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Marketing/Sales Manager
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&
THE T-REX 700N

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JK
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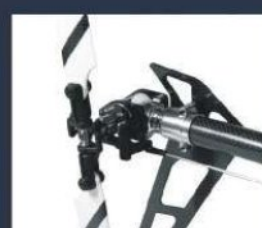


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Autorotation Tail Drive Gear: 150T
Drive Gear Ratio: 8.2:1:4.54 (E:M:T)
Weight: 3.2kg



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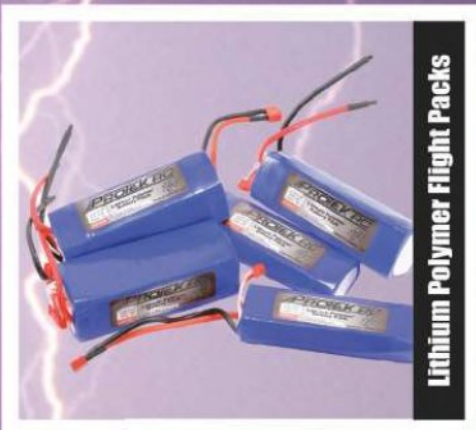


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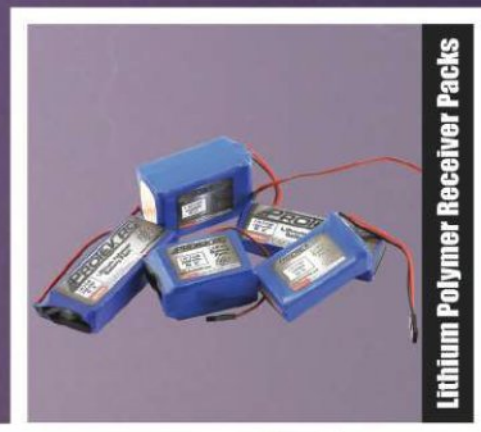
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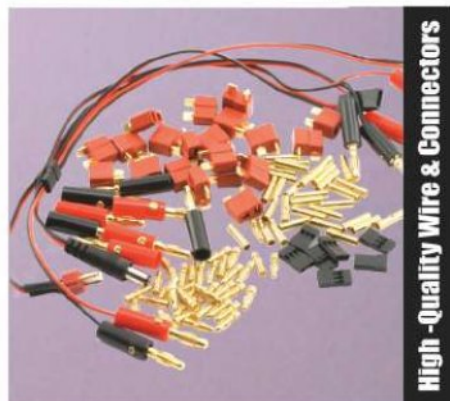
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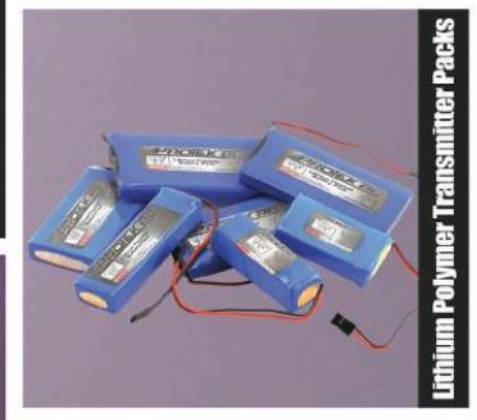
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An OFF YEAR?

WITH 2009 COMING TO A CLOSE I'VE FOUND MYSELF REFLECTING QUITE A BIT. WHEN I WAS THINKING ABOUT WHAT TO WRITE ABOUT IN THIS MONTH'S INSIGHT I THOUGHT TO MYSELF THAT THERE WASN'T REALLY ANYTHING MAJOR IN 2009 IN THE WORLD OF RC HELICOPTERS. Sure there were some new kits released, some very good, but nothing quite groundbreaking, no huge technology developments. Flybarless systems gained a lot of ground this year but I don't think they've found their sweet spot just yet. For the absolute top pilots most have found them not to perform as well as a conventional headed helicopter. I think this coming year manufacturers will begin to exploit flybarless's true potential which is making flying easier and more accessible to the masses. I think other technologies will emerge in the coming year that will be hugely beneficial to our hobby. I think this year was one of those where the sagging global economy had many manufacturers holding off on releasing new products in favor of further development. As economic activity increases and we slowly recover 2010 will be the year that companies introduce these new products they've been working on.

With this issue going on-sale just before Christmas we figured it was a good opportunity to cover some basic how-tos for you new pilots. We've got a complete how-to on hovering, one on engine break-in, and probably one of the most important adjustments on your helicopter; measuring and adjusting pitch. We hope those of you just starting out get a lot of benefit from these articles. For those of you further along the learning curve we've got some good stuff for you too.

This time of year I hope everyone is able to spend it with their families. We're thankful for all of you as readers, and all of you serving our country in the armed forces.

Mike Velez

Publisher/ Editor-in-Chief
mikev@rchelimag.com



CHATTER BOX

WHAT DO YOU PREDICT FOR RC HELI'S IN 2010?



MIKE VELEZ - Publisher/Editor-in-Chief
RC Heli magazine will continue to get better and we'll see servos look more like those found on the TT Innovator. Maybe Cyclic Servo Units.



RYAN KEPHART - Associate Editor
Flybarless helicopters will become even more popular as major brand names will start creating their own electronic stability components.



BRANDON UPDIKE - Editorial Assistant
I think the SlingBlade will come out in 2010. The first bladeless helicopter!



JIM INNES - Editor-At-Large
Further refinement with electronics is a current hot trend in the hobby, we will see more "all-in-one" electronics for our helis. I also foresee a big wave of fast-charging and more durable LiPo packs on the way.



CHUCK BASSANI - Contributor
2010 will be the year of the gasser. I think we'll also see a growth in scale enthusiasts. And with any luck, we'll probably see a wave of new radio offerings from the JR/Spektrum camp.



ART KORAL - Contributor
Flybarless. The rise of 53+ motors. Cheap LiPOs. Multi function RXs. Sub-micro low cost helis will rule the market.

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G10 version with LT heli shown.
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Width: 260mm
Main rotor diameter: 1435mm
Tail rotor diameter: 262mm
Main rotor blades: 600mm-660mm
Tail rotor blades: 95mm
Flight time: More than 30 minutes w/consumption of 300 ml
Weight: complete w/electronics and engine 4500g

With our experience and knowledge from producing aerobatic and trouble free gasoline powered helicopters, Century Helicopter Products is proud to announce the ALL NEW Radical G20! This highly anticipated helicopter (the smaller sibling of the Predator gasser) is capable of smooth F3C style flight yet has the power and agility for 3D aerobatics. Designed from the ground up with the latest manufacturing framework, we're proud to offer the latest generation of technologies which has been incorporated to produce this G10 and Carbon Fiber framed helicopter powered by the new Zenoah 20cc gasoline engine. With its high torque and its relatively low speed, the Zenoah 20cc offers smooth, vibration free operation. The gas powered engine produces absolutely no smoke offering endless capabilities for aerial photography/videography as well as scale fuselage applications. Whether you are an experienced pilot or just a beginner, the economic flight times and aerobatic flight performance of the Radical G20 is a perfect choice for your first helicopter or a great addition to your current fleet.



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 Height: 311mm
 Main rotor diameter: 929mm
 Body weight: approximately 850g

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 Weight: approximately 670g

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 Height: 200mm
 Main rotor diameter: 600mm
 Weight: approximately 390g

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000155
Digital Servos 7.5g





2.4GHz ET61



HONEY BEE CP3
 Length: 525mm
 Height: 185mm
 Main rotor diameter: 540mm
 Weight: approximately 410g



HONEY BEE 2
 Length: 510mm
 Height: 165mm
 Main rotor diameter: 510mm
 Weight: approximately 304g



BIG LAMA
 Length: 510mm
 Height: 260mm
 Main rotor diameter: 460mm
 Weight: approximately 410g



LAMA V4
 Length: 408mm
 Height: 180mm
 Main rotor diameter: 340mm
 Weight: approximately 230g



HUNTER
 Length: 380mm
 Height: 188mm
 Main rotor diameter: 340mm
 Weight: approximately 216g



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UNDER ONE ROOF

HELI PROZ GRAND OPENING

In November we had the opportunity to venture up to Billings Montana for the Grand Opening of HeliProz new facility. The parent company of HeliProz is company you've never heard of called FlyCo. All of the FlyCo brands are under one very large 24,000 square foot roof. HeliProz, Heli Wholesaler, Big Sky CNC, and Miniature Aircraft are all headquartered at the brand spanking new facility in Billings. Look for a complete behind the scene's look next month.



WWW.HELIPROZ.COM | WWW.HELIIWHSALER.COM
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Ryan looks like Guy Fieri from the Food Networks Diners, Drive-Ins and Dives.

RC HELI ON FACEBOOK

When you're not plowing your fields or planting crops in Farmville, you can now become a fan of RC Heli magazine on Facebook. We've been updating regularly and have had lots of fan feedback worth reading. After becoming a fan, check out some of the RC helicopter companies that have Facebook pages. Some of those companies include Ready Heli, Inertia RC, Futaba, CanoMOD, Hitec, Thunder Power, Thunder Tiger, HeliDirect, and others. To check us out, type "RC Heli Magazine" in the search bar.



NEW O.S. PUMPED ENGINE

Some time ago, O.S. introduced the 91HZ designed with F3C-type flight in mind. Well, now O.S. has come out with the 91HZ-PS 3D ringed with a 61B-PH carburetor. This is a balls-out 3D .91 engine that would look good in the hands of any 3D pilot. The pump works with the matched carb to deliver a steady fuel supply, no matter what angle or altitude you're flying at. The short rectangular heatsink head can fit just about anywhere. It's shipping now and can be yours for just under \$500 at most stores.

WWW.OSENGINES.COM



WOULDN'T YOU LIKE TO KNOW?

Hitec recently announced the new Telemetry Monitoring System. Install the HTS-SS On-Board Telemetry Sensor Station and go crazy with all the information. The system measures everything you can imagine. You can measure four different temperatures, the liquid fuel level (with a unique sensor that sticks to the outside of your fuel tank), the position, the speed, the acceleration (with a GPS sensor), and the engine's RPM. The data can be transmitted back to the Hitec Aurora 9 radio and downloaded to your PC. The new system will be available at the end of the first quarter of 2010.

WWW.HITECRCD.COM



NEXT 3D MASTERS IS IN HOLLAND

Isn't that Vierd? Yup, the next 3D Masters event will go to the Netherlands! Mark your calendars: July 23rd through 25th will be the time, and the place is the Jupiter Flying Club near the town of Venlo. For those of you not familiar with the event, the 3D Masters routinely draws the world's top 3D pilots to compete in three different disciplines: set maneuvers, freestyle, and flight to music. Classes are broken down into Experts and Masters. Experts are experienced pilots who might not be sponsored while Masters are the sponsored hot shots who get paid to fly. The level of competition at this event is amazing. Be sure to look into it.

WWW.3DMASTERS.ORG.UK



RESCUE 4-1-1

Reenact some rescue missions in your living room with this new Blade Tandem Rescue RTF from e-flite. The new tandem coaxial is fully assembled and ready to fly out of the box. The heli features a 5-in-1 DSM2 receiver/ESC/mixer/gyro/servo control unit and is controlled by a four-channel 2.4-GHz DSM2 transmitter. LED "navigation" lights are factory installed, and a 250-mAh LiPo and charger are included. Looks like something to keep you busy when it's cold outside. The heli goes on sale before the end of the year with a street price of \$179.

WWW.E-FLITERC.COM



PHOENIX MEETS SPEKTRUM

The very popular Phoenix RC Pro Flight Simulator 2.5 is now being paired up with a Spektrum DX5e radio. Yes, an actual transmitter you can use with most DSM and DSM2 receivers along with all of Horizon's Bind-N-Fly aircraft. Along with an actual radio, the combo comes with the latest version of the Phoenix simulator, which includes helicopter kits like the TREX 600 (night fly) and 700, Synergy N9, JR Vibe 90 3D, Avant Aurora, Raptor 50 3D, Blade CX-2, Century Swift, Mikado Logo 500, and many others. The combo pack will sell for about \$175.

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Blade CP+



Blade CP Pro 2

It's no secret that Blade® is the number one name in helis. But what you may not have heard is that from now until December 31st, while supplies last, you can get as much as \$15 back when you buy one of these Blade helis!

We're talking about some of the most popular Blades of all time, including Bind-N-Fly favorites like the Blade mCX and Blade CX3. And while you're buying a Blade for yourself, put on that Santa hat and buy a few for your friends too.

But hurry, an offer this hot on helis this cool means supplies will be moving fast. Get to your favorite Blade retailer right away and look for the Blade rebate display.

Offer valid until 12/31/09 or while supplies last. Offer limited to one rebate per household and proof of purchase required. Offer good only in U.S. and Canada. Rebate forms and complete rebate information available at participating retailers or online at E-fliteRC.com. © 2009 Horizon Hobby, Inc. 16597 US Patent # D576,146. PRC patent number ZL 200720069025.2. Multiple patents pending. www.freedowns.net

GAUI TILT ROTOR

Gauji is a company known for coming up with some pretty innovative products. The latest innovation is the TG-609. It's a scale model that looks a heck of a lot like a Bell 609. Little information is known at this time, but from the photos we've seen, the model looks pretty cool. As soon as we can get our hands on one, we'll be sure to give you the lowdown on it.

WWW.EMPIRERC.COM



MORE C FOR YOU!

Thunder Power continues to push the limits with a new full range of 45C batteries. The Pro Power 45C series batteries are available in capacities from 325 mAh to 5000 mAh and in configurations from 1S 3.7 V to 10S 37 V. That's a lot of juice! The batteries can be charged at up to 6C and, according to Thunder Power, have no loss in cycle life delivery when charged at this high amperage.

As with other Thunder Power packs, these are assembled by pros at the Thunder Power facility in Las Vegas, Nevada. Thunder Power is also now offering a 1-year warranty and 50% off damage replacement. There are some limitations, so check out the Thunder Power website for the details. The new Pro Power 45C batteries are shipping now.

WWW.THUNDERPOWERRC.COM



HELI-MAX GOES NANO

Heli-Max is coming out with a new nano-sized fix pitch RTF heli skinned with a cool-looking Sea Cobra canopy. The heli comes fully assembled and ready to go with a four-channel 2.4-GHz radio, 400-mAh LiPo, and charger. The heli features a CNC aluminum rotorhead and swash for some durability. It looks pretty cool; we can't wait to take her up. Street price will be \$180.

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LETTERS

WHAT GIVES?

In your recent article on "Going Wireless" using JR/ Spektrum radio with your simulator, the Spektrum WL1000 Flight Simulator Adapter for FSOne has been discontinued by Spektrum. I wanted to purchase one for myself, but everywhere that I've tried to purchase one is sold out. Just letting you guys know what the deal is about the wireless adapter.

Yours truly,

Kenneth Pearman, an avid reader of your magazine.



■ **Hi Kenneth,**
Thanks for reading. We were very disappointed to find out that the adapter was discontinued. Should a reasonable alternative become available anytime soon we'll be sure to share that with our readers.

REPORTING FOR DUTY

Here are a few pictures of my Augusta A-109 Military Helicopter from RC Aerodyne. It's based on TREX 600e mechanics.

Its list of features include; Lightning Heli 4-blade head, with Rotortech 570mm main blades, Century 4-blade tail rotor, w/CY 95mm tail blades, Scorpion 4025 1100Kv motor, Align 75amp ESC, Futaba S9255 servos, Duralite 6V regulator, JR 12X radio, Helicommand stabilization, and a 6S 5000mAh battery.

Mike L.

South FL.



FLEET WEEK

Just wanted to send in a quick note, and some photos of my pack of TREX, sitting on a stack of your magazines! I started in this hobby back in June of '07, and I was lucky enough to come across a hobby shop that keeps RC Heli in stock I have not missed an issue since! This hobby has really stuck with me, I fly most every day the weather permits, and fly the sim on days it does not! My fleet starts with a 250 DS410, DS760/DS3500G, 450 HS65MG, Inertia 860/S9257, 500CF HS5245MG, GP750/S9257, 500ESP, DS3517MG, DS760/DS3500G, 600CF, HS6975HB, DS760/BLS251, 600NSP DS8717, G7703D/DS8900G, 700NP DS610, Inertia 860/DS8900G. My favorite Batteries Zippy Flightmax, Fuel preference 30% Rotor Rage, Chargers 1010 for 8S pack 610x2 for the rest. The list of goodies goes on and on! I want to say, thanks for the great publication I do look forward to it every month.

Jay Vandersluis
Kissimmee, Florida
snjbird on Heli Freak
snjbird on RR



■ **Hi Jay, that's some fleet in just two year's time. Keep flying, make sure no fuel drips on those beautiful covers.**

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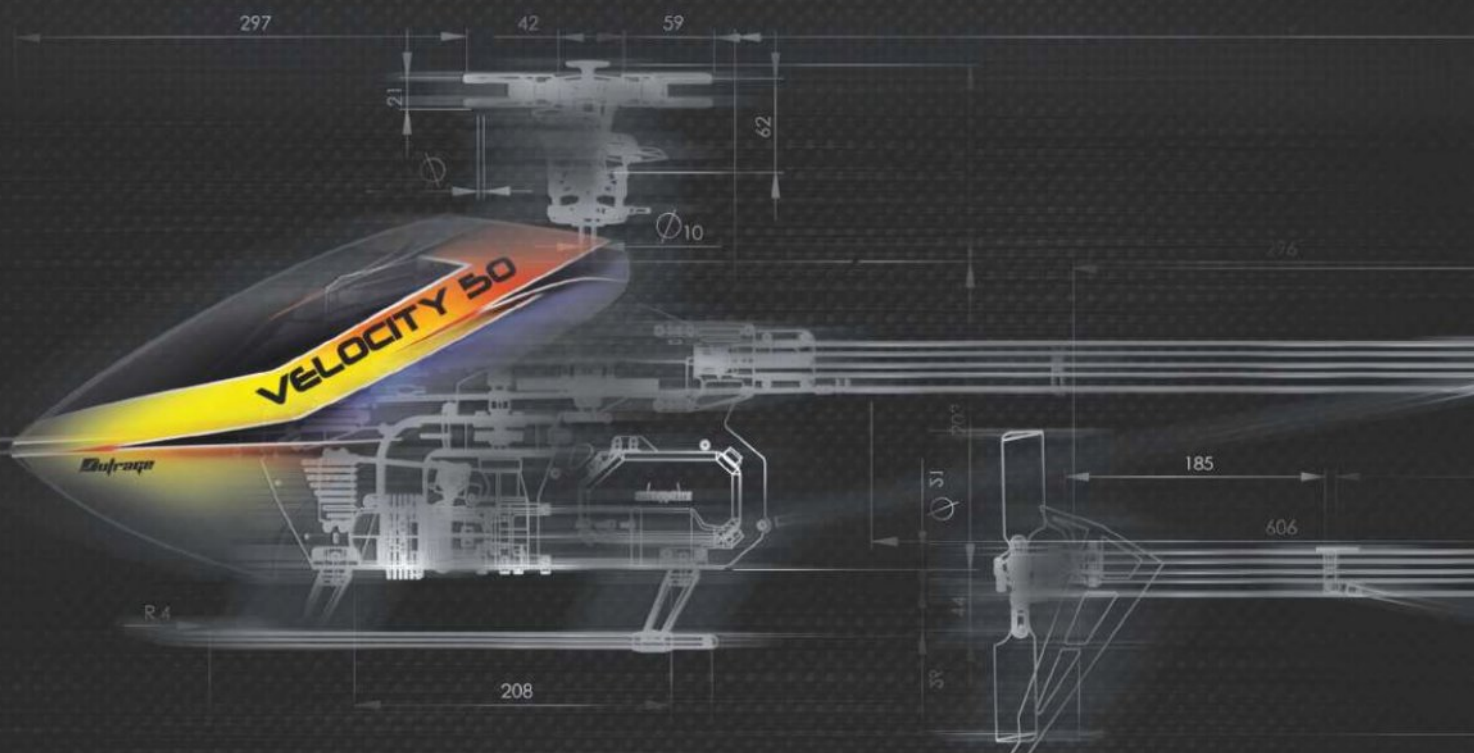
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Width

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- Tail Blade Length: 95mm
- Tail Rotor Diameter: 250mm

- Main Gear ratio: 8.6:1 (8.8:1 Optional)
- Tail Rotor Ratio 4.583:1
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ROTOR HEAD

RC HELI IS INSURANCE

I have been reader and a subscriber to your magazine for a long time. I can't count the number of times your magazine has help me in understanding the in's and out's of setting up RC helicopters. You have been a great help to me. I have enclosed two pictures of my Align 500 with the Align Air Wolf fuselage caring a ski lift tower. Nothing special about the 500 helicopter it is a basic kit right out of the box. I built a balsa ski lift tower 36 inches tall with a weight of 2 ounces and attached it by a hook to the fuselage. The 500 had no problem caring the tower around. I did the same thing years ago (1970's) using a fixed pitch American Revolution 40 fuel helicopter. The round ball you see above the cockpit is a simulated searchlight that comes on when the battery gets low. It is a lot of fun to fly with the tower but it is most important to watch the helicopter and not the tower.

Keep up the good work!

Best Regards

Larry J. Bingham

West Jordan, Utah

PS. Photo by Richard Despain

■ **Great job Larry. Love the fuse and the utility of your scale machine.**



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FREQUENTLY ASKED QUESTIONS

Q: I am soon to get a Trex 600N limited.

It comes with servos, gyro, governor and 2n1. This question may sound silly but never having had experience with nitro it is something that I am not clear on. If I use the 2n1 I will need a 7.4-volt Li-Po which steps down the voltage to approximately 6 volts (5.8). I know the DS610 and DS620 are rated for 6 volts, but what about the gyro and governor, and the AR7000 receiver I am going to use? Also is using this type of set-up better than just using a 4.8-volt NiCad? It sounds more complicated than just not using a 2n1. Any help and suggestions on this will be appreciated. Thank you all in advance. **-dwoodworker**



A: Yes, you will need a 7.4-volt Li-Po. Since the heli is coming with a 2n1 I'm sure all the cyclic servos are rated for 5.8 volts. The gyro, receiver and governor will be fine. The tail servo will have a step-down between the servo and the gyro if it's

a 4.8-volt digital servo. To put it in layman's terms, the Li-Po will have a lot more nut and is much better than a 4.8-volt NiCad. Plus, you'll have on-board glow igniter.

-vermonster

Q: Can someone please give me a brief explanation how swash mix works? I have a general idea, but would like to be clear on this. I adjust mine all the time to get the heli to do what I want but am not really sure of the mechanics behind it. It's the percentages I'm not

sure of. For instance, I increased the settings on my 450 from the stock 65% to 73% to get faster action, i.e., increased roll and elevator, and pitch rates. How does the percentage affect the swash mix rate, or exactly what is it doing? **-augerin2**

A: The percentages control how much of the servo's overall movement is devoted to that particular function. For example, increasing the collective from 65% to 70% allows more of the servo's travel to be devoted to the collective function. That will allow the servo(s) to have a few more degrees of rotation with respect to collective inputs. Also, the absolute value of the setting controls the range and the sign controls the direction. So changing the same setting from +65% to -65% will not change the overall throw, just the direction with respect to stick movement. The same is true for aileron and elevator functions. Because the transmitter calculates the movement of each of the three servos, it uses those percentages to figure out exactly how much to move each servo. **-cbflys**



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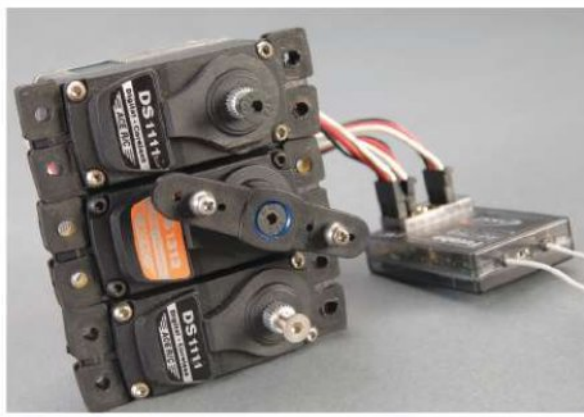
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QUICK TIPS

TEST YOUR SERVOS BEFORE YOU INSTALL

Finding out your servo is bad after you installed it in your helicopter can cause you a lot of extra work that would not be needed, had you just tested them before you installed your electronics. Servos have come up in quality over the years, but electronics fail and testing them before you put them in can save you some time. Setups that require 90° servo arms can be installed during this process, to insure an accurate installation.



BABY WIPES FOR YOUR BABY!

I am not talking about your newborn, but your helicopter. This tip came from Mickey Johnston, a fellow pilot that I fly with over at a local street in Rancho Cucamonga, CA. Mickey just recently bought his first nitro helicopter and has a newborn kid that can make quite a mess. His wife buys baby wipes in bulk and he decided to give one a try on his baby (TREX 600N). The wipes clean off the oily residue and leave the helicopter nice and dry.



RUBBER MAID TO THE RESCUE

Leaks, grime, oil, and grease are common after-flight characteristics that nitro helicopters produce as a by-product of flight. Rubbermaid makes storage containers that are made from durable plastic and these can really come in handy during helicopter maintenance and cleaning. This tip from Jason Schoeberl in Colorado Springs uses this method when working on his helicopter on the dining room table. It can hold small parts and contains any liquid without damaging the dinner table. Thanks, Jason—this tip will keep us guys safe when the wife comes home and sees us working inside the house on a cold winter day.



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TESTED and RATED

Walkera **UFO 117**

Straight Outta' Area 51

WORDS: Brandon Updike

WALKERA HAS BEEN PUMPING OUT RTFS AT A RAPID-FIRE RATE THESE LAST FEW YEARS, and they come in all shapes and sizes. The company has been growing steadily with solid-performing products. Their UFO line originated a couple of years ago and became a smash hit. They recently released the newest version of their UFO line with the UFO 117. UFO-type aircraft have always been unique to us as it isn't necessarily a helicopter per se. However, its flying characteristics mimic very closely the way a helicopter flies so it's only fitting to cover it in the magazine. Some of you may recall that we reviewed a similar product in Issue 25 called the Y-UFO, and it turned out to be a solid performer for such a unique design. I'm curious to see how well Walkera was able to utilize the UFO design.





FEATURES

Walkera first came out with their UFO 4 model in 2007 and has since improved upon their original design with the UFO 5 and UFO 8. The UFO 117 integrates the core design of their earlier models but now has a body that resembles an F-117 stealth fighter. The body is merely a foam cutout in the shape of the famous stealth bomber. It has large cutouts since it most likely serves no aerodynamic purpose and is used



more for a cosmetic appeal to save some weight. The core mechanics is the classic four-bladed system that we have seen in past UFOs. Each plastic blade disc is driven by an individual motor using plastic gears to mesh with it. A main circuit located in the center of the UFO houses the three-axis gyro. The gyro regulates the head speed of all rotor systems, which it allows it to maintain its stability in all aspects of flight. Everything is connected with the use of thin carbon rods. The carbon rods extend from the circuit board to all the motors. A thinner piece of carbon going from each motor attaches to the base of the foam cutout. These rods keep the UFO fastened to the F-117 cutout. The UFO 117 comes RTF in true Walkera fashion. The transmitter that is supplied is a 2.4-GHz system and even has a menu screen outfitted with digital trims.

TESTING

Having never flown a UFO before I was excited to see how one felt in the air, so I got the battery charged up and began prepping for flight. The Li-Po battery charges relatively quick, in around 15 to 20 minutes. After charging, I plugged the pack in and tucked it away in the battery cage at the bottom of the aircraft. I then turned the transmitter on, and after a little delay everything seemed to bind just fine. We took it to the warehouse out in the back of the office and I started to spool it up. I was a little quick on the collective and was surprised to see how fast it jumped off the ground. Once it was in the air I realized how stable this thing really was. I kept it in a hover briefly and then began flying it around because I have a hard time keeping my aircraft in the same spot for long periods of time. I immediately noticed that it tracked really well and

maintained impressive stability during all aspects of forward flight. I increased the speed and was able to keep it under control without much effort at all. I also liked the fact that when you push the nose forward, it stays locked in that position, making very fast flying a breeze. I brought it back into a hover and transitions back into slow speed effortlessly. This time I decided to keep it in a hover for a little longer to see just how stable it was when not moving around. It locked in just fine so I began doing pirouettes and was surprised that it spun around at a relatively quick rate. It also stopped on a dime, which is always a definite plus. I did much more testing, such as backwards flight and pirouetting circuits, and found that the UFO surpassed expectations no matter what flight characteristic I threw at it. We even flew it outside in moderate wind conditions and the UFO 117 didn't miss a beat. It was a solid performer both indoors and out. I did however crash it lightly on one occasion and was a little disappointed to see some of the carbon rods break, and a prop break. They do supply an extra prop but

the UFO is a little on the fragile side, so be careful when flying indoors.

CONCLUSION

Overall, I was very pleased with the way that the UFO 117 flew. The way that these UFO designs are flown allows it to resemble our helicopters in basic flight almost perfectly. Walkera did a great job designing the control system for the UFO 117, making it excel during all the flight characteristics I performed with it. The three-axis gyro did everything I wanted it to and was always on top of all controls without any problems whatsoever. The only gripe about the UFO is that it's a little flimsy, so be careful when flying because it damages easily. Other than that, I recommend this to anyone who wants a fun and different indoor flyer. **RCH**



+ THE GOOD

- Awesome performance
- Comes RTF
- Entertaining

- THE BAD

- Fragile

CONNECT

| | |
|---------------|--|
| MANUFACTURER: | Walkera |
| WEBSITE: | www.walkera.com |
| PART NUMBER: | UFO117 |
| STREET PRICE: | \$149.99 |

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Edge 603mm BLADES

Living life on the edge!

WORDS: Mark Madsen

THERE HAS BEEN AN ABUNDANCE OF NEW BLADE COMPANIES THAT HAVE ARISEN IN RECENT YEARS, giving us pilots a greater selection of what to fly. Carbon Fiber blades have become the norm in the hobby and are becoming more affordable with the increased competition. Companies are now able to release carbon blades at affordable prices, as opposed to a few years ago when these blades could only be had with expensive price tags. A new company called Edge has recently appeared that is generating quite a buzz with their line of blades. Edge was the first company to design a blade with a flybarless setup in mind. In this scope, we take a look at their 603mm flybar version of blades and see how well they perform.

FEATURES

While most blades for this class come in a measurement of 600mm, the Edge blade is unique in a sense, as it measures in at 603mm. The slightly bigger blade disc can possibly give it a flight advantage through the creation of more lift. Edge's main goal is to produce a blade that retains both pop and quick cyclic, without binding the head during hard flying. They advertise this with a newly designed airfoil that is able to achieve this feat. Each blade has a 4mm bolt hole and a 12mm root. If shims are needed, Edge supplies each set of blades with four 1mm shims. Each blade is carbon fiber, with a white finish that outlines the top of the blade from the root to the tip. The Edge logo is also located off center, to the right of the blade. The weight of this set came in at around 126g, so it is pretty lightweight. The main difference between the flybar and the flybarless set of blades seems to be mainly the weight used to accommodate the differing cyclic speeds. There is also a weight container safety system that prevents the weights in the blade from being tossed out during a crash.

TESTING

We decided to test this nice set of blades on our in-house 3D 50, the new Outrage Velocity 50. Since the root is 12mm, there was no need for any shims when applying them to my helicopter. I was able to install the blades within a matter of minutes

and checked each blade for the proper tightness. Once each blade was installed, I decided the helicopter was ready to fly. Once I lifted off into the air, I was happy to see that the tracking remained the same and that the trim was very close to how it had been before. I made the usual one-click trim adjustments and observed how well the helicopter maintained a hover. Overall, the blades felt stable and never had the tendency to want to drift. I decided to pop the collective and do a large climb out. The helicopter cut through the air and felt as if it were floating. I decided to pull back on the cyclic, to transition into a tail slide, and quickly realized that these blades are fast! During a few minutes of hard flying, the blades performed flawlessly, with a steady combination of good pop and quick cyclic ability. As advertised, I found it hard to load the head, even through some of the harder cyclic and collective combination maneuvers. Having flown many different brands of blades, I would say that the Edge ranked right up there with some of the best I've flown. Even during forward flight and big sky eating moves, the Edge, despite being fast, was easy to maintain and keep on track.

CONCLUSION

Overall, this is a very good set of blades and I'm happy to say that I was quite pleased. The cyclic was fast, but it didn't lose any pop and always cut through the air without any issue. It was easier

on the head, making transition moves smoother and easier. It is priced similarly to the competition, making it a very good option for anyone looking for a great set of blades for their 50-size helicopter. I see Edge as a great up-and-comer company, with a lot of potential in the future if they continue to head down this road. *TIM*



+ THE GOOD

- Fast cyclic
- Great pop during collective moves
- Safety features

- THE BAD

- Focuses mainly on 3D flying

CONNECT

| | |
|---------------|--|
| MANUFACTURER: | Edge |
| WEBSITE: | www.edgerotorblades.com |
| PART NUMBER: | EDGE603 |
| STREET PRICE: | \$89.99 |

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FLY WITH STYLE

Ray's Helitech AUTHORITATIVE DVD SERIES

Volume 10-12... Ray's Back!

WORDS: Brandon Updike



RAY'S AUTHORITATIVE MANUALS AND DVD SERIES HAVE BEEN AROUND FOR MANY YEARS and have been good tools for beginners to understand the basics of helicopters. His DVDs have made it easier to see how Ray Hostetler builds and sets up his helicopters while getting reliable tips and pointers along the way. Previously his DVDs have extensively covered all the basics from radio setup to bench setup to the right steps in getting your helicopter in the air safely to proper techniques to tune your helicopter while flying. Now Ray is back with his newest collection of DVDs: volumes 10-12.

FEATURES

Each volume of Ray's new Authoritative DVD Series comes in a separate DVD. The main focus of this series is that Ray goes over setting up an eCCPM helicopter. In volumes past Ray has gone over the proper methods of setting up a mechanical mix helicopter so he's trekking into new territory. He's featuring the relatively new Futaba 10C and the Align T-Rex 600N. Ray breaks down everything about helicopter setup from the beginning stages all the way to the flying field.

TESTING

The first DVD starts out with Ray going over the Futaba 10C. He goes over every menu, discussing the importance of them and how they're used. He even goes over aspects of the radio that aren't used and explains why. He includes the very basics everything from putting in model names to the functions of pitch curves and the swash plate. He also employs charts to help describe the different angles and calculations to which some of the settings apply. Overall, nothing is overlooked when Ray gives a breakdown of the Futaba 10C, as he does a good job explaining aspects from the basics such as stick movements all the way to advanced setup options like curves and endpoints.

On the next DVD, Ray spends most of the time going over his already-built T-REX 600N. He explores the entire helicopter, pointing out modifications that he has made and giving his opinion on how it improves the already existing design. These changes

are useful suggestions, and he does a good job discussing how they might improve your helicopter and why he made them. However, some of the modifications shown in the film aren't necessary, as the T-REX 600N flies quite well out of the box. Ray then goes on to explain everything there is to know about eCCPM setup, which is where the most valuable information is. He does a great job explaining all the basics like a level swashplate, washout arms, and centered servo horns. He then discusses all the features of the 10C that are used in setting up an eCCPM helicopter. He talks about setting up the Revmax, GY401, and your throttle linkage.

On the third and final DVD, Ray takes his finished 600N to the field for the first time. He goes over all the necessary steps to prepare for liftoff of a helicopter for the first time. This section is pretty long, as he covers everything from tracking and trim adjustment to gyro gain adjustment. He takes a lot of baby steps as he makes one adjustment at a time for the duration of the DVD, explaining as he goes. Once the helicopter is ready for regular flight he has Mikado team pilot Kyle Dahl ring it out and give his opinion of the setup. The DVD ends with Kyle and Ray saying their good byes.

CONCLUSION

As usual, Ray does a good job explaining just about everything that needs to be explained when it comes to helicopter setup. He did a good job elaborating the setup process of an eCCPM helicopter,

and this DVD will help any newcomers who need to learn how to set up their helis. Even experienced pilots might benefit from giving these DVDs a try. One crash from an improper setup can cost hundreds, with that in mind these are a great value. **THU**



THE GOOD

- Very informative
- Vast amount of information for beginners
- Good eCCPM breakdown

THE BAD

- A little bland
- Some modifications are presented in an opinionated way

CONNECT

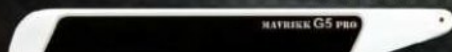
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|----------------------|--|
| MANUFACTURER: | Ray's Helitech |
| WEBSITE: | www.rayshelitech.com |
| PART NUMBER: | RAYSDVD10 |
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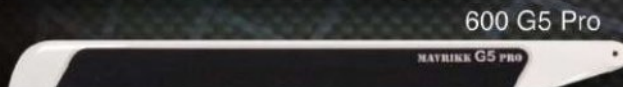
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550 G5 Pro



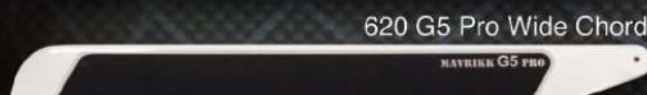
550 G5 Pro Wide Chord



600 G5 Pro



600 G5 Pro Wide Chord



620 G5 Pro Wide Chord



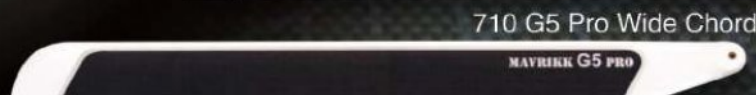
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Aerospire **MULTIGOV PRO**

Aspire for a better governor

WORDS: Jim Innes

THREE YEARS AGO, WE REVIEWED THE FIRST VERSION OF THE MULTIGOV FROM AEROSPIRE. It was the first product from this Hawaii-based company and it has proven to be a popular governor over the years. Now Aerospire has refined the product further, and added some features, in the MultiGov Pro. Will we be impressed yet again?

FEATURES

The MultiGov Pro boasts all the features of the original: governor and limiter modes, three customizable RPM settings, which are selectable in flight, compatible with most digital and analog servos, etc. In addition to those features, the Pro also offers:

- Each RPM selection can independently be set to either the aggressive 3D mode or the smoother standard mode.
- Automatic mixture control capability has been added to the unit, with no change in price (you do need to provide the hardware, sensor, and servo).
- Menus have been refined further for ease of setup.

The Pro is about the same size as its predecessor: roughly 1.5 x 1.4 inches. Instead of having the board wrapped in clear heat shrink, it is now encased in a blue plastic box. The new case is thin enough that there is no real weight penalty for its inclusion. The Pro uses the same slick detachable LCD interface as the original unit, as well as the same sensor, magnets, and mounting brackets, all of which are included in the package. It should also be noted that the MultiGov Pro works with most RPM sensors being used by other governors, including Spektrum's engine back plate sensor that comes with the 7100R.

INSTALLATION AND TESTING

Installing the MultiGov Pro is very simple. You can mount the governor unit with Velcro or double sided tape to your radio tray or frame side. Simply plug the throttle and an auxiliary channel lead from your receiver, the throttle servo, and the sensor lead into the unit. The sensor is installed using one of the included brackets, or you can custom make one if your heli requires it. The magnet is usually installed in the engine fan or clutch bell using epoxy, JB Weld, or thick CA. Be sure to check the magnet's polarity before setting it in the fan!

Programming the MultiGov Pro is also a simple task. Plug in the LCD panel to the governor and power up the radio system. Pressing the NEXT-MENU button on the LCD for three seconds gets you into the governor configuration menu where

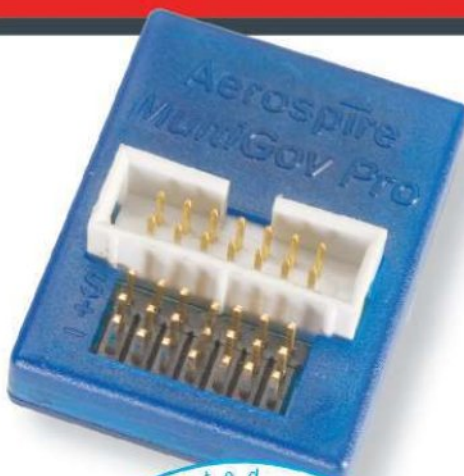
you will set the throttle channel endpoints, gear ratio, and the desired RPM speeds for each flight mode. There is also an advanced menu, if you find you need further refinement during flight. Let me note that you should not run the MultiGov, or any other governor, on a heli until you have tuned the motor to run well. Leave the governor turned off until the engine is running properly.

I have test run the MultiGov Pro on various machines, using the aggressive and smooth flight modes as well as the limiter functionality. Just as I found with the original MultiGov, the Pro works exactly as advertised. The governor kicks in properly and holds engine RPM very well, regardless of how much loading and unloading is placed on the system. I never ran into any case where the governor stopped working or "let go" during flight. Even when I purposely de-tuned a motor a little bit, the Pro would still hold the RPM properly, up to a point of course. It's a great governor!

AUTOMATIC MIXTURE CONTROL

New to the Pro is the addition of automatic mixture control. Automatic mixture control is achieved by installing a temperature sensor (one is available from Aerospire, or you can use the CSM CarbSmart sensor) to the engine and hooking a servo up to the mixture needle. The software in the MultiGov allows you to set a desired engine temperature and the unit will adjust the engine mixture needle in or out during flight to maintain that temp. The benefit to using mixture control is that your engine will be kept at a constant temperature and be kept at an optimum air/fuel ratio. Because the air/fuel ratio is maximized, there is a possibility to get more power and increased fuel efficiency from the engine. In my testing, I did notice a slight increase in my flight times, and more consistent power, but nothing major.

There are basically two camps in regards to mixture control: those that swear by it, and those that do not think the benefit is worth the added weight, servo, linkage, etc. Aerospire has aimed to please both camps by adding this functionality without increasing the cost of their governor. Most of my engines are running well enough without



+ THE GOOD

- User friendly
- Superb performance
- Competitive pricing

- THE BAD

- None

CONNECT

| | |
|----------------------|---|
| MANUFACTURER: | Aerospire LLC |
| WEBSITE: | www.aerospire.com |
| PART NUMBER: | AMG-PROKIT (with LCD) AMG-PRO (with out LCD) |
| STREET PRICE: | \$115 (with LCD) \$90 (with out LCD) |

adding mixture control, so I am not currently using it, but if I ran into a motor that seemed to need it I would have no concerns using the functionality.

CONCLUSION

The MultiGov Pro is a fantastic governor, much like the previous version. It holds well, sets up in minutes, and is small enough to fit onto any nitro machine. I have always liked the detachable LCD interface idea; it allows a unit to remain small and inexpensive without sacrificing user-friendly programming. I have been flying the MultiGov Pro for many months now, without a single issue. Whether I am cruising around the sky or banging the sticks, the MultiGov Pro takes care of the rotor RPM for me, so I can focus on flying and having fun. See you at the field! **THU**

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CANOPIES

Cover me!

WORDS: Brandon Uptdike

A helicopter is a fine piece of machinery that needs to flow together perfectly for everything to work just fine. What really is the icing on a helicopter is the canopy as a canopy can really make or break a helicopter. If a helicopter has a sleek nice canopy chances are it will generate more interest than a helicopter with a not so attractive canopy. For the most part, pilots do not only want a good flying helicopter but they want it to look good in the process. Canopies have come a long way over the years and they continue to get sleeker and nicer. Canopies serve a wide range of purposes and are not only for the looks.



TYPES

The most common materials used to make a canopy are plastic and fiberglass. Most mass-produced budget helicopters traditionally will come with a plastic canopy. However in recent years many companies are beginning to supply fiberglass canopies standard with some even pre-painted. Most plastic canopies today are the "milk-jug" type plastic materials that really work ideally with only decals. "Milk Jug" plastic can be painted but most likely won't come out pretty. On a more limited supply, some companies supply a Lexan Plastic canopy that generally comes clear. These canopies can easily be painted and come at cheap prices. Sometimes they'll be required to be cut out with the use of Lexan scissors because they come from the factory still in their molded form. They will usually have guidelines that makes cutting them easy to follow. Some "milk jug" plastics will come in their mold form and will also require to be cut out. Fiberglass canopies are usually looked upon in higher regard as they have a much nicer finish but are harder to prep. Most if not all custom canopy paint jobs are on a fiberglass canopy. If painting is not your forte then preparing a fiberglass canopy can be very tricky so a pre-painted canopy would probably be your best bet. Arguably the highest quality of canopy is carbon fiber canopies but these are very rare but nice nonetheless.



PLASTIC

FIBERGLASS

LEXAN

ADVANCEMENT OF CANOPIES

Canopies have come a long way since the early days of helicopters and have even advanced tremendously in recent years. Just a few years ago most 90 sizes came with very wide and heavy fiberglass canopies. At the time they didn't seem to be that bad and many pilots found them desirable. However as flying continued to advance to the level it's at today canopies along with all other components of a helicopter have evolved. Gone away are the days of super heavy and wide canopies. It doesn't take a rocket scientist to figure out that a sleek canopy will catch less air in backwards flight and a lighter canopy will allow it to cut through the air relatively quicker. Plastic canopies were once the norm in the industry but now they are starting to get smaller in numbers as companies are finding ways to produce and sell fiberglass canopies at affordable prices. Custom paint jobs are even coming down in price but the really high detailed jobs are still quite pricey.





SCALE BODIES

One of the most popular but overlooked types of helicopters is ones with full bodies on them. This mostly pertains to scale helicopters and F3C competition style helicopters. The possibilities for scale helicopters are almost limitless and the craftsmanship that goes into some of these scale choppers are amazing. Generally they take a long period of dedication and hard to work to complete. Scale helicopters are usually made up of fiberglass bodies and may come pre painted or you'll have to paint and detail it yourself. The hardcore scale pilots are the ones that mold the fiberglass themselves. F3C fuselages are usually fiberglass bodies that cover the entire helicopter. These sleek designs help the helicopter cut through the air at very high speeds. They are usually painted with very cool and unique schemes and look flat out impressive. In a world dominated by 3D flying watching F3C style flying is a breath of fresh air and should be witnessed by everyone in the hobby.



BENEFITS OF A CANOPY

The most obvious benefit to flying with a canopy is that it helps tremendously with orientation. Some pilots like to paint their canopies using bright colors to help them see their helicopters in the sky. When your helicopter is at odd angles, the canopy is a good reference point to figure out what orientation it is at. Another benefit to flying with a canopy is that it keeps all your components inside the helicopter just in case something decides to eject. So if your battery gets un-strapped it won't go flying from the helicopter. It might prevent it from unplugging but that one is up to the heli gods. Your canopy will also help protect your electronics from damage during a crash. It isn't guaranteed to save your equipment but any help is better than no help at all. A canopy will also keep your electronics clean which is always an added benefit.



Sleeker the better.

CONCLUSION

Whatever your tastes maybe everybody's helicopter comes with a canopy of some sort of fashion. Canopy art is almost a whole other art within our hobby and has really been exploding in recent years with many new paint companies arising. Some of these custom paint companies are truly pushing the envelopes on designs and quality of their paint jobs while other offer a solid paint job at a decent price. Plastic and fiberglass canopies will continue to be the norm for years to come and I'm sure there will be more companies in the future that will come up with new design features for canopies. **TBL**



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CNC MILLS

How helicopter parts are made!

WORDS: Ryan Kephart | PHOTOS: Jason Boulanger

A CNC or Computer Numerical Controlled machine operates using a computer run by commands that are encoded on a storage medium. The commands operate the different functions of the machine, which are controlled by motorized screw drives. These screw drives allow the part to be moved in any horizontal plane. The cutting head of the mill can also move up and down, allowing for vertical movement as well. Today's CNC machines have taken the basic functions to an all-new level. Parts are now drawn up using CAD software on a computer and transferred to the milling machine to create the part. The CAD software allows you to see a 3 dimensional object before a single tool starts to cut into the material. Milling machines can cut many different materials including plastic, fiberglass, carbon fiber, and aluminum, which are the building blocks of a helicopter.

» WHAT DO MILLING MACHINES DO ON A HELICOPTER?

Mills can perform many functions to provide a finished product. Frames, bellcranks, swashplates, head blocks, blade grips, and bearing blocks are all made using a mill. Some of the basic functions of a milling machine are drilling, routing, and cutting. These three functions allow most of the work needed for our helicopters to be complete. A mill uses tools that can cut both on the side of the bit and the head. These tools are called end mills. The end mills can have many different tips including a ball end, which allows for a radius cut. Taped holes are also a task that a CNC milling machine can perform with ease. A special tool can make threads into any part with precision. These can be seen on bearing blocks, clamps, and threaded mixing arms. The frames of our heli's are the most noticeable part that the CNC milling machines form. Each carbon fiber plate is cut out using an end mill and then holes are drilled in precise locations. These two steps are done at the same time, using the same machine, to accurately locate every hole in the correct position. CNC mills can also cut gears that our helicopters use to drive the main rotor and tail. Beveled gears, helical cut gears, and umbrella gears can all be made with a CNC mill.



TOOLS OF THE TRADE

CNC MILLS

Quality Control That Can See The Difference!

CNC milling machines are very accurate and can produce parts with tolerances of 0.001 inch. Human error or worn drills can produce parts that are not in tolerance. Some CNC machines will run a certain number of parts and stop to allow for a tool change. This keeps the bits sharp and the accuracy up. Computerized inspection machines can accurately trace the part and insure that the part is within the specifications of the manufacturer. Quality control is where companies spend most of their time to produce good parts. Quality checks usually take place every certain number of parts. The number of parts between checks is where different manufacturers' quality control efforts pay off. The lower the number of parts that gets by quality control, the better. This step is also what makes the helicopter toy grade or hobby grade.



TOOL CHANGER: This turret type device allows the CNC to automatically change tools for whatever type of job that needs to be done. The turret moves in and grabs the tool holder, the Z axis moves up, tool changer selects a different tool, Z axis moves back down, and the spindle locks the tool down.

BED: The bed of the CNC mill moves in both the X and Y-axis.

SPINDLE: The spindle holds the tool into the machine, using a locking mechanism and suction. The spindle also allows the bits to spin, much like a drill press.

TOOL HOLDER: This steel holder utilizes a clamp or collet to secure the end mills to the tool holder. The purpose of the tool holder is to allow a quick change-out of tools to perform another function. The tool holder is designed specifically for the brand of machine that is being used.

Z AXIS: This axis allows the cutting bits to be raised and lowered onto the part.

COOLING/LUBRICATION NOZZLES: These flexible nozzles are used to cool a part while it is being cut. Air or liquid can pass through these nozzles, depending on whether you need just cooling or lubrication as well.

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HOVERING

The Fundamentals

WORDS: Jim Innes | PHOTOS: Name Here

There are few things that compare to lifting your first helicopter off into a successful hover. It

is an exhilarating feeling to see the culmination of your build and set-up work in the air. Presented here are some tips and practices that will help you master the hover.



Matt Botos learned to hover years ago.

» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

2.0



» TIME TO COMPLETE



2-4 Weeks

» TOOLS NEEDED



■ SIMULATOR



■ STICK TIME



■ PATIENCE

WE ALL START IN THE SAME PLACE

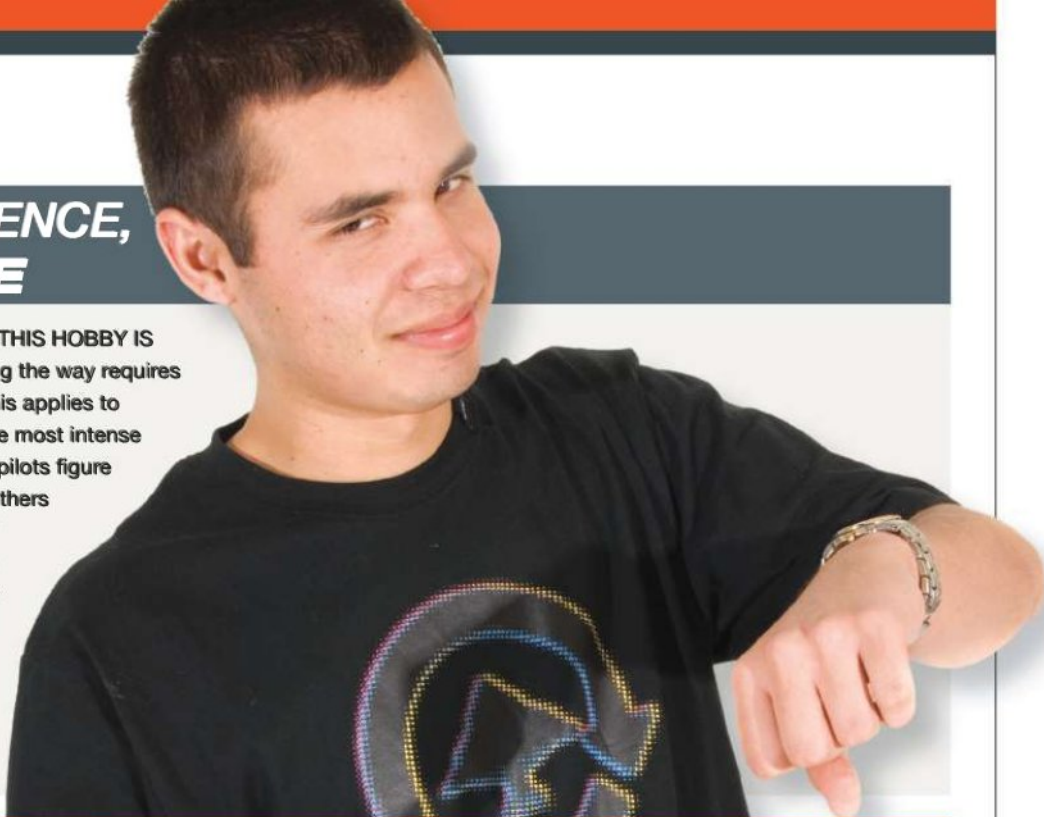
"I will never be that good." Many new pilots utter this comment when they witness a helicopter being flown to perfection by a pro. One thing every pilot must remember is that every one of us was a beginner at some point. Precise and controlled hovering in all orientations is the key to mastering helicopter flight. Even the most seasoned pro at some point along the way had to figure out how to hover. (And you can always tell which pilots skipped this important step in their rush to be 3D kings.) If you take the time to master this crucial beginning step, it will pay dividends every step of the way.

Even these guys had to go through the process of learning how to hover when they began.



PATIENCE, PATIENCE, PATIENCE

FIRST AND FOREMOST IN THIS HOBBY IS PATIENCE. Each step along the way requires forethought and exactness. This applies to everything from the build to the most intense precision-flight routine. Some pilots figure out how to hover right away; others need time. Regardless of your natural talent, patience will be an indispensable asset in your progress. If you find hovering difficult, have patience, and practice as much as you can; you will get it.



PRELIMINARIES TO FLIGHT

If you have never hovered a helicopter (other than a simple coaxial type model), you are in for a great experience. There are some simple things you can do to add to the success of that first hover:

SIMULATOR TIME: Though nothing can replace actual flight time, a sim is the closest thing we have. If you have access to a simulator, spend as much time as you can hovering. Don't fall into the trap of just taking off and playing around. Focus on stick movements and keeping true control of the model.

PROPER SET-UP: Nothing is more aggravating than trying to control a model that is out of trim or set up improperly. Unfortunately, many a pilot has quit this hobby shortly after starting due to frustrating crashes that were ultimately caused by poor set-up. This is not usually due to negligence on their part but is all too often the result of pilots taking on the hobby alone. Use every resource available to get your machine trimmed in and set up well. Internet forums, articles in your favorite heli mag, local clubs, and hobby shops are all great places to get assistance and find answers along the way. A properly set up heli is infinitely easier to hover and control than a poorly tuned one, especially for a new pilot.

PRACTICE, PRACTICE, PRACTICE: The best idea is to try one of the many super-stable coaxial models now available. It is amazing how well-behaved the newer mini RTF helis are. Just a few years ago, there was nothing in the inexpensive indoor category that flew very well. If you have access to one of these models, fly it a lot, even if just to practice proper stick movements.

Of course, the most important preliminary item is to prepare yourself for flight. Do what you can to calm your nerves; don't go flying if you are overly tired, etc. Remember that it is a hobby; don't stress too much over it.



Simulator time aids greatly in teaching proper stick movements and can greatly minimize the learning curve.



If you have an experienced pilot nearby, have your set-up inspected by him or her. Ask questions, and make sure you understand any changes that are made.



If you lack patience you may find this hobby frustrating, especially in the beginning. Patience is necessary to succeed in and enjoy RC helis.

Brandon gives you props.

WHILE AT THE FIELD

Do a thorough pre-flight of your model, batteries, and transmitter once you arrive at your flying spot. You want to take care of every possible variable so you can focus on the transmitter sticks once the heli is airborne. If you can, have an experienced pilot do a quick test flight of your model to ensure it flies correctly.

After your heli has been checked over and test flown, it is time to get flying! Be sure the model is at least 25 feet away from any people or objects. If possible, have the pilot that test-flew the model stand with you as a spotter so he or she can give advice if needed. If you are not a natural at the sticks, the following steps may help you:

1 Keep in mind that only small stick movements are needed to control the helicopter. The most common mistake a new pilot makes is over correcting. If the heli begins to drift or change altitude, small adjustments will correct the heli. Remember, patience is key.



All you need are small stick inputs to correct drifting or make slight altitude corrections.

2 Increase the throttle to the point that the skids are light, just before the heli leaves the ground. Do this a few times to get a feel for when the heli takes off.

3 Now, take the heli into a hover. Your natural inclination will be to keep the heli really low to reduce the risk of damage. You actually want the model flying at least at eye-level: This will get the heli out of ground effect and make it easier to control. If you are comfortable, hover the model even higher, as the extra altitude allows more room to correct errors.



Keep a good distance between you and the model, as well as between the model and the ground.

4 Do not worry if you have a hard time keeping the heli in one place at first; do your best, and land the model as often as needed to regain your composure.

5 Begin focusing on keeping the helicopter in the same altitude and position throughout the flight, which is much more than just keeping the heli in the air. Draw an imaginary box on the field, or use visual markers and try to keep the heli in that box. As you progress, make the box smaller. The end goal is to be able to keep the heli in an exact spot for a whole flight.



For good practice, imagine a box in the air where you are flying, and try to keep the heli in that space.

Keep repeating the above steps as much as needed. There is no set amount of flights required for a person to learn to hover a heli comfortably. Take your time, and have fun with it.



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MASTERING **THE HOVER**

Of course, once you master keeping the heli hovering in one spot, you are not done yet. You will want to practice hovering the helicopter with each side facing you until those orientations are mastered. Then you need to begin hovering with the nose of the model facing you. This is called nose-in hovering and is very important in your progression as a pilot.

Remember that when the nose of the model is facing you, your cyclic and tail controls will be reversed from your perspective. Instead of flying the helicopter from your point of view, try to control the helicopter from the perspective of a pilot inside the model. Right cyclic will always move the helicopter to its right regardless of how it is oriented to you.

Once you have mastered hovering the heli at all upright orientations and have mastered forward flight and basic flips and rolls, the next exciting stage begins: Inverted hovering! Learning to hover inverted is the same process as hovering upright.



Inverted hovering is fun to learn and to watch. Even though inverted hovering sounds more difficult than upright hovering, the learning process is the same.

TWO TIPS FOR **LEARNING HOW TO HOVER INVERTED**

1 Take the heli up as high as you can so you can bail out when needed.



2 Practice getting inverted and your bail-out maneuver until they are second nature. I like to flip the heli backwards into an inverted hover and, when I need to bailout, pull the stick back to flip it back over. This is the same as a full flip, just paused in the middle to hover the machine.



CONCLUSION

Though hovering is considered the first step in a helicopter pilots training regimen, it is one of the hardest maneuvers to truly master when you consider all the hovering orientations there are. Enjoy the journey, take the time to truly control your model, and the benefits of your work will show up in every maneuver you do. See you at the field! **TREX**

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| Transmitter Size: | 50mm x 17.5mm | USB Charger: | 5v 300mA |
| Working Current: | 30mAh | TX Output: | 20dBm / 100mW 2.4Ghz |

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TRANSMITTER



RECEIVER



ANTENNA MOUNT



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BREAK IN YOUR ENGINE

Break it in right!

WORDS: Ryan Kephart | PHOTOS: Jason Boulanger

TUNING YOUR NITRO MOTOR IS ONE STEP TO PROVIDING THE MAXIMUM POWER your engine can produce, but breaking in your engine can also mean the difference between a smooth powerful engine and a rough, sluggish engine. Properly breaking in your engine is not all that difficult and does not take a lot of time. We are here to guide you through the proper way to break in your nitro engine and we will even throw in a few tips for you gas lovers.

DOES YOUR FUEL SELECTION MATTER?

Helicopter fuel contains additional oil content over airplane fuel or car fuel. This extra oil comes in handy when limited airflow is distributed over the head of the engine. If you are using 30% or 15% nitro, the fuel will still have enough oil to properly break in your engine. Decide what type of fuel you will want to run throughout the life of the engine and stick to it. If you plan on doing some 3D flight in the future, go with 30%. If sport flying or scale is more your type, then use 15% nitro.



» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

2.0



» TIME TO COMPLETE



1-2 Hours

» TOOLS NEEDED



■ FUEL



■ SMALL FLAT HEAD SCREWDRIVER



■ MARKER



■ TACHOMETER

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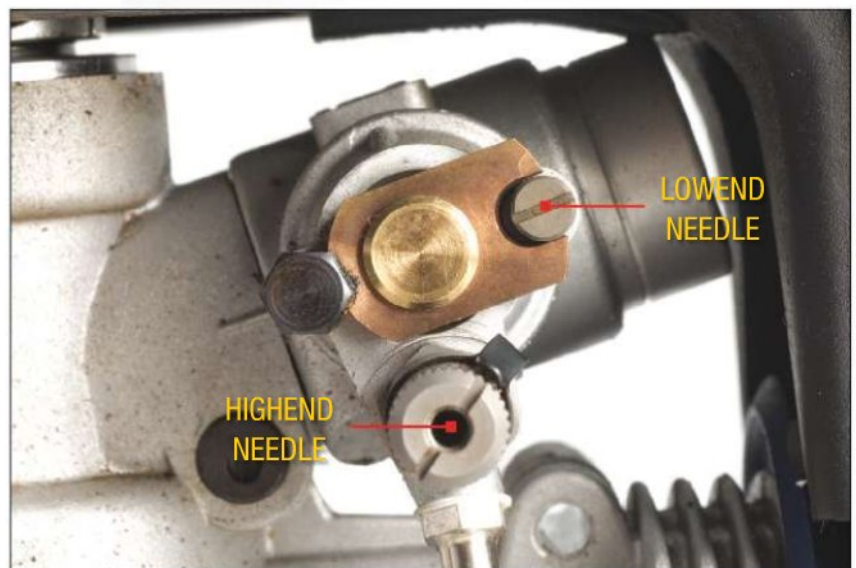
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SKILLS

NEEDLES: WHAT THEY DO AND HOW TO USE THEM.

Every nitro engine has a set of needle valves that regulate the fuel-to-air mixture before it enters the compression chamber. Some carburetors utilize more than two needles to allow for adjustments to the low, mid, and high range. Mid range needles are not common amongst 50 sized engines but are frequently used in our 90's. For this article, we will stick to the basics of adjusting the low and high range needles. Your engine usually comes with a manual that will give you break-in needle settings. These are a good estimate of where your needles should be. The settings are read by threading the needle in, until it stops. Be careful not to tighten it too much, as this could damage the needle. Once the needle is resting against the stop, you can loosen the needle the given number of turns. Marking the needle with a felt tip marker, to identify how many turns you loosen the needle, also helps. Needles work by limiting the amount of fuel going into the carburetor; they are essentially a small angled needle that rests inside a cone. Turning the needle clockwise will allow less fuel into the carburetor, resulting in a leaner mixture. Counter-clockwise turns allow more fuel, resulting in a richer mixture. These settings also apply to the low-end needle valve.



Every engine is designed a bit different, the low end needle might be on the other side of the carb. The low end usually has a standard flat screwdriver head, and the high is usually knurled and able to turn by hand.

RAY HOSTETLER'S

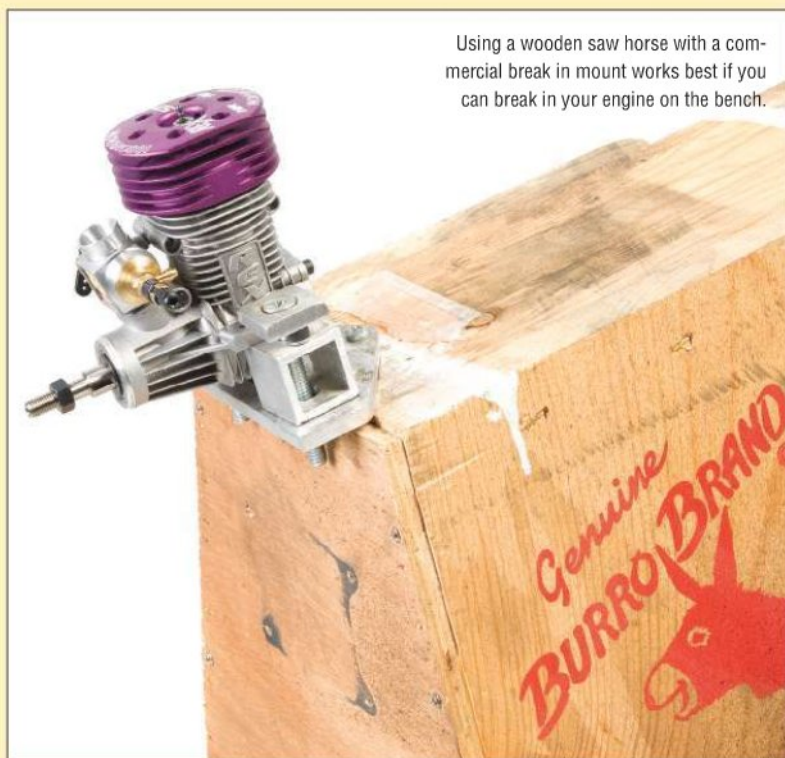
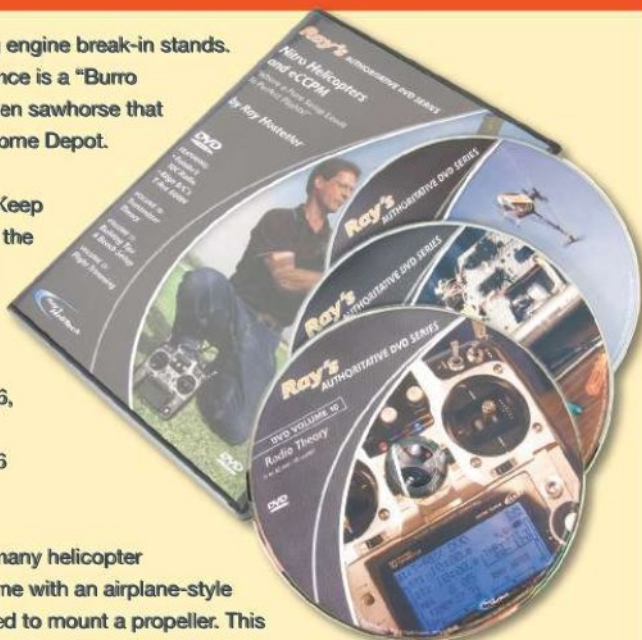
EXTREME TIPS FOR BREAK-IN

Ray prefers using **engine break-in stands**. His latest preference is a "Burro Brand" 24" wooden sawhorse that you can find at Home Depot.

PROP SELECTION: Keep in mind you want the load factor down and the RPM up.

90: 16 X 14
60: 11 X 6, 12 X 6, 13 X 6
50: 10 X 6, 11 X 6
32: 9 X 6

Be advised that many helicopter engines don't come with an airplane-style thrust washer used to mount a propeller. This may be available as an extra, or possibly not available at all. In this case, you have no choice but to break in the engine in the helicopter.



Using a wooden saw horse with a commercial break in mount works best if you can break in your engine on the bench.

TIP: On the bench, if at all possible, use the muffler/tuned pipe combination that you're going to use in the helicopter. The point is to keep everything the same from the bench runs to the final installation in the helicopter.

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FLYBARRLES

SKILLS

WHAT SETTINGS AND PROCEDURES SHOULD BE USED FOR BREAKING IN AN ENGINE?

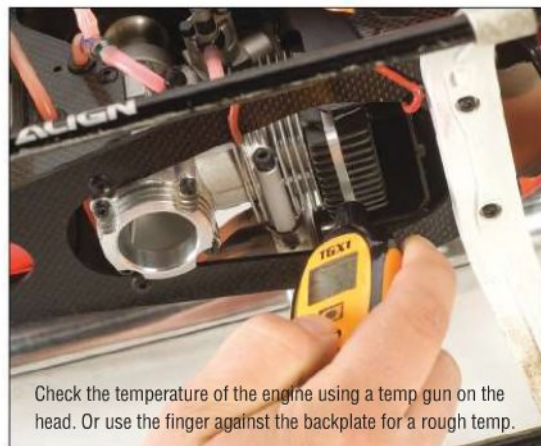
When breaking in an engine, you will want to strive for a rich setting, but want to still be able to fly your helicopter without it bogging to the point that the head speed cannot reach flyable speeds. A new motor will usually have the low-end needle pre-adjusted for a reliable idle, but sometimes this needle needs to be adjusted. Reference the manual to find a starting point and then back the needle out about $1/8^{\text{th}}$ of a turn. This will result in a little richer fuel mixture, which should be a good starting point. The high-end needle should also be adjusted a little on the rich side. Back out the high-end needle about a half a turn during break-in. Start your engine and allow the temperature to come up. Allow the helicopter to idle for about a half a tank, and then bring the throttle up a little

so the helicopter just starts to spool up. If the engine dies, or does not want to spool up, lean out the low end by just a few degrees. A little hesitation is ok and is a sign of a rich setting. Start to alternate from $1/4$ stick to idle for the rest of the tank. Let your engine cool down to room temperature between runs. Fill the tank back up and let the engine warm up. After the engine is warm, bring the throttle up and hover the helicopter. Do not put a lot of load on the engine by bumping the throttle up and down; keep the helicopter in a low stable hover for about a minute. Set the helicopter back down and let the engine idle. Alternate every minute with the helicopter hovering and idling for the next few tanks of fuel. On the fourth tank of fuel, you should be able to adjust the low end a little leaner, to provide a

smooth transition into a hover. Go ahead and lean the high-end needle about a $1/4$ turn. This setting should still be rich, but will allow you to fly the helicopter around without it dying. Keep your eye on the smoke trail, as you should see plenty of smoke when you are breaking in. Fly your helicopter around in forward flight, staying smooth on the sticks and not placing a lot of load. Do this for the fifth tank of fuel as well. On the sixth tank of fuel, your engine should be close to broken in. Lean the fuel mixture on the high-end needle out, until your engine is tuned. Move the needle a small amount and fly your helicopter for about a minute. Land and check the temperature of the engine by placing your finger on the back plate. You should be able to hold your finger there for about five seconds. If it still feels cold, lean out the mixture and fly your helicopter, land, and recheck. Repeat this process until you can hold your finger on the back plate for around 5-7 seconds. This should get you in the ballpark.



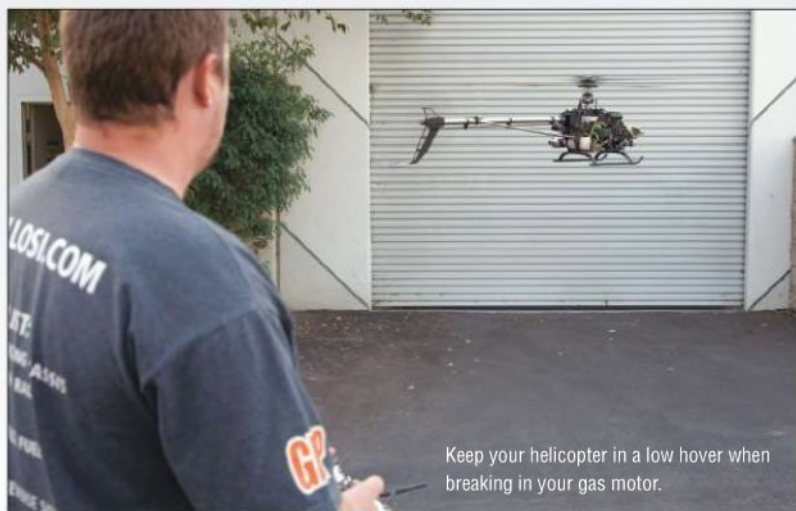
Adjust the high end needle to achieve a rich setting in a hover.



Check the temperature of the engine using a temp gun on the head. Or use the finger against the backplate for a rough temp.

» BREAKING IN A GASOLINE-DRIVEN ENGINE

Gasoline engines are not far off from nitro motors. The carburetors in both are much like each other, as they both have a high and low needle valve for adjusting fuel mixtures. With a gas engine, you will also want to heat cycle your engine, by allowing the engine to heat up for a minute or two and then cool back down by running it at idle. One of the biggest differences in breaking in a gas engine in over a nitro is fuel selection and oil content. You will want to break in a gas motor using a castor-based two stroke oil for at least a gallon of fuel, mixed to a ratio of around 32:1. After running this fuel mixture, you can run fully synthetic two-stroke oil with a ratio of 32:1 to 40:1. Adjust your needles accordingly, to keep the temperatures in check, while breaking in your motor. A little hesitation or gurgle is fine for the first gallon of fuel.



Keep your helicopter in a low hover when breaking in your gas motor.

TIP: Don't bog the engine too much during break in. Gas engines are loud and can fool you into thinking the head speed is too high. Keep the RPM's up and the load down when breaking in your engine.

THAT'S A WRAP!

Properly breaking in your engine will give it a longer life and more power through its life span, compared to an engine that was thrown in and pushed to its limits. A piston and sleeve require a special bonding that takes place within the first few flights of your helicopter. This bond allows the piston ring to seat inside the cylinder sleeve and so that they match each other perfectly and allow a high compression. If the engine is not broken in properly, this seat can be non-uniform, which will allow some compression to be lost. Take your time and do it right; you will not regret it in the long run. **THE**

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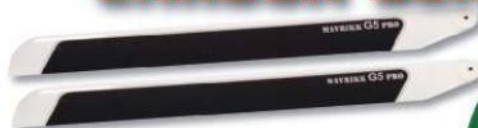
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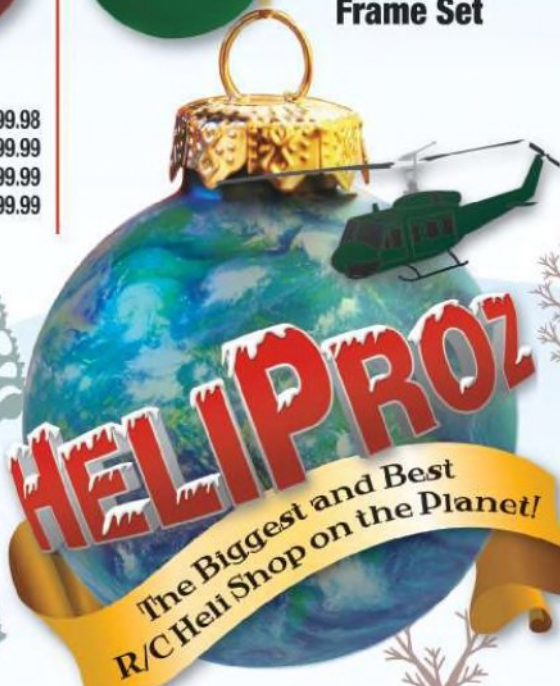
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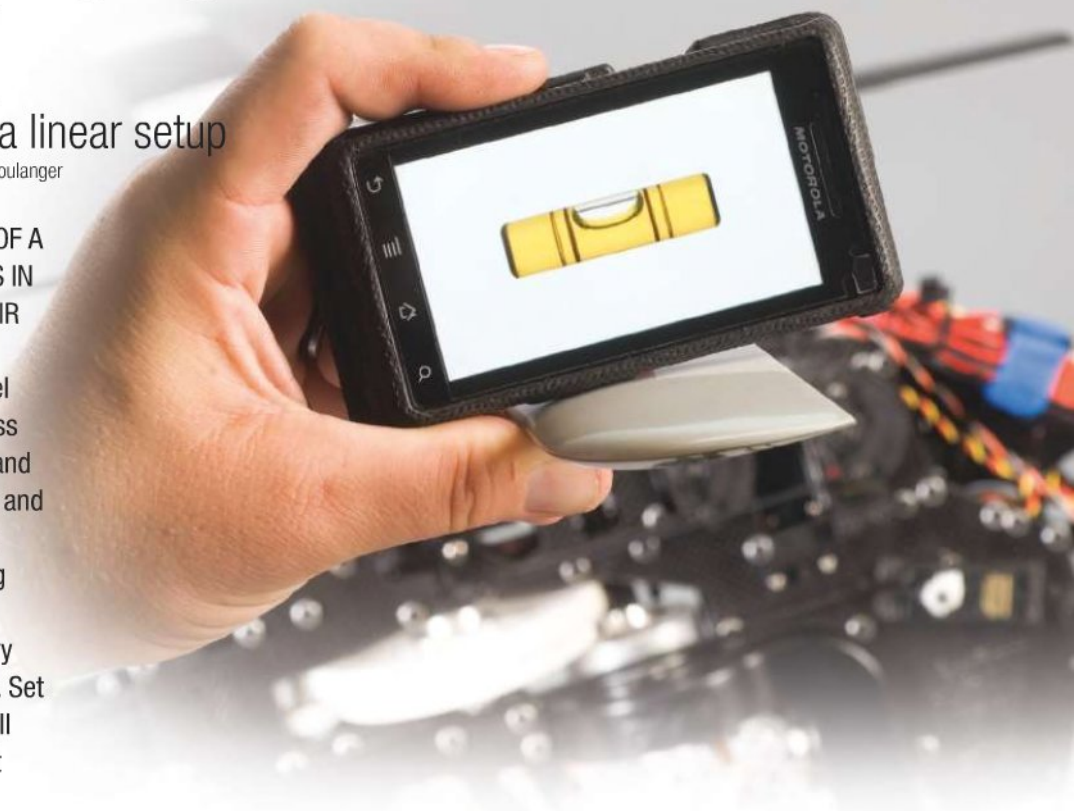
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SETTING UP PITCH

The backbones of a linear setup

WORDS: Jim Innes | PHOTOS: Jason Boulanger

THE ANGLE OF ATTACK OF A HELICOPTER'S BLADES IN FLIGHT IS CALLED THEIR PITCH. Knowing how to set up the pitch range on a model helicopter is crucial to success in this hobby. Too little pitch and the heli will not fly; too much and you risk stalling out the rotor. Luckily, the process of setting the pitch on these models is quite simple and requires very little in terms of tools or time. Set the pitch properly and you will be rewarded with an efficient model that performs well.



DROID!!!!

» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

2.0



» TIME TO COMPLETE



45 Minutes

» TOOLS NEEDED



■ PITCH GAUGE



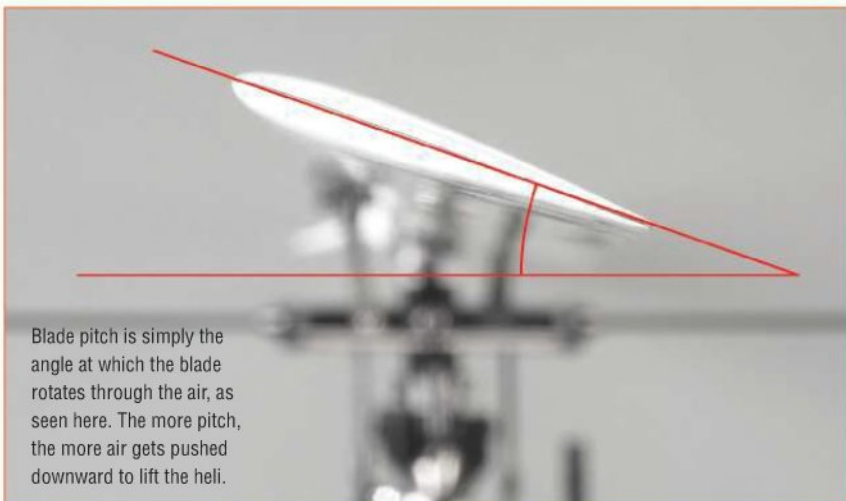
■ LEVEL



■ BALL-LINK PLIERS

PITCH, WHY IS IT IMPORTANT?

Blade pitch gives a helicopter its lift; without some sort of pitch in the blades, a heli could not fly. While some models are fixed pitch, meaning the angle of the blades is set at the factory and never changes, all 3D capable helicopters are equipped with collective pitch systems. Collective pitch systems allow the pilot to change the blade pitch as desired. Thanks to collective pitch, RC helis can do aerobatics, fly inverted, and do all manner of 3D maneuvers that would be impossible to do otherwise.



Blade pitch is simply the angle at which the blade rotates through the air, as seen here. The more pitch, the more air gets pushed downward to lift the heli.

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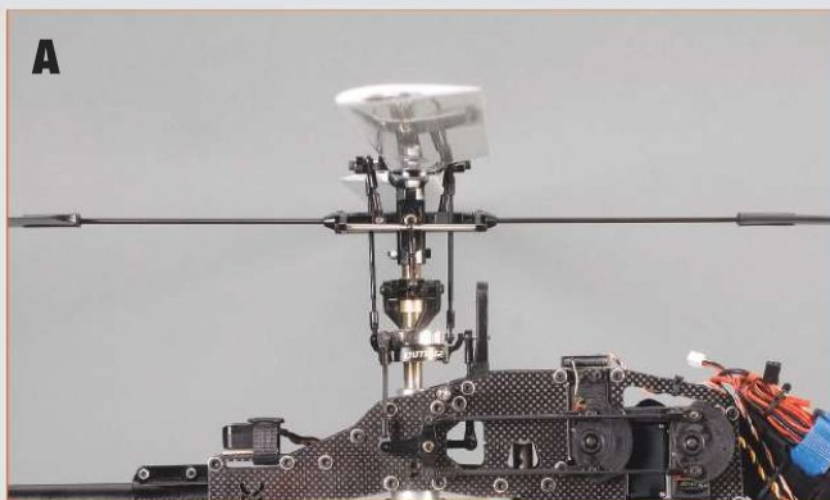
PITCH, HOW DO I MEASURE IT?

Let's jump right into how to measure the pitch of a helicopter blade. First, we need to get the helicopter placed properly. **(A)** Put the heli on a level work surface with enough room around it to rotate the rotor disk without hitting a wall or other object. Straighten out the rotor blades so they run inline with the rotor head and with each other. On a helicopter with a flybar on it, you need to level the flybar so that it runs perpendicular to the model's main shaft. You can use a lock to hold the flybar in place, or just keep a hand on it. If you have one, you can place a line level on the flybar so you can check that it stays level as you go. Flybarless models need to have the heli set level on the work surface so that the main shaft is perpendicular to the surface. A pitch gauge with a built in level is highly recommended as well.

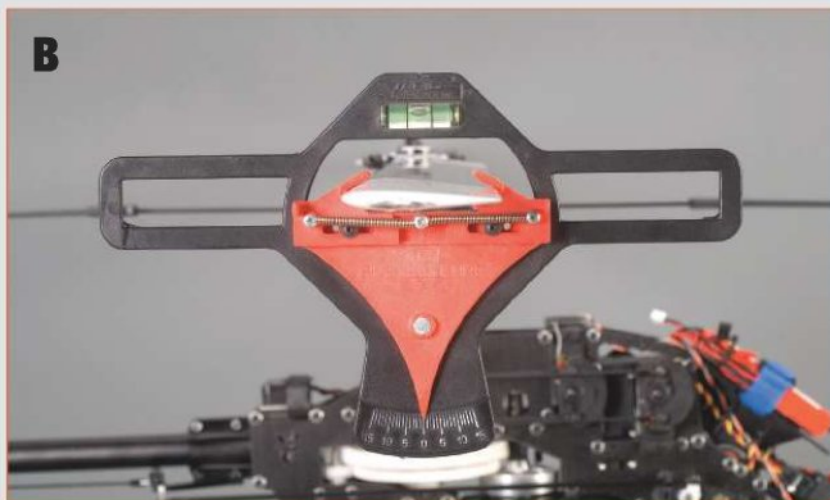
Now that the model is ready, turn the radio on and center the stick, make sure that your motor will not engage if the heli is electric—either set the throttle output to zero in the radio or unplug the motor from the ESC. **(B)** Place the pitch gauge near the end of a blade, within four inches or so from the tip. You want to measure pitch at the blade ends as that is where most of your helicopter's lift is generated.

Checking the pitch is as simple as lining up the flat edge of the pitch gauge with the level flybar. **(C)** Whatever the gauge indicates is the current blade pitch. On a flybarless model, you would line the gauge up using a level instead. As long as the heli is level and the flat edge of the gauge is level, the proper pitch will be indicated.

Repeat the measurements above on the other blade, as well as throughout the pitch range to make sure both blades are equal. Use your ball-link pliers to adjust the blades as needed.



With the machine and flybar leveled out, you are ready to measure and set the blade pitch.



Mid-stick on the radio and zero degrees at the blade is a great starting place when setting up the pitch. If things line up well here, the rest of the process is a piece of cake.



Here we see that at full stick on this particular model, we are reading ten degrees of pitch. We can verify that the other blade is tracked in with this one by moving the pitch gauge to it, while leaving the transmitter stick in the same spot.



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GOOD INITIAL SETUP IS KEY

The previous process assumes that the machine has been set up properly. The most common method, and the one I use as well, is to center everything up as you build the heli, so that the middle of the mechanical range of the head components results in zero pitch at the blade grips. This means running all mixing arms, washout arms, and servo arms so they are in their neutral position when the swash is at the center of its available movement range on the main shaft.

The same is said for the radio and collective/cyclic servos. Plug in the servos and set the collective stick to the center and make sure your pitch curve is set in a straight line, with 0% at the bottom, 50% in the middle, and 100% at the top. With the radio and receiver on, the servos will move to their center so that the servo arms can be installed in the proper neutral position.



Having a neutral setting on all control arms when at zero pitch is highly recommended. This type of setup gives the greatest flexibility in programming at the radio.

90° + 90° - 90° = 90°

DON'T FORGET THE CYCLIC

As you are moving along checking pitch ranges, take a minute and check the cyclic pitch on your model while you are at it. This is simple to do: set the main blades to zero pitch and run the blades parallel with the boom and body of the model. Give a left or right aileron and you will see the blades change their angle. With the pitch gauge on the blade, give a full aileron input and align the gauge with the flybar again. As long as you started at zero, the reading on the gauge will be your max cyclic pitch for the aileron.

Repeat the above for the elevator input, by turning the rotor so that the blades now run perpendicular to the boom and body of the model.



It is important that you see what kind of pitch is being added to your blades via cyclic commands, so you know what true total pitch potential your machine is running with.

RADIO ADJUSTMENTS

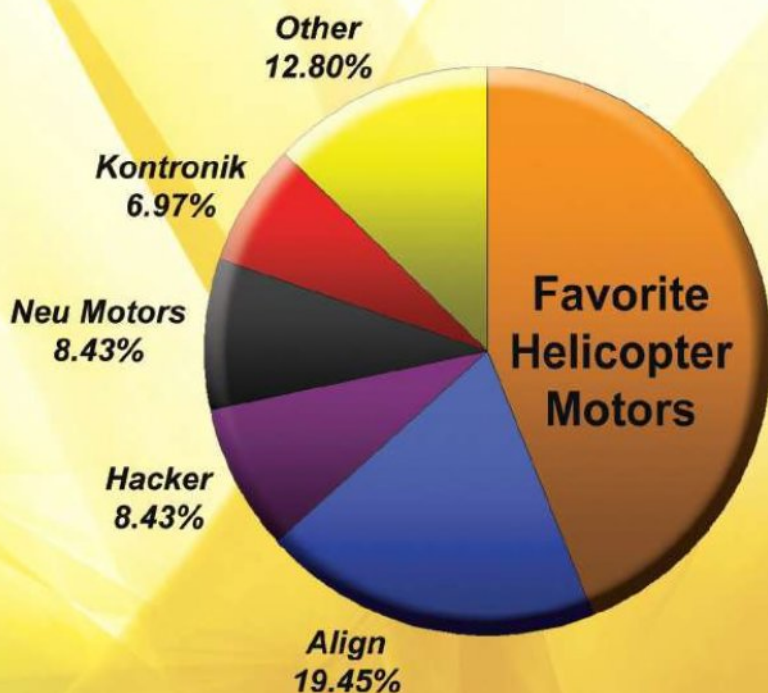
The great thing about setting your helicopter mechanics so that the collective uses a straight and symmetrical pitch curve is that you can then use the radio to make any change that you want. You can add or take away overall pitch by simply adjusting the CCPM swash mix (or adjusting the collective servo endpoints on single-servo mechanical setups) or you can tweak individual ends of the pitch range using your pitch curves. A symmetrical pitch layout gives the flexibility to adjust the pitch to match any flight style without needing to adjust anything on the model.



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2009 Survey by RC Heli Resource.com



In a recent survey by RC Heli Resource.com*, pilots were asked to select their favorite Heli Motor. When the votes were counted, Scorpion was the overwhelming winner, with more votes than the next 4 motor brands combined!

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*For complete details about the survey, please visit www.rcheliresource.com/results-2009-visitors-choice-awards/

www.freedomis.net

WHAT PITCH RANGE SHOULD MY HELI BE RUNNING?

How much pitch you run is purely a personal preference, but there are things to consider before deciding how much pitch your model should run. First, remember that helicopter blades generally stall out at around 17-18 degrees of total pitch (that's collective + given cyclic pitch). Seasoned pilots with good stick management can run pitch ranges that would exceed 17 degrees if full collective and cyclic were applied simultaneously, as they know when to back the collective off to add cyclic and vice-versa, as needed. Second, consider how you fly. The list to the right charts average pitch ranges for different flying styles and heli types:

Of course, the above list is based on my observations over the years. There are just as many different "preferred" pitch setups around as there are helicopters out there. The bottom line is to find what will work for you without stalling out the blades. Also, the truth is that more pitch does not always equal better.

I have seen some of the great pilots in this hobby do amazing things running just average 3D pitch settings. It is all in how you manage the sticks! In fact, if you are not good at stick management yet, I recommend staying away from extreme pitch ranges to avoid stalling out the model until your skills improve.

- 3D Maniac with good stick management: +/- 13 degrees or more on collective, 8 degrees or more on cyclic.
- 3D pilot: +/- 10 to 12 degrees on collective, 6 to 9 degrees on cyclic
- Sport pilot: +/- 10 degrees on collective, 6 degrees on cyclic
- Beginning pilot: +10 degrees on the top of the collective and -2 or so at the bottom (helps reduce damage potential when the collective is slammed down in a panic). Cyclic is run at 5 to 6 degrees.
- Scale pilot: depends on the bird, but usually around 10 degrees collective at the top and -2 or -3 at the bottom. Cyclic is generally set at 5 or 6 degrees still.



CONCLUSION

The pitch ranges on your model determine how much pop and overall speed the model will have, both in standard flight and in aerobatics. It is important for your progress in the hobby that you know what kind of range to run as well as how to set it up. By setting things up mechanically neutral in your model, you are then able to tailor the pitch ranges to fit any flight style, right from the radio. Set your pitch exact enough on the bench and you will find no need to make adjustments to tracking when you take off for the first time. See you at the field! *[THH]*

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Looks like the 50NX canopy to me!





RADIKAL G20

This 20CC is totally Radikal!

WORDS: Ryan Kephart | PHOTOS: Jason Boulanger

Century Helicopters is no new company to the gasser world. It has produced the popular Predator line of gassers and has had great success creating different versions of the model. Century has continued its innovative designs in a completely new class of gasser that has rarely been seen. The newest gas helicopter named the Radical fits into this misfit class with only a few other competitors in this market. The 20cc class helicopters are a breed that fits in somewhere between a 50 and 60-sized nitro. Let's take a look at the Radical and see how well this helicopter will perform including 3D maneuvers.

California Dirt = Dirty Helicopter

» AT A GLANCE

| | |
|-------------|----------------------|
| SIZE: | 640 |
| POWER: | 20cc Gasoline Engine |
| TYPE: | Pod and Boom |
| BUILD TYPE: | Kit |
| TAIL DRIVE: | Belt |

FEATURES

The Century Radical features a split frame design that allows the engine to be removed without separating the frames. The Radical is controlled by a push-pull bell crank system that controls a 120° CCPM swashplate. This helicopter uses a popular 20cc airplane engine made by Zenoah. Century makes several different variations of the Radical, which include a G10 frame with both a heavy duty and a standard head. We are reviewing the heavy duty carbon fiber version. Century also offers several different gear ratios for the Radical depending on your flying style. We will be trying out the 1:6 and 1:6.4 gear ratios.

» MAIN FRAME



SWASH CONTROL: The control is accomplished by a 120° CCPM system that utilizes bell cranks to achieve a push-pull linkage. The bell cranks are bearing supported and offer a smooth action to the swashplate.

DESIGN: The design of the frames was Century's key feature in producing a gas helicopter with an engine which is fairly easily removable in case of any problems. The frames are a split one-piece design that allows you to separate the front half from the back. The frame halves connect much like a puzzle and are secured using the bolts that attach the clutch assembly and the lower engine plate. A mix of plastic parts and metal bearing blocks separate the frames to about 52mm. This wide frame design was required to fit the bigger gasoline-powered motors.

COMPONENT LAYOUT: The servos are laid out around the swashplate with most of the servos up front, with the exception of the elevator and tail servos. The receiver and its battery fit on a radio tray that sits behind the fuel tank. Above this radio tray a gyro plate is incorporated into the tail boom clamp using a separate carbon fiber plate. The electronic ignition and its battery sit at the front of the helicopter on a plate that has cutouts that provide a way of strapping the electronics down.

CANOPY: The canopy was not a complete redesign from Century, but rather the same exact canopy as the NX50. The canopy is made from a plastic bleach bottle that has been pre cut and ready to add the windscreen. Holes for the canopy grommets need to be reamed out. Century includes with the kit a tinted windscreen that needs to be cut out and trial fitted before it is secured down using six self-tapping screws. The canopy is mounted to the frames using two canopy standoffs and grommets in the back and a slide-on clip in the front.

LANDING GEAR: The landing gear uses the standard four-piece design and attaches to the frames using four screws that thread into the engine plate. The skids are attached to the strut using setscrews to hold them in place.

Clean on the inside and out

» DRIVE TRAIN

ENGINE/MOTOR MOUNT: The engine is secured to the frames at multiple points. Four screws thread into the back plate of the engine. A G10 plate is also attached to the crankshaft side of the engine and is mounted on aluminum channels that also serve as a mounting point for the lower main shaft-bearing block.

CLUTCH/PINION: The clutch system on the Radikal is much like that of a nitro. The clutch bell is made from aluminum and has a fiber liner. The clutch has a one way bearing pressed in to allow for easy start up. The clutch is threaded onto the fan hub and must be secured using a red thread lock or it will back off when starting the Radikal. The pinion is threaded onto the clutch bell.

COOLING FAN AND SHROUD: The cooling fan is made from aluminum and incorporates the magnet used for the electronic ignition. The fan has also been balanced by drilling two holes next to the magnet to counter the weight difference. A G10 plate is installed on the engine before the fan is installed. Three screws hold the plastic molded fan shroud to this plate.

MAIN GEAR: The main gear is made from a durable Delrin plastic and has helical cut teeth. This provides

a smooth gear train that is not only durable but quiet as well. The main gear is comprised of 84 teeth and is mounted to an aluminum hub that houses a one way bearing for the autorotation drive.

AUTOROTATION DRIVE: As previously mentioned, a one way bearing is pressed into the main gear hub. A thrust bearing and two main shaft bearings support the whole drive unit. The tail is driven during autorotations.

TAIL DRIVE: The tail is driven from a secondary gear that meshes with the main tail drive gear that is directly connected to the main shaft. The secondary gear is attached to a shaft that drives the tail pulley. These gears are also made from the durable Delrin. The tail belt is supported and guided with an idler pulley located at the tail case.



“THIS GAS HELICOPTER IS A PERFECT OPTION FOR A PILOT LOOKING TO GET THE MOST OUT OF FLIGHT TIME WITHOUT HINDERING THE FLIGHT PERFORMANCE.”

Century RADIKAL G20 MODEL SPECIFICATIONS

| | |
|--------------------|-----------------|
| CLASS: | 640 Gasser |
| BUILD: | Kit |
| BLADE SIZE: | 640mm |
| LEVEL: | Novice-Advanced |

FRAME

| | |
|--------------------------------|------------------------|
| MATERIAL: | Carbon Fiber |
| TYPE: | One Piece Split Design |
| SERVO TO SWASH LINKAGE: | Push Pull Bell cranks |
| SERVO SIZE: | Standard |

ROTOR HEAD

| | |
|--------------------|--------------------|
| GRIPS: | Plastic |
| HEAD BLOCK: | Aluminum & Plastic |
| LINKS: | Ball |
| SWASH: | Aluminum & Plastic |
| CONTROL: | CCPM 120° |

TAIL

| | |
|---------------------------|------------|
| DRIVE SYSTEM: | Belt Drive |
| AUTO DRIVEN: | Yes |
| TAIL PITCH SLIDER: | Single |
| TAIL BLADE GRIPS: | Plastic |
| TAIL CASE: | Plastic |
| BOOM MATERIAL: | Aluminum |

GEARING

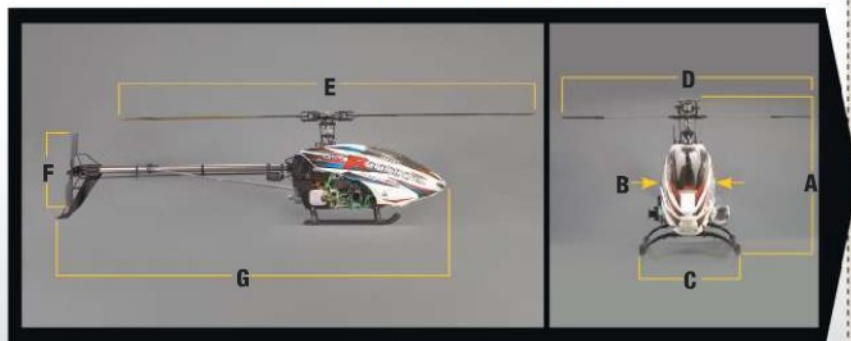
| | |
|------------------------------------|--------|
| MAIN ROTOR TO PINION RATIO: | 1:6.01 |
| MAIN ROTOR TO TAIL RATIO: | 1:5 |

WEIGHT

| | |
|----------------------|--------------------------|
| EMPTY: | 6 lbs., 13 oz. (3,089g) |
| WITHOUT FUEL: | 10 lbs., 11 oz. (4,847g) |
| FULLY LOADED: | 11 lbs., 7 oz. (5,189g) |

DIMENSIONS

| | |
|-----------------------------------|-------------------|
| HEIGHT (A): | 15.3125in (389mm) |
| CANOPY WIDTH (B): | 6in (152mm) |
| LANDING GEAR (C): | 10in (254mm) |
| PADDLE TO PADDLE DIA. (D): | 27in (686mm) |
| MAIN ROTOR (E): | 56.75in (1,442mm) |
| TAIL ROTOR (F): | 10.25in (260mm) |
| LENGTH (G): | 52in (1,320mm) |



FEATURES CONTINUED

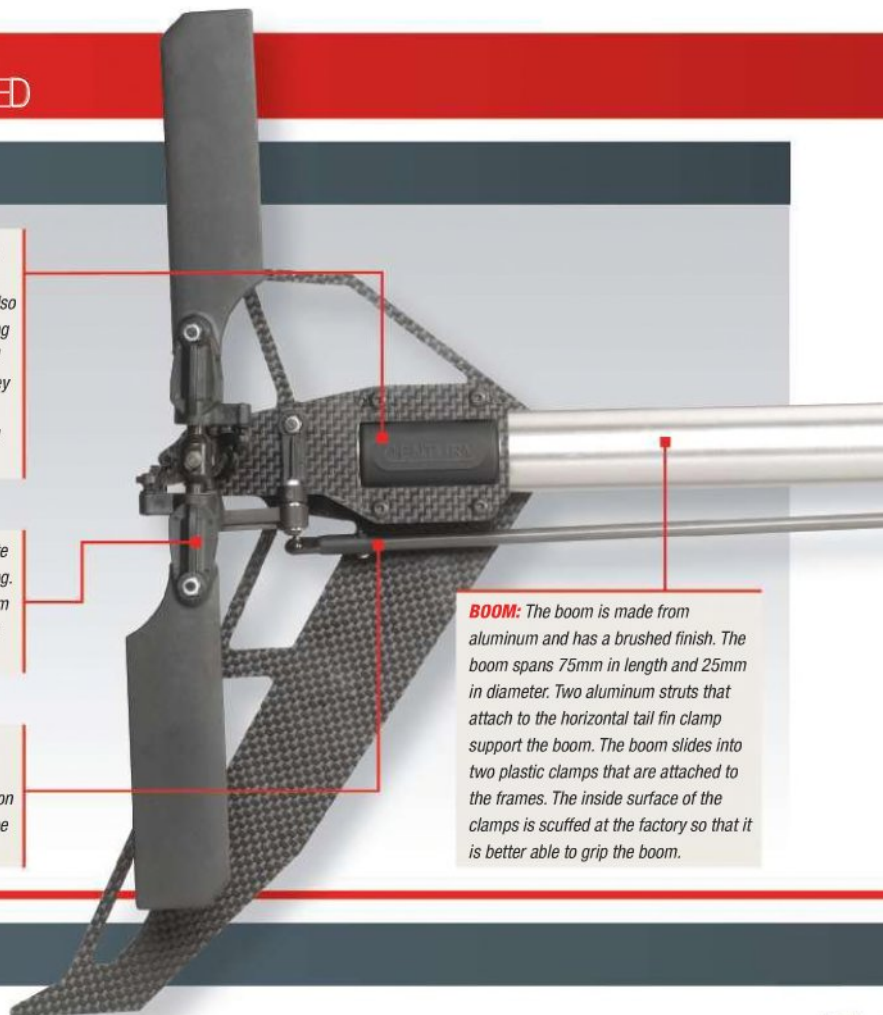
» TAIL & BOOM



TAIL CASE: The tail case is a two-piece plastic clamp that also serves as a mounting point for the vertical tail fin. An idler pulley is used to keep the belt taut on the tail shaft pulley.

TAIL BLADE GRIPS: The tail blade grips are composed of composite plastic and are supported by two radial bearings and a thrust bearing. The grips attach to the tail hub by sliding them on and securing them with a locknut. The tail blades attach to the grips using a single bolt that is threaded into a locknut.

PITCH ACTUATOR SYSTEM: The pitch actuator system is a single point design. The bell crank attaches to an aluminum post and is supported by two bearings. The bell crank actuates the pitch slider on the tail shaft using a plastic ball. The pitchfork links are pinned to the slider and do not require retaining clips.



BOOM: The boom is made from aluminum and has a brushed finish. The boom spans 75mm in length and 25mm in diameter. Two aluminum struts that attach to the horizontal tail fin clamp support the boom. The boom slides into two plastic clamps that are attached to the frames. The inside surface of the clamps is scuffed at the factory so that it is better able to grip the boom.

» ROTOR HEAD

HEADBLOCK: The headblock is a mix of aluminum and plastic. The plastic yoke is pressed onto the aluminum center section. The block is secured to the main shaft using a Jesus bolt and two screws that clamp the block secure. A single damper in each end of the headblock performs the dampening. The blade grips are held onto the spindle by a bolt that threads into the spindle.



BELL/HILLER ARMS: The Bell/Hiller arms are made from aluminum and mount to the blade grip pitch arms. No output options are available but they offer five different input options. The arms are dual ball bearing supported.



PHASING: The phasing is handled by a separate aluminum-phasing ring with two steel pins pressed in. The phasing ring can be adjusted on the main shaft and is locked down by two setscrews. The washout base slides smoothly and has no noticeable slop.

WASHOUT ARMS: The washout arms are made from molded composite plastic and are dual ball bearing supported. The links are pinned to the arms and do not require clips. The arms have no output options.



» INSTRUCTIONS & BUILDING TIPS

WHEN YOU OPEN THE BOX

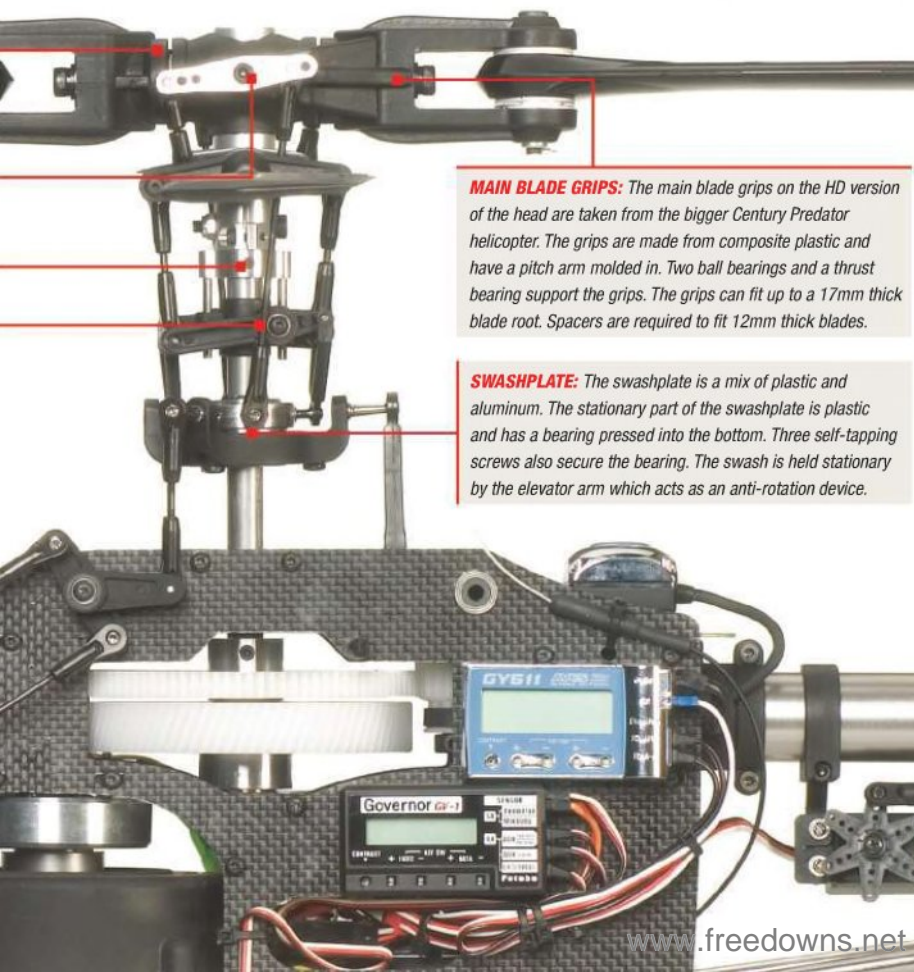
Upon opening the box, you will find the Radical nicely and neatly packaged. The parts are packaged in sections and are sealed off from each other to prevent damage and scratching during shipment. A comprehensive decal sheet and paper manual are included.

MANUAL AND BUILD

The manual does a great job of explaining the build.

Detailed pictures and exploded views aid in the assembly. Text is also

included in the manual to explain in detail how the sections are assembled. Building the Radical is much like building any nitro machine. The clutch system is a cinch and Century includes a manual on how to remove the prop hub. The split frame design takes a bit of getting used to, but once you figure out how to remove the front half, it becomes a time saver when maintenance is required on the engine or clutch system.



MAIN BLADE GRIPS: The main blade grips on the HD version of the head are taken from the bigger Century Predator helicopter. The grips are made from composite plastic and have a pitch arm molded in. Two ball bearings and a thrust bearing support the grips. The grips can fit up to a 17mm thick blade root. Spacers are required to fit 12mm thick blades.

SWASHPLATE: The swashplate is a mix of plastic and aluminum. The stationary part of the swashplate is plastic and has a bearing pressed into the bottom. Three self-tapping screws also secure the bearing. The swash is held stationary by the elevator arm which acts as an anti-rotation device.

Century RADIKAL G20 RTF & TEST GEAR

» TEST GEAR



■ **RADIO:** Hitec, Aurora 9, 191244, \$430



■ **RECEIVER:** Hitec, Optima 7, N/A, .60oz. (17g), Included with radio



■ **CYCLIC SERVOS (3):** Hitec, HS-7940TH, 37940S, 2.4oz. (68g), \$150 ea.



■ **THROTTLE SERVO:** Hitec, HS-7940TH, 37940S, 2.4oz. (68g), \$150



■ **TAIL SERVO:** Futaba, S9256, FUTM226, 2.0oz. (57g), included with gyro

■ **GYRO:** Futaba, GY611, FUTM0825, 2.01oz. (57g), \$400



■ **ENGINE:** Zenoah, G20E, G20E, 33oz. (935g), \$340



■ **BLADES:** RotorTech, 640mm, 640mm CF, not yet released



■ **PIPE:** Century, Torpedo Slim, CN3070, 7.7oz (220g), \$135

Only the best of the best gear.

TESTING

We tested the Radikal with the latest and greatest gear to get a true feeling of how well this helicopter would perform. The Radikal was set up with digital Hitec servos rated for 7.4 volts along with the new Hitec Aurora 9 radio with telemetry that can tell your onboard battery voltage. The tail was set up using a Futaba GY611 combo with the S9256. The gas powered Zenoah G20 is regulated using a Futaba GV-1. The Zenoah ignition system requires a 4.8 voltage so I opted for a two cell LiPo and regulated the voltage using a Castle Creations 10amp BEC. Let us take a closer look at how well the Radikal performed.

HOVERING • The hover of this oversized 50-class helicopter was stable and predictable. The heavier weight of the gasoline engine and the 640mm blades made the Radikal nice and easy to control in a hover. The Radikal vibrates a bit more than your standard nitro helicopter, which required a little more foam, tape for the gyro sensor.

Rating: 5

FORWARD FLIGHT • Pitching the Radikal forward it flew much like the NX50. The Radikal flew smoothly and tracked very well through the air. Much like all gassers, the extra weight made the helicopter feel a bit sluggish in the turns but seemed to have plenty of cyclic control to swing the helicopter around with some authority. Overall the forward flight characteristics were very predictable and I felt in complete control throughout the circuits.

Rating: 4

CYCLIC PITCH RESPONSE • Surprisingly, the Radikal felt much better than the NX50. The rate was decent and responded as quickly as I could apply the inputs. Operating the helicopter out of governor mode required a little throttle to cyclic mixing to keep the head speed up, but this is normal for a gas-powered engine. Throwing the helicopter around in governor mode was much more rewarding as the head speed stayed consistent throughout the flight. Rolls and loops were easily accomplished with the Radikal and even some minor 3D maneuvers.

Rating: 4

COLLECTIVE PITCH RESPONSE • The collective was a bit sluggish on the Radikal much like most gassers are, but the Radikal seemed a bit better than usual. Tic tocks and other mild 3D maneuvers were easily accomplished on this size machine. Overall the collective was not as responsive as a nitro, but is well rounded and can handle

most of the maneuvers that you can throw at it. Intermediate and beginner pilots will find this helicopter to be substantially easy to fly and it can help to teach collective management.

Rating: 4

TAIL ROTOR RESPONSE • The tail rotor responds much like other Century helicopters. The belt driven tail is smooth and stops abruptly when you let go of the control input. The tail has plenty of authority to keep stationary when performing maneuvers that require a solid tail. Overall the tail can handle anything that the Radikal can perform.

Rating: 4.5

AUTOROTATION CAPABILITIES • Using 640mm blades on an airframe about the size of a 50 really allows the Radikal to perform great autorotations. Although this helicopter is a little heavy, the smooth autorotation hub and drive train allow for plenty of energy to touch down softly even if you mess up a bit on the flair.

Rating: 4

POST FLIGHT INSPECTION • Going over the helicopter and inspecting every screw and ball, the Radikal seemed to hold up quite well. I did find a few screws a little loose, especially the short screws that are supplied to hold down the boom supports on the boom clamp. Make sure to use a good amount of CA to keep these screws locked down. I had also noticed during the testing process that the clutch has

the ability to slip when starting the helicopter. Make sure to use some red thread lock to keep the clutch from backing off. Overall the Radikal is a reliable helicopter that will provide hours of flights.

Rating: 3.5

CONCLUSION

With the testing complete, I felt that the Radikal is a new size gasser that is here to stay. Performance was above average compared to other gassers I have flown. If you're looking for a great performer that can do mild 3D maneuvers while still being able to fly for around 20 minutes, then the Radikal just might be for you. Although an airplane engine powers the Radikal, it seems to do just fine. With any following we hope that Zenoah sees this size helicopter and specifically designs a motor for helicopters in this size. This will hopefully eliminate the need for a second battery pack and save some weight to allow the Radikal to perform even better. *TBI*



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TESTING SPECS

Century **RADIKAL G20**

Part #: CN1330F

Distributor: Century

Web: www.centuryheli.com

Street Price: \$649

Price as Tested: \$2555

Build/Setup Time: 22 hours

PERFORMANCE

MODE FLOWN: Normal, idle up 1, idle up 2

RPM OF EACH Normal: 1700

MODE: Idle Up 1: 1800

Idle Up 2: 1850

ENGINE TEMP

(after flight): 220° F

FLIGHT TIME: 20 minutes

CRASH COST:

PART PRICES NOT

YET AVAILABLE.

TEST CONDITIONS

WEATHER: Sunny

TEMP / HUMIDITY: 68° F/ 20%

BAROMETRIC PRESSURE: 29.99 in.

WIND SPEED: 6 mph

VISIBILITY: 10 miles

ALTITUDE: 675 feet

PITCH CURVES

NORMAL: -6, 0, 10

IDLE-UP 1: -11, 0, 11

IDLE-UP 2: -11, 0, 11

REQUIRED TO FLY

Radio transmitter, receiver, 3 matching cyclic servos, gyro, 20cc engine, muffler, receiver battery, ignition battery, thread lock, CA, governor, grease.

WHO'S IT FOR?

This gas helicopter is a perfect option for a pilot looking to get the most out of flight time without hindering flight performance. The Radical can be set up to fly both smoothly or aggressively which allows this helicopter to hit a bigger market.

» SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

5 Instructions

4 Parts Quality/Fit

4 Durability

3.5 Tunability

4 Overall Performance

4 Value

+ THE GOOD

- Split frame design
- Good performance for a gasser
- Different versions available for the consumer

- THE BAD

- Tail boom supports need longer screws



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Thunder Tiger
Zenoah



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Exhaust Systems

Hatori
Align
Muscle Pipe
Thunder Tiger
Zimmerman



Exhaust systems aren't cheap. The old saying about getting what you pay for, really applies to your muffler. Of course we want the muffler to be quiet, but we also want it to enhance the performance of our engines. Give us a call and we'll help you choose the right muffler for you. We've tried them all.

Starting Systems

Align
Sullivan
Hobbico
Extensions
Batteries
Battery holders



There aren't very many things that are more aggravating than getting to the flying field and finding out your engine won't start. That's why we always make sure our starter battery is charged and we have a couple extra glo plugs with us. I've used Enya glo plugs for almost 20 years and I don't think there's a better plug on the market. Sure, I've tried others, but I always go back to Enya.

Batteries

Lipo
Lipo Tx Batteries
NiCd
NimH



Wow! Batteries have come a long way! Lipo has changed the way we play, that's for sure. Now we can fly for weeks without charging our transmitter, or fly all day long on one charge of our receiver battery. We have the right battery for you.

Chargers

Bantam
Hobbico
Align
Futaba



Your charger has to keep pace with the battery technology. That's why we like the Bantam line of chargers. A size to fit anyone's needs. From basic chargers to feature rich models such as the incomparable BC8 series. Check them out on our website.

Blades

Mavrik
SAB
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Radix
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ModelSport



Hundreds of blades are in stock. If you call us, we will help you choose the right blades for your model. We put hype aside and use performance as our criteria. We've flown them all.



Here's the bottom line. We carry tools that work, and work well. If a tool doesn't, work, we'll tell you before you spend your hard earned cash!

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RC-Heli

Q&A

WORDS: Brandon Updike

THE MAN

Unless you've been living under a rock for the last seven years, you've most likely heard of at least one of the Szabo brothers if not both. Hailing from Las Vegas, the Szabo name has become synonymous to our hobby like Jordan in basketball or Tiger in golf. Both brothers are lucky enough to have made a career out of the hobby, which has allowed Danny to live comfortably at a young and tender age of 20. He

is currently an employee for the Italian helicopter company ElyQ. He's already a homeowner and has a wide variety of toys to play with when not flying helicopters. Danny was nice enough to invite me to his house for a few days when I got to check out his crib.

Danny

RC

DANNY SZABO

TRAVEL TO ANY HELICOPTER EVENT ACROSS THE GLOBE, AND YOU'LL MOST LIKELY FIND A FEW PRO PILOTS IN ATTENDANCE REPRESENTING THEIR RESPECTIVE COMPANIES. Some of these pilots hold an almost iconic status in the heli community and are even idolized by many. We've all seen how our favorite pilots act at events, but do you ever wonder about their lives outside of the hobby? In this issue of RC Heli, we decided to offer some insight on the life and times of a famous pro pilot. I journeyed to Las Vegas, Nevada, where I met up with Danny Szabo and got to see how he kicks it when he's home. We've decided to format this article after the hit show MTV Cribs; this is like a RC Heli Cribs of sorts.

THE PETS

Now, if you get to know Danny, you'll quickly learn that he's an animal lover; he will often be seen at fun flies with his dog, Spike. Spike is a Jack Russell terrier and has become a popular figure at events because of his friendly yet hyperactive personality. This hyperactive personality also transitions back to his home life, as Spike often runs through the house and plays with Danny's newest addition to the family, Klutch.

Klutch is a half-breed pit-bull who is still a pup. Klutch is very friendly and seems to be getting along just fine with Spike. Then there's Jake, his Savannah Monitor lizard, who spends most of his day sleeping and eating cut-up salmon.



That almost sounds like a cool circus act.

THE CRIB



Welcome, make yourselves at home.



Danny lives in a nice, two-story house in a suburban neighborhood located in Henderson, Nevada. He lives around 15 minutes away from Bennet field, which hosts the Vegas Fun Fly. Outfitted with a two-car garage and three bedrooms, the house is a pretty good size. Once through the door, we first hit a large living room area that serves as the entertainment area. Danny's entertainment system does not disappoint with a 65-in Sharp AQUOS TV, Blu-Ray DVD player, and a surround-sound home audio system. Danny is also an avid gamer and enjoys playing Gears of War on his Xbox 360 online. The couches were quite comfortable and fit perfectly around the living-room area.

Immediately noticeable is the large cage that houses his pet lizard, who proved to be very friendly. The living room area connects to the kitchen where you can often find Danny cooking for his guests. There is also a bathroom located in the kitchen, which at first seems like an odd location but is actually useful. Some sliding doors lead out into the backyard. The backyard is relatively big and has a nice-sized patio area. There is also a bar and another sound system to keep guests entertained during parties and kickbacks. Danny has plans to revitalize his backyard area, and I look forward to seeing what changes he makes in the future.

After looking at the backyard, we made our way upstairs and checked out his master bedroom where he claims, "the magic happens." He sleeps on a nice queen-sized bed that has a 40-in Samsung LCD TV right in front for his viewing pleasure. The window located above his bed has a great view of the Las Vegas Strip. We then migrated to his office room, which houses all of his familiar RC toys. He's got a workbench for all his wrenching needs when working on his Visions. He also has a computer desk with a 24-in iMac desktop and a massive Horizon Hobbies Blackjack 55 boat located on it.



PITTS SPECIAL

HOBBYKING PITTS SPECIAL PLUG-N-FLY

The HobbyKing Brushless Pitts Special is as exciting to look at as it is to fly!

The Pitts comes 97% pre-built and will take you around 10 minutes to attach the main wing and include your own receiver.

SPECIFICATION:

Length: 760mm
WingSpan: 860mm
Prop: GWS 1047
Weight: 540g
Motor: C4038-15 Brushless outrunner 700kv
ESC: 20A brushless
Battery: 11.1v 1300mAh 3S1P (Not included)
Servos: 9g x 3

F4U CORSAIR

HOBBYKING F4U CORSAIR PLUG-N-FLY

The F4U Corsair is accurately moulded and a true representation of the full sized machine. Attention to detail, 20A powerful brushless system, steerable tail wheel and scale less makes it what makes this an excellent foamie.

SPECIFICATION:

Wing Span: 1000mm
Length: 835mm
Motor: C4038-15 Brushless Outrunner 700kv
Battery: 11.1v 1300mAh 3S1P (Not included)
Weight: 570g
Prop: 1160x3
ESC: 20A brushless
Servos: 9g x 4



MIG-15 FIGHTER

R/C DUCTED FAN JET PLUG-N-FLY

The HK Mig-15 foamie is as much fun to fly as it is attractive. The 30A 64mm ducted fan provides more than enough power and the large intake/exhaust make for rapid acceleration and easy takeoffs.

SPECIFICATION:

Wing Span: 800mm
Length: 800mm
Flying Weight: 580g
Motor: B2040-14L-2 Brushless (4000KV)
ESC: 30A
Servo: 4 x 9g
Battery: 1600mAh 3S1P 20C Lipoly Pack (Not included)
EDF Diameter: 64mm

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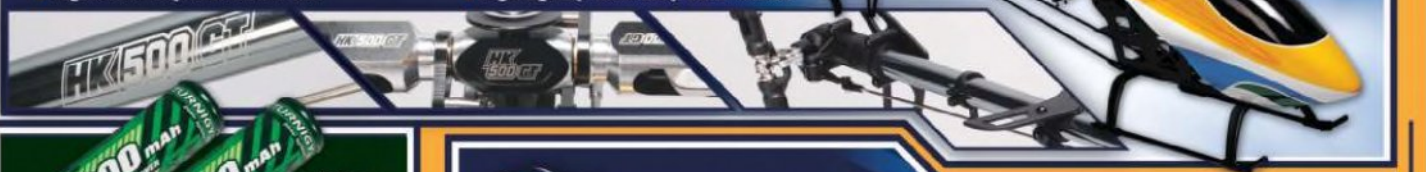
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THE WHIPS

Danny has accumulated a good variety of vehicles over the years, and his current lineup is pretty impressive. I'll give you a breakdown of the whips in which you can see Danny cruising around:

■ His pride and joy, however, is his gigantic red truck on which he's done a lot of work. It is a Dodge 2500 turbo diesel with a mega cab. It has a Bilstein 6-in lift kit on it, KMC XD-series Revolver black 20-in rims, Kenwood in-dash, edge performance chip, four 9-in pro comp heads on the front, and of course the train horn that can be heard a mile away. Everything is blacked out, and it's also covered in vinyls bearing the logo of his new and upcoming clothing line named Mayhem. Be on the lookout for it in the future.



■ His newest addition, a red and black Honda CVR 600RR street bike. It is stock for now.

■ He also recently picked up a 1974 Omega jet boat that is fitted with an Oldsmobile 455 short block.



■ Then there is his trailer, which is a 2007 Titan tandem axial.



■ Danny likes to ride on the dunes, and his vehicle of choice is a Suzuki LT-R450. It is heavily modified with a K&N intake, Yoshimura full exhaust, power commander reflash, Hot Cams high-performance cams, a high-compression piston, and mild porting on the head, and it is retuned to run on C12 racing fuel.



■ His daily driver is a Toyota Yaris that he purchased from his brother, Alan. The Yaris has blacked-out windows, a carbon-fiber body kit, black rims, Kenwood in-dash, JL Audio speaker system, and two 12-in Kenwood subwoofers.



CONCLUSION

As you can see, Danny is doing quite well for himself these days. He is still very active in the heli scene, as he is working hard to help push the ElyQ line and perfect it. He's been flying more than ever lately, so look out for him in the upcoming flying season. He is also very determined to start Mayhem. Not much is known about the clothing line yet, but he's working very hard to get it started. I'm sure we'll hear more about it in the future and we'll continue to see Danny flying for years to come. **THEL**

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PILOT PROFILE

BERT KAMMERER

Pilot and friend

WORDS & PHOTOS: Mike Velez

I FIRST MET BERT IN 2006 AT THE IRCHA JAMBOREE. I WAS DRIVING THROUGH THE HOTEL PARKING LOT AND SAW SOMETHING IN A PARKING STALL THAT LOOKED A LITTLE OUT OF PLACE. I picked it up and it was a fully-stocked shiny case for a Futaba 14MZ, radio and all. Figuring that it didn't just fall from the sky, I took a closer look and discovered it belonged to a pilot named Bert Kammerer. The following day, Bert and his radio were reunited. Since then I've considered Bert not only one of the country's top 3D pilots, but a good friend. At the recent HeliProz Grand Opening, I had the opportunity to sit down with Bert for a few minutes and find out a little more about him, to share with you.

PILOTING BACKGROUND

Bert started flying helicopters in 2004. Before that, he'd been flying radio control airplanes since he'd been a kid. Bert's first helicopter was a little \$150 fixed pitch machine. If any of you have ever attempted to fly one of these early fixed machines, then you know it's no easy task. With a background in airplanes, he managed to at least get a flavor for helicopter flight and was bitten by the bug bad enough to invest in a more capable machine soon after. Bert was so enthusiastic about the hobby that he routinely began flying nearly every day at a local field a few miles from his home in Orlando, Florida. Less than a year into flying, he was approached by Tim Schonard from Miniature Aircraft to become a field rep. Bert's work schedule allowed him to travel often to fun-flies around the country and he soon caught the attention of Jason Krause and Align. Since then, Bert has been flying for Align with a full sponsorship. His other sponsors include Heli Wholesalers, Spektrum, Thunder Power, O.S. Engines, Byron Fuels, and others.

Today Bert doesn't fly quite as often as he used to. He says that he makes it to the field at least three times a week and will usually get in three to four flights a day. Unlike most pilots, he flies for the enjoyment. Thankfully Bert still loves to fly, but almost every flight is for the sake of testing, whether it be a small part prototype, servo, new fuel blend, or battery. Bert's constantly making notes of flight characteristics from the modifications made. Bert was one of the main test pilots for some of Align's most successful kits, including the T-REX 250. Bert says that during the main testing of that kit, he didn't want to fly anything else and was obsessed with flying the pint sized dynamo.

PERSONAL BACKGROUND

One of the things that struck me the first time I met Bert was how quickly he went from his first flight to becoming a top pilot. Bert definitely possesses some amazing hand-eye coordination that few of us are blessed with, but he also has an unquestionable dedication to the hobby. Bert's routinely attends fun-flies once or twice a month and will have attended 24 separate events in 2009. I asked him what pays the bills and allows him to dedicate so much time to the hobby. "In '99, I purchased a server and went out and sold hosting space on that one server for companies and friends looking for safe and reliable hosting for their websites. Today I'm a partner in a web hosting company. This allows me to work from anywhere in the country, remotely. It's nice to have that kind of freedom and really lets me spend more time on the hobby than most people." Bert's various helicopter sponsorships

now account for half of his income; this has become a full-time job for him. Bert's a do-it-yourself kind of guy—not only does he love flying, he also loves working on his machines and is a huge proponent of routine maintenance and pre and post-flight rituals.

Three years ago, Bert met Suzi Cruse who, at the time, was working for V-Blades, a former sponsor of Bert's. Sparks flew and they've been dating ever since. Today, Suzi is Dealer Sales Manager at ReadyHeli.com. This year, Bert made the move from Orlando to Jupiter, Florida and lives with Suzi. I've seen these two together and love is definitely in the air for this heli power couple.

HELPING OUT

If any of you have met Bert, then you know he's not one to turn a blind eye to a pilot in need. I asked him for some advice for begging pilots. Rather than give flying advice, his words of wisdom were focused on purchasing. "I would tell a new pilot to choose their first kit carefully. Don't do what I did and waste your money on something that's not going to last you very long. Imagine where you want your piloting skills to be in a year or longer and buy for that. Go to your local field and seek advice from the pilots there, or your local hobby shop if they stock helicopters." Bert's best tip for more experienced pilots looking to improve their skills had to do with both purchasing and flying. "One of the things that helped me out the most early on was focusing on one size of helicopter at a time. I see some pilots at the field that bring three different machines out and fly all of them in a day. Your piloting skills will progress much slower when you're not able to focus your attention to one machine. When you're just flying one helicopter, you will spot something that might be out of sorts quicker, your piloting will naturally adapt to the characteristics of that helicopter and you'll be able to progress." When it comes to pure piloting, he recommends mastering the fundamentals first. "I got ahead of myself early on. I tried the hard stuff before I was ready and it cost me. Get comfortable with basic fundamental forward, backward, and inverted flight before you start to attempt the 3D stuff." Bert also recommends spending lots of time on the simulator. This will save you lots of \$\$\$ in crash expenses and get you more and more comfortable with the basics.

Having known Bert for a few years I can tell you that he's a great ambassador for the hobby. His advice appears to be pretty sound and I would definitely heed it if it applies to you. We wish Bert the best, on and off the airfield. **TRE**

AGE: 38

RESIDENCE: Jupiter, Florida

BORN: Frankfurt, Germany

FAVORITE TV SHOWS: Fringe, Weeds

FAVORITE MOVIE: Gladiator, The Patriot, Cold Mountain, Super bad, The Hangover (too many to mention!)

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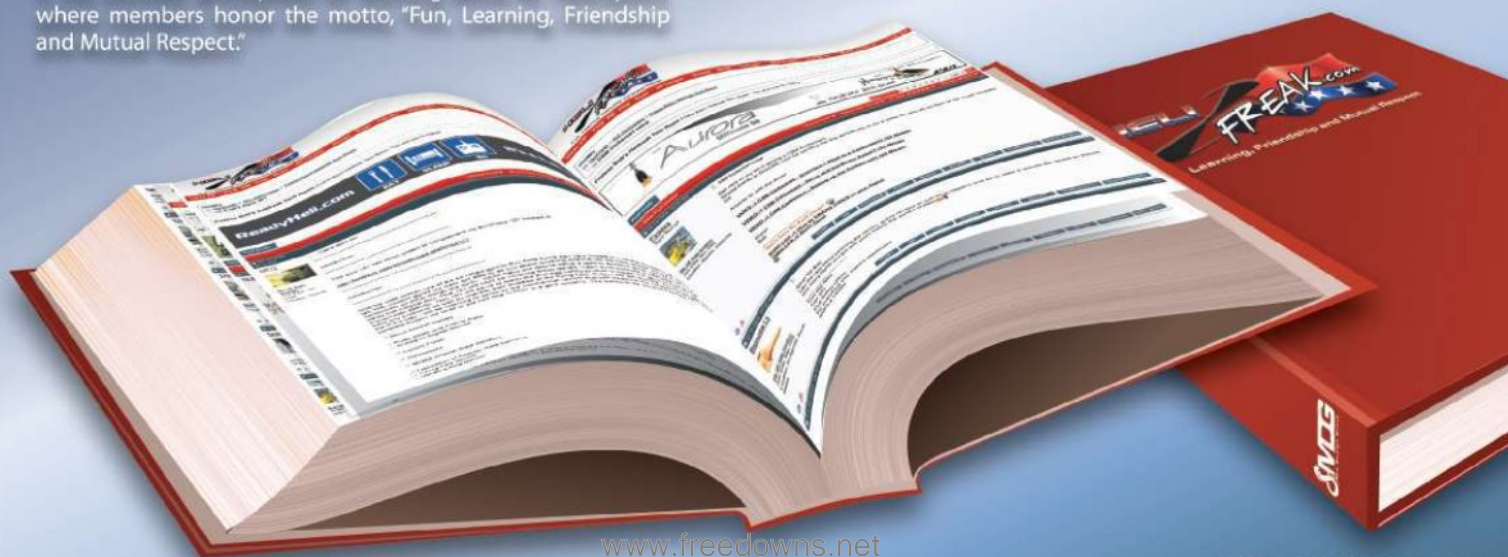
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Fun, Learning, Friendship and Mutual Respect



HELICOPTER PERFORMANCE

Learn how to increase performance by decreasing power required

WORDS: Art Koral | ILLUSTRATIONS: Dave Palacios

THE SECRET TO HELICOPTER PERFORMANCE LIES IN CREATING THE LARGEST DIFFERENCE BETWEEN POWER AVAILABLE AND POWER REQUIRED. The greater this difference the greater the power for climbouts and radical 3D maneuvers. It's no mystery that powerful motors deliver greater performance, but what might be less obvious are the ways to reduce power needed. In this issue of Heli IQ, major sources of power consumption will be discussed, along with some simple methods on how to reduce it, giving your helicopter greater flight performance.

HELICOPTER POWER— WHERE DOES IT ALL GO?

Probably the most obvious place where power is consumed is the main rotor, using approximately 80% of the total power needed. The main rotors use power in two primary ways: to generate lift (**induced power**) and to turn the rotors (**profile power**). **Tail rotor power** consumes about 10% of the power. The rest is consumed by **miscellaneous power**, including transmission friction losses, parasite drag, and the creation of additional flow phenomenon not used to generate lift such as swirls generated in the rotor wake and blade tip vortices.

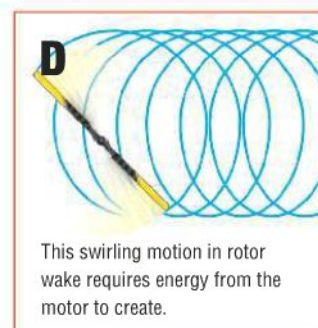
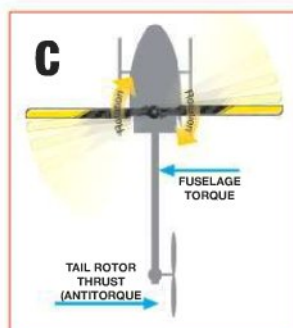
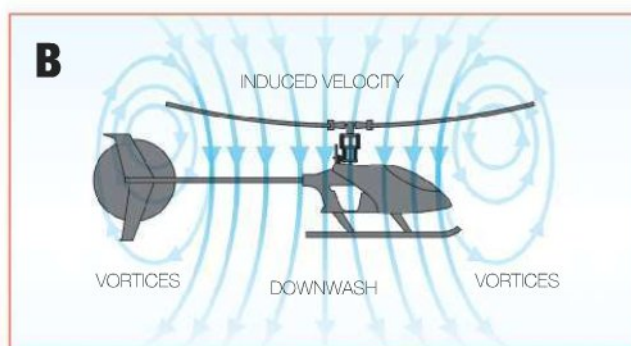
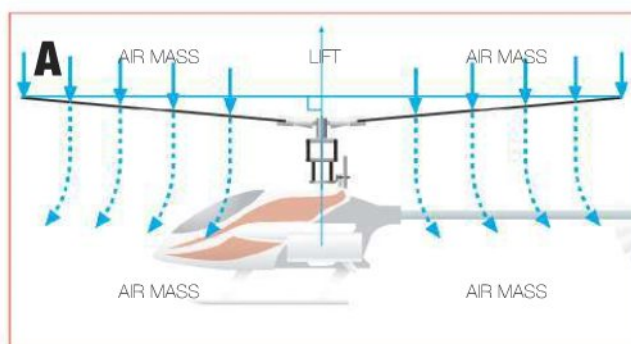
INDUCED POWER (A) can be thought of as pumping power. Imagine the rotor head as a giant air pump, and you'll get the idea. The more air pumped, the more power required.

Not all the air is pumped efficiently. Some of the pumped air is circulated back into the rotor system in the form of blade tip vortices, increasing the induced power required.

PROFILE POWER (B) is needed to overcome the drag forces caused by the blade's profile against the rotational wind. Increasing blade width, thickness, length, and pitch angle increases profile drag proportionally, requiring greater profile power.

TAIL ROTOR POWER (C) is used to power the tail to overcome main rotor torque. This power is consumed in much the same way as the main rotor in the form of induced and profile power.

MISCELLANEOUS POWER (D) is the rest of the power not consumed by the main rotor or tail rotor. Some power is used to overcome friction losses from rotating and moving components. Some is used to overcome parasitic drag forces created by the fuselage as it moves through the air. And some is wasted creating by-products of induced flow, such as trailing wind swirls formed by the rotation of the main rotor formed in the wake of the helicopter.



PUTTING IT ALL TOGETHER

HOW TO INCREASE PERFORMANCE BY DECREASING POWER REQUIRED

Knowing how power is consumed, we can optimize the way we fly and the configuration of our helis to reduce it. Main rotor power, tail rotor power, and miscellaneous power can be reduced with some simple setup and flying tips.

How To Decrease MAIN ROTOR POWER

REDUCE WEIGHT • Force is required to lift a helicopter. That force comes from the second law of physics ($F = \text{Mass} \times \text{Acceleration}$). Air is accelerated to create this force. A decrease in weight of the helicopter will require less force and thus less air needs to be pumped. Pumping less air requires less induced power.

You can reduce the weight of your helicopter in many ways—lighter servos, RXs, and batteries, and by using lighter materials such as carbon fiber, plastic, aluminum, and titanium. Try to avoid components that are stronger than you need. They will only add weight, and many stronger components will still break in a hard crash. Plastic main blade grips are often replaced with costly metal ones with little value added other than looking nice.

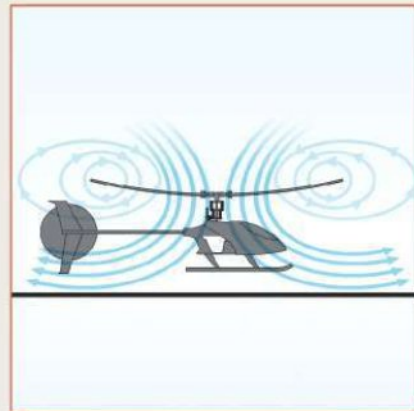
FLY THE RIGHT ROTOR BLADES AT THE RIGHT RPMs • Excessively high RPMs or large rotor blades will increase profile power required. High RPMs may be desirable for 3D flight but are unnecessary for beginners and scale flyers. After 1800 RPMs for most 50-size helis, profile power dominates, consuming considerably more power as RPM increases.

TAKE ADVANTAGE OF TRANSLATIONAL LIFT • Moving into forward flight reduces induced power required. This phenomenon is known as translational lift and is caused by the helicopter entering undisturbed air that's overrunning its tip vortices and shifting the induced flow horizontally, requiring less pumping energy. Take advantage of translation lift to increase the duration of a flight, break in a motor, or gain momentum and extra energy for performing 3D aerobatics.

TAKE ADVANTAGE OF GROUND EFFECT • Within about $\frac{1}{2}$ rotor diameter, less air needs to be pumped due to the interaction with the ground and the reduction in blade tip vortices.



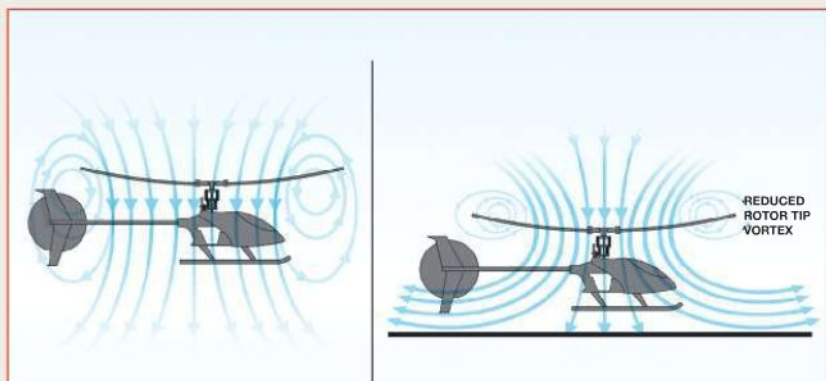
MAH blades are designed with a taper decreasing profile drag from root to tip.



With the helicopter in a hover, induced flow is higher due to the vertical movement of air and the generation of tip vortices increasing power required



In forward flight, vertical induced flow is reduced and vortices are overrun, decreasing power required.



Flying low to the ground is not only cool, there is an added benefit of ground effect, giving a little more power just prior to popping into a 3D maneuver.

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How To Decrease TAIL ROTOR POWER

PIROUETTE WITH THE TORQUE • Get that 10% back from the tail to power your head by going with the torque and not against it. If your rotors turn clockwise, your heli will want to turn counterclockwise, so pirouetting to the left will keep more power to your rotor head.

FLY THE RIGHT TAIL ROTOR BLADES •

As with main rotor blades, larger than necessary tail rotor blades will use more tail rotor profile power.

How To Decrease MISCELLANEOUS POWER

REDUCE FRICTION AND TRANSMISSION

LOSSES • Binding gears, worn-out bearings, and poorly lubricated parts cause higher transmission losses. Keep your helicopter well lubricated, replace worn bearings, and keep belt tension and gear mesh just right, reducing power transmission losses.

REDUCE PARASITE DRAG • Reducing the cross-section of the canopy seen by the rotor head and the relative wind will reduce parasite drag and improve performance.



The Synergy N9 canopy uses a low profile design, allowing the air to slip around it with minimum parasite drag.

CONCLUSION

It's not just the motor that gives you performance. Optimizing your helicopter's configuration and smarter flying will decrease the power required. Benjamin Franklin said, "A penny saved is a penny earned." Of course, you're not going to save any pennies flying RC helicopters, but less power needed is more performance gained. **THE**





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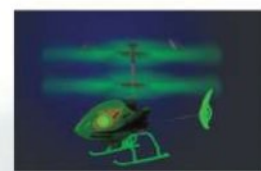
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BACKWARDS ROLLING CIRCLE

Two Moves at Once!

WORDS: Brandon Updike | PHOTOS: Carl Hyndman

I'M GOING TO GO AHEAD AND THROW IT OUT THERE...THE ROLLING CIRCLE IS A TOUGH MANEUVER. WITH THAT BEING SAID, THIS MONTH'S PILOT SKILL IS GOING TO BE A TRICKY ONE. My good friend Ryan has been struggling trying to learn the rolling circle. So, with intense pressure, he persuaded me to do an article on how to properly perform one. The rolling circle is a move that's been around for a while and is still used extensively in the competitive scene. XFC loves using the rolling circle in several different variants for its Known Maneuver segment. First popularized by planks, it has since crossed over to the heli scene, where it has been proven much harder to perform (that's right, I took a jab at the plank pilots). So, in this flight school, we're going to attempt to tackle this monster and break down how to do this maneuver.

This one is tough.

Flight School Training

SETUP:

If you are ready to tackle a maneuver of this magnitude, then I'll assume your helicopter is probably set up for 3D flight. Just be sure to have a good roll rate, so get some lighter paddles and increase your cyclic throws. The speed of your roll rate varies from pilot to pilot; some prefer it to be faster, while others prefer to have a slower rate. Play around with it and find out what feels best for you. A well running motor is also a must, so you'll have that consistent energy to carry you through the circle. A roll can be quite demanding on your helicopter—paired with the circle, it can wreak havoc on your motor if not flown properly.

PRACTICE:

The first thing you want to master is performing a regular roll properly. Work on your rolls in all orientations and characteristics of flight. This includes

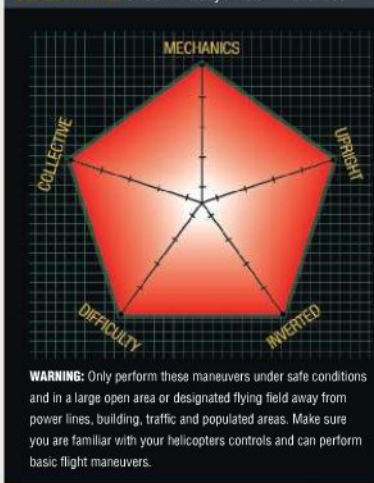
working on your stationary rolls and rolls while moving forward. Work on your collective management during the rolls, as this is key to pulling off a successful rolling circle. You also want to be comfortable in doing a large circular circuit, so practice some large circuits in forward flight, inverted flight, backwards flight, and backwards-inverted flight. This sounds funny, but you'll be surprised how turning into yourself affects some pilots. You don't want to get disoriented during that phase while rolling, because it can be quite dangerous. It will also help you with your turning abilities on all aspects of the circuit. Tail inputs are extremely important, so you'll need to learn which tail input does what during all aspects of your roll.

FLYING THE MANEUVER:

You can perform the rolling circle either going forwards or backwards, with the latter being easier, in my opinion. Going

» SKILLS NEEDED

SCALE RATING: GREEN = Easy / RED = Advanced



backwards is a little easier because the tail will naturally point downwards, giving you that angle of momentum to carry you through the move. I will, however, go over both orientations.

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BACKWARDS FLIGHT

You can begin your backwards circuit in one of two ways. The first is just merely entering the circuit during backwards flight, while the other is entering it while flying backwards inverted. I personally like entering it backwards inverted because you can get greater momentum when applying full negative pitch. I will explain the next steps from the backwards-inverted position, going counter-clockwise.

START

1 Pull back on your cyclic stick while applying negative pitch, to get yourself into a backwards-inverted circuit..

6 Repeat steps 1-5 until you do a complete circle. Pay attention to how wide you make your circle and always keep it out in front of you. Sometimes pilots misjudge the size of their circle and almost end up hitting themselves when flying the helicopter back towards them.

5 Now make your turn while you're flying backwards inverted, by moving your cyclic and tail to the right while adding negative pitch. You want to also pull back on the cyclic to carry yourself through the turn. However you always want your tail to point towards the ground, so make any necessary adjustments to maintain that perfect angle to make sure you don't lose any momentum. If it is a little high, push forward on your cyclic to bring it back down. If your tail is dipping too low, pull back on your cyclic to bring it back up a bit. However if you're in knife-edge flight, you're going to have to use your rudder control to maintain that angle. With the skids facing you, left tail input will move your tail towards the ground, while right input will move it up into the air.

Note: Always watch the angle of your helicopter! You want your tail to point towards the ground at a slight angle so that you will maintain your speed. The angles are perhaps the most important aspect of a rolling circle, so you must be constantly correcting to maintain a straight line. For the most part, the tail will naturally want to dip towards the ground; this is why it is easier to perform a rolling circle backwards.

FORWARD FLIGHT:

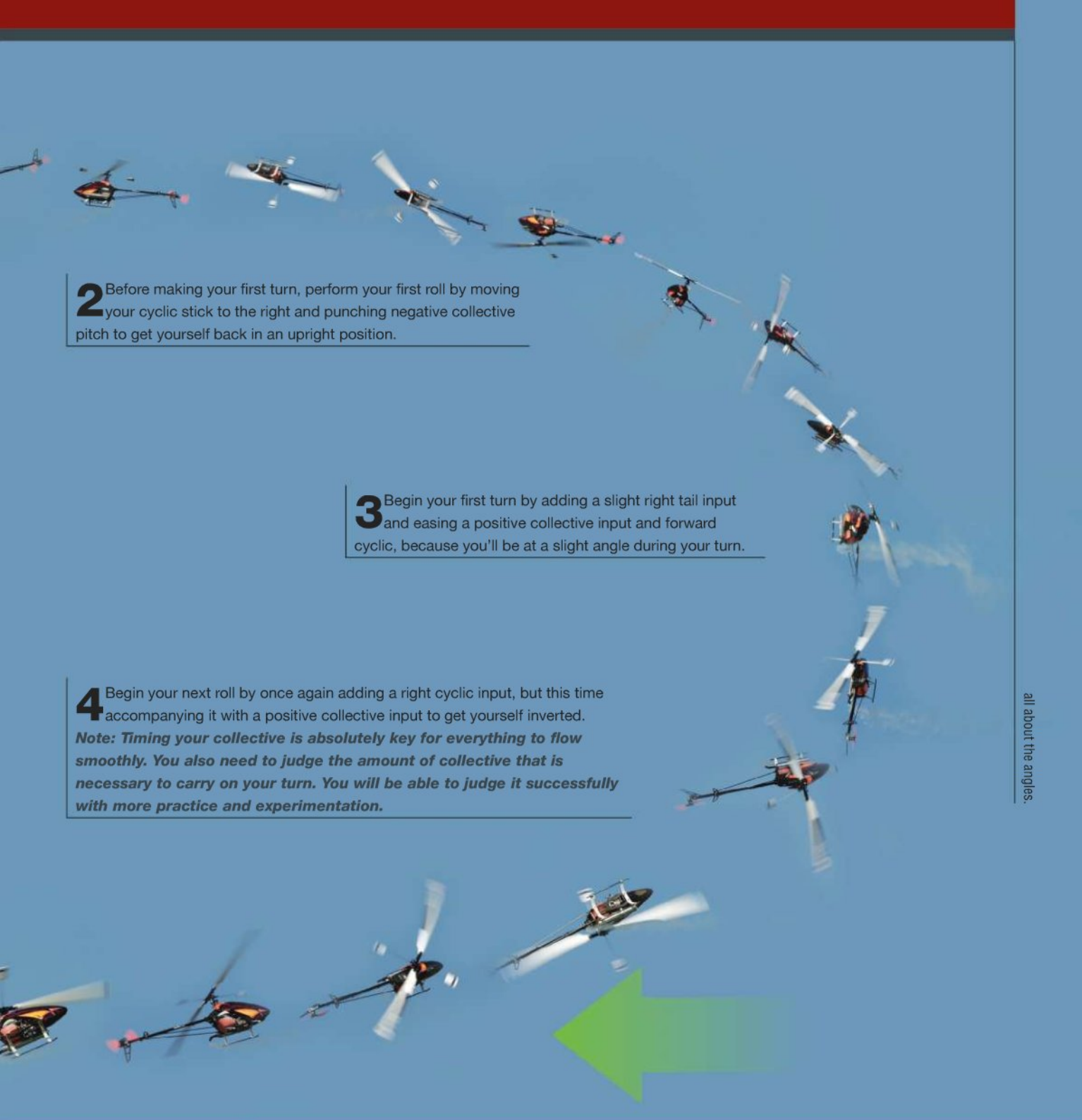
Forward flight incorporates many of the same steps mentioned above, but is a little trickier. Keeping the nose down throughout the circle is pretty tough, because it has a tendency to want to come up rather than down. While turning, you'll have to make sure that the nose stays down to avoid losing forward

momentum, so be ready to apply forward cyclic when necessary. You can pretty much follow the same steps as mentioned above, by making the necessary orientation changes for your stick inputs.

THINGS TO WATCH OUT FOR:

I stated it before, but I can't stress it enough: keeping the perfect angles is the

key to the rolling circle. If you can maintain that perfect line, paired with perfect collective management and the collective inputs, this move will be a snap for you. I know...it's a lot easier said than done. This is the type of maneuver that takes a lot of practice to really get down, because so many variables can go wrong. The main thing to remember (if going backwards) is to watch your tail. If your angle is too



2 Before making your first turn, perform your first roll by moving your cyclic stick to the right and punching negative collective pitch to get yourself back in an upright position.

3 Begin your first turn by adding a slight right tail input and easing a positive collective input and forward cyclic, because you'll be at a slight angle during your turn.

4 Begin your next roll by once again adding a right cyclic input, but this time accompanying it with a positive collective input to get yourself inverted.
Note: *Timing your collective is absolutely key for everything to flow smoothly. You also need to judge the amount of collective that is necessary to carry on your turn. You will be able to judge it successfully with more practice and experimentation.*

steep, your rolls will look very sloppy—or worse, you'll risk possibly crashing straight into the ground. Another thing to look out for is the diameter of your circle. Make sure you keep your circle far enough away so that when you start coming back towards yourself, you won't have to risk possibly hitting yourself. Always have an escape plan and be ready to bail out at any given time, just in case your rolling

circle comes in a little hot. Be easy on the collective; try your best to really time the rolls perfectly, because the wrong collective inputs at the wrong time can put a halt on your circle.

CONCLUSION

This isn't a maneuver you'll be able to pick up right away; it'll most likely take some

time to perfect. Use the tips and follow the steps above and just go out and practice it. Just remember to be safe and keep the helicopter at a distance, at a high altitude, so you'll be ready for anything. **TED**

RAINBOW

Somewhere over the rainbow, heli's fly...

WORDS: Brandon Updike | **PHOTOS:** Jason Boulanger

IF YOU'RE GETTING PAST THE LEVEL OF PERFORMING BASIC FLIPS AND WANT TO KNOW WHERE TO GO FROM THERE, the Rainbow is a great next move. A few years back, the Rainbow was the hottest move and was taking the heli world by storm. One of the best things about the Rainbow is that it can be altered in many different ways, making it a versatile maneuver. It is also an easy maneuver to pull off, so it's good for 3D beginners trying to expand their flight catalogues. There are several different orientation changes in a Rainbow, so performing it helps boost confidence with your orientation. In this Pilot Skills, we'll break down the Rainbow step by step to help you perfect it.

WARNING: One thing to remember is you'll be starting off to one of your sides when performing this maneuver; this can be tragic if you get disoriented because you'll be flipping toward yourself. If you cannot maintain a straight line and you make a wrong input, you can crash into yourself or the pits. The first few times you try this move, keep it up high in the sky, and get the motions down. You don't necessarily have to go from one end of the field to the other.

6 Once your helicopter levels, add a slight positive input to prevent it from hitting the ground, and center your cyclic stick back to its normal position.

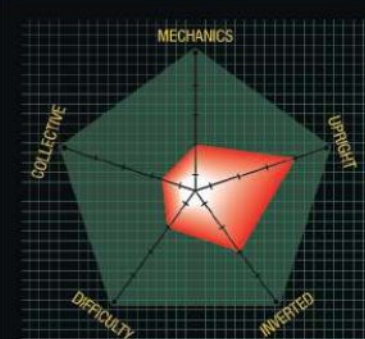
5 Keep adding negative collective and forward cyclic until the tail starts pointing toward the ground. Then begin moving your collective stick back to center.



Flight School Training

» SKILLS NEEDED

SCALE RATING: GREEN = Easy / RED = Advanced



WARNING: Only perform these maneuvers under safe conditions and in a large open area or designated flying field away from power lines, building, traffic and populated areas. Make sure you are familiar with your helicopters controls and can perform basic flight maneuvers.

BEFORE YOU BEGIN:

- The Rainbow is pretty much an extended forward or backward flip where your helicopter makes an arch across the runway.
- The better your motor is running, the easier this maneuver can be performed; even though it is not a collective-intensive maneuver, the helicopter will need to climb through the air.
- Work on all your orientations because your orientation will change throughout the entire maneuver. You don't want to panic halfway through and get disoriented because you can possibly crash into yourself.
- A well setup tail with a high-end gyro is a definite plus but not necessarily required.

HOW TO PRACTICE FOR IT:

- **THE BEST WAY** to work on performing a Rainbow is by performing flips in a sideways orientation.
- **WORK ON THESE FLIPS** in a slower motion, and practice making all the necessary corrections until it becomes second nature.
- **GRADUALLY BEGIN** adding more collective between each point of the flip so your helicopter begins gaining momentum across the center line.
- **KEEP WORKING** on these tricks until you're able to perform a high, arching rainbow over the runway.

3 Continue to add these inputs. When your helicopter's nose is pointing toward the ground, begin dropping collective stick toward the center.

START

1 Start off in a hover on either side of the field (in this case the right side).

4 Once inverted, ease the collective stick toward the negative pitch range while continuing to keep the cyclic stick pushed forward.

2 Gradually add positive collective and forward cyclic input really softly.

CONCLUSION

There are many variations of the Rainbow being performed by many pilots today, and that makes it one of the most effective maneuvers out there. There isn't really a maneuver like it, and it is pretty fun to perform. It will really get your heart going the first time you see that blade disc flipping toward you then away from you from one end to the other. Have fun, and be safe. **TRE**



CESSNA CH-1

Not the airplane

WORDS: Brandon Updike

For the most part everyone's familiar with at least one variant of a Cessna airplane as their high wing flyers have become a staple in aviation. The Cessna name has become synonymous with training aircraft, as they have taught millions of pilots around the world. With that being known, not many people know that Cessna has developed a helicopter years ago. It is there one and only helicopter, the CH-1 or the military variant, the YH-41 Seneca.

SPECS

CREW: One or two pilots

CAPACITY: four, including crew

LENGTH: 42 ft 6 in (13 m)

MAIN ROTOR DIAMETER: 35 ft 0 in (11 m)

HEIGHT: 8 ft 5 in (2.6 m)

MAIN ROTOR AREA: 962 ft² (89.4 m²)

EMPTY WEIGHT: 2,080 lb (940 kg)

GROSS WEIGHT: 3,100 lb (1,400 kg)

POWERPLANT: 1 × Continental FSO-526
6-cylinder, supercharged, flat engine, 270
hp (200 kW) each

BACKGROUND

The Cessna Aircraft Company had been around since the 1930's but really began to boom during WWII developing trainer aircraft for the military. After WWII Cessna acquired Seibel Helicopter Company and all their designs and patents came with it. Cessna wanted to develop a helicopter so the acquisition allowed the idea to become a reality. Charles Seibel was slated to be in charge of the development of a new helicopter for Cessna. Cessna wanted a light helicopter that had versatile performance capabilities. Seibel thought the idea of integrating Cessna's airplane design into a helicopter would be a great idea. A model with a semi-monocoque that closely resembled a Cessna airplane airframe was thoroughly tested in wind tunnels with prototypes soon to follow. Test flights were then conducted and the CH-1 performed well with capabilities of reaching altitudes of 10,000ft. Testing went smoothly and the CH-1 began to go into

moderate production.

The Army became interested in the CH-1 and showed interest in possibly awarding a contract to Cessna for experimentation. As the details were being ironed out, Cessna decided to improve upon the existing design and developed the CH-1B. The Army decided to purchase ten models solely for testing purposes. The Army quickly found out about the excellent low altitude performance of the CH-1 but was turned off by some of the quirks of the helicopter. It was designated as the YH-41 and proved to be hard to maintain and had payload issues. This was enough for the Army to decide not to mass-produce the YH-41 and the remaining prototypes were designated for miscellaneous flight duties.

FEATURES

One of the most distinct features of the CH-1 is that the supercharged engine is mounted to the front of the helicopter. It was great for easy access and cooling

but proved to be troublesome for a proper exhaust system. Like mentioned before the all-metal fuselage was designed with a Cessna airplane in mind but with a short tail boom it struggled at times in a hover and forward flight. The blades were attached to the hub with the use of L-shaped angles, which carried the blades centrifugal load.

CONCLUSION

Cessna's first and only entry into the helicopter world was a minor hit. They were able to develop a helicopter that actually performed quite well and shared design features with their airplanes. Even though not many were built, the ones that remained flew for many years and continued to push the high altitude envelope. In 1955 a modified CH-1B was able to set a world record for highest-flying helicopter at an altitude of 29,777 feet. The record has since been broken but that CH-1B still remains to this day the highest-flying piston helicopter in existence. **TRE**



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Flight distance: 300-350m



SPECIFICATION

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Rotor Diameter: 7.40" (188mm)
Overall Length: 8.39" (213mm)
Weight: 1.27oz (36g)
Power System: Φ6mm Motor X 2pcs
Battery: 1-cell 3.7V 110mAh Li-PO

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2.4GHz--4CH



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Weight: 0.95oz (27g)
Power System: Motor X 2pcs
Battery: 1-cell 3.7V 120mAh Li-PO



BALANCE SYSTEM FOR REMOTE CONTROL HELICOPTER

1. Invention patent No: 200710170488.2
2. Utility Model Patent No: 200720076261.7

CONTROL SYSTEM FOR SINGLE BLADE REMOTE CONTROL HELICOPTER

1. Invention patent No: 200810036355.0
2. Utility Model Patent No: 200820057528.2

PCT patent of "SINGLE ROTOR MODEL HELICOPTER WITH IMPROVED STABILITY BEHAVIOR".

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