



TRICKS OR TREATS! What's coming for Christmas? pg. 10

RC+Heli

THE WORLD'S BEST-SELLING RC HELICOPTER MAGAZINE

TESTED:
» **OUTRAGE** FUSION
50 LONG TERM
» **WALKERA**
DEVOTION DEVO-12
RADIO
» **FOXTECH** A10
VIDEO GOGGLES

6 Killer How-To's!
» Upgrade Your mCP X
» Find Your Center of Gravity
» Add Scale With Water Slide Decals
» Proper Gyro Install
» Fly A Multicopter
» Fly a Tail Slide With Bobby Watts

RAPTOR'S REVENGE!
TT's New Generation
G4 Takes Off

OCT/NOV 2011 / ISSUE 61



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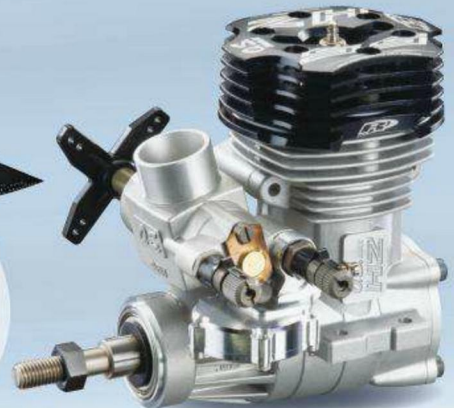


O.S. 55HZ-R



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O.S. 55HZ-R

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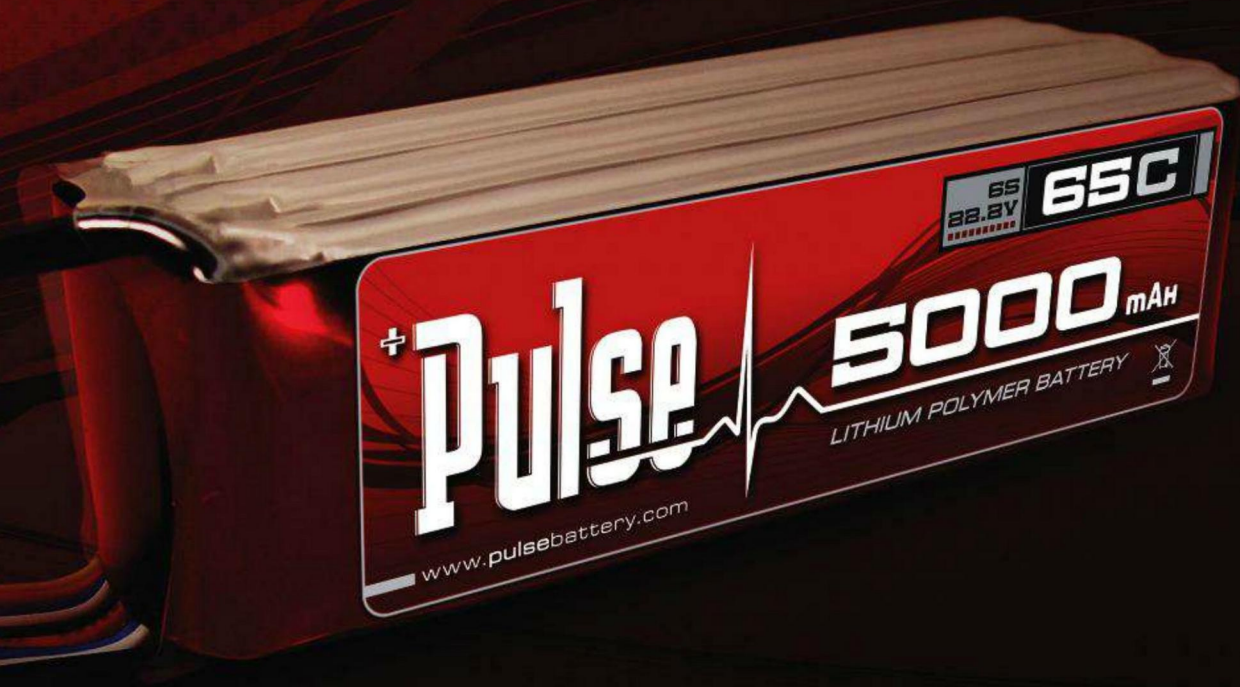
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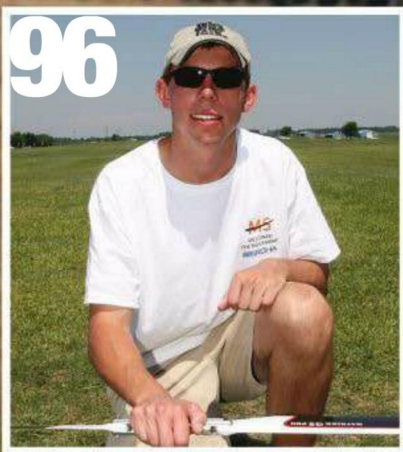
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THE NEW BLADE SR UH-1 HUEY GUNSHIP RTF BLH1700

It came in low and hot, the unmistakable "WHUP!" of its advancing rotor blades proclaiming to friend and foe that the "Air Cav" was on the way. It was the Bell UH-1 Huey and the exploits of the U.S. Army aircrews that flew it during the Vietnam War cemented forever its place in aviation history.

The new Blade® SR UH-1 Huey Gunship is the best ready-to-fly replica of this landmark war-bird you will find anywhere. Based on the proven Blade SR platform, it comes out of the box completely assembled and flight tested with everything you need, including a 6-channel 2.4GHz DSM2™ transmitter and a 3S 11.1V 1000mAh Li-Po battery with charger. The great looking Huey body you see here is already mounted and includes scale gun and rocket pod details that you apply. An optional LED light kit is available separately (ask for EFLA625).

Get to bladehobby.com right now for complete details on this no-hassle scale heli experience and to find a retailer near you.

LENGTH: 19.1 in (485mm)

HEIGHT: 7.00 in (178mm)

FLYING WEIGHT: 14.0 oz (397 g)

ROTOR DIAMETER: 21.8 in (550mm)

MAIN MOTOR: Brushless Outrunner (installed)

TAIL MOTOR: Direct Drive N60 Brushed (installed)

ON-BOARD ELECTRONICS: 2-in-1 ESC/Mixer, E-flite® G110 Heading Lock Gyro, Spektrum™ AR6100e 6-Ch DSM2™ Receiver (installed)

SERVOs: E-flite DS75H Digital Sub-Micro Servos (3 installed)

BATTERY: E-flite 3S 11.1V 1000mAh Li-Po (included)

CHARGER: 3S 11.1V Li-Po 0.8A Balancing Charger (included)

TRANSMITTER: HP6DSM 2.4GHz DSM2 6-channel (included)

BLADE

#1 BY DESIGN

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horizonhobby.com

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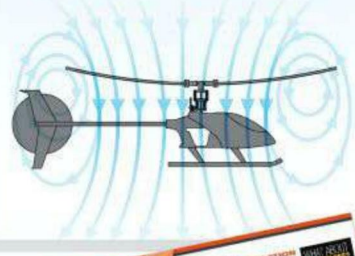


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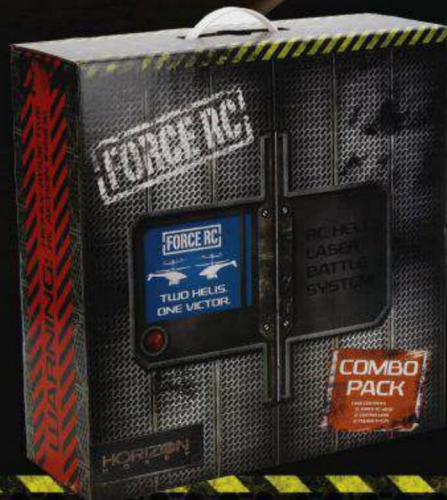
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This mini guy just got a whole
lot better.



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Naughty OR NICE?

Well it is almost that time of year again, when we stuff our bellies with holiday feasts and write our letter to Santa for that new RC helicopter or product we have been wanting all year.

This issue is packed full of new products that I am sure will somehow make

that list grow. IRCHA Jamboree this year was geared up and focused on the consumer. The grounds were setup like a local fair with tents and booths (well, that is if your fair ate a bunch of LiPo batteries and washed it down with a bottle of nitro). IRCHA was held early August and we just couldn't help but add the newest news along side the IRCHA coverage.

On another note, this issue we have added an all-new category to our Regular section of the Magazine. I would like to welcome Butch Wellmaker to the RC Heli Magazine team. You may know Butch from a past special feature, and a Regular Guy article. Butch is well known in the scale helicopter community as a hands on pilot that builds, details, and fly's beautiful scale helicopters. So for all you scale guys that want some great How To articles, and special features Butch will be here every month sharing his knowledge in Scale Shop. This month Butch will show you how to create custom water slide decals and how to apply them.

I hope you all enjoy this issue of RC Heli and remember don't ask too much from Santa, he might get angry with us and put us on the naughty list!

Ryan Kephart

Associate Editor
ryank@rchelimag.com



CHATTER BOX

WHAT ARE YOU GOING TO DRESS UP AS FOR HALLOWEEN THIS YEAR?



MIKE VELEZ - Publisher/Editor-In-Chief
Ali-G... Rizpect.



RYAN KEPHART - Associate Editor
I am going to make my Scion into the Back to the Future Time Machine!



CHUCK BASSANI - Editor-At-Large
I really don't costume up for halloween, but for the sake of funny; I'll just be getting a haircut and going as George Clooney!



JIM INNES - Editor-At-Large
If my kids get their way, I will either be a character from the Zelda games, or Yo-Gabba-Gabba.... Here's hoping that the Zelda idea wins out, though I would make a pretty good "Jack Black version" of DJ Lance Rock.



SHAWN KITCHEN - Editor-At-Large
I'm going as an overworked magazine copy editor. It looks a lot like my normal clothes.



DAN GOLDSTEIN - Editor-At-Large
Sweeney Todd ... since I just got into old school wetshaving



BUTCH WELLMAKER - Contributor
Going as Chuck Bassani. Now that's funny. Actually, have not thought of one just yet. I am sure it will be "kick azz" when I do.



AARON SHELL - Contributor
Same as every year, I'm the Jolly Green Giant! I've got the green body paint, tunic of leaves, and can of peas to do it right!

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RADIKAL



G30

PETROL ENGINE

*Production model may differ slightly.
Shown with optional items.

For Zenoah 23-30cc
GAS POWERED R/C HELICOPTER

Specifications:

- Length: 55 inch / 1397 mm
- Height: 17 inch / 432mm
- Main Rotor Diameter: 62.2 inch / 1580 mm (with optional RotorTech™ 710mm)
- Tail rotor diameters: 11.1 inch / 282.5 mm (with optional RotorTech™ 105mm)
- Engine: Zenoah™ Z-231, 26 or Modified Z-27 and Z-30 gasoline engine.
- Start method: Top Hex start or Optional pull start.
- Dry Weight: approximately 5 kg / 11 lbs. when full load tested with 5 Futaba digital servos, Futaba 611 Gyro, Futaba 2.4GHz receiver, Li-Po Receiver battery and Century 3D Torpedo Slim Muffler.

CN1340 Radikal G30 kit:MSRP \$650

- Semi-metal rotor head with two types of hard dampeners. (for 690-710mm Main blades) For 3D maneuver.
- Aluminum triple bearing metal swash plate with zero-slop bearing design.
- Black modular G-10 side frames with aluminum ridge frame enforcements.
- Top quality ball bearings, thrust bearings and one way bearing.
- Aluminum bearing blocks with double upper main shaft bearing and extra thrust bearing.
- Heavy Duty double bearing supported and double NSK One-way bearing autorotation design with extra large aluminum lower bearing support.
- Advanced 4-point supported engine mounts for less vibration and highest rigidity.
- Adjustable gear ratios available: 6.0, 6.42 and 6.92.
- Designed to be powered by Zenoah G231, G26 or after market G27 and G30 modified gasoline engines. This side frame design accepts up to 4 BHP power output.
- Extra large clutch and clutch bell with Heavy Duty one way starter design.
- Advanced intake/exhaust cooling fan system and specially designed fan cover.
- Machined POM Main Gear and DuPont™ plastic parts.
- Automotive grade tail drive belt supported by aluminum timing pulley and idler pulley along with double bearing supported aluminum tail bearing coupler.
- Carbon adjustable tail pitch control rod.
- High Gloss white fiberglass painted canopy (Black windshield and white body).

CN1340C Radikal G30 Carbon kit:MSRP \$750

- Fully carbon fiber side-frames, tail fins with rigid aluminum frame enforcements.
- Metal center hub along with two different hard dampeners. For hot 3D maneuvers.
- Aluminum tail gear box, flybar control arm set, seesaw control arms.
- Carbon tail boom supports with aluminum ends.

CN1340CE Radikal G30 SE Carbon kit:.....MSRP \$850

- New Style Aluminum Metal Rotor head, mixing arms and metal blade grips.
- New aluminum flybar seesaw holder.
- New aluminum seesaw assembly.

Coming September 2010



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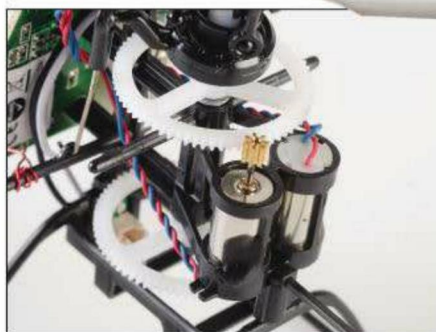
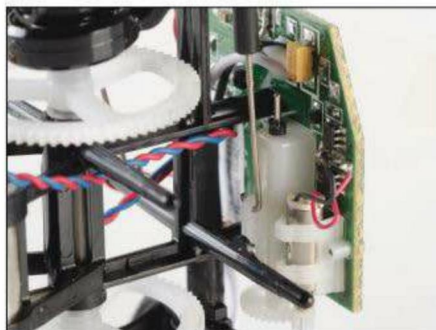
CENTURY
HELICOPTER PRODUCTS

HORIZON HOBBY

IN THIS HOBBY YOU WILL FIND SOME MANUFACTURES WORK LONG AND HARD ON PRODUCT DEVELOPMENT. Horizon Hobby does just that. What better timing for their newest product coming sometime in October is the Blade Scout CX. This three channel helicopter is a perfect gift for your youngsters as it is easy to fly, and will hover hands off. It comes in a small and durable package that will surely last more than a dozen crashes into your sofa. Check out next month's issue of RC Heli for a full product scope.

WWW.HORIZONHOBBY.COM

This truly is a beginners helicopter.



The 7-Channel Everyone's Been Waiting For

The NEW Spektrum DX7s

The 7-channel transmitter that ignited an RC revolution is back and better with advanced DSMX™ technology, new Spektrum™ AirWare™ software and the situational awareness of built-in telemetry. Even its ergonomics are best in class. In fact, the first time you pick up the DX7s and feel its superb balance, precise quad-bearing gimbals and rubber comfort grips, you'll instantly be spoiled for anything less. Add to this an intuitive SimpleScroll™ programming interface, large LCD screen and SD card reader, and the DX7s doesn't simply raise 7-channel expectations, it redefines them.

The wait is over. Get to your favorite Spektrum retailer right away or visit spektrumrc.com to learn more.



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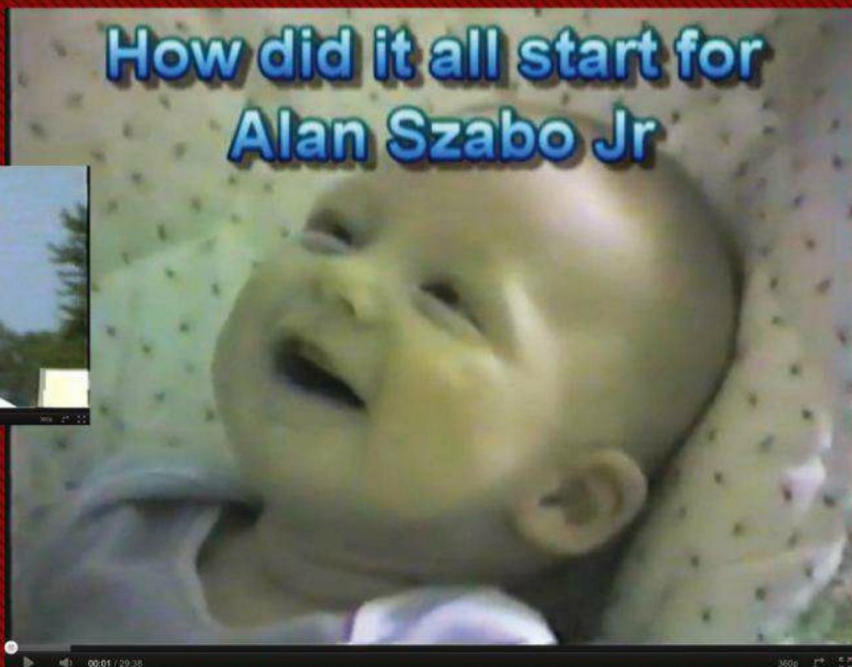
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HOW ALAN SZABO JR. MADE IT TO THE TOP



World-class pilot Alan Szabo Jr. started flying when he was just a few years old and slowly worked his way up to the top. He is known around the globe as one of the best RC helicopter pilots. His father Alan Szabo Sr. created a video showcasing his progress through the years. The video is a bit long, but as compared to the years of practice, this is just a fraction of a clip. Check out Alan's adventure and you will see what it takes to compete in this hobby.

WWW.TINYURL.COM/HISTORYOFALAN



A.R. DRONE HAS GONE ANDROID

A new firmware update has just made the popular Apple controlled A.R. Drone into a multi platform flyer. The new firmware allows the A.R. Drone to use a different type of WiFi connection. Parrot has also released their very own Android application and it is available in the market now. The new firmware requires the latest app from the apple store to update it through an apple device, but once the update is complete your A.R. Drone can take wind on a new OS.

WWW.ARDRONE.PARROT.COM



RCLOGGER RC EYE 650

The RC Eye 650 is a new quad copter designed by RCLogger to go along with their RC Logger Pro camera and data logger. This quad copter features 3 selectable flight modes from beginner to expert, multiple transmitter modes, MEMS sensors, high efficiency power system, lightweight construction using composites and aluminum, extra wide and tall landing gear to provide a clear view for FPV, and balanced rotor blades. Optional accessories can be purchased for the RC Eye 650 including a night flying kit and several data kits including GPS.

Street Price \$729

WWW.RCLOGGER.COM



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- Utilizes highest specification CNC mod-1 helical main gear, with highest load tolerance and lowest noise.

Specifications:
 Full length: 1160 mm
 Total height: 353mm
 Main rotor diameter: 1347mm
 Tail rotor diameter: 260mm
 Motor Pinion Gear: 13T
 Main Drive Gear: 112T
 Autorotation Tail Drive Gear: 131T
 Tail Drive Gear: 34 T
 Weight (with Motor): 2290g
 Drive Gear Ratio 1:8.61:3.85
 Ask your local dealer for
 KX016017T

Fly It, Feel It, See It, Pure 3D Performance!

3G
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Awarded the Constructor Championship

- Utilize direct link CCPM swashplate control system to enable direct and fast control response. Specially designed anodized CNC servo horns are not only visually pleasing but are extremely rigid.
- Heatsink embedded into motor mount for effective cooling of motor.
- The most optimal motor pinion ratio and tail gear ratio to achieve the most efficient power output.
- High quality 5mm carbon rod and CNC metal tail scissor control arms are used in rudder control system.
- Additional radial bearing is added to the one way bearing block to ensure smooth rotation, and eliminate jammed one way bearing.

ALIGN FEATHERING SHAFT WRENCH

Well it seems like everyone is coming up with a way to remove your feathering shaft nowadays. Align wasn't the first to create this wrench, but their version looks like it will work well and be used somewhat like a ratchet. This tool features an aluminum handle with two one-way bearings pressed into each end. The wrench is available for both large and small helicopters including the 700 and 600 combined on one wrench, and the 500 and 450 on another.

Street Price: \$17

WWW.ALIGNRCUSA.COM



TURNIGY HELI-TACH

Guessing your helicopters headspeed is anything but accurate. With today's power systems helicopter headspeeds can reach amazingly high. Without knowing your true headspeed you may be out of your power systems efficiency range. This will cause your flight times to be dramatically reduced. Thankfully Turnigy has a new 1000-3200 RPM Heli-Tach. This tach is very reasonably priced and is accurate to +/- 40 RPM.

Street Price: \$30

WWW.HOBBYKING.COM



CENTURY HELICOPTERS

Do you love Rotortech blades? Century has just announced a new set of Rotortech 700mm FAI/F3C Carbon Fiber Main Blades. These blades feature a safety wire that runs through the whole blade, a high efficient airfoil and high gloss resin finish to keep the parasitic drag at bay, matched C.C.G and S.C.G for stability and performance.

Street Price: \$120

WWW.CENTURYHELI.COM



SPEED!

You want to know what a helicopter moving at 150mph looks like. The Banshee has what it takes to do it and the video proves it all. Not only does it look fast but it sounds fast too. Check it out and you will be shocked that an RC helicopter can move this fast.

WWW.TINYURL.COM/BANSHEESPEED



RAPTOR

90-Class Heli

G4

ENTER THE NEW MILLENNIUM OF
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Main Rotor Diameter: 62.4 in (1584 mm)
Tail Rotor Diameter: 11 in (280 mm)
Fuselage Length: 53.3 in (1354 mm)
Flying Weight: 9.7 lb (4400 g)

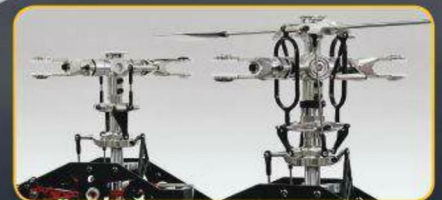
Flybar Version

Flybarless version also available.

It started with a clean sheet of paper and no preconceived notions on how to engineer a top-of-the-line glow heli. The end result is the Raptor G4 90-class, a machine so advanced it's setting new standards and earning more admirers with every F3C and 3D competition it enters.

Topping the Raptor G4's list of features is the Quick Calibration System, which makes setup a snap. The helical main gear transfers torque more efficiently, and provides more surface area for strength. The head is all metal, with the main rotor shaft made of hardened steel. The collective pitch range is a very impressive $\pm 15^\circ$. And the Raptor G4's overall flying weight is surprisingly lightweight, which enhances its agility even more.

Exceptional performance. Silky handling. It's everything you'd expect from Thunder Tiger, in a machine that's destined to become a legend.



The Raptor G4's rotor head is a technical marvel, delivering stability and agility for 3D or F3C flying. Choose the traditional flybar design, or go flybarless with Thunder Tiger's streamlined 3-axis stabilization system.

**Thunder
Tiger**

ttamerica.com/105q

HIROBO EMBLA 450E

It has been awhile since we have seen something from the Hirobo, but this doesn't mean they haven't been working on their next project. The Embla 450E is a 450 sized electric helicopter that will be available in two versions; flybarred and flybarless. The kits will included the power system (motor and ESC), and carbon fiber main blades. The Embla will also feature 16 degrees of pitch, high performance aluminum head, carbon fiber main frames, fiberglass canopy, and a Kevlar reinforced tail belt.

WWW.MODELRECTIFIER.COM

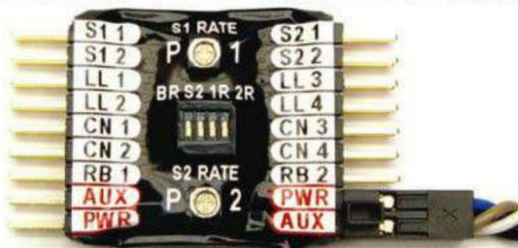
SPECS:

LENGTH: 656mm (25.8 inches)
WIDTH: 128mm (5.0 inches)
HEIGHT: 220mm (8.6 inches)
MAIN ROTOR: 725mm (28.5 inches)
TAIL ROTOR: 153mm (6.0 inches)
MAIN GEAR RATIO: 1:12.5:4.4
STREET PRICE: not yet listed



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Available:
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1S 3.7V to 10S 37.0V

G6 PRO PERFORMANCE 45C SERIES

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Available:
325 to 7700mAh
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LETTERS

VAMPIRES WILL BE HIDING

I am a subscriber and look forward to RC Heli more than any other mail! A recent postal strike here caught an issue in a warehouse somewhere and I was close to withdrawal when it showed up 4 weeks late.

Wairwolf is a TREX 500 ESP in an Align Airwolf fuselage. It is equipped with the GP780 gyro, 500M motor, Align digital suite of servos, the black on black Align HD 420D carbon fiber blades, and a 70-amp speed controller. The Airwolf / Werewolf / Wairwolf idea came to me last fall. The original concept for Wairwolf is a green werewolf I found online from this picture archive. I looked around on the web and did not find anyone else who had tried this theme.

I ordered one of the blue and white body kits and then took three months to find an artist with the skill necessary to pull it off. I ended up haunting local Tattoo shops and talking to the guys about airbrush artists, after Kijiji (Canadian eBay) ads didn't work out. Travis Roma (see his work on Facebook – Travis Roma Custom

Paints) - very cool!) gave a new skin and life to the machine. His work stands for itself and does not benefit from trying to describe it. Travis works in Dartmouth Nova Scotia painting custom cars.

Right from the start I knew the canopy had to become the eyes. You can see them when it is flying from 100's of feet out. The Body design of the original Bell 222 is incredible and I believe lends itself to unusual artwork.

A coffin is under construction now in my basement to transport Wairwolf.

Best of all and the most fun was making the video of Wairwolf that you will

find here, www.tinyurl.com/rchfb1. Many thanks to Kevin Patterson for the steady hand on the airborne video segments.

Thanks to Vincent Price for the amazing evil laugh on the video, and especially to Lyall for the awesome hi-res photos.

From concept to the end of video editing took 10 months of work.

Cheers

**Kentville, Nova Scotia
Canada**



MASH UP

Check out what I did to my Blade mCPx! I was in my local hobby shop getting a new clutch for my 600 and saw a Revell 1:35 Bell H-13H plastic kit and thought, "I know what I could do with that." I just needed an excuse to cut up my mCPx because the brushless one will be out very soon. Now I need one. It flies great but I only get about 2 minutes on a battery. I also don't think the motor is going to hold up very long. I did this also for practice because I just ordered the Century Bell 47G to replace my Helibaby. I'll just display the mini version and fly it for a minute whenever someone sees it and asks if it really flies. I love your magazine, keep them coming.

**Dan Weigand
New York, NY**



X-cell WHIPLASH CAN YOU FEEL IT?

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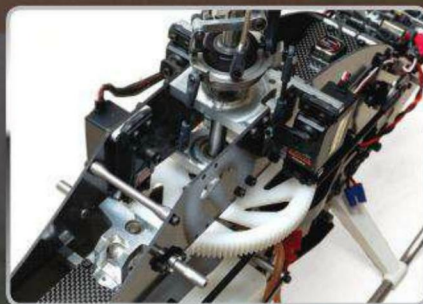
WHIPLASH

MA grows and influences all R/C Helicopter designs, past and future. MA again redefines the R/C helicopter again with the Whiplash models. Redefinition comes in usability and enjoyment minded designs. Gone are the goofy things that irritate all modelers. MA's next generation of models bring reinvented, redefined simplicity to the field and bench.

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FUN UNTIL IT GOES GUNS UP!

This was originally a Multiplex "Funcoputer". But now it's my own version of an Airwolf Marine Copter! I've also added the FMA Co-Pilot to keep from crashing. The guns are made from aluminum tubing; the rockets on the bottom are made from crossbow pistol bolts. The fins were made from scrap plastic. The camo paint job is all me, my first attempt. I added the canard fins on the rear. It flies great and is very stable thanks to the Co-Pilot. Hope you guys like it!

John Edge
Pensacola, FL



BUENOS DIAS!

Hello and Greetings from El Salvador; I have been a member of RCHELIMAG magazine now for more than 2 years. Thanks a lot on all the articles,

as we all agree when it comes to Helis it brings a lot of Engineering and you guys make it easy to understand (Although I am an Engineer and just love the very simple and great explanations).

I do fly also airplanes, but as for now I am in "heli mode" just purchased my first Nitro Heli, a Raptor SE and flew it last Saturday... what a blast.

I have a B400, which I learned (Blade CX2 for two and a half years to B400) it was a good preparation for the Raptor 50. Keep up the good work and cheers from Central America



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FREQUENTLY ASKED QUESTIONS

Q: I'M USED TO LI-POS BUT NOT NI-CD AND NIMH

I have a 2300 NiMH rx pack, but at what amperage do I charge it? Am I correct in saying 0.1 amp, as my charger has a two-digit selection? Also, my glow plug says to be charged for 8-10 hours @ 150 mA. Am I right in saying this is to be charged at 0.5 amp? I did charge it at this rate and the plug was not even warm. Am I safe to continue this at 1.0 amp?

This is on my Hirobo Shuttle. **—Matti Dickson**

A: Hey Matti, it is funny just how a few years ago pilots were saying they were used to Ni-Cd and NiMH batteries, and had all sorts of questions about Li-Po. It seems that the times have changed. To answer your questions, a 2300mah NiMH receiver pack should be able to handle charging at 2.3 amps. It's almost like a Li-Po in that regard. Just make sure that you select the right battery chemistry on your charger. You'll also want to make sure that your wires can handle that on the receiver pack. To be on the safe side, just charge at 1.0 amp. As far as your glow driver, 1.0 amp should be just fine. It will charge much quicker than the 0.5 amps you were charging at. And for your last question, 150mA equals 0.150 amps. **—RKephart**



Q: HI ALL, I FLY THE ALIGN TREX 450 PRO AND HAVE BEEN DOING IT FOR THE PAST YEAR. I CAN NOW PERFORM A FEW STUNTS, BUT MY CONCERN IS THAT I JUST CANNOT FLY NOSE-IN. I THINK IT'S JUST DOWN TO MASTERING IT AND NOT HAVING THE BOTTLE IN ATTEMPTING IT! IT'S REALLY UPSETTING ME, ANYONE ELSE SUFFERING WITH THIS? **—NEIL LYON**

A: Neil, you are not alone! That is why magazines like ours are here to help you. Speaking of which, have you taken a look at some of the hovering articles? Check out issues 8, 30, 42, and 49. My suggestion is to start off slow. Master sideways hovering. It also may help to turn your body to the side and position yourself so that you feel as if you are in the cockpit. Then work your body back to normal. Remember it's all about muscle memory. **—RKephart**



Q: HOW ARE YOU GUYS KEEPING YOUR HELICOPTERS SECURED IN A TRAILER? I JUST GOT ONE AND I CAN'T DECIDE HOW TO KEEP THEM DOWN WITHOUT BOUNCING ON ROAD TRIPS! PLEASE HELP AND THANKS. **—Nick McCooy**

A: Nick, I used a metal bar, wrapped in hockey tape. I put magnets on the ends and stuck it to my truck bed. Run the bar through skids and it holds the helis down on the truck bed. You could fashion something for trailer like that. **—Dan Pesonen**





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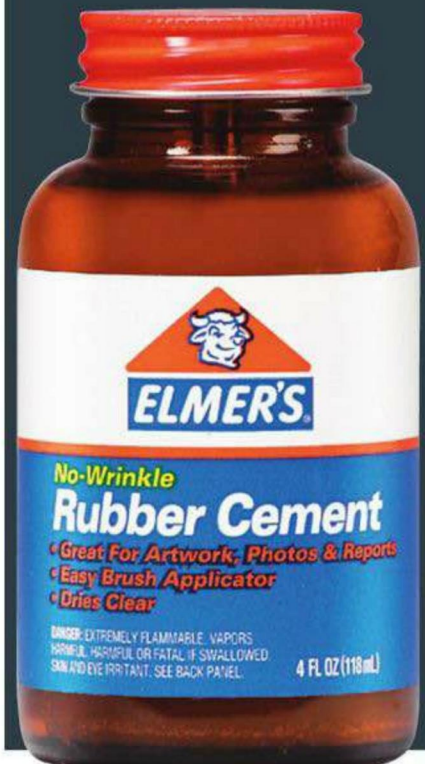
BLADE CHIP

This is one of those things that seems to happen to all of us. A chip can leave them looking unfinished and downright horrible. A small chip does not affect how the blade performs, so a quick fix will make you feel better and give your blades a nice finished look. Take a small piece of sandpaper and round out the edge. This will make the edge look clean. Then sand down the opposite blade's edge to match the damaged blade.

RUBBER CEMENT

Most modern helicopters come with aluminum skids that utilize either a plastic or rubber cap.

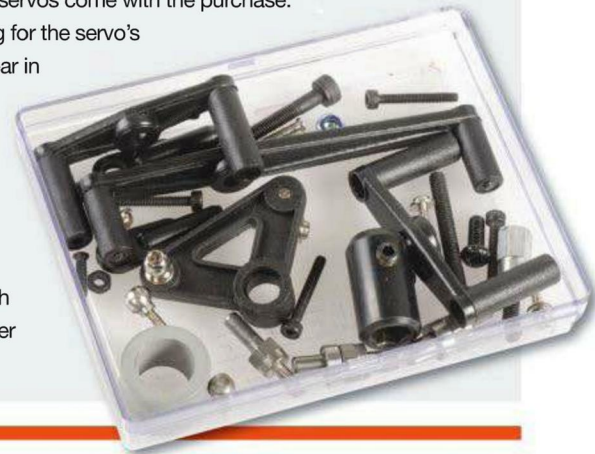
Traditionally it's been suggested that you use CA to adhere the cap to the skid. This works, but over time the glue can become brittle and the cap will come loose in flight. You hobby store usually has a rubberized CA that allows some flex and will secure your landing gear skid caps much better and last the life of the skids.



Save your servo boxes

With many new kits, servos come with the purchase. Rather than waiting for the servo's installation to appear in the manual, take

the servos out right away and save the boxes for your build. The boxes come in handy when you need to empty a bag full of screws for the build steps. The boxes will contain the screws and parts, which will allow you to build your helicopter without dropping one on the floor.



READERS TIP OF THE MONTH

This month Rob Thorpe brought up an old RC car trick that still can be used today on micro helicopters.

Almost every micro helicopter uses a brushed motor for the main rotor and/or tail motor. These motors can be a little on the weak side, which is never a good thing. Rob likes to squirt some WD40 into the motor. This allows the motor to operate smoother and produce more power by creating a better electrical charge. This may work for a while, but can wear out the brushes a little faster than normal.

Scorpion Motors Dominate at IRCHA!

For the second year in a row, a Scorpion powered heli took First Place at the prestigious "One Competition" at the 2011 IRCHA Jamboree. For the third year in a row, Scorpion was voted the #1 electric helicopter motor in the annual RC Heli Resource Visitor's Choice Awards! For Sport Flyers and Competition Pilots alike, you can trust Scorpion power and reliability for your helicopter models. Scorpion has an extensive range of motors and speed controllers available to fit virtually every electric powered helicopter on the market today.



Kyle Dahl Wins the 2011 One Competition!

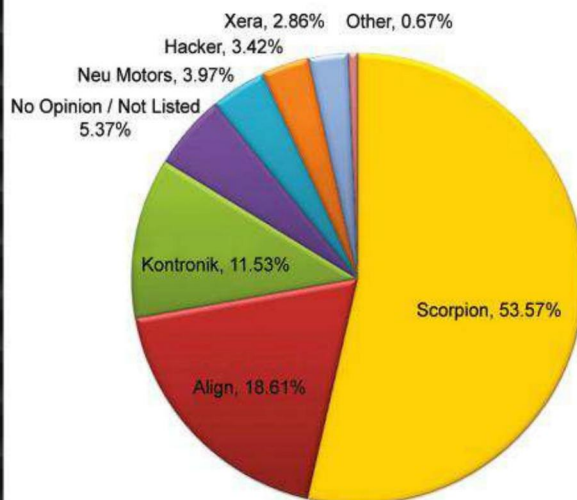
Team Scorpion pilot Kyle Dahl was crowned "The One", at the second annual "One Competition" held at IRCHA on August 13th, 2011, and received a cash prize of \$7,000. Kyle flew to victory with the new Mikado Logo XXTREME helicopter powered with a Scorpion HK-5035-380 motor, running on 14-cell Li-Po power. Rounding out this years field of Top 7 One Competition pilots was Bobby Watts, Kyle Stacy, Jamie Robertson, Nick Maxwell, JaeHong Lee and Lukas Riva.

Scorpion Motors Voted #1 Again!

For the third year in a row, Scorpion Motors were voted the number one brand for electric powered helicopters in the annual RC Heli Resource Visitor's Choice Awards. This year, Scorpion received more votes than all the other brands of motors combined! For the past four years, Scorpion Helicopter Motors have proven themselves again and again at heli competitions all over the world. For your next heli, go with the proven winner, choose Scorpion.



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Walkera DEVENTION DEVO-12

Walkera's Top Shot!

WORDS: Chuck Bassani

QUICK QUESTION... WHAT BRAND NAMES COME TO MIND WHEN YOU'RE IN THE MARKET FOR A NEW 10+ CHANNEL RADIO? Probably Futaba and JR, right? How about Walkera? That's right, Walkera is venturing into the high-end 'sport' or dare I say 'pro' class market by virtue of its introduction of the Devention DEVO-12. The Walkera Devention DEVO-12 is a 12-channel system that, at first glance, appears to have the modern styling of the JR 11X with a nice, large, color LCD touch-screen display like the Futaba 14MZ. I bet you're probably thinking, "Walkera and 'pro' class?" Try to keep an open mind here – I think you may be in for a shocker!



KEY SPECIFICATIONS

- 4.7" Color LCD Touch-Screen Display
- Programming for Helicopter / Airplane / Glider
- 5 Flight Modes (when helicopter model type is selected)
- 6 Swashplate Geometries (when helicopter model type is selected)
- 60 Model Internal Memory
- 4 User-Configurable Stick Modes
- Adjustable RF Power Output
- Wireless Model Copy and Trainer Functions
- Fixed and Automatic ID Assignment
- User Upgradable Firmware (via USB cable)

WHAT YOU GET

The system as submitted for this review arrived in a nice aluminum storage case. Included was:

- DEVO-12 Transmitter
- 1S 3000 mAh (hard case) LiPo TX battery
- TX battery charger
- DEVO RX1201 receiver
- USB cable
- DSC/Trainer cable
- Neck Strap
- Transmitter





PHYSICAL LAYOUT

The first thing you'll notice is that there's no shortage of controls, switches, knobs, and levers on this transmitter. After all, it does have 12 channels. Starting at the top left you find a 2-position (HOLD) switch at the outside rear location, a 3-position (RUDDER D/R) switch at the outside front, and a variable (AUX6) control knob towards the center. Along the top right there's a 2-position (TRN) momentary switch at the outside rear location, a 3-position (FMOD) switch at the outside front, and a variable (AUX7) control knob towards the center.

Each side of the TX contains two variable lever controls configured as inside/outside sliders. The inside sliders have both front and rear facing actuation tabs while the outside sliders contain only rear facing tabs and thus are only accessible from the rear.



Moving onto the front, the upper left features a 3-position (ELEV D/R) switch towards the outside and a 2-position (GEAR) switch towards the inside. On the upper right are a 3-position (AILE D/R) switch towards the outside and a 2-position (MIX) switch towards the center. Dead center you'll find left and right digital trimmer switches along with a speaker, power switch, and neck-strap attachment point. The four primary stick controls are dual ball bearing supported and feature digital trims. Interfacing with the programming transpires through a large touch-input color display along with six program navigation buttons (should you opt not to use the touch-screen).

The transmitter itself is rather large, but does feel very comfortable in your hands. The ergonomically designed case has soft rubber grips on both sides as well as along the rear where your finger wrap around. I do find the switch spacing along the top to be a bit too tight for my liking. I also find that the sensitivity of the touch-screen is quite low. But I did find a stylus that makes interacting with the touch-screen a much more pleasant experience tucked away in a hole at the bottom right of the transmitter. Some nice touches include a hinged battery compartment as well as rubber dust caps covering up all the ports (Charge, DSC, USB) and adjustment access holes that help keep dust and exhaust residue out.

FEATURES & PROGRAMMING

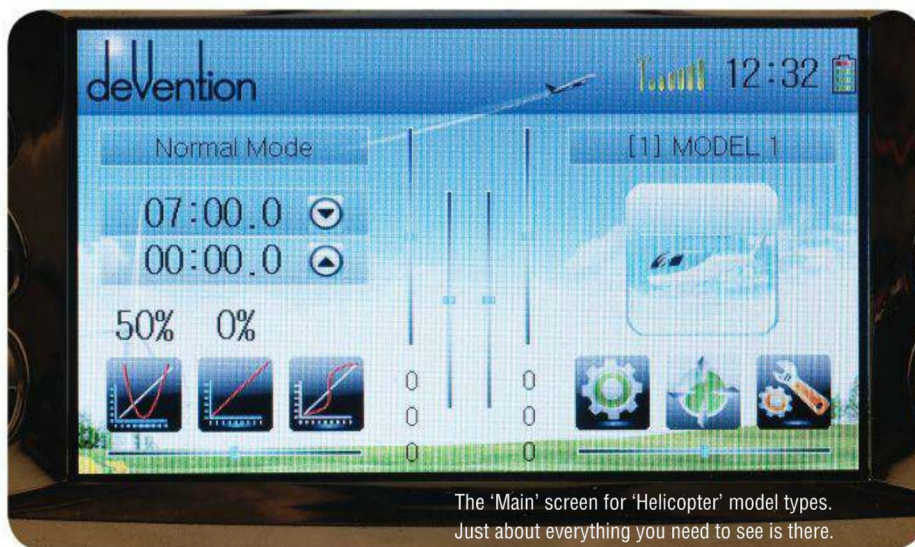
Charging the TX is as simple as plugging the included charger. Indicator lights on the front of the TX show status. Two colors (green and blue) while it's charging with the blue light going out when it's done.

The remainder of this review will focus on what the DEVO-12 has to offer us heli folks with respect to the 'Helicopter' programming suite.

The designers definitely took advantage of the large amount of screen real estate by presenting a wealth of information on the 'Main' screen. The time of day, RF power output setting, and battery charge level are displayed on the upper right part of the screen. Touching the power level or time of day display instantly calls up the corresponding programming screen. The active flight mode, two timers, pitch and throttle channel output values, as well as graphical and numeric representations of all trim positions are also displayed.

Additionally, there are short-cut icons for calling up the pitch and throttle curves, dual rates & exponential, gyro settings, and model select functions as well as quick access icons for calling up 'system', 'function', and 'model' menus.

Programming wise, this system does it all. Unfortunately, the 'User' manual is essentially non-existent. I thought that was included and all I was able to find searching the Internet was a 'Quick' guide. With that, I felt compelled to go through everything and present a brief synopsis of what the system offers. Everything is grouped into three menus: 'System', 'Function', and 'Model'.



The 'Main' screen for 'Helicopter' model types. Just about everything you need to see is there.



IN THE 'SYSTEM' MENU:

LANGUAGE - Choose between English and what I can only guess is Chinese.

SKIN - Select one of three different screen backgrounds. There's no mention of being able to customize with a user provide image.

DISPLAY - Adjust LCD brightness, contrast, backlight intensity/timeout, and power saver (turns the display off) time.

BUZZER - Enable/disable variable tone when throttle stick is moved, tone when levers/knobs are centered, and tone pitch.

DATE & TIME - Set the TOD clock and Calendar.

TFT SCREEN - Perform touch screen alignment.

STICK MODE - Select the desired stick mode, supports modes 1-4.

STICK & LEVER - Stick direction reversing for each of the four primary controls as well as a re-calibration procedure for ALL variable position controls.

POWER AMPLIFIER - Select RF output power (six discrete levels between -5 dBm and +20 dBm). This essentially allows you to optimize RF energy and subsequently battery power usage based on the class of model (e.g. park flyer, full-range) being flown.

ABOUT - Display the software, hardware, and library version information.



'Elevator-Aileron' mixes are available and can be enabled/disable on a per flight mode basis. Also here is the 'Aileron', 'Elevator', and 'Pitch' travel adjustments as well as swash 'exponential'.

PITCH CURVE - Same programming model as the 'Throttle Curve'.

PROGRAMMABLE MIX - Up to eight general-purpose programmable mixes are available. Mixes can be set to be always on, on per flight mode, or assigned to a switch. Up/Down gain and switch point offset can be set.

CHANNEL MONITOR - Displays output position of all twelve channels.

FAIL SAFE - 'Servo hold' or 'pre-set position' can be individually programmed on all twelve channels.

TRAINER - Program which functions ('Elevator', 'Aileron', 'Throttle', 'Rudder', 'Gear', 'Pitch', 'Gyro', and 'Governor') are transferred to the student during training.

TIMER - Two individual timers are available. Each can be configured as 'Stopwatch' or 'Countdown'. A timer can be assigned to switch (physical or stick position) and be configured as 'One-Time' start or 'Start/Stop'. 'Interval' and 'Down Timer (reaching the end-time on count-down)' can be set/enabled/disabled.

THE 'FUNCTION' MENU CONTAINS:

SERVO REVERSE - Servo direction reversing is available on all 12 channels.

TRAVEL ADJUST - Individual travel adjustments are provided for each side of neutral on all 12 channels.

SUB TRIM - Sub trim adjustments are available on all 12 channels.

DUAL RATES / EXPONENTIAL - Set dual rate and exponential for the 'Elevator', 'Aileron', and 'Rudder' channels. Up to six separate positions (or settings) can be programmed. You can then assign any of those positions to each of the up to five active flight modes. Furthermore, you can alternately assign a flight mode to a corresponding D/R switch and realize three different settings per flight mode.

THROTTLE HOLD - Enable/disable and optionally select to have it activate based on a programmable throttle stick position.

THROTTLE CURVE - Program the curve with up to nine points. Each point (except the first and last points) may be inhibited. Any of the seven mid-points may be

designated as the 'hover' point (the point that the hover pitch/throttle trims center around). There's also an option to enable 'Exponential', which will smooth out the inflection points on the curve.

DEDICATED COMPENSATION MIXES FOR AILERON/ELEVATOR/RUDDER TO THROTTLE

- Program compensation adjustments that address the increase and decrease in drag that occurs with aileron, elevator, and/or rudder inputs. Can be set to always on, on/off with a switch, or on/off based on the active flight mode.

GYRO - Program 'automatic' gain settings (1 per flight mode) or assign gain settings to a switch position.

GOVERNOR - Program one RPM setting per flight mode.

TAIL CURVE (A.K.A REVO MIX) - Program a tail 'offset' for each point on the pitch curve.

DUAL PITCH - Fine tune the slave pitch channel when using 2-servo mCCPM setups.

SWASH MIX - 'Aileron-Elevator' and

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THE 'MODEL' MENU CONTAINS:

MODEL SELECT - Call up any one of 60 model memory locations.

MODEL NAME - Assign a name up to 16 characters.

MODEL COPY - Select a source and then copy it into any of the other 59 model memory locations.

MODEL TRANSMIT - Select a source to send to another transmitter (via DSC or wireless).

MODEL RECEIVE - Receive a model into the currently selected model memory location (via DSC or wireless).

MODEL RESET - Select one (or all) of the 60 model memory locations and reset programming to the factory default settings.

TYPE SELECT - Select the Airplane, Glider, or Helicopter programming suite for the currently selected model.

TRIM SYSTEM - Individually adjust the number of increments (or resolution) per step of change on all six digital trim switches. The 'Elevator', 'Aileron', and 'Rudder' trimmers can also be set to either 'Limited' (trim will not cause channel move past its set end-point) or 'Normal'.

STICK POSITION - Four logic switches that are on/off based on a programmable stick position. For each switch, the control stick ('Aileron', 'Elevator', 'Rudder', or 'Throttle'), switch point, and whether the switch is on or off above that point can be programmed.

WARNING - Individual alarms may

be enabled to warn you whenever the transmitter is turned on with the throttle stick above a programmable point, when you're in a particular flight mode, or the GEAR, AILERON D/R, RUDDER D/R, or one of the stick position switches are in an undesirable position.

DEVICE SELECT - Allows you to program which physical switch functions as the 'Main' and 'Alternate' flight mode switch, whether or not the stick trims are common across all flight modes or maintained on a per flight mode basis, which physical switch functions as the throttle hold switch, and which physical controls function as 'Hover Pitch' and 'Hover Throttle' trims.

DEVICE OUT - Select which physical control functions as input to the 'Gear', 'Pitch', and 'AUX2' - 'AUX7' channels. Additionally, each of

those channels can be enabled/disabled or assigned to output the 'Gyro', 'Governor', or 'Pitch 2' ('Dual Pitch') functions.

SWASH TYPE - Six swash geometries. 1-servo (normal), 2-servos (180°), 3-servos (120°), 3-servos (140°), 3-servos (90°), and 4-servos (90°).

FIXED ID - Allows you to overtly set a specific numeric ID or let the transmitter automatically select an ID to use for TX/RX binding.



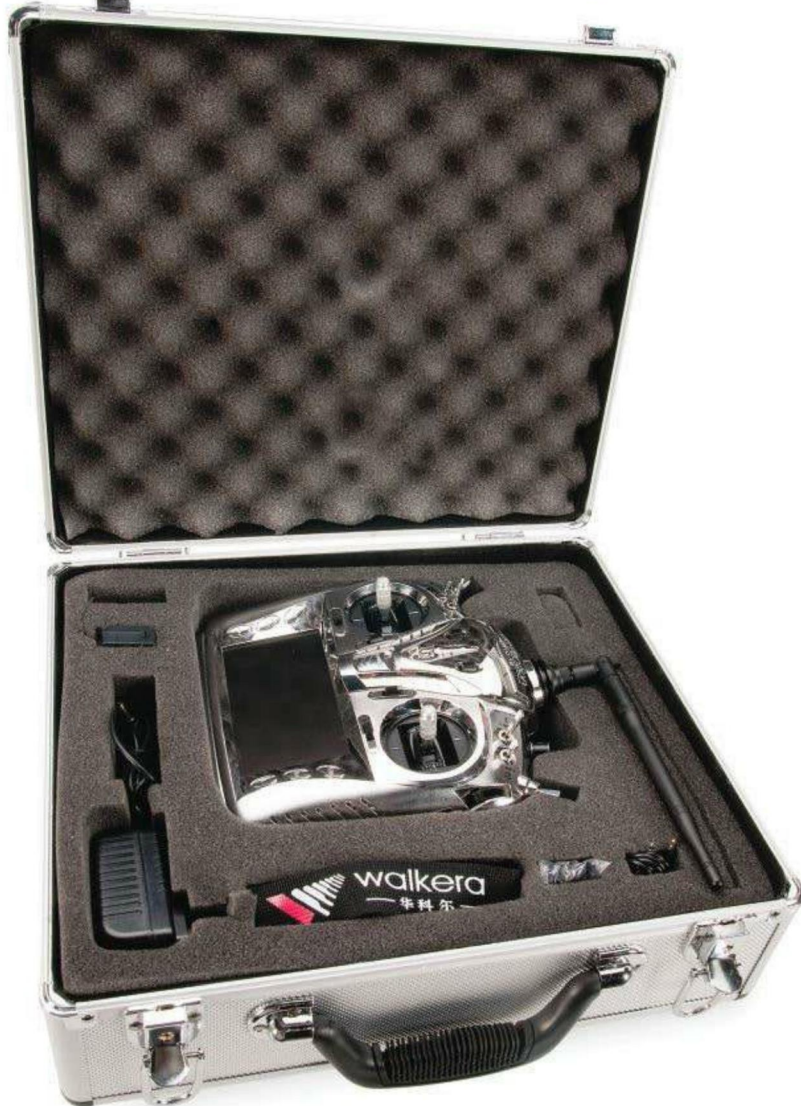
RX1201 RECEIVER

The RX1201 Receiver is a single unit, utilizing two monopole antennae oriented at 90° angles to each other. While this is considered a full-range receiver, the short antenna length and lack of extension cable does easily lend itself to the effects of shadowing. Therefore, I suggest taking extra care during installation to ensure the antennae have a fighting chance to 'see' the transmitter with the model in all orientations.

The receiver contains a dedicated battery input/bind port, meaning there's no need to y-connect power when all twelve channels are used. You will notice that the battery input port also functions as the bind port, however Walkera only uses the bind plug to erase the currently stored bind information. The bind plug does not need to be present during the actual bind process.

As there is no mention of the operating voltage range of this receiver, I hooked up my lab power supply for some tests. On the bench, the receiver remained linked to the TX and continued to work down to 3.4v. Below that, it lost the link. Not wanting to push the upper limit, all I did was verify that it functioned normally at the fully charged 2S LiPo voltage of 8.4 volts.





FLIGHT TESTS

Getting ready for IRCHA, I decided to remove the DSM2 receivers out of the helis I was taking with me and replace them with DSMX. One of those helis is a scale 450-size Airwolf. I took this opportunity to test drive this Walkera system in that heli before installing the DSMX receiver. So out came the JR921 receiver and in went the DEVO RX1201.

Setup was uneventful and took only about 20 minutes from scratch. I took Airwolf out to the local park and put it through its paces. It was here that I discovered that it's somewhat difficult to read the display in the bright sunlight. However, performance wise the system worked flawlessly. Flying using the lowest RF power setting, the link was solid – even at some pretty good distances that at times pushed the limits of my eyesight.

I may just have to take this system with me to IRCHA and see how it performs in that RF saturated environment!

CONCLUSION

Overall, I am generally impressed with the DEVO-12 system. What you get is a rather extensive programming suite at a relatively attractive price point. And most importantly, the radio does work quite well. However, I feel inclined to mention that when you get into systems in this price range, I feel that customer support and service should be paramount considerations when making a purchasing decision. Hopefully Walkera has a plan for that. Happy Flying ...*THL*

LATENCY & PERFORMANCE

One of my 'pet' projects has been to develop a stand-alone microcontroller based latency tester. With a little guidance from our resident latency expert John Kos, I'm happy to report that I finally finished that project. Look for a feature article on this tester in an up-coming article.

That said, the DEVO-12 has the dubious honor of being the first radio tested with this system. The tests were performed with the radio in 'Heli' mode and the swash-type set to 120° eCCPM. Here are the results:

Latency (Channels 2, 3, & 6):

- Minimum: 20.3 mSec, Maximum: 53.5 mSec, Average: 43.3 mSec. Aileron and Elevator input latencies fall within this range.

Frame Period / Rate: 20.2 mSec / 50 Hz



+ THE GOOD

- Comprehensive programming
- Attractive price
- 60 model memory
- Wireless trainer
- User upgradeable firmware

- THE BAD

- Very poor (essentially non-existent) manual.
- Display is difficult to read outdoors

CONNECT

MANUFACTURER:	Walkera
WEBSITE:	www.devention.com
PART NUMBER:	WK-DEVO12
STREET PRICE:	\$479.99 - Extra DEVO-RX1201 receivers can be purchased for \$69.99 each.



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REGULAR GUY INTERVIEW

with TOM HEFFEL



WELCOME TO THIS MONTH'S NORMAL GUY INTERVIEW. EACH MONTH WE INTERVIEW A RELATIVELY UNKNOWN PILOT WHO IS ONE OF THE "GOOD GUYS" AT THEIR LOCAL FIELD. We hope to shed some light on what we consider the lifeblood of this hobby - those pilots who day-in and day-out train and help new pilots succeed, and who do so without fanfare or payment. We're always looking for more of the unsung heroes in the hobby; if you know of such a person we could interview in your area, please email Jim Innes at rchelijim@gmail.com and we can arrange to spotlight one of your local heroes.

PILOT INTRO



This month we're talking with Tom Heffel. Tom was introduced to us by our very own Chuck Bassani. Tom flies with Chuck and they've known each other for quite a while. Chuck specifically talked about how much help Tom is to the new pilots who walk into their local hobby store, Elwood Hobbies.

RCH: SO, TELL US A LITTLE BIT ABOUT YOURSELF. WHAT DO YOU DO? WHERE DO YOU LIVE?

TOM: I am a graphic designer for Centiv Services and do design work for one of the largest wine & liquor distributors in the country. I also work part time for my local hobby shop, Elwood Hobbies, doing helicopter setups, repairs, builds, and troubleshooting. I live in Commack, New York with my beautiful wife of 12 years and my two amazing daughters who are 4 and 7 years old.

RCH: HOW DID YOU GET STARTED IN RC HELIS?

TOM: It's kind of ironic how I got into RC helis. I used to fly RC airplanes and about seven years ago, due to a freak accident, my left hand got hit by a prop at full throttle on a YS 110 four stroke with a 17" APC prop. At the time I was running commercial

printing presses, and due to the extensive damage to my hand I was out of work for seven months. I had to have three surgeries to repair the knuckle on my ring finger as it was shattered and had nearly 70 stitches over three fingers. During this time my first daughter was around 5 months old and money was getting extremely tight. When the owners of the hobby shop I always dealt with heard about what happened, they offered me a job to help get me through that rough time.

When I started working there, I met a great bunch of guys who were into helicopters and I couldn't resist getting one once I got back to my regular job. I continued working at Elwood Hobbies even after resuming my normal work. My first heli was a Raptor 30. I was taught how to set it up by a guy named Tommy



Smith. After hovering it for the first time, I was hooked (I had practiced on sim a lot before buying the heli). I bought a Raptor 50SE two weeks later.

I took a big interest in getting maximum performance from my helis as my skill level progressed, and I also found it very interesting to troubleshoot problems that I came across. I am always willing to help anyone having a problem. As a result, I now do the setups and troubleshooting for the hobby shop.

RCH: WHAT ARE SOME OF THE MANEUVERS YOU ARE CURRENTLY WORKING ON? WHAT ARE YOUR FAVORITES?

TOM: I'm currently working on piro flips and transitions. My favorite maneuvers are backwards inverted Hurricanes and Tic-tocks. I've been limited on flying time lately, but I hope to get more time in this season.

RCH: WHAT ARE YOUR TOP PIECES OF ADVICE FOR NEW PILOTS?

TOM: I am a firm believer in using a simulator, but not too much. I find doing about 20 minutes a night to be most beneficial. You don't want to burn yourself out. There is still no substitute for real stick time, so practice whatever you are comfortable doing on the sim as much as possible on your real heli, and fly within your means. Also, seek out the help of experienced pilots to make sure that your machine is set up correctly, as a properly built machine is crucial to success. There are plenty of how-to's on the Internet but just one thing

not being right could spell disaster. It's always better to have it checked out and know that it's right.

RCH: WHY DO YOU FLY HELIS NOW AND WHAT ARE YOUR FUTURE PLANS WITH THE HOBBY?

TOM: I fly helis because I have never found another hobby I enjoy as much as this one. I love the challenge of learning new maneuvers and the adrenalin rush I get from pulling off something new. Even after seven years I try to fly with every chance I get. I've also made so many great friends as a result of this hobby. I plan to continue flying and helping others in any way I can. I especially like it when I see someone I have helped helping out someone else.

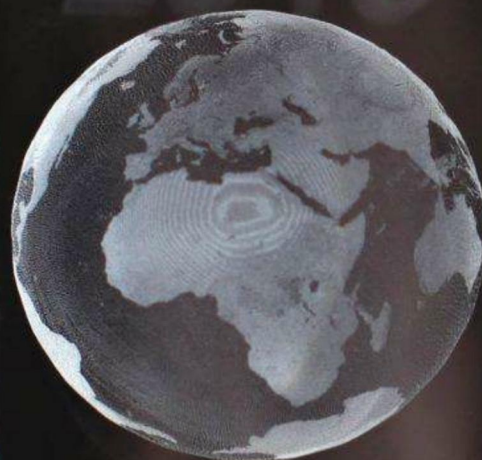
RCH: THANK YOU TOM FOR THE STORY AND FOR SHARING YOUR HOBBY WITH OTHERS. ALSO, IT SOUNDS LIKE THE PEOPLE AT ELWOOD HOBBIES ALSO UNDERSTAND WHAT BEING A GOOD GUY IS ABOUT!

CONCLUSION

Tom's story is a little different than most. It's inspiring to hear about the care that the owners of his LHS had upon hearing of his predicament. Not only did they help Tom get back on his feet, but they also set the stage for his introduction into our hobby, a hobby that Tom now gives back to on a regular basis. The regular guys are what keep this sport alive and well. If you know a person at your local field who is like Tom, please let us know. See you at the field! *RCH*

FAI ENV

3D MASTERS 2010



1

2010 ENV Wins

3D Masters
Nick Maxwell - 1st Place

FAI AMA National
Helicopter Championship
Curtis Youngblood - 1st Place
Nick Maxwell - 2nd Place

HEMOSTATS

Scalpel... Sponge... Hemostat STAT!

WORDS: Ryan Kephart

HEMOSTATS HAVE BEEN AROUND SINCE THE EIGHTEENTH CENTURY AND WERE DEVELOPED TO AID IN SURGICAL OPERATIONS. Hemostats come in a variety of shapes, sizes, and functions to help doctors reach areas that are normally out of reach with the human hand.

Many times we find ourselves trying to reach an area of a helicopter that would not be possible without the use of a special tool. Some try to use needle nose pliers and others try and muscle their way into that hard to reach place. Thankfully there is an easier way.

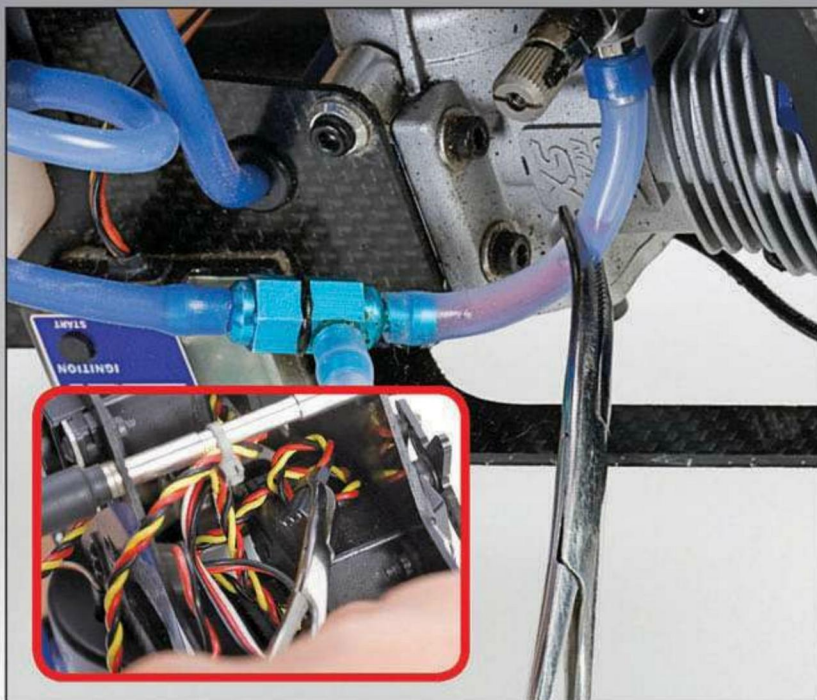
Hemostats received their name from the process of halting blood, which is called hemostasis. A basic set of hemostats consists of a nose, which can be straight, curved, blunt, or sharp. There is also a pivot point, which is usually closest to the nose of the tool. Long arms extend past the pivot point to give additional power delivered to the jaws. Finally there's the grip, which usually consists of two holes for your fingers and a locking mechanism that allows the jaws of the tool to remain closed on an object.

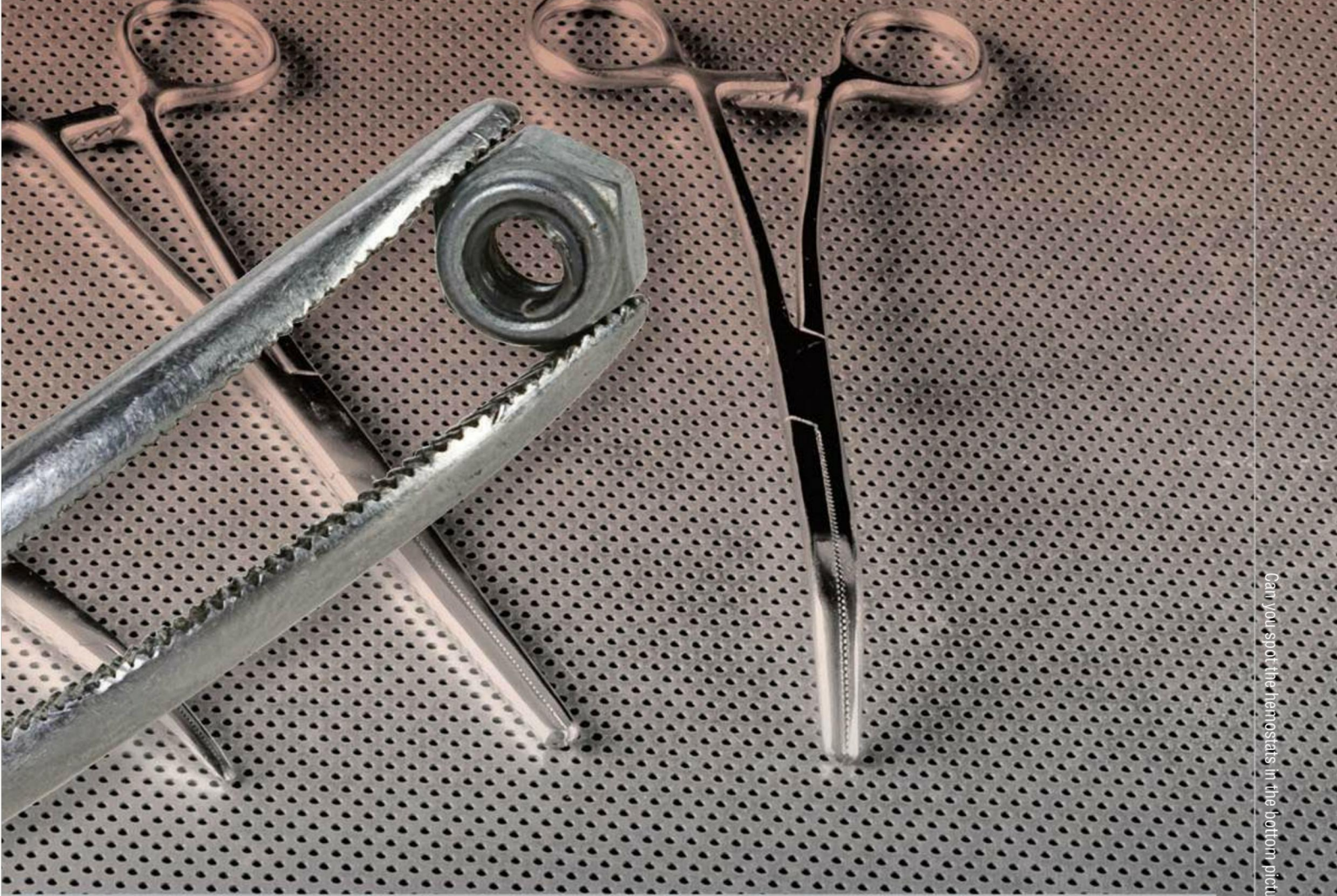
METAL LOBSTER!

» THE MANY USES OF THIS SURGICAL TOOL

In surgery the hemostat is used to stop the blood from an artery. The helicopter equivalent is a fuel line. In a pinch you can use the hemostat to stop the fuel from entering the carburetor when fueling or during maintenance.

Another useful function of the hemostats is the ability to reach in between the frames to pull or hold down a part. For example, you can use the hemostats to hold a nut between the frames while tightening a screw. You can also use this tool to help guide servo wires to their appropriate spot. I have even used hemostats to help guide zip ties into their holes to help secure the servo leads. You can only imagine how many more uses you can find for hemostats. It's almost imperative to own a pair if you're into scale models. When the space you are working in is tight and there isn't enough room for your hands, there will always be a use for the hemostat.





Can you spot the hemostats in the bottom picture?

HOW TO GET **YOUR HANDS ON ONE**

Hemostats can be purchased at just about any hobby store or hardware store. These hemostats are usually a general version of this versatile tool, with a straight jaw and a short reach. To really get a good selection and variety of this tool, a good place to look is your local military surplus stores. They usually carry a variety of hemostats from curved jaws, locking, non-locking, long, and short. The prices are usually cheaper than at other outlets. I have also seen these tools at various events such as the AMA show, county fairs, and fun flys. The price of these tools range from around five to twenty dollars.



CLOSE IT **UP**

With the plethora of tasks that can be performed by the hemostat, this is one tool that should not be left behind. Rather than just buying one pair, a variety of hemostats is the way to go and could change a nightmare of a build into a smooth and easy one. The relatively low cost and ease of use makes this a great tool to have in your flight box as well as your workbench. **TRH**

MACHINE THREADS

Screw That!

WORDS: Aaron Shell

MACHINE THREADS ARE ONE OF THE PRIMARY COMPONENTS TO ANY RC HELICOPTER. The ability to fasten parts together with precision and strength is paramount to being able to get your RC heli to fly and being able to fly accurately and safely. Machine threads provide a mechanical advantage over other types of fasteners, but not all machine threads are created equal. Just because a screw is labeled 3mm, it doesn't necessarily mean that it's the right 3mm screw for your helicopter, and understanding what makes quality threads will help you keep your machine in top condition.


Some of these threads are pretty dirty


» TOLERANCES AND QUALITY

Many factors go into making a correct fit between male and female threads. In most RC heli applications, screws thread into pre-threaded holes to mate parts together. The male threads on the screw and the female threads in the hole must not only match, but meet tolerance levels for the screw to function properly. Several factors come into play; a common misconception is that coarse threads are of lower quality than fine threads, but there can be good quality coarse threads which meet tolerance levels and poor quality fine threads which don't.


'Lead' and 'pitch' are often the same in many threads, but are actually two different measurements. Lead is the distance the screw travels in one 360° rotation, and pitch is the distance between the crests of the threads.

Screws, which have a "double-start", actually have two separate helical ridges coiled together instead of the more common "single-start", and in this case the lead and pitch will not match.

 **MAJOR DIAMETER [1]** is the largest diameter measurement of the thread, whether male or female. On a male thread this is the widest point on the outside of the threads, and on the female side it's the widest point on the inside of the threads.

 **MINOR DIAMETER [2]** is the smallest diameter measurement of the thread. On a male thread this is this narrowest diameter inside the threads, and conversely on the female side it is the narrowest diameter on the crest of the threads.



 **PITCH DIAMETER [3]** is a critical measurement between the minor and major diameters. If male and female threads do not have very similar pitch diameter, they will not mate properly. Thread pitch diameter of a screw is similar to how pitch is measured for gears; if the pitch is not closely matched the gears will not mate properly.

STANDARDIZATION

Many factors come into play to determine the class of fit of a male and female thread under the metric-based International System of Units (ISO) classifications: friction, play, achieving certain tolerances, and surface finish. In addition, threads of the same diameter may have different thread depth. Screw threads are almost never made perfectly sharp; thread depth is the percentage of truncation from a perfectly sharp cross-section of the thread. A typical depth for standardized screws is around 75% of the pitch, and many screws may be acceptable at 60%. As the percentage of depth decreases it affects a screw's effective holding power, but lower percentage thread depths are easier to machine and cause less wear on taps and dies during the machining process.

Manufacturers must decide how accurately to machine male and female threads in every component, taking into account how critical the intended use is and the cost to machine. All of these factors are also affected by the material chosen, and this is one critical area of decision making where the engineering must find a happy medium with the economy of the project to produce a quality helicopter that is still affordable.

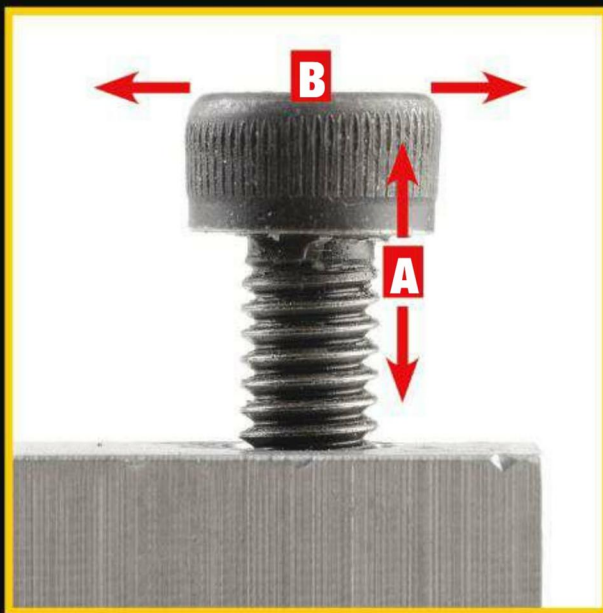


Hey screws, watch out for that rust!

PRACTICAL REALITY

All of these factors of fit and accuracy can be summed up with one question: How well do the threads fit together? There can be two types of "slop" in the threads, axially (in and out - "A"), or laterally (side to side - "B"). For critical areas such as your spindle screws or the pivot for mixing arms, there isn't much room for error. Even with thread locking compound large amounts of slop will eventually cause the parts to wear themselves loose in areas with high loads and vibration.

It's important to pay attention to the accuracy of the threads during rebuilds; areas that have been cross-threaded or stripped out should be addressed and not overlooked. Although it's not always practical to implement, some designers incorporate keys or tabs into mating parts to help with alignment and to take the shear loads. This can dramatically improve the strength of the assembly versus simply relying on the screws for shear strength. In addition, by eliminating the shear load the screw is able to do its job better and a smaller screw can be sufficient in many cases. **TCL**



INSTALLING A GYRO

It's called a gyro, not Yeero!

WORDS: Jim Innes

GYROS ARE NOW CONSIDERED AS MUCH A PART OF A MODEL HELICOPTER AS A SET ROTOR BLADES ARE. These little devices save work and time, allowing us to focus on other aspects of flying. The modern gyro unit is a complex piece of electronics that is usually straightforward to set up as long as you understand how they work and use some simple installation techniques.



» WHAT IS A GYRO?

Back in the beginning, model heli pilots had to “fly the tail” on their helicopters. They had to compensate with their rudder sticks and mechanical compensation mechanisms depending on how much throttle was being given, how much wind was present, and other factors. Just hovering a helicopter required constant attention to the tail in order to maintain position.

Fast forward in time just a little bit, and the first gyros were introduced. These initial gyros were mechanical in nature. They consisted of a small motor that spun a set of heavy wheels inside the case. This assembly was spring loaded in the housing so that if the gyro was rotated or acted upon, the spinning assembly would tilt and contact sensors inside the gyro. The data generated by this motion tells the gyro what direction the tail was moving so that it could give commands to counteract the movement. Also, all the older gyros were called “rate” gyros. These gyros would send commands to the tail servo to counteract unwanted tail movements, but they did not hold the tail in place during sideways

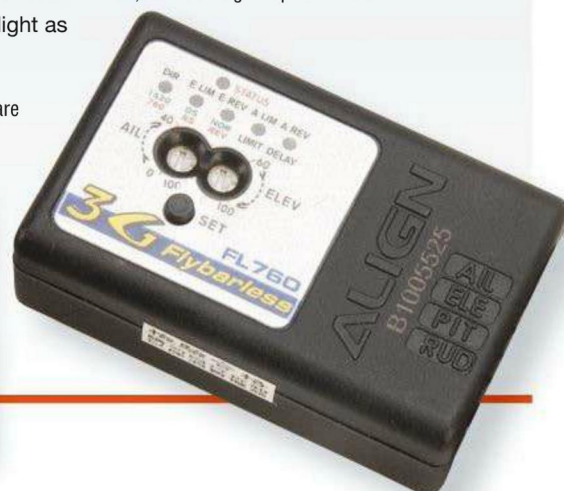
and backwards flight. If you wanted to do a backwards circuit, you had to keep the tail there yourself.

Now move further forward in time to today. Most modern gyros use MEMS sensors in them to do the job the large spinning assemblies used to do. These little sensors have no moving parts and are very precise and sensitive, allowing a much higher amount of control and faster reaction to unwanted tail movements. Almost all modern gyros are of the “heading hold” variety. A “heading hold” gyro not only counteracts unwanted tail movement, but it will also attempt to hold a tail in any location, regardless of which direction the helicopter is moving. These gyros opened up the world of 3D flight as we know it today.

Modern gyros are small, solid-state, and are extremely effective at their job.



This beast is what some of the original gyros looked like, even though it looks antiquated to us now, it was a huge leap forward at the time.

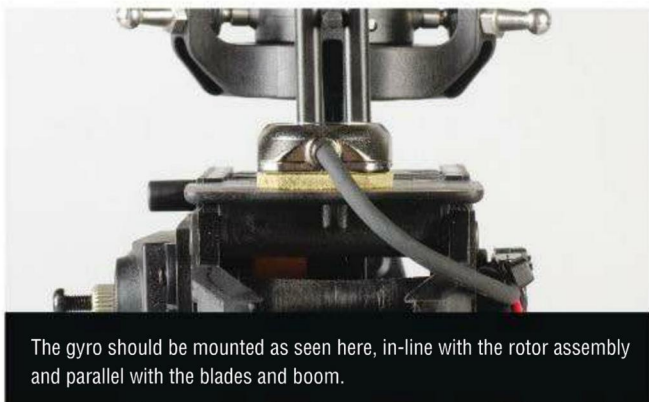


PHYSICAL **INSTALLATION**

Physical installation of a tail gyro should be done according to manufacturer instructions. With that said, there are a few tips that will help ensure that the gyro works to the best of its ability.

STEP 1:

Gyros should be installed inline with the main shaft, either in front of or behind it. The surface that the gyro is mounted to should be perpendicular to the main shaft.



The gyro should be mounted as seen here, in-line with the rotor assembly and parallel with the blades and boom.

STEP 2: Vibrations are a gyro's worst enemy. Mount the gyro in a place where it is not too close to a vibration source (such as the engine). Also, you should reduce vibrations in the model by dial indicating clutch assemblies and balancing all of the rotating parts.

STEP 3: Use the proper gyro tape for the unit. Gyros come packaged with double-sided foam tape. The foam tape included with the unit has been tested to work well with that specific gyro.

Proper gyro tape is essential to ensure proper performance out of most gyros.



STEP 4: Clean the surfaces. Before sticking the tape to the gyro or heli, take a small drop of rubbing alcohol and wipe any oil from the mounting location and the bottom of the gyro sensor.

STEP 5: Check the voltage and servo requirements for the unit. Some gyros are limited in how much voltage they can handle, as well as what types of servos they can use. Double check that your flight gear meets these requirements.

When you install the gyro unit, make sure that the wires going to the gyro are secured to the helicopter not too far from the unit. Leave just a small amount of slack in the wires. This will ensure that moving wires are not affecting the gyro during flight.



The wires coming from the gyro should be secured so that they place no in-flight stress on the sensor unit.

WHAT ABOUT **FLYBARLESS?**

Though this article is focused on tail gyros, it would be impossible to not talk for a moment about flybarless gyro units. Most flybarless units incorporate three sensors into one gyro unit. The three sensors are mounted so that one senses movement for the tail, another for aileron, and the last senses elevator motion. Following the same principles presented on tail gyros, a flybarless unit does the job of counteracting unwanted motion (movement not commanded by the pilot) for all three axes. Because of the complex nature of a flybarless unit, the setup procedure is usually quite different than that of a regular tail gyro.

Modern flybarless units take the proven performance of a tail gyro and apply it to the elevator and aileron as well. These are fast becoming the norm.



A level swash is a happy swash.

BENCH **SETUP**

With everything installed in the helicopter, it's then time to set up the gyro. The exact procedure varies depending on the make of the gyro, so be sure to follow the manual.



THE FIRST STEP is often setting the servo type in the gyro.

There are various types of servos in use for a tail servo: analog, digital, and narrow pulse digital units. Though analog tail servos are rarely used, there are still gyros with that option available. It's highly recommended that you use a digital servo designed for tail rotor use. Be sure to set the servo type before attaching the servo; you can damage a servo if it is plugged in with the pulse width set incorrectly.



Ensure that your servo and gyro are compatible with each other before plugging in the servo.

NEXT, set the gyro's direction properly. A right stick movement should move the tail blades so that they push the tail to the left (nose to the right). If this is wrong on your helicopter, simply reverse the rudder channel in your transmitter.

Next, you need to check that the corrective inputs from the gyro are also correct. Swing the helicopter's nose to the left quickly; the servo should move in the same direction it did when you gave it right-stick in the previous step. If it moves in the wrong direction, reverse the direction in the gyro itself.

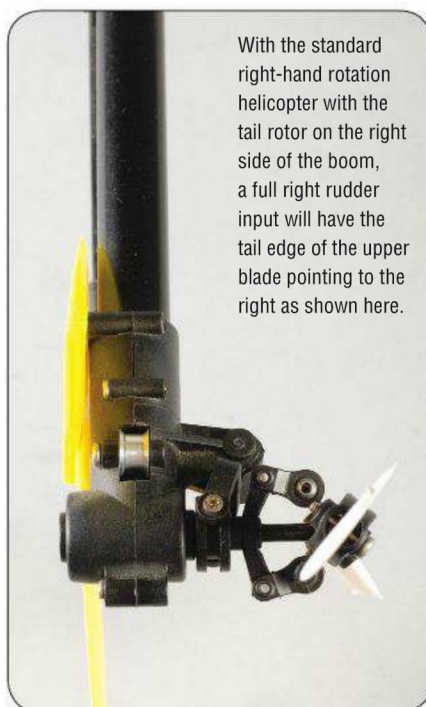
With the directions all set properly, it is time to do the basic setup. This starts with installing the servo horn on the tail servo with the servo in its center position. The arm should be exactly perpendicular to the tail boom. You will usually set the gyro to Rate mode at this point, as rate mode allows the servo to center exactly, although some gyros will include centering as part of the regular setup routine.

The next step is often simplified. Most gyro manufacturers recommend that you install the tail link at a length that has the tail rotor set so that it pushing to the right a little bit, 5 degrees or so, when the servo is centered. This right push is designed to keep the tail straight during a hover with the servo basically centered. Many pilots simply choose to center the tail rotor slider on the tail shaft and call that the center

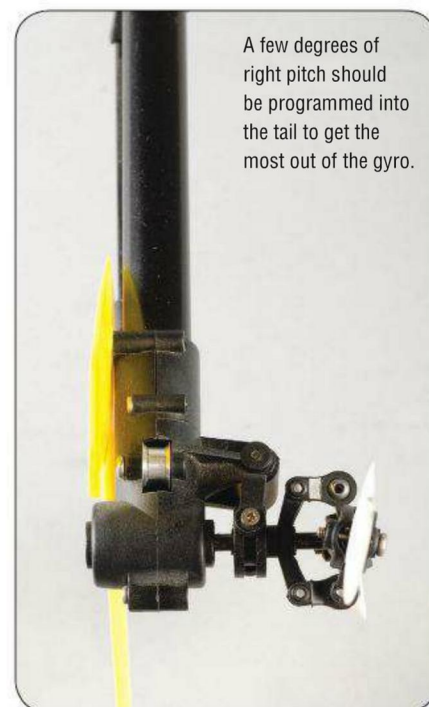
point. Most modern gyros are perfectly capable of working properly either way, but the preferred method is to install the rod so that there is some built-in right rotor input as this will cause less stress on the servo and result in a better performing tail overall. In fact, many modern helicopter manufacturers have now made their tail systems so that when the slider is centered, there is some right pitch already in the blades, making setup even easier. How much right pitch you put in may have to be tweaked later during flight testing.

With the center point set, the last step is usually to set up the end points on the gyro. This is either done using a button, programming interface, or small dial on the gyro. Set the endpoints so that there's no binding at either end of the slider travel on the tail shaft. Also, set the gain to the recommended level at this point.

Verify that all the settings are correct and that the tail does indeed move to counteract when you rotate the heli on the bench. You are now ready to test it in flight!



With the standard right-hand rotation helicopter with the tail rotor on the right side of the boom, a full right rudder input will have the tail edge of the upper blade pointing to the right as shown here.



A few degrees of right pitch should be programmed into the tail to get the most out of the gyro.



GRAB ONE NOW

...why fly with anything less?

ProTek RC

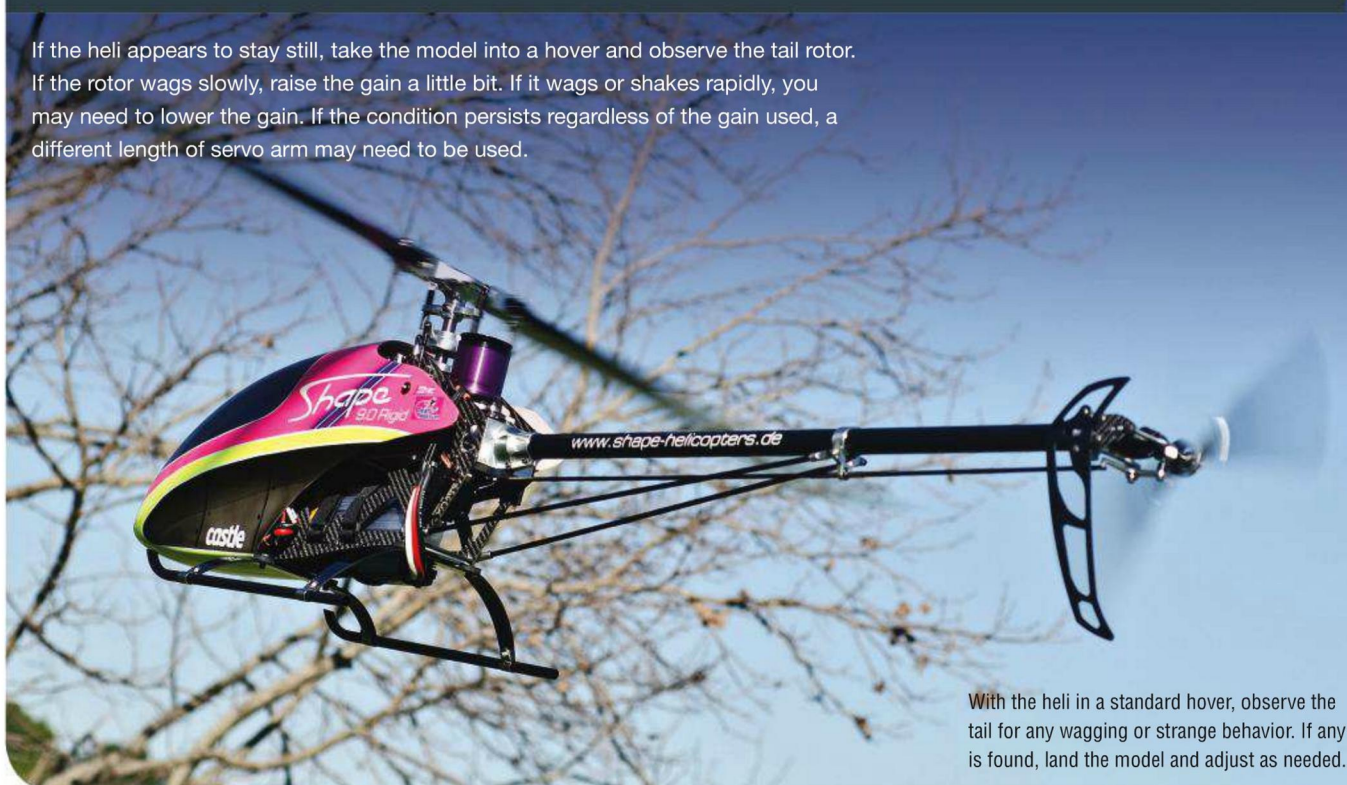
A higher level of performance

BATTERIES • CHARGERS • POWER SUPPLIES • BEARINGS • SCREWS & NUTS

FLIGHT CHECKING **AND TRIMMING**

The first time you spool up the helicopter with a new gyro in it, you should keep the skids on the ground and slowly give pitch until the heli is "light on the skids". If you set the gyro direction improperly, the heli will rotate out of control at this point. With the skids on the ground, you can simply drop the throttle and correct the direction.

If the heli appears to stay still, take the model into a hover and observe the tail rotor. If the rotor wags slowly, raise the gain a little bit. If it wags or shakes rapidly, you may need to lower the gain. If the condition persists regardless of the gain used, a different length of servo arm may need to be used.



With the heli in a standard hover, observe the tail for any wagging or strange behavior. If any is found, land the model and adjust as needed.

If the tail holds well, try giving a small right stick input, does the nose turn to the right? If not, land and reverse the rudder channel in the transmitter. At this point, many pilots will take off and start flying. Modern gyros are so good that there is not much else necessary to start flying normally. But, there is an extra step that can help prolong servo life and increase tail performance.

Most modern gyros allow you to switch between Heading Hold and Rate mode in the unit. By setting the gyro in Rate mode

you can test if the initial right pitch you established on the bench is enough to hold the tail. Switch the gyro to Rate mode and take off into a hover. Does the tail drift to the right or left? If so, note which way it drifts, land the helicopter and adjust the tail rod to increase or decrease the right pitch to counteract that drift. Keep making adjustments until the tail stays steady in Rate mode. Once this is accomplished, re-check that your end points are still sufficient and adjust as needed.

With the Rate mode trimming done, the gyro setup is complete. Put the gyro back into Heading Hold mode and go fly. It should also be noted that you should not use revo mixing with a heading hold gyro. Disable revo mixing in your transmitter completely. Rudder trim is also almost never used, but there are a few gyros out there that require some rudder trim in order to find their center pulse location. Again, read the gyro manual carefully during the install.

CONCLUSION

TAIL GYROS HAVE NOW BEEN IN THIS HOBBY FOR OVER TWENTY YEARS, AND IN THAT TIME THEY HAVE ADVANCED SIGNIFICANTLY. MODERN GYRO UNITS ARE VERY SMALL, VIBRATION RESISTANT, FULL OF ADJUSTABLE FEATURES, AND INEXPENSIVE. Pilots who have flown without a gyro can attest to the fact that the gyro is possibly the single greatest innovation in this hobby in terms of removing "barriers-to-entry" and allowing more people to succeed in it than were ever possible before. The gyro, though small, has made a truly large impact on this hobby. See you at the field! **THE**



Ultra Compact Frame TECHNOLOGY



VELOCITY 50



► Canomod's Canopy



► Torque tube tail drive
► Full metal tail unit



► Full programmable rotor head
► Precision CNC Engineered



► 3.6Kg ready to fly
► Ultra rigid compact frame design

- Main Rotor Blade Size 600-630mm
- Main Rotor Diameter: 1355mm - 1415mm

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

- Main Gear ratio: 8.6:1 (8.8:1 Optional)
- Tail Rotor Ratio 4.583:1
- Approximate Flying Weight with Fuel: 3.6kg / 7.936 Lbs. (depends on equipment used)

WATER SLIDE DECALS

Adding a little detail to your scale bird.

WORDS: Butch Wellmaker

Where do you find the small placards that say "JET-A" or "SERVICE WITH MIL-H-83282" or "DISCONNECT GPS ANTENNA BEFORE REMOVING FAIRING" for your scale bird? Some manufacturers offer something that is close and looks the part. You may be able to find the micro scratch and sniff rub on letters, but now try and run a line of 25+ characters and keep them perfectly straight. Oh, and it could be multiple lines all in a very small space. There are a few alternatives. Some of the word type programs offer very small font in several type styles, so why not use that common house appliance we have all learned to know and love, your computer and printer?



» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

1.0 *RC-Heli*

» TIME TO COMPLETE

60 Minutes

» TOOLS NEEDED

- BOWL OF WATER
- TESTORS CUSTOM DECAL KIT
- CLEAN TOWEL
- CLEAN PAINT BRUSH

DE'TAIL PRONUNCIATION: de'tal'

n.1. A minute portion; one of the small parts; a particular; an item; - used chiefly in the plural; as, the details of a scheme or transaction

Remember when you were a kid. You would buy the AMT or Monogram models and they had the water slide decals.

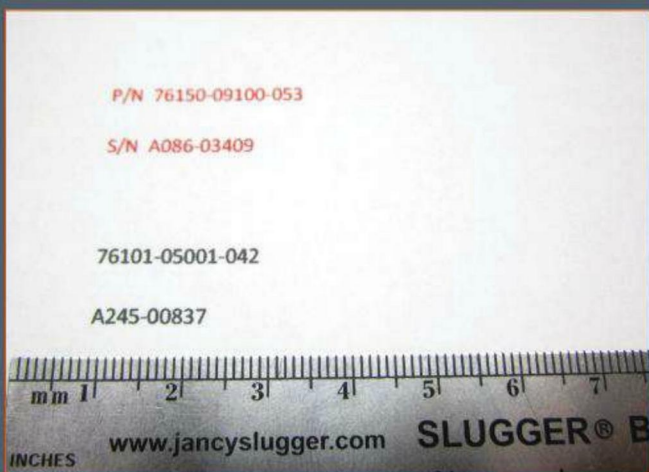
It's not that hard to make your own. There are several off-the-shelf kits that you can use. With a little practice you can have that hard to find placard you need for the finishing touch on your scale model.

There are two kinds of decal paper, clear and white. You can find these at your local hobby store, arts and craft store, or on-line retailer. You can buy them as a kit that includes everything to make the decal, or just buy the paper and use a clear coat on top. The price is very reasonable either way and it will add a very nice touch to your completed model. Keep in mind that this may be limited in some areas (such as dark backgrounds using the clear decal paper). When the lettering starts to get small, the printer doesn't use much ink, making the lettering too transparent to see on the dark background. There are other options for this application which we will cover at a later time.



With a little research you can find the correct nomenclature for the placard you wish to duplicate. For this exercise we'll make part and serial number decals for the main or tail blades you are trying to replicate. The background is white, so for this application I'll use a clear decal paper to add a little enhancement to the blades.

Open up a word processing document. Choose the font that matches the lettering you are duplicating and type away. Check your work by printing a test page and verify the font size, spacing, and the overall appearance before you print on the decal paper. Make any adjustments required, and repeat until the test print is correct.



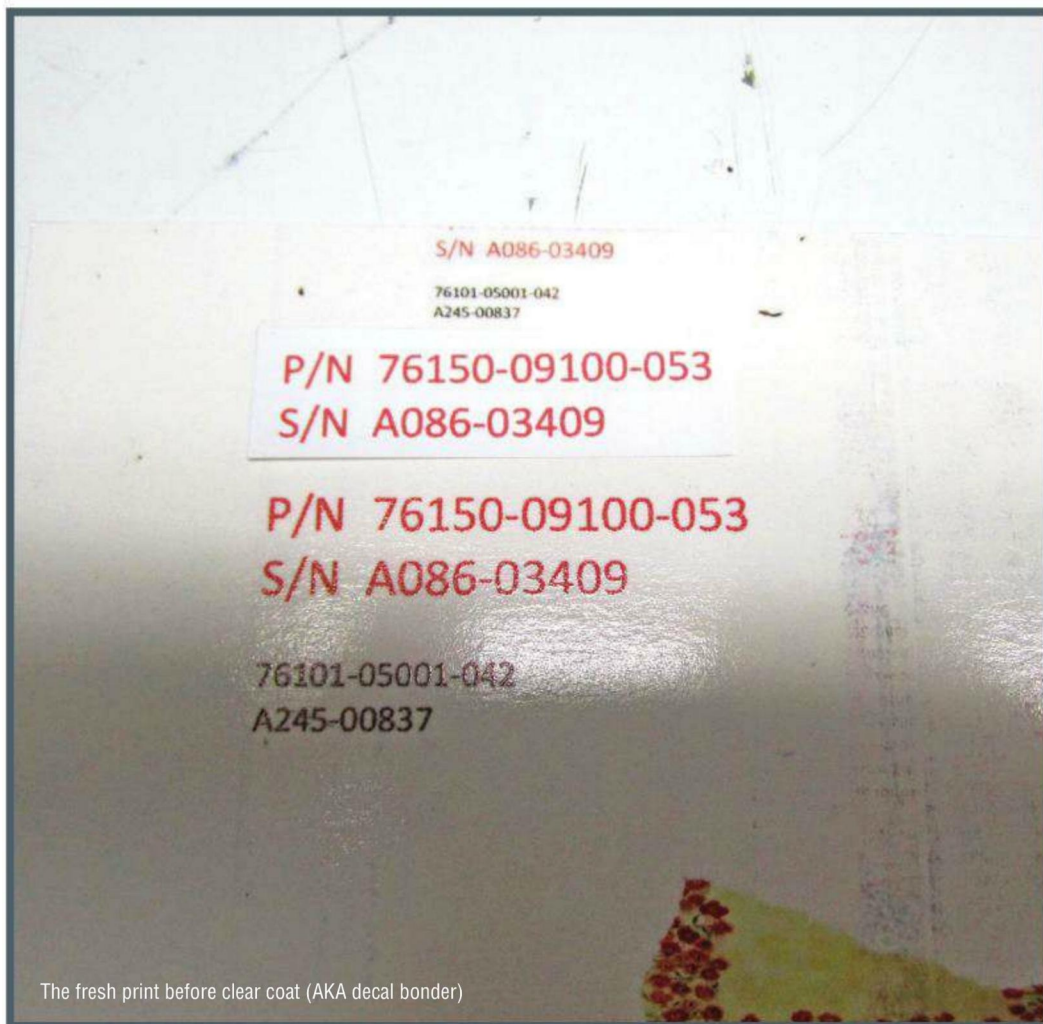
This is a test page for sizing.



The final decals will be the one on the lower left.

Decal paper is very reasonable in price, however you'll want to fill the paper up with several other decals. Once you have printed the graphic on the decal paper and given it time to dry, you'll need to use a decal bonder over the top of the ink to bond the inks together.

"Decal bonder" is a term for the clear coat that you can get at the local hardware store or home center. Important note: It's always a good idea to do a test piece of your finished decal that you have clear coated with decal bonder. Use the clear top coat you plan to use on your model to make sure that it all works well together. While at the home center or local hardware store it's always a good time to take a little walk through the tool section where you may find something else that you need.



The fresh print before clear coat (AKA decal bonder)

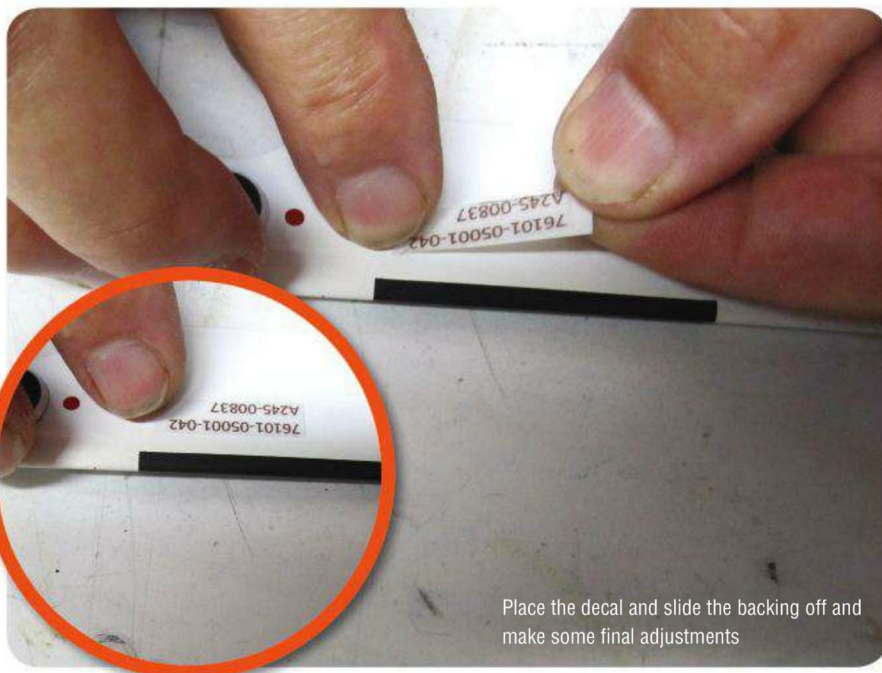
Detail is something that goes a long way.

Once the clear coat has dried, it's time to cut and place your newly made decal. It's the same process as the decals in the Monogram models we all built as kids.



Just a little soak in the water and you're ready to go. Follow the manufacturer's time suggestions for soaking.

Test the placement to make sure you're getting the look you desire.



Place the decal and slide the backing off and make some final adjustments



Place the decal on the main rotor.



Remove excess water with a clean dry cloth.

Once the decals are placed, with a dry cloth, work the excess water from under the slide. After they've had time to dry on the part surface, you should put the appropriate clear top coat over the water slide to protect them against the elements. Important note: It's always a good idea to do a "test" piece of your finished decal. Use the clear top coat you plan to use on your part or model to make sure it all plays nice together. (I think I have heard that somewhere before). When you're laying down that last coat of clear top coat and everything is looking great, it's not a good time to find out that your top coat wants to eat the clear on the decal.



This little detail adds a real nice touch to the finished product

CONCLUSION

Play with this and you may be surprised what you can come up with. The possibilities are limited only to your imagination. [T.H.I.](http://www.rc-heli.com)

Both before and after it is complete!

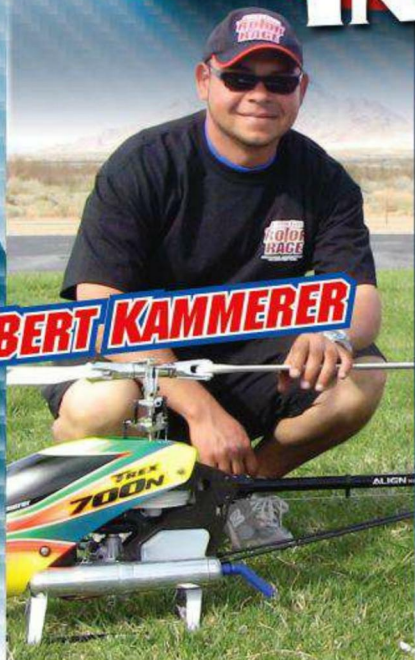
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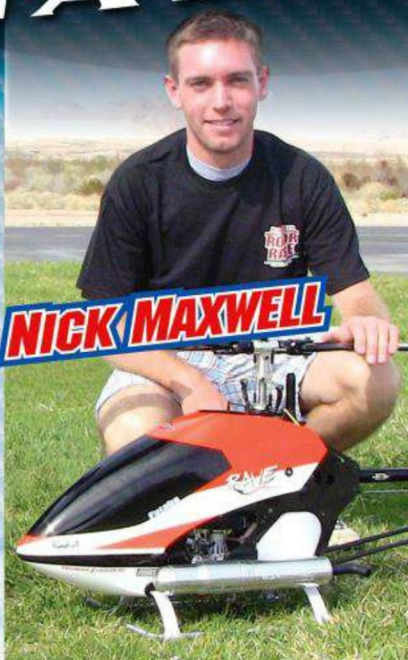
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Thunder Tiger RAPTOR G4

The next generation of Raptors!

WORDS: Ryan Kephart | **PHOTOS:** Jason Boulanger

After the fall of Ace Hobby, Thunder Tiger has steadily produced a handful of new models incorporating new technology and design. This holds true for the new Raptor G4, which has features never before seen in a helicopter.

» AT A GLANCE

SIZE:	90
POWER:	Nitro
TYPE:	Pod & Boom
BUILD TYPE:	Kit
TAIL DRIVE:	Torque Tube

Is that canopy purple?



Nice pictures Boulanger!

FEATURES

The Raptor G4 features a 650cc capacity fuel tank, a carbon fiber frame, all aluminum rotorhead and tail rotor, innovative Quick-calibration system, helical cut main and tail drive gears, 15mm main shaft, torque tube driven tail, and much more.

» MAIN FRAME

SWASH CONTROL: Thunder Tiger also decided to do something a little different from the norm for the swash control. The G4 uses a 140° CCPM swashplate. Two long aluminum arms pass through a channel in the frames for swash control. Aluminum servo arms are also included in the kit. The calibration system operates by leveling the swash with two drivers placed into the frames which lock down the bellcranks. The system is powered up with the servo arms loose. The servo arms then clamped down to the spline and secured with a setscrew. This allows the helicopter to be programmed with absolutely zero sub trim.

COMPONENT LAYOUT: The Raptor G4 has a large plastic tray the holds the receiver battery, receiver and gyro control unit. Two cyclic servos are just behind the tray mounted to the frames and in line with the tail boom. The tail servo is located underneath the cyclic servos and has a control rod that feeds through the middle of the frames. Above the cyclic servos a plastic gyro tray is attached to the frames. The engine is mounted in the traditional place with the fuel tank just behind it. A header tank is also mounted to the right side of the helicopter and is aligned level with the carburetor. The elevator servo is mounted behind the main shaft.

DESIGN: This Raptor is designed much differently from the previous versions. The frames consist of two 2mm carbon fiber side frames with large cutouts to reduce weight. The frames are held together using aluminum spacers, bearing blocks, and mounts. What's different from the norm is the use of Torx head screws. The screws give the Raptor a clean look, as the head of the bolts is more flush to the frame. A nice Torx driver is included with the kit, which also serves as a calibration tool.

CANOPY: The Raptor G4 still retains that same Raptor style canopy, but it has been updated to a nice fiberglass painted unit. The paint used on the G4 is a glitter-based paint that changes colors at different angles. This makes the G4 look amazing in the air as well as on the ground. The canopy mounts to the frames using a plastic clip on the bottom and two rubber grommets at the top.

LANDING GEAR: If you have ever seen a Raptor before, than these skids will look familiar. They're molded from plastic and are attached to the frames with four machine screws. The aluminum skids slide through the struts and are secured with setscrews as well. Plastic end caps finish off the skids and give it a clean look.

Some impressive features, right?

» DRIVE TRAIN

ENGINE MOUNT: The engine is mounted to an aluminum mount. The mount is then attached to the frames using four machine screws that thread into the mount. The mount is adjustable and allows you to set the gear mesh.

CLUTCH: The clutch is mounted on top of the cooling fan. It has a one-way bearing press fit inside to allow for easy starting with or without a one-way style starting wand. The clutch bell is made from aluminum and has cooling holes machined into it. The pinion is threaded into the bell and secured with red thread lock. The starting shaft engages the clutch and has a shaft that runs through the clutch bell and pinion, and is then attached to a 6mm hex starting coupler. The whole system is supported by two ball bearings.

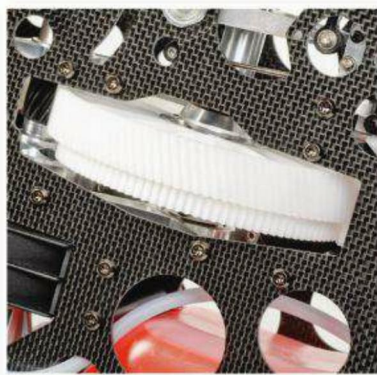
COOLING FAN AND SHROUD: The Raptor G4 includes a nice aluminum cooling fan that moves plenty of air to help keep the engine running cool. The fan also has two drilled holes to allow for governor magnets to be placed. The shroud retains that Raptor look by utilizing it as the front landing gear mount as well.

MAIN GEAR: Much different from the original Raptor helicopters, the G4 uses a Delrin helical cut main gear. The main gear is also much larger than the previous versions. This provides a smoother, quieter, and

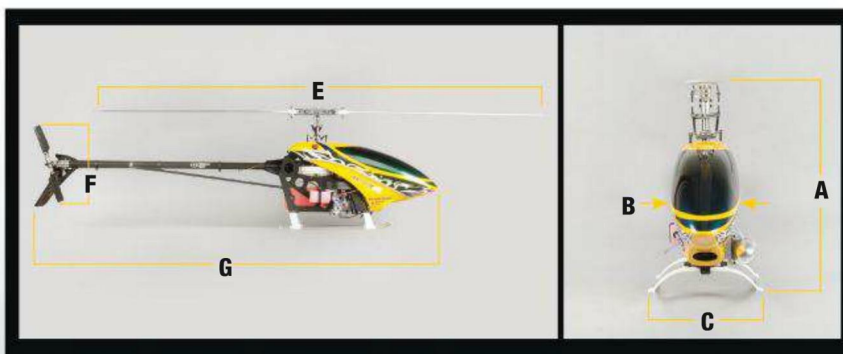
stronger drive train that will surely withstand some abuse.

AUTOROTATION DRIVE: The autorotation drive is comprised of a one-way bearing press fit into an aluminum hub. The hub is attached to the main gear using machine screws. The tail drive gear is locked down to the main shaft and allows the tail to be driven during an auto.

TAIL DRIVE: The main tail drive gear is made from Delrin and drives a secondary gear system. The secondary gear then drives a normal bevel gear that in turn drives the torque tube. The torque tube is made from aluminum and has aluminum ends attached to the shaft using a machine screw and nylon lock nut. The tail drive gears in the tail case are also made from Delrin, but are helical cut. This is one of those unique features that have never been seen before in a Raptor.



“WITH THE QUICK CALIBRATION SYSTEM AND THE ABILITY TO CHANGE FROM ELECTRIC TO NITRO IN LESS THAN A HOUR, THIS HELICOPTER IS A GOOD CHOICE FOR ANYONE.”



Thunder Tiger RAPTOR G4

MODEL SPECIFICATIONS

CLASS:	90 Nitro
BUILD:	Kit
BLADE SIZE:	690-710mm
LEVEL:	Intermediate to adv.

FRAME

MATERIAL:	Carbon fiber
TYPE:	Two-piece sandwiched
SERVO TO SWASH LINKAGE:	Push-pull with bellcranks
SERVO SIZE:	Standard

ROTOR HEAD

GRIPS:	Aluminum
HEAD BLOCK:	Aluminum
LINKS:	Ball
SWASH:	Aluminum
CONTROL:	CCPM 140°

TAIL

DRIVE SYSTEM:	Torque tube
AUTO DRIVEN:	Yes
TAIL PITCH SLIDER:	Single
TAIL BLADE GRIPS:	Aluminum
TAIL CASE:	Aluminum
BOOM STRUT MATERIAL:	Carbon fiber with plastic ends

GEARING

MAIN ROTOR TO PINION RATIO:	1:7.92
MAIN ROTOR TO TAIL RATIO:	1:4.67

WEIGHT

EMPTY:	7 lbs., 1 oz. (3203g)
WITHOUT FUEL:	9 lbs., 7 oz. (4300g)
FULLY LOADED:	11 lbs., 0 oz (4989g)

DIMENSIONS

HEIGHT (A):	16.9in (430mm)
CANOPY WIDTH (B):	5.25in, (133mm)
LANDING GEAR (C):	8.75 in (222mm)
PADDLE TO PADDLE DIA. (D):	N/A
MAIN ROTOR (E):	61.5 in. (1563mm)
TAIL ROTOR (F):	11in. (280mm)
LENGTH (G):	53.8in. (1366mm)

Now the canopy looks green.

FEATURES CONTINUED

» TAIL & BOOM



TAIL CASE: The tail case is machined from a single piece of aluminum. It's then attached to the boom using a clamping style method combined with a screw that thread into the boom. This keeps the tail case aligned properly on the boom. A thick carbon fiber vertical tail fin finishes off the case.

TAIL BLADE GRIPS: The tail blade grips are machined from aluminum and are each supported by two radial bearings and a thrust bearing. The grips are machined with the pitch arms. The tail blades attach to the grips using a machine screw and nylon lock nut.

PITCH ACTUATOR SYSTEM: As mentioned before, the tail servo is mounted up front between the frames. The control linkage passes through the center of the frames and inside plastic guides that mount to the clutch bearing block and through the plastic tail boom mount. The push rod then passes through three plastic guides before reaching the plastic bellcrank. The bellcrank is supported by two ball bearings and is attached to an aluminum standoff from the tail case. The pitch slider is made from aluminum and rides on a brass bushing that is supported by two ball bearings. The aluminum pitch fork is attached to the blade grips using two plastic links and brass bushings.

BOOM: Thunder Tiger has also redesigned the tail boom on this model. The boom has a carbon fiber weave on the outside with aluminum inside. This allows the boom to be much more rigid than the previous carbon fiber only booms. The boom is supported by two carbon fiber struts with plastic ends. The struts attach to the rear of the frames just behind the fuel tank. The struts attach to an aluminum tail clamp on the other end.



» ROTOR HEAD

HEADBLOCK: The head block is machined from aluminum and is mounted to the 15mm main shaft using four machine screws. It also has an aluminum head button that is attached with four machine screws. Two plastic sleeves that hold a hard nylon damper perform dampening. This type of damping was seen in the Raptor 90 3D.

PHASING: Phasing can be adjusted with the swash follower.



SWASHPLATE: The swashplate is made from aluminum and has a nice adjustable ball bearing to keep it slop free. The swash is arranged for a 140° CCPM setup. The linkage balls on the outer ring of the swash are much larger than normal, which makes for a stronger design.



» INSTRUCTIONS & BUILDING TIPS

WHEN YOU OPEN THE BOX

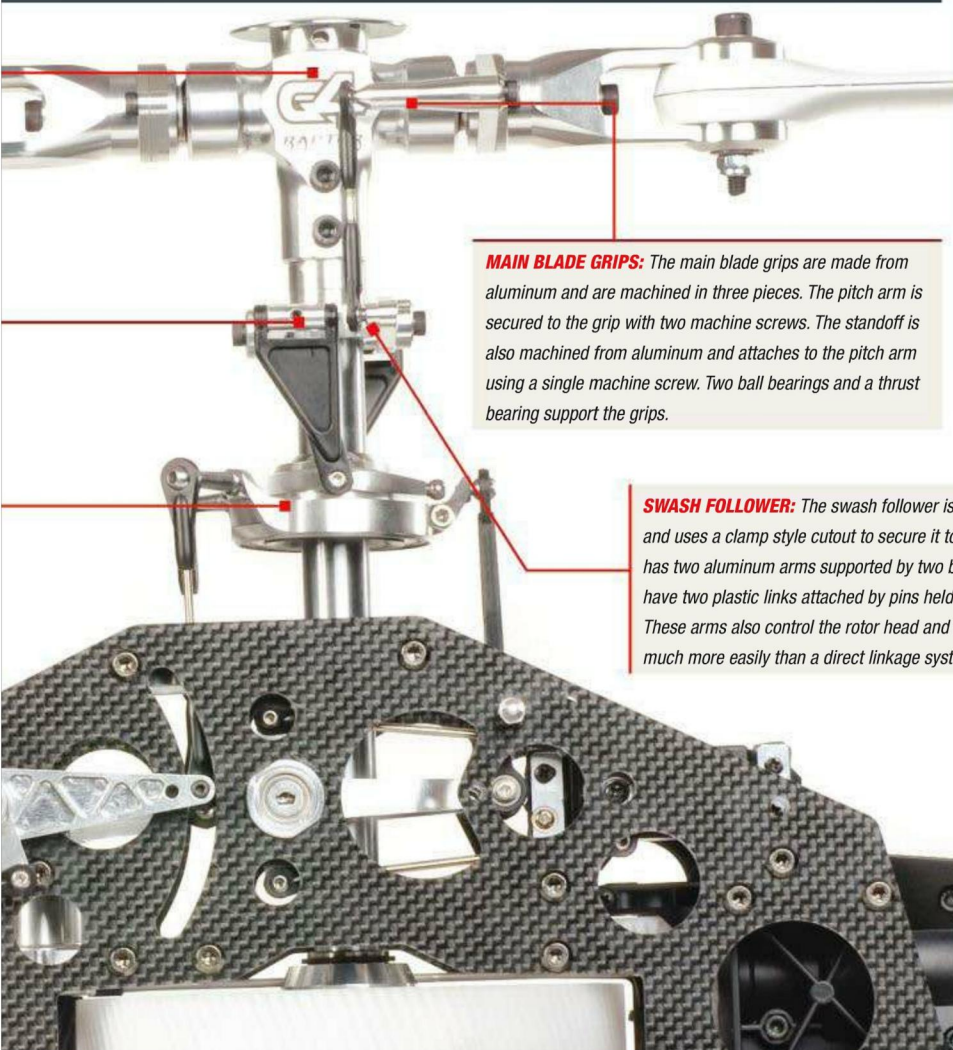
Upon opening the box you'll find that the Raptor G4 is packaged nicely in separate boxes that contain the various main components of the helicopter. The head and various aluminum parts were packaged in a molded foam container, keeping them well protected from damage.

MANUAL AND BUILD

The G4 included the usual Raptor manual, with detailed pictures and written instructions where needed. The manual included every version of the G4, including

nitro and electric, flybarred and flybarless.

Building the Raptor was fun and easy. The manual was well thought out except for one area. The servo installation in the manual was a vague and required a little knowledge on how a helicopter is set up. Keep this in mind if you are a beginner builder. Check online for additional help if needed. Overall, the build went smoothly and every part fit together perfectly.



MAIN BLADE GRIPS: The main blade grips are made from aluminum and are machined in three pieces. The pitch arm is secured to the grip with two machine screws. The standoff is also machined from aluminum and attaches to the pitch arm using a single machine screw. Two ball bearings and a thrust bearing support the grips.

SWASH FOLLOWER: The swash follower is made from aluminum and uses a clamp style cutout to secure it to the main shaft. It also has two aluminum arms supported by two ball bearings. The arms have two plastic links attached by pins held in place with a setscrew. These arms also control the rotor head and allow the servos to work much more easily than a direct linkage system.

Thunder Tiger RAPTOR G4

RTF & TEST GEAR

» TEST GEAR



■ **RADIO:** Futaba, 10CHG, FUTK9256, \$650



■ **RECEIVER:** Futaba, S.Bus R6203SB, R6203SB, 0.25oz. (7.2g), \$80



■ **CYCLIC SERVOS (3):** Futaba, BLS253, BLS253, 2.0oz. (58g), \$150 ea.



■ **THROTTLE SERVO:** Futaba, S9255, 1.9oz. (55g), \$110



■ **TAIL SERVO:** Futaba, BLS251, BLS251, 2.1oz. (59.5g), \$150



■ **ENGINE:** O.S. Engines, 91HZ, 18650, 22oz. (623g), \$335



■ **FUEL:** O' Donnell, 30% Heli Fuel, ODOP2130, \$9 per quart



■ **FLYBARLESS UNIT:** Futaba, CGY750, CGY750, 0.9oz. (23g), \$300



■ **RECEIVER BATTERY:** A123, Nanophosphate 2300 RX Pack, AR26650-2S1P-B, 5.4oz. (155g), \$45



■ **BLADES:** Mavrikk, PRO G5 710mm Flybarless WC, 802294, \$120

15mm main shaft

TESTING

We tested the Thunder Tiger Raptor G4 with the latest and greatest products offered by Great Planes and Hobbico. We outfitted the nitro flybarless model with a Futaba GY750 gyro, Futaba brushless Servos, S.Bus receiver, and an O.S. engine.

HOVERING • With the Futaba CGY750's ability to use AVCS mode for the cyclic, hovering the Raptor G4 was almost hands-off, even in wind. The Raptor G4 was smooth on the cyclic controls as well as the collective. Every input was immediately felt and I was never chasing the helicopter around to find the balance point.

Rating: 5

FORWARD FLIGHT • With the 14° of pitch and the flybarless system installed, the Raptor G4 cruised around at a decent speed. Although this helicopter wouldn't win a speed contest, it was fast enough to have fun with. The G4 tracked well through the sky and the controls remained predictable and agile.

Rating: 4

CYCLIC PITCH RESPONSE • Cyclic commands were crisp and agile when flying around in Idle-Up. I didn't notice any bobble or lag when applying full cyclic stops during quick stops, flips, or tail slides. The weight of the helicopter, combined with the quick cyclic, made the Raptor G4 extremely maneuverable, and truly made this helicopter a 3D machine.

Rating: 4.5

COLLECTIVE PITCH RESPONSE • Probably the most positive aspect of this helicopter is the collective. With the ability to set the pitch to a maximum of +/- 15 degrees, the Raptor G4 had plenty of pop. The swash follower set up with the mixing arms allowed for a smooth feel, while providing plenty of torque to

stop the helicopter at an instant. I set the helicopter up with 14° of pitch, which in my opinion is a bit high and not really needed, but it was fun to play around with as long as your collective management is up to par. Overall, the collective was as good (if not better) than any other helicopter I have flown in this class.

Rating: 5

TAIL ROTOR RESPONSE • The tail seemed much improved from the previous Raptor helicopters. With the unique pushrod setup, I didn't notice any abnormal issues. The tail was crisp and accurate in all flight modes and styles. Piro reversals were spot on as well as piro consistency. The tail is elevated off the ground, giving it plenty of clearance for landing in the grass. This helps during autorotations, take-offs, and landings. I was pleased with the performance and could not detect any bad tendencies.

Rating: 5

AUTOROTATION CAPABILITIES • The Raptor G4 seemed to auto really well. The lightweight design and super smooth autorotation drive, coupled with the helical cut tail gears, seem to make the helicopter float for extended periods at the bottom of an auto. I even had a spectator say to me "If you can't auto that thing, than you probably can't auto anything."

Rating: 5

POST FLIGHT INSPECTION • I went over everything on the helicopter and didn't notice any abnormal wear. Every component felt as tight and slop free as when it was first built. I noticed, however, that some crucial areas of the frames might be prone to breaking during a crash. I was thankful that I didn't get a chance to test my theory, but we might find out before we take a look at the Raptor G4 for its long-term review.

Rating: 4



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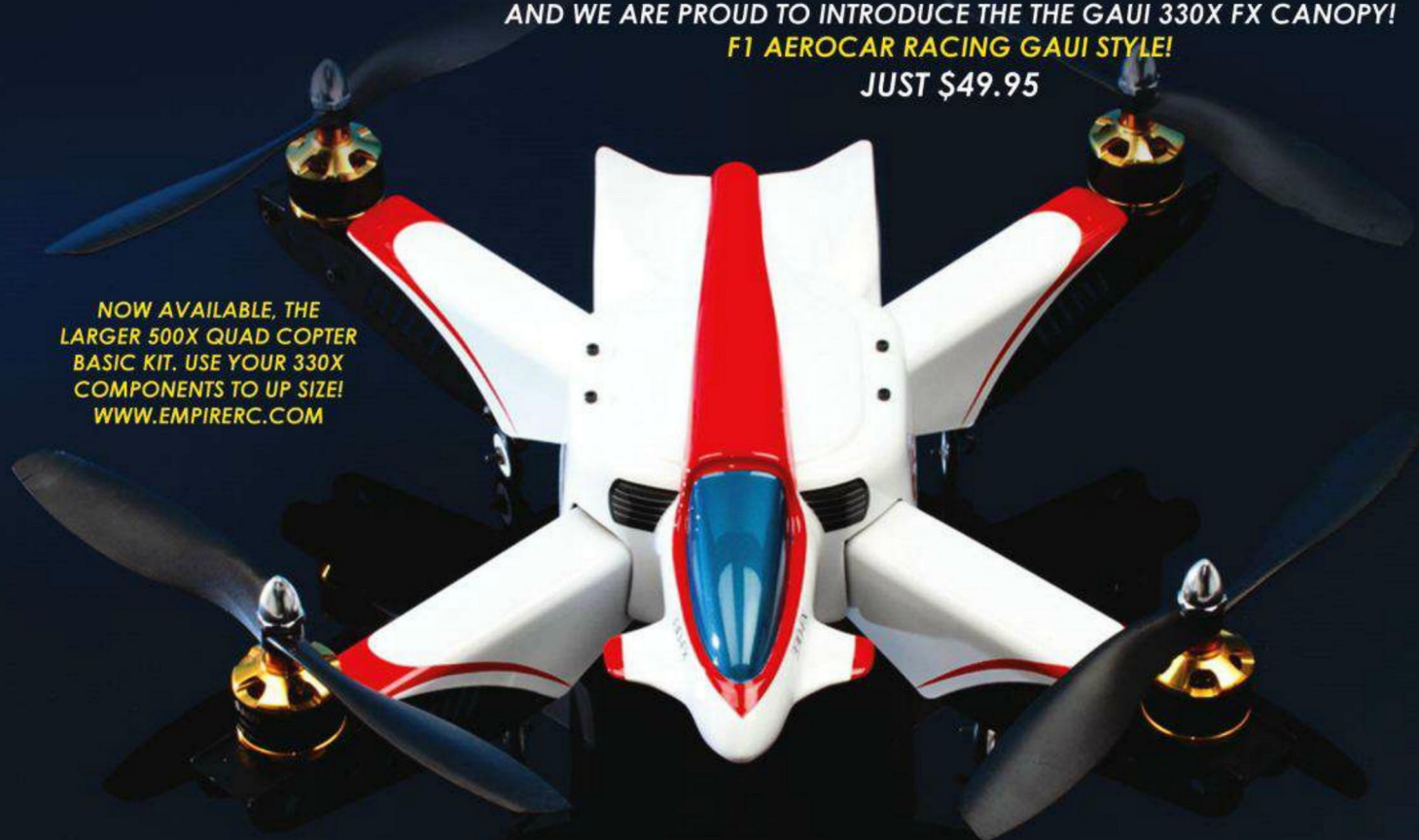
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TESTING SPECS

Thunder Tiger **RAPTOR G4**

Part #: 4894-K10
Distributor: Hobbico / Great Planes
Web: www.ttamerica.com

Street Price: \$999
Price as Tested: \$3,239
Build/Setup Time: 14 hours

PERFORMANCE

MODE FLOWN:	Normal, Idle 1, Idle 2
RPM OF EACH MODE:	Normal: 1800 Idle Up 1: 1950 Idle Up 2: 2100
ENGINE TEMP (after flight):	180° F
FLIGHT TIME:	8-9 minutes
CRASH COST:	\$134.00

TEST CONDITIONS

WEATHER:	Sunny
TEMP / HUMIDITY:	80° F/15%
BAROMETRIC PRESSURE:	29.89 in.
WIND SPEED:	10 mph
VISIBILITY:	10 miles
ALTITUDE:	725' ASL

PITCH CURVES

NORMAL:	-8, 0, 14
IDLE-UP 1:	-14, 0, 14
IDLE-UP 2:	-14, 0, 14

* Includes main shaft, tail boom, spindle, landing gear, flybar, torque tube

REQUIRED TO FLY

Transmitter, receiver, receiver battery, three matching cyclic servos, tail servo, gyro/flybarless gyro, 90-size engine, throttle servo, exhaust, fuel, 690-710mm main blades.

WHO'S IT FOR?

The Raptor G4 is a versatile 90-size helicopter that can fit many pilot needs. With the quick calibration system and the ability to change from electric to nitro in less than an hour, this helicopter is a good choice for anyone.

SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

+ THE GOOD

- Beefy main shaft
- Lightweight
- Unique design

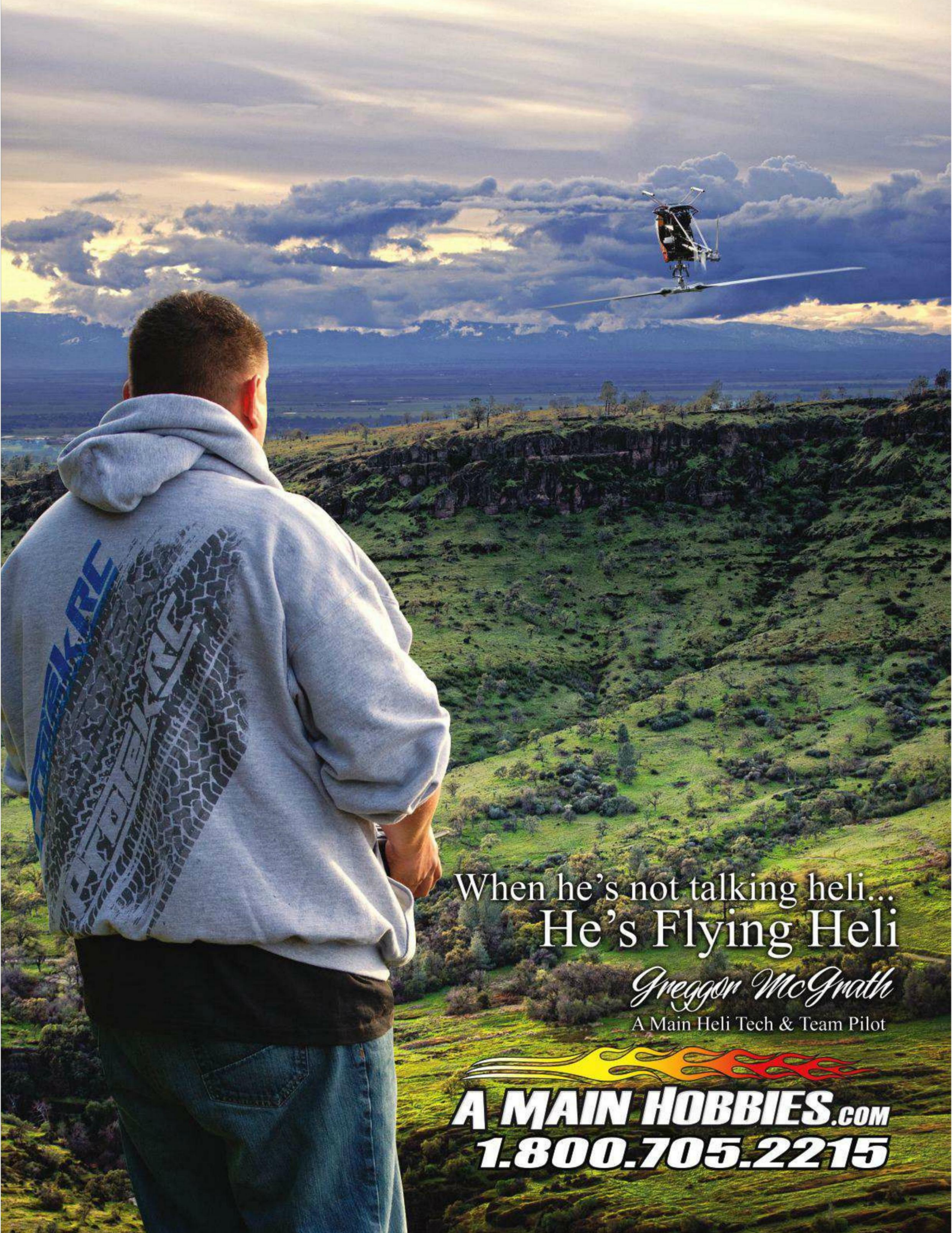
- THE BAD

- Parts cost

CONCLUSION

The Thunder Tiger Raptor G4 series helicopters are a new breed of high quality machinery. The unique design and easy setup makes this bird a winner. The quick calibration system is something Thunder Tiger has always taken to heart, and it has surely paid off with this new design. Overall, the Raptor G4 is a high quality machine that can compete with even the highest end helicopters. **TTL**





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LONG TERM

OUTRAGE FUSION 50

Fusion goes to the shore

WORDS: Dan Goldstein PHOTOS: Sarah Hayes

After being reviewed by our California staff, this Outrage Fusion 50 made its way to the Jersey Shore for some tweaks, mods and hot rodding.



Peter Brady knows all about change.

TIME TO CHANGE

Since this model appeared in the May 2011 issue, Outrage has been quick to produce several updated parts to refine the model. At the tail end, the tail case hub assembly (RF50820B-SS) now has a thickened section for a M3 button head screw to pinch the tail boom to ensure that the tail case stays put. The torque tube spline set (R50N973B-SS) was redesigned to provide improved engagement of the bevel gears. The tail boom supports (R50N928B-SS) received a materials revision, switching from aluminum ends to plastic ends to help reduce vibration transmission. The boom mount assembly (R50N941B-SS) also received several improvements. The boom locating pin was thickened for improved durability. The hex cross-members can now be removed without splitting the case halves and there are now molded recesses for the external lock nuts, thus eliminating the need for a wrench. The internal bearing recesses now have tighter tolerances to improve bearing retention. Up front, there is a new pinion support assembly (RF50835-56) that can be used with either 5mm or 6mm output shaft equipped motors by just changing the bearing.

Shortly after the debut of this model, reports of tail gear stripping started popping up on the various online forums. Outrage responded quickly and began testing revised gear

materials to find a solution. By the time you read this the upgraded tail drive gears should be available.





Av, yo... Danny-Gi

Earlier this summer Outrage announced that the G5 and 550 models were being discontinued. Outrage indicated that they would continue parts support so long as the demand was there. However, an upgrade program will be offered to their customers as a way to step up to the Fusion line. In addition, a 550-size conversion kit with shorter tail boom, torque tube and tail push rod should now be available. This conversion kit and many of the updated Fusion parts will also fit the Velocity 50.

Outrage generously provided all of the parts to update our review model. While in the process of installing the updated parts I decided to change some other bits. The Cali crew ran a 10S setup for the original review, but I swapped in a 12S setup and tried to shed some weight. I changed out the Scorpion HK-4225-610 motor for a Compass 5026-540 and dumped

50 grams. I also installed a lightning fast MKS BLS980 brushless tail servo paired with a Spartan Quark gyro. For radio control, I used in a Futaba FASST R617FS receiver. To power the rig, I picked up two Turnigy 6s3000 Li-Po's to run in series. To smack some air around, I bolted on Mavrikk's G5 Wide Cord 600mm main blades and some KBDD 87.5mm tail blades. In all, without the batteries, the model weighs in at 6lbs (2721.5g).

Once I had all of the electronics sorted out and set up, I made some cosmetic adjustments. I've never been a fan of sparkly bling, so all those finishing washers on the frame screws had to go. Technically, they're used to further spread out the load of the fastener. I opted to remove the finishing washers from all of the screws that are sunk into plastic. I applied some thick CA glue to the threads of all of the metal-to-plastic fasteners to ensure that

they don't wiggle loose. I'll eventually ditch the rest of the finishing washers by changing to button head screws for a blacked out, smooth look.

On the Fusion 50's prototype there had been a design suggestion of a quick-release battery tray. That feature didn't make it to production. Fortunately, Custom Heli Parts (customheliparts.com) has developed a large, strong, carbon fiber battery tray that is easily removed. It has plenty of room for the most popular sizes of packs, it's nice and stiff, and you can change it out in a few seconds.

In my last long-term review I tore the model down to bits and pieces to blueprint and rebuild it. In this case I chose select components to blueprint to reduce down time. When the model arrived from the Cali office, it had maybe a dozen or so flights. While checking the model over I noticed that the swash and washout action on the

main shaft was a bit sticky. The fix involved pulling the shaft out, chucking it up in a drill and running it at high speed under dribbling tap water with some 2000-grit wet/dry sandpaper for a few seconds. It polished up the finish and made the action silky smooth.

I treated the tail output shaft in the same manner as the main shaft. The pitch slider would more or less move under its own weight. Out of the box it was better than the majority of models I've worked on. However, it had just a slight bit of resistance that irked me. I removed it from the model, polished it up and now the pitch action is satisfyingly smooth. My tail servo surely appreciates it!

While I was in the process of working on polishing the main shaft, I noticed the autorotation rotation hub wasn't spinning as freely as I would have expected, so out it came for an inspection and rebuild after about 15 flights. Despite removing the hardware, it was stuck in the gear pretty good. As luck would have it, the sleeve was also stuck in the one-way bearing. To pop the sleeve out, I used my Allen driver's shaft

through the second gear bolt hole and gave a good yank. Following suit with the "stuck" trend, the brass bushing on the sleeve also required some blunt force to remove.

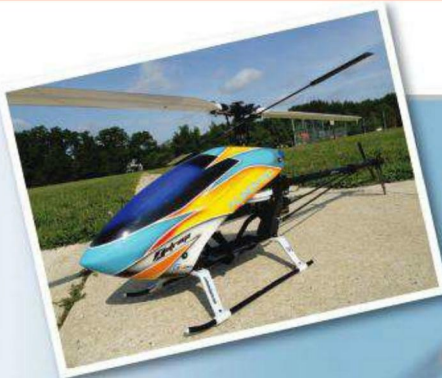
I greased the auto hub's radial bearing with my greaser tool and cleaned out the one-way bearing. I used some 2000-grit sandpaper to apply a light crosshatch pattern to the one-way sleeve. I learned this trick while working at an automobile transmission shop. This improves the ability of the sleeve to retain lubrication while in contact with the bearing surfaces. I also made sure that the flat sides of the brass bushing were devoid of high spots by lightly rubbing it back and forth on the sandpaper and then rubbing it 45-degrees to the first rubbing pattern, and then I repeated on the other side. After everything was cleaned up, lubed and thread-locked, the rotating action improved slightly, but wasn't totally free-spinning. The model didn't have any trouble autorotating before, so for future flights it'll surely be a smidgen better. At least now I know I won't have to pry or hammer on things to separate them next time.



FLYING

Off the bench, the model picked up into a hover quietly. I quickly dialed in the tail mechanically to give no drift in rate mode. There was barely a breeze, but the model wanted to run off to the left and forward. I had to add a bunch of trim to dial this out. I also noticed that the model was quite squirrely around center, giving it a very lively feeling. This was due to the aggressive ratios set in the programmable head. To tone it down a bit around center I added -20% (Futaba) expo on the cyclic.

Once the model was dialed in, it really grooved and felt like it wanted to keep moving faster. So far after nearly two dozen flights, the hardware, ball joints and wear points are wearing well and holding together. The performance on 12S is monstrous, but I appreciate the versatility Outrage has afforded us by allowing the model to accept various power systems and a wide range of main rotor sizes. I've noticed many other 600-class models having the presence of a foot ball with a 1200mm+ rotor disc attached. Fortunately, Outrage proportioned the Fusion to be a satisfyingly sized "true" 50.



CONCLUSION

By the time you read this the Fusion family will have grown to house a 700 and the Velocity will have been refreshed. Outrage has developed a homogeneous line of models that are easy to fly, inexpensive to repair, and allow for future adaptation. This Fusion 50 has held up exceptionally well to the rigors of reviewing and already is slated to be reborn in a flybarless configuration. It'll be epic! **THL**

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IRCHA JAMBOREE 2011

Muncie, Indiana

International Radio Controlled Helicopter Association

WORDS: Ryan Kephart | **PHOTOS:** Ryan Kephart / Dave Dijkmans

THE BIGGEST RC HELICOPTER EVENT OF THE YEAR IS AT HAND. IRCHA Jamboree is known for its vast flying fields and a plethora of pilots. The event is held in Muncie, Indiana at the AMA home field. The grounds are spread out over many acres with grass and paved runways as far as the eye can see. Pilots from around the world gather in this small town and fill numerous hotels to enjoy this one of a kind event.

IRCHA Jamboree is not just about the flying - tents, booths, and seminars are run all week. The seminars allow attendees to learn new innovations in the hobby, hands on how-to sessions, and see products in action. This year the Jamboree could not have been better, with the near perfect weather and supreme organization, this event was one no RC helicopter pilot should have missed.

NEW PRODUCTS SPOTTED



AHF

From the makers of the Aeolus 50 AHF is making their way into the AP market. This 800-size camera ship. This helicopter is a purpose built platform that comes with a dampened gimbal, servos installed on the pan and tilt, and everything you need to install your own electronics and power system. The helicopter

is designed to use a variety of power system depending on your camera gear and flight time requirements. The kit runs about \$3300 and is a special order item.

www.ahf-usa.com

MKS

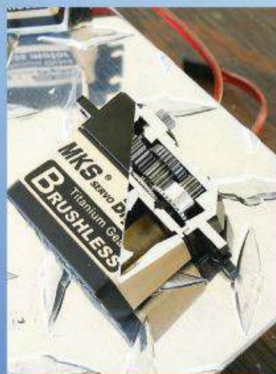
Are you looking for a new high quality servo? MKS displayed an impressive array of high power servos for you to drool over. Starting off the line is the DS95, designed for a flybarless model. The servo is made with an all aluminum housing and rated at 0.053 sec/60° 42.36 oz. of torque at 6V with a full metal gear train. To match the cyclic servo, MKS has the DX95i that operates at 0.038 sec/60° 33 oz./in. at 6V with a 760us pulse rate. Another 450-size servo is the DS92 designed for a flybar model, but can be used as a cheaper alternative to the DS95 for a flybarless model. These servos use a nylon top and bottom case with an aluminum center case for cooling. The DS92 is rated at 0.06 sec/60° 39.58 oz./in. at 6V.

What really stood out at the MKS booth was their new flagship servo for standard helicopters. The HBL950 and HBL980 feature a full aluminum case with an all-metal gear

train coated with titanium. The servos are a high voltage brushless servo with specs to impress. The HBL950 has a 0.1sec/60° 229.14 oz./in. @7.2V, and the HBL980 tail servo has 0.036sec/60° 77.8 oz./in. @7.2V.

**Street Price: DS95: \$75 •
DS95i: \$96 • HBL950: \$178
• HBL980: \$186**

www.mksservosusa.com



KDS

Innova Series helicopters were on display showing off their 550, 600, and 700 sized ships. The Innova series helicopters feature a 120° CCPM swash with a direct linkage to the servos, pulley driven tail, three main shaft bearings, and aluminum side bracing. The 700-size helicopter can run off a power system between 10 and 14 Li-Po cells, The 600 can fit a 6 to 12-cell Li-Po pack. Complete kits are available that include a painted canopy, cyclic servos, tail servo, motor, ESC, KDS main blades, KDS tail blades, and the KDS flybarless controller.

Street Price:

550: \$850

600: \$950

700: \$950 without motor and ESC

www.kdsmodel.com



DJI-INNOVATIONS

With the rise in quad copters it is no wonder why DJI the makers of one of the most advanced auto pilot systems to date the wanted to make a new controller board that is more than just a few cheap gyros. The Wookong (Multi-Copter) control board features an autopilot, auto hover fail-safe, return-to-home and landing, quadrotor and hexarotor support, customized motor mixer, and remote gain. The Wookong allows the pilot to use standard helicopter ESC's, giving the option to customize the flying craft without having to worry about the ESC refresh rate. The GPS provides accurate position hold while outdoors, while an attitude mode maintains a precise altitude hold while indoors. A high-power LED light is also used in this system to let the pilot know the condition of the control unit with just a glance. No word on pricing yet, so check their website often as they are just about to be released.

www.djiusa.com

www.dji-innovations.com



MINICOPTER DIABLO HAS THE NEED FOR SPEED

Minicopter is a manufacture of one of the fastest helicopters on the market. The Diablo is a 700-size electric helicopter that was clocked at 132 mph in the speed runs held at the IRCHA Jamboree. The Diablo features a two-stage helical cut gear system. The gears are made of thick, Mod 1 Delrin plastic. The helicopter is designed to be very easy to maintain, with the ability to remove the upper gear system by removing the top bearing block and sliding the gear system out along with the rotor head. The head is designed to be very rigid for hard 3D and speed flying. A Kevlar reinforced belt rides on a shock absorbing mechanism that is reminiscent of an RC car shock spring. The battery is also mounted to the Diablo using a unique system that includes a carbon fiber platform that slides in and is secured to the frame with large O-rings.

Street Price: \$1099

www.helixhobbies.com



THUNDER POWER

Are you ready to kick up the juice in your mCP X? Thunder Power has the answer with their newest battery on the market, the TP125-1SPL25UM. This battery is designed to fit perfectly into your mCP X without any modifications. This small pack produces a 25C discharge rate and the ability to be charged faster than 1C. Thunder Power was also displaying their newest G6 chemistry battery packs, which have already proved to be a great performer both in the helicopter and on the charger.

Street Price: \$7

www.thunderpowerrc.com

TILT-A-WHIRL

You saw it last year, and now Tilt-A-Whirl is back with some new attachments for your helicopter workstation. These new adapters allow for any style of helicopter to be mounted to the stand. The skid mount is able to rotate in or out, and allows the stand to hold larger scale skids. If your skids are pigeon toed, then this adapter is a must.

www.prontow.com





HITEC

Looking for an all-in-one charger that is four chargers built into one? Hitec released the X4 charger a while ago, but they have improved the product. The X4 AC is the same great charger with a built in 22-amp power supply. No longer do you need an external power supply to keep your X4 running. Along with the new charger, Hitec displayed their newest line of brushless servos. These servos have an ultra low current consumption, a hybrid MPD (Metal-Plastic-Duralumin) primary gear, and a fully programmable digital circuit. These bad boys have yet to be released, but should be priced competitively.

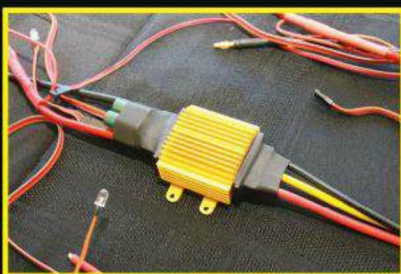
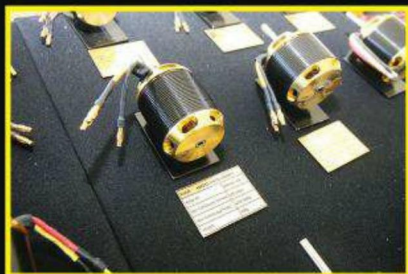
Street Price: X4 AC: \$220



INNOV8TIVE DESIGNS / SCORPION

Version 3 motors have hit the shelves. These motors are replacing some of the older models with new more efficient and powerful motors. The version 3 motors use a finned outer case that allows for better cooling as well as better retention of the flux field. They are also releasing a new limited addition motor, all the proceeds of which go to a new school in Laos. Scorpion has also decided to re-engineer their line of ESC to update them to newer and better technology. The original 4-cell ESC will now have switching 5-amp BECs, which will allow the full five amps to be utilized regardless if you run a 3S or 4S setup. The 6S ESCs will also be upgraded to 8S and also have a 10-amp BEC that has a peak of 15 amps. These BECs will also be programmable to output 5.2, 6, or 7.2V. They also displayed the new 130-amp ESC that can handle up to 12S and it includes anti-spark connecting, two power outputs, and a USB interface.

www.innov8tivedesigns.com



THUNDER TIGER

The conversations inside the Thunder Tiger booth were all about the two new Raptor G4s. The nitro and electric versions were on display fully loaded. These new helicopters feature a 15mm main shaft, 12mm tall helical cut main gear for extra grip and strength, a quick calibration system for the 120° CCPM control, and custom servo horns that allow you help calibrate the system without using any sub trim. Another unique feature about the Raptor G4 is the ability to switch from an electric to a nitro power unit in about an hour of time. The tail is designed with helical cut bevel gears. The tail case and control is made from aluminum and looks to be a simple, straightforward design. The electric version of the Raptor G4 allows the batteries to be installed in the helicopter without removing the canopy. A special battery tray slides through the bottom of the helicopter and snaps into place, making this one of the fastest battery change systems for a 90-sized helicopter. The kits are soon to hit the shelves and should be available by the time you read this.

Street Price:

4790-K10 (elec. Flybar): \$1000

4791-K10 (elec. Flybarless): \$950

4893-K10 (Nitro Flybar): \$1100

4894-K10 (Nitro Flybarless): \$1000

www.hobbico.com

www.ttamerica.com



Check out the Raptor G4 in this month's issue.

MINIATURE AIRCRAFT

The MA booth displayed several new products, including the highly anticipated Whiplash series of 90-size helicopters. The Whiplash is designed by Bobby Watts and Chris Lund to be a major competitor in the 90-size market. The design includes version for both electric and nitro, with or without a flybar. Bobby also created a gasser version of the Whiplash that he nicknamed Whipgas. The kits should be arriving soon.

On a completely new note, Miniature Aircraft has released something a little different from the norm. The Rotor X 404 is their first quadcopter design, and it looks to be a winner. The X 404 is constructed from mainly carbon fiber. The kit includes high quality Rotor X brushless motors, 20-amp speed controllers, upgradeable control board, and a lighting system. They are also planning on releasing plenty of options in the near future.

Street Price:

Rotor X 404: \$600

www.miniatureaircraftusa.com



HORIZON HOBBY

On the bench at the Horizon booth we saw a few new products ready to hit the shelves. The DX10t platform radio was on display and received a few curious spectators, as this radio is not the norm we see here in the states. Thumb fliers cringe at the look, but pinch style fliers seems to like the way this radio feels. Also on display was the new Spektrum DX7s. This radio looks similar to the DX8 with one less channel. On the horizon is a new JR gas helicopter with fully enclosed fiberglass fuselage. The GSR260Z Sport is controlled by a 120° CCPM control system and has many mixing ratios available to suit your flying style. A new flybarless controller is also in the mix from JR. The TAGS (Three Axis Gyro System) flybarless will be available sometime in the fall and will feature an easy to program control board that does not require a computer, and a separate gyro unit for ease of installation. Telemetry has also been a big hit recently, and Spektrum now has the ability to make any helicopter (regardless of the radio) into a telemetry unit. The TR1000 changes your iPhone into a telemetry display screen and receiver. Vital information is transmitted to your phone, including airspeed, temperature, rpm, amps, and battery voltage.

www.horizonhobby.com



HOBBICO/FUTABA

In the Hobbico/Futaba booth we were able to see the one and only picture of the new Futaba T18MZ. This radio resembles the 14MZ with several more channels and what looks to be a brand new display screen. Not much was said about this radio, but we will keep you up to date on the latest news. Also on the Futaba side we saw a brand new servo for all the high voltage nuts. The BLS255HV is a brushless high voltage servo that has the speed and torque that helicopter pilots crave.

Two new O.S. engines were also in the booth with a completely new case. These O.S. 91HZ R engines receive the O.S. royal treatment. "Speed tuned" is not something that the RC helicopter pilot is used to hearing, but if you ask any car driver they'll respond with a big smile on their face. "Speed tuned" engines are factory tuned engines to optimize the power, reliability, and performance. These engines will surely be a hit in the near future. Expect to see them hitting the shelves soon.

www.hobbico.com • www.futaba-rc.com • www.osengines.com



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KBDD

What is orange, yellow, green, and white, and visible from a mile away?

The new main blades for your mCP X from KBDD. These blades are brightly colored and perfectly matched to one another and designed to have more stability and control. The blades fit perfectly into the grips and no modification is needed. You won't find an mCP X on the flight line using the stock blades after they debut these new bright wonders.

www.kbddintl.com



AMAIN HOBBIES/PROTEK RC

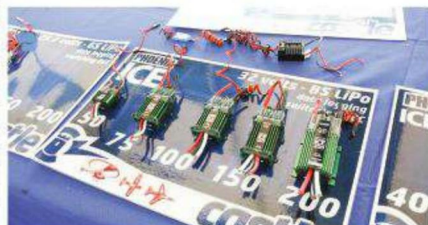
What better way to display your product than in a custom charging box loaded with the latest and greatest chargers and power supplies from Protek? This charging station featured four Prodigy 610 Duo chargers and two brand new Super Pro 2000-watt power supplies.

www.amainhobbies.com

CASTLE CREATIONS

Although Castle did not bring out any new product, they were offering hands-on help to any pilot with a question. They were also giving out free T-shirts to their fans and a neck strap. They had their products on display showing their full range of speed controls including the Phoenix ICE and ICEHV lineup.

www.castlecreations.com



OUTRAGE RC

After a successful launch of the Fusion 50, Outrage has devoted their attention to a new 90-size electric helicopter. The Fusion 90 prototype was on display, showing off the design and power system that runs this beast. The Fusion 90 still had some white plastic prototype parts installed, but from the looks of it we should see the release of this bird in the near future.

www.outragerc.com



ALIGN

Align set up a nice tent loaded with comfortable chairs and every helicopter they manufacture. This booth displayed their newest helicopter, the TREX 450 Pro 3GX. This helicopter features a new brushless motor, flybarless head, 3GX flybarless control unit, and a few other new features.

www.alignrcusa.com



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today's top pilots.*



A "super" value in 2.4GHz control.

14 available channels. Support for flybarless 3-axis gyros. Free software updates. Believe it or not, the 8FG Super is the only system to offer all these features. S.Bus system compatibility and menus tailored to the CGY750 gyro are added bonuses. Easy-to-navigate SensorTouch™ programming and numerous factory-defined mixes add up to a "super" value in 2.4GHz control. It's no wonder today's top heli pilots prefer the 8FG Super over any heli radio.

Futaba®

futaba-rc.com/I07h



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GAUI In the Gaui booth we spotted a few new products. The Gaui X7 was on display outfitted with a Scorpion motor, 12S battery, 160-amp ESC and a flybarless head. This helicopter features a direct link CCPM swash linkage and

two aluminum PC links that run through channels that also serve as a swash follower. The X7 looks to be a well-designed machine and we can't wait to get our hands on one. The 500X upgrade kit was also on display, showing how you can take your 330X Quad Flyer and super size it using the same electronics.

www.gauicom.tw
www.empirerc.com



SYNERGY Matt Botos was on site showing off his latest creation – the Synergy N5c Contender and the highly anticipated Synergy E6/E7. This helicopter features a helical cut main gear, three main shaft bearing supports, a bearing block supported pinion, and the ability to run a 8S, 10S, or 12S power system. Keep an eye out for a full review in an upcoming issue of RC Heli.

www.synergymhelicopters.com



HACKER BRUSHLESS

Right next door to Synergy, Hacker displayed their new brushless motor. The Turnado is a completely newly designed motor that has cooling channels on the outside of the case to keep the motor running in top shape. They claim that this motor has enough power for even the hardest 3D fliers. We'll be the judge of that, so look out for a review.

Street Price: \$190
www.aero-model.com



CONCLUSION

IRCHA Jamboree is one of those events you just have to attend at least once if you are even remotely interested in RC helicopters. The event is filled with talented pilots and innovative products to get your blood pumping. **TEL**

FUSUNO CANOPIES

You want a special canopy for visiting IRCHA 2011? FuSuno had you covered. These custom painted canopies with the IRCHA 2011 logo were for sale in their booth along with T-shirts. The canopies were available for every major helicopter.

Show Price: \$55
<http://fusuno.com>



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HELICOPTER OF THE YEAR ★★★★★

FIVE STAR REVIEW

"I ordered this the very first day it came in stock. I just got it in the mail and opened the package and it is awesome! This was my first helicopter and with zero experience except from what I have seen, read, and researched. I had this baby up and hovering 20 minutes after I took it out of the box. Everything was trimmed, just had to charge the battery. Very stable and looks great. This is a 6ch heli, has great 3D capabilities and an upgraded 3D gyro. It's awesome!"

-Mike Shrader, Xheli.com's Customer

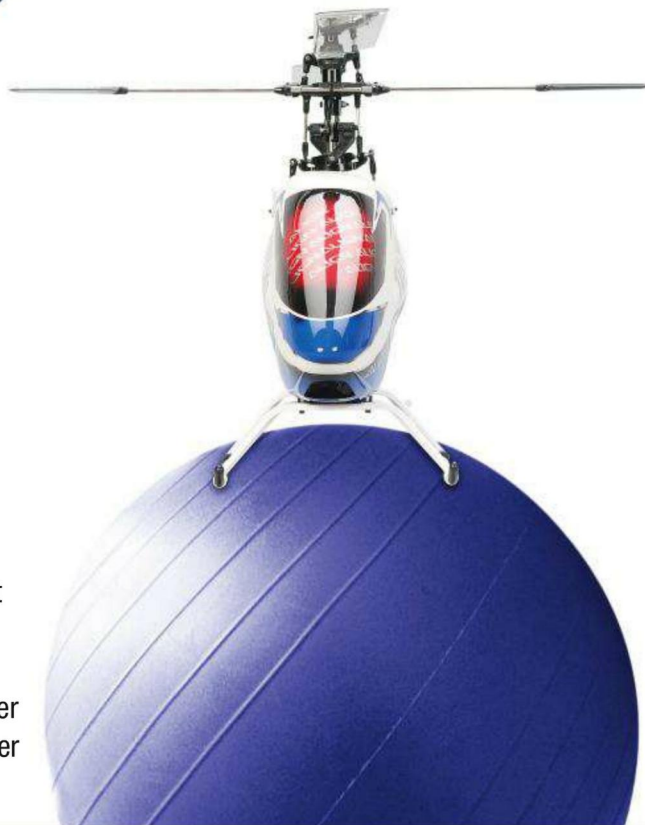


Center of GRAVITY

Find Your Center of Gravity

WORDS: Jim Innes

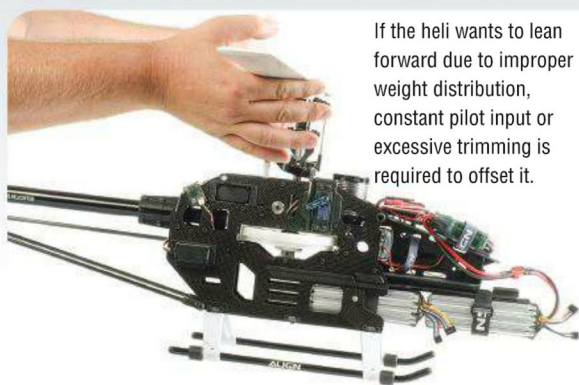
CENTER OF GRAVITY, OR “CG”, is defined by Webster’s as “the point at which the entire weight of a body may be considered as concentrated so that if supported at this point the body would remain in equilibrium in any position”. Setting up a helicopter with proper CG is crucial to how it flies. A balanced helicopter will function better for its pilot.



» WHY IS CG SO IMPORTANT

Why is center of gravity so important? There is an illustration often used to describe how difficult hovering a helicopter can be that also explains CG. It has been said that hovering a helicopter is much like trying to balance a marble on top of a beach ball. Just as you move the beach ball to correct a movement of the marble, you find yourself needing to make a different movement to keep it from rolling the other way. What you are really trying to do in that exercise is line up the CG of the marble with the exact center-top of the beach ball. If you are able to keep the CG lined up, the marble will not attempt to roll off.

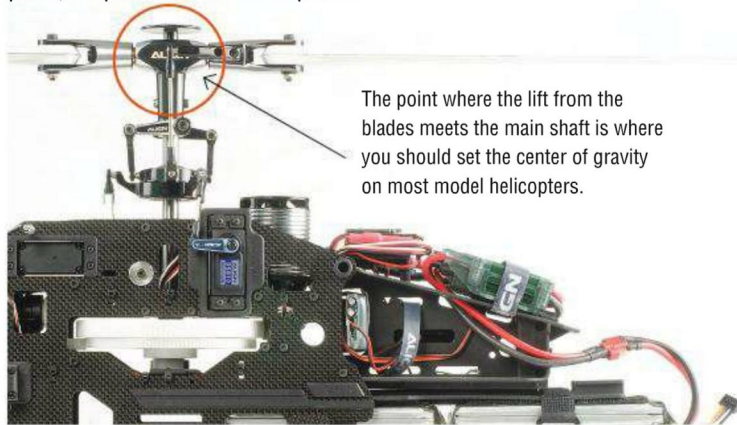
With that image in mind, imagine a helicopter that always leans forward in flight due to its nose being heavier than the tail, and how much more difficulty is presented in trying to keep that bird stationary.



If the heli wants to lean forward due to improper weight distribution, constant pilot input or excessive trimming is required to offset it.

WHERE SHOULD THE CG BE ON A MODEL HELICOPTER?

In looking at a helicopter in flight, you can logically deduce where the center of gravity should be. What lifts all the weight of a helicopter? The rotor blades. Where does the lift of the rotor blades join together? At the center of the main rotor shaft. This is the point where the center of gravity should be located - at the center of the rotor disc. It's at this point that all the weight of the bird is lifted. If your helicopter is balanced at this point, it's performance will improve.



The point where the lift from the blades meets the main shaft is where you should set the center of gravity on most model helicopters.

A helicopter that leans forward all the time is called “nose heavy”, while one that tilts backwards is considered “tail heavy”. Helicopters with improper CG will exhibit some strange characteristics in flight, such as the inability to maintain a straight line in a circuit, nosing up or down in flight, inability to piro smoothly (tend to bobble), will never hold a hands-free hover, and they tend to fight your control during aerobatics instead of following inputs.

» HOW TO CHECK THE CG

There are two popular methods for checking the center of gravity with a model helicopter. Please note that in both methods, flight batteries and canopies should be installed. Also, if the heli uses fuel, the tank should be filled halfway to get a good average CG determination.

- Perhaps one of the most precise methods is to simply grab the helicopter by the blade grips, turn them parallel to the ground and then hold the helicopter by the blade grips and tilt it so that it is knife-edge to the ground (skids facing directly away from you and main shaft parallel to the ground). With the helicopter in this manner, you should be able to have the boom and body of the helicopter run parallel to the ground. Neither the nose nor the tail should rotate towards the ground. If either end drops to the ground repeatedly, that end is the heavy end. It's important with an electric helicopter that you do this test twice, with the tail facing to the right of you in one and to the left in the other. This will ensure that the motor isn't holding the helicopter straight when the one-way bearing is engaged.



This method basically turns the helicopter into its own balancer tool, using the main shaft and bearings as the pivot point. It is easy to tell if there is a CG problem with this method.

- One of the most common methods used to test CG is one that you can do quickly before every flight. If the helicopter has a flybar, simply align the flybar so that it's perpendicular to the boom. Then, place a finger underneath the flybar on each side of the helicopter, close to the rotor head. Lift the helicopter up by the flybar and watch the nose and tail. Does the nose or tail lift up before the other end? Look for a tilt in the bird when it is lifted; if it tilts one way repeatedly, that side is most likely heavier. Another tip with this method is to watch the landing gear as you lift the bird up and see if one end comes off the table before the other.

This method of checking for CG is simple and can be done anywhere; though it's not as precise as the previous method, it's usually adequate.

- With a flybarless helicopter, you can make this same type of test by turning the main blades perpendicular to the boom, turning the grips so they're at zero degrees, then placing a fingertip under the blade bolt on each side to lift up the heli.

These are common ways to quickly check the CG of a model helicopter. I have seen pilots also use various jigs or hooks to hang the helicopters that also serve the same purpose, but in most cases the above methods turn out to be pretty precise.

» TIPS TO SETTING CG

There are a number of factors that contribute to the weight distribution of a model helicopter. Even though manufacturers take center of gravity into effect during the design, they cannot consider every possible variation of electronics and power sources that pilots will use. That means that as you set up your helicopter, you need to consider CG early in the build process and adjust as needed. Here are some tips to aid in getting the CG right from the start.

- As soon as the airframe is built up with the servos and engine/motor installed, temporarily strap on the rest of the electronics where you plan to install them. Add the flight battery, some fuel (if applicable), and the canopy. Test the CG at this point before you have gone through the process of mounting and wiring everything to see if your chosen components and install locations will work. It is easier to decide now that the receiver battery needs to go forward another inch, than later when it may require more work.

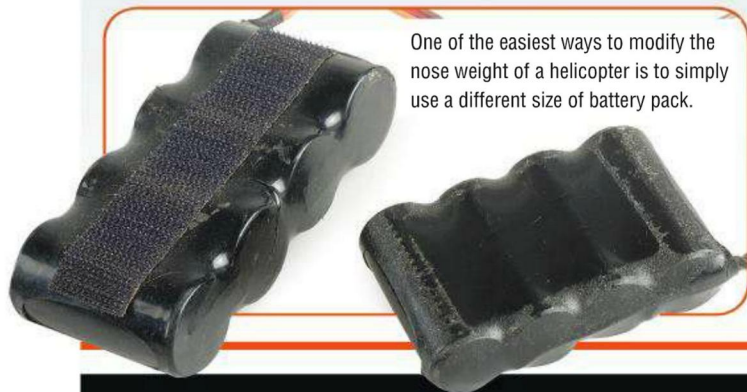
- Since most pilots are looking to keep the weight down in their models, if you find that the helicopter is tail heavy – look for ways to remove weight at the tail instead of adding weight at the nose. Since the tail is so far from the main shaft, small changes in weight have a large impact on CG. Something as easy as removing the horizontal fin or sliding the tail servo forward or backward may be all that is needed.



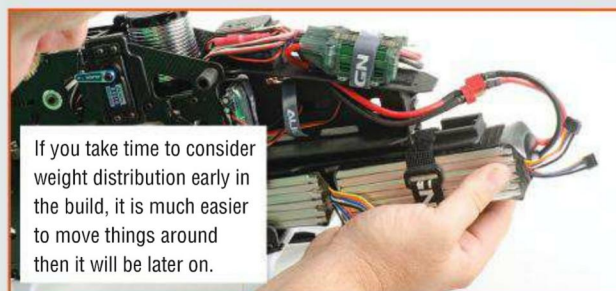
Sometimes the simplest of things can have a big impact on CG.

- If you find that you have to add weight to the nose of a bird in order to set the CG, look at adding a larger receiver battery or flight pack as the source of that weight. Batteries are dense and going bigger with them also adds more flight time.

- Don't be afraid to think outside the box a little bit. Look at things like alternate gyro locations or a different canopy for setting the center of gravity. Proper CG is really important to the flying characteristics of the helicopter and it is worth the effort to get it right.



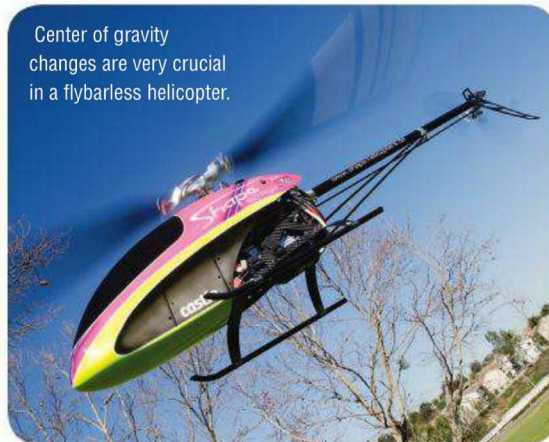
One of the easiest ways to modify the nose weight of a helicopter is to simply use a different size of battery pack.



If you take time to consider weight distribution early in the build, it is much easier to move things around than it will be later on.

FLYBARLESS? CG IS CRUCIAL.

Some would think that since they have a flybarless (FBL) system in their heli, that center of gravity is not as important since the gyros will take care of it. While there is some merit to that belief (modern FBL units are amazing at overcoming poor setup and maintaining direction), the fact is that in order for a FBL system to perform properly the CG must be correct. With proper CG, the helicopter's gyros are allowed to work solely on helping the pilot fly the model instead of fighting what the off-balanced helicopter's weight is doing. If you have ever watched a properly setup FBL bird do pirots, they are beautiful and smooth as silk. If the CG is wrong, however, you'll notice it right away during a pirouette, since the tail bobbles all over the place and looks quite ugly.



Center of gravity changes are very crucial in a flybarless helicopter.

CONCLUSION

Center of gravity is one of those concepts not often discussed with new pilots, and it is seldom spoken of in online forums as well. It's something often taken for granted and forgotten about because of the simplicity of it. Setting up CG is one of those crucial parts of this hobby that should be part of every new helicopter build. Keep those birds in balance and see you at the field! **TTL**

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UPGRADING YOUR BLADE mCPX

Get the most out of your micro heli.

WORDS: Ryan Kephart

THE MCPX: With any new helicopter you'll find that many people may not be happy with the way it may perform. Thankfully we have a lot of talented individuals who like to tinker with their helicopters and make them better than stock. This usually leads to the manufacturer redesigning the helicopter to accommodate many of the pilots' modifications, and including some of their new ideas into a new version. We'll show you how to upgrade you mCPX to get better flight performance and help you understand what tinkering with your helicopter is all about.

STOCK

Looking over the mCPX you would think that there couldn't be much done to improve on the design. While looking for little things you can upgrade, the major upgrades can sometimes be missed. Before upgrading any helicopter you should always be comfortable with it and know the ins and outs of the machine, so take the time with your helicopter and find out what you'd like to improve. For this How To we selected the Blade mCPX, as we have flown countless flights on it, crashed it many times, and we know exactly what it needs to make it fly a little better.



» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

3.0



» TIME TO COMPLETE



40

 Minutes

» TOOLS NEEDED



■ SMALL PHILLIPS SCREWDRIVER



■ WD40



■ DREMEL



■ RULER



■ SOLDERING IRON



■ DISTILLED WATER

» ITEMS NEEDED



■ SR120 TAIL



■ KBDD MAIN BLADES



■ NOVUS FP TAIL ROTOR



■ 2MM CARBON ROD
(ALIGN TREX 250 BOOM STRUT)

» WEAKNESSES

Although the mCPX flies just fine for a beginner, we think that its tail performance is still weak. The tiny brushed motor has to work hard and when performing high tail demand maneuvers it just doesn't cut it. Another issue is the rotor blades. The advanced blades seem a bit too unstable, but the fast flight blades are not very aerodynamic. This leads me to believe that maybe the main rotor is just not putting out much power.

Selecting Your UPGRADES

NOW THAT WE KNOW SOME OF THE WEAKNESSES OF THE BLADE MCPX WE CAN MAKE AN EDUCATED DECISION ON WHICH PARTS COULD POTENTIALLY WORK. Let's look at the major issue, the tail control authority. We want to select a little bigger motor that can spin a larger tail rotor. The SR120 uses a bigger motor and tail rotor, so we'll use one of those. The problem with the SR120 is that the tail rotor is a bit too big for our use, so we bought a tail rotor from the Novus micro helicopter.

For clearance and more authority we wanted to extend the tail boom. For this we needed a 2mm diameter carbon rod. The hobby store was out of this size of carbon rod, but I found that the TREX 250 boom supports were the same size and plenty long enough for the job at hand.

Next we looked into the main motor. I had well over 100 flights on the old motor so I picked up a new one and planned to break it in with some distilled water. Aftermarket parts are becoming readily available for the Blade mCPX, so I looked and found that KBDD sells a pair of main rotor blades that really stand out and offer the stability and better control without the big bulges of the stock blade. Now that we have selected some upgrades, it's time for the installation.



These KBDD main blades come in all kinds of colors.



The SR120 tail motor should provide plenty of power.



A new main motor with proper break-in should provide plenty of power for the main rotor.



These TREX 250 Boom Supports should be perfect for a new tail boom.

COLOR: i

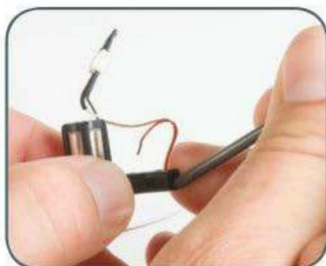
» INSTALLATION

First we need to remove all the parts we are going to upgrade. This includes the main motor, tail motor and boom, and the main blades. The step-by-step installation process is fairly simple.

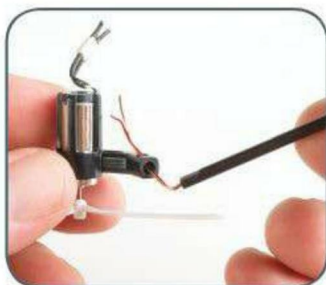
TAIL



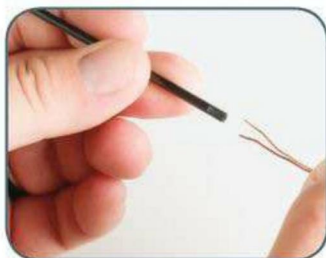
1: Grab the SR120 tail boom and motor and cut the wires off near the connector. Save the connector for later use.



2: Remove the tail motor mount by pulling it until it pops off the boom.



3: Remove the wire from inside the boom and save it for later use.



4: Measure the radius of the stock and Novus tail blade.

5: Take the difference and write down this number. We'll add this length to the new tail boom.

6: Measure the stock tail boom and add this number to the difference in step 5.

7: Mark and cut the new tail boom from a 2mm carbon rod using your calculations.

8: Look at the stock tail boom. You'll see that a key is cut out in each end to keep the boom straight in the frames. You'll want to cut this same keyway in the new boom.

9: Slide the SR120 tail boom onto the carbon rod. You may need to add some tape to the boom or a piece of shrink tubing. Glue the tail motor mount onto the boom.

10: Take the tail motor wires and wrap it around the boom, and solder the connector back on.

11: Insert the boom back into the frames and connect the motor wire to the board. You should also wrap the wire around the canopy post a few times.

MAIN MOTOR

1: Remove the new motor from the packaging.

2: Charge up a flight pack for the mCPX

3: Pour some distilled water into a cup.

4: The new motor uses a small connector. This connector will plug into the battery without having to cut the wires. Submerge the motor into the water.

5: Plug the battery into the motor wires and let it run for two minutes, then unplug the battery.

6: Repeat this process a few more times.

7: After the last dip in the distilled water, spray the motor with WD40.

8: Let it sit for a while until the water evaporates.



CONCLUSION

The rest of the upgrade process is pretty simple. Replace the old blades with the new KBDD main blades and you're good to go. Another quick upgrade is to change out the battery. Several companies such as Spyder and Thunder Power make a great set of batteries that will not only last longer than stock, but also provide up to a 25C discharge rate. Remember that upgrading your helicopter can be worthwhile – it's not just bling!



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Guai EP255 / T-Rex 250

4000mah 4S 25~50C Logo 500

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Rex 250 / GAUI EP-200 V2/
E-SKY LAMA V2/V3/V4

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Rave 450

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GAUI X5 / Outrage 550

\$72.85

2200mah 3S 35~70C
T-Rex 450 / Eflite Blade 450

\$19.47

4000mah 6S 25~50C
Hirobo Lepton EX / HIROBO SDX-EP

\$64.75

4500mah 10S 45~90C Logo 600

\$138.82

4500mah 6S 35~70C
T-Rex 700

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4500mah 10S 25~50C Ma Furion 6

\$98.41

5000mah 6S 35~70C
T-Rex 550/600

\$77.81



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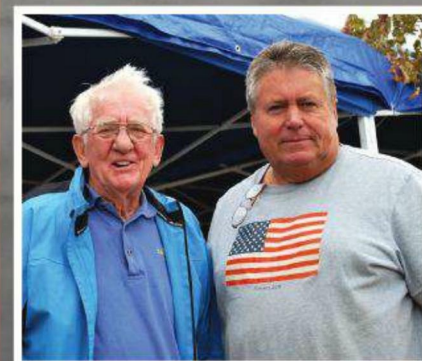
FUN FLY

SEPTEMBER 14-18, 2011

WORDS: Aaron Shell | PHOTOS: Aaron Shell

FOR 20 YEARS THE PORTLAND, OREGON AREA HELI CLUB CASCADE ROTARY WINGS WAS BLESSED WITH A FANTASTIC LOCATION AT A PRIVATE GRASS AIRSTRIP IN BROOKS, OREGON TO HOLD THEIR TWICE ANNUAL FUN FLY. The airstrip was located among hops fields and even allowed flyers from around the west coast to fly directly to the fun fly in their private aircraft. At its peak the field hosted a flight line up to half a mile long allowing 15-20 flyers at a time to get in the air. 50 campers lined up by Thursday morning was common, and 200+ spectators would come out to see the helis on Saturday. During the fall 2010 fun fly at Brooks, the owner of the field died in a car crash not two miles from the event. After losing her husband, the widow decided she did not want the event hosted at her field anymore.

It's a tight group of people, but they party like animals.



Grant Sharp spent a few minutes checking in with Duane Hesketh, owner of Tammies Hobbies.



A SCRAMBLE, NO SPRING FUN FLY

With no field to host the event, the spring 2011 Brooks event was canceled, but by the end of the summer word had spread around the area the club was looking for a field to host the event for the fall. Grant Sharp, owner of Sharp's Green Acres R/C field, offered to host the event at the Molalla R/C Association's home field.



SPECIAL THANKS

Field owner Grant Sharp spends much of his free time helping organize charity auctions. One of the recipients of these auctions is Shriners Children's Hospital in Portland Oregon, and it just so happens that this author's daughter was a patient at Shriners. It was extra special to learn that Grant's charity work impacted my family and to be able to thank him directly for his work.

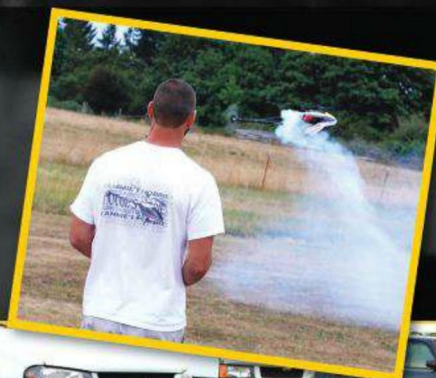


She will be flying before she is three.

Despite the event not attaining the same scale with the smaller field, it was great to have a Portland area heli event before the end of the summer. With rain on the horizon much of the time, we were fortunate to get a fairly dry weekend. Northwest flyers are a hardcore bunch, clouds, turbulent wind from surrounding trees, and even a little drizzle won't stop them from getting some stick time. The hosting club asked that Sunday be kept open for them to fly airplanes, unfortunately for them the rain only held out through Saturday; Sunday dawned wet and miserable.

Sean Whitney was using every second of stick time he could squeeze in, having recently completed an overseas military tour; he's home for a short time before he deploys again. He must have been getting in lots of practice while out there, since his flying has reached a new plateau of precision. Sean converted his Trex 700 to flybarless using the stock Align V2 flybarless head parts and a Futaba CGY

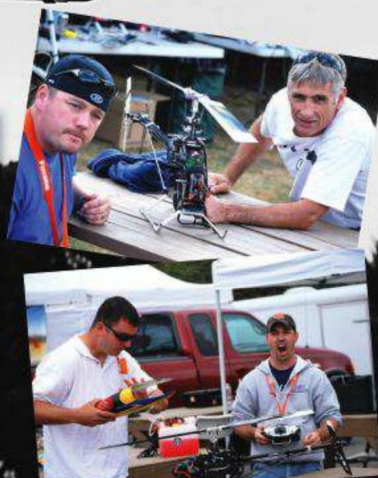
750 flybarless controller. On his first flight he experienced some kind of failure and the heli boom struck, but with Tim Schelhass' help they had the bird back in the air for Sean to abuse Friday and Saturday. Sean is pushing his flying to include piro reversal maneuvers, piro snakes and funnels, as well as rolling circles.



Lower Heli had a clean and well stocked booth at the event.



Mark Shugart's Trex 600E flew right in front of my FPV airplane to create this interesting perspective.



Peter Halay was a sight to see at the event. Peter was flying 3D with his Hirobo machines 10 years ago and made big impressions with his big air style and grace, but he kind of vanished from the scene for the past decade. Peter was the first person I ever saw fly aerobatics with a helicopter, and after watching him fly I was hooked. It was great to see Peter still flying the same ol' Scedu, Freya, and Eagle gasser. We spoke about how far the hobby has progressed in such a short amount of time, and how talented pilots seem to be coming out of the woodwork. For pilots who flew 3D ten years ago it meant acquiring a certain level of precision to make the most out of the available power. Now, new pilots can get into 3D much faster with so much power on tap.

Tammies Hobbies and Lower Heli were both present with parts support. Tammies is the oldest hobby shop in the Portland area, and they have been a big supporter of the helicopter scene since the early 90's. Lower Heli is a Vancouver, Washington based web store, and owner Ken has been building his business for Trex parts support at a steady pace. Patrick Koegler, owner of KDE direct, and Rob Clark, his lead designer and test pilot, were there flying Patrick's high powered electric monsters. Patrick has his own line of brushless outrunner motors designed for specific helis. His Trex 700E commanded attention on the flight line with its high head speed and snappy performance.

CONCLUSION

It's uncertain at this point whether Sharp's Green Acres will be a permanent home for the CRW twice annual funfly, but with so many heli flyers in the Portland area it's great to at least have access to this field. Although the field is only big enough for 4 or 5 flight stations and 30 or so campers, beggars can't be choosers! Grant Sharp mentioned he's always wanted to host a heli fun fly at his field, so there's a good chance the event will stay put unless a better option comes up. CRW members always valued the amazing grass strip in Brooks, but it wasn't until we lost it that we really learned how meaningful it had become. CRW members extend their deepest condolences for the widow and family of the owner of the Brooks field, and want to thank them for so many years of fantastic fun fly events. **RCH**

That guy kinda looks like Ryan.

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Foxtech AIO VIDEO GOGGLES

Head tracking included

WORDS: Ryan Kephart



FOXTECH HOBBY CO.,LTD IS A COMPANY FOUNDED IN 2008 AND SINCE THEN HAS BEEN DEVOTED TO OFFER THE BEST QUALITY FPV AND AERO PHOTOGRAPHY PRODUCTS. Their products go much further than just the video goggles we are reviewing today. Foxtech offers wireless video links, cameras, OSD systems, ground stations, autopilot systems, tracking antennas, and much more. Customer service is also another key component that Foxtech is dedicated to.

Customer service representatives are already FPV pilots with a knowledge base that allows customers to have a full time product support for Foxtech products. Probably one of their most known products by far is the AIO (all-in-one) FPV Goggles. So lets take a look at these and we will show you why Foxtech knows FPV.

Head gear for pilots.

FEATURES

The Foxtech AIO video goggles stand a league apart from other manufactures. Their vision to create a goggle that can do multiple functions and still compete with high-end video goggles was realized with the making of the AIO. These glasses were developed by FPV pilots for FPV pilots to get the most out of the experience of FPV flight. These goggles feature a built in anti-drift head tracking system, an 8 channel 2.4ghz and 5.8ghz receiver, 2x non-blue (black) professional FPV monitors with a 640X480 resolution, and a new silicone shade that keeps all of the light out while wearing the goggles. Let's take a look at the features in detail and how this new all in one video goggles performed.

INSTALLATION

Foxtech sent me a basic system to test out including a small 5.8ghz 10mw transmitter for video relay, and a high-resolution video camera. We already had a 900mhz system from Hobby wireless, so we decided to give these goggles a try on that system. Foxtech at this time does not have a combo system for the goggles, but if you want to try a wireless connection remember to pick up a small 10mw transmitter for video relay.

Installing the system was strait forward. We setup our TREX 450 Pro with the camera and transmitter. The transmitter sends its signal to a 900mhz receiver. From the 900mhz receiver we installed the small 5.8ghz transmitter from Foxtech and used the video goggles to receive the wireless video feed. This made the goggles wireless, which really

makes a difference and makes you feel much more free than with wires hanging from your face.

We also gave the head tracking system a test out on an FPV plane. The installation and programming of the head tracking was simple and strait forward. We used the 10C Futaba transmitter, as these seem to work best with head tracking. Opening up the nice on screen display by selecting it using the dial on the goggles, I set the head tracker to use channel 5 and 6 for pan and tilt. From there, I just plugged the goggles into the radio and setup the trainer function to handle the head tracking system.

TESTING

COMFORT: The Foxtech AIO Video Goggles weigh in at 5.9oz (167g) with the wireless antenna. This is comparable to



THE GOOD

- Wireless receiver
- Great head tracker
- Clear Video
- Priced reasonably (head tracker included)

THE BAD

- Silicone shade is a little uncomfortable

CONNECT

MANUFACTURER:	Foxtech
WEBSITE:	www.foxtechfpv.com
PART NUMBER:	AIO
STREET PRICE:	\$435



most video goggles without the added features of the head tracking system. These goggles feature a silicone shade that blocks out the light and provides enough gap to facilitate a person wearing glasses. I however do not wear glasses, but our photographer gave them a try and said his glasses did not interfere with the goggles. As for my feeling for the glasses they feel lightweight on, and the silicone shade does an okay job blocking out the light. I did see a few specs of light coming through near my ears, but as soon as the goggles were turned on, the display was plenty bright enough and I did not notice the light coming in. I had a little trouble finding the sweet spot for the wide comfortable elastic headband. I had to place it a little lower than usual to keep the display at a perfect level. You can also lower the goggles down a little, but the hard plastic pressed a little too much on the bridge of my nose. Overall the comfort was enough for a long flight, but movies might be out of the question without some modification. I looked on the forums and found some people

are modifying the glasses to use foam instead of the rubber. Foxtech has also commented on this and are planning to make a foam shade as an accessory.

FUNCTION

As soon as I powered up the display I immediately noticed how clear and bright these goggles are. The 640X480 resolution was crystal clear and the color was spot on. The Foxtech AIO goggles have the ability to adjust the brightness and contrast on the fly with the push buttons on top of the goggles. This made flying in dusk an easy task. As the sun dropped I just added a few clicks of brightness and I was able to continue flying without having to land. The built in receiver worked flawlessly as a video relay system. This allowed me to even pilot the helicopter inside my car without having to worry about video signal. I also took a look at the OSD. This function allowed you to adjust the color, receiver bandwidth, head tracking channels, pan and tilt range, and the auto correct feature.

The head tracking system was by far the

best I have ever used. Almost every head-tracking unit has problem with drift. With these goggles I have not noticed any drift whatsoever and the auto correct feature works amazing. This feature allows the gyro to auto correct and reposition itself so wherever you are looking, that is the true position of the camera. Foxtech uses a digital compass, accelerometers, and a gyro for their head tracker. This allows for the utmost precision and function. I was very pleased with the performance of this system and I am sure it is one of the best on the market.

CONCLUSION

If you are looking to get the most out of FPV, then these goggles are the right choice for you. You cannot compare the performance of the head tracker, and the display is nice and sharp. As for the comfort, Foxtech has already started on producing a foam shade for us who do not wear glasses. For eyeglass wearers the Foxtech goggles provide the perfect shade to use. **RCH**

HELICOPTER PERFORMANCE

It just keeps getting better all the time.

WORDS: Art Koral | **ILLUSTRATIONS:** Dave Palacios

HELICOPTER PERFORMANCE CAN BE A RELATIVE TERM SINCE ALL HELICOPTERS CAN BE OPTIMIZED FOR A CERTAIN DISCIPLINE FOR EXAMPLE: F3C, 3D, BEGINNER, PHOTO PLATFORM ETC. For this Heli IQ we'll define helicopter performance by the textbook definition, and that is "achieving the greatest gap between power available and power required". We'll cover component selections and maneuvering techniques that can have direct control over to maximizing performance to the limitations of your abilities.

INCREASE POWER **AVAILABLE**



There are many ways to increase the power available on your helicopter. Just keep in mind that there is often a trade-off when choosing a high performance component. Here are some things to think about when trying to squeeze out as much power as possible:

BATTERY SELECTION

High energy and power density batteries will ensure greater power and flight times. Often energy and power density are traded for each other, but new generation batteries offer both. If maneuvering performance is what you want, then select the smallest battery that will give you the minimum flight time you desire and the maximum power output. There are two qualities that determine the batteries ability to deliver power:

"C" rating and capacity. Since output is a function of C rating X capacity. If either is small performance will suffer.



Weight:	816g
Configuration:	6S1P
C-Rating:	65C
Ah Rating:	5000mAh

Latest generation batteries are powerful and light.

MOTOR SELECTION

Whenever picking an electric motor, always try to find the one with the lowest internal resistance and no-load current for the rated power and Kv rating you're looking for. Lower resistance simply means more of the energy is used for flight instead of generating heat by internal losses. You'll typically find that a lower KV rating for a given size of motor has more winds of a smaller gauge wire with higher resistance. The opposite is true for higher KV motors. This is traded with the ability to run a higher voltage system, thus lowering the amount of current and resistance losses.

Same as resistance, finding a motor with the lowest no-load current for a given size and Kv rating will also give you more power. If power is used to overcome internal air drag, friction, or hysteresis losses, then less of it is available for flight. Typically you'll find higher no-load current on motors that either run faster or have higher magnetic forces. More power is required to spin the motor at a faster speed, and power is often wasted by magnetic induction not used to transmit mechanical power.



Engines today offer more horse power than the same sized engine of years past.



Select a motor with the lowest no load current and internal resistance for a given Kv rating and rated power to achieve the highest peak power.

HIGH POWER, WELL-TUNED NITRO ENGINES

Just like your automobile engine, state of tune is critical for maximum performance. The higher the compression ratio, the better tuned, and better balanced the higher the RPM and peak power available from a heli motor. Special care should be taken to follow break-in instructions and needle settings.

FRICTION- Since your helicopter is filled with moving parts, friction also plays a key role in power available. Keeping rotating shafts, bearings and pivot points well lubricated will minimize the power wasted in overcoming this friction. As an additional benefit, the inertial energy generated during an auto will be maximized as well.

BLADE SELECTION AND PITCH- We could write an entire article on blade selection alone, but for the most part bigger blades (chord and span), higher RPMs, and more pitch equals more potential performance. However, there's a point where the blades will stall and bog if they are too large or pitch angles are too high. Also, excessive RPM carries a safety risk and an almost certain reduction in flight time.



Obviously there is no limit on how fast the blades are designed to spin on some of these helicopters. 2700RPMs on a 600 wow- just remember to keep a safe distance.

Mikado canopies tend to seem rather flimsy to the touch but are lightweight.

WEATHER CONDITIONS

Avoid high altitude and high temperatures that decrease air density. Since helicopters fly by the laws of physics decreasing the mass of air that is accelerated also decreases the net force produced.



DECREASE POWER REQUIRED

If you don't need the power you will have extra to do more with. The two areas that have a profound impact on reducing power required are weight and pilot technique.

WEIGHT

It's always a good idea to select the lightest components that give you the performance you desire. This is a list of components that weight is often overlooked when making a selection:

1. Metal parts that are less crash resistant. All too often, plastic grips are unnecessarily replaced with metal grips only to add weight with no added strength.
2. Batteries that achieve power density with added weight. New generation batteries tend to be powerful and light.
3. Excessively large motors that operate cool to the touch during flight. Motors should get a little warm if they are sized correctly.
4. ESCs working at half their capacity when running high voltage. An 85-amp ESC will handle up to 5 hp at 12S!
5. Using a separate receiver battery when a BEC can be used.
6. Heavy painted canopy



PILOT TECHNIQUE

It's easy to recognize a pro pilot because they can take any kit and make it perform. Less correction means that more energy is available for the maneuver. Here are few techniques to reduce power required that even a beginner pilot should take advantage of:

TRANSLATIONAL LIFT- Moving into forward flight reduces the amount of induced power required. This phenomenon - known as "translational lift" - is caused by the helicopter entering undisturbed air overrunning its tip vortices and shifting the induced flow horizontally, requiring less pumping energy. Taking advantage of translational lift allows the pilot to gain momentum and extra energy for performing maneuvers.

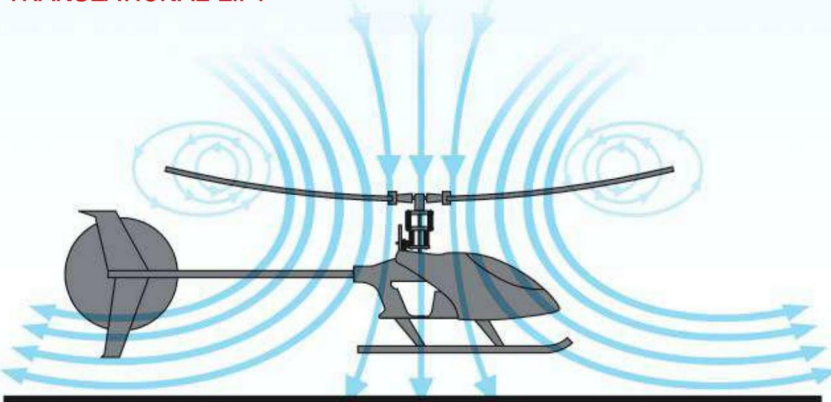
TAKE ADVANTAGE OF GROUND EFFECT- when the helicopter is close to the ground, less air needs to be pumped due to the interaction with the ground and the reduction in blade tip vortices.

FLYING LOW TO THE GROUND IS NOT ONLY COOL, there is an added benefit of ground effect, which gives a little more power just prior to popping into a 3D maneuver.

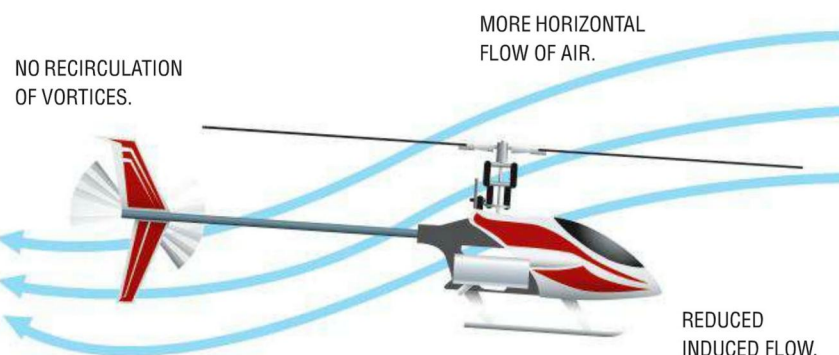
PIROUETTE WITH THE TORQUE- Get 10% more power back from the tail to power your head by going with the torque and not against it. If your rotors turn clockwise, your heli will want to turn counterclockwise so pirouetting to the left will keep more power to your rotor head.

GAIN ALTITUDE and speed before initiating maneuvers. Once again, physics takes over and all that potential (altitude) and kinetic (speed) energy can be traded off for your next maneuver. Loops, rolls, autos, and stall turns go much better with more energy at the start.

TRANSLATIONAL LIFT

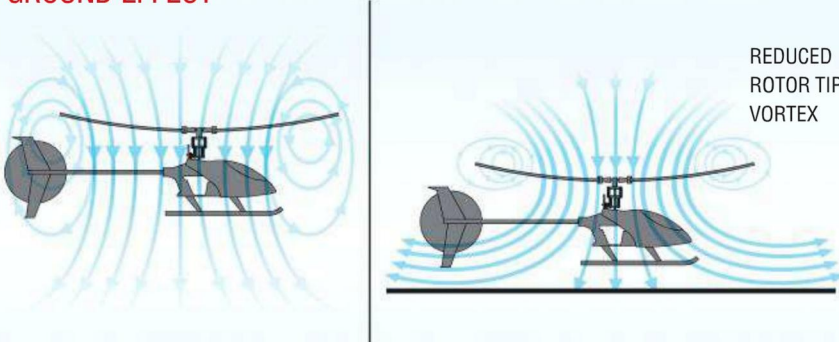


With the helicopter in a hover, induced flow is higher due to the vertical movement of air and the generation of tip vortices, increasing the power required



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

GROUND EFFECT



CONCLUSION

Performance is attained by increasing the gap between the power available and the power required. Think of this Heli IQ before choosing the components on your next helicopter or going for a flight. You'll find it easy to gain performance if you haven't already considered the tips we covered today. **RCH**



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Tail Rotor Dia.	45 mm	Main Motor	0820F
Overall Length	220mm	Tail Motor	0615R
Weight	35g	Transmitter	DEVO 6

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- ★ 6ch color touch screen computer radio
- ★ Strong power and extrem stable

DEVO 6



Guangzhou Walkera Technology CO.,LTD.

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FLYING A MULTICOPTER

Just the facts

WORDS: Ryan Kephart



WHAT IS A MULTICOPTER? In the last few years, numerous models have been introduced with nothing more than motors directly driving airplane propellers and electronic stability. These aircraft come in a variety of configurations using anywhere from two to eight motors. The most common multicopters are quads (four motors), and many of the specialized multicopter flight control systems are built for four motor platforms. Multicopters with six or eight motors can even maintain flight if a motor fails, but these require more sophisticated and expensive flight control systems (plus more motors and speed controllers), so these can be prohibitively expensive. Many new flyers are getting into RC helis with multicopters - they're easy to fly, durable and easy to repair, and they even serve very well as a stable platform to carry cameras.

FLIGHT ENVELOPE

Multicopters can be made to be very capable, but they are limited to upright flight. It's possible to perform loops, rolls, and other basic aerobatics, but extended inverted flight is out of the question.

Multicopters offer a degree of stability, which is comparable to a flybarless helicopter. Like a flybarless heli, the electronic stability system in a multicopter does all the hard work of keeping the aircraft under control and flying according to the pilot's commands. Multicopters are even more reliant on stability augmentation than a flybarless heli; although it wouldn't provide the best performance, a flybarless heli can be flown without stability control while a multicopter cannot.

One of the biggest limitations of all multicopters is the inability to autorotate. Don't fly your multicopter until the battery is dead, because it will fall out of the sky.



If you want to see how much you can push a multicopter, check out Warthox's videos online.
<http://vimeo.com/14192366>

DON'T FIGHT IT!

Because a multicopter is so reliant on the flight control system, you have to guide the model with deliberate control inputs and avoid making many small corrections. This is very similar to a flybarless heli; trying to make corrections for every small movement will only make the model appear more erratic as it tries to follow every command.

When you get in trouble flying a multicopter, your best option is to let go of the cyclic stick and try to stabilize the throttle. Let the flight control system do its thing to stabilize the aircraft if you lose orientation; most multicopters can be brought down safely using only throttle control if you descend slowly. To make a smooth and slow decent, lower the throttle stick to just below the hover position and let the model descend at a reasonable pace. If you just chop the throttle, the props will stop and you may not be able to recover.

SUGGESTIONS FOR IMPROVING VISIBILITY

If you plan to fly from the first person view (FPV), which multicopters excel at, you won't have to worry at all about orientation, but if you fly "regular" RC it can be difficult to tell which way your multicopter is heading. With symmetrical airframes, most multicopters use colored booms, colored props, or lights to help distinguish orientation. These options certainly help, but you can also add some heli-like features to help guide the way. Depending how your multicopter is laid out mechanically, you can add a vertical tail fin to the rear boom or even add a small heli canopy to the front of the center fuselage section. Landing gear from a heli can also help with orientation. Many multicopter frames use extended portions of the frame to serve as landing skids. While this functions fine for landing gear, adding heli type landing gear also serves to improve visibility.



Bright colors are a plus.



CONCLUSION

With more multicopter models hitting the market, these uniquely simple aircraft are here to stay. Despite having restricted flight envelopes, multicopters have a lot to offer. For the hobbyist who wants to build their own RC Heli, multicopters make that a practical possibility without having to worry about complicated things like rotor heads, tail rotors, and gear drives. Many companies are introducing flight control systems for multicopters in different configurations, and you can even hack a Nintendo Wii controller and build your own flight control system for a multicopter (do an internet search for "multiwiiicopter" for more information). On the flip side there are multicopters which are some of the most ready to fly models you can purchase, such as the Parrot AR Drone. Whether you want to build your own airframe and electronics or just have something that is plug and play, stable and easy to fix, multicopters are a great option for pilots with a variety of needs. **THE**

PRO PILOT FAVORITES with **BOBBY WATTS** **THE TAIL SLIDE**

WORDS: Ryan Kephart

START

1 Start from a high altitude and pitch the nose up using back cyclic. Center the collective stick as the helicopter pitches.

3 In very short time your helicopter will be at terminal velocity. Watch out for the tail and make sure that it doesn't blow out. If any indication is seen, you should bail out of the maneuver.

4 To exit the maneuver, apply forward cyclic and some positive collective. This will orient your helicopter upright and maintain the exit altitude. More collective is used to slow the helicopter's decent, and reduced shortly thereafter to maintain the bail out altitude.

Watts up Doc?



2 Hold the collective stick at zero pitch and allow the helicopter to build up some speed. Small collective inputs might be needed to counter any wind.

PILOT INTERVIEW

RCH: WHAT IS YOUR FAVORITE MANEUVER TO PERFORM?

BOBBY: The tail slide

RCH: HOW DID YOU LEARN THIS MOVE, AND WHAT ARE SOME OF THE CHALLENGES YOU FACED?

BOBBY: I saw Jim Stark and Jerry Sudimick doing them around 2004-2005 and I thought it was so cool! It's been my favorite or my least favorite maneuver since (depending on the outcome). The biggest challenge I faced was lawn darting it into the dirt if the pullout is too low. Fortunately I've only done that once!

RCH: HOW DO YOU FIT THIS MANEUVER INTO YOUR FLIGHT ROUTINE?

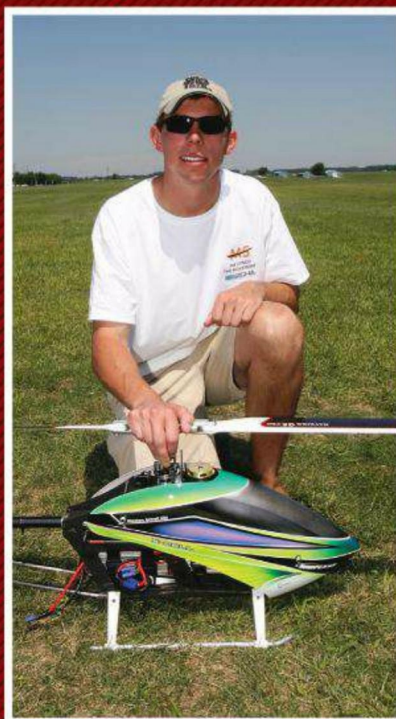
BOBBY: I usually save this maneuver for the climax of the routine. I let the routine and music build up, then I line up for a tail slide and try to nail the pullout to the beat of the music. Then I usually go into some smack or low cool stuff afterwards once all that adrenaline is pumping

RCH: WHAT ARE SOME THINGS TO WATCH OUT FOR WHILE PERFORMING THIS MANEUVER?

BOBBY: Watch your pirouetting speed consistency; this is essential to a properly executed piro flip. Piro flips are not only about timing, they're about flying the machine; you have to be in complete control at all times and know exactly where the tail is, as this will translate into cyclic movements that have to be quite precise. If not, it won't look good.

RCH: HOW CAN A PILOT LEARN THIS MANEUVER?

BOBBY: 1) Take the helicopter really (really really really) high. 2) Pull back on elevator cyclic. 3) Zero the collective. 4) Let it fall as long as possible. 5) As low as you are comfortable, give a positive collective pop, as well as forward elevator at the same time to make a



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Thunder Power RC.

nice blade pop, and exit. Exiting into a pirouetting flip usually looks really cool!

RCH: WHAT ARE SOME THINGS TO WATCH OUT FOR?

BOBBY: The ground

RCH: BOBBY WATTS IS ONE TALENTED PILOT THAT HAS THE SPONSORS AND FLIGHT PERFORMANCE TO PROVE IT. HE HAS BEEN ALL OVER THE WORLD TO PERFORM DEMONSTRATIONS. YOU CAN ALWAYS CHECK BOBBY OUT AND LEARN FROM HIS EXPERIENCES ON HIS CO-FOUNDED INTERNET TV SHOW CALL *SMACK TALK*, WHICH ALSO STARS LAST MONTH'S PRO PILOT BERT KAMMERER. CHECK OUT BOBBY PERFORMING THE TAIL SLIDE AT 2:30 HERE: WWW.TINYURL.COM/TAILSLIDE

With a name like Watts, Bobby must like electricity!



POWER LINE MAINTENANCE

It's a Shocking Job!

WORDS: Ryan Kephart

Helicopters are used for many things including transportation, military roles, police work, and rescue. However, one of the most interesting uses for helicopters is power line maintenance. This job requires that both the worker and pilot be extremely cautious. This month we'll show you how this job is done, and what it takes to be a power line maintenance helicopter personnel.



HOW DO THEY DO IT?

Getting to the power lines is the easy part - just hop on the helicopter on a tiny little seat mounted to the skids and travel high above the tree covered forest until you reach your destination. The maintenance worker is outfitted with what they call a "hot suit". It's a metal suit that allows the voltage of the power lines to move across the suit, charging it up to over 500,000 volts. The helicopter is also attached to the power lines while the worker climbs onto the lines. This is all possible because both the helicopter and the worker are not touching the ground. A probe is used to gradually

increase the voltage of the worker's suit and the helicopter. Once the worker is suspended on the lines, the helicopter can be detached from the cable and is free to fly around. The worker is now suspended over a 100 feet off the ground and performing his normal work duties.

WHY ARE THEY UP THERE?

Power lines need to be maintained to operate correctly. These lines are affected by weather, corrosion, and even overgrown trees. There are other ways to maintain the lines, but every other method requires that the power lines be taken out of service, leaving the

towns they supply without power. This method allows the power lines to remain operational throughout the year. Without these brave men, electricity would be all but eliminated to those who live in rural areas of the world.

CONCLUSION

Do you think you can perform this job? These guys have nerves of steel and yet some say they are afraid of electricity, heights, and helicopters. So next time you turn on a light or reach for that microwave dinner, thank the hard working guys who put their lives on the line to help your home receive electricity. **REEL**

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Specifications:

Minima 6T **Stock#** 26610

Size: 1.22 x 0.82 x 0.28 in

Weight: 0.23 oz (6g)

Minima 6E **Stock#** 26612

Size 1.25 x 0.82 x 0.43 in

Weight: 0.23 oz (6g)



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