedy the situation by removing the glow plug and letting the fluid drain. This can be caused by over-filling your gas tank which 'spills' into the muffler, from where it has direct entrance into the cylinder.

Idle up

A feature on most transmitters that will not allow the throttle to fall below a minimum setting. This is useful because the vertical portion of the left stick simultaneously controls throttle and collective. When flying inverted you need negative collective, you do not want your engine to go to idle when you move your stick all the way down, so idle-up will keep the RPMs high so you can maintain inverted flight indefinitely. Effectively putting a "cap" on the low-end of the throttle.

Jesus Bolt

Most helicopters have two of these bolts. The Jesus bolts are the bolts that hold the main mast to the frame, and the head to the main mast. If you loose either one of these bolts your entire rotor-head will separate from your helicopter. They're called a "Jesus Bolt" because when they break the pilot was known to say "Oh Jesus!"

Lean-Nitro

This means that fuel to air ratio is too low, and the engine will run hot. This can damage the engine rapidly, so it is recommended to start adjusting the engine on the rich side and work toward the lean end. Usually, turning a needle valve clockwise makes the mixture more lean.

Loctite (Red / Blue)

A special glue for holding metal to metal screws in their sockets so they don't come loose in a strong vibration environment. Loctite is color coded by strength, red being the strongest and blue being medium. Most people use blue loctite because if red is used the screws may never come out again.

Mixing

A term that describes a function of many transmitters that allows one control movement to affect more than one control surface at a time. Revolution Mixing is an example of this, but mixing can also be used to add power when you input large cyclic movements.

Mixture

As in "Fuel / Air" mixture. This balance of fuel and air is what determines the effectiveness of the engine, as well as how fast the engine runs. You tune the mixture with the needle valves.

Needle Valve

A small dial near the carburetor of the engine that adjusts the mixture of fuel and air into the combustion chamber. Some carbs have two needle valves, one for high rpm and one for low. The low RPM also controls how smooth the

transition is from low to high.

Nose-In

A term that describes hovering or maneuvering with the nose of the helicopter pointed at the person controlling it. This is an advanced step in the learning stages of flying a helicopter because both roll and yaw are backward in relation to the controller.

Paddles

These are the shorter stubby blades on the end of the two rods opposite the rotor blades. These aid in pitching the main rotor blades for quicker responses and less servo stress.

Paddle Timing

A term to describe how far off the rotation cycle the paddles rotation should be. There is a delay from when the pitch is applied to a paddle and when the paddle is actually moved up or down, it turns out that the paddle pitch must be applied about 90 degrees before you want the paddle to have risen or lowered. This delay is designed to work with gyroscopic precession which is why the movement of the paddles and blades may make it SEEM like forward cyclic would actually make the heli pitch backward. 90 degree timing offset + 90 degree gyroscopic precession turns the backward control into the correct movement. This is also why you should look at the swash plate to test the servo reversing, and not look at which way the blades / paddles move.

PCM / PPM

PCM is Pulse Code Modulation which means the signal is somewhat digital, meaning the receiver can tell the difference between the transmitter signal and rf noise. Most PCM receivers can be set for a "default" so that when transmission is lost you can have the controls go to a predefined position, this is also called failsafe. PPM is strictly FM, and is susceptible to RF noise, but not as much as AM. PPM, or FM, is the most common because it's cheaper than PCM and the failsafe abilities of PCM are not as useful to a helicopter as it is to an airplane, since airplanes can somewhat fly themselves if trimmed right.

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

Pirouette

A maneuver described as a high yaw rate of a helicopter, when the tail spins around the canopy one or more times.

Pitch Meter

A measuring device used to check the varying pitch settings of your rotor blades and paddles. You need the pitch of the corresponding blades to be very close or they will not track evenly.

Pressure Patterns

The distribution of pressure over an airfoil.

Push/Pull

A method of connecting servos to the control points with two connections, one on either end of the servo connection / control connection. This allows the servo to push a connection on one end and pull the connection on the other end. This is used to fight slop and use the servo power more effectively by "balancing" the pivot point.

Relative Wind

The direction the wind is hitting the rotor blades taking into consideration flapping and retreating blades.

Resonance Frequency

Every rotating or shaking thing has a resonance frequency. When something is at its resonance frequency, every imbalance adds to itself at every cycle. This leads to a force which mathematically goes to infinity and no helicopter can handle those stresses for long. Using large training gear usually changes the resonance frequency to right around that point your helicopter likes to hover. This can result in violent shaking even if your blades are balanced and all your mechanics are good. What you can do is change the resonance frequency, or avoid it by changing your hover rpm. Shorten or lengthen your training gear to easily solve this problem, or increase your rpm a bit.

Retreating Blade Stall

A dangerous situation resulting when in fast flight where the blade that is flying toward the helicopter's tail loses enough airspeed to generate lift. This can result in losing control of the helicopter.

Revolution Mixing

This is a mixing function on a transmitter which lets you program a throttle to rudder mix so that as you add more

power the transmitter automatically adds more rudder to compensate for the increase in torque. This function should be inhibited if you're using a heading hold gyro.

Rotary Wing Platform

Term which describes the main rotor blades of a helicopter.

Rotational Velocities

Describes how the airspeed over the tips of the blades is different than that over the other parts of the blade.

Rudder

Yet another airplane term, but not as common as aileron and elevator. This is what controls the yaw of an airplane, and is synonymous with the tail rotor / vertical stabilizer aka "tail fin."

Rudder Offset

This is a transmitter function that lets you specify a additional amount of rudder trim for idle-up modes which usually have a higher RPM or different blade pitch curve and thus different amounts of torque to compensate for. This function should be inhibited if you're using a heading hold gyro.

Rich-Nitro

This means that the Fuel to Air ratio is too high, and the engine will garble. This does not damage the engine, but it does drastically reduce the power output. Usually, turning the needle valve screw counter-clockwise makes the carburetor run more rich.

Rx

Abbreviation for Receiver, the portion of the radio system that is mounted in the helicopter and adjusts the servos according to the transmission from the Tx.

See-Saw Head

A form of rotor head where the two rotor blades are "connected" through a feathering shaft (thick wire) so that when one pitches up the other pitches down. This makes for a more stable helicopter in a simpler design, but does not handle as well as a flapping head type.

Servo

A device that can turn a lever arm one way or the other with many points between the two extremes. These adjust all the control points of a R/C vehicle.

Settling with Power

A dangerous condition when descending from a hover where the helicopter's rotor blades enter their own down-wash. This can cause a crash if you don't recover soon enough. Note: This is not a fatal condition on model helicopters because they have such a huge power to weight ratio, however it can catch you off guard and it does require more time to stop descending if you're in this state.

Slop

Describes the imprecision of a control system, meaning the controls can be "wiggled" without the servos moving. Slop can make the helicopter more unpredictable and less responsive to control input.

Stabilizers

There are two stabilizers, the horizontal and vertical. These help the helicopter to weather-vane, so that while in forward flight, the helicopter points into the wind. 3D fliers will have smaller stabilizers so that they can fly sideways / backward faster without weathering. The vertical stabilizer also prevents the tail rotor from hitting the ground.

Sub-trim

This is a feature of many transmitter models that allows you to adjust the trim of control surfaces while still having the trim control on the Tx centered. This way you have full trim adjustment while flying.

Swash Plate

A device that the control arms spin around on so that the pitch of the blades is changed depending on their relative position to the helicopter.

Thread

A particular subject being discussed on a news group, or the grooves that a screw has / grooves that a screw screws into.

Throttle Curve / Pitch Curve / Programmable Points

Somewhat like exponential in that you change the way the servos move as you move the stick. Usually you would have a different curve setting for each idle up mode. In idle up one you might have the throttle at 100% when the

left stick is full down, at 50% when it's in the middle, and back to 100% when the left stick is full up. This way you can fly upside down. Some radio's have more curve points than others, which means you could have parts of the stick less sensitive than others, so you could make it easier to hover gracefully on a machine with a very sensitive collective.

Throttle Hold

A feature that comes with many transmitter models. The opposite of Idle-Up, as in, this switch will keep the throttle at idle so that you can increase the collective without gaining high rpms / power. This switch can be used as a "safety" switch while you carry your heli to the flight line, but is more commonly used to practice auto-rotations or if tail rotor control is lost causing the heli to pirouette rapidly opposite rotor blade direction, because when the engine is at idle, the tail rotors lose power so the heli will slow down its pirouettes and you can auto-rotate to the ground in a more controlled manner. It is also advisable to hit this switch in the case of an emergency so that if the heli hit something it has no power being applied to the rotor / tail blades.

Torque

Torque is applied to the body of the helicopter because of the engine spinning the rotor blades, this causes the helicopter to want to spin in the opposite direction of the rotors.

Total Aerodynamic Force

The net force vector applied by the various forces of lift.

TR or T/R

Short for Tail Rotor. Used to counter the torque then engine puts on the rotor blades which left unbalanced would make the heli spin like crazy.

Training Gear

Larger landing gear so that landing at an angle is less dangerous. Beginners use these while learning to hover and they typically are made of two crossing sticks with whiffle balls on the ends.

Tracking

If the pitch of both rotor blades is not exact, one rotor blade will be slightly off axis of the other blade, it will look like one blade is higher than the other. Ideally, you want perfect tracking, so that the blades appear to be perfectly flat.

Translating Tendency

When holding a heading with a helicopter hovering level the force the tail rotor puts on the helicopter to keep it aligned causes the entire helicopter to move the opposite direction of the tail thrust. This is compensated with right-cyclic in most US helis, but depends on the direction the rotor blades spin.

Transitional Lift

When in forward flight, the spinning rotor disc produces more lift than in a hover.

Transverse Flow Effect

When in a slow forward flight, wind in the rear part of the disk enters at a lower angle of attack due to the leading edge of the disk pulling air down, which results in vibrations.

Tx

Abbreviation of the remote control unit. "Transmitter"

Washout

When you're talking about a wing or a rotor-blade, washout is a twist in the blade so that part of it is at a different angle of attack than the rest, allowing you to recover from a stall before it's too late. The term washout mixers, levers or arms are also used in the rc helicopter community and are referring to the mixing arms that connect directly to the top of the swash-plate and are mixed with the paddles and main blades through a set of linkages and joints.

Weather-vane

The property of the helicopter to point into the wind like a windsock. The amount of weatherizing is determined by the size of the vertical stabilizer.

Windsocks

A funnel shaped tube of fabric that generally signifies a 10 knot wind when fully extended.

Yaw Rate

A term that describes the control input of a heading hold type gyro. Instead of the rudder control adjusting strictly the tail pitch, as it does with a other gyro, a yaw rate gyro will uniformly control the rate at which the helicopter yaws.

Yaw / Pitch / Roll

Terms that describe the change of attitude of a helicopter. Yaw is the movement about the vertical axis; Pitch describes leaning forward or backward; and roll describes leaning to the left or right (bank).