

**DON'T GET SCREWED!** Your Guide To Heli Hardware. pg74

# RC Heli

THE WORLD'S BEST-SELLING RC HELICOPTER MAGAZINE

## WAR MACHINE!

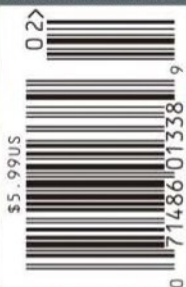
Thunder Tiger's Mini Titan Goes Guns Up with new Super Cobra Fuselage

**ENTER TO WIN!**  
T-REX 500 and Spektrum Radio  
Details on pg80

### TESTED:

- » **CENTURY**  
RAVEN 50 SE
- » **HELI-MAX**  
AXE CX MICRO
- » **CY** SOLID-G  
GYRO
- » **GAUI** 365  
FLYBARLESS

FEBRUARY 2009 / ISSUE 32



www.RCHELIMAG.com



# 20

### Pages of Tips and How-To's

- Basic Trim Adjustments
- Setup Throttle Linkage
- Removing Broken Screws
- Understanding Static Electricity
- Proper Li-Po Disposal

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# HELICOPTERS MADE EASY



Innovator MD530  
TTR4720-F05E2

The Innovator is a helicopter that is designed for high performance yet enables beginners the ability to learn at their own pace. The MD530 is pre-programmed for rotor head speeds of 1500-1700 depending on your flight conditions. At these rotor head speeds the beginner can focus on the helicopter. For the intermediate to advanced pilot they can relax and enjoy the smooth positive control provided by the digital control system built into each and every Innovator.

What is included: TS6 2.4 GHz Radio, Integrated Control System; motor, speed control, battery with ID and charger, blades, servos and gyro.

## SET-UP AS EASY AS



**1** Bind links radio to helicopter



**2** Calibrate max travel defined by radio gimbals



**3** Set-Up automatic helicopter programming

and it only takes **3 minutes!**

### Innovator MD530 Specifications:

Full length:	25.60"	Rotor Blade:	Foam Blade
Full width:	5.30"	Stabilizer:	Standard
Total height:	10.40"	Motor:	S1/KV3500
Main rotor diameter:	28.00"	Battery:	3S1P 1800mah/15C
Tail rotor diameter:	5.90"	Speed Control:	35A
Gear ratio:	1:11.0:4.95	Default Flying Data:	PCS-STD-0001
Full equipped weight:	29.6 oz.		

Ask your local dealer for TTR4720-F05E2

TS6 Transmitter 2.4GHz



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# INTRODUCING OUR NEW PALM-SIZED POWERHOUSE



## Blade® mCX Bind-N-Fly™: Fly It with Any DSM2 Compatible Transmitter

What more could you want from an ultra micro heli? E-flite's Blade® mCX Bind-N-Fly™ offers more than enough excitement for any pilot. With as much technology as the Blade CX2 packed into one ounce and with a main rotor diameter of 7.5 inches, this 4-channel heli can be flown with precision and control anywhere indoors, making it the perfect alternative for those times when you can't make it out to a park or flying field.

Compatible with all DSM2 aircraft transmitters, the Blade mCX Bind-N-Fly is a stylish heli that offers DSM2 transmitter owners a one-of-a-kind indoor experience. All you need to do is bind the Blade mCX to your transmitter and your adventure into the new era of RC flight begins. It even includes the Lithium Polymer battery and charger for lightweight power and great performance.

Want to see one in action? Visit your local E-flite dealer or check out [E-fliteRC.com](http://E-fliteRC.com) or [bindnfly.com](http://bindnfly.com) for more information. These hot helis are sure to fly off the shelves.

**E-flite®**  
ADVANCING ELECTRIC FLIGHT

**HORIZON**  
H O B B Y

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# 3D MASTERS 2008™

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TO OUR CHAMPIONS



LUKAS RIVA  
&  
THE T-REX 700N

# ALIGN



*JK*  
Designed by:  
**Jason Krause**

# ALIGN

# TREX 700 Nitro Pro



## Improved Design:

- ★ Simple and light weight design provides awesome flight performance.
- ★  $\pm 13^\circ$  collective pitch is possible for extreme 3D performance.
- ★ Heavy duty tail with thrust bearings.
- ★ Clutch, Fan and Bell assembly provide a very smooth operation even at high RPM.
- ★ Forward mounted tail servo helps to keep exhaust oil from entering servo also improves the CG.
- ★ Battery tray designed for easy and clean radio gear installation.
- ★ Fuel Tank Capacity 630cc.
- ★ Heavy duty tail with thrust bearings.
- ★ Torque Tube driven tail for incredible 90 sized performance.
- ★ Rigid frame design that can also handle hard crashes without damage.
- ★ Super engine cooling system very efficient airflow to provide unequal cooling and horsepower.
- ★ New main gear with one-way bearing design for high torque.
- ★ Ready to fly weight (no fuel) is an incredible 4.2Kg.

## Specifications:

- Length: 1335mm
- Height: 450mm
- Main Blade Length: 690~710mm
- Main Rotor Diameter: 1562~1602mm
- Tail Rotor Diameter: 281mm
- Engine Pinion Gear: 20T
- Autorotation Tail Drive Gear: 150T
- Drive Gear Ratio: 8.2:1:4.54(E:M:T)
- Weight: 3.2kg



# ASSURANCE

RC distributor

[www.alignrcusa.com](http://www.alignrcusa.com)

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# TIS THE SEASON

**Y**ES, I KNOW, THIS IS THE FEBRUARY ISSUE BUT LOW AND BEHOLD IT GOES ON-SALE AT THE BEGINNING OF JANUARY. The "tis" I'm talking about in the title is not the holiday season; it's the new helicopter season. If you were a good boy this year chances are you may have gotten a new heli under the tree, Menorah, or where ever your wife/girlfriend puts the presents. If that's the case maybe you're new to radio controlled helicopters. With that in mind this issue is focused a little more than normal on you newbies. If you're new to helicopters the old saying that "knowledge is power" could not be more true than in this hobby. Time on the simulator and soaking up as much information as possible, whether it be here, in the chat rooms, at the field, will be invaluable. Another excellent resource that's often taken for granted is a good hobby shop. In the age of the Internet and on-line shopping it's easy to forget about your local hobby shop. A good helicopter hobby shop is not too easy to find, but when you do, cherish it. We all want to find a bargain and save a buck, but if you have the opportunity to patronize your local hobby shop please do. The local hobby shop is where it all begins. Reward a good hobby shop that supports local helicopter pilots with your business. Especially in these tough times, they can use the support and it keeps the dollars in your local community. Of course, if you must go on-line be sure to shop with stores that advertise here in RC Heli, and let them know that you saw their ad here.

Lastly, in Randy Pausch's book *The Last Lecture* he quotes his grandfather saying that when there's an elephant in the room it's best to introduce it, or something to that effect. This month the elephant is our page count. You may have noticed this issue is a bit thinner than most months. Two reasons for this, we had some advertisers reduce pages shortly before going to press citing slower overall sales. This is an unfortunate reality of business and business cycles. Secondly, a couple of kit reviews we've been working on required some additional testing and had to be pushed back until next month. Rest assured, we'll be adding pages back for next month and beyond.

**Thanks for reading  
and fly safe,**

**Mike Velez**  
Publisher/Editor-in-Chief  
mikev@rchelimag.com



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# SWIFT

## 100% READY TO FLY



Elite 6-Channel Computer Programmable Radio

1.

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2.

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3.

Fly

# 100% RTF 2.4 GHz SPREAD SPECTRUM TECHNOLOGY

**Go from the box to the sky with a large high performance helicopter in just a few minutes.**

We are proud to introduce the Swift RTF (Ready-To-Fly) .30 sized electric aerobatic, high performance helicopter. This is no toy. This is a proven high-flying 3D machine that many veteran and pro pilots use today. If you're looking for a quick and affordable avenue to get into high-performance helicopter flight the Swift 100% RTF provides you with EVERYTHING you need to get up in the air in a hurry without hurting your pocket book.

### Factory tuned and ready-to-fly!

For many R/C helicopter enthusiasts, tuning a helicopter is half the battle. With a properly tuned heli, flight control, response and predictability is tremendously improved which vastly reduces the possibility of a fatal crash. With the Swift RTF, you have the experience of factory experts to fine tune your bird to optimize it's flight performance so you spend less time tuning and more time flying.

### Elite 2.4 Spread Spectrum Technology

With the Elite 2.4 GHz Spread Spectrum Technology your days of waiting around for the frequency pin are gone and your freedom to enjoy your flying experience is like never before. This is a completely programmable radio. We've included the software along with the interface cable if you choose to make any changes. The programmable interface allows easily swappable files between radio systems so you can swap programs with your friends! Get in the air faster with the reliability and performance of the Swift 100% RTF.

### It's all here!

Elite 6 Channel 2.4GHz Transmitter, Signal Booster, Receiver, Gyro, Servos, Charger, and Batteries... All installed and factory tuned. All installed and factory tuned. The smart charger plugs into a standard wall outlet; no more hooking up to your car battery. We've thought of everything. We've even included the 8 AA batteries required for your transmitter! The 4 Cell Lithium Polymer battery is a high discharge battery rated at 20C. This means you get long flight times and the juice to push the Swift to it's limits. Just pull the Swift out the box, charge and install the batteries and go fly!

### Features



Dual bearing supported tail grips and high pitch control provides extremely fast tail response.



Thrust bearing supported blade grips. 8mm feathering spindle and 10mm shaft offer improved durability.



eCCPM offers direct control, and quick response for full 3D flight. Fiber re-reinforced side frames.



2.4GHz control system with signal booster. Light-weight compact frame design.



Powerful 550 outrunner motor with built in cooling fan.



High speed tail mounted servo mated with a heading lock gyro.

# CENTURY

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# THE COMPASS POINTS TO 90!

Compass has a new helicopter to add to their already successful lineup. The new Odin 90 is a helicopter that does not use the standard cooling fan and shroud we normally see today. Compass has incorporated a new type of cooling system that will not rob power from your engine. This electric brushless cooling fan is powered by your receiver battery pack or separate pack. This will allow for maximum power delivered to the rotor blades. The Odin is controlled by a 120° CCPM swash-plate and ball bearing supported mixing arms. Look for this new helicopter on-sale by the time you read this. [www.compassmodel.com](http://www.compassmodel.com)



Nitro electric hybrid.



## CURTIS' FAVORITE NUMBER: 500

Curtis Youngblood has been known for his blades, Stubz paddles, and nitro pipes. Curtis has even made blades for electric 450's, 60's, and 90's. What about the helicopters in between? Well, Curtis has now started producing main rotor blades, Stubz paddles, and tail blades for 500-sized helicopters. These products exhibit the same high quality craftsmanship as his other products. [www.curtisyoungblood.com](http://www.curtisyoungblood.com)

## SPEKTRUM'S BARGAIN RADIO

The new Spektrum DX5e is a great little radio if you are on a budget and looking to upgrade your current ready-to-fly 72mhz transmitter to an interference-free transmitter. This radio can be used on your 4-channel helicopter, or even a plane with retracts.

This new radio features digital trims, servo reversing switches, and a mix switch. This new basic radio can be had for \$99.99. [www.spektrumrc.com](http://www.spektrumrc.com)





## FUSUNOS **NEW UPGRADED CANOPY**

Fusuno is known for creating gorgeously painted canopies that can take a beating. The newest canopy in their lineup is the JR Vibe 50 fiberglass canopy. This brightly painted canopy is made using the same high quality resin and fiberglass as their other popular canopies. The bright paint job provides a good visual contact of the helicopter. The low price and excellent durability make this canopy hard to beat.

**Price: \$65.00**  
[www.helidirect.com](http://www.helidirect.com)



## Walkera's **NEW micro 3D machine!**

Walkera had a hit with the micro 4#3 4-channel fixed pitch helicopter. However, they did not stop there. One of their newest helicopters will impress any helicopter pilot with its small size and flight performance. The new 4G3 is slightly longer than the 4#3 and offers a bevel gear-driven tail. The 4G3 was completely redesigned to allow this small helicopter to actually sustain inverted flight and mild aerobatic maneuvers. Expect to see the 4G3 to hit the states by the time you read this news.

[www.walkera.com](http://www.walkera.com)



Photoship, not Photoshop.



## **PHOTOSHIP ONE???**

Who is PHOTOSHIP ONE? If you happened to check out the displays at the expo in Chicago then you know what it is all about. PHOTOSHIP ONE is a company that devotes its entire purpose to photograph and video helicopters. Their camera mounts are made from lightweight carbon fiber materials. The mounts can also be bought in affordable G10 material. So who is PHOTOSHIP ONE? They are a sister company to Gauji, the creator of one of the smallest 3D helicopters. Keep an eye out for these impressive camera mounts by logging onto their website.

**Price: \$119-\$699**  
[www.photoshipone.com](http://www.photoshipone.com)  
[www.empirerc.com](http://www.empirerc.com)

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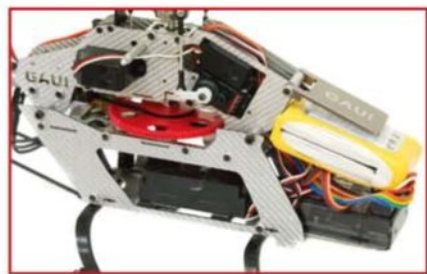


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## GAUI'S NEW HURRICANE 200 V2-SE

Speaking of Gaii, they have now released a new version of their popular Hurricane 200 SE. This version has changed an already great helicopter into a well-oiled machine. This new version now includes a battery plate to adjust the CG of the helicopter; a CNC tail gear case with dual point tail slider; new bearing-supported tail pitch links, rigid CNC machined mixing arms, and much more. The Hurricane 200 V2-SE will be available in the standard flybar arrangement and a flybarless combo, which includes the Gaii 365 flybarless stabilization system reviewed in this issue. Additionally, the kit will come 95% built from the factory. Keep an eye out for a full review on this new truly micro 3D machine.

[www.empirerc.com](http://www.empirerc.com)



## ALIGN'S LITTLE MACHINE GETS ACCESORIES

The TREX 250 has swept the world and found its

home in many of our garages, hobby rooms, or apartments. Align has stayed ahead of the game and will be releasing two different sets of carbon fiber blades. The all-white set will be slightly heavier to give the helicopter a stable feel, whereas the black and white blades will be lighter for maximum 3D performance. These blades should be available by the time you read this and set for a price around \$20.00. Other new items are being released weekly.

[www.alignrcusa.com](http://www.alignrcusa.com)





This **indoor outdoor** machine thinks it's a nitro. And flies like one.



The Quark's single, Bell-Hiller rotor head, controllable tail and multiple, adjustable settings deliver stable hovering and smooth flight in tight, indoor spaces, as well as in a light outdoor breeze.

- **As a newbie** practicing hovering and learning to fly forward, backwards and side-to side, you'll appreciate its confidence-building, full-size handling.
- **If you're flying Hirobo's XRB or similar electric mini** and you're ready to step up, but not ready for a 400 or larger electric or a full-size nitro, the Quark is ideal.
- **If you're an experienced pilot** craving convenient, non-sim flying time, get your fix in your den or living room, or challenge the outdoors. The Quark will easily manage pirouettes, funnels and more. Hirobo's S.R.B. Quark ... a toy it's not.

The Quark comes assembled and ready- to- fly with 4-channel FM radio, servos, LiPo battery, charger, extra sets of main and tail blades and tools. Available with or without transmitter.

- Length ..... 13.77"
- Main Rotor Diameter ..... 13.98"
- Weight.....6 oz.

# A toy it's not!

Don't confuse **Hirobo's S.R.B. Quark** with any other electric mini.



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## G-FORCE IS ON THE LEVEL

G-Force Heli is known to make high quality aluminum upgrades and tools. They have now released a new swash leveling tool that can be used on both a 50 and 90-sized helicopter. This fully adjustable swash leveling tool can fit a 10mm shaft and a 12mm shaft by sliding interlocking pads in and out. The SwashPro tool also supports 120°, 135°, and true 140° swashplates. The elevator pad uses a notch to keep the SwashPro stationary during setup and adjustment. This allows for fast and easy setup without having the tool twist off the ball links. The SwashPro from G-FORCE has also been released for a 450-500 sized version for any one who owns smaller helicopters.

Price: 450-500 Size \$38.00, 50-90 Size \$49.00  
[www.gforceheli.com](http://www.gforceheli.com)

Canopies for the lazy.



## CENTURY'S NEW BLADES FROM ROTORTECH

With the help of pro pilot Scott Gray, RotorTech has developed a new set of 710mm carbon fiber blades. These blades were designed for the 3D pilot in mind. The cyclic response are quick but are also designed to be stable. The design also incorporates the design to perform better autorotations. These blades will be a hit for the new Scott Gray edition Vibe 90 to be released by the time you read this.

Price: \$129.99  
[www.centuryheli.com](http://www.centuryheli.com)



ATTACK

## PROLINE TAKES IT ONE STEP FURTHER

As seen in the past issues of RC Heli you will notice Pro-Line has made its own set of canopies, which include the Assault and Attack style made from a thick polycarbonate plastic. They are now offering these popular canopies pre-painted. The Assault style canopy for the TREX and Mini Titan comes in red, orange, white, and green. The Attack canopy—which looks like a modified Apache—is pre-painted in desert brown, jungle green, and gunner gray.

Price: Assault pre-painted: \$29, Attack pre-painted: \$29  
[www.pro-lineracing.com](http://www.pro-lineracing.com)



ASSAULT

# HeliHobby.com

HeliHobby is your one stop .com shop for all your heli needs. Huge selection of Electric/Nitro- parts, upgrades, tools, and electronics. Great Customer Service and the lowest price guaranteed!



*Smokin Hot Combos!*

Call us so we can help, **[818] 348-HELI**

# HITEC for helis



## Big or Small

## Sport or Extreme 3D

Hitec has a Servo for your Heli

## Micro and Mini

Whether it be a Gauji Hurricane 200 (HS-45HB) or a T-Rex 500 (HS-5245MG) there is a Hitec servo that is a perfect match for any micro or mini helicopter.

**HS-5065MG**  
Now Available



Model	Torque	Speed	Gear Train	Size	Weight	Ball Bearing	Digital or Analog
HS-45HB	17 oz	.12	Karbonite	.92x.38x.88"	.28 oz	Top Ball Bearing	Analog
HS-65HB	31 oz	.11	Karbonite	.92x.45x.94"	.39 oz	Top Ball Bearing	Analog
HS-65MG	31 oz	.11	Metal	.92x.45x.94"	.42 oz	Top Ball Bearing	Analog
<b>HS-5065MG</b>	25 oz	.09	Metal	.89x.45x.94"	.45 oz	Top Ball Bearing	Digital
<b>HSG-5084MG</b>	27 oz	.05	Metal	1.14x.51x1.18"	.78 oz	Top Ball Bearing	Digital
HS-225MG	67 oz	.11	Metal	1.27x.66x1.22"	1.09 oz	Top Ball Bearing	Analog
HS-5245MG	76 oz	.12	Metal	1.27x.66x1.21"	1.12 oz	Dual Ball Bearing	Digital



## High Performance G2 Digitals

Our second generation of programmable digital servos have twice the resolution than our original digital servos. They feature high performance coreless motors making them perfect for any high performance helicopter.

**New!**  
**HS-7940TG**



Model	Torque	Speed	Gear Train	Size	Weight	Ball Bearing	Digital or Analog
<b>HS-7940TG</b>	182 oz	.07	Titanium	1.57x.79x1.50"	2.29 oz	Dual Ball Bearing	Digital
<b>HS-7965MG</b>	139 oz	.10	Metal	1.57x.78x1.45"	2.18 oz	Dual Ball Bearing	Digital
<b>HS-7966HB</b>	111 oz	.08	Karbonite	1.57x.78x1.45"	1.87 oz	Dual Ball Bearing	Digital
<b>HS-7975HB</b>	114 oz	.11	Karbonite	1.57x.78x1.45"	1.87 oz	Dual Ball Bearing	Digital
<b>HS-7955TG</b>	333 oz	.15	Titanium	1.57x.78x1.45"	2.29 oz	Dual Ball Bearing	Digital



Contact your local hobby shop to purchase Hitec products

12115 Paine Street, Poway, CA 92064 • 858-748-6948 • [www.hitecrd.com](http://www.hitecrd.com)

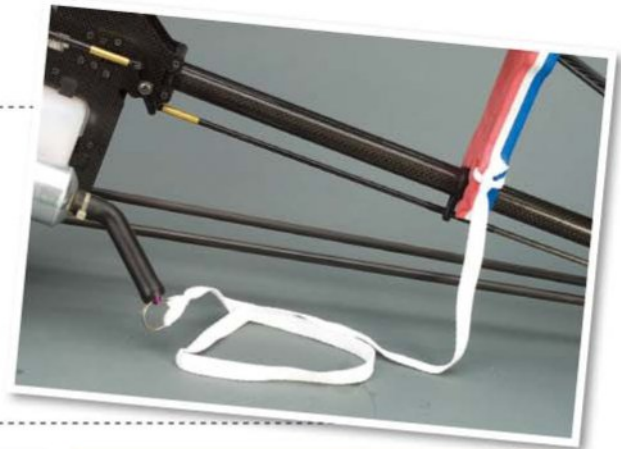
Hitec would like to thank Over the Top Designs for providing us with the hot looking canopies and Pure Tech Products for providing the battery straps for our helicopters



## QUICK TIPS

### UNPLUGGED

Have you ever tried to start your engine and ended up with a flooded disaster because you forgot to remove the muffler plug? Chances are that you have, and this tip submitted by Irwan from Brunei shows a way to prevent this from ever happening. Attach a long string (perhaps an old shoelace) to the exhaust plug and the other end to your blade holder. This will ensure that when you stretch out the blades you will remove the plug at the same time. Great tip, Irwan—keep 'em coming.



### LANDING GEAR CAPS

You can purchase end caps for a wire shelf to prevent snags and leave a clean, professional finish. These caps can also be used for the end of your skid pipes. This will prevent dirt from going into the skids during rough landings or where the conditions are less than perfect.



### WIRE CAP = TRANSMITTER SWITCH COVER

The steel wires which we use to create pushrods usually come with a rubber cap to prevent damage during shipping. These caps can serve another purpose, which is to help you get a grip on your switches. Remove the cap from the wire and slide it over the transmitter switch. This will leave a clean, professional look and will also help in identifying the switch without looking at the radio.



### QUICK CANOPY FIX

The paper thin canopies on smaller helicopters have their advantages and disadvantages. They are lightweight, but they're very fragile and crack when you crash. Replacing the canopy can



often cost more than the parts required to get the helicopter back in the air. As a beginner, crashes are more abundant and often leave you broke, so replacing the canopy isn't always at the top of your list. Paul Meddings in Geelong, Australia sent this tip to help remedy the broken canopy blues. Place a piece of tissue paper on the inside of the canopy over the crack. Then drip thin CA on the tissue paper and smooth it out with a brush. Next, place another piece of tissue paper over the first and reapply CA. This will create a bond similar to fiberglass and it will only take you about two minutes.

### ADDING A NAVIGATION LIGHT TO YOUR CX2

Ray Heimbecker submitted this tip after crashing his son's Blade CX2 into the wall when practicing a nose-in hover. He wanted to add a little excitement to the CX2 by adding a navigation beacon, which also serves as a warning to let his son know that the

helicopter is armed and ready for takeoff. Pick up a blinking LED from Radio Shack in the 5-volt range and a cheap servo extension. Carefully remove the white wire from the extension and discard. Next, you will want to cut off the male end and solder the LED to the wires. After that, drill a small hole in the top of the fuselage just behind the main shaft and glue down the LED. Then, plug the LED into the battery port on the receiver and put your fuselage back together. When you plug in your battery, the LED will turn on and start blinking, letting everyone around know that you are about to fly. *THH*



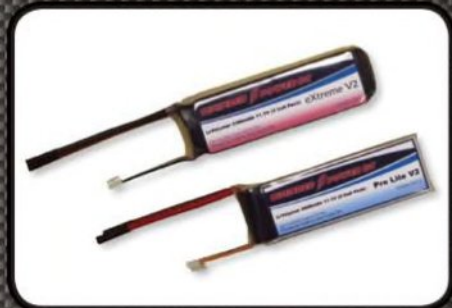
Tie a yellow ribbon around the old exhaust plug.



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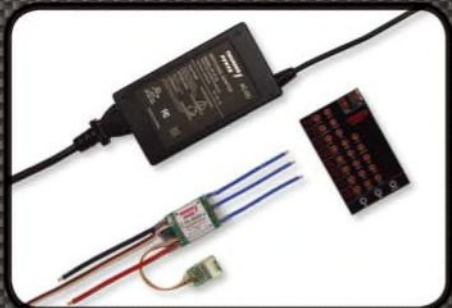
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**LETTERS**



Raptor 30 v2, with O.S. 37 SZ-H, Futaba GY401 / 9254 gyro and servo, and a Futaba 9CHPS transmitter.

Thanks to my dad for the picture.

**BEST REGARDS,**  
ANDRÉS ORTEGA ALBANIA, GUAJIRA - COLOMBIA

flying skills. Having a stable machine has helped me immensely to achieve this.

I have found that for the best stability, the swash should be perpendicular to the rotor shaft axially and the center of gravity of the machine should be at the rotor shaft.

If the rotor shaft is not plumb when swash leveling, the vial type gauges will not work. That's why I have found that the eyeball works best. It's amazing how close you can see a right angle.

For the Center of Gravity, I used to try to hang the heli from the rotor shaft for plumb, but have now found it much easier to find a point BELOW the shaft and balance on a fine edge or by drilling small holes in the frame for a stiff wire or rod as a

**ANOTHER CUP?**

Hello, here I am with my Rappy. I upgraded it to a push-pull control system on collective pitch and cyclic after reading the advantages of this system in the October

2008 edition of your magazine. Thanks to the articles in *RC Heli* magazine, my training process has been costeffective, and I've reached great progress in a short period of time. Here are the stats:TT

**"FEEDBACK"**

Great mag! Can't wait each month to see what you have in store. I am by no means an expert, and am only beginning to feel comfortable with my

Nice balls!

» **MORE READERS' PHOTOS**



**SUN BATHING**

Hi, I am sending you a few fresh photos of my Trex-500. She was posing on nice sunny day. One photo is showing a low battery mount, which seems to provide me with more stable hovering.

**BEST REGARDS,**  
ANDREW KOUZMITCHEV

**POWER UP**

Wow, what a great mag you guys produce. I was able to build a power supply from an old computer (glad I didn't throw it out) and it works great. The article in your mag on building a power supply was excellent. I've got every issue of *RC Heli* and believe I've learned the equivalent of a RC helicopter school. Keep up the great work. Hope you like the pic of my power supply.

**WARREN SENTIVANY**  
MANCHESTER, CT.



■ **Well congratulations,** when Chuck Bassani came up with the idea for the article I thought our readers would get a lot of use out of that one. Glad to hear it worked out well for you. Thanks for reading.  
-Mike

fulcrum. When the machine is balanced, it will almost balance and teeter either way with a light nudge.

Keep up the good work and thanks for a great magazine.

SCOTT MATHEWS  
OSAN AB KOREA

■ *Scott, thanks for dropping a note to us. In addition to the methods you described, a good set of setup tools—like the tools sold by Fortune Model Products—can be an invaluable addition to your toolbox. As your skills progress, you'll benefit more and more from the results that a properly designed set of setup tools can provide. Fly safely!*  
- Shawn K

## ISN'T SHE BEAUTIFUL?

Hello from the Philippines. Here's a picture of my Hirobo EC 135 kit. I'm flying it with an OS 91 ZX engine and all Futaba electronics. The pipe is a Hatori. Love the magazine.

EDWARD GANTO



## WANT TO SEE YOUR HELI IN THE MAGAZINE?

Send us pictures of your heli along with a description of what it's got. We prefer digital files (no zip files please) in a **HIGH RESOLUTION**, so be sure to flip that switch on your camera to the "fine" setting. One submission per month will receive a full-year subscription to **RC Heli Magazine!**

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Digital files should be sent to:  
**feedback@rchelimag.com**  
Please put "Feedback" in the subject line.

If you still want to send film, please send your photos to:  
**RC Heli Magazine**  
Attn: Feedback  
13401 Yorba Ave,  
Chino, CA 91710

Looks full-size to me.



## BETTER THAN CHARM SCHOOL

First of all, I would like to say that I love your magazine and it has really helped a lot. I'm from the Big Island of Hawaii and there are not many resources available. The articles seem to be written just for me—I buy a new part or heli and you guys have a review article to

follow. It's just amazing what you guys do. I have finally found a hobby worth sticking to. Recently, a friend of mine took some pictures of me flying my heli in my backyard.  
ALOHA  
GILL PECCEU



## NEVER TOO YOUNG

This is my Vibe 50 with my pit crew member making some adjustments. His name's Cody and he's 2 years old. My Vibe's powered by a TT53, MP5, Airtronics 94758z's on the cyclics and a JR770 with 8900G on the tail. Thanks for a great mag every month.

TOMMY AND CODY WAGNER  
FT. PIERCE, FL



Cody's richening it up a few clicks for dad.



## CRIKEY

Hi guys. I'm from down under and wanted to send my heli pics. I'm new to this hobby and find more of an addiction to fun now. I've bought three helis in 8 months! Thanks for a fantastic mag and reviews. I find it so helpful that I can't stop reading it. I have a Raptor 50 Titan with BLS45I on cyclic and a Futaba GY40I gyro with a 9257 on the tail. Power is from an OS 50 Hyper bolted to a Hatori pipe. I also have a Mini Titan and a Blade CX2, all controlled with my Spektrum DX7. I look forward to reading the next reviews!

Thanks,  
NHIM COUCH  
AUSTRALIA

## » MORE READERS' PHOTOS



## ADDICTED!

My new additions: RC heli's and RC Heli magazine.  
JIM MERTES



## WE'RE GREAT, WE KNOW.

Thanks for the article "Mod a PC power supply" in the Oct 08 issue. I had an old Gateway computer gathering dust in the basement, now I have a power supply for my charger. This kind of article sets RC Heli apart from the rest.

THANKS,  
TREVOR STAFFORD

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# FREQUENTLY ASKED QUESTIONS



**Q:** Why can my coaxial helicopter only go about 15 feet forwards, then it stops and starts again?

—BootsMcShandler

**A:** Counterrotators are designed to be very forgiving and are naturally stable. After comfortably flying a counterrotator and progressing into forward flight, you'll find yourself pushing the helicopter to its limits. Applying full forward on the cyclic and holding it there will cause this problem as the helicopter reaches terminal forward velocity. What is happening is that the helicopter's flybar will try to stabilize the helicopter during fast forward flight and overcorrect to make it stable again. Once the helicopter slows down enough it will speed back up until it repeats the same pattern. To overcome this, you will have to back off the speed. If you are ready to try something faster, you will want to switch to a conventional helicopter that can perform fast maneuvers.

—FirstStrike

**Q:** Why do they call it a Jesus nut and bolt?

—Basshead28

**A:** The term Jesus nut or bolt describes the nut or bolt that holds the main rotor blade to the mast. Vietnam pilots and crew conjured up this term, they said if the Jesus bolt failed in flight the helicopter would detach from the main rotor and the only thing left to do is pray to Jesus.

—RKephart



**Q:** Why does my helicopter look like it's going around in a drain when it's supposed to sit still? It's a Blade CX2 from eFlite.

—ChargerFan



**A:** When did this problem form? Was it after a crash? Did it appear from nowhere? These questions should be kept in the back of your mind when diagnosing a problem. If the problem happened after a crash and you replaced the parts that were needed, check to make sure that both the rotor heads are attached at the gears. If the shaft is slipping on one rotor head, then you will not generate enough counter lift to prevent the helicopter from spinning. If the problem just showed up one day, you might want to check the motors. One motor may be wearing out and not spinning the rotor blade fast enough to compensate for the drift. You may also want to check your trims to make sure that you plug in your helicopter when the trim is neutral.

—RKephart [\(TBL\)](#)

Thank Jesus!

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**Turnigy Accucell-8 150W**  
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## HELI 101 WHAT TO DO WITH A DAMAGED LITHIUM POLYMER BATTERY PACK

Words: Ryan Kephart

Anyone who uses lithium batteries in their electric helicopters has run into a damaged battery pack. Knowing what to do with these packs can often cause confusion. This edition of Heli 101 is here to teach you how to properly handle and dispose of that dangerous pack so that the next time you have a puffed pack or a damaged cell, you will know exactly what to do.

After they have sustained damage, lithium packs can be dangerous if not handled correctly. The chemicals that make up lithium battery packs consist of lithium cobalt oxide, carbon, polymer, copper, and aluminum.) These chemicals vary in ratio from manufacturer to manufacturer. When these chemicals are active they are very corrosive. If the pack smokes, even the vapors can be hazardous when inhaled. If any chemical is leaking or smoking from the pack, use gloves and safety glasses, and avoid inhaling any smoke by wearing a respirator or by keeping the battery in a well ventilated area. Lithium batteries can also ignite into a ball of flame if the temperature of the cell gets too hot. If this ever happens, a foam or dry chemical extinguisher will extinguish the flames.

It is always a safe idea to charge your batteries in a fire safe bag like a Li-Po sack, or ceramic pot. These items will contain the fire into one area and give you plenty of time to react if a fire ever happens. The remaining question is, how do you dispose of a lithium battery correctly?

### IS IT SAFE TO TRASH IT?

Once a lithium battery is decommissioned correctly, it can be thrown away in your trash can. The battery itself is environmentally safe and is considered a dry battery. Once disposed of they do not produce any hazardous waste.

The first step to dispose of a lithium battery is to put on your gloves and safety glasses and discharge the pack as much as possible by using either your

battery charger's discharging function, or by plugging in the battery to a motor until the battery is completely drained. After the pack has been drained, it needs to soak in a bucket of salt water. Make sure to add enough salt to the water because the salt is what breaks down the chemicals to render them safe. A good ratio is one quarter cup of salt to one half-gallon of water. Let the battery soak inside the water for at least two weeks, then remove the battery and place it in your outgoing trash.

Knowing the right way to dispose of your lithium battery can mean the difference in your waste management truck leaving with a flaming garbage pile or having a safe trip to the dump. Remember, safety first. Happy landings! **RKH**

Brandon's in the dark on a lot of things.





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"Shake it like a Polaroid picture."



# FLIGHT TRIMMING

WHICH INCLUDES BALANCING

**Words:** Jim Innes

**T**he first flight on a new helicopter is both an invigorating and a tense experience. It is the moment of truth so to speak; the time when all the effort put into the build and setup of the bird has finally paid off. It is also the time when the next phase of breaking in a new helicopter begins; this phase is referred to as flight trimming.

## » FLIGHT TRIMMING STARTS ON THE BENCH

Trimming out a helicopter is simply adjusting the various components on the model to get it to fly as expected. Most of the trimming on a model happens at the flying field, but you can speed the process along by doing a few things while building and setting up the heli.



Ensuring smooth and level movement of the swashplate during the build will result in a better flying heli.

Level the swashplate and check for interaction during the build. Your swashplate should move up and down the mainshaft without wobbling or tilting when you give collective input. If there is a large amount of swash interaction and wobbling going on, it can result in odd flight behaviors.



Save yourself the hassle of not truly knowing what your pitch range is by using a pitch gauge during setup. Used correctly, a pitch gauge will also negate the need to track your blades in flight.

Check your rotor blades for balance and spend some time adjusting the pitch on your heli so that the pitch is equal on both sides throughout the range of travel. If you are exact enough on the bench you often do not have to adjust the blade tracking at all during flight.



Airplane guys know how crucial center of gravity is on an aircraft. It is just as important to ensure that your helicopter's CoG is in the right place, otherwise your model will have odd tendencies in flight.

Check the helicopter's center of gravity, which should be at the main shaft. Do this by filling the fuel tank halfway

or installing the battery pack on an electric model, install the canopy and line the flybar so it's perpendicular to the model. Then pick the helicopter up by the flybar with your fingers close to the rotor head. If the center of gravity is right the heli should remain level hanging off your fingers. You can check this by slowly setting it back down on a level surface, the four contact points of the skids should touch the ground at the same time. If the heli leans in any direction, you should rearrange the components on the model to level it out. A nose heavy or tail heavy helicopter will drift in that direction and require trim input to correct.

While there is more you could do on the bench, the above covers the vast majority of trimming issues while not taking too much time. The rest we will finish in flight.

### » DIFFICULTY

SCALE RATING: 1=EASY 5=ADVANCED



### » TIME TO COMPLETE



### » TOOLS NEEDED



### » TOOLS HELPFUL



**TECH TIP**

# To expo or not to expo

One subject often related to flight trimming is the use of radio expo. What expo does is change the output curve of a channel so that it is no longer a straight line in relation to the control stick input. In a JR/Spektrum and Airtronics radio, positive expo flattens the curve out near the center so that the output reacts less to input when the stick is near the center while still allowing full control throw (in a Futaba or Hitec radio, negative expo does the same thing).

Expo can be especially helpful for the beginning pilot as it may help shield the heli from those inadvertent stick inputs due to fingers shaking. Many advanced pilots continue to use expo as it allows a heli to be flown slowly and smoothly when wanted without affecting the overall performance. I would not recommend using more than around 30% on any expo channel, as you can get to the point where you are almost disconnected from the heli at center stick. Expo can help in-flight trimming because it masks those tiny inadvertent inputs that are occasionally the root cause of some "trim" problems.



As you can see in the graph above, expo lowers the sensitivity of the stick as you get closer to the center without affecting total available throw.

Expo is one of those areas where some people love it and others hate it. Some will not use or recommend it while others are completely for it. In this case, either way is correct—it just boils down to style. For me, personally, I like to use a little expo on all my helis as it fits my style.

## » BASIC FLIGHT TRIMMING

When you spool up a new bird for the first time, try to do so on a windless day. Do a proper preflight, check all control directions and take off into a hover. You will know right away if the cyclic is in need of trimming, as the heli will drift in a certain direction if it's off. Use the trim buttons on the radio at this point to get the swash set to where the heli will hover "hands free" for a while before it moves. Also check the blade tracking at this point and adjust if needed.



Use the links attached to the lower swash ring to make trim adjustments as needed. If you set things up correctly on the bench you should only need a turn or two at most to get the swash level.

After you are finished with that flight, take the heli to the pits and look at how much trim was needed to level the model. I like to flip from the normal flight mode where I changed the trim settings to another flight mode with no trim to see how much the swash moves. You can then adjust the swash linkages between the swash and the servos according to how much trim was needed and reset the normal mode trim back to zero. You should be able to mechanically adjust the linkages so that little to no trim is needed at the radio to maintain a stable hover.

After you are satisfied with the cyclic on the bird, move on to the tail. You should be able to fly the heli around, backwards, etc without the tail blowing out. The heli should also be able to climb out quickly with the tail remaining locked in. If the tail seems soft or "lets go" you will need to raise the gain a little until the tail is holding well without "hunting" (hunting is often a sign of too much gyro gain). I personally do not like the often recommended method of raising the gain until the tail hunts and then backing it down until it stops. This method sets the gyro at its highest useable gain level, which can put more strain on your tail servo. Often a lower gain setting



will do the job just as well while being gentler on the servo. I like to start with a relatively low gain and slowly raise it until the tail acts as I desire through all maneuvers; no more, no less.

A fast reverse slide is one of the easiest ways to test how well a tail gyro is holding. If the tail lets go during the slide, bump the gain up a little and try again.

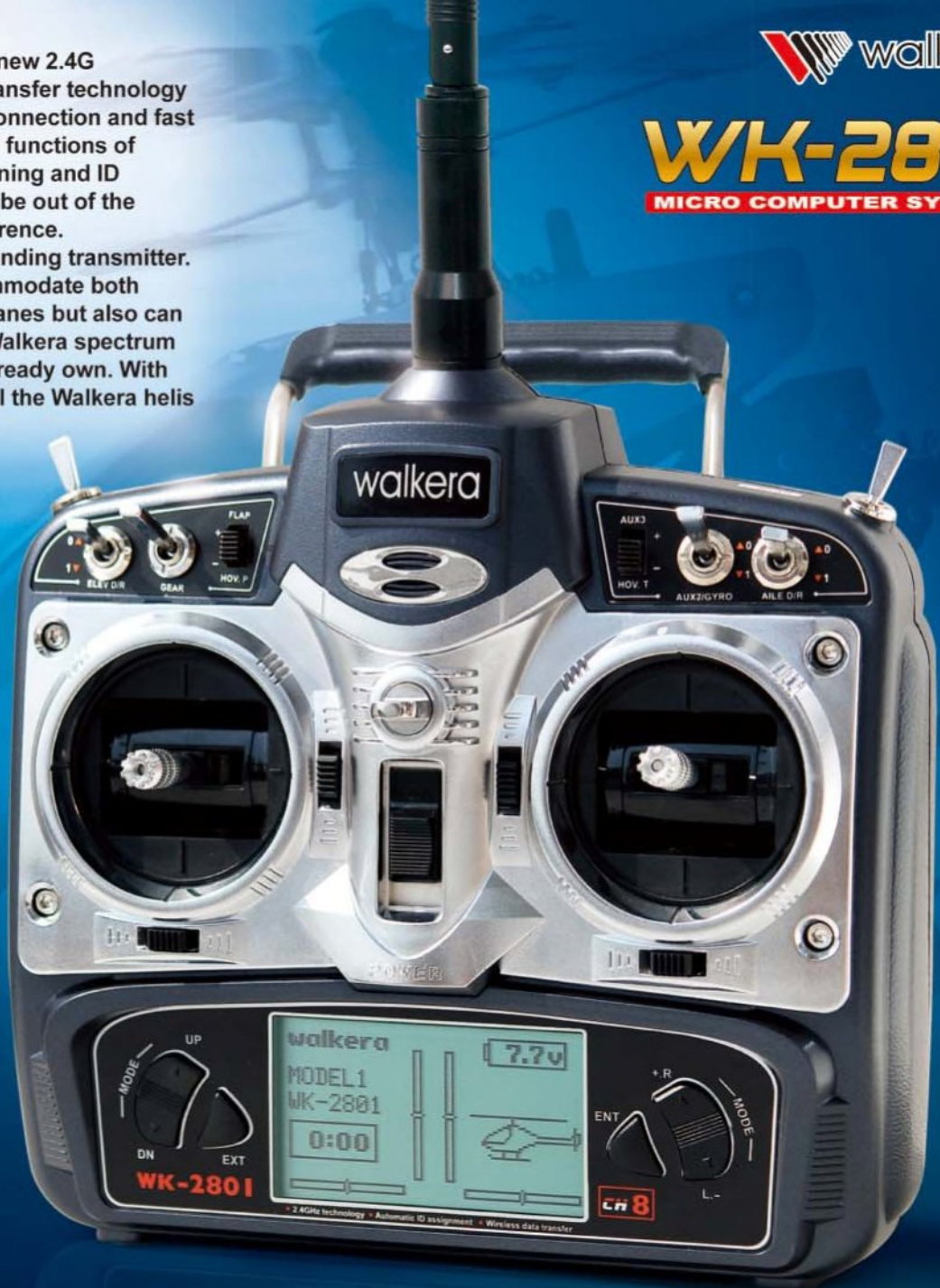
These are the basics.

WK-2801 adopts the new 2.4G spectrum wireless transfer technology to achieve full data connection and fast data transfer. With the functions of automatic code scanning and ID assignment, you will be out of the trouble of any interference.

WK-2801 is an outstanding transmitter. It not only can accommodate both helicopters and airplanes but also can work with all of the Walkera spectrum receivers you may already own. With only one WK-2801, all the Walkera helis will be under control.

# WK-2801

MICRO COMPUTER SYSTEM



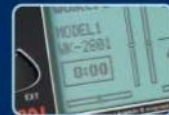
### RX-2801 RECEIVER

WK-2801 includes a dual receiver system which can get the same signal source simultaneously to filter the interference caused by other equipments.



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## TECH TIP

# A well trimmed bird VS. a poorly trimmed bird

Over the years, I have had the chance to try out other people's helicopters. Some have been so out of trim that flying them was less of a joy than a constant battle of flight corrections. These pilots have flown their models enough that they compensate for poor trim almost subconsciously. I imagine that because of this, a few of these pilots had a harder time than needed while learning to hover. A well trimmed bird increases the chance of success for a new pilot. If you are a new pilot and don't know whether your bird is set up properly or not, please have a local club or experienced pilot take a look at it with you and test hover it. You may be surprised how much can be learned about your bird from just a single test hover.

Jason looks scared to death.



If you have an experienced pilot available, ask him or her to test fly your new model. An amazing amount of info can be gathered and shared from just one test flight.

## » BASIC FLIGHT TRIMMING (CONT.)



Last, make sure you use a tachometer to check the head speed during the first flights to make sure that your pitch/throttle curves are set correctly and also to verify your motor and ESC settings. Keep the head speed within the parameters of the helicopter and blade selection you are using.

Have a flying buddy check your head speed in each flight mode to verify you have things setup as you anticipated.



## CONCLUSION

Properly trimming out your helicopter begins on the workbench. A little extra care during the build and setup phase will result in a better flying model. Try to make the vast majority of your trim adjustments mechanically so that the radio is not being used to compensate for improper setup. A well trimmed model is a joy to fly, easier to train with, and just flat out flies better. See you at the field! **TREX**

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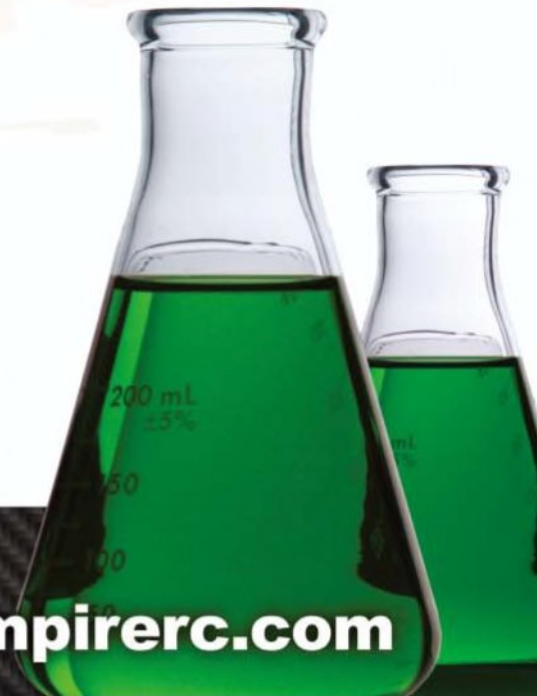
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# THE TAIL ROTOR

## BRINGING UP THE REAR

**Words:** Shawn Kitchen

When your engine or electric motor is turning the helicopter's head, the torque generated from turning the head would cause the helicopter to spin violently in the opposite direction if we didn't have any way to counteract it. Fortunately, we have a way to correct for this, and it's called the tail rotor. It's the smaller version of the main rotor, it's hanging off the back of your helicopter, and without it you're going nowhere!

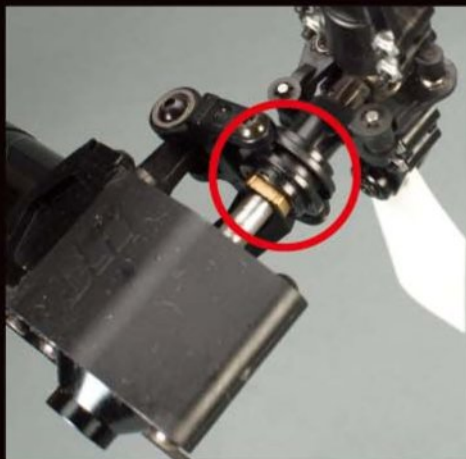
*(The parts shown here may look slightly different than the parts on your helicopter, but the general principles are the same for all tail rotors. There may be a pop quiz later, so make sure you study!)*

**TAIL ROTOR GEARBOX** • This is what holds it all together. The gearbox provides the mounting point for the tail rotor control system, the tail gears or pulley, and in some cases the vertical fin, and attaches the whole tail rotor assembly to the tail boom.

## HOW IT WORKS

The tail rotor works by spinning at a high rate of speed and generating side thrust that counteracts the torque produced by spinning the main rotor. By changing the amount of side thrust produced by the tail rotor (via changing the pitch of the blades), the pilot can control the rate at which the helicopter pirouettes. Now we have a controllable helicopter!

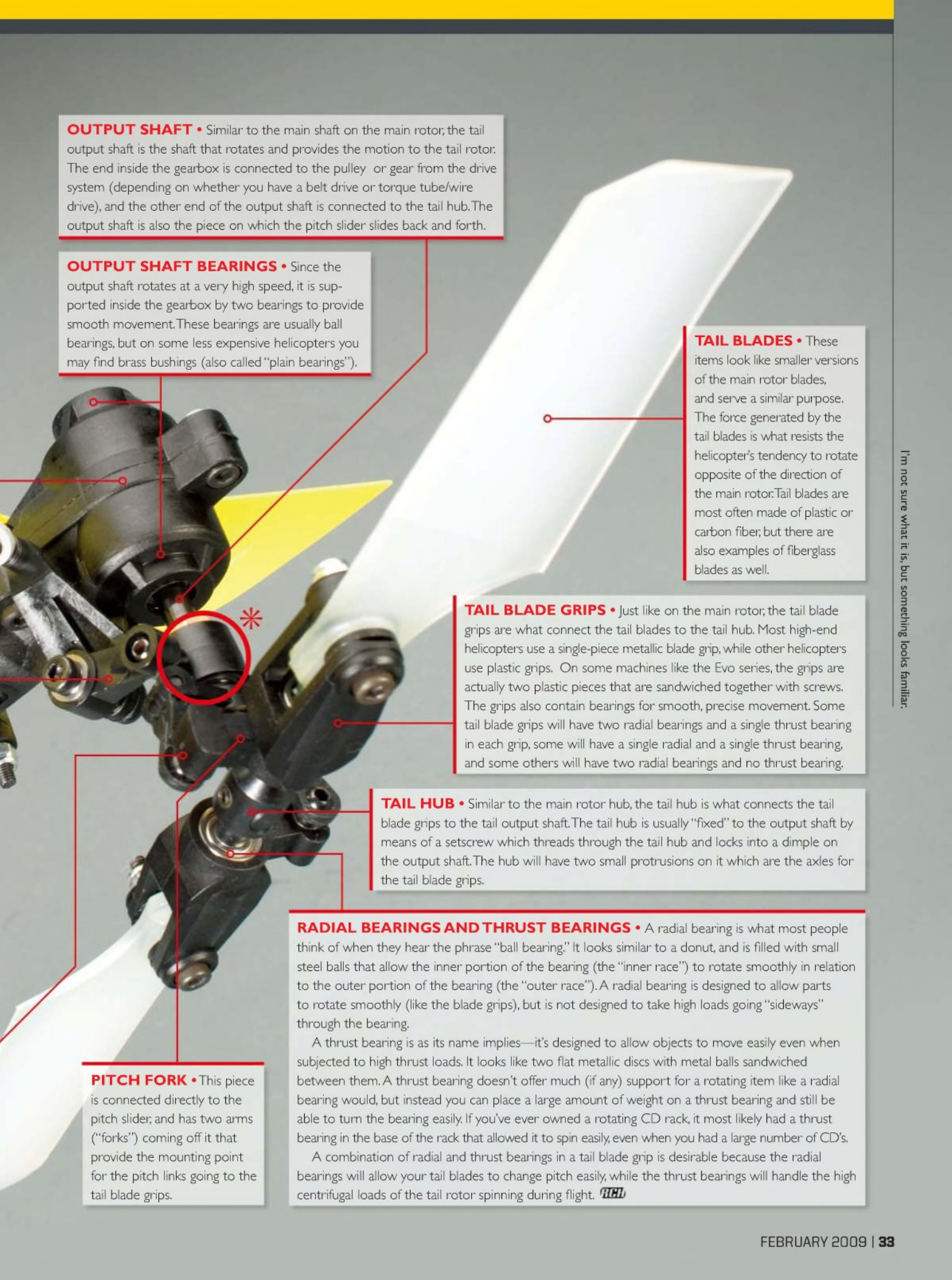
**PITCH SLIDER** • This round piece of hardware is connected by small links to the tail blade grips, and as the pitch slider slides back and forth on the output shaft, it changes the pitch of the tail rotor blades. There are two basic types of pitch sliders—a “Single-Point” slider (large photo), which is connected to the control arm with a single “ball and socket”-type joint (like the Raptor helicopter), or a “Dual-Point” slider (as shown in small inset photo), which is connected to the control arm on the top and bottom of the slider (like the Evo or the Fury helicopter).



**PITCH CONTROL ARM** • This arm is what connects the pushrod from the tail servo to the pitch slider assembly. As the tail servo pushes and pulls on the tail pushrod, the pitch control arm moves back and forth and slides the pitch slider along the tail output shaft, thus changing the pitch of the tail blades. On a single-point pitch slider system, the control arm usually looks like an L-shaped arm, and on a dual-point system, the control arm has two “forks” which wrap around the top and bottom of the pitch slider.

**PITCH LINKS** • These small linkages are the connection between the pitch fork and the tail blade grips. They can be a single plastic piece (Hirobo Evo), a ball link (Bergen Intrepid), or a metallic link with bearings (Miniature Aircraft Stratus). The ends of the pitch links will pivot to allow for movement of the tail blade grips.





**OUTPUT SHAFT** • Similar to the main shaft on the main rotor, the tail output shaft is the shaft that rotates and provides the motion to the tail rotor. The end inside the gearbox is connected to the pulley or gear from the drive system (depending on whether you have a belt drive or torque tube/wire drive), and the other end of the output shaft is connected to the tail hub. The output shaft is also the piece on which the pitch slider slides back and forth.

**OUTPUT SHAFT BEARINGS** • Since the output shaft rotates at a very high speed, it is supported inside the gearbox by two bearings to provide smooth movement. These bearings are usually ball bearings, but on some less expensive helicopters you may find brass bushings (also called "plain bearings").

**TAIL BLADES** • These items look like smaller versions of the main rotor blades, and serve a similar purpose. The force generated by the tail blades is what resists the helicopter's tendency to rotate opposite of the direction of the main rotor. Tail blades are most often made of plastic or carbon fiber; but there are also examples of fiberglass blades as well.

**TAIL BLADE GRIPS** • Just like on the main rotor, the tail blade grips are what connect the tail blades to the tail hub. Most high-end helicopters use a single-piece metallic blade grip, while other helicopters use plastic grips. On some machines like the Evo series, the grips are actually two plastic pieces that are sandwiched together with screws. The grips also contain bearings for smooth, precise movement. Some tail blade grips will have two radial bearings and a single thrust bearing in each grip, some will have a single radial and a single thrust bearing, and some others will have two radial bearings and no thrust bearing.

**TAIL HUB** • Similar to the main rotor hub, the tail hub is what connects the tail blade grips to the tail output shaft. The tail hub is usually "fixed" to the output shaft by means of a setscrew which threads through the tail hub and locks into a dimple on the output shaft. The hub will have two small protrusions on it which are the axles for the tail blade grips.

**RADIAL BEARINGS AND THRUST BEARINGS** • A radial bearing is what most people think of when they hear the phrase "ball bearing." It looks similar to a donut, and is filled with small steel balls that allow the inner portion of the bearing (the "inner race") to rotate smoothly in relation to the outer portion of the bearing (the "outer race"). A radial bearing is designed to allow parts to rotate smoothly (like the blade grips), but is not designed to take high loads going "sideways" through the bearing.

A thrust bearing is as its name implies—it's designed to allow objects to move easily even when subjected to high thrust loads. It looks like two flat metallic discs with metal balls sandwiched between them. A thrust bearing doesn't offer much (if any) support for a rotating item like a radial bearing would, but instead you can place a large amount of weight on a thrust bearing and still be able to turn the bearing easily. If you've ever owned a rotating CD rack, it most likely had a thrust bearing in the base of the rack that allowed it to spin easily, even when you had a large number of CD's.

A combination of radial and thrust bearings in a tail blade grip is desirable because the radial bearings will allow your tail blades to change pitch easily, while the thrust bearings will handle the high centrifugal loads of the tail rotor spinning during flight. **TREK**

**PITCH FORK** • This piece is connected directly to the pitch slider; and has two arms ("forks") coming off it that provide the mounting point for the pitch links going to the tail blade grips.

# The power you need

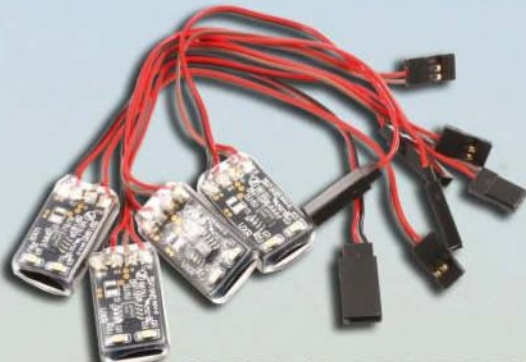
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# TEMP GUNS

FOR WHEN THINGS GET HOT... AND THEY WILL.

**Words:** Staff

**N**itro engines can vary drastically on how well they run; once tuned properly, these engines usually run at a consistent and reasonable temperature range. A temp gun can be used to give you a base temperature if your motor begins to act funny.

Tuning engines can be a hard task, even for some of the most knowledgeable pilots. Some pilots tend to be naturals at it, while others just can't get it down no matter how long they work at it. The ones who struggle can always benefit from the use of a temp gun to reference the different temperatures of their motors, and even the engine-tuning professionals can be reassured that their engine is running at a safe temperature.

Temp guns can also be used for several other applications, especially in the electric helicopter side of things. You can gauge your battery temps, motor and engine temps, and your ESC temps. In this Tools of the Trade, we'll discuss how exactly temp guns work and the benefits you can get from having one in your toolbox.



I don't think that thermometer will fit.

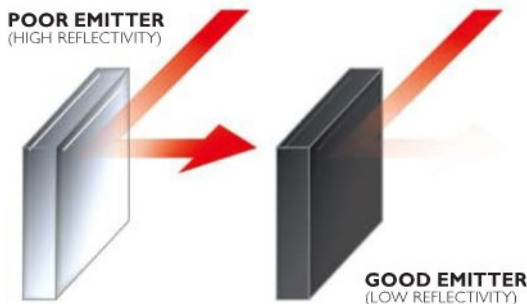
## » HOW IT WORKS

Temp guns are pretty complicated pieces of machinery, but the principal behind how they work is rather simple. All objects emit infrared radiation. Infrared radiation is electromagnetic radiation that has a longer wavelength than normal light, making it invisible to the naked eye.



## EMISSION VALUES

Emissivity is a ratio of the energy omitted from a material to the energy radiated from a black body at the same temperature. Different materials have different emissivity values; so they can both give completely different ratings despite being the same temperature. Temp guns found in the hobby typically have a "catch all" setting for emissivity settings. However other types of temperature readers can be further calibrated for exact temperature readings. For example lets say that you are measuring



the temperature of two different engine heads that are made up of two different materials but have the same temperature. To get perfect results you would have to measure each head with a traditional thermal gauge and then adjust the gun's emissivity rating until they're matched.

## USAGES OF A TEMP GUN

Perhaps the most common usage of a temp gun is checking engine temperatures. As mentioned above, engine tuning can be a daunting task for many, so any help is usually appreciated. A temp gun is a good indicator of whether you're running your engine too lean or too rich. There is no ideal temperature, but one of the best methods is get the engine running the way you like it to run then take the temperature as a base measurement.

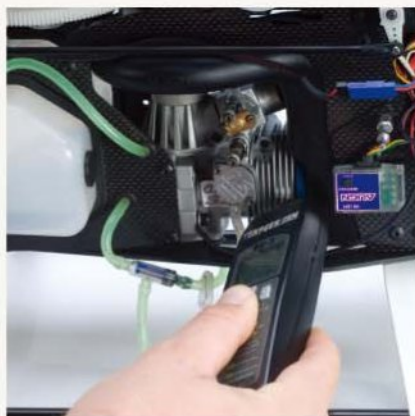
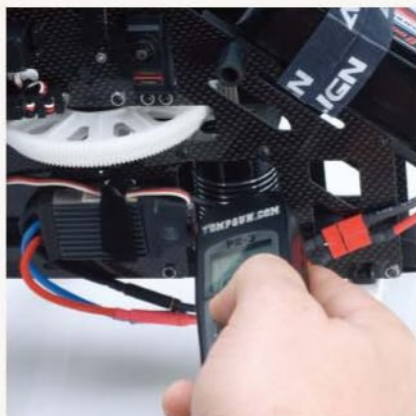
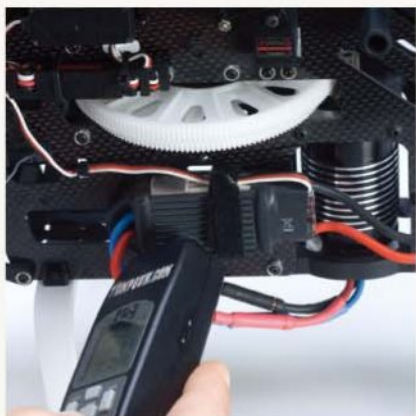
Typically, you take the temperature from the engine head or a consistent spot each time. There are many factors that can affect the temperature of the engine that will require small adjustments. Eventually, you'll have a range of temperatures that best suit you. You should not tune to temperature, but it can be used as a warning to alert you if your motor begins to run outside that window.

There is a good temperature range that your engine will run at its peak performance. When breaking in a nitro engine a temp gun can come in handy to keep the engine at the desired temperature. The engine should be broken in around 180°-190°F for .50s or .90s.

However check your engine's instruction manual before assuming any temperature range. This will make sure enough lubrication goes through the engine, and is hot enough to set the piston and ring. After the engine has broke in leaning the mixture will give you more power. Most of us helicopter pilots tune our engines to get the most amount of power. This can mean that we run our helicopters on the hotter end of our engine's temperature range. For the average pilots that don't need all the power they rather trade power for longevity keep your temperature in the middle of the range. An ideal temperature range for a nitro engine can vary anywhere between 190°F to 220° depending on the engine size, fuel, plug, and conditions. This will give you a basic range that you can maintain by leaning or richening the mixture.

Temp guns have also proven to be quite valuable when it comes to electric helicopters. Since there is no motor tuning like found in a nitro helicopter, it is not as easy to sense if you are running too hot. This is when a temp gun comes in handy to check your battery, motor,

and ESC temperatures to be sure that you're not overheating. Check your gear's instruction manuals for a temperature range. Running a bigger pinion, which puts more stress on the motor when spinning the main rotor blades, can cause overheating. Overheating can cause bearings to wear out faster in our motors, cause thermal shut down on the ESC and reduce battery life. Extreme heat can also damage the motor windings and magnets. Keeping a close eye on the temperature when changing pinions or setting up a new helicopter can save you money in the long run.



Depends where she takes it from I guess.

## CONCLUSION

No matter your skill level a temp gun is a nice tool to have in the flight box. There are many different temp guns on the market, and prices vary. Typically, the small \$ 30 sensors do more than enough to read proper temperatures. Once you have that temp gun in your arsenal you'll soon realize how it may come in handy. *TREX*

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# CURTIS YOUNGBLOOD SOLID G

HEADING HOLD GYRO

SOLID AS A ROCK!

Words: Ryan Kephart



**C**urtis Youngblood, the father of modern 3D flight, is known to design products that perform well. His company has made everything from exhaust pipes to governors. This month we are reviewing his Solid G heading hold gyro and testing it in JR's newest 50-sized helicopter, the Vibe 50. The Solid G gyro is small and offers extensive programming using the G-View programming tool. Will the Solid G perform like their other products? Will it stack up against other top gyros?

Oh, so shiny!

## FEATURES

The Solid G features heading lock capability for both hard 3D maneuvers and precision flying. This gyro can be used in combination with various tail servos, which include the JR 8900g, 8700g, Futaba 9254, 9256, and any standard servo. The gyro is encased in hard plastic, which is coated with a chrome finish. The sensor is the same size as a Futaba GY401 and it includes a small lightweight amp. The amp provides basic programming functions to get you set up quickly. If you would like a more detailed setup, the G-View will provide all the advanced features to make your setup perfect. Programming the Solid G with the G-View is a cinch. Plug the gyro in and select what helicopter you're flying. The G-View lists several helicopters that are pre-programmed to give you a rock-solid tail without having to make a lot of adjustments. The G-View can also be used to fine-tune the gyro. The Solid G has adjustable rebound, coast, piro gain, piro speed, piro offset, and much more. The Solid G is rated for up to 7 volts, which is

higher than any tail servo on the market. The Solid G claims to be one of the most consistent piro rate gyros. Will the claim live up to its name?

## TESTING

Testing of the Solid G was performed on the JR Vibe 50 with the stock tail blades and a JR 8900g tail servo. The Solid G includes the sensor, amp, gyro tape, and a strap to wrap over the sensor. Installing the Solid G is similar to installing the Futaba GY611. I placed the sensor on the gyro mount and wrapped the strap loosely around the gyro. I then mounted the amp and proceeded to program the gyro. I wanted to check both types of setup, so I opted to first set up the helicopter using the manual menu on the amp. The manual does a great job telling you how to get into program mode and what the flashing lights mean on the amp. Going through the manual process involved selecting what type of servo I was using, gyro direction, left end point adjustment, and finally right

end point adjustment. It was fast and simple to set up the heli with only a few adjustments on the transmitter. The piro rate and gain was set on the radio, and then it was time for some flight tests.

I started with a gain around the mid 70's and worked my way up until the tail started wagging. I then backed off a couple of points and took to the sky, throwing everything I had at it. I started a test with pirouetting in both directions to see if the speed of the piro was consistent. The tail performed flawlessly, and no variation in speed was noticed. Spinning the tail and quickly stopping the helicopter resulted in a minor bounce back known as "rebound". I tried to eliminate this problem by lowering the gain a bit, but the problem still existed.

I decided to try out some hard collective moves while spinning the tail. I pulled the nose up 90 degrees, fed full rudder input and slammed the collective. The piro remained consistent through the full pull without changing speed or whipping around. I was truly amazed how well this gyro held the tail. Next, I wanted





CY's got a winner.

to try some high speed backwards flight and began by performing a very fast Hurricane. The tail held without blowing out even when I tried bogging the head down while exiting the move.

The gyro held better than I thought when I programmed it in manual mode. I was anxious to see if I could remove the rebound issue with the G-View, so I landed and proceeded to program the advanced features with the addition of this handy tool.

Programming the Solid G gyro using the G-View is a lot like programming the ATG governor from the same company. The simple procedure only took about a minute or two. I tried softening up the rebound by increasing the left and right coast/rebound value. This will allow the tail to remain still as soon as I release the tail input. I went through the rest of the setup, adjusting the stopping force, piro gain, and other key features to see how well the tail would perform. I took the Vibe back out and noticed that the feel of the tail improved dramatically. The

rebound was gone and the tail stopped exactly where I wanted it to without any problems. Piro rates to the left and the right were spot on. Piro Flips became much easier to accomplish, as the tail never changed speed throughout the flips. The Solid G did its job without any problems and programming it with the G-View could have not been easier.

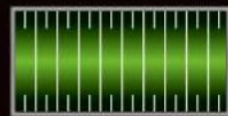
## CONCLUSION

Flying the Solid G was nothing less than a pleasure. I enjoyed the consistent piro rates and loved the way the tail would stop on a dime when doing 4-point Tic-Tocks. I believe this gyro ranks with the best of them. The G-View is a must-have in my opinion. It allows easy programming and the ability to set up the tail to meet your needs. The G-View can also be used on other Curtis Youngblood products, so you can manage both your gyro and governor. With the reasonable price of \$195, this gyro would be perfect for any sized helicopter, whether you are a beginner or an advanced pilot. **TREX**

## » SCORECARD

SCALE RATING: 1=POOR 10=EXCELLENT

**10**



### + THE GOOD

- Advanced programming features
- G-View compatible
- Very consistent piro rates
- Can be used with any tail servo

### - THE BAD

- For optimum performance you must purchase a G-View

## CONNECT

**MANUFACTURER:** Curtis Youngblood Enterprises

**WEBSITE:** [www.curtisyoungblood.com](http://www.curtisyoungblood.com)

**PART NUMBER:** Solid G

**STREET PRICE:** \$195.00

# HELI-MAX AXE CX

MICRO

MINIATURIZED AXE EZ

Words: Brandon Updike



Hi Zary.

Coaxial helicopters have increased in popularity since their inception. They have proven to be excellent trainers due to their stability, durability and cheap price tags. Heli-Max burst onto the coaxial scene with the Axe EZ that we covered back in issue 14 (that was a long time ago). Now they have a new heli on the market that is smaller (ditched the scale body) and has some minor design changes. In this Product Scope we will examine this new counter-rotator and see how well it performs.

## FEATURES

The Axe CX shares a resemblance to its bigger brother, the AXE EZ. The thing that stands out the most is that it is still powered by two separate motors. The two motors drive two different gear sets. The helicopter is controlled by a 4-in-1 circuit board that controls the majority of the helicopter's functions. It serves as the speed controller for the motor, the receiver for all your inputs, receives the

power from the battery, and takes care of any necessary in flight mixing options.

The CX comes with a 500 mAh LiPo battery pack, but still takes around an hour for a full charge. The Axe CX loses the scale body of its predecessor and uses a single Hughes 300-type canopy for easy removal. The canopy comes in several different colors, so you have plenty of options to pick from. The frame layout is a little different, as the servos

now face towards the rear and the 4-in-1 board is now laid across the frame horizontally.

## FLYING CHARACTERISTICS

It comes as no surprise that this thing flies very well. Like many other counter-rotators, this helicopter has the capability of flying nearly hands-off. To



get it into forward flight you have to move your cyclic stick towards full, and it flies around at a decent rate. I was pretty impressed with the tail piro rate because it had good speed and stopped without any lag. I was able to pull reversals off without any problems whatsoever. That's right... pirouetting reversals with a counter-rotator.

One of the quirks we had with the EZ was that the stock power system seemed to lag during climbouts. This problem no longer exists with the CX because the lighter size really suits it well. When I pop the collective, the helicopter jumps quickly and it's also able to catch itself in a medium speed freefall. Flight times were decent despite the smaller battery size. The heli flew for around a solid eight minutes without any problem.  
(continued on page 58)

# Perfect Setup Out of Reach?

## Grasp it!



"I truly enjoy how thorough you are in the book and DVDs. As a mechanical engineer, I like to know WHY, and your materials are excellent in providing me a better understanding of helicopters. Thanks!"

— David Messina, LaGrangeville, NY






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## » AT A GLANCE

<b>SIZE:</b>	50 Size
<b>POWER:</b>	Nitro
<b>TYPE:</b>	Pod and Boom
<b>BUILD TYPE:</b>	Kit
<b>TAIL DRIVE:</b>	Torque Tube



# CENTURY RAVEN 50 SE

UPDATED AND READY TO RIP

Words: Mark Madsen | Photos: Jason Boulanger

The Raven line of helicopters has been around for quite sometime now. Century continues to upgrade it in order to keep it competitive in the growing helicopter market. Century Helicopters has never really dominated the helicopter market here in America but has gained a large global following due to great consistency in making reliable, well rounded, and solid performing helicopters. The Raven does a great job exemplifying this because it was designed from a solid platform in the beginning of the decade, but has evolved with the times to stay relevant. This has resulted in it becoming a respected name. The Raven SE comes with a great price tag of \$299.95, but after all these years does the performance still compare to the onslaught of the new latest and greatest helicopters?

# FEATURES

Anyone who is familiar with any kind of nitro Century helicopter will feel right at home with the layout of the Raven. The SE utilizes the same direct connect CCPM system that has been seen on the Raven helicopter since day one. The familiar stacked frame set is nearly identical to its Hawk brother, but with the CCPM control system comes a different radio tray.

## » MAIN FRAME

### SWASH CONTROL:

As mentioned before, the Raven uses a direct connect 120-degree CCPM system that proves to be rather effective and simple. The direct connect design is quite easy to set up because of the absence of any bellcranks.

**COMPONENT LAYOUT:** Since the Raven uses direct connect CCPM, the servos are all located in close proximity to the swashplate. Two of the cyclic servos are located on a designated servo mount on the left and right side of the frame directly in front of the swash. The elevator servo is located directly behind the swash plate in a servo mount that is bolted directly to the frame. The fuel tank is molded in an unconventional shape but sits snugly in the rear of the frames.

**DESIGN:** The lower half of the four-piece stacked frame is made of aluminum while the top half of the frame is plastic. The bearings are fitted in plastic bearing blocks that are integrated into the frames.

**CANOPY:** The yellow plastic canopy needs to be cut in order for the windshield to be bolted on. The windshield comes in a smoky color and needs to have its edges cut to fit the grooves of the canopy, and bolts to the canopy using 6 self-tapping screws. The canopy is mounted on the helicopter using two rubber grommets in the back and a plastic bridge that is bolted on the bottom and hooks onto the frame.

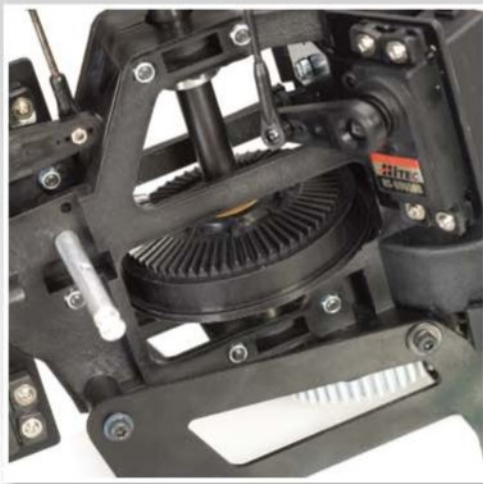
**LANDING GEAR:** The landing gear is made of two plastic struts that bolt to the frames. The skid pipes are pinned to the struts with the use of setscrews.

Is that a raven's nest?

## » DRIVE TRAIN

**ENGINE MOUNT:** The engine mounts to a single CNC engine mount that wraps behind that back of the motor case. The mount fits between the frames and is bolted into elongated holes for mesh adjustment.

**CLUTCH/PINION:** The clutch assembly is a little different on the Raven because it sits below the fan instead of above it like most other helicopters. The clutch is positioned upside down, with the clutch facing the top of the helicopter rather than the bottom of the helicopter. The clutch bell has a 26t pinion gear. The bell has a ball bearing fitted into it for smooth movement.



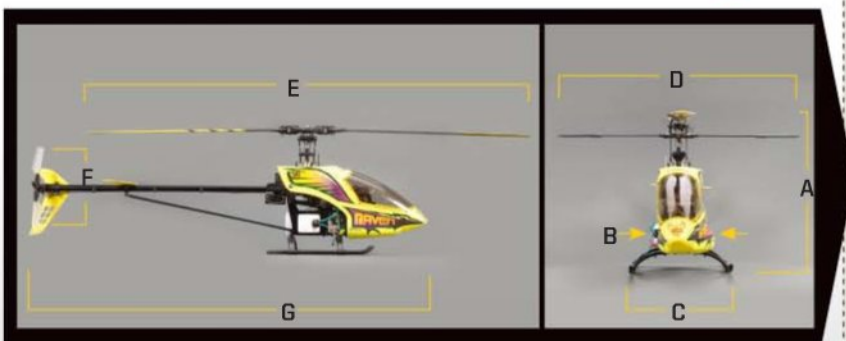
**COOLING FAN AND SHROUD:** The fan sits above the entire clutch assembly and bolts directly onto the clutch. There is a fan shroud integrated into the top half of the frame, but it doesn't reach all the way to the top of the engine. As such, there is an additional fan shroud that bolts directly below it to direct the airflow over the motor.

**MAIN GEAR:** The plastic main gear is also a unique design that doesn't look anything like a conventional main gear found in most helicopters. The bottom of the main gear is hollow sort of like an umbrella and contains teeth on the inside as well as the top.

**AUTOROTATION DRIVE:** The Raven uses a completely separate counter gear assembly that meshes directly with the clutch pinion. The counter gear assembly contains a pinion pinned to the shaft, which meshes with the teeth on the inside of the main gear. When the counter gear turns the pinion turns the main gear. The one-way bearing is press fit into the main gear. The tail is constantly driven during autorotations.

**TAIL DRIVE:** The torque tube is driven by a crown gear that meshes directly with the main gear. The back of the tail transmission assembly contains a plastic coupler that allows the torque tube to key into it.

**“I went into this flight check not knowing what to expect from this helicopter but was left pleasantly surprised because the Raven exceeded my expectations when it came to basic fundamental flight.”**



## CENTURY RAVEN 50SE MODEL SPECIFICATIONS

<b>CLASS:</b>	50 sized nitro
<b>BUILD:</b>	KIT
<b>BLADE SIZE:</b>	600mm
<b>LEVEL:</b>	Beginner to Adv.

### FRAME

<b>MATERIAL:</b>	Metal/Plastic
<b>TYPE:</b>	Stacked
<b>SERVO TO SWASH LINKAGE:</b>	Direct
<b>SERVO SIZE:</b>	Standard

### ROTOR HEAD

<b>GRIPS:</b>	Plastic
<b>HEAD BLOCK:</b>	Plastic
<b>LINKS:</b>	Ball
<b>SWASH:</b>	Metal
<b>CONTROL:</b>	3 Servo   120° CCPM

### TAIL

<b>DRIVE SYSTEM:</b>	Torque Tube
<b>AUTO DRIVEN:</b>	Yes
<b>TAIL PITCH SLIDER:</b>	Single
<b>TAIL BLADE GRIPS:</b>	Plastic
<b>TAIL CASE:</b>	Plastic
<b>BOOM STRUT MATERIAL:</b>	Metal

### GEARING

<b>MAIN ROTOR TO PINION RATIO:</b>	9.1:1
<b>MAIN ROTOR TO TAIL RATIO:</b>	1:4.75

### WEIGHT

<b>EMPTY:</b>	4 lbs., 9 oz. (2239g)
<b>WITHOUT FUEL:</b>	7 lbs., 1 oz. (3,221g)
<b>FULLY LOADED:</b> (Includes fuel or battery)	8 lbs., 0 oz. (3,629g)

### DIMENSIONS

<b>HEIGHT (A):</b>	15in (381mm)
<b>CANOPY WIDTH (B):</b>	5 in. (127mm)
<b>LANDING GEAR (C):</b>	9.5 in. (241.3mm)
<b>PADDLE TO PADDLE DIA. (D):</b>	2.1 in (53.34mm)
<b>MAIN ROTOR (E):</b>	600 in. (15240mm)
<b>TAIL ROTOR (F):</b>	9.7 in. (246mm)
<b>LENGTH (G):</b>	48 in. (1219mm)

# FEATURES CONTINUED

## » TAIL & BOOM



**TAIL CASE:** The torque tube is connected to a drive coupler on an input shaft with a plastic bevel gear pinned to it. The bevel gear meshes with another gear on the tail output shaft. The output shaft is able to rotate smoothly thanks to two ball bearings pressed into the plastic tail case. The two plastic tail case halves house everything with a snug fit.

**TAIL BLADE GRIPS:** The plastic blade grips house three different bearings - a ball bearing, a thrust bearing, and a thin ball bearing. The thin ball bearing and the thrust bearing are located inside the blade grip while the regular ball bearing is pressed into the back of the grip. Like the head assembly, it is all tightened down using a nut rather than a bolt.

**PITCH ACTUATOR SYSTEM:** The tail linkage rod is a two-piece type design that uses a connector to join the two rods. The plastic bellcrank uses two bearings for smooth movement and cups the ball on the tail pitch sleeve. The tail pitch sleeve has two bearings and a brass slider.

**BOOM:** The aluminum tail boom is 20mm in diameter and approximately 914mm in length.

Charlie Brown calls that a block head.

## » ROTOR HEAD

**HEADBLOCK:** The aluminum head block is bolted to the main shaft using a single Jesus bolt. The damper system consists of two rubber o-rings that are pressed into the head block.

**PHASING:** The phasing pins are pressed into a separate aluminum assembly from the head block, which allows for phasing adjustments. The phasing can be adjusted by loosening the setscrew that pins the assembly to the main shaft. The pins slide into the washout hub and there is no noticeable play.



**BELL/HILLER MIXER:** The plastic Bell/Hiller arms are bolted directly to the blade grips and contain two bearings and a brass spacer.

**WASHOUT ARMS:** The plastic washout arms use dual bearings and have the links pinned to them. There are no output options.





## » INSTRUCTIONS & BUILDING TIPS

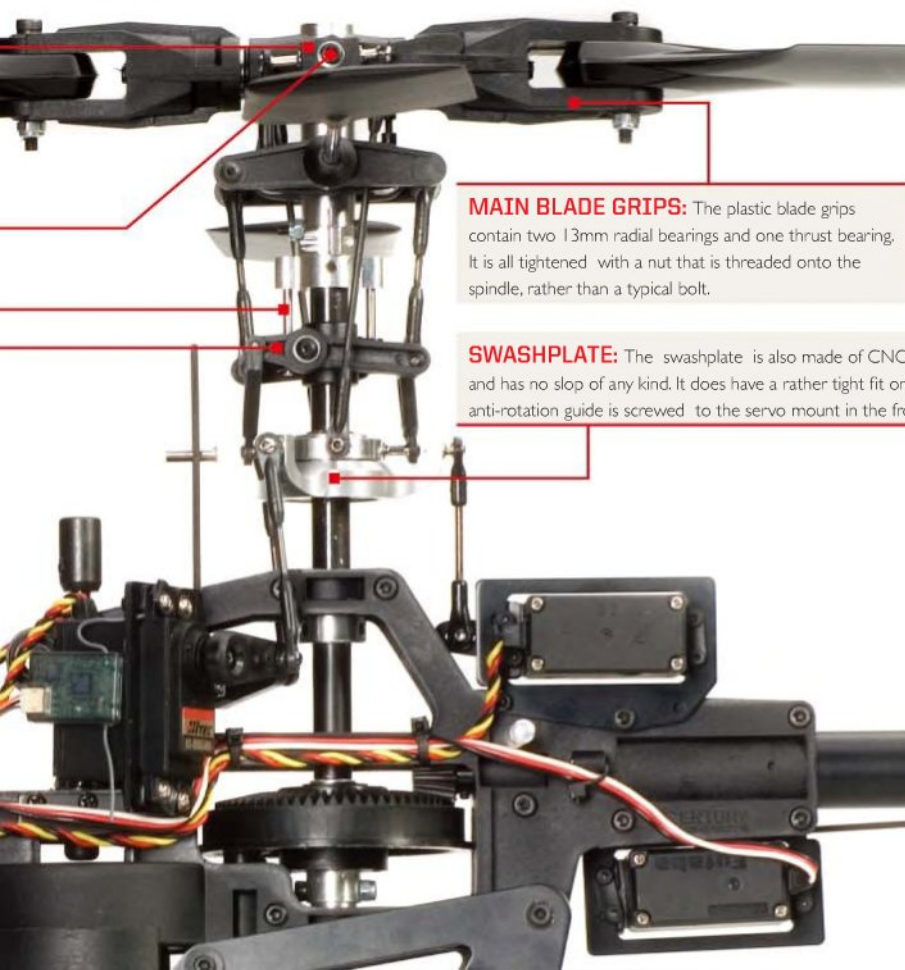
### WHEN YOU OPEN THE BOX

The kit comes in a plain white box with an illustrated sticker front and center. Upon opening the box, you'll find all the familiar features of any helicopter. All the parts came in labeled plastic bags and most were placed into the canopy. There was a designated area for all the long components such as the rods and the tail boom. The Raven comes with decent looking stickers, but they're somewhat of a nuisance to apply because of the shape of the canopy. The kit came with quite a bit of extra hardware such as random bolt sizes, but there wasn't a specific bag with extra hardware.

### MANUAL AND BUILD

The manual describes the build process for both

the 30 and the 50-size helicopter so make sure you're following the right directions. It consists of both drawings and descriptions of the various assemblies. The drawings look great and you can easily complete the entire build by only using the drawings. The descriptive text is good for the areas you may get confused in to help clarify what your doing. Overall, the build went smoothly without any problems. I did find the fan shroud a pain to install, so be sure to keep your frame halves a little loose so it'll slide in a little easier.



**MAIN BLADE GRIPS:** The plastic blade grips contain two 13mm radial bearings and one thrust bearing. It is all tightened with a nut that is threaded onto the spindle, rather than a typical bolt.

**SWASHPLATE:** The swashplate is also made of CNC-machined aluminum and has no slop of any kind. It does have a rather tight fit onto the main shaft. The anti-rotation guide is screwed to the servo mount in the front of the swash.

## CENTURY RAVEN 50SE RTF & TEST GEAR

### » TEST GEAR



■ **RADIO:** JR, 9303 2.4, JRP2925, Price: \$629.99 with receiver.



■ **RECEIVER:** Spektrum, AR7000, SPM6070, Weight: 15g, Price: \$99.99.



■ **CYCLIC SERVO(S):** Hitec, HS-6965 for the Swash HS7966HB for throttle, Weight: 52g, Price: \$84.99.



■ **ENGINE:** OS, Hyper 50, Weight: 406g, Price: \$190.



■ **FUEL:** O'Donnell Premium Fuel, 20%, Price: \$15.99 per quart.



■ **GYRO:** Futaba, GY401, FUTM0807, Weight: 27g, Price: \$129.99.



■ **RECEIVER BATTERY/BEC:** Spektrum, 1100mAh NiCd Receiver Pack, SPM9520, Weight: 134g, Price: \$24.99



■ **BLADES:** Rotor-Tech, Angled Tip 600mm Blades, CN266001, Weight: 140g, Price: \$99.95.

# TESTING

The Raven had no problem proving itself as a capable flyer over the years, but my main question going into testing was how well it compares to today's hottest 3D helicopters. Paired with a strong OS 50 Hyper and a set of Hitech servos, the Raven had no limiting factors in its nimbleness. We put the Raven through its paces and came to a conclusion to the lingering question stated above.

**HOVERING** • The Raven was absolutely rock solid in a hover. Right after takeoff there was no need for any trim adjustments, as the helicopter just locked into a stable hover. Hands-free hovering was possible and it wasn't twitchy whatsoever. The helicopter didn't fight minor corrections and was able to transition to other orientations with relative ease. The wind even had a minor effect on the helicopter as it held steady and kept its ground.

**Rating: 5**

**FORWARD FLIGHT** • The Raven continued its trend of rock solid flying in forward flight. The helicopter naturally flew its pattern with no odd tendencies and held its line. Going into turns, the Raven kept a good angle and transitioned through the turn with great speed. When flying in a straight line the Raven's nose stays pointed at the ground and shows no sign of the ugly pitching or drifting that some other helicopters suffer from. Once the Raven gets going, it practically carries itself through the circuit as the speed increases.

**Rating: 5**

**CYCLIC PITCH RESPONSE** • Cyclic was quick, but not the fastest. It is suitable for any kind of 3D flying, but it wasn't blistering fast. During flips, the Raven keeps its line and requires minimal corrections for a clean flip. Tic-Tocs are relatively easy, but you need to emphasize your collective management in order to compensate for the little bit slower cyclic speed. Stock paddles work surprisingly well, as the heli shows very little sign of sluggishness. With the slower cyclic speed comes greater stability, which benefits the helicopter in the hovering and forward flight aspect as mentioned above. The Raven we received used an older style flybar paddle. The newer kits come with a lighter paddle that will increase the cyclic speed.

**Rating: 4**

**COLLECTIVE PITCH RESPONSE** • The Raven was relatively slow in its collective, and it lacked the "pop" that so many pilots require in this new era of flying. It felt heavy in the air whenever you unload the collective and dipped down a bit during sudden stops. It is manageable, however, and any maneuver can be performed with the helicopter. It may not be the fastest helicopter out but it still holds it own even through all these years.

**Rating: 3.5**

**TAIL ROTOR RESPONSE** • The torque tube driven tail performed as expected without any problems. It remained consistent in pirouettes and stopped when needed. During backwards inverted flight the tail held steady and showed no signs of blowing out. During tail slides there was no hunting or drifting as both the tail and gyro did their jobs well.

**Rating: 4.5**

**AUTOROTATION CAPABILITIES** • The Raven did well during autos but with the minor increase in weight the helicopter had a tendency to bleed off head speed a little quicker than I would have liked when flaring. However, similar to many other 50

size helicopters the Raven can float for days when playing with the pitch on the way down. The Rotor Techs were a good combination with the helicopter, as they had no problem retaining their head speed.

**Rating: 4.5**

**POST FLIGHT INSPECTION** • Century has proven to be a reliable brand, and with this helicopter I was able to witness this first hand. After logging several flights, there were no loose parts or anything broken. The Raven took everything I could throw at it in stride and I am happy to report that there were no failures.

**Rating: 5**

## CONCLUSION

The Raven continues to stand the test of time and it has proven to be a good flyer even by today's standards. It may not be as quick as its competition, but it can still hold its own and is still a very capable machine. I feel this helicopter is ideal for the beginner who is looking for a cheap and stable helicopter or the sport flyer who isn't into the hardcore smack down flying style. I went into this flight check not knowing what to expect from this helicopter but was left pleasantly surprised. The Raven exceeded my expectations when it came to basic fundamental flight. **TREX**



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# TESTING SPECS

## CENTURY RAVEN 50SE

**Part #:** CNI061  
**Distributor:** Century  
**Web:** www.centuryheli.com

**Street Price:** \$299.95  
**Price as Tested:** \$1714.83  
**Build/Setup Time:** 10 hours

### PERFORMANCE

**MODE FLOWN:** Normal, idle up 1, idle up 2  
**RPM OF EACH MODE:** Normal: 1700  
 Idle Up 1: 1850  
 Idle Up 2: 1950  
**ENGINE TEMP (after flight):** 160° F  
**FLIGHT TIME:** 6 minutes

### TEST CONDITIONS

**WEATHER:** Sunny  
**TEMP / HUMIDITY:** 60° F / 80%  
**BAROMETRIC PRESSURE:** 30.09 in.  
**WIND SPEED:** 5 mph  
**VISIBILITY:** 2 miles  
**ALTITUDE:** 675 feet

### PITCH CURVES

**NORMAL:** -5, 0, 12  
**IDLE-UP 1:** -12, 0, 12  
**IDLE-UP 2:** -12, 0, 12

\* Average taken from 3 test. Tested by going from a hover to 10° pitch climb out with idle up headspeed, recorded with using an Eagle Tree Flight Data Recorder with G-force expander

\*\* Average taken from 2 upwind and 2 downwind passes. Recorded using Eagle Tree Flight Data Recorder with GPS expander.

### REQUIRED TO FLY

Transmitter; receiver; three cyclic servos, throttle servo, tail servo, gyro, engine, muffler, receiver batter, battery charger, and glue

### WHO'S IT FOR?

This helicopter is great for anyone wanting a solid flying 50 that flies great and is different from the rest of the pack. The reliability and cheap price tag make this affordable and fun for anyone's budget.

## SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

- 5** Instructions
- 4** Parts Quality/Fit
- 4.5** Durability
- 4.5** Tunability
- 4** Overall Performance
- 5** Value

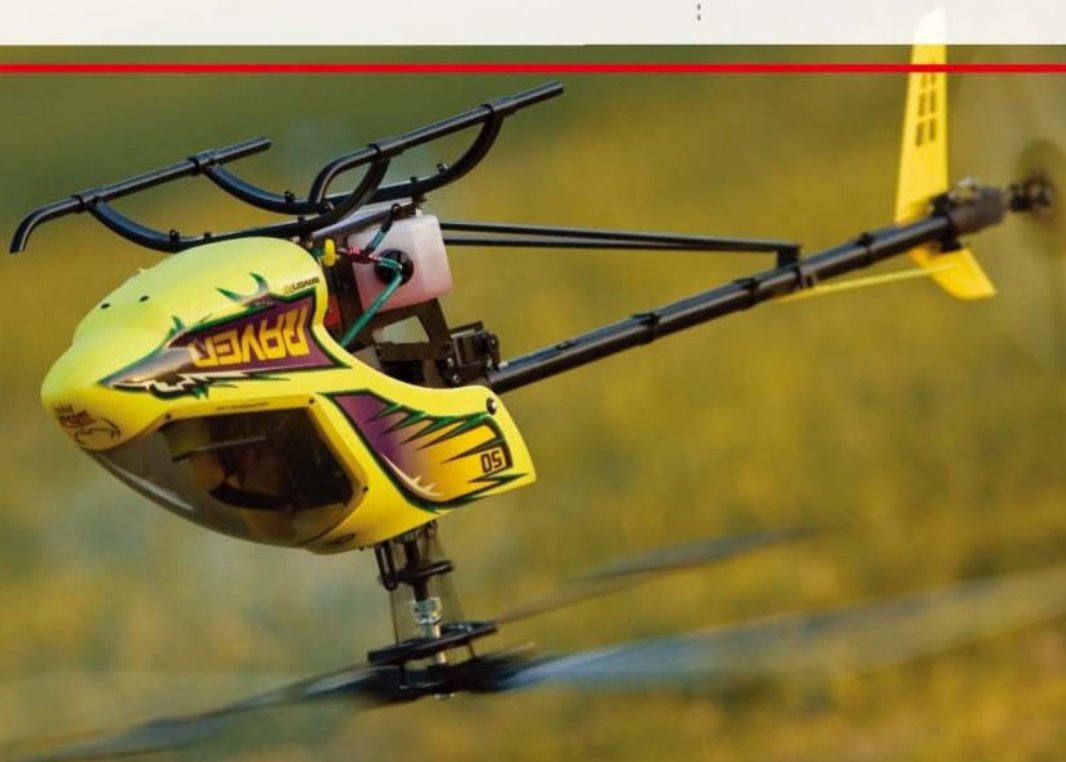
### THE GOOD

- Stable solid flight performance
- Great Price Tag
- Good Instructions

### THE BAD

- Not as fast as leading competitors
- Fan Shroud design

Very high in the "bang for the buck" category!



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91HZ-PS (OSMG1976)



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Not pictured  
70SZ-H Ring (OSMG1972)  
91RZ-H Ring (OSMG1978)  
91RZ-H DH Ring (OSMG1979)

# MODIFY YOUR G4 TRANSMITTER

WE DON'T USE NO STINKIN' DETENTS!

Words: Ryan Kephart

Flight simulators, which usually come with transmitters, have throttle gimbals with detents. This is a great feature for airplanes, which do not require precise constantly varying throttle inputs. Helicopters, on the other hand, require smooth collective and throttle response to achieve a solid hover. Small adjustments and smooth gimbals are a must and are needed to keep the helicopter exactly where you want it during precise maneuvers. Removing the ratcheting feel from the transmitter is not difficult and it should only take you about five minutes. You will find yourself flying better and more smoothly with the throttle detent removed. We will walk you through the process step by step.

**NOTE:** PERFORMING THIS PROCESS WILL VOID YOUR MANUFACTURERS WARRANTY ON THE CONTROLLER.

## » DIFFICULTY

SCALE RATING: 1=EASY 5=ADVANCED



## » TIME TO COMPLETE



## » TOOLS NEEDED



Is that Brandon Updikes sister?



**1** Remove the four screws on the back of the transmitter to expose the circuit board and the back side of the gimbals.

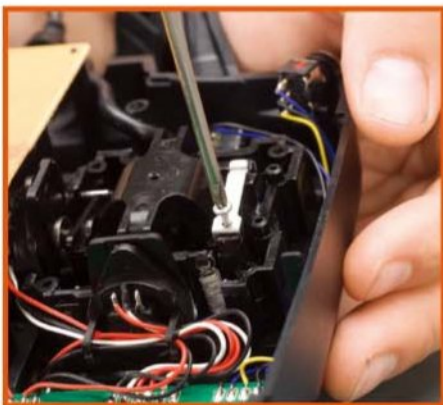


**2** Carefully lift the back of the transmitter away from the front face. Be careful and do not pull to hard, because the switches may be stuck to the back side of the transmitter.



**3** Next, you'll want to examine the throttle gimbal, which will be on the right side if you are looking at it from the back. Notice that there is a little metal tab

that rides on a toothed arch. This is where the ratchet feeling is produced.



**4** Remove the detent tab by removing the screw that holds it in place. Then, simply lift straight up on the detent to remove it from its mounting post.



**5** Next, flip the detent tab upside down and bend the tab back slightly to add additional pressure on the arch.



**6** Reinstall the tab on the transmitter and tighten down the screw. At this point, you are pretty much finished. You will want to check the tension on the collective

gimbal to ensure that the tension is to your liking. If the stick is too soft, then bend the tab down more. If it is too stiff, then remove some of the pressure.



**7** After you have found the correct tension, replace the back half of the transmitter and tighten down all the screws.

## CONCLUSION

PIECE OF CAKE, HUH? NOW YOU CAN ENJOY YOUR SIMULATOR AND HAVE THE PRECISE CONTROL THAT IS NEEDED TO FLY A HELICOPTER. THERE ARE SEVERAL DIFFERENT METHODS OF PERFORMING THIS TASK, INCLUDING THE ADDITION OF A PIECE OF FUEL TUBING OVER THE METAL TAB, WHICH SUPPLIES MORE PRESSURE THEN THE WAY THAT WAS DESCRIBED. WHICHEVER WAY YOU WOULD LIKE TO PERFORM THIS TASK IS UP TO YOU. BOTH METHODS WORK EXTREMELY WELL; IT IS JUST A MATTER OF FEEL. HAPPY FLYING, AND REMEMBER A SIMULATOR IS WORTH ITS WEIGHT IN GOLD! **TREX**

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# OUTRAGE 550

ENTER THE RAGE

#### SPECIFICATIONS:

- Length: 1077mm
- Height : 344mm
- Main Rotor Diameter: 1250mm
- Tail Rotor Diameter: 228.8mm
- Blade Length: 550-575mm
- Tail Blade Length 82-95mm
- Main Gear 140T 0.7 Mod gear
- Auto Rotation 42t
- Tail rotor ratio: 4.66:1
- Approximate flying weight: 6.5lbs depending on equipment used

#### KIT FEATURES:

- Beautifully crafted CNC anodized parts
- 120 Degree CCPM Servo layout for precision control
- 140 Degree CCPM servo layout (Optional)
- Light weight compact frame design for extreme 3D flight
- Rigid motor mount and middle bearing design for extreme power systems
- New 3rd bearing design for motor shaft support
- Large battery tray opening for various battery shapes and sizes
- 15 Degrees +/- achievable pitch ranges
- Fully programmable head design that can be set From Mild to Wild
- Thrust bearings on main and tail blade grips
- One piece 3D dampers
- Ball raced double pivot tail control system
- High quality tail rotor drive belt
- Fiberglass painted canopy



**DIMENSIONS**

- Length: 10.8 in (275 mm)
- Canopy Width: 1.5 in (40 mm)
- Landing Gear Width: 2.3 in (58 mm)
- Paddle-to-Paddle: 5.6 in (143 mm)
- Main Rotor: 10.6 in (275 mm)
- Weight: 4.26 oz (121 g)



**CONCLUSION**

Overall, I was satisfied with the performance of the CX. The smaller size proved to be a benefit to the helicopter. The only gripe I have about the helicopter is that it can take a while to charge and I don't ever feel like waiting. With a cheap price tag of \$99.98, the CX proves to be a good value for anyone wanting an entry-level helicopter. Heli-Max has once again done a great job by developing another beginner helicopter that can entice potential pilots into this hobby. The CX also does a great job serving as an alternative for anyone just wanting a toy to play around with in their spare time at home. **TREX**

**SCORECARD**

SCALE RATING: 1=POOR 10=EXCELLENT



- 8** Instructions
- 8** Parts Quality/Fit
- 9** Durability
- 7** Tunability
- 9** Overall Performance
- 9** Value

**+ THE GOOD**

- Very stable
- Inexpensive price tag
- Easy to operate
- Good flight times

**- THE BAD**

- Similar to most other counter-rotators
- Catered to beginners

**SPECIFICATIONS**

<b>CLASS:</b>	Counter-Rotator
<b>BUILD:</b>	RTF
<b>LEVEL:</b>	Beginner

**FRAME**

<b>MATERIAL:</b>	Plastic
<b>TYPE:</b>	Multi-Piece
<b>SERVO CONTROL TYPE:</b>	Direct Connect
<b>SERVO SIZE:</b>	Micro

**HEAD**

<b>GRIPS:</b>	Plastic
<b>HEAD BLOCK:</b>	Plastic
<b>LINKS:</b>	Ball/Z-Bend
<b>SWASH:</b>	Plastic

**CONNECT**

<b>MANUFACTURER:</b>	Heli-Max
<b>DISTRIBUTOR:</b>	Great Planes
<b>WEBSITE:</b>	www.helimax-rc.com
<b>PART NUMBER:</b>	HMXE0954
<b>STREET PRICE:</b>	\$99.98
<b>PRICE AS TESTED:</b>	\$105.98 (with batteries)

Continued from page 43

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For the 40mm Helicopter  
and 55mm Airplane Motors



## HK-2221-1630 Motor

For 450 class Helicopters  
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## HK-4035-800 Motor

For 700 class Helicopters  
and 4 to 5 inch Ducted Fans



## HK-4025-1100 Motor

For 600 class Helicopters  
Running on 6 Li-Po cells



## 2212-1920 Motor

A Higher Kv model of the  
2212 airplane motor for  
use in ParkJets or Racers



## HK-3026-880 Motor

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Electric Helicopter



## 2215-1860 Motor

A Higher Kv model of the  
2215 airplane motor for  
use in ParkJets or Racers

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DESIGNS



A vibrant, colorful background featuring a rainbow gradient. The colors transition from yellow on the left, through green and blue, to purple and pink on the right. Several translucent, multi-colored bubbles are scattered throughout the scene, some appearing to float in the air. The text "A main Ho" is written in a stylized, bubbly font across the center.

A main Ho



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# THUNDER TIGER AH-1W SUPER COBRA

THE GUNSHIP OF THE  
VIETNAM ERA!!!

Words: Ryan Kephart



**T**hunder Tiger is a company devoted to its customers. The recent release of the Mini Titan helped create a market of many other unique items for this size of helicopter. With the addition of the new Cobra conversion kit, you can make your Mini Titan a true scale war machine. The Super Cobra is known world wide for its aggressive look and giant machine gun. The Cobra was used as an escort helicopter for the popular Huey transport helicopter. The huge machine gun on the front of the Cobra was used to clear a landing zone for the troop transport helicopters. They were also used to monitor the surrounding area while the troops were loading or unloading. Thunder Tiger has captured this impressive look by taking its popular Mini Titan and transforming it into this iconic helicopter.

It still strikes terror on the receiving end.

## FEATURES

The AH-1 W Super Cobra from Thunder Tiger features a lightweight PVC shell in both various painted and unpainted versions. A tail boom, 45-degree coupler, tail belt, and tail rotor blades come with the kit to give your Mini Titan tail an authentic look. The kit also comes with all the other accessories to make this helicopter stand out at the field.

## SURFACE DETAIL/SCALE APPEARANCE

The factory painted fuselages come with simulated panel lines that look really good in the air. The front half panel lines are molded into the extra thick canopy. The kit comes with cable cutters, antennas, and fins to accent the scale appearance. A turret and missiles are also included and add to the realism. The Thunder Tiger Super

Cobra also has molded exhaust outlets. Overall, the scale appearance is as impressive up close as it is far away. This landing gear comes with all the details you would see on the real helicopter, such as steps,, tow hooks, and rivets.

## FUSE PREPARATION

The only thing required to prep the fuselage is to cut out the clear part of the windshield and cut the tinted windscreen to fit inside. The extra thick material made it a bit difficult, but a good set of Lexan scissors will get the job done. Holes must be drilled to allow the fuselage to attach to the helicopter using 1mm, 2mm, and 4mm drill bits. The last step is installing the rubber grommets on the front half of the fuselage.

## PREPPING THE MECHANICS

This is the part that converts your Mini Titan into a platform that will carry the scale fuselage and its accessories. First, the main shaft is removed and the main gear is pulled out. Then, the tail boom and gear assembly must be removed. The tail case and tail fins are removed from the boom and the old boom and belt are discarded. Next, the canopy are standoffs, landing gear, and battery tray are removed. Now the mechanics need to be modified by cutting the receiver tray off along with the end of the battery tray. The conversion kit comes with molded plastic parts like you would see on a plastic static display model. These parts are the same color as the fuselage.

The next few steps involve removing the plastic parts from the mold and placing them on the helicopter. The horizontal stab fits through the main gear location and snaps onto the frames.

Check out the guns.







Not bad for out of the box scale.



**DIMENSIONS**

Complete Weight:  
2 lbs., 0 oz. (907g)

Height:  
8in (203.2mm)

Canopy Width:  
6in. (152.4mm)

Landing gear width:  
4.75in, (120.65mm)

Paddle to Paddle diameter:  
12.25in (311.15mm)

Main Rotor Diameter:  
28.5in. (723.9mm)

Tail Rotor Diameter:  
6.25in. (158.75mm)

Overall Length (Nose to tail):  
28.5in. (723.9mm)

Then, an extended battery tray snaps on to the back of the mechanics and the battery tray is refit with shorter braces. After that, the fuselage standoffs and canopy mounts are attached to the pre-existing locations. The scale landing gear is then attached and the main shaft and head reassembled. The front cannon is mounted to the lower radio tray and held in place by two screws. The tail is then assembled using the supplied belt and 45-degree gearbox. The belt is guided by a geared pulley and belt tensioner. The tail is then assembled to the frames and the radio gear is installed.

## INSTALLING THE MECHANICS

Installing the clamshell fuselage on the mechanics is the easiest step of all. One side of the fuselage is mounted to the mechanics using the supplied hardware and then the other half is mounted in the same fashion. One half of the shell has a recess to allow the other half

to set flush. The top of the fuselage is then glued down and the bottom half is taped to allow access to the mechanics. After the halves are assembled, the front canopy slides on and is mounted using rubber grommets like a conventional pod and boom helicopter. The remaining plastic parts that make up the antenna and fins are glued to the fuselage. The missiles and flare boxes are then mounted to the horizontal wing with a single self-tapping screw. All that is left is applying the pre-cut decals and the model is finished.

## ACCESS TO THE MECHANICS

Accessing the battery is only slightly more difficult than removing a canopy from a pod and boom helicopter. The front half slides over the cannon and allows access to the front half of the mechanics. This will allow you to change the battery pack and continue flying. To access the main mechanics,

### THUNDER TIGER SUPER COBRA RTF & TEST GEAR

#### » TEST GEAR



■ **HELICOPTER KIT:** Thunder Tiger Mini Titan, TTR4710-K11, \$345.99



■ **RADIO:** Spektrum DX7, SPM2722, \$339.99



■ **RECEIVER:** Spektrum AR6100, SPM6100, \$49.99 (included with radio)



■ **CYCLIC SERVO(S):** Hitec HS-65mg, HS65mg, \$35.99 each



■ **MOTOR:** OBL 29/36-10H Brushless motor, TTR2381, \$33.99 (included with kit)



■ **ESC:** Ace BLC 40amp, ACE-8041H, \$79.99 (included with kit)



■ **GYRO:** TG6000 w/C0915 servo, ACE8073, \$78.99



■ **BATTERY:** FullyMax 2200 25C, \$63.60



■ **CHARGER:** Tahmazo T15, TMO1057, \$149.99



Clearing a path for the full-size Huey coming in behind.

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you must remove six screws on each side and the tape that is holding the bottom of the fuselage. Then, slowly separate the halves and slide the fuselage up and away from the front of the helicopter.

## FLYING

Flying the AH-1W Super Cobra is both fun to fly and visually impressive. The model flies just like a bigger nitro scale model, but is only a fraction of the size. The additional weight creates a very stable hover and smooth flight characteristics. Forward flight is fast and looks impressive when banking around turns. While using the G-Force head and flybar cage, the Mini Titan had a bad ground resonance tendency. This caused the blades to “bunny ear,” nearly hitting the fuselage every time you would spool up or spool down. To overcome this effect, I had to tighten the blades to make them more rigid to prevent a boom strike. This caused the helicopter to shimmy when the head speed dropped for a landing or slowing down after a fast forward pass. Keeping the head speed up resulted in a smooth flying helicopter that impressed the pilots and spectators alike. I did not notice any weird vibrations

throughout the Cobra after I raised the headspeed and tightened down the blades a bit. The raised tail performed flawlessly and did not feel much different than the stock configuration.

## CONCLUSION

The Thunder Tiger AH-1W Super Cobra not only looks impressive but flies well, too. The quick build and snap-together parts made this helicopter a fun project that is reminiscent of my childhood Lego days. The greatest part of this build is the ability to fly the helicopter when you are finished. The included plastic turret, rockets, and fins really add to the visual scale look of the Cobra and create a mean looking outline when flying around or just hovering right in front of you. If you have a Mini Titan and are looking to build a military helicopter, look no further. The Thunder Tiger AH-1W Cobra conversion kit is hard to beat. The reasonable price and included accessories really make this helicopter one of the top fuselages on the market for this sized machine. **TREX**

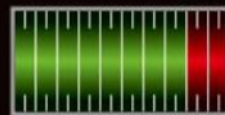
Going in for an attack.



## SCORECARD

SCALE RATING: 1=POOR 10=EXCELLENT

8.0



10	Instructions
8	Parts Quality/Fit
7	Durability
6	Accessibility
9	Overall Scale Look
8	Value

### + THE GOOD

- Plastic accessories look really good
- Landing gear looks like it fits the helicopter
- Lightweight material for fuselage

### - THE BAD

- Panel lines not molded into the back half of the fuselage.

## TECHNICAL INFO

<b>FUSELAGE MATERIAL:</b>	PVC
<b>MECHANICS USED:</b>	Thunder Tiger Mini Titan E325
<b>FLIGHT TIME:</b>	5-6 minutes
<b>BUILD/SETUP TIME:</b>	4 hours
<b>EXPERIENCE LEVEL:</b>	Novice, Intermediate, or Advanced

## CONNECT

<b>MANUFACTURER:</b>	Thunder Tiger
<b>DISTRIBUTOR:</b>	Ace Hobby
<b>WEBSITE:</b>	www.acehobby.com
<b>PART NUMBER:</b>	TTR3870-D
<b>STREET PRICE:</b>	\$92.99
<b>PRICE AS TESTED:</b>	\$936.54 (Includes mech.)

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# SETUP THROTTLE LINKAGE

## YOUR SIMPLE GUIDE TO THE PROCESS

Words: Mike Fortune

The throttle linkage is arguably the most overlooked linkage on the whole helicopter. Sometimes it seems that if just goes fully open and fully closed, that's good enough. Well, those things are important but the opening and closing rate are just as important. It's the rate of opening and closing of the throttle barrel that determines, in part, how well your throttle governor and gyro will work. Only when the linkage is properly setup will the opening and closing rate of the throttle also be correct.

Fortune says...

### » DIFFICULTY

SCALE RATING: 1=EASY 5=ADVANCED

# 1.0



### » TIME TO COMPLETE



# 15

 Minutes

### » TOOLS NEEDED



■ YOUR BRAIN



■ DIGITAL CALIPERS



■ TRANSMITTER

### » BEFORE YOU GET STARTED

IN ORDER FOR THE THROTTLE LINKAGE TO BE SET UP PROPERLY, THE FOLLOWING MUST BE TRUE:

1. The pushrod must be the correct length
2. The pushrod must be 90 degrees to the servo wheel
3. The pushrod must be 90 degrees to the carburetor arm
4. The opening and closing rate of the throttle barrel must be at the same rate, no matter what throttle setting is being used
5. The throttle barrel must open fully at 100% throttle on the transmitter without binding
6. The throttle barrel must be fully closed at 0% on the throttle curve and with the trim fully down without binding
7. The throttle barrel must be 1/2 open at 50% on the throttle curve

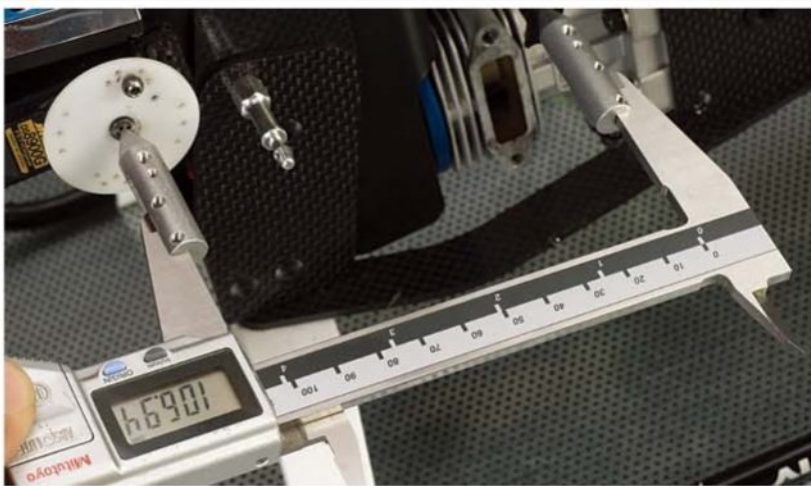
Wow! That is a lot just for the throttle linkage! Well, it's really not that hard, but careful attention to a few critical steps will insure that you will have it all right in the end.

## THROTTLE PUSH-ROD LENGTH:

This can be accomplished in several different ways, and I'll try to show you a couple of them here. The correct length of the pushrod is the same length as the center of the throttle servo output wheel to the center of the carburetor barrel. You can measure them with a small scale or ruler. If you choose this method, use a metal ruler or scale.

The plastic and wood types will change length as the weather changes and they absorb moisture. The easiest way is to use a set of dial calipers and to

go one step further, is with a set of Fortune Model Products (FMP) Ultimate Pushrod Measuring Tool extension tips installed. (NOTE: Shameless Plug alert!) Place one of the extension tips in the center of the throttle servo wheel and the tip of the other extension in the middle of the throttle barrel attachment screw. The tips of the tool are tapered and will automatically center themselves properly in the exact center of the throttle barrel and the throttle servo. Now, the reading on the dial caliper is the exact length of the pushrod when measured from the exact center of the ball links ends. You can use calipers without the tips installed, just make sure that you're measuring center to center. Now that we know the correct pushrod length, we can build the pushrod and go on to the next step.



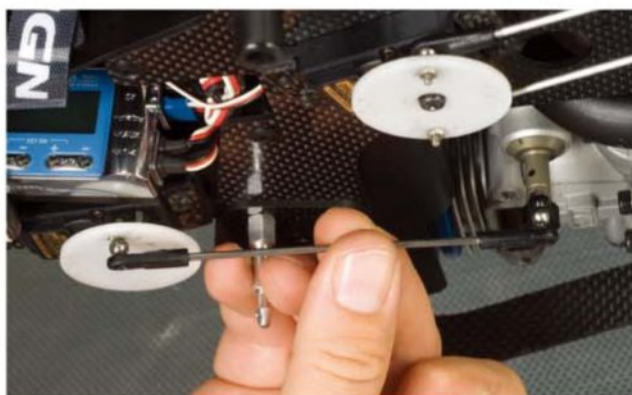
## SETTING THE PUSHROD 90 DEGREES TO THE THROTTLE SERVO ARM AND CARB ARM:

With the throttle pushrod now made to the correct length, it's time to install it. Since it takes just as much time and energy to install it in the wrong place as it does to install it in the right place, we might as well install it in the right place the first time.

Let's do the servo first. Turn your radio on and set the throttle trim at full low and the throttle stick at its mid point of travel. This is easy to confirm by the throttle curve setting and see that it shows 50%. Also, confirm that the throttle servo end points are at 100% for high travel and 100% for low travel and that there are no points programmed in your throttle curve. The throttle curve should be a straight line.

Hold the throttle servo pushrod on top of the throttle servo and carb body and see if the servo wheel holes look close to 90 degrees to the pushrod. It doesn't have to be perfect at this point, this is just to get us close. Next, using a steel rule or the set of dial calipers with the tool extensions installed (the preferred method), measure from both sides of the servo wheel holes to the center of the carb arm.

You'll notice that on the servo wheel, there are different numbers on the wheel. This is because the servo wheel and the servo output shaft spline have a different number of splines. This allows us to rotate the servo wheel to a position that more correctly sets the distance on either side of the servo wheel. It's most likely that even after rotating the servo wheel to the best position, the two sides still will be different lengths. No problem, this is where sub trim on your radio comes in. (It's tempting to



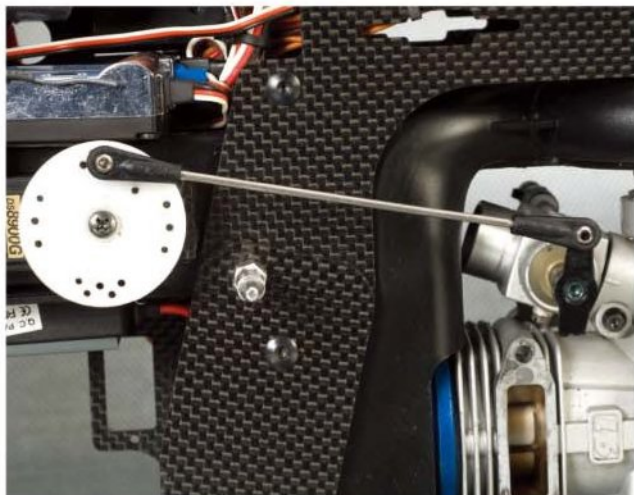
jump right to the sub trim and not set the servo wheel first. Don't fall into this temptation. I'll explain why later.)

Okay, now that the servo wheel is set in the correct position, let's get the carb arm installed and set, too.

The carb arm is really easy to install in the correct position, since the servo arm is already set and the throttle pushrod is already built to the correct length. Install the ball link ball in the position that is the same distance as the servo. Loosely install the carb arm on the carb, but do not tighten the attachment bolt at this time. Most carb bodies now have an index mark on the carb body that will align with a mark on the throttle barrel. When aligned, this sets the carb throttle at it's middle position.



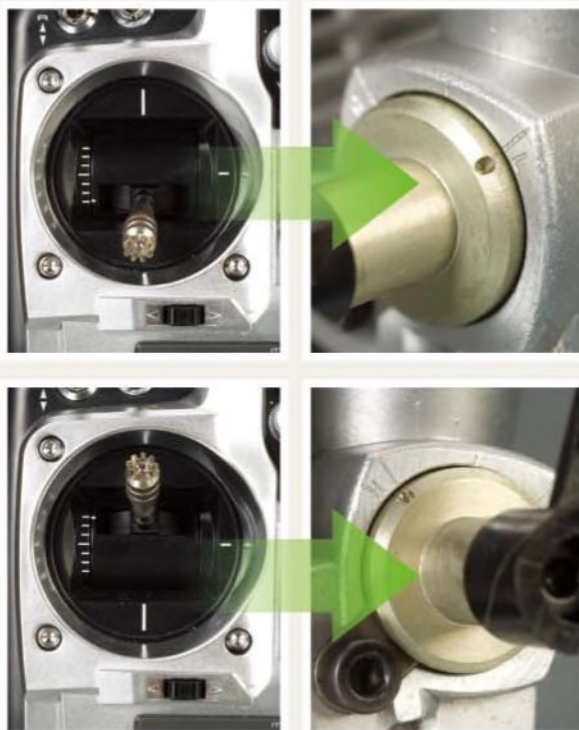
Install the throttle pushrod on the carb arm and throttle servo and align the marks on the throttle body and throttle throttle barrel. Then, tighten the carb throttle arm attachment screw. The carb arm and throttle servo arm/wheel are now automatically set at 90 degrees to the throttle pushrod!! Simple, Huh?



Linkage bone is connected to the carb bone.

## SETTING TRAVEL AT 100% AND 0% STICK POSITIONS:

Now that we have the throttle and servo hooked up, lets look at the overall travel. On the Y.S. 50 carb shown here, it's easy to see the high, middle, and low position alignment marks. Push the throttle stick to high and confirm that the throttle barrel mark aligns with the mark for high on the carb body. Do the same for the low stick position (make sure the trim lever is still at full low or all the way down). If the marks don't line up, make small adjustment in the travel adjust screen until the carb opens and closes fully. This will not affect the throttle position at 50% throttle or the 90-degree relationship of the pushrod and servo/carb arms. It's important the travel adjust numbers are the same for both hi and low!



## CONCLUSION

Now we have our throttle pushrod 90 degrees to the servo and carb arms all the time, our carb goes fully open and fully closed and we have the throttle servo and carb set up properly! This will make life much easier for your throttle governor as it makes adjustment to keep the rotor RPM constant without over or under shooting the target RPM. Now that the governor is performing at its best, it makes life easier for your gyro to keep the tail locked in place. One advantage of this setup is that it keeps your throttle curve numbers pure and accurate. If the throttle screen shows 72% at a certain stick position, that means you are at 72% throttle opening as well (or as some will refer to this as 72% power). **RCHELIMAG**



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Charge : 1-5.0A	Discharge : 1-1.0A	Max Charge : 50W	Max Discharge : 5W	Charge : 1-5.0A	Input : 11-17v	

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# HELI HARDWARE

## GUIDE GET TO KNOW THE HARD STUFF



Words: Mike Velez

An old full-size helicopter pilot once said... "A helicopter is an assembly of forty thousand loose pieces, flying more or less in formation." Well the number might not be forty thousand for our scaled down machines, but essentially the same quote could apply to the helicopters we fly. Keeping all of those loose pieces in formation takes a pretty decent number of screws, nuts, bolts, washers, and other hardware. Knowing what type of screw to use with which type of washer can be a huge advantage both at the field and in the air. In this article, I'm going to share with you all of the common RC helicopter hardware you'll typically come across.

## SCREWS AND BOLTS



### SCREW SOCKETS

First off, what's the difference between a screw and a bolt? According to the Industrial Fastener Institute (IFI), screws are used with tapped holes and bolts are used with nuts. The FAA distinguishes the differences by the material, fit, and if the item is engaged by a "screw driver." In the RC helicopter hobby, the more common term is screw. For the purposes of this article we're going to refer to screws/bolts as screws. Beyond their threads, the screws used in RC helicopters can be further divided by the type of socket used to turn the screw. There are four basic categories.

**PHILLIPS** • Phillips screws are popular among many manufacturers, but can be found just about anywhere. Phillips sockets come in various sizes, but most of those found in RC helicopters use either a #1 (smallest) or #2 (most common) driver. You can put a lot of torque on a screw when using the correct size driver for its socket, but be careful not to angle the driver and the screw head too steeply or you'll risk stripping the socket. At the first sign that a screw is beginning to strip, you should replace it.

**POZIDRIVE** • Pozidriv screws are less common than Phillips, but found on some helicopters. Pozidriv screws are easily identifiable by four single lines between the drive recesses. The difference is the shape of the driver tip and recess in the screw head. A Phillips uses a more rounded tipped driver where a Pozidriv has additional angles. A Phillips head screw driver will often times work in a Pozidriv screw, however a Pozidriv driver will slip out of a Phillips screw and end up stripping out the Phillips screw.

**ALLEN OR HEX** • Allen screws have a six-sided hexagonal socket and are driven in using an Allen wrench (also known as a hex driver). Allen screws are commonly found on larger, more advanced kits. Allen screws work great, as long as you use the proper size of driver for the socket. The drivers come in both standard and metric sizes, so although a driver may appear to fit in a socket, it's always a good idea to make sure you are using the right size to prevent the socket from stripping. Some Allen wrenches have a round head that

allows the tool to be inserted at up to a 45° angle, which makes Allen screws great for use in hard-to-reach places.

**TORX** • Torx screws are less common than Phillips and Allen screws, but can be found occasionally. A Torx screw is easy to distinguish by the multi-point star-shaped pattern in its socket. There are various sizes of Torx sockets, but the only one used commonly in RC helicopters is a Torx #10.



PHILLIPS



POZIDRIVE



ALLEN OR HEX



TORX

## SCREW THREADS

The various screws used in RC helicopters can be divided into two basic categories, depending on their thread type.



**SELF-TAPPING** • Self-tapping screws are designed to be used where no tapping (pre-threading) is present. Tapping can be thought of as the reverse threads that a screw will be mated with. Self-tapping screws have longer threads relative to their diameter, and the gap between threads is greater. These two properties mean that a screw can actually cut a thread into the material that it's being driven into, rather than just making the hole wider.

**MACHINE** • Machine screws have a thread pattern that's engineered to mate with a hole that is already tapped (threaded). Machine screws have short threads relative to the screw's diameter. Machine screws can tap their own threads when necessary, but only if they're being screwed into a plastic object that can deform just enough for them to fit, like a fuselage or main frame. But for the best result, the hole should be tapped with the appropriate thread size beforehand.



## SCREW HEADS

Any kind of screw can be found in a variety of head types, be it a Phillips, Allen, Pozidriv or Torx socket, and regardless of whether it is self-tapping or uses machine threads.

**COUNTERSUNK** • A countersunk screw (also known as a flat-head screw) has a tapered head that anchors flush with a surface when mated with a countersunk hole. In RC helicopters, these screws are not very common. Because of their tapered design, the shoulder of the screw has a lot of surface area, which means that countersunk screws make a tight, firm connection that's less likely to come loose than most other screws.

**CAP** • Cap head screws are commonly found with an Allen socket. These screws have a deep head that allows the Allen wrench to get a large amount of contact area with the socket. These screws have a narrow shoulder and are often used with a washer to help spread the mechanical load.

**BUTTON** • Button head screws are similar to

cap head screws, but with a shallower, round head, and a wide shoulder. Because of the wide shoulder, it is not typically necessary to use a washer with a button-head screw.

**COLLAR** • For lack of a better category, I'll put collar screws here. Sometimes referred to as "shouldered" screws. These are screws that can have either self-tapping or machine threads on a large portion of the shaft length followed by a smooth round portion. Sometimes these screws are without threads because there's no need for threading, since a specific length is required and the nut that mates with it will not need to be further down than a certain point. An example of this would be screws that bolt an exhaust pipe to an engine. Another use for a collar screw is

where a pivot point is needed, for instance on a bellcrank. In this application, the smooth portion of the screw is to a specific measurement. Often times a bearing or bushing will pivot on this point.



Torx and Pozidriv are pretty rare.

## SCREW MEASUREMENTS

Most helicopters from micros on up to 90-size nitro birds use metric hardware. There are some exceptions that use American Standard, but not very many. Measuring metric screws is straightforward. Metric screws are labeled by their type (either machine or self-tapping) and by their diameter and length. For instance, a 3mm x 12mm machine screw has a 3mm diameter, is 12mm long, and has a standard machine thread. The most common screw diameters in RC helicopters are 2mm (smaller helicopters), 2.5mm, and 3mm (larger nitro and gas helicopters). Should you come across American Standard screws, the method of measurement is a little more complicated. For instance, a 4-40 screw looks a lot like a

3mm screw. The designation 4-40 refers to the diameter of the screw and the number of threads per inch. In this example, the first number (4) means a #4 screw diameter, with larger numbers indicating larger diameters. The second number (40) refers to the number of threads per each inch of length. So with that in mind, a 6-32 screw would be a #6 diameter with 32 threads per inch.

**HOW TO MEASURE** • To measure the length of a screw, go from the bottom of the head (or the shoulder) to the tip of the screw. The only exception comes when measuring countersunk screws; these are measured from the end of the threaded shaft to the top of the head.



# NUTS

Nuts are used to fasten screws in place wherever possible. Most of the nuts found on RC helicopters are six-sided, although they differ in shape and features depending on how much holding power is required for the task at hand.

**JAM NUT** • Jam nuts can be easily identified by how thin they are. Also known as plain nuts, jam nuts are held in place by the amount of pressure applied as they are threaded into place. When a more secure fit is necessary, a drop of liquid thread lock can help keep jam nuts in place.

**LOCKNUT** • A locknut has a small amount of plastic or Nylon above the threading. The plastic or Nylon stretches to fit the screw as the nut is threaded on, helping to keep the nut from backing off. Locknuts don't need to be tightened with a lot of pressure, which makes them ideal in areas where free movement is important, like on blade grips.

**FLANGED LOCKNUT** • A flanged locknut has the virtues of both a jam nut and a locknut. A flange on the bottom of the nut helps spread the load when the nut is tightened down, and also features a plastic or Nylon insert at the top to help keep the screw in place. A flanged locknut is used wherever maximum holding power is needed.



# WASHERS

## STANDARD WASHERS •

Washers are the small rings found in many RC helicopter applications. Washers are measured by their diameter, but there are different diameters for standard and Metric screw sizes. American washers are numbered according to the screw size that fits their inside diameter. For example, Metric washers are also measured by their inside diameter, so a 3mm washer would work with a 3mm screw. For American washers, a #6 washer would work with a 6-32 screw. Washers are used for two basic reasons: to limit the reach of a screw if it is too long, or to help spread the load on a screw so it can be tightened with more force than it could be otherwise. Most washers are flat, although coned washers can be used when varying amounts of force are required. Coned washers will flatten out when they are tightened completely, but can still do their job without being completely tightened. This gives them a spring-like effect.



## BEVELED WASHERS •

Some washers that add to a helicopter's appearance are actually very useful. Beveled washers are sometimes referred to as "load spreaders." Sometimes they're beveled to be used along with a beveled screw, and sometimes they're just bored out. These washers, usually made of aluminum, help to spread the load placed on the screw.



# MATERIALS

Screws, nuts, and washers all come in a variety of materials. Each material has different properties that account for the weight, strength, and ideal use of each of them.

**ALUMINUM** • The strongest advantage of aluminum is its light- weight. Screws and nuts in not-so-critical or low-load areas can be replaced with aluminum screws. Weight will be reduced, but at the cost of strength and durability. Aluminum is often anodized, and can add some color to your kit.

**STEEL** • Most standard RC helicopter hardware is made of steel. Steel is strong and inexpensive, but weighs more than most other materials. Just about every stock kit comes with steel hardware.

**TITANIUM** • Titanium offers the best of both worlds. It is stronger than steel and is almost as light as aluminum, although it is more expensive than both. As far as hardware goes, titanium isn't widely used on helicopters, although that may change soon. Some pilots use titanium for head linkage and screw kits.

**PLASTIC** • Plastic, Nylon, and other molded materials can be made into screws and nuts. When used as nuts, molded products have plenty of strength and work similarly to locknuts or flanged locknuts. When a screw is molded, it's typically used in a low-stress situation. Molded screws and nuts are pretty uncommon on anything larger than a micro sized helicopter.

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# OTHER HARDWARE

**C-RINGS** • C-rings (sometimes referred to as snap rings) are named after their unique shape that resembles a “C.” In RC helicopters, C-rings are used to hold tubes, bearings, or shafts in place. C-rings are classified in two categories: external, for use on a shaft or pin, or internal, for use on housings or bores. To properly install and remove a C-ring a pair of C-ring pliers is needed. These pliers feature small shafts that insert into the holes found on the end of the C-ring. Exerting force on the pliers will pry the C-ring open or force it shut.

**TURNBUCKLES/THREADED RODS** • Turnbuckles or threaded rods are used to transfer movement from one area of the helicopter to another. Most commonly, turnbuckles are used to transfer movement of a servo to a control surface. Most helicopters use 2mm turnbuckles that feature a 2mm thread. The threaded rod threads into a molded plastic rod end.

**LINKAGE BALLS** • Linkage balls allow mechanical movement to be transferred freely with minimal slop or binding. On all but the smallest helicopters, linkage balls usually measure between 4.5mm and 5mm in diameter. For instance, two of the most popular helicopters, the T-REX and Raptor, use 4.5mm and 5mm linkage balls respectively. In some circumstances you may find smaller or larger, that just depends on your bird.

**BALL ENDS** • A ball end has a shaft like a screw and a shoulder like a screw, but instead of a screw head it has a ball that’s just waiting to be attached to a rod end. Ball ends are very commonly found threaded into swash plates.

**ROD ENDS** • With all this talk about rod ends, wouldn’t it seem logical to tell you what they are? Of course! Rod ends are the molded pieces that thread onto threaded rods and snap onto linkage balls. Typically, rod ends are not tapped, meaning that they have no internal threading. They will often times mate with machine thread turnbuckles. This combination means that the rod ends fit tightly with the turnbuckles so that nothing rotates loose while in use.

**E-CLIPS** • E-clips are named after their unique shape that resembles an “E.” In RC helicopters, E-clips are used to hold shafts or pins in place. E-clips snap into a groove that’s usually ground into a shaft. There are actually two sides to an E-clip, a smooth side and a rough side. When installing an E-clip, you want the smooth side with the round edges to be facing the surface it might come in contact with. The rounded edges and smooth surface on that side of the clip will decrease the likelihood of the clip popping off during use.

C-RINGS



TURNBUCKLES/THREADED RODS



LINKAGE BALLS



BALL ENDS



ROD ENDS



E-CLIPS



## TECH TIP

# Shear Strength

I’ve mentioned the differences between aluminum, steel, and titanium, but one thing that must be taken into account when working with screws is their shear strength. A cardinal rule when it comes to helicopters is to “tighten, but don’t over tighten.” A screw that’s over tightened will do a few things. First, it will “tweak” the helicopter. If one side of the helicopter has screws that are over tightened, the over tightened side will not be symmetrical with the other side. This can cause problems while in flight. Also, screws that are over tightened tax the screw’s shear strength. If over tightened, the screw shaft can literally pull itself away from the head. You might not feel this when you’re flying, but when it comes time to spin that rotor head up to 2,800 RPM, you just might find out. Not a good idea. Whenever you’re tightening something up, as soon as the screw stops, stop tightening it. Don’t over tighten; if you see that the shoulder of the screw head has bottomed out, you’re done.

# FINISHED

No matter what hardware task you come across, you now know the why and how of getting the job done. They might be small and they certainly aren’t glamorous, but these screws, nuts, clips and washers are what hold your helicopters together. Give them the attention they deserve! **TRU**

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# UNDERSTANDING ELECTROSTATIC DISCHARGE

## KEEPING YOUR HELI FROM SHUTTING DOWN

Words: Art Koral

Going into the dry winter months, there's no better topic for a Heli IQ than Electro Static Discharge or ESD. ESD can plague our helicopters by causing them to behave erratically or possibly shut down. ESD occurs around us all the time even though we don't always feel it or see it. ESD in a helicopter is much more severe and flows like water from a firehose. Fortunately, there are ways to minimize ESD. Understanding ESD, how it is generated, and how to avoid it may save your helicopter.

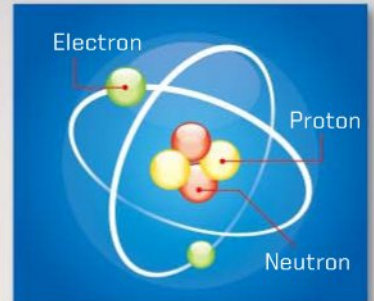
As you can tell, Angie wasn't too happy about doing this photoshoot.

### STATIC ELECTRICITY

Before we can talk about ESD it's important to understand static electricity. Remember grade school physics and chemistry when your teacher introduced the atom and molecules? All matter is composed of atoms and groups of combined atoms called molecules. Atoms can be broken down into protons, neutrons, and electrons. The bonds of shared electrons hold molecules together. Some molecules hold electrons tightly while others lose them easily.

When you rub a piece of material that gives up electrons with material that doesn't, the electrons will pool up in that material if they can't discharge anywhere else. This phenomenon is known as the Triboelectric Effect and causes static electricity. The end result is an object that has either a net positive or negative charge that is ready to discharge if it comes in contact with another object of a lesser charge.

When you rub a balloon against your hair, the Triboelectric effect causes your hair to develop a net positive charge. The charged hair will cling to the balloon. Because each hair fiber is positively charged the like charges repel each other forcing them to stand up.



The atom is composed of Neutrons, Protons, and Electrons. The flow of displaced electrons causes static electricity.



## » STATIC, ESD, AND YOUR RC HELICOPTER

An RC helicopter has many materials that contribute to the Triboelectric Effect. The gears, rotor blades, rubber belt, and frame can all share and build static charge.

Probably the greatest static generator on a helicopter is the belt tail drive. The rubber belt builds charge on tail drive pulleys as it comes in contact with them. The charge continues to build until it gets high enough to discharge into the frame and nearby electronic components.

The tail rotor belt drive is similar to the Van de Graaff generator shown. A positive charge is built up in the larger sphere and when the small negatively charged sphere gets nearby ESD occurs, as evidenced by a spark that is conducted through the air just like lightning.



## DRY AIR CONDITIONS ARE THE WORST FOR ESD

Moist/humid air allows static to discharge from insulated components to the moisture in the air. Dry air offers little conduction path and the static that is built up is forced to discharge to nearby lesser charged components in your helicopters such as the BEC, gyro, servos and receiver.



## TECH TIP

### Definitions

**INSULATORS:** Insulators prevent the free flow of electrons.

**CONDUCTORS:** Allow the free flow of electrons.

*Most materials are neither perfect insulators nor conductors, but rather something in between. Given enough charge, even the toughest of insulators can become conductors. Water and air are perfect examples of poor conductors but with enough electrical charge they will conduct electricity.*

**ELECTROSTATIC DISCHARGE (ESD):** A statically charged and insulated object will maintain its charge until placed in contact or proximity with an object of lesser charge. When the charged object can suddenly overcome the insulation resistance of the nearby object, it will discharge into it. This sudden discharging of electricity is known as ESD. There are many examples of ESD. Do you remember playing a joke on your friend by rubbing your feet on the carpet then touching him? You were building electric charge in your body by rubbing the carpet. That charge was then rapidly discharged into your friend.

*Lightning is the most powerful example of ESD. The incredible charge build up in the atmosphere discharges into the air causing incandescent light as it heats up the air to extremely high temperatures.*



## CONTROLLING ESD

So how do we control ESD? Well, first of all we can try to use materials that minimize the Triboelectric Effect. Unfortunately, we often get what we get. You could use a shaft driven tail instead of a belt. But of course, this option is not always available in the kit you desire and may add unwanted weight, cost and complexity. If you are stuck with a tail belt and/or you simply want to reduce ESD, the best thing you can do is allow static to immediately discharge to a common potential.

### HERE ARE SOME TIPS ON DOING THAT.

1. Sand down powder coated booms and components where they contact other components to allow a conduction path.
2. Connect grounding wires that lead to your batteries negative (ground) lead in as many locations as possible. Your goal is to give components a discharge path not blocked by insulated nylon frame components and materials. You will find that carbon infused plastic frames as found on helicopters such as the MSH Protos aid in reducing static build up.
3. Spray lubricant on all rotating equipment to allow the thin film of lubricating fluid to act as a conductor. You will rarely find a nitro bird that has problems with ESD simply because the nitro residue found on everything allows static to discharge.
4. Spray static guard on your components. This is similar to the spray lubricant in that it allows static build up to discharge. The one benefit of static guard is that it tends to be more long lasting and less filmy.
5. Use electrical components with grounded metal cases. This allows ESD to flow through a grounded case instead of the main circuit board.



Spray lubricant or static guard on components to allow static to discharge.



The carbon infused frames on the Protos allow static to discharge.



Allow static electricity to discharge to ground rather than build up in the frame.



The metal case on the JR770 allows ESD to travel through the case instead of through the gyro. Note: This is why circuit boards are shipped in foil pouches so occasionally ESD travels through the pouch and not the board.

No more static cling

## CONCLUSION

ESD can wreak havoc in our heli's. Taking time to spray your bird down with lubricant or static guard and grounding the boom and frame may save your bird from a trip to the dirt. Adding lubricant to your helicopters rotating components is always a good thing for reduced friction and longer life. Now you just get the added benefit of reducing static electricity as well. **REEL**

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## REMOVE A **BROKEN FASTENER**

YOU BROKE IT, NOW FIX IT.

**Words:** Jim Innes

Undesired things occasionally happen in this hobby; helis crash, pilots make mistakes, and components occasionally fail in flight. Stay in the hobby long enough and you will probably experience them all. One of those things that can quickly ruin a flying day is stripping out or busting the head off a bolt or screw. The good news is that, in most cases, a broken fastener can be removed without damaging the heli.

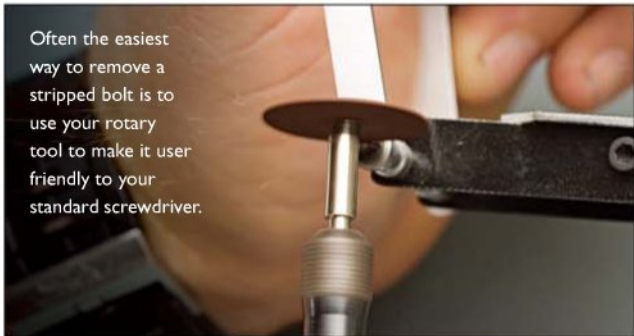
### STRIPPED BOLTS ARE EASY

If you only stripped a screw or bolt, you are in luck; these can be easily removed. With a stripped Phillips head screw, your best bet is to either grip the head of the bolt with a set of Vice Grips™ and spin it out, or use the cutting wheel on your rotary tool and cut a slot in the head. You can then use a standard slotted screwdriver to remove the screw.

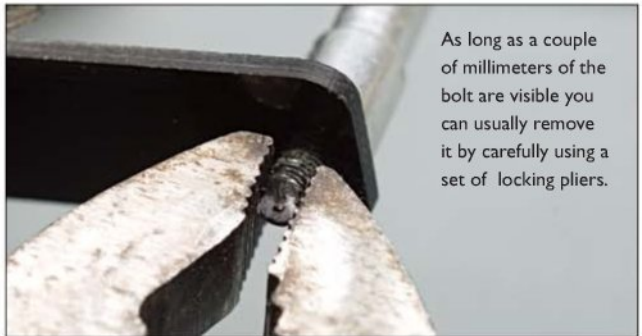
A stripped hex head bolt can be removed using the above two methods as well. You can also try forcing a slightly larger

hex driver into the stripped bolt, for example a 1/16" hex driver works well in stripped out 1.5mm bolts.

As a last resort with stripped bolts and screws, you can choose to drill/cut the head off the fastener and then remove the component it was attached to. This should leave some amount of the threaded portion of the bolt exposed. Use a set of Vice Grips™ (aka locking pliers) to grab this portion and slowly back it out.



Often the easiest way to remove a stripped bolt is to use your rotary tool to make it user friendly to your standard screwdriver.



As long as a couple of millimeters of the bolt are visible you can usually remove it by carefully using a set of locking pliers.

## » SO YOU BROKE OFF A SCREW...

Sometimes the entire head of a fastener will break off, leaving the threaded portion completely inside the component. What are you to do in this situation? Do you just throw away the part and buy a new one? This is certainly an option, and for cheaper parts it may even be the best solution. However, if you want to try to reuse the existing part, there are ways to remove the bolt.



In cases where the part with the broken fastener only costs a few bucks, it is often the most cost effective route to just replace it instead of trying to remove the fastener.

## REMOVAL METHOD ONE: THE SCREW EXTRACTOR SET OR LEFT-HANDED DRILL BIT

The most common tool for removing broken bolts is called a screw extractor or "easy out". A screw extractor is basically reverse threaded cone that is used to grab the bolt from the inside and back it out. I have found that the Alden Micro Drill-Out extractor set works quite well for the common M3 to M5 sized bolts on most model helicopters. It can be found at Sears, Ace, or other hardware stores.



To use an extractor you must first drill a hole in the center of the broken bolt. The size of the hole made will depend on the size of the extractor used. This step is very crucial, the hole must be well centered and straight down without removing too much of the bolt material. Once the hole is made, insert the extractor into the hole and slowly turn it counter-clockwise to loosen the bolt. Add some heat to loosen any thread lock if needed.



### » DIFFICULTY

SCALE RATING: 1=EASY 5=ADVANCED



### » TIME TO COMPLETE

**2-10** Minutes

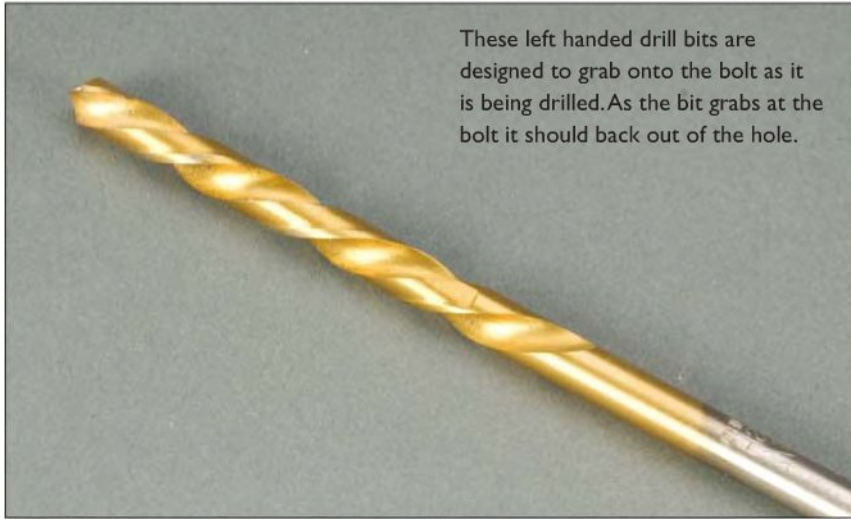
### » TOOLS NEEDED

-  ■ DRILL
-  ■ ROTARY TOOL (DREMEL)
-  ■ SCREW EXTRACTORS
-  ■ TORCH OR SOLDERING IRON
-  ■ LEFT HAND DRILL BITS
-  ■ SCREWDRIVERS
-  ■ VISE GRIPS
-  ■ JB WELD

You must be very careful using an extractor. They are made of very hard metal and can be quite brittle. Turn slowly and keep the extractor straight, since any side-to-side pressure could break it. If the bolt will not budge with moderate pressure do not force it. If you break the extractor off inside the bolt, you will probably have to replace the affected part entirely.



There are also a number of left-handed drill bits out there that combine the drilling and extracting tools. You turn the bit counterclockwise into the center of the bolt with your drill. As it drills into the material, the bit grabs the bolt and starts to back it out. I have never personally been able to remove a fastener with just a left-handed drill bit, but I have talked with others that successfully with them.



These left handed drill bits are designed to grab onto the bolt as it is being drilled. As the bit grabs at the bolt it should back out of the hole.

## REMOVAL METHOD TWO: JB WELD

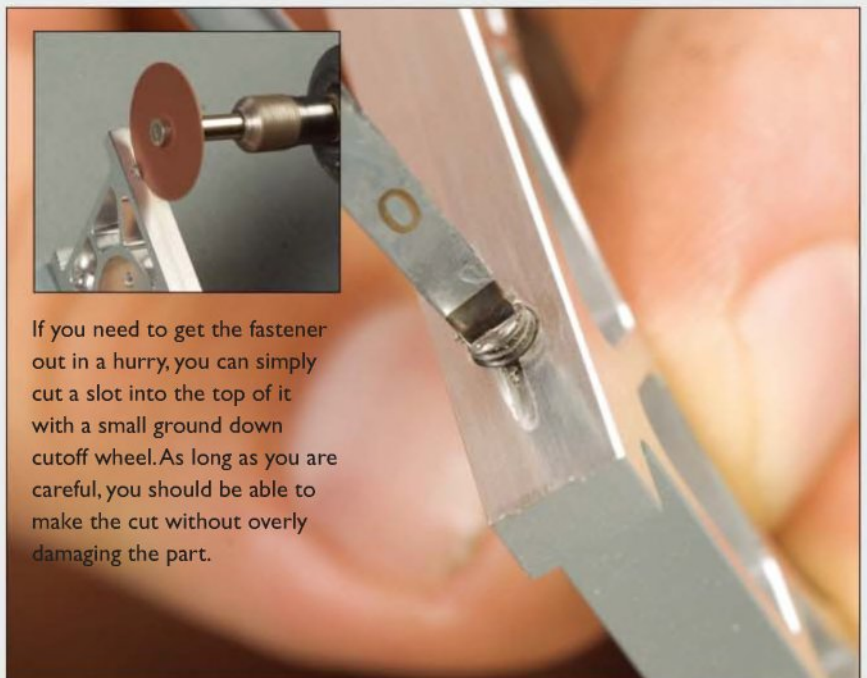
If you do not have an extractor set, or if the bolt is in an area where drilling into it may not be feasible, you can try the JB Weld method. Simply take some JB Weld and glue the end of a new bolt to the broken off portion left in the component. Be sure to allow the JB Weld to touch only the bolts, wipe it off the threads or other areas. Set the part aside to dry overnight. Once it is dry, you can use a hex driver to remove the joined bolts. This method only works well on bolts that are not too tight.



Nice and clean, right?

## REMOVAL METHOD THREE: THE ROTARY TOOL AND SCREWDRIVER

This is the fast and dirty method of removing a broken off fastener. Take a rotary tool cutoff wheel and grind it down until the wheel is very small in diameter, the smaller the better in the case of a M3 bolt. Now, take that small cutting wheel and cut a slot right into the top middle of the broken fastener. With this method, you may end up cutting into the component a little bit, so only do this where the loss of a little material won't affect the performance of the part. Use a small slotted screwdriver to remove the bolt from the hole. Again, apply heat if needed to free the part first.



If you need to get the fastener out in a hurry, you can simply cut a slot into the top of it with a small ground down cutoff wheel. As long as you are careful, you should be able to make the cut without overly damaging the part.



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## IF NOTHING WORKS

If you find yourself with a broken bolt still stuck in your heli after trying the previous methods, you have a few more options. You could just trash the part, pat yourself on the back for the effort, and buy a new one. If it's an expensive part you could take it to a machine shop to have the fastener removed professionally. As a third option, drill the entire bolt out and install a Helicoil thread repair kit that creates a new set of threads for a bolt to be fastened to.



Ryan showed those bolts wuzzup!

## CONCLUSION

Chances are that at some point in your RC heli journey you will run into a broken fastener that needs extracting. With a little patience and care, you can get these stubborn bolts to break free from your model without causing any damage. While a broken bolt is never a welcome experience, with the right tools and methods you can make short work of the repair job and get your model back into the air. See you at the field! **TRC!**



## TECH TIP

### Avoid Getting Into This in the First Place

Even better than any of the previous methods is doing what you can to minimize the chances of having a broken fastener in the first place.

Avoiding stripped screws and bolts is easy – use the proper tools. Most of the Phillips screws found on model helicopters are not standard Phillips design; they are manufactured to the JIS (Japanese Industrial Standard) specifications. Get yourself a good set of JIS screwdrivers and you will be amazed by how well they fit.

Hex wrenches vary greatly in their true sizes and quality. Buy a good set of wrenches that fit tightly into the bolts, you do not want a lot of play in between the wrench and bolt. A tightly fitting set of wrenches greatly minimizes the chances of stripping bolts out.




**To avoid breaking bolts off remember these four rules:**

- 1.** Only tighten things as tight as they need to be to do their job, any more than that just stresses the fastener.
- 2.** If you question the quality of any fastener, replace it.
- 3.** Anytime you crash, check out all the fasteners on the helicopter. Even a slight bend in a bolt greatly weakens it.
- 4.** And last, use the proper type of thread lock for each joint and only use a small amount. Remember that thread lock, in general, is not used to hold the components together; it simply is there to keep the fasteners from backing out.

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# GAUI FLYBARLESS E-STABILIZER SYSTEM

GU-365

ELECTRONICALLY STABILIZING YOUR ELECTRIC HELICOPTER!

**Words:** Ryan Kephart

**G**ai, the manufacturer of the Hurricane series of helicopters, has started a new trend in the R/C helicopter market. The company was established in 1996 and dedicated its resources to creating innovative RC products. Since the release of its first RC product back in 2002, Gai now produces electronics to go along with their flybarless heads. The latest product is the new Gai GU-365 Flybarless E-Stabilizer System (FES).



## FEATURES

The new Gai 365 stabilization system features a 3-axis gyro with a straightforward and easy setup. The 365 can be operated from 4 to 6 volts. This small and compact unit weighs in at 18 grams and is about the same size as the GY611 amp. The gyro portion uses their new V2 Piezo sensors that do not drift like the older sensors. The GU-365 can only be used on an electric powered helicopter do to the vibration sensitive

sensors. The third axis on this unit acts like a heading lock gyro to provide a solid tail hold. This feature allows the user to purchase this unit without having to buy a second gyro for the tail.

## INSTALLATION

Installing the GU-365 is much like installing a normal gyro. The unit is held down with two strips of foam tape that are included with the gyro inside a nice plastic case. The manual describes

how to set up the unit quite well. The translation leaves out a few little things, but anyone who has some radio and binding experience should be able to get by without a hitch.

The first thing to do is set up your helicopter normally and make sure that your swash and tail are moving in the correct direction.

After your helicopter is completely programmed, it is time to add the unit. I chose to use the Align TREX 500 for my test bed because it is easy

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O.S. .91 SX-H C-Spec w/Pump .....	\$299.99
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CarryMaster Starter kit .....	\$109.99

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Quick and easy.

to convert the head to a flybarless design without having to purchase the separate flybarless conversion from Gaii. I installed the 365 to the gyro mount on top of the boom and taped it down with two strips of foam tape. I then unplugged the servo leads from the receiver and replaced them with the leads from the GU-365. The leads that come off the gyro are color coded to aid installation. The manual describes which color is associated with the function it controls. The servo leads are then connected to the GU-365 into ports that are labeled like a transmitter.

At this point, the dip switches need to be adjusted to tell the gyro if you are using digital or analog servos on the cyclic. A separate switch is used for the tail to select its mode of operation. After this, the gyro needs to know how it was installed, either vertically or horizontally, by flipping a switch. This concludes the mechanical installation and the unit is ready for software calibration.

Gaii has made the 365 easy to program. No external software or computer is needed to program the unit. This easy process involves reducing your dual rates to a lower value to get use to the feel for a flybarless electronic stabilization system. The second step

is to flip a switch on the 365 the turn on your radio and helicopter. The gyro will then go into program mode and is ready for the next step. Next, apply full forward on the cyclic and hold it there for about two seconds. The LED will blink green and then you release the input. Then, flip the switch back on the 365 to exit the programming mode.

Next, set the gyro sensitivity to the heading hold value and then turn off the helicopter. You will then turn the helicopter back on and check that the swashplate moves the opposite direction that you tilt the helicopter. If it moves the same direction, then a switch is flipped and you check again to ensure proper correction. The gains for the cyclic gyros are adjusted on the unit using pot dials.



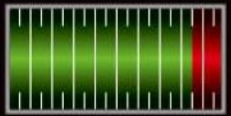
initialized the helicopter. I spooled back up and lifted it up into a hover. The Gaii GU-365 locked in and the TREX 500 just sat there without drifting. Moving into forward flight, the helicopter felt just like it had a flybar. The nose remained down without any inputs and the helicopter tracked around turns without a problem. The tail seemed to be holding well in forward flight and seemed pretty solid in a hover.

I decided it was time to try out some 3D and see how well this system can perform. Flipping and rolling were fast and a little off-axis. This feeling takes some time to get used to, but once you do the rolls and flips can be performed right on axis. The tail did not hold as well as some other gyros do. I could not remove the kicks when performing demanding collective inputs. The tail was inconsistent when performing piro flips and would surge and lag causing a change in tail speed. Tic-tocks and Rainbows can be performed, but the tail still seemed to want to surge and lag. Overall, the cyclic gyros did a great job in fooling the pilot into thinking it had a flybar. The increased cyclic rate made this helicopter a blast to fly. Where this gyro performs best would have to be in smooth forward flight characteristics and the ability to gain the 10% of power that is usually robbed by the flybar.

» SCORECARD

SCALE RATING: 1=POOR 10=EXCELLENT

8.5



+

- THE GOOD**
- Easy Setup
  - Heading hold gyro for tail
  - Small, compact unit

-

- THE BAD**
- Tail does not hold well for 3D

CONNECT

<b>MANUFACTURER:</b>	Gaii
<b>DISTRIBUTOR:</b>	Flying Hobby
<b>WEBSITE:</b>	www.flying-hobby.com
<b>PART NUMBER:</b>	GU-365
<b>STREET PRICE:</b>	\$199.99

TESTING

First flights are always scary on new products. Watching the helicopter spool up without a flybar is quite interesting when you are so used to seeing the paddles following the main blades. The TREX spooled up nice and slowly and lifted gradually off the ground. The helicopter drifted a bit, so I added some trim to keep it nice and level.

After the trims were set I noticed that the 500 did not correct enough to eliminate some drifting issues. So I sat the helicopter back down and adjusted the gain higher on the 365 and re-

CONCLUSION

The Gaii GU-365 is a great little unit that is perfect for the scale flyer looking to make his helicopter a little closer to the real thing. If you are looking for a flybarless 3D system, this can do the trick for the newer 3D pilots. However, if you want a rock solid tail to perform insane moves, then a second gyro dedicated for the tail would be a better option. The easy installation of this unit allows both the beginner and advanced pilots to set up their machines without the help of a flybarless professional. This unit is available through Flying-Hobby.com and is distributed by Empire RC as well. Gaii did a good job in producing a flybarless stabilization unit that is easy on the wallet and the mind. **FH**



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# MAKE IT FLOW

LOOKS ARE EVERYTHING!

Words: Brandon Updike

Most Flight School articles consist mainly of covering a single maneuver, but in this month's edition I'll be talking about how to tie all of those maneuvers together to make a solid, well flowing routine. Anyone can go up in the air and do a maneuver, but what really separates an average pilot from a good pilot is their ability to mix those maneuvers together to create a routine. Linking maneuvers can be hard for some people, because pilots tend to ask themselves, "What should I do next?", and in doing so cause a delay in their routines. The purpose of this flight school is to eliminate that "What should I do next?" variable, so that linking your moves together gets a little easier and becomes second nature.



## PLAYING THE MENTAL GAME

Thinking of maneuvers during a flight can be one of the hardest things to do but can be easily solved with some brainstorming and simple tactics. Compile a list of your most comfortable moves that you have the most confidence in. Now, brainstorm some comfortable methods that you can use in order to mix those moves up in a smooth manner. For example, let's say that you like the Forward Flip and

the Tic-Tock. Let's think about the best way you can link these two maneuvers together. When performing a forward flip, you can go directly into a Tic-Tock by stopping the flip right before it comes over the top and then reversing the direction back the other way. You can also do an inverted climb out, throw in a pirouette, and then straight into a Tic-Tock. The opportunities are endless; just experiment with what feels right to you. Once you figure out transitions for all your trusty moves, go out and experiment with all of them and build on that foundation to make your transitions smoother.

**KEY TIP:** When working on a routine, just imagine a center line such as a runway and try to keep your helicopter over it at all times from



Joe the Intern looks a bit puzzled.





Can you see the wheels turning?

left to right and right to left (unless performing a Hurricane or a move similar to it).

### FLIPS AND TRICKS!!!

The basic concepts of flips will be used in even the most complicated 3D routines. The bottom line is this: if you want things to flow nicely, then you'll hardly ever fly in a regular upright orientation. You'll be surprised to know that you use basic flipping inputs on a majority of 3D moves. If you watch anyone flying off the deck and really analyze it, you'll see that all they're doing is basic flipping functions but mixing up the flips. So let's say that you're doing a backwards roll, but you stop at the inverted orientation. Now, you can do a back flip, throw in a quick pirouette, and then do

some forward flips. If you work on mixing up your flips and incorporating pirouettes into them it'll look impressive. You even use basic flip stick movements when performing climbouts and slams, but the only difference is delaying inputs so that your helicopter covers more ground.

### THE USE OF PIROUETTES

A simple pirouette is perhaps the most powerful tool in the bag of 3D tricks. You can do a pirouette anywhere in your routine and it'll look good. A good exercise to work on is improving your half piro-flips in a stationary position. Once perfected, you'll be able to incorporate it into several moves to help you with your transitions.

For example, one of the most common

usages of a half piro-flip is when coming in backwards inverted, flipping out quickly while adding a quick pirouette so your tail faces towards the ground. Now you're set up perfectly to do some low front flips right off the deck. Or, you can let the tail fall towards the ground, and then pull out in the last second, but while pulling out throw in some pirouettes to give it some flair. You can also perform a complete pirouette while flipping out so that your nose faces the ground, setting you up with a low back flip instead. It's all about the angles; you can throw in a pirouette between any move but you'll need to time it properly. Just experiment a bit and you'll be surprised how much a simple pirouette can be used to help you transition from one move to the next. **TBI**

## CONCLUSION

The best way to overcome the mental block is to come up with a game plan and build on it. Once you get some basic transitions down, you'll see that it opens the door to even greater transitions. Once you get that foundation down you can work on smoothing it all out and improving upon it with even more complicated transitions. Just remember the basic transitions consist mainly of flips and pirouettes. Initially it'll be hard but with enough practice transitions will become second nature, similar to learning how to hover. **TBI**



**FEATURES**

- GENERAL CHARACTERISTICS**  
**Crew:** 1-4  
**Capacity:** 3,880 lb including 14 troops, 6 stretchers, or equivalent cargo  
**Length:** 57 ft 1 in with rotors (17.4 m)  
**Fuselage width:** 8 ft 7 in (2.6 m)  
**Rotor diameter:** 48 ft 0 in (14.6 m)  
**Height:** 14 ft 5 in (4.4 m)  
**Empty weight:** 5,215 lb (2,365 kg)  
**Loaded weight:** 9,040 lb (4,100 kg)  
**Max takeoff weight:** 9,500 lb (4,310 kg)  
**Powerplant:** 1x Lycoming T53-L-11 turboshaft, 1,100 shp (820 kW)
- PERFORMANCE**  
**Maximum speed:** 135 mph (220 km/h)  
**Cruise speed:** 125 mph (205 km/h)  
**Range:** 315 mi (510 km)  
**Service ceiling:** 19,390 ft (Dependent on environmental factors such as weight, outside temp., etc) (5,910 m)  
**Rate of climb:** 1,755 ft/min (8.9 m/s)  
 Power/mass: 0.15 hp/lb (0.25 kW/kg)

UH-1  
**IROQUOIS**  
 OR "HUEY" FOR SHORT

**Words:** Brandon Updike



That water looks cold.

The UH-1 or the "Huey" is perhaps one of the most iconic helicopters to serve the United States and the rest of the world. It's kind of surprising that we haven't covered the Huey yet in our Full Size articles, considering how it has proven itself in history.

The Army wanted to utilize turbine powered technology and the performance benefits that come with it. The Army awarded a contract to Bell Helicopter Company to develop a helicopter that could be used for casualty evacuation, instrument training, and general utility duties. Bell began designing a helicopter that they designated as Model 204. Prototypes were then built, and the Army liked the performance so much they decided to fund the helicopter into production. It became the first turbine-powered helicopter to go into production. The Huey was then implemented into service during the Vietnam conflict.

**SIGNIFICANCE IN VIETNAM**  
 The Huey is looked upon as an icon of sorts due to its rather large involvement in the Vietnam War and how important its role truly turned out to be. Its role consisted mainly of ground attack, medical evacuation, and search and rescue missions. Once the Huey entered into service, Bell made some modifications to better suit it for combat, such as redesigned rotor blades and an enlarged cabin fitted with three stretchers. The new rotor blades allowed for increased speeds and improved maneuverability that benefited low-level

flight over the mountainous terrains of Vietnam.  
 The Huey was fitted with different features depending on the type of role it needed to fill. Attack helicopters were fitted with rockets and guns, while transport helicopters removed the weaponry but still maintained a door gunner. As the war went on there were continued upgrades to the helicopter; but the most significant upgrade was the development of the AH-1 Cobra. The Cobra was developed using the basic design concepts of the Huey and functioned mainly as an attack helicopter.

When the war was all said and done, a total of 3,305 Hueys were destroyed in combat and operational accidents.

**HUEY TODAY**  
 The Huey is still used by the Army today, but has been phased out in favor of the UH-60 Blackhawk helicopter. The Marine Corps continues to upgrade their Huey variant, as it is still very effective during combat. Both branches continue to use the Huey in the Iraq War. There is no telling how much longer the Huey will remain in service, but its iconic status is backed up by its longevity and effectiveness in battle. **TBL**



**JR® DS8717HV**  
Standard Size High Voltage Digital Servo  
Operating Voltage: 7.4V (2S LiPo)  
Torque: 230 oz/in  
Speed: .06 sec/60°  
Deadband: Zero  
Gears: SuperSteel  
Weight: 2.6 ounces  
Size: .82 x 1.58 x 1.57

## Blazing .06-second speed, SuperSteel™ gears plus 230 oz/in of torque on a 2S LiPo. And no regulator!

While the original 8717 digital has remained the servo of choice for 3D heli enthusiasts world wide, we must've heard the following request a thousand times: "Please make it compatible with a 2S LiPo flight pack."

So that's exactly what JR's done, and this one's got "lower-faster-crazier" written all over it.

With its new aluminum case, SuperSteel gears, a high voltage motor and improved electronics,



the 8717HV takes helicopter servos to a whole new galaxy of performance.

Plus it maintains JR's legendary reliability and unmatched, true zero-deadband precision.

Simply stated, the 8717HVs are the servos of your dreams and they'll be at your JR dealer's soon.

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Heli-Max chose the best components for superior aerobic performance...then developed a new 2-piece molded frame specifically to support them. Even a quick glance at the rotor head is revealing: With its underslung flybar, this machine wants to go inches-off-the-ground inverted!

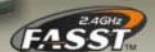
Out of the box, the Axe 400 includes a big 425-size brushless motor; perfectly matched 25A brushless ESC; smooth, precise HM4000 Heading Lock Gyro — and a 6-channel 2.4GHz radio system from the world leader in spread spectrum technology.

Do more, and do it now, with the Axe 400 RTF. For more information and the location of the dealer nearest you, visit [www.helimax-rc.com](http://www.helimax-rc.com) or call 1-800-682-8948 and mention code number 84B.

**Main Rotor Diameter:** 27.5 in (699 mm)  
**Length:** 24 in (610 mm)  
**Weight w/o Battery:** 18.5 oz (520 g)\*  
**Requires:** 11.1V 2000-2500mAh LiPo battery pack, balancer, LiPo-compatible charger & 8 "AA" batteries (Rx-R also requires 6-channel heli radio & receiver)  
\* Flying weight of 21 - 25 oz. (610-700 g) is typical depending on your selection of required components.



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