

The RC Helicopters Bible 1

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Buyers Guide for RC Helicopters

WHAT SHOULD I CONSIDER WHEN BUYING????

Price, size, collective pitch, fixed pitch, flying conditions required, upgradeability, cost of the spare parts, brands, is it ready to fly or does it need to be built. What about a flight sim?

READ the DEFINITIONS below and HELICOPTER STATS, I will further clarify these sections in following paragraphs.

DEFINITIONS:

Fixed pitch (**FP**) helicopter blades have blades that remain at a fixed angle (you can not alter their pitch). To get lift on these helicopters you must increase the power to the main blades. They are simpler in design, they are easier to fix when damaged, they are easier to set up and they are cheaper.

Collective pitch (**CP**) helicopters control lift through the angle of the blades, they have 3 servos instead of 2 (like the fixed pitch models) allowing you to alter blade pitch. This result in a more agile machine but it also means they are harder to repair and are more suited to an experienced flyer.

HELICOPTER STATS:

(**CP** = Collective Pitch, **FP** = Fixed Pitch, **RTF** = Ready To Fly, **UQ** = Unique Quality)

A Ready To Fly (**RTF**) helicopter comes 99% assembled and requires no extras such as electronics or transmitter, if the helicopter has not got an RTF beside it then you may have to buy extras such as electronics and radio which gives you greater flexibility but with added expense.

I have added a category of (**UQ**) Unique Quality this will be for one of two reasons it is constructed of the best quality components or it is a very innovative design.

Sub micro: (smallest)

Bumblebee rc helicopter

Micro/mini:

Dragonfly 4 (FP, RTF)

HoneyBee (FP, RTF)

HoneyBee2 (CP, RTF)

HoneyBee CP2 (CP, RTF)

Jabo II (FP, RTF)

Slightly larger:

Trex (CP)

Dragonfly 35 (CP, RTF)

Dragonfly 36 (CP, RTF)

Petrol:

Raptor V2 (CP)

Counter rotating:

Dragonfly 5 (Counter blades, RTF)

Chinook:

CH46 Sea Knight (Chinook, UQ)

CLARIFICATION:

The HELICOPTER STATS above give you a brief guide to price. If the rc helicopter has **NOT** got RTF beside it you will have extra costs to get it flight ready and will have to do some building.

Wind conditions; the bigger the helicopter the more wind it can cope with, and a collective pitch (CP) helicopter can handle windier conditions as well (more power, stiffer rotor head).

Spare parts; The basic formula is the cheaper the helicopter the cheaper the spares, and the lighter the helicopter the less crash damage you will incur.

* The Bumblebee is so small and hard wearing (G10 materials) meaning you will hardly ever have to buy spares, reducing your costs!

Brands; there is nothing really to say about this if you know what your looking for then we stock some of the best brands including Century, JR, Futaba, Hirobo etc...

Flight sims; will enable you to get going with FREE flight sims or commercial flight sims and controllers ranging from £19.99 - £129.99, these flight simulators can save you a fortune and some of them must be seen on 48" plasmas!

Remote Control Helicopters FAQ - Newbie Questions



So you have seen some guys (or girls) playing with these cool helicopters down at the local park and you think to yourself "*I would like to try that*". But before buying one, I have some questions.

We have put together a FAQ full of useful information which will hopefully answer most of your questions.

Q: How long do they stay up

A: My nexus has a nice sized fuel tank and can fly 15 to 20 minutes on one tank of gas.

Q: How far do they go

A: They go as far as the transmitter can broadcast, which is about 2 miles. They will go very high and far out of sight before the radio loses contact, unless your batteries are low.

Q: How fast do they go

A: Same as an average plane, the record top speed is under 90 mph straight and level (without diving first) I think. Most 30 sized helicopters can do around 40 mph fairly easily.

Q: How much do they weigh

A: Most 30 sized helicopters weigh in around 6 lbs empty (no fuel or electronics)

Q: How much can they lift

A: An entry level (30 size) helicopter can lift 1-2 lbs with a significant performance hit. A typical 60 size can lift 5-8 lbs with a significant performance hit. A specialized 60 with flat bottom blades and designed to lift can lift around 15 lbs. (Bergen Observer)

Q: How fast are the blades moving

A: Most .30 sized helicopters spin their main blades near 1600 rpm for easy flying around, and for sport loops and such closer to 1900 rpm. This calculates to over 200 mph at the blade tips and near 300 lbs of force pulling on the center of the blades. The average .30 engine produces a mean one and a half horsepower.

Q: How much do they cost

A: Starting the hobby from zilch materials and tools, the saying goes, \$1000 US dollars, I spent a little more. You can get by with a .30 size helicopter for around \$800 complete, or you could get a LMH which isn't quite a real helicopter because it doesn't have collective pitch (see glossary) for around \$400 to \$500.

Q: What kind of mechanical experience do you need to build a heli

A: Minimal: I had never built an rc car, or boat or anything all mechanical before, only an airplane which was all wood. Not at all like this heli. However, following the directions very closely and double checking everything seems to have worked.

Q: How long does it take to build

A: I built my nexus in 3 days. The manual is very good and some components are pre-assembled. With a pre-built ARF (Almost Ready to Fly) kit like the Raptor, you're only a few hours from ready to hover when you get it in the box.

Q: Are they much harder than planes

A: They are more complicated to fly than airplanes, however it is possible to learn to fly a helicopter by yourself which is next to impossible for an rc airplane because with a helicopter you can fly a little bit, 2 inches off the ground and land safely, but with an airplane it's all or none.

Helicopters become more complicated because of the fact that there are more ways to fly them, and thus, more orientations you must get used to.

Q: How do you learn to fly

A: By use of a computer simulator which hooks up to your real transmitter through the trainer interface and large training gear which prevent the helicopter from tipping sideways when learning to hover a few inches above the ground.

Q: Do they run on gas

A: Not so much gasoline, as they do on a liquid fuel made of alcohol and nitro methane. They do make r/c helicopter engines that run on regular gasoline, but they're not as common due to their increased cost, weight, and lower power output. They are however much cheaper to buy gas for and can stay up longer, since the regular 2-stroke model engine gas can cost anywhere from \$13 to \$23 depending on the mixture. Model engine fuel (glow fuel) produces more power than conventional gasoline because of the high contents of nitro methane, which is why it is more popular than gasoline for model aircraft.

Q: What kind of engines do they run on

A: Special remote control helicopter engines. They come in 2-stroke and 4-stroke glow burning engines as well as 2 stroke gasoline models. They range in size from .06 cu inches to .91 cubic inches. The most common of these are glow fuel .30 and .60 two stroke engines. The O.S. .32 SXH runs at a peak power RPM of around 18000 RPM with 1.2 horsepower, while the 60 size engines can make 2 to 3 h.p.!

Q: Whats a glow engine

A: An engine that uses a glow plug instead of a spark plug. A glow plug does not require a spark to ignite the next cycle, it has a small coil which remains hot enough to ignite the next cycle when the fuel is compressed in the cylinder head. In order to start the engine, you must use a glow heater which heats the coil in the glow plug like a coil in a light bulb, and once the engine is running it produces enough heat by itself and you remove the glow heater.

Q: What happens when you crash

A: In a light crash (bad bounce) you might break the landing gear and a couple other things, in a average crash (lands on it's side) the first things to go are the main blades, the tail boom, the main shaft, the flybar, possibly the landing gear and the boom supports. Then there are the bad crashes where you look for the parts that aren't broken. Thanks to Stewart for providing this sample of what happens when you turn a rotory-wing into a fixed-wing while in flight.

More Remote Control Helicopters

Newbie Questions



In the last section we answered some common newbie questions which help you get started in remote controlled helicopters. Now, these questions get a bit more technical. Enjoy.

Q: How much are simulators (\$\$\$) and how helpful are they

A: \$160 for CSM and \$220 for RFD with the cable that connects to your tx. Some people swear by them, others say there not needed. I think it teaches you coordination very well. It teaches some bad habits maybe, in that the real one doesn't fly exactly like the sim, but the coordination is much more worth it than the perfection of flight dynamics. Besides, they're fun too. I like to push it to the limits and do all sorts of weird shit I would never do for real. I know the simulator worked for me, because I

was hovering and following the heli all around a baseball field my first solo! The simulator I bought was the CSM RC Simulator. It connects directly to your Tx via the trainer plug and to the parallel port of your computer. The graphics are simplistic, but effective. I highly recommend it..

Q: Can you learn to fly on your own

A: The answer is yes, with enough patients and if you are very careful when putting the heli together. I recommend two things for sure, if you are going to put your heli together and fly it by yourself. 1. A simulator. 2. Ray's complete guide to model helicopters.

Q: Should I buy new or used

(It seems that most people suggest buying new)

A: I think that the experience building your first heli is extremely valuable. Especially after your first crash, which will happen. Also, beginner pilots don't have the experience to know what they are buying as far as wear and tear goes.

Q: How important is it to find an expert to set up the pitch and balance

A: Like I said, I had someone who was good, give it a test flight, mainly to see if it would explode in mid air. He trimmed it out for me and flew it all around fast and slow, but I eventually had to re-trim it anyways after I

added the training gear. Make sure to buy a balancer and a pitch gauge, you want errors to be less than 1 degree, and the balance of the blades to be perfectly level / even.

Q: Can you set it up yourself, if you are careful

A: Extremely careful. I put the blade holders on upside down, but it seems to fly ok with them that way. When I get some extra money I'll buy new wood blades. Just follow the entire manual to the 't' Don't get all excited when the heli is all put together, you still have many hours of configuring / balancing / and adjusting everything.

Q: Is there any particular club I should sign up with

If you want to fly with the airplanes (which they tend not to like, when you hover all over the runway) you will need AMA insurance. If you don't fly on an AMA sanctioned field AMA insurance (\$60 / yr) still has many benefits, theft insurance to name one. ...and so long as you follow all the AMA guidelines when flying at a park or school, you are covered there too, incase the unimaginable happens and someone gets hurt. (It doesn't cover family though)

Q: Do you think it would be useful to get some R/C experience on planes first

A: Not worth it, they don't fly quite like planes and you must learn to hover before you fly. I have one. Planes are nice in that, they're much more relaxing to fly than heli's, but the coordination you learn from flying planes is not so useful when flying helicopters that it warrants buying a whole airplane first. The reason is because planes do not sit still and move backwards or sideways on you, and helicopters are much less forgiving of mistakes that on an airplane could be fixed simply by pulling up and adding throttle.

Q: How do you like your first heli

A: Well, I like it a lot, and it went together in two full days, using all day. It's called a Nexus, from Kyosho. It's their replacement for the concept 30. I've heard it's a good starter heli, and capable of doing a lot of advanced maneuvers if set up right. However, eventually you'll want to move on to a bigger .60 sized heli which can do more tricks and flies more stable. (the nexus is a .30 size)

Q: Which Gyro do you use / recommend

A: The new gyro's from CSM, the CSM 360 HH (for Heading Hold) gyro is very impressive, along with the newer CSM 540 and the Futaba GY-501. You don't have to even touch the yaw while hovering / transitioning. I'm serious. With a standard gyro you must work hours to adjust all the trims and mixing functions to achieve the same steadiness of the tail. There are now many heading hold gyros on the market, CSM, Helimax and Futaba are all good brands.

Q: How do I know which heli to buy

A: Take into account the availability of parts in your area and what other people are flying. You don't want to be the odd kid on the block, but you don't want to spend 3000 to be like everyone else either. Besides the Nexus, the Ergo, Shuttle, and Raptor are all very good learning helicopters. Many people would argue the Raptor is now the best, however it has some short-comings such as low availability of kit and parts (7/15/99) / Poor manual / Long break-in period for the engine.

Q: How did you make the stripes on the blades and how do you adjust your tracking like that

A: They're only striped on the top of the blades. I know it's kind of cheesy, but it helps a lot when trying to see if the heli is banking toward or away from me. (Stripes means it's banking toward me) I can always mark the bottom of one of the blades to know which one is out of track or temporary tracking tape which you remove when you get the tracking right. For now, since they both are tracking perfect, it's not a problem. ...lucky me. :-) The stripes were made with a perm black marker 2" wide and do smear a little bit after each flight. They probably need a coating to make them fuel / oil proof. I just wipe off the smear and it's back to new again, surprisingly enough the smear does not stain the white part of the blades. The ink must be stuck in the oil.

Q: Is there a Nexus or Raptor specific CSM simulator file to download

Should I even worry about it

A: Yes, you can download the model (good) and aerodynamics (not great) from <http://www.slewin.clara.net/>. All you have to do is double-click the file and change the path to where ever you installed CSM to. FULL is the entire program + all addons pre-installed and ADDONS is all the addons only. I don't think the simulator is ever going to be exactly like the real thing. There are just way too many physics things going on for it to calculate everything. I don't think CSM simulates descending with power at all... this is a dangerous situation you get in when descending from a hover with power, which means you're blades are going through your own downwash, which means your blades aren't able

to work very good, which means hard landings / crashes. The simulator does teach you coordination and reflexes, which is what you really need. The rest, I think, is up to practice with the real thing. Just take it slow. :)

Q: Does training gear affect how the heli handles

A: Yes, there is a huge difference with the training gear off the .30 sized heli. Mine performs like a completely different heli. Takeoffs are different. Hovering is different. Transitioning to FF is different. Landing is different. The controls are the same, but the response different. Also, and maybe most importantly, the heli ~looks~ different. Don't use those balls for reference; try to focus on the body itself. But hey, everything with the gear off is BETTER, as in more responsive and more stable. You should take the gear off after you're proficient in hovering, especially if you've progressed into forward flight / can nose-in hover.

A Guide To Learning How To Fly Remote Control Helicopters



Fly your helicopter is not quite as simple as it looks. We have all seen the pilots when we were newbies and thought that looks simple. Then you try it on your own remote control helicopter and find out to your frustration, that it is not simple after all. Follow these guidelines and we hope you will be up in the air and in control in no time.

Before we start, it is traditional for other pilots to share their experiences so get there and ask, ask, ask and ask.

Simulator First

Following these guidelines when using a simulator will improve your performance in real life.

My actual flying tips are based on the idea that you have infact used a simulator and have familiarized yourself with the charecteristics of rc flight. There are many unexpected things you will encounter if you don't have a simulator that are not listed here. I can not stress the usefullnes of a simulator enough. You may think they're expensive, at 160 to 230 dollars, but I guarentee you they'll save you that much in parts as well as time learning how to fly.

- The simulator is not a game. Each time you crash could end up costing you hundreds of dollars. Yes, it is going to happen and it's fun some times to see what you can make it do, however, do not get into the habit of watching the helicopter fly into the ground. Fight it to the end and try to recover as hard as you would if a thousand dollars were riding on it. You are trying to form GOOD habits here, not bad ones.
- Don't let the helicopter hit you! This is a habit you definitely want to avoid. (Even though it can not in the sim, it can in real life)
- Don't let that helicopter get too far away. Even though you think it's too hard to see just because it's on a computer screen doesn't mean it's any easier to keep it close in the real world. This is definitely something to work on.
- Ok, so you can land your helicopter in the sim now, but can you make it land where you want it to precisely? Work on this.
- Ok, so you can make it land where ever you want to, can you make it land pointing any direction you want it to? Work on this too.
- Try flying with all the trims slightly off center
- Adjust the trims at random and get used to it, then do it all over again.

- Move all the sticks like crazy all over the place until the helicopter is in a precarious position... then level it out as fast as you can
- Turn the wind up to 10 mph and repeat all the above
- Turn the turbulence up to 10 mph and repeat all the above
- Practice flying from left to right back and forth, then practice flying in and out without hitting or flying over yourself
- The autorotations in CSM are way way way too easy. Don't rely on the practice to help you in a real event. To help you get close to the difficulty of a real autorotation, go into whichever configuration screen has "blade drag ratio" and double it. I think it's at .22 by default, set it to at least .44
- Experiment, if you haven't already, with loops and rolls
- You're ready to try the real thing!

More advanced sim practice

- If you have CSM, turn all the colors of the model to pure black. This will simulate the common lighting conditions you fly in for real when the helicopter just turns into a silhouette. This is supposed to disorient you because it will be hard to tell if the helicopter is banking away or towards you etc. This happens in real life so you should practice for it.
- Turn the rudder trim half way off center so that the heli is doing a complete 360 once every 2 seconds or so. Don't touch the rudder now! Only use the collective. Try and slowly fly around without touching the rudder, to do this you need to continually be adjusting the cyclic (bank and pitch) since the helicopter will always be pointing in different directions. Try to land this way. When you get

good at it, reverse the direction of the rudder. When you're good at this, land while slowly pirouetting.

- Turn the gyro gain channel on your tx as low as it can go. This will make you control that tail!
- Practice hovering inverted and flying around inverted
- Practice flying around backwards slowly. This is very difficult
- Practice flying around backwards while inverted. Yikes.

The Real McCoy

- I suggest that you should wait to fly the real thing until you can confidently fly around in the simulator and land without crashing. You'll be much better off in the event of an emergency and learn quicker too.
- Put big training gear on your heli
- Have someone verify the linkages, reversing, and test fly if possible
- Practice doing small hops up to 6 inches, paying attention to how the helicopter is trimmed. Don't adjust your trim in the air unless you are very confident. Drifting to the left (in US helicopters) is normal and results from the tail rotor thrust which you can compensate for by putting a very-very slight right-bank in just after takeoff, but this is different than pitching. If your helicopter banks, yaws or pitches by itself you need to compensate with trim.
- Practice hovering from 6 inches to 1 foot. Be prepared for ghosts: wind will increase the effectiveness of your rotorblades and make your helicopter climb fast. Don't overreact and slam it into the ground. Slowly lower the collective and gradually bring it back

down. Be prepared for the wind to stop and the helicopter to descend more quickly. Again, don't over-react and send it launching into the sky. Just take it easy and if it gets "on top of you" don't touch anything but a little forward cyclic for 1 or 2 seconds. Eventually it will fly out in front of you, level off and use back cyclic as needed to stop, then level off again.

- Adjust gyro as needed to stop wagging or tail swaying when you adjust power.
- Practice hovering out of ground effect. At least 3 feet up, and hold it steady, the wind will really affect the height at this level.
- Get used to how responsive the collective is. Give it a few SMALL taps. You want to get used to NOT over-correcting with the left stick. This is hard, most people want to move the stick all the way down when they get in trouble, this slams the heli into the ground. Get used to merely lowering the collective 1/4 way down or so.
- Practice walking the heli around. Follow at a safe distance behind it and make it go places slowly. Be careful not to step in any holes.
- Practice turning the heli a little bit to the right and left. Get used to the perspective in real life. The sim experience only helps.
- Practice flying the heli out and back (tail in both ways)
- Practice a little side to side slow-flying
- Practice doing left / right turns in front of you while flying back and forth. Almost like a figure-8, but always keeping the tail in a little. Basically, just fly the helicopter sideways to the left and right, in front of you, then start adding rudder so instead of flying sideways back and forth, the nose leads the turn a little. The helicopter will never turn with JUST the rudder or JUST the cyclic. You need to use both the same time.

- Practice turning the heli towards you a little more
- Practice doing small, very slow, circles. This is difficult
- Flying left to right is easier than flying in and out. Start doing this
- Don't fly with the sun near the horizon. It gets hard to see the attitude
- Practice hovering a little bit higher, say 10 - 20 feet. Don't force it back down, lower the collective a little bit at a time. If it starts to sink rapidly, raise the collective slow at first and slowly raise it faster until it stops falling. Start lowering it again and do a slow, controlled descent. If you descend too quickly you will enter your own down wash and the helicopter will pull itself into the ground and need considerable collective to compensate. This is a bad condition.
- Practice doing a little bigger circuits but keep the speed down.
- You're ready to take the training gear off. They're slowing you down and you're probably developing bad habits by using them for visual cues
- After you take the training gear off, start all over again, because it's much more responsive now and much more difficult to see, however, it will fly much much better.
- Practice subtle 180 stalls and figure-8's
- Practice going faster and slowing down
- Practice transitioning from fast forward flight to landing. I had a lot of trouble getting the helicopter anywhere near me by the time it was hovering
- Practice in a little more wind... wind really makes a 30 size jump around, be on top of it!
- Practice controlled flight. Try to make the helicopter go exactly where you want it to. Take more authority of the sticks

- Practice "baby-autos" where you hit the throttle hold at 3 or 4 feet to send the engine to idle. The helicopter will drop suddenly, but don't over react and pop it up into the sky or you'll use up all your momentum and it will really drop like a rock. It would be better just to let it land itself if you're unsure about how much collective. Start with a little and work your way up and try to use up all the blade speed touching down at the last second.
- Practice doing nose-in landing approaches and hovering at many different aspects
- Practice "fake-autos" where you don't use the throttle hold at all, just bring it in as fast and hot as possible with the collective as low as you can, to simulate a emergency decent. Stop the helicopter at 8 feet up in a hover and do it some more.
- Practice the "baby-autos" from 6 feet, NO MORE than that. You should have enough rpm in a hover to softly touch down from a 6ft power loss.
- Practice aborting autos, where you hit the throttle hold up high and "glide" on in, but abort at about 10 feet by unflicking the throttle hold.
- You're ready to try a whole auto. Autorotating in 10 to 20 mph wind is the easiest because forward speed makes the blades lift better. Start your auto with power and get 15mph of forward speed, hit the hold switch and keep the nose down 15 degrees and the collective so the blades have -2 or -3 degrees in them. If you have too much negative you'll actually loose rotor speed. Bring it in with as little cyclic and collective change as possible. As you get to 15 feet, gradually pull back on the elevator to slow down your forward speed. As you start to drop from your decrease in forward speed gradually feed in collective like you did from your 6ft baby-auto

and you know the rest. Note: It's better to land with too much forward speed than to land on the tail, the helicopter will harmlessly slide like an airplane on skies with extra forward speed.

Moving on

- Before moving to loops and rolls you should switch some parts out for higher performance parts
- Servo upgrades are important for the tail rotor and collective. I recommend Futaba 9202 or equivalent for these high stress servos.
- K&S Paddles which are about half the mass and a little more area will double or triple the cyclic response on the standard nexus.
- Unfortunately, the K&S paddles make the helicopter want to pitch up in forward flight so you'll need to increase your idle up rpm to around 1900 RPM. These paddles will also make the helicopter very hard to trim perfectly, and the trim will drift during flight, so that if you trim it at the beginning of your flight when you're done you may be pulling to the right or back or what ever. This is the nature of the lighter paddles.
- For looping and rolling you'll need to adjust your pitch range to include at least -2 degrees at the low end of the collective.
- For sustained inverted with some climb-out power you'll need to adjust the pitch range to at least -6 to +8 degrees. This amount of pitch range is one of the limitations of the stock nexus. You can not get a -10 to +10 degree collective set up with the stock nexus head.
- If you haven't already, you're going to need to set up and idle-up on your tx so when you pull the collective all the way down your

engine doesn't go to idle, but maintains a constant RPM throughout the pitch range.

- The Futaba 6XH helicopter remote has a very limited idle-up throttle setting. You can only set the minimum throttle to as high as 50% which means you'll never have more than 50% engine power for inverted flight. This is ok for loops and rolls only, but if you want to do more aerobatics like sustained inverted flight you'll need a different radio.
- Before you start looping, get used to very steep 180 stall turns where you practice the first 1/4 of a loop. Your goal is to get as high as possible so you understand how smooth to be on the elevator in the first part of the loop.
- Remember to enter the loops with a high forward speed, plenty of altitude and start the loop gracefully so that you don't kill your airspeed, as you reach the top of the loop your collective should be at about -2 degrees then pull more and more cyclic to return to a right-side-up dive and pull out while adding positive collective. Never add negative collective until you're at least on the top of your loop or you'll stop all your forward motion and start flying upside down backwards. If this happens, just yank back on the elevator to follow through with your loop. It won't be pretty, but you'll come out of it all the same.
- When practicing aileron rolls, try to time it so you have 0 pitch at the 90 degree bank and -6 at full invert, and 0 again at 90 then back to what ever at level. If you're used to airplanes and pull up prior to doing a roll you'll lose all your forward speed and end up with a helicopter flying right-side up but backwards in the end. I actually dive 5 or 10 degrees before I roll to maintain forward speed.

Tricks

- Add a pierouette to the top of your loop.
- In FFF, climb 45 degrees, bank 90 degrees with 0 collective and do fast pierouettes, then level off and come out of it nose-down 45 degrees as it would naturally.
- A tic-toc is when you make the helicopter look like the boom is fastened to a metronome. You alternate positive collective and backward elevator with negative collective and forward elevator back and forth so you don't lose any altitude. The boom from the profile view looks like this motion: \ to | to / and back and forth.
- A death spiral is when you go from a high hover to a 90 degree bank with 0 collective and 0 speed, then give full forward or back elevator only for as long as you can. Correct any time by banking the opposite as you did to begin the bank. If you wait too long the tail may not keep up and it will dive nose down. Be prepared!
- The "moon walk" is when you go through the motions of a loop, but you make it look stretched out so it's not really a loop any more. Enter it as a regular loop, when you're vertical from the 1/4 of the loop add lots of negative so it maintains its forward momentum, keep the elevator steady the whole time. You'll end up flying backwards inverted for a second or two, but keep holding the elevator. As it points straight down start adding in lots of positive collective and level out.
- The Split-S is a half loop and half roll. You can choose if you roll first or loop first. If you roll to inverted first you pull out rightside up with a half loop. To gain altitude, do a half loop to inverted, then roll to right side up.

- Inverted auto's are done by hitting throttle hold while inverted up high. You add positive collective to maintain rotor RPM and as late as possible you roll to rightside up, regain your RPM and land in the last second. Hard to do with a .30, but it's been done with my raptor. (Not by me!)
- Fly inverted, and do all of the aerobatics you can do, inverted.
- Fly backwards, and do all the aerobatics you can do, backwards.
- Try doing big circles in front of you while rolling.
- Try doing big circles in front of you while pierouetting.
- Try doing extremely tight circles (10ft diameter at 75 degree bank) with near full collective.
- Combine pierouettes and flips to do strange looking "pierouetting tumbles"

Thunder Tiger Raptor Remote Control Helicopter Tips



This page is dedicated to the Thunder Tiger Raptor helicopter, we have tips we've read and discovered on our own. Here is a list of the common issues that the Raptor helicopter may have. I suggest that you read through these completely, as there are some tips that would be easier to impliment before building the helicopter.

Problem: Blade Grips do NOT come guled on!

Solution: Glue the blade-grips onto the blades! They do not come glued on! Unscrew them, cut the plastic where the blade grips are and sand the blades / blade grips then use Epoxy.

Problem: The TT 36 engine that comes with the helicopter doesn't run right.

Solution: There are a few things you can do to help the engine along.

- Wait till you've run at least 2 gallons of fuel through your engine for it to become reliable.
- I've seen two high-speed needles self-adjust (towards lean) from engine vibrations, even when I thought it felt secure. I used large fuel tubing and slipped it around the needle and it's holding mechanism to lock it in place.
- Run CoolPower 30% fuel with the head shim installed
- Make sure you have the new low speed needle. To get the low speed needle out...
 1. First take note of how many turns out both your needles are.
 2. Unscrew the large high speed needle all the way
 3. Unscrew the small low speed needle hidden inside the throttle arm, it won't come all the way out.
 4. Get a small drill bit or needle or t-pin and push it through the high-speed needle hole to poke the low speed needle out the other side.
 5. The new low speed needle has a 3-tapered tip, which comes to a point. The old needle valve is a single taper that stops at a blunt end about 1 or 2mm dia.
 6. If you don't have the new needle, write tthelihotline@yahoo.com and request one, they'll mail it to you free of charge.
- The o-ring seal on the large high-speed needle valve may leak, use a small section of fuel tubing and place it over the entire needle to seal it up.

- Put on a pipe or a better muffler
- People report that the O.S. 6B carb on the TT 36 works very well, however this carb retails for 60 bucks so it may not be worth it unless you have a spare one laying around.
- Run a high head speed, 1600 hover to 1900 sport flying.
-

Problem: The clutch keeps breaking with the part that spreads out snapping off the clutch body

Solution: The clutch liner on the drum is too thin, there is too much clearance between the clutch and the clutch liner and you need to replace it.

- It is a somewhat tedious process to replace the liner because the clutch drum pinion gear is pres-fitted to the ball bearing on the top side of it. The ball bearing is enclosed in the frame of the helicopter and will not come out without splitting the frame at least 1 inch apart, which means you have to take off the collective rocker arm. (1 hr job)
 - The clutch drum is regular-threaded onto the pinion, but it is loctited and hard to unscrew. If you find a way to hold the pinion and unscrew the drum you won't need to split the frame. I could not find a way to do this.
 - To replace the liner, you need to remove the drum, which is screwed tightly on to the pinion, which is press-fit to a bearing, which is completely enclosed by the frame, which is why you must split the frame to replace the liner.
 - It is also very difficult to get the drum/pinion/bearing component out when the main gear is installed, so it's easiest to remove it. Removing the main gear is actually very easy

and quick, just loosen the boom, remove the Jesus bolt under the gear, pop the links and the entire mast/head slides right out. Once the mast is out nothing holds the main gear in any more so you can remove it. This demonstrates how the only thing holding your blades on is one Jesus bolt. (Called a Jesus bolt because when pilots loose them they say "Oh Jesus!") This is also a good time to replace the Jesus bolt if you haven't done so in a while. You actually have 2 Jesus bolts, one on the bottom of the mast and one on the top in the head. Replace them both seasonally, or after a crash.

- Splitting the frame also requires you to remove the collective lever. Be careful not to loose the spacer-bushings and tiny washer inside of some of the bearings.
- There is a way to avoid having to split the frame to replace the drum, once you have everything apart, or before it's built. What I did was to use a dremel and sand down the lower recess of the bearing enclosure so that it was just a 1mm bump holding the bearing up. Be careful not to sand away any of the actual enclosure walls, or your bearing my spin in the frame. You don't need the lower bracket to hold the bearing up, because tightening the frame puts a lot of friction on the bearing and the starter nut also holds the shaft from moving. Now you will just have to loosen the frame screws around the bearing to remove the clutch bell. Unfortunately, the main gear gets in the way of the bearing coming out, so that too must be removed still, but that's much eaiser than splitting the frame because it's only a matter of 1 bolt and 4 links..

- Another option is to use some lubricant, such as grease, on the pinion/drum threads. Since the torque of spinning the main blades will keep it tight, it should never unthread unless your engine starts backwards. This way (in theory), you'll be able to unscrew the drum from the pinion without having to split the frames. Of course, this only works with the clutch already out.
- You must first remove the old liner and the adhesive from the old liner. Someone with a lathe can do this in less than 20 minutes and leave a very clean surface. If you don't have a lathe, you'll have to do a lot of scraping, you want as smooth a surface as possible.
- One option is to use a XCell 60 liner and trim it for a tight fit OR use the stock liner and a strip of some business card paper between the liner and the bell. The XCell 60 liner will be slightly too thick and you'll need to sand it down till it just barely fits with just enough room to turn the clutch in the drum with a tiny bit of friction. Wrapping the clutch with one layer of electrical tape is the thickness you want. With the tape on the clutch your fit should be very snug. The tape is used to judge the gap only, don't leave it on! If your clutch rubs a little bit when you start the engine, you're close enough and it will stop rubbing after a couple flights.
- Another theory is that the bottom of the clutch is rubbing hard against the top of the fan hub every time it stretches out causing a twist on the clutch, so the preventative measure is to use a very small washer between the clutch and fan hub screws. You'll probably have to custom make these washers since there is so little space for them. The other option is to grind away a small amount of the fan hub around the screw holes, this is the area that is worn looking on a used fan hub. It's this worn-look on the fan hubs that

first alerted the guy who thought of this fix that the clutch might be twisting and breaking early.

- This off of TT's web page: If you are onto the 4th clutch, then the problem is definitely not the clutch. I am pretty sure it is due to the clearance between your clutch liner and the clutch is too big. The standard that all brands of helicopters use is the gap should be around .008 to .012 inch. If the main rotor is held on for an extended time or the engine is revving too high while holding the rotor on the ground, that will wear out the liner quickly. When the gap become bigger than .020 inch, then the clutch shoes have to spready out too far, therefore, cause the steel clutch shoe to fatigue and crack. Changing the clutch is not solving the problem. You simply need to change the liner. and that is a lot cheaper. the liner comes in a pack for around \$4. When gluing in the liner, do not press the liner down too hard. Leave some epoxy between the liner and clutch bell. One trick is wrap the steel clutch with one layer of electrical tape, then place the clutch in the clutch bell while the liner and epoxy cures. After they cure, then remove the clutch and the tape and you should have the correct .008 to .012 inch clearance. But measure it to be sure. Now you will never have clutch breaking problem again.
- Write tthelihotline@yahoo.com and ask for the address to get the clutch/liner replacement. They'll replace the 1st one for free.

Problem: The screws for the main boom supports can dig into the fuel tank.

Solution: Pad the fuel tank, use a couple washers or cut off the tips of the screws.

Problem: The fuel tank can have a split in it new from the factory

Solution: Contact tthelihotline@yahoo.com for a replacement fuel tank or seal it with adhesive silicone.

Problem: The stock fuel tubing in the gas tank deteriorates with a few months of flying time, which causes it to suck up mainly air bubbles and the engine dies

Solution: Replace the fuel tubing in the gas tank with quality fuel line and make sure it's the exact same length.

Problem: The blades can go suddenly out of track by a couple inches when descending with a near 0 pitch on the collective. If you're doing a inverted loop and this happens you'll get a boom strike and the helicopter will explode.

Solution: The exact cause of this is not known, but many people claim to have found a solution...

- First, to make the blades return to in-track apply full collective sharply
- Use silicone grease on the rubber dampeners and feathering shaft.

- Recover the stock wood blades or re-shrink them with a heat gun. Don't melt the covering!
- Get different blades, such as NHP or CMT carbon fiber blades.
- Someone on the raptor list can describe how to adjust the lead lag timing by trimming the ball links on the blade grips.
- Another radical solution to change the delta angle is to mount the head upside down. This requires some hacking and when all is said and done your collective will operate backwards. Tweak at your own risk.

Problem: The pitch meter built in to the side of the frame is incorrect because the pushrod lengths are not accurate.

Solution: Thunder tiger has the correct lengths on their web site to make the pitch meter accurate.

Problem: The tail tends to rest on the ground digging in the dirt

Solution: Turn the landing gear struts around so they arch backwards instead of forward.

Problem: Some people report mysterious radio hits or interference

Solution:

Check to see if the starter nut has any vertical slop, pull and push on it and see if it slides a little up and down. If it does, yank the engine, loosen the set screws on the nut and push up on the start shaft from the bottom while pushing down on the nut to remove the slop. Then tighten the

screws. Listen for any noisy bearings. They can cause radio hits. Make sure that the screws holding your boom supports to the boom are secure and can't vibrate against the boom.

Range test your raptor and see if it's sensitive at only certain angles. Some people have trouble if their antenna is pointed directly at the helicopter. There could be excessive noise on your channel. Make sure you're not on a harmonic of a local tv channel. Ask people that do rc planes if there are any "bad" channels in your area.

Make sure your antenna stays as far away from any servo's or electronics as possible. Also, don't let it come into contact with anything metal on the helicopter. Look for anything metal to metal that is not secured or loctited. To demonstrate how sensitive this stuff is, just take a screw driver and rub it on the skid or boom and odds are your servo's will start twitching.

Problem: The set screws that hold the tail rotor on the tail drive shaft may not have enough loctite or may be loose.

Solution: Feel for slop in the tail rotor system and if there is ANY reassemble the tail rotor and loctite the set screws.

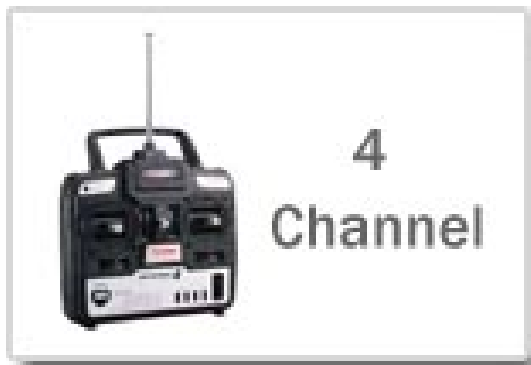
Problem: The tail rotor stops/starts suddenly while turning the throttle up and makes a racket noise.

Solution: The belt is too loose and the teeth are hitting each other inside the boom, you need to tighten the belt. This can also happen if your helicopter has been sitting a while and the belt gets a 'memory bend' in it

which needs to get stretched out by use.

You should inspect your belt every few gallons for missing teeth because there can be many teeth missing and you wouldn't even know.

Guide To Controlling Your Remote Control Helicopter

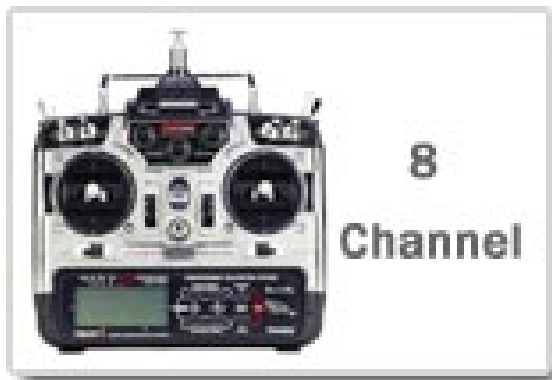


The number of channels a transmitter has determines the number of individual things on the aircraft that can be controlled. For example, *one channel for throttle, one channel for up / down, one channel for pitching forward / backward, one for banking left / right and another for yaw.*

This is the case with a helicopter, where 5 channels are required for flight. (4 on a fixed pitch machine like the LMH - See fixed pitch in glossary)



The reason you would want more than 5 channels is so you can adjust more things from the remote without having to land or approach the helicopter. Some people have a control to adjust the fuel-air mixture of their engine while in flight for example, you can also tune the sensitivity of your gyro by using yet another channel. Some people have a governor to control the RPMs the engine is running at, and turning this off and on and picking a preset RPM requires yet another channel.



A beginner, strictly speaking, could get away with a 5 channel remote, if he could find one, but since using the 6th channel for tuning the gyro is so common, it's considered a standard requirement.



Also, because the people who want more channels are generally more advanced, radios with more channels tend to also have more features and customizations. Some that come to mind are the number of programmable points on a throttle curve, number of flight models and number of programmable mixes. These features tend to drive up the price drastically as you add channels, the Futaba 4 channel is less than \$200 while the 9 channel is more than \$1500!

The Computer

There are two kinds of transmitters out there, computer based ones and non-computer based remotes. You can find non-computer remotes up to 6 or 7 channels, but usually an 8 channel remote will be computer based if it's not extremely old.

The benefits to a computer remote are many: You can store multiple models in memory, so that you can use your one remote to control several different rc things without having to re-adjust all your settings on the remote when you switch between them which is what you would have to do with a non-computer transmitter. Generally, all of your settings (revo mixing, hover pitch curves, throttle curves, rudder offsets etc) can be more finely tuned for better flying characteristics. You don't need small screwdrivers to adjust the settings like you may on some other remotes.

The switches on a computer remote can usually be programmed to do many different things.

I highly suggest that if you're only going to get a 6 channel remote, that you get at least a computer based one, such as the Futaba 6XH or better yet the JR 652. In this case, the JR652 has some features that will allow you to use it longer before you need to upgrade to an 8 channel for advanced aerobatics.

The Switches

The switches are used for different flight modes, such as normal flying, and high performance or inverted flying. Some switches are on their own channel and are used to 'do' things on the helicopter, while others just change the way an existing channel behaves. Some of them are used to adjust the rotor speed, the throttle curves (see glossary) and control sensitivities. These switches are not required for regular flight and most beginners wont use them until they've mastered forward flight.

The most common of these switches (even for beginner remotes) is idle-up, throttle hold, and possibly dual rates. Almost all helicopter remotes have these two or three switches. They're also listed in the glossary.

The Sticks

For regular flying, only the two sticks are used on the remote control.

The left stick is used to control the collective (up and down) by moving it up and down as well as the rudder (yaw left and yaw right) by moving it left and right. While the right stick controls the cyclic left and right

(bank) by moving it left and right and the cyclic forward and backward (pitch forward / backward) by moving it forward and backward.

Moving the left stick up and down actually controls two things: the collective (pitch on the main blades) and the throttle. As you add pitch to the blades, you need more torque to maintain the rpm's of the blade, so these two are mixed to help maintain a steady rotor RPM. The problem that this makes is that as you add torque, you need to add rudder to compensate for the torque. This is where revolution mixing comes in, as you add throttle and collective, you can set your radio to also add rudder to compensate for the change in torque. This is called "Revo Mixing."

Depending on how fast the helicopter is going and in which orientation it is flying, the controls behave differently. For example, in a hover the elevator controls if the helicopter moves forwards or backwards, and collective controls altitude, but these two are the opposite while in forward flight because the faster you go, the more the rotor disk starts behaving like a wing and the collective, more like a propeller.

Here is a chart describing what the controls do when...

	Hovering	FAST Forward Flight
Tail	Controls yaw	Controls yaw, coordinated with turn rate
Rotor		
Aileron	Controls lateral movement	Controls turn rate
Elevator	Controls forward / backward movement	Controls altitude
Collective	controls height	Controls Airspeed

These are merely extreme circumstances, there is always a blend of these two phenomena, and the closer you're to one extreme, the more the helicopter will act as I've listed... in the middle, when you're merely moving forward moderately, they both apply to a degree. Remember that when you use elevator to increase your altitude, you decrease your airspeed and get closer to the hovering rules.

Also, when you're flying in a different orientation, like backwards or upside down, the controls do the same thing, but feel "backwards." This is because when you're flying backwards, and you want the helicopter to turn right, and it does, it turns to its right, which is to your left and even though your eyes want it to go the right, you need to move your hand to the left. Here is a chart to show you which controls "feel reversed" in different orientations.

	Tail Rotor	Aileron	Elevator	Collective
Forwards	N	N	N	N
Backwards	N	R	R	N
Upside Down Forwards	R	N	R	R
Upside Down Backwards	R	R	N	R
Nose-in Hover	R	R	R	N

Programming A Helicopter Remote Control - RC Helicopters



We will try and describe the most common functions on a computer radio in helicopter mode. Note that the syntax may be different on different models and makes, but odds are it's there. I own futaba radios, so my terms will coenside with theirs. Some of these terms may be in the glossary as well.

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The Switches

Idle Up 0,1, 2 (switch)

Idle Up 0, or Normal Mode as it's called, is for take-off and forward flight. Typically, this has the lowest RPM of the three idle-up settings which makes the controls less sensitive making it easier to hover with accuracy.

Idle Up 1 is your "sport" mode. It is for Fast forward flight, high speed turns with sharp cornering as well as loops and rolls. This has a slightly higher RPM, somewhere around 1600. Also, the bottom of the collective in this mode probably won't be set for idle on the throttle.

Idle Up 2 is your aerobatic or 3d mode. Usually, this is a symmetric throttle curve, meaning at full down on the collective, you're at full throttle so you can climb inverted. Then, in the mid stick, which would be 0 degrees of collective, you've still got plenty of power for doing tumbles.

Throttle Hold (switch)

This switch is used to disconnect the mixing of the collective with the throttle. By flipping this switch you can apply full collective pitch while having the engine stay at idle. You use this switch to practice autorotations and in the event of a tail failure. By cutting power to idle, the helicopter will stop spinning if the tail fails and give you a chance to autorotate to the ground. This mode usually has its own pitch and throttle curve.

Throttle Cut (switch)

This switch is used to turn off your motor. Usually this switch only works if your throttle is at idle, or a very low position so that accidentally hitting it while you're flying won't force you to autorotate.

Trainer (switch)

This switch will let a second remote (plugged into your remote) take control of your aircraft so long as it's held. The moment you let go of the switch your remote is back in control. Usually, the instructor holds the remote that belongs to the flying aircraft and the student holds the extra remote.

Hover Pitch (knob)

This knob will let you adjust the pitch near the middle of the collective so that you can increase or decrease it. Ideally, you should be hovering around 6 degrees in Normal mode.

Hover Throttle (knob)

This knob will let you adjust the throttle near the middle of the collective so that you can fine tune your RPMs in a hover. Your target is 1550 RPM in a hover while in Normal flight mode.

Revolution Mixing

This mixes tail rotor with throttle. (which is mixed with collective) As you add collective you need more power to maintain your head speed, but once power is increased so is the torque which means you need to add rudder. This mix lets you program in some percentages so that the remote does most of the work for you.

To set this value you want to hover your helicopter and use your trims so that it does not spin in a hover. Then, after you land you want to program in or tweak your revolution mixing so that as you add or remove power while hovering the tail stays still. Which way you adjust it depends on which direction your rotor blades spin. In the U.S. they spin clockwise, so if you add power and the helicopter turns to it's right you have too much and need less mixing. These values require a lot of trial and error. If you have a heading hold gyro you must inhibit this function because the gyro will automatically compensate for anything including torque from the motor.

In 3D mode, your revo mixing should be a v-curve similar to your throttle curve so that as you add power for inverted hovering, you're also adding revo mix.

Throttle -> Needle Mixing

This will let you program in adjustments to the high speed needle valve at various amounts of throttle. Most people don't use this feature as it requires an extra servo.

Rudder Offset

This lets you set a different trim position for higher rpm modes, like idle-up 1. Since there is a higher rpm, there is more torque and thus will require a different trim setting to hold a steady hover. This is another trial and error function where you must land and tweak the settings. This function is also inhibited if you have a heading hold gyro.

Invert Mode

Not really used any more, this mode (when activated by a switch) would reverse the elevator and rudder controls so the helicopter would respond as if it were right-side up. You have to switch it back and forth as you go from right-side up to upside down. Don't use this!

Throttle Curves

Throttle curves tell the helicopter how much throttle to use at which collective setting. All radios come with a linear curve, so 0 throttle corresponds to 0 collective, and 25% with 25%, 50% with 50%, 75% with 75% and full collective with full throttle. This linear "curve" rarely will maintain a constant RPM, which is your goal. You can fine tune your throttle so power is applied when needed to maintain a constant rotor speed.

There are many throttle curves, one for each idle up so that you can change how much power is applied with collective.

Pitch Curves

Pitch curves allow you to adjust the way the collective responds to the collective control. Most people leave it linear (0/25/50/75/100) but some people like to make the middle of the stick less sensitive (similar to exponential) for example 0/35/50/65/100. This way, the middle of the collective will be much less sensitive allowing you to hover more gracefully. It's up to you if you adjust these values, but bare in mind that you'll need to tweak your throttle curves in a similar way to maintain constant RPM. Pitch curves also have their own settings for each flight mode (idle up) as well as throttle hold. Some people have extra pitch (too much pitch for flying around) in throttle hold for that last bit of umph when landing with no power.

Programable Mixing

This will let you set up custom mixes from either switches or controls. You can for example mix power with cyclic, since every control movement takes power which will lower the RPM.

ATV

Adjustable Travel Volume lets you set the limitations on servo travel so that you don't "bind up" any controls. That's what happens if your control arm can only turn so far, but your servo wants to keep going. This is hard on the servo and can break it, so you want to set the end-points to prevent it from happening. This is usually the first thing you set because it's the highest up on the priority for the servo movements. When the atv reaches its limit there is no other function that can over power it to make the servo move more.

Sub-trim

You can use these to fine-tune the trim of your aircraft, or use them completely so that you can leave your trim settings centered. The reason you would want to do this is so you have full trim control at your finger tips if you need it, otherwise you might have to have your trim all the way left, and your flying along and something happens and you need more left you won't have any room on the trim lever. The sub trims let you always

have room to trim it out in flight. It's best though to get the links physically set to as close as possible so you don't need to use sub-trims.

Reversing

This lets you reverse the response the servo's move to the sticks. You would use this if right goes left or up goes down, etc...

Gyro Gain

This lets you set how sensitive your gyro is. If the gyro is set too high, the tail will wag like a dog's tail. If it is set too low it may be hard to control and wander all over. You want to set it as high as possible, but without getting it to wag. Remember that in forward flight the blades are more effective so it may still wag when moving even if it does in a hover. I usually use 5% less sensitivity than the best I can do in a hover because of this.

Exponential

This will make the center of the sticks less sensitive and the extremes of the sticks more sensitive, allowing graceful hovering and snappy rolls. Most people use 15% to 25% expo, but it's only a preference.

Typical Beginner Setup

Normal Mode

Pitch Curve: 0 degrees / 6 degrees / 10 degrees

Throttle Curve: What ever it takes to maintain a constant 1550 RPM while in flight (including decents)

Idle up 1

Inhibited (Disabled)

Idle up 2

Inhibited (Disabled)

Throttle Hold (For emergency autorotations)

Pitch Range: -4 degrees / 6 degrees / 12 degrees

Typical Intermediate Setup

Normal Mode

Pitch Curve: 0 degrees / 6 degrees / 10 degrees (1550 RPM)

Idle up 1

Pitch Curve: -4 degrees / 5 degrees / 10 degrees (1650 RPM)

Idle up 2

Inhibited (Disabled)

Throttle Hold (For emergency autorotations)

Pitch Range: -4 degrees / 6 degrees / 12 degrees

Typical Aerobatic / 3D Setup

Normal Mode

Pitch Curve: 0 degrees / 6 degrees / 10 degrees (1550 RPM)

Idle up 1

Pitch Curve: -4 degrees / 5 degrees / 10 degrees (1650 RPM)

Idle up 2

Pitch Curve: -10 degrees / 0 degrees / 10 degrees (1750 RPM)

Throttle Hold (For emergency autorotations)

Pitch Range: -4 degrees / 6 degrees / 12 degrees

Pitch and throttle curves are totally personal preference though. These are only possibilities. I myself fly all modes with the same pitch range (-10 degrees / 0 degrees / +11 degrees) This way I'm totally used to how the collective responds through all flight modes and it never changes. Many people actually prefer it this way, although it's the most sensitive on the collective. It requires very subtle movements to climb or descend in a hover rapidly.

Setting Up the Helicopter

First, you make the mechanical connections. You want to set up your links so they use as much physical movement on the servo and are close to centered as possible, then you use your radio to fine tune it.

The reason you do this is to get the most "resolution" out of your servos. They only have so much accuracy, and the more travel you can use physically, the more accurate your controls will be.

As an extreme example, say you have your servo geared so that only 1 degree of motion would move the rudder full deflection. Then the servo must be very accurate to smoothly transition from one side to the other. This isn't the case, there are only a finite number of steps the servo can move, and the more you use, the smoother control you will have.

Also, the more throw you can use, the more leverage and thus power your servo will have.

Second, tweak the connections so that mechanically they conform to the list of pitch ranges above; if you're a beginner, use the beginner pitch ranges etc... Ok, now say you get your pitch range to be -1 / 8.5 / 12. I would slide your mechanical adjustments a bit (by adjusting the links) to be more focused around 6 degrees in the middle. 6 degrees is the optimal hover pitch, because if you're hovering and your blade pitch is 6 degrees, you must be using a good rpm from 1500 to 1600 which is what you want and when you're a beginner, you want to hover at the middle of the stick. If you're at -1 / 8.5 / 12, change the links 2 degrees until you get to -3 /

6.5 / 10. These are more practical values, closer to what you want went learning.

Third, use the atv settings so that you can use as much as the servos as possible, but below the point at which they bind. (Binding is when the link goes as far as it can mechanically go, but the servo tries to move it further)

Before you start actually flying, you should set up your throttle hold and kill switch if you have them. These are safety features and might save your helicopter or the skin on your back. Set your throttle hold so it has just enough throttle to idle smoothly. You can use this (or kill) if you know you're going to crash or while you carry your helicopter out to the landing pad.

Fourth, set up the pitch curve settings on the radio to make your helicopter accurately conform to the pitch range that suits your skill level. The only reason you want -1 instead of -3 or -6 on the bottom is because no newbie is used to how sensitive the collective is and so is destined to slam it into the ground when they panic and move the left stick down more than they should. By setting this value to a high number (high as in 0, or -1 degrees compared to -4 or -10 like I use) you minimize the damage you'll do when you first panic.

Once your pitch range is set up and accurate, you only adjust the throttle curves from then on. You do not adjust them both here and there then and again. This makes it confusing and impossible to "home in" on a good setting. One problem at a time, so start with pitch, get that set, then work your throttle curves until you get a constant rotor rpm.

Fifth, If you have a gyro that is NOT heading lock, you'll need to adjust the revolution mixing (revo mix) function on your radio. This is a two step process; first you must set the 0-degree mid point as a starting reference. Once your helicopter is set up not to yaw at 0 degrees, you configure the ratio of power to rudder mixing you need when you add or take away throttle. Your helicopter manual should tell you what approximate settings to start with. It's difficult for a newbie to set this portion of their radio up, because the best way to do it is to fly up and drop the collective to 0 degrees. The helicopter will drop very fast, but by watching which way the helicopter turns on it's way down you will find out if you need to add more mixing or less mixing. This 0 degree fall is used to set your anti-torque at the lowest point of torque. After that, you set the mixing percentage of throttle to rudder; that is, the more power the more you need the radio to correct for the torque by adding rudder automatically. Same for descending, when you need to take rudder away while there is less or no torque.

After that, you can set expo if you like. This will help soften the center of the sticks so you don't over react, but leave room for the hard yank and bank you may need in an emergency.

After you get used to the sensitivity and don't over-react, you'll want at least -4 degrees on the low end so you can do an autorotation if you have to.

Eventually, you'll want all the range you can get, symmetric if possible. I fly -11 / 0 / 11 on my raptor. On the nexus, I could only get -6.5 / 2 / 8.5 because of the mechanical design limitations. This is barely enough for inverted hover and minimum positive pitch for autorotations.

FMS Interface How To - Flight Model Simulator Interface Guide



Important Interface Notes: This cable is not supported by default in Windows 2000 or Windows XP. However Deon van der Westhuysen has created a program called [PPJOY](#) for you to install that will allow this interface to work with Windows 2000 and Windows XP. PPJOY will allow many various controller interfaces to work as virtual joysticks in Windows which means the interface can be used in other games too!

Alternatively, there are instructions in the install directory of FMS on how to build a serial interface but it does require much more electronics experience, although even electronics hobbieists should be able to figure it out.

The other option is to buy one of the USB or Gameport pre-built cables on the internet. If you use Google.com to search for "Futaba Joystick Adapter" you will get many people who sell these for about 30-50 dolalrs.

The benefit of these joystick adapters is they allow your transmitter to work as a joystick in all Windows games and simulators, including most versions of Realflight.

Radio Shack Parts

276-2009 NPN 2222a Transistor (Many NPN transistors will work)

271-1126 1/2 watt 5% 10k-Ohm Resistor pack of 5

276-1547b 25 Position Male D-Subminiature Solder-type connector

276-1536 Shielded hood for DB25 connector

274-020a 6-Pin DIN male plug (For FUTABA connections)

???-???? You also need some 5 ft. wires of course

(CAT-5 would work nice - I used speaker cable!)

=====

Total cost: Around \$10 - \$15 or £10

It's come to our attention that the DIN connector has been discontinued from radio shack. Special thanks to Laurance Ford for finding an alternate on-line source, Jameco. Here are the parts required from Jameco.

Jameco Parts

15886 6 Pin DIN Plug

15114 D-Sub Solder Cup Conn

15106 D-Sub Metalized Hood

178511 Small Signal GP Transistor (PN2222A)

Transmitter Interface

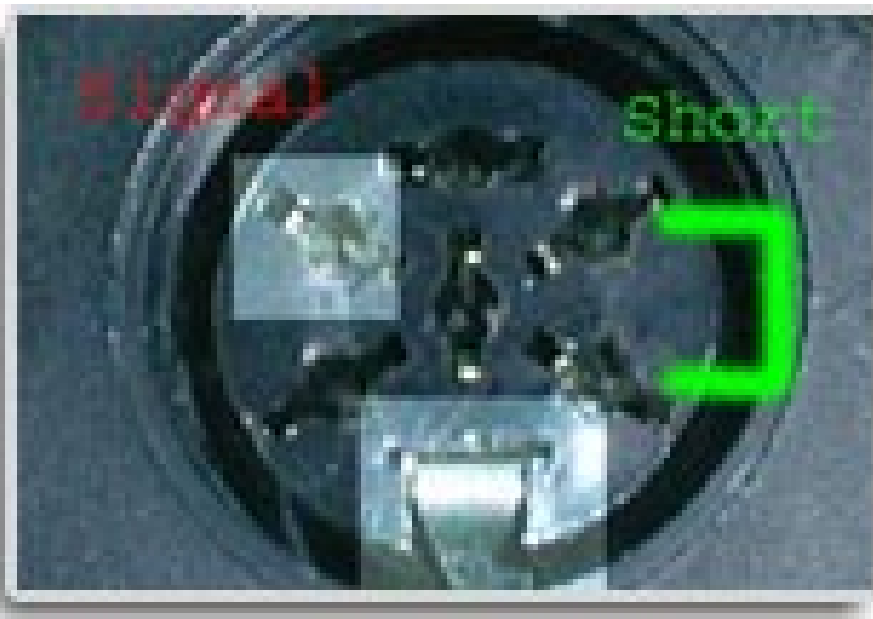
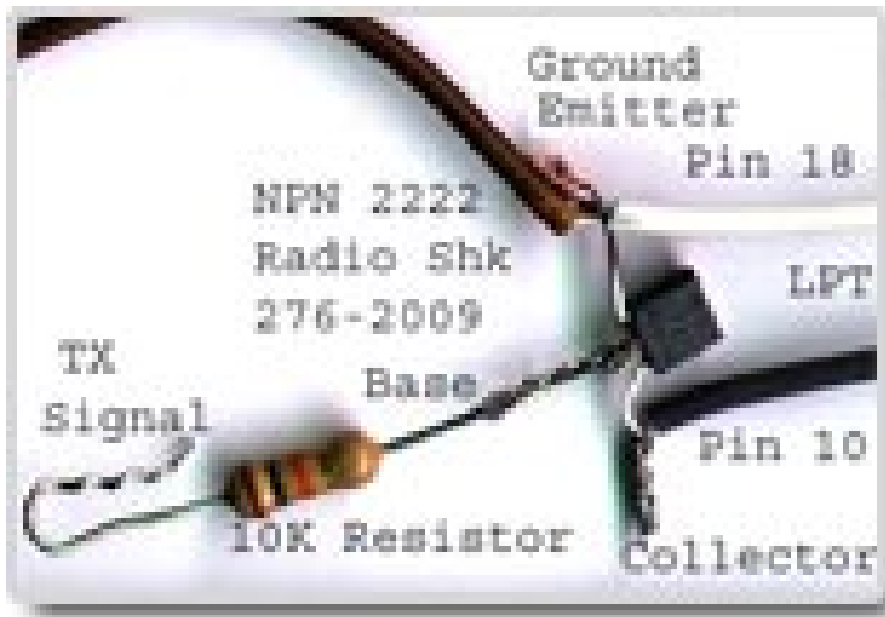
Here are some random links to other interface tips I've found on the web. When I find a combination that works flawlessly and put it together, I'll update this page with more detailed building instructions.

- ["Simple" JR Serial Interface](#) by Mike Roberts. Build this one first, supposedly it works with many models of JR interfaces. You can buy this interface pre-made from the UK at <http://www.customelectronics.co.uk/>
- [Joystick Interface](#) How to build a transmitter to joystick interface to play any sim with your transmitter, including FlightSim 98 and FMS etc. This page is in french, but you can use babelfish.altavista.com to roughly translate it.
- [Rick G](#) designed a very simple hardware interface to connect your transmitter to the printer port of your computer. The best thing of all is that it also works with FMS! I have made this page off of his simple schematic and have only tested it with a futaba transmitter. Here is the design of the transmitter interface: (This particular design will not work with JR, see link above.)
- *If you dont have the round futaba connection* and you're sure your radio is compatible with futaba here are [some various pin-outs](#) including the new futaba style pin-out.

•

Generic Interface

This was my first test, it worked but was obviously difficult to use since I had to jab the ends of the wires into the appropriate holes of my parallel port each time I wanted to use it.





Packaged Interface

This is a much more polished version of the same thing. Here you can see that I've soldered the transistor directly to the leads of a parallel port connector. I also bought a 6-pin DIN connector for my trainer jack, note that I shorted the two right pins.



Flat side is DOWN, Pin 18 (Ground) is the one on top in this picture and Pin 10 (Collector) is the lower pin



Pin 18 (Ground) on the left, pin 10 (Collector) on the right. (Flat side DOWN)



It's hard to see, but the ground cable is soldered to the outer rim. *Note:* When soldering use some sort of heat sink on the transistor leads (hold them with a plyers for example) to avoid over-heating the transistor which may damage it. Clamp it with some aligator clips or hold it with a pliers. This will prevent the heat from passing the pliers into the transistor.



The futaba trainer cord has a short in it, this probably tells the remote that there is a trainer cord connected. You may (I have not proven this) need to connect a wire where the green line is shown if you don't have a real cable.

In order for the test program to work, your transmitter must be in standard FM mode (NOT PCM) and your parallel port must be set to use Printer Port IRQ 7 and I/O Port 378h. These settings must be set in the BIOS Computer Setup which you usually access by pressing F1, F2, F10 or DEL key just after your turn your computer on, not in Windows, however after you change the setting in the BIOS you may need to remove the parallel port from the Windows Device Manager (System in Control Panel) and let Windows redetect it with the new settings. This is the default setting used on most computers. Also, this is NOT what FMS

defaults to, you must manually set the lpt port to 378 inside the fms transmitter settings for it to work.

Also, if you have a PCI Soundblaster (and maybe other soundcards?) you may need to disable sound blaster compatibility in the device manager. I recently upgraded sound cards to a PCI and my interface would say "signal detected" but not show any movement. When I disabled the soundcard's SB Emulation it worked fine.

As you can see, I put the thing together and it really does work! It also is very simple to put together, obviously.

On the futaba transmitters, the signal is the top-left pin when looking at the trainer jack (Pin 2) and the bottom middle / outer casing is the ground.

The only problems I noticed were that it was slightly "twitchy" meaning it was like I was getting radio interference. You can fix this by having shorter exposed leads and shielding the wires I'm told. It was not TOO twitchy to use so it's still a great tool and the little random acts help hone your skill of inputting the correct movements. Kind of like turbulence!

The Dangers Of Remote Control Helicopters



A common question we get asked is "*Has anyone been hit by a rc helicopter?*" and we thought the replies might be of interest to people who think these are toys...

Although this page demonstrates the danger involved in RC Helicopters, they can be *flown quite safely if you are careful* and respectfull of these things. You should be in the habit of doing a quick pre-flight checklist as well as **ALWAYS** holding on to the rotorhead tightly while starting.



Recently, we found a [video clip](#) of someone's leg having duked it out with a rotorblade spooling down post-flight. Kevin Forsyth's leg isn't looking so good, although it does seem to be smiling.

Before we begin though, lets take a look at some of the forces and velocities involved in a 30 size helicopter with average wood blades at 1800 rpm...

- Each spindle, blade holder and nylon nut screwed to it has to hold 270 pounds (122Kg) to keep the blades from flying away!
- The tip speed of each blade is about 250 MPH or 413 KPH!
- If your a person who can throw about 50mph (81 KPH) that's equivalent to hitting something with the tip of an 8 ft (2.5m) ruler as hard as you can. It would HURT!
- If one blade seperates and the other is still attatched, the helicopter will have to sustain the force of a somewhat large man jumping on

it from every direction 30 times per second. It won't last the blink of an eye and peices will fly hundreds of feet in every directoin.

- Remember, these statistics are for 30 sized helicopter blades. 60 Sized helicopters are much more powerful, and they're blades are considerably longer and heavier.
-

RC Helicopter Horror Stories

These stories have been sent in by you.



What a coincidence that this thread starts. After flying helis for 7 years, I finally got wacked last Sunday AM. was autoing my Rappy 50 with MS600 blades which I have done hundreds of times but this time, I got a little sloppy.

It was hot, flared hard to bleed speed, got tail low with the ground approaching on a slight rise, no biggy, just a boom strike, right. 20ft away, the head still had plenty of speed. Broke the last 4 inch of one blade off (with lead intact). Got me right above the waist line. Luckily it was aerodynamically stable and hit me square leading edge on.

Three days after, here is a picture. Smarts a bit. Especially since its right where my belly overhangs my beltline!

(Goodyear's disease).... Henry



Well, this happened while I was trying to start it as I battled to get any life out of it. I had been flying earlier that day and used a throttle switch as engine cut off. I took the blades off and tuned the motor. I put the blades back on and tried to restart. I had reversed the throttle hold and as the engine kicked into life the chopper started to scream. I put my leg on the hulla hoop to try to stop the chopper from taking off as it started to lift

off the ground. It was too late as the angle of the chopper was 45 degrees. I didn't feel it until the chopper had stopped shaking. The conclusion of this Moral of the incident, check your radio settings before start the chopper, make sure your engine and throttle are responding to the inputs.



This is what your leg can look like if you don't understand your equipment. 10 internal stitches and 15 outside. The funny thing about this is that it happened on April fools day. I always wanted to see what the inside of a person's leg looks like.

Regards Andrew M, Cape Town SA

Look Out

#1 Posted By: Joe - Nexus

Posted On: 1 of March 2005, at 5.19 pm

This happened a few years ago. I was standing with a group of 4 or 5 other flyers, just talking before packing up to go home. About 150-200 feet away, someone was hovering an excel 60, with his back to us. I wasn't really paying attention until someone yelled "Look out!". As we learned later, the heli lost its fore-aft servo and it locked in the aft position. All I saw was the heli lifting up over the pilots head and arc toward the group of us. I swear I saw my name on the blades. We all ran, I think I tripped, landing on the ground, rolling up into a ball and covering my head with my hands. About 5 minutes later (it seemed) I felt something hit my left ankle. Well, I figured it was broken, but when I turned to look at it found that it wasn't. Fortunately, the heli had hit the ground, breaking the tips off the blades (and slowing them down) before it ran blade first across my ankle. I had lots of pain, a big dent and bruise for a few weeks, a fear of flying, and blade tips as a souvenir.

Have I Got A Story For You

#2 Posted By: John - Raptor

Posted On: 1 of March 2005, at 5.20 pm

This happened a few years ago. I was standing with a group of 4 or 5 other flyers, just talking before packing up to go home. About 150-200 feet away, someone was hovering an excel 60, with his back to us. I wasn't really paying attention until someone yelled "Look out!". As we

learned later, the heli lost its fore-aft servo and it locked in the aft position. All I saw was the heli lifting up over the pilots head and arc toward the group of us. I swear I saw my name on the blades. We all ran, I think I tripped, landing on the ground, rolling up into a ball and covering my head with my hands. About 5 minutes later (it seemed) I felt something hit my left ankle. Well, I figured it was broken, but when I turned to look at it found that it wasn't. Fortunately, the heli had hit the ground, breaking the tips off the blades (and slowing them down) before it ran blade first across my ankle. I had lots of pain, a big dent and bruise for a few weeks, a fear of flying, and blade tips as a souvenir.

Blades Spun Quickly

#3 Posted By: Tom - MFA 500

Posted On: 1 of March 2005, at 5.21 pm

About ten years ago I thought I would try helis and I bought a MFA 500 from Hobby Lobby. No knowing what I was doing I tried to crank the thing and was not holding onto the blades. It wouldn't start so in frustration I pushed the throttle forward and hit the starter the engine started and the clutch engaged. The blades started spinning suddenly and I was lying under them with my hand holding one of the skids. All of this happened so quick and I reached my hand forward anticipating a strike in the head. It hit me in the palm, breaking a blade, but I had a severe deep bruise to my palm and wrist. The blood clot (bruise) was pressing on my nerves and made my hand numb and weak for about a week or two. I gave the damn helicopter away and stayed away from them until recently. I learned a new respect for them. Those blades are not like aircraft propellers (.40-.60 size) they might cut you, but a tremendous amount of

force is behind those long heavy heli blades. Even a .30 size could do alot of damage if it hits the right spot. A strike to the head or neck could be lethal.

Learned my lesson,

Tom

If It Is Out Of Control And Coming At You ...

#4 Posted By: Stephen - Raptor

Posted On: 1 of March 2005, at 5.23 pm

A local RC shop owner and long time helicopter pilot showed me pictures where an out of control 60 sized machine, that he was flying, got him across the back in three or four places. He had 1/4 in deep and 1/4 in wide gashes across his back from one side to the other. His whole back, except for the deep gashes, was black, blue, yellow, green, and all the colors in between. Very nasty looking! He said it wasn't responding right, and he tried to stay with it too long as it was coming at him. All he could do at the last second was turn his back to it. I guess the moral of the story is, if it's out of control and coming at you.....dump it in the ground rather than trying to save it....we all know how hard it is to purposely ditch one though. :o)

Stephen

Never Overlook Any Part Of The Pre-Flight Checks

#5 Posted By: Iain - Nexus

Posted On: 1 of March 2005, at 5.23 pm

Hi there, just a quick warning to anyone as stupid as myself. 3 weeks ago I went flying with my Dad so he could take some pics of my new pride and joy. After the first flight (which went very well) while refueling he asked what the buzzing noise was. I informed him it was the gyro, which I then switched off (to increase battery life) while we chatted and took the static pics. I then fired her back up for the next flight, the obvious happened as it went out of control. I applied full power to get out of trouble but it was pointing straight at me and was heading for my face. My natural reaction was to put my hands up to protect my face which resulted in a sickening 'thud' as the blades hit the back of my hand. The end result was two broken bones in my hand, three weeks in plaster, and I currently have strapping on two fingers to immobilise part of my hand. There was also considerable damage to my Nexus which due to my condition I cannot fix until I have full use of both hands. I know this all sounds like stupidity on my part but it was just something that was overlooked prior to flight.

The moral of the story is NEVER overlook any part of your pre-flight checks.

Happy (and above all, safe) flying.

Iain.

The Pre-Flight Check List

#6 Posted By: Tom - Cricket

Posted On: 1 of March 2005, at 5.24 pm

Another interesting story in relation to this topic occurred about 12 years ago as well. This guy who was teaching me to fly bought a used heli, I think it was a Cricket. He put in his radio and proceeded to attempt to hover and was doing a fairly good job of it. It was getting dark and he was doing this under an overhead street light. The heli was about 4 feet up and started drifting back toward him. He tried to compensate but as it turned out the batteries, which he didn't check, weren't very good. Well to make a long story short, he stepped out of the way just as the blades caught the edge of his transmitter. The heli then drifted into a fence where it proceeded to beat itself to death. As we stood there looking over the pieces we noticed his clothes were extremely bloody. The heli blades also caught his 3rd and 4th fingers of his left hand, slicing them to the bone. He never even felt it. We took him to the hospital and he got several stitches. More reasons for me to swear off helis until I got older and was closer to death anyways.

Tom

Nice Gash In My Knee

#7 Posted By: John - Raptor

Posted On: 1 of March 2005, at 5.25 pm

We had one guy hit in our club many years back. A 60 size heli had an RX battery failure while hovering close in and the fellow watching just

barely turned away before the chopper was on him and the blades struck him several times in his back. Thankfully they were wood blades as I'm afraid to think how bad a set of stiff carbon fiber blades would hurt a person. He had 3 or 4 deep long cuts across his back and required many stitches. The emergency crews went wild when they heard a person had been hit by a helicopter (they thought full scale!). When they showed up and couldn't find the full size heli, I think the panic level settled down a bit. The fellow has fully recovered but his back was a mess for a couple of months.

John

I'd forgotten my recent experience with a new set of carbon fiber blades. Virgin flight...half tank in, stopped to adjust the needle valve and walked right into the slowly rotating disk. Nice gash in my knee and one dead set of blades...split the trailing edge open over about a 2 inch span...sh*t...no stitches required :-) Beware of black blades!

... John

Really Stupid

#8 Posted By: Aron - Dragonfly

Posted On: 1 of March 2005, at 5.26 pm

I got hit about 2 months ago... realllly stupid on my part-- I was leaning over to slow the head down after a nice flight...and one leg to too close. First blade cut straight through my jeans, tipping the machine closer into me, the 2nd blade came round and took a 1" long, 1/8" deep of skin with

it. The 3rd swip directly hit into the wound and stopped the head.

The result: A small scar, and about 2 weeks of a base-ball sized swollen wound... seriously black and blue... and a new respect for the energy left in those blades.

-- Aaron

Suddenly The Thing Went To Full Throttle

#9 Posted By: Pete - Hirobo Condor

Posted On: 1 of March 2005, at 5.27 pm

A few years back, I had just finished trimming out my pride and joy, a new Hirobo Condor (60 size). I was going to offer some of the nearby club experts a go with it, and was unhooking my neckstrap from the Tx to hand it round. I must have accidentally caught the power switch, because suddenly the thing went to full throttle, and leapt off the ground. It came back straight towards us and we all scattered!

It locked on to me like a homing missile and chased me round the patch. I realized it was gaining on me, and at the last moment bent forward away from it.

The rotors (wooden, thank heavens) caught me right where I keep my brains with an almighty wack!

Fortunately it was the middle of winter and I was wearing a LOT of clothes (jeans, ski suit, poachers jacket etc). It didn't actually hurt much at the time, but I reckoned I was going to have a severe bruise on my rear. When I got home and changed, I discovered that the blade had gone right

through ALL that clothing, and left a 3" long cut on my backside, which had been bleeding quite heavily. Of course, by now it had all dried, so getting my underwear off was quite a painful procedure. The next morning I had a bruise covering almost the whole buttock, and I couldn't sit down for a week!

The heli escaped with broken blades, bent flybar, shaft and feathering spindle.

After that I fitted a second latch onto the Tx switch so I could lock it ON as well as OFF!

The story sounds quite amusing, and in many ways it is, but I learned a lot from it, and now have a VERY healthy respect for the inertia in the rotor blades!!!

Pete

I've never been bitten by a rotor, but ...

#10 Posted By: Gianmarco - Jabo

Posted On: 1 of March 2005, at 5.27 pm

I've never been bitten by a rotor, but some time ago i was teaching hovering to a guy. the shuttle clutch failed (!) and i switched to the eagle. While overing about 10 meters in front of us and with the guy in control, for some reason the heli pitched up about 60 degrees and in no time it was right on top of my head. o took control back, nosed down and fully throttled to send the damn thing away from my new haircut. i swear i can

still remember seeing the blades no more than 12 inches from my face, the rotor downwash on my face, and i could clearly see every blade rotating in front of me and ear the beat of it in the air.- recovered the heli and landed. on the other side of the training lead was nobody. the guy still running like hell!!

Ciao

Gianmarco

It Was Quite Painful

#11 Posted By: Dave - Lite Machine

Posted On: 1 of March 2005, at 5.28 pm

I once got whacked in the forearm by a Lite Machine heli blades during startup. Now you may laugh because this is such a small helicopter. However, it was in late February, cold and I was wearing a THICK padded winter coat.

It was quite painful and I had two sore red whelts (spelling?) on my arm for over a week and the bruises didn't go away for nearly a month. Amazing how much rotational energy that little .06 Norvel can spool those blades up to. If it had been summer and I was in short sleeves it would've been ugly especially considering the LMH blades are very sharp in comparison to collective blades found on most 30s to 60s. No doubt a trip to the emergency room would've been in order. That was enough to get my attention. Lesson learned; any size helicopter blades.....very scary.

Dave

This Is A True One

#12 Posted By: Scott - Concept 30

Posted On: 1 of March 2005, at 5.28 pm

Here is a true one, embarassing but it may help someone.

I has learning how to fly with a Concept 30 that didn't want to cooperate in any way at all. Nothing was going right so in frustration I held the tailboom and reved the engine up trying to tune it and maybe get somewhere. The blade struck the back of my hand and ripped it open exposing the tendons and leaving a nasty scar. I am lucky I didn't loose my function in 3 fingers!

While I was waiting for my friend to arrive and take me to the emergency room I went into the house and got my revolver (a Colt Army 1860, 50 cal muzzleloader) and holding my bleeding hand against my chest I fired all six shots into the Heli with my left hand. I am now a VERY satisfied LMH 110 pilot and will never again do something that I KNOW is wrong. I have however inspired a local tradition of shooting offending models. A friends pylon racer folded it's wing in half and crashed a week ago. He calmly walked back to his truck, retrieved his pump 12 guage and tought the offending plane a lesson.

This is an expensive way to deal with it but the satasfaction is well worth it.

Scott

The X-Ray Showed No Broken Bones

#13 Posted By: Sportcraft - Larma

Posted On: 1 of March 2005, at 5.28 pm

I can tell you from experience, they are very dangerous. I was doing a high speed vertical out in front of me with a size 30 at max power and when it reached about 50 feet the controls went dead. The heli came straight at me and before I could get away it crashed at my feet and shattered both blades across my shin bone just above the ankle. I was lucky, X-rays revealed no broken bones, but the pain was unbearable. It was almost a month before I could walk. Needless to say I stand further back now and don't get anywhere near those blades. I was lucky that time.

Sportcraft

Shocked And Embarrassed

#14 Posted By: Mikey - Concept 30

Posted On: 1 of March 2005, at 5.29 pm

When I was stationed in Seoul, South Korea, I would go and fly near the Han river with the local heli pilots. One day there was a new guy who was hovering a concept 30 DX was doing quite well. Then he attempted to hover the heli nose in and without warning his heli flew straight forward and hit him in the chest and fell to the ground making that sick dying helicopter sound, and knocking the pilot off his feet. The amazing thing about this the pilot was shocked and embarrassed but otherwise unharmed. It was a very cold winter day and he was wearing a very heavy coat and gloves, and the old concept 30 DX came with these crappy foam blades.

Both of which contributed to this guy walking away unharmed.

Mikey

Hard Lesson

#15 Posted By: Dave Townsend - Nexus

Posted On: 2 of March 2005, at 1.44 am

We had a guy come into our shop few weeks ago lookin to buy a heli... after talkin with him for an hour he bought a kit (nexus 30)...I strongly suggested he let someone at a flying field look it over or bring it to us (we do free setups if bought from us) just so someone looks at it before he tries to fire it up...

Well... he came in the next day and bought the radio gear he needed, (8103)... brand new... and went home... well..he came back the following day, his hand all bandaged up...and i said to him " you didnt?" and he started out.. "well what i was doing...was...." and thats all i needed to hear..

Apparantly he tried to do some tracking which in itself isnt so bad sounding , except he said the throttle reved way up... (since he had no clue where to set it i imagine) and then it vibrated (hmmm, blade tracking etc..) and shook the RX crystal OUT! He, went on saying the heli lifted up, came across the yard at him...got his hand with the blade, and also got the NEW JR 8103 radio also.... plus mashed up the machine when it finally stopped after hitting one of his vehicles.....

This is the second person that has done this (first time rc'er thats bought from our shop) thinking they can do this on their own, even after you talk and talk to them about havin someone else look it over first....

After he explained this story to me... he said he would bring me the machine the next time and let us go over it

Hard lesson but by jo i think he's got it now..lol

RC Helicopters

Raptor Vs. Nexus

How They Compare



In the blue corner we have the mighty Raptor. The Raptor is a great *learning machine, capable of almost every aerobatic or recreational flying styles* and we give it thumbs up.



In the red corner we have the brilliant Nexus. The Nexus is a *fine learning machine, capable of many aerobatics and versatile flying styles* with some upgrades. We also give it the thumbs up.

So now lets see how the two match up together.

The Nexus

The Nexus is a fine learning machine, capable of many aerobatics and versatile flying styles with some upgrades.

The Nexus has 19 bearings standard

The Nexus has an excellent manual

The Nexus has a all plastic swash plate

Nexus parts are becoming hard to find

People who are familiar with the Nexus may be hard to find.

The Nexus does not auto rotate

The Raptor

The Raptor is a great learning machine, capable of almost every aerobatic or recreational flying style.

The Raptor has 29 bearings, upgradeable to 49 for \$29

The Raptor manual is very difficult to use, with little or no text describing what to do. A new person to the hobby will need to get help from web pages to build it properly. See "Fritz the Cat" in Best Links.

The Raptor has a half metal, half plastic swash plate

Raptor parts are now wide-spread and most hobby shops carry a good supply. Crash kits are also very cheap and have a lot of parts for the money.

The Raptor has caught on very quickly to dominate the market, and almost everyone has either seen one or owned one.

The Raptor auto's with the stock

very well; there is no room for error.

The Nexus typically comes with the OS 32 SXH engine, a tried and tested - very reliable engine which rarely has problems and is easy to configure.

The Nexus needs replacement parts in order to be mostly 3d-capable. The stock paddles are too slow to even loop safely. KSJ paddles for \$9 fix this, but make the helicopter pitchy / pull up a LOT in FFF

The collective throw on the nexus standard is very limited. I could only get +8 to -6 degrees out of it. (14 degrees of throw) Enough for inverted flight, but not climb-outs.

The nexus gets blown around in the wind. It's flyable in high-wind but it's all over the place.

The Nexus has a nice large fuel tank, capable of letting you fly for upwards of 20 minutes with fuel to spare.

The engine of the Nexus can be

wood blades probably better than any 30 sized helicopters on the market.

The Raptor usually comes with the Thunder Tiger .36 which is notorious for leaning out in mid flight and dying. Some people say this goes away after 4 gallons of break-in, which I think is a LONG time.

The Raptor is fully 3D capable out of the box and flies straight and level no matter the speed. Cyclic response is good enough to do flips (in-place rolls)

The Raptor is capable of amazing +12 to -12 degrees on the collective! (24 degrees of throw!)

The Raptor holds its own, even in high wind it's a very smooth flier

The Raptor is done flying in 15 minutes.

The engine of the Raptor can be

removed with 4 screws, although you must first remove the muffler (2 screws)

Parts for the Nexus are very inexpensive and durable

The Nexus has z-bends and plastic ball links.

Retail price of kit complete: \$???

Retail price of kit in parts: \$???

Lowest street price we have seen: \$200.00

Annoying Issues:

- Starter shaft pin breaks
- Clutch shoe bolts break
- Starter cone wears quickly
- T/R pitch slider strips
- Wire-drive bushings move around
- Rear landing gear spread out
- Frame insert nuts snap easily
- Some kits suffer from mysterious vibrations
- Standard kit builds considerable slop

removed with 4 screws, muffler attached.

So are the parts for the Raptor, but they're slightly less expensive

The Raptor is 100% mettles ball links

Retail price of kit complete: \$280.00

Retail price of kit in parts: \$741.97

Lowest street price we have seen: \$240.00

Annoying Issues:

- Inconsistent carb can make engine die
- Clutch shoes engage at low rpm and snap
- Landing gear too far forward
- Fuel tubing is cheap and needs to be replaced soon.
- Blade covering is known to unshrink.
- Stock muffler has no baffle and little pressure.
- Some people complain about leaky fuel tank
- Several reports of radio hits / interference

RC Helicopter Stats

The following are some RC Helicopter stats. If you know of any more and you think we should add them then please contact us, and we will put them up. Thanks.

Nexus .30 Standard Statistics

Length: 41.3 in (1050 mm)

Width: 5.5 in (140 mm)

Height: 16.4 in (417 mm)

Weight: 6.17 lb (2800 g)

Gear Ratio: 9.5:1:5

Main Rotor Diameter: 49 in (1245 mm)

Tail Rotor Diameter: 9.6 in (230 mm)

Rotor Head Type: Seesaw

Control System: Bell-Hiller with ajustable pitch

Tail Drive System: Shaft drive "wire-drive"

Requires:

- * 5- or 6-channel radio w/5 servos
- * gyro
- * .32-.36 cu in (5.0-6.0cc) heli engine
- * glow starter
- * fuel
- * electric engine starter

O/S .32 SX-H Heli Engine Statistics

Displacement: 5.23cc

Bore: 19.5mm

Stroke: 17.5mm

Output: 1.2PS / 18,000 r.p.m.

Practical Range: 2,000 - 22,000 r.p.m.

Weight: 290g

Raptor .36 Standard Statistics

Length: 43.5 in (1100 mm)

Width: 4.35 in (110 mm)

Height: 15.75 in (400 mm)

Main Rotor Diameter: 49 in (1245 mm)

Tail Rotor Diameter: 9.0 in (230 mm)

Weight (Equiped): 6.25 lb (2850 g)

Gear Ratio: 1:9, 56:4.56

Rotor Head Type: Seesaw

Control System: Bell-Hiller with ajustable pitch

Tail Drive System: Belt drive

Requires:

- * 5- or 6-channel radio w/5 servos
- * gyro
- * .32-.36 cu in (5.0-6.0cc) heli engine
- * glow starter
- * fuel
- * electric engine starter

Thunder Tiger Pro 36 Heli Engine Statistics

Displacement: 5.98 cc

Bore: 20.8 mm

Stroke: 17.6 mm

Output: 1.00 BHP/14500 RPM

Practical Range: 2,000 - 17,000 r.p.m.

Weight: 314g

Thunder Tiger Raptor Remote Control Helicopter Tips



This page is dedicated to the Thunder Tiger Raptor helicopter, we have tips we've read and discovered on our own. Here is a list of the common issues that the Raptor helicopter may have. I suggest that you read through these completely, as there are some tips that would be easier to impliment before building the helicopter.

Please feel free to add your own Raptor Tips here or just let us know how helpful you found the page. Cheers

Problem: Blade Grips do NOT come guled on!

Solution: Glue the blade-grips onto the blades! They do not come glued on! Unscrew them, cut the plastic where the blade grips are and sand the blades / blade grips then use Epoxy.

Problem: The TT 36 engine that comes with the helicopter doesn't run right.

Solution: There are a few things you can do to help the engine along.

- Wait till you've run at least 2 gallons of fuel through your engine for it to become reliable.
- I've seen two high-speed needles self-adjust (towards lean) from engine vibrations, even when I thought it felt secure. I used large fuel tubing and slipped it around the needle and it's holding mechanism to lock it in place.
- Run CoolPower 30% fuel with the head shim installed
- Make sure you have the new low speed needle. To get the low speed needle out...
 1. First take note of how many turns out both your needles are.
 2. Unscrew the large high speed needle all the way
 3. Unscrew the small low speed needle hidden inside the throttle arm, it won't come all the way out.
 4. Get a small drill bit or needle or t-pin and push it through the high-speed needle hole to poke the low speed needle out the other side.
 5. The new low speed needle has a 3-tapered tip, which comes to a point. The old needle valve is a single taper that stops at a blunt end about 1 or 2mm dia.
 6. If you don't have the new needle, write tthelihotline@yahoo.com and request one, they'll mail it to you free of charge.

- The o-ring seal on the large high-speed needle valve may leak, use a small section of fuel tubing and place it over the entire needle to seal it up.
- Put on a pipe or a better muffler
- People report that the O.S. 6B carb on the TT 36 works very well, however this carb retails for 60 bucks so it may not be worth it unless you have a spare one laying around.
- Run a high head speed, 1600 hover to 1900 sport flying.

Problem: The clutch keeps breaking with the part that spreads out snapping off the clutch body

Solution: The clutch liner on the drum is too thin, there is too much clearance between the clutch and the clutch liner and you need to replace it.

- It is a somewhat tedious process to replace the liner because the clutch drum pinion gear is pres-fitted to the ball bearing on the top side of it. The ball bearing is enclosed in the frame of the helicopter and will not come out without splitting the frame at least 1 inch apart, which means you have to take off the collective rocker arm. (1 hr job)
 - The clutch drum is regular-threaded onto the pinion, but it is loctited and hard to unscrew. If you find a way to hold the pinion and unscrew the drum you won't need to split the frame. I could not find a way to do this.
 - To replace the liner, you need to remove the drum, which is screwed tightly on to the pinion, which is press-fit to a

bearing, which is completely enclosed by the frame, which is why you must split the frame to replace the liner.

- It is also very difficult to get the drum/pinion/bearing component out when the main gear is installed, so it's easiest to remove it. Removing the main gear is actually very easy and quick, just loosen the boom, remove the Jesus bolt under the gear, pop the links and the entire mast/head slides right out. Once the mast is out nothing holds the main gear in any more so you can remove it. This demonstrates how the only thing holding your blades on is one Jesus bolt. (Called a Jesus bolt because when pilots loose them they say "Oh Jesus!") This is also a good time to replace the Jesus bolt if you haven't done so in a while. You actually have 2 Jesus bolts, one on the bottom of the mast and one on the top in the head. Replace them both seasonally, or after a crash.
- Splitting the frame also requires you to remove the collective lever. Be careful not to loose the spacer-bushings and tiny washer inside of some of the bearings.
- There is a way to avoid having to split the frame to replace the drum, once you have everything apart, or before it's built. What I did was to use a dremel and sand down the lower recess of the bearing enclosure so that it was just a 1mm bump holding the bearing up. Be careful not to sand away any of the actual enclosure walls, or your bearing may spin in the frame. You don't need the lower bracket to hold the bearing up, because tightening the frame puts a lot of friction on the bearing and the starter nut also holds the shaft from moving. Now you will just have to loosen the frame screws around the bearing to remove the clutch bell. Unfortunately,

the main gear gets in the way of the bearing coming out, so that too must be removed still, but that's much easier than splitting the frame because it's only a matter of 1 bolt and 4 links..

- Another option is to use some lubricant, such as grease, on the pinion/drum threads. Since the torque of spinning the main blades will keep it tight, it should never unthread unless your engine starts backwards. This way (in theory), you'll be able to unscrew the drum from the pinion without having to split the frames. Of course, this only works with the clutch already out.
- You must first remove the old liner and the adhesive from the old liner. Someone with a lathe can do this in less than 20 minutes and leave a very clean surface. If you don't have a lathe, you'll have to do a lot of scraping, you want as smooth a surface as possible.
- One option is to use a XCell 60 liner and trim it for a tight fit OR use the stock liner and a strip of some business card paper between the liner and the bell. The XCell 60 liner will be slightly too thick and you'll need to sand it down till it just barely fits with just enough room to turn the clutch in the drum with a tiny bit of friction. Wrapping the clutch with one layer of electrical tape is the thickness you want. With the tape on the clutch your fit should be very snug. The tape is used to judge the gap only, don't leave it on! If your clutch rubs a little bit when you start the engine, you're close enough and it will stop rubbing after a couple flights.
- Another theory is that the bottom of the clutch is rubbing hard against the top of the fan hub every time it stretches out causing a twist on the clutch, so the preventative measure is to use a very small washer between the clutch and fan hub screws. You'll

probably have to custom make these washers since there is so little space for them. The other option is to grind away a small amount of the fan hub around the screw holes, this is the area that is worn looking on a used fan hub. It's this worn-look on the fan hubs that first alerted the guy who thought of this fix that the clutch might be twisting and breaking early.

- This off of TT's web page: If you are onto the 4th clutch, then the problem is definitely not the clutch. I am pretty sure it is due to the clearance between your clutch liner and the clutch is too big. The standard that all brands of helicopters use is the gap should be around .008 to .012 inch. If the main rotor is held on for an extended time or the engine is revving too high while holding the rotor on the ground, that will wear out the liner quickly. When the gap become bigger than .020 inch, then the clutch shoes have to spready out too far, therefore, cause the steel clutch shoe to fatigue and crack. Changing the clutch is not solving the problem. You simply need to change the liner. and that is a lot cheaper. the liner comes in a pack for around \$4. When gluing in the liner, do not press the liner down too hard. Leave some epoxy between the liner and clutch bell. One trick is wrap the steel clutch with one layer of electrical tape, then place the clutch in the clutch bell while the liner and epoxy cures. After they cure, then remove the clutch and the tape and you should have the correct .008 to .012 inch clearance. But measure it to be sure. Now you will never have clutch breaking problem again.
- Write tthelihotline@yahoo.com and ask for the address to get the clutch/liner replacement. They'll replace the 1st one for free.

Problem: The screws for the main boom supports can dig into the fuel tank.

Solution: Pad the fuel tank, use a couple washers or cut off the tips of the screws.

Problem: The fuel tank can have a split in it new from the factory

Solution: Contact tthelihotline@yahoo.com for a replacement fuel tank or seal it with adhesive silicone.

Problem: The stock fuel tubing in the gas tank deteriorates with a few months of flying time, which causes it to suck up mainly air bubbles and the engine dies

Solution: Replace the fuel tubing in the gas tank with quality fuel line and make sure it's the exact same length.

Problem: The blades can go suddenly out of track by a couple inches when descending with a near 0 pitch on the collective. If you're doing a inverted loop and this happens you'll get a boom strike and the helicopter will explode.

Solution: The exact cause of this is not known, but many people claim to have found a solution...

- First, to make the blades return to in-track apply full collective sharply
- Use silicone grease on the rubber dampeners and feathering shaft.

- Recover the stock wood blades or re-shrink them with a heat gun. Don't melt the covering!
- Get different blades, such as NHP or CMT carbon fiber blades.
- Someone on the raptor list can describe how to adjust the lead lag timing by trimming the ball links on the blade grips.
- Another radical solution to change the delta angle is to mount the head upside down. This requires some hacking and when all is said and done your collective will operate backwards. Tweak at your own risk.

Problem: The pitch meter built in to the side of the frame is incorrect because the pushrod lengths are not accurate.

Solution: Thunder tiger has the correct lengths on their web site to make the pitch meter accurate.

Problem: The tail tends to rest on the ground digging in the dirt

Solution: Turn the landing gear struts around so they arch backwards instead of forward.

Problem: Some people report mysterious radio hits or interference

Solution:

Check to see if the starter nut has any vertical slop, pull and push on it and see if it slides a little up and down. If it does, yank the engine, loosen the set screws on the nut and push up on the start shaft from the bottom while pushing down on the nut to remove the slop. Then tighten the screws. Listen for any noisy bearings. They can cause radio hits. Make

sure that the screws holding your boom supports to the boom are secure and can't vibrate against the boom.

Range test your raptor and see if it's sensitive at only certain angles. Some people have trouble if their antenna is pointed directly at the helicopter. There could be excessive noise on your channel. Make sure you're not on a harmonic of a local tv channel. Ask people that do rc planes if there are any "bad" channels in your area.

Make sure your antenna stays as far away from any servo's or electronics as possible. Also, don't let it come into contact with anything metal on the helicopter. Look for anything metal to metal that is not secured or loctited. To demonstrate how sensitive this stuff is, just take a screw driver and rub it on the skid or boom and odds are your servo's will start twitching.

Problem: The set screws that hold the tail rotor on the tail drive shaft may not have enough loctite or may be loose.

Solution: Feel for slop in the tail rotor system and if there is ANY reassemble the tail rotor and loctite the set screws.

Problem: The tail rotor stops/starts suddenly while turning the throttle up and makes a racket noise.

Solution: The belt is too loose and the teeth are hitting each other inside the boom, you need to tighten the belt. This can also happen if your helicopter has been sitting a while and the belt gets a 'memory bend' in it which needs to get stretched out by use.

You should inspect your belt every few gallons for missing teeth because there can be many teeth missing and you wouldn't even know.

Kyosho Nexus Remote Control Helicopter Tips



For all you lover of the Nexus RC Helicopter we have put together this page packed full of hints and tips for both beginners and experienced pilots. We hope you find it useful. If you do, or know something that you feel the rest of the world should know, then please add it in our Nexus Helicopter Tips section and help spread the knowledge of this fantastic helicopter.

Remember, we all had to start somewhere!

Nexus tips

- Always grease / oil the tail sliding ring / pitch adjuster or it may wear away to nothing. Also use CA or get the replacement part that comes with a screw-on washer as a backup. I've talked to a couple people who have had this plastic piece loose it's threads and then you loose the tail.

- Do not, repeat, do not over tighten the frame screws, the ones that screw into the hex nuts will snap those plastic dowels in two with a loud "crack!" Stop screwing the instant the bottom of the screws come in contact with the plastic frame. Don't give it that last bit of a turn you want to.
- Keep those "special type" set screws designed for the tail rotor together (they're the ones with a pointy end), or you may have to look all over that heli for where you screwed them in. When it says "kyosho label on" some particular side, they mean it.
- Make sure the coupler for the tail pitch adjuster rod is on secure and that the set screws are very tight and loctited. More than one person I've talked to has lost the tail when the coupler got loose..
- You may want to support your landing gear when not in use or they seem to tend to spread out with time which means the tail will sit lower to the ground. I've tied fishing line around the rear of the landing gear keeping them from spreading out to keep the tail up more.
- If your nexus makes a rattling noise when it idles, check to see if there is any play in the starter shaft. There are 1 or 2 set screws that hold the shroud on (384A) which you may need to loosen, take the engine out and push the shaft (390A) up from the bottom and the cone down from the top to take the play out, then re-tighten the set screws onto the flat area of the start shaft.
- You CAN remove the entire starter shaft and clutch mechanism without taking the frame apart. 1st remove the engine and then remove the 2 set screws from part 384A. Then pull the shaft out the bottom of the heli and the cone off the top. Next, unscrew the 4 screws holding part 383 to the frame so that you can move it around. After that you'll be able to either unscrew the clutch drum

or pull it out the bottom where the engine was, but be careful of the teeth on the main gear, they're tricky to get the bearing in part 383 around. If you just unscrew the drum you wont have to worry about the main gear.

Some upgrades to think about while building your Nexus

- Aluminum hex nuts that don't snap if you over tighten by 1/8 of a turn
- The replacement "reverse thread pitch slide" (91) comes with a screw-on washer which will hold the pitch arms (178) in place if the threads give out on it.
- You may want to replace the mettle bushings (part 232) with ball bearings. They will cause less ware and tear and you wont need to grease the tail drive shaft as often. .
- A rubber exhaust extender will help keep your helicopter clean
- Yes, you're going to need a foam blade holder so that your feathering shaft doesn't get bent while sitting on the shelf. Don't let the blades be folded back and not have support or you will stretch out your mixing levers and introduce slop to your cyclic.
- A tube drive will take some of those t/r worries away. I've had the wire-drive guides vibrate to the front of the boom so there was no wire-drive support throughout most of the boom... this lead to very strange vibrations at only specific rmp's. I didn't figure out what the problem was until my tail gear case had vibrated apart.

Mistakes in the Nexus Manual

- Page 6-Step 1 in the manual shows you gluing the clutch liner onto the clutch drum, but this is pre-installed also.
- Step 3 in the text supplement talks about using a piece of fuel tube for a bushing on a 10mm screw. I have no idea what they're talking about. The part they mention is not in the manual. I skipped the bushing part and everything seems fine with my bird.
- Page 34 shows 3 shaft guides for the drive shaft; page 14-step 23 shows only 2; there should be 3.
- Page 8-step 7 shows the 2x10 mm screw going into the ball joint of the "elevator arm" and the 2x8 mm screw into the collective arm ball joint, when in fact, it should be the other way around. If you do put the 10 mm screw on the elevator ball it will stick out 2mm the other side and get STUCK on the collective arm!
- Don't use soap to put the stickers on, or they'll fall off before you even start your engine. Make sure to sand / treat that plastic before you expect anything to stick to it too.
- If you think you're missing a part, check to see if it's pre-installed. The manual doesn't show some of the parts pre-installed when in fact they are.
- The 1:1 diagram of the pitch rod on page 16-step 30 is not 43.5mm as it should be. This is one of the reasons you have a supplemental paper with your manual.
- Page 14-step 22 shows the 2x10 mm screw for the ball link, but it should be a 2x18mm screw and use the extender part too. This is also in the supplement.

- The manual says you can use soap when putting the rubber dampeners in on page 13-step 21, I say definitely use soap on them because you won't get them out after they're half way in when you decide you may want them a little more slippery.
- Page 23-step 46 shows you how to put the blade grips on, but they don't tell you the diagram is showing the blades upside down. The kyosho logo on this illustration would be on the bottom, but the text tells you to put the kyosho logo on top of the blades (which in this illustration are the bottom). Remember the blades spin clockwise and the blade grip surfaces when installed should be parallel, not beveled.

Radio Control Helicopter Check Lists - For Newbies And Experienced Pilots



The all important check list. Forget one thing on the list and the day could be ruined, not to mention dangerous. We have compiled a check list for both newbies and experienced pilots and we hope you like it. Remember you can Print This Page and take it with you. Enjoy.

Going to the Field

1. Helicopter and Canopy
2. Flight Box
3. Starter motor
4. Starter battery
5. Glow heater

6. Transmitter
7. Fuel and fuel pump
8. Quick charger (if you have one)
9. Check batteries
----- Optional -----
10. Chair
11. Pop
12. Snack
13. Camera

First flight EVER.

1. Check all links secure.
2. Check tail drive system. Belt or shaft to make sure it's secure or tight.
3. Check blade grip tightness of main blades and tail blades. Should be firm, not loose, enough to hold the blade straight at any angle.
4. Check fuel tube to make sure it's secure and not punctured.
5. Check for others on your channel
6. Turn on transmitter before the receiver.
7. Turn on receiver
8. Turn on gyro (if mechanical)
9. Wait for gyro to initialize (if heading hold)
10. Check switch positions on transmitter
11. Check throttle position to make sure it's not at full throttle
12. Check transmitter model to make sure you didn't leave it set for the simulator or an airplane
13. Check trims to see if they're where you left them

14. Check throttle: You can tell if the throttle is backwards by trying to start it. (Without the glow heater attached) Full throttle will be a lower pitch bawwww noise, while idle will be a higher pitch brrrr noise.
15. Check cyclic: The swash plate should move the way you want the helicopter to move, for example, forward cyclic to make the helicopter bank forward should cause the swash plate to bank forward as well.
16. Check collective: Adding positive collective will make the trailing edge of the blades point down towards the ground, thus blowing air down and lifting the helicopter up. The trailing edge is the sharp sleek edge, while the leading edge is more rounded and thicker. Full collective should be 11 degrees and full down should be 0 degrees. Center stick should be 6 degrees of downward thrust.
17. Check tail rotor: Right rudder should make the trailing edge of the tail rotors point to the right side of the helicopter. (if it's facing away from you and you're looking at it from the tail)
18. Test the gyro reversing: If you are standing behind the helicopter and pick up the tail a little, and move it quickly to YOUR right (making the helicopter turn to the left) the trailing edge of the tail rotor should point briefly to the right. If you have a heading hold gyro, the tail rotor trailing edges should STAY pointing to the right until you return the tail to it's original position.
19. Range test transmitter
20. Connect glow warmer
21. Start engine
 1. Hold the head of the helicopter firmly in case it tries to take off unexpectedly.

2. Start the helicopter with your other hand. NEVER start the helicopter without holding on to the blade grips.
3. If the engine wont start, try adding 1/8th stick throttle.
4. If it still doesn't start, try plugging the exhaust while you run the starter for about 1 second.
5. After it starts make sure you have one hand still on the head and the other hand on the throttle stick.
6. At first sign of trouble immediately yank the fuel line off the carb, do not try and diagnose why the engine is at full power.

22.Remove glow warmer

23.Expand transmitter antenna if not already

24.Ensure the tail rotor is straight

25.Take off

1. Hover low for a minute, check tracking, control sensitivities and engine performance.
2. If it won't lift off and you're sure about your pitch range then you need to tune your engine. If there is white smoke coming out of the muffler, but it doesn't have enough power to lift off, lean the big needle screw 4 clicks and try again. If there is no white smoke richen the needle 4 clicks. Do this until you get the engine running as rich as possible while still having enough power to fly. To lean you turn the screw clockwise.
3. If it takes off and the tail wags like a dog, your gyro sensitivity is too high. Turn it down 20% and use trial and error to make it as sensitive as possible without causing the tail to wag.

4. If the helicopter starts to spin like a top before it lifts off, immediately cut power. Odds are your gyro is reversed. Check it again.
5. If the helicopter starts to spin slowly odds are your rudder trim is off, or your revo mixing is off. Revo mixing should be inhibited with a heading hold gyro.

First flight of the day

1. Check for others on your channel
2. Turn on transmitter
3. Turn on receiver
4. Turn on gyro (if mechanical)
5. Wait for gyro to initialize (if heading hold)
6. Check switch positions on transmitter
7. Check throttle position
8. Check transmitter model
9. Check trims to see if they're where you left them
10. Check throttle, cyclic, collective and tr movement
11. Range test transmitter
12. Connect glow warmer
13. Start engine
14. Remove glow warmer
15. Expand transmitter antenna if not already
16. Ensure the tail rotor is straight
17. Take off, check tracking and engine performance.

Pre flight

1. Check for others on your channel
2. Transmitter on
3. Receiver on
4. Gyro on (if mechanical)
5. Wait for gyro to initialize (if heading hold)
6. Check switch positions on transmitter
7. Check throttle position closed
8. Connect glow warmer
9. Start engine
10. Remove glow warmer
11. Expand transmitter antenna if not already
12. Ensure the tail rotor is straight
- 13.

Post flight

1. Turn off receiver
2. Turn off gyro (if mechanical)
3. Turn off transmitter
4. Check voltage on battery
5. Make sure the throttle is down
6. Switches on transmitter to default

7.

Last Flight

1. Land and idle, don't kill engine
2. Remove or pinch fuel line to kill
3. Receiver off
4. Gyro off (if mechanical)
5. Transmitter off and to defaults
6. Check Voltages
7. Empty fuel tank
8. Clean residue
9. Collaps blades into blade holder

Extended storage

1. Remove main blades
2. Use after-run engine oil
3. Clean thoroughly
4. Relax belt tail drive (if belt driven)
5. Drain batteries completely
6. Cover with cloth for dust
7. Store in cool dry place

Seasonal Replacements

(Or more frequent with heavy use)

1. Both Jesus bolts, including after a crash
2. Fuel tubing inside gas tank
3. Glow plug
4. Highspeed and stressed bearings
5. Possibly the belt drive
6. Any worn-down part

Crash Logs 1

Pilot Error

#1 Posted By: Ian Milner

Posted On: 24 of May 2005, at 9.36 pm

Weather: Fine, slight wind

Date: 23rd May 2004

Time: 20:30

Helicopter: Nexus 30

Problem: Pilot Error

Cause: Not flown much in wind

Damage: Pretty much everything; Both main frames, Boom and supports, tail drive wire, carbon rudder pushrod, landing gear

comments:

Comments:After a long hard day, I decided to relax with some flying (and a bit of practice before a planned demonstration the helicopter to my son's Cub group the following day). Went through a tank of fuel with no problems. Decided to do some lazy 8's that I had been practicing before (in calm conditions). When the heli was slightly nose in, going right to left, the wind caused it to bank left (towards me). I applied LEFT aileron (dummy!) and the inevitable contact with the ground soon followed, with the noise of about 50 cheap plastic rulers being broken in 1/2 a second. GUTTED.....! So, A) Don't fly when you're tired and B) Make sure you're happy hovering in various orientations in wind, before you try lazy 8's in wind! Now build new Nexus, and will be flying soon :->

Hunting Instinct

#2 Posted By: AussieFlyer

Posted On: 24 of August 2004, at 9.36 pm

Weather: Perfect

Date: 6th Jun 2004

Time: 18:20:15

Helicopter: Electric DragonFly

Problem: Hunting Instinct

Cause: Big Orange Cat

Damage: Undercarriage

comments:

Was finally hovering my small electric after many weeks practice, Went too close to a bush and heli was jumped on by the family cat. Must've thought it was a big moth. Undercarriage surgically removed by cats teeth and rear legs before I could retrieve it. Everything else survived, amazingly tough little helicopter.

Something in the way

#5 Posted By: Zoli

Posted On: 16 of October 2005, at 5.55 pm

Weather: indoor

Date: 15/10/05

Time: 2pm

Helicopter: Walkera #35

Problem: Something in the way

Cause: stupidity

Damage: stripped gears

comments:

I'd already done some set-up on the tail-rotor servo and i was trying the ailerons. I was wondering why the hell is it still turning around, when the little dragonfly walked slyly into a plastic bag. The main blade got caught first, then so did the tail blades. I suddenly turned down the throttle but it was too late, three gears had died. Clearer course next time.

Out of control

#6 Posted By: David Wasney, Jr.

Posted On: 17 of October 2005, at 2.36 am

Weather: indoor

Date: September 29th. 2005

Time: 8:00 PM

Helicopter: Esky Honey Bee CP2

Problem: Out of control

Cause: Interference? (not sure)

Damage: Rotor blades, lost linkage, broken landing gear

comments:

I was in my kitchen doing the best hover I have done to date. I yelled to my wife to come check it out. As she stood there watching, I got a little close to our brand new stainless steel stove/range. I set the helicopter down in front of it without incident. I looked at my wife and said "what did you think?" Just then the heli comes to life WIDE OPEN and beats the hell out of itself against the front of the stove. The stove won the battle, the heli came in second, and I took a beating from the helicopter in

the process of disconnecting the battery! Believe it or not, my wife looked at the stove, saw no damage and asked me how the helicopter was doing.

Still Learning

#7 Posted By: Dustin

Posted On: 22 of October 2005, at 4.18 am

Weather: Perfect

Date: October 21, 2005

Time: Early Afternoon

Helicopter: Walkera Dragonfly

Problem: Still Learning

Cause: Inexperience

Damage: Tail Rotor came off....I fixed it

comments:

I'm a new RC Pilot....and after logging many hours in the flight sim...I thought I was ready to fly this little guy....I placed the heli on a cardboard box(for a HeliPad) and slowly started to rev up the throttle...Well it got into the air and started going left....so I compensated to the right and down she went...The tail rotor came off as I cursed in disbelief....but I managed to fasten it back on using a wee bit of silly putty...at this point I'm about 5% confident in my flying ability...so I decided to fasten the heli's landing gear to an old wooden easel by means of 4 strings and 4 nails (it aint going anywhere) now I can get a feel for it before I crash again!

Helicopter Flying Me

#8 Posted By: Jerry

Posted On: 22 of October 2005, at 10.02 pm

Weather: Great

Date: 20 Oct 05

Time: 0830

Helicopter: CP Blade

Problem: Helicopter Flying Me

Cause: Jacked Gyro

Damage: none

comments:

Flying in the garage one morning before leaving out the tail boom started over compensating, needless to say I could not shut it down fast enough and unfortunately the cat took the blunt of the blow, hence the reason for no damage. Fortunately the cat was fine as well.

the wind was too strong

#9 Posted By: Jesus

Posted On: 9 of November 2005, at 2.28 pm

Weather: windy

Date: 101505

Time: 4:00

Helicopter: Blade cp

Problem: the wind was to strong

Cause: cause me to go into a nose dive

Damage: Front part of the body kit was crack

comments:

This heli works fine in low wind conditions but if the wind is too strong it just too difficult to control .

Damage to expensive helicopter and the RSPCA

#10 Posted By: Gavo McBigChopper

Posted On: 18 of November 2005, at 3.59 pm

Weather: Perfect

Date: 10/11/2005

Time: 1520

Helicopter: raptor 90

Problem: Damage to expensive helicopter and the RSPCA

Cause: The family cat

Damage: Smashed blades, tail boom and landing gear

comments:

I was in my back garden and had just started my raptor 90 on full throttle under the big apple tree in our back garden which i usually try to fly around as fast as possible. When suddenly the family cat jumped on my helicopter out of the tree and was sprayed all over me! it all went in my mouth as well. The neighbour who had seen the event contacted the rspca after which i had to explain to them why i was covered in liquid cat.

recent interference

#11 Posted By: stephen

Posted On: 20 of November 2005, at 6.21 pm

Weather: perfect

Date: 11-20-05

Time: late afternoon

Helicopter: esky honeybee cp2

Problem: recent interference

Cause: maybe my TX antenna

Damage: not much

comments:

keeps getting hit when 30' away and flying perfectly fine then cuts out and drops.

Before takeoff when walking away a little flutter in the surfaces I wait until it stops and then fly and at about 30' it glitches then loses power and drops. not a lot of damage but has been unflyable in VARIOUS LOCATIONS.

Also a strong FM radio tower signal seems to cross over on my 72.130mhz channel 17 and all RC Air channels 10 -30 in my local area. We can detect it on wide and narrow band fm scanner. That totally screws up the heli so I went to my friend's house and it happened again, just cut out at about 30 feet.

So my antenna is broken TX missing two of the end extensions. Maybe that's it?

This heli had been working great with no interference problems for many flights, until recently and the TX antenna is the only thing I can think of.....

kamikazy bird

#12 Posted By: hugo

Posted On: 6 of December 2005, at 8.06 am

Weather: sunny and calm

Date: 12/01/05

Time: 09:30

Helicopter: Walkera Dragonfly 4

Problem: kamikazy bird

Cause: big bird suicide

Damage: rotor blade, tail boom.

comments:

kamikazy bird

#13 Posted By: hugo

Posted On: 6 of December 2005, at 8.11 am

Weather: sunny and calm

Date: 12/01/05

Time: 09:30

Helicopter: Walkera Dragonfly 4

Problem: kamikazy bird

Cause: big bird suicide

Damage: rotor blade, tail boom.

comments:

it was a perfect day. i had just woken up when i went outside to fly my heli. i noticed that there was lots of birds screaming around. after about 10 minutes of flight i was hovering over a bush when i saw this big bird yelling and flying straight to the heli. after that i hear a loud impact sound and feathers flying everywhere. i went to the bushes and found my heli on the ground with a big brown bird stuck on the main blade. the poor thing got killed instantly.

my advice is. dont fly when there are lots of birds around.

Lost helicopter orientation

#14 Posted By: Hash

Posted On: 14 of December 2005, at 12.45 am

Weather: overcast and calm

Date: 12/11/2005

Time: 3:30pm

Helicopter: Blade CP

Problem: Lost helicopter orientation

Cause: Distance/Canopy removed

Damage: rotor blades, tail blades, tail gear

comments:

I had been hovering my Blade for a while. I took the canopy off and was adjusting the tail proportion and gain. All was well until I decided to attempt some forward flight. The heli got about 20 feet from me and when I pulled back on the stick to stop the forward flight the heli turned

left on me. Since the canopy wasn't on, it just looked like a hovering black mass and promptly smashed into the ground! I only figured out it was turning left after it had smashed into the ground. I didn't kill the motor until after it hit the ground since I was caught off guard and was still trying to save it. That caused the tail motor to strip the tail rotor gear.

Lesson learned: If you fly with the canopy on, ALWAYS fly with the canopy on since you probably use it as a reference point more than you realize.

Lost Ship

#15 Posted By:

Posted On: 16 of December 2005, at 12.14 am

Weather: Slight breeze

Date: 12 Dec

Time: 17:00

Helicopter:

Problem: Lost Ship

Cause: Wind

Damage: AWOL

comments:

I bought a \$59.00 special to see if I liked it or not. Indoor it was pretty cool. I was getting confident. Decided to take it out doors to put my "no skills" to the test. Full Throttle Up to about 25 feet up hover. Nice breeze blew her away into the Nature Preserve. Search and Rescue were

deployed. No Survivors nor wreckage... Nonetheless, I got the Heli Bug in
me and ready for a \$80.00 special

Remote Control Helicopter

Troubleshooting Chart



Ok so you have your brand new helicopter and you took it down to the park for a fly and it did not quite go as planned and you can not figure out why. With this in mind we created the *Remote Control Helicopter troubleshooting guide*. We hope this helps.

Uneven tracking you should check the following:

- One of the blade pitch rods is slightly longer than the other
- Possibly a bent or damaged feathering shaft
- Paddles that are not level or not symmetric. Just because they're parallel does not mean they are level.
- Damage thrust bearing in the blade grips

Helicopter gradually pulls up in forward flight check the following:

- The pitch in the paddles may be slightly positive overall.
- The helicopter may be nose heavy, yes - nose heavy.

Helicopter gradually dives in forward flight check the following:

- The pitch in the paddles may be slightly negative overall.
- The helicopter may be tail heavy, yes - tail heavy.

Helicopter is pitchy, rapidly pulls up and down check the following:

- You may need heavier paddles
- You may want to add flybar weights
- If it's optional, move to the mounting hole closer to the leading edge of the paddle.

Uneven tracking while performing high rate yanking and banking:

- Check that the center of gravity of each blade is the exact same distance out and that the blades are the exact same weight.
- Check for excessive slop in the control linkages

-

Vibrations

There are only a few systems that can cause a "low speed" shake. (5 - 30Hz) Low speed shakes are the most scary kind because the thing looks like it might explode or resembles a paint shaker.

- Nonbalanced rotorblades
- Nontracked rotorblades
- Blade grips that are not exactly spaced from the head the same, or have slop in them allowing the blade grips to shift laterally more than .5mm.
- A flybar who's paddles are not exactly the same distance out from the center when the paddles are screwed in the same number of turns.
- A bent flybar or spindle.
- A bent main shaft. Unfortunately the only way to tell if it's bent is to remove it and roll it on glass.
- A damaged head.
- Excessive slop in the mixing arms possibly.
- A set of blades that don't have matched CGs (debatable) Matching the CG is different than just balancing.
- Worn out rubber dampeners.
- Training gear can amplify a otherwise harmless imbalance into a scary violent shake. You can usually cure this by running a different head speed and or changing the length of the training gear and how securely or loosely they're fastened to the landing struts.

There are also only a limited number of things that can cause a "high freq shake." (100-300 Hz) High frequency vibrations are most evident by a hum sound coming from the canopy, blurred stabilizer fins, and or foamy fuel in the main tank.

- Engine vibrations or bent crank shaft.
- Damaged or unbalanced clutch or clutch bell.
- Cooling fan not balanced.
- Bent start shaft.
- Resonating tail drive shaft.
- Tail blades unbalanced or not tracking.
- Tail mast or hub bent.
- Damaged pinions or gears.

Radio Problems

There are many causes of radio interference and lockout. If you just have plain FM, radio hits will manifest themselves as control jerks and spasms. If you have PCM your controls will just stop responding and move to your pre-programmed positions. Usually with a helicopter this is all servo's maintain last position and throttle to idle. I'll list as many causes as I can think of.

- Antenna touching something metal.
- Metal to metal screws that are not loc-tited.
- Any loose metal to metal connections that can rattle or vibrate.
- Bad bearings that are notchy, noisy or otherwise damaged.

- TV channel interference from a harmonic frequency. Channel 20 is bad around my area and channel 40 gets interference from the audio band of TV channel 4. Check your hobby stores for info.
- A receiver that is not sufficiently insulated from engine vibrations.
- Antenna is too close to electronics. Try to avoid other wires, servo's, governors and gyros as much as possible.
- Grease any bearing that's supposed to be greased. Usually just in the tail gear case
- Make sure if you can, that you're not flying close to another field where people might be on the same channel
- Loose connections inside your receiver (maybe from a previous crash) or any other leads to servos or a loose frequency crystal in the receiver
- Low battery power on the receiver or transmitter.
- If you point your antenna directly at the helicopter it has the weakest signal. 45 degrees in any direction from the tip of the antenna has the strongest signal.
- If you have a short whip antenna, take special care to avoid mounting it near other electronics and that the electrical connections are very secure.

Tail Jerks (Non radio related)

Sometimes your tail wags, jerks or spasms randomly from time to time.

Here are some things to check for...

- Gyro too sensitive, although if you have to make it so insensitive the tail is "slippery" this isn't the problem.

- The gyro might be too sensitive for very high rpm's like those experienced when descending or the "weightless parts" of aerobatics. Also, fast flight makes the tail more sensitive so you might get tail wag if you're going faster than usual. You'll just need to decrease your gain 5%.
- Gyro mounted poorly. Avoid mounting a gyro in a manor that waging will be able to wobble the gyro along the verticle axis. Don't use the side of the gyro to mount it to a vertical section, use the base of it on a horizontal surface.
- Use the gyro tape suplied with the gyro, or material designed for gyro's.
- Bad high frequency vibrations and interfere with the electronics of a gyro and make it work poorly.
- If you have a belt drive make sure the teeth on the belt aren't hitting inside the boom, which can happen if your belt is too loose.
- If your engine is running too lean it can sputter which will cause sudden loss of tail power, or sudden burst of tail power which will "kick" the tail around.
- This could be a warning sign that your drive shaft is loose, slipping or backing out.
- This is also a good indication you're running low on gas, or sucking up air bubbles from fuel intake.
- Many times the tail is the most sensitive part of the helicopter, so radio hits may be mostly noticed in tail jerks. See the above for troubleshooting radio interference.

Perhaps your belt, gear or pinion are missing teeth or have damaged (rounded) teeth which are skipping. Check the clutch area, main gear and tail gears for rounded or missing teeth.

Remote Control Helicopter Glossary Of Terms



Have you ever wondered what a *Centrifugal Force* is? Or perhaps had many sleepless nights over your *Feathering Shaft* (not know what the hell it is for a start!). Well you have found the right place. Learn to speak like the experienced pilots do, and more importantly, get to grips with your remote control helicopter with our handy *Glossary Of RC Helicopter Terms*.

3D (flying)

High performance flying, usually combining two maneuvers at once. For example, mixing a loop and a roll, to loop while rolling etc...

540 Stall

A high speed climb followed by a 540 degree Pirouette as the heli stops climbing. See Pirouette.

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.

Aileron

This is really an airplane term, but is easier to say than "cyclic roll."
Ailerons are what banks a plane left or right, but does not really exist on a helicopter.

Airfoils

The shape of a wing which produces lift.

Angle of Attack

The angle between the direction of the cord of the blades and the relative direction of the wind.

ARF

A prefabricated model - Almost Ready to Fly

Autorotation

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.

Base Load Antenna

A short "whip" antenna about 6 inches long used instead of the long dangly antenna that comes with the receiver.

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 swashplate and linkages to adjust the pitch and Hiller is the part that uses a flybar or paddle to make the cyclic more responsive.

Binding

A bad condition where the control adjustments can not 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 servo's pushrods directly to the swash plate at 120 degree increments, like an equilateral triangle. With these three servo's 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 to assure the intake line is always in fuel

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 autorotation 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 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 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.

Dissymmetry 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.

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 servo's 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 autorotations 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 are 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 autorotation where you start to add positive pitch back in the blades to slow down your descent. Flare too late and you slam into the ground. Flare too soon and all the energy in the rotorblades 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 rotorspan 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 a 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 weathervane. 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 do program advanced and custom mixing rates for vario us flying styles. Computer remotes also let you store multiple "models" so you can save all your programming to memory for multiple aircraft. I use 1 model for real flight and a 2nd model for Sim flight.

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 da ngerous 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.

IRC

Internet Relay Chat, a real-time chat medium that has been part of the internet before the world wide web existed. Here you can talk to many people real-time in groups called "channels." Each channel has a specific topic you're supposed to talk about, but as you can imagine, the topic usually drifts.

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 rotorhead will seperate from your helicopter. They're called a "Jesus Bolt" because when they break the pilot was known to say "Oh Jesus!"

Too Lean

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 va lve 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 locktite 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.

News Group

A special part of the internet where everyone and anyone can discuss anything. The part that discusses RC Heli's is rec.models.rc.helicopter. This link will only work if a news server is specified in your browser. If your browser was configured automatically when you installed the software from your service provider, it will probably already be set. However, if you downloaded the browser you are using now, you must specify your ISP's news server.

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 backwards 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 helicopter pitch backwards. 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 change 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 towards the helicopters 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.

Too Rich

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 an a simpler design, but does not hand le 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 servo's 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 weathervane, so that while in forward flight, the helicopter points into the wind. 3D fliers will have smaller stabilizers so that they can fly sideways / backwards faster without weathervaneing. 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 autorotations 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 autorotate 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 a 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 then the other. Viewed from the side with blades at eye level rotor blades would look like this: >< Ideally, you want perfect tracking, so that the blades appear to be perfectly flat and look from the side like this: --

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 rotorblade, 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 swashplate and are mixed with the paddles and main blades through a set of linkages and joints.

Weathervane

The property of the helicopter to point into the wind like a windsock. The amount of weathervaining 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.

Woof and Poof

Named after the sound it makes when the rotor blades go wildly out of track, 4 inches or more vertical separation! The cause of this is debatable, and there seem to be many ways to help fix it, such as lubricating the rubber dampeners, replacing the blades, tightening the blades, reducing slop and reshrink-wrapping the blade covering.

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 ya ws.

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).

Z-Bend

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

