



« Is This **THE BEST 3-AXIS GYRO** Ever?

# RC+Heli

THE WORLD'S BEST-SELLING RC HELICOPTER MAGAZINE

**TREX!**  
**EVOLVED!**  
**TREX 500**  
**SUPER COMBO**

**TESTED:**

- » **PROTEK RC**  
PRODIGY 610 DUO
- » **FUTABA** CGY750  
3-AXIS GYRO
- » **G-FORCE** 4-IN-1  
SPINDLE TOOL

**HELIS EXPLAINED:**

Flybarless Blades  
Brushless Motor Ratings

**HOW-TO:**

- ▶ Do An Inverted Loop
- ▶ Track Your Blades
- ▶ Pirouetting Loop
- ▶ Selling your Helis
- ▶ Build A Deans Jumper

JUNE/JULY 2011 / ISSUE 59



www.RCHELIMAG.com

**FUN FLYING COAST-TO-COAST: SAN DIEGO TO JERSEY!**





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now for helis!***



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AVAILABLE SPRING

# 2011

COMPETITION PERFORMANCE  
AT THE PRICE YOU'VE BEEN WAITING FOR!



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# THE BOLDEST BLADE YET



## 450 3D

The Blade® 450 3D is a completely new ready-to-fly heli design that lets you boldly fly aggressive, stick-slaming 3D maneuvers as soon as you can get it out of the box and charge the battery. The Blade development team set out to equip it with engineering and mechanics that rival anything you would find on more expensive machines that take hours to build. It even comes equipped with new cyclic and tail servos that were developed specifically for the hard 3D maneuvers it was designed to fly.

### Blade 450 3D Advances Include:

- NEW** rotor head mechanics and engineering
- NEW** weighted tail blade screws that improve tail response
- NEW** wider diameter tail boom for added stiffness and precision
- NEW** E-flite® G210HL MEMS gyro for superior heading hold performance
- NEW** E-flite DS76 digital cyclic servos for more precision and power
- NEW** E-flite DS76T digital tail servo for faster response
- NEW** E-flite 35A Pro S-BEC brushless speed controller for more power and efficiency
- NEW** E-flite 3S 11.1V 2200mAh 30C Li-Po battery (included with RTF)
- NEW** Spektrum™ DX6i DSMX™ 6-channel transmitter with two pre-programmed setups (included with RTF)

**LENGTH:** 25.8 in (655mm)  
**FLYING WEIGHT:** 26.9 oz (760 g)  
**ROTOR DIAMETER:** 28.4 in (720mm)  
**MAIN MOTOR:** E-flite 420H brushless outrunner, 3800Kv (installed)  
**ESC:** E-flite 35A Pro S-BEC brushless (installed)  
**RECEIVER:** Spektrum AR6115e 2.4GHz DSMX (installed)  
**CYCLIC SERVOS:** E-flite DS76 Digital (3 installed)  
**TAIL SERVO:** E-flite DS76T Digital (installed)  
**GYRO:** E-flite G210HL micro heading lock MEMS gyro (installed)  
**BATTERY:** E-flite 3S 11.1V 2200mAh 30C Li-Po (included with RTF)  
**CHARGER:** E-flite DC 3S 11.1V Li-Po balancing (included with RTF)  
**TRANSMITTER:** Spektrum DX6i 2.4GHz DSMX™ 6-channel computer radio (included with RTF)

**RTF**

BLH1600

**BNF**  
BASIC

BLH1650

Ready-To-Fly and Bind-N-Fly® Basic versions are available. Get to [bladehelis.com](http://bladehelis.com) right now for complete details, videos and more.

# BLADE

#1 BY DESIGN

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H O B B Y

[horizonhobby.com](http://horizonhobby.com)



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ON THE COVER: This month we'll take a look at two all around good helicopters that pretty much come with everything you need to get up into the wild blue yonder.



» **27 FUTABA CGY750**  
Futabas first flybarless gyro. Did they do it right?

» **70 E-FLITE BLADE 450 3D**  
An all around good heli to get you started



» **60 FLIGHT CHECK: ALIGN TREX 500 SUPER COMBO**  
Everything you need.



» **HOW-TO: TRACK BLADES**  
Matching your blades to fly in unison.



## TESTED

**60 ALIGN TREX 500 SUPER combo.**



**70 E-FLITE BLADE 450 3D**  
Batteries.... Included



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Pack it up, and ship it out.

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Something looks a little off.

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Step back from that ledge my friend.

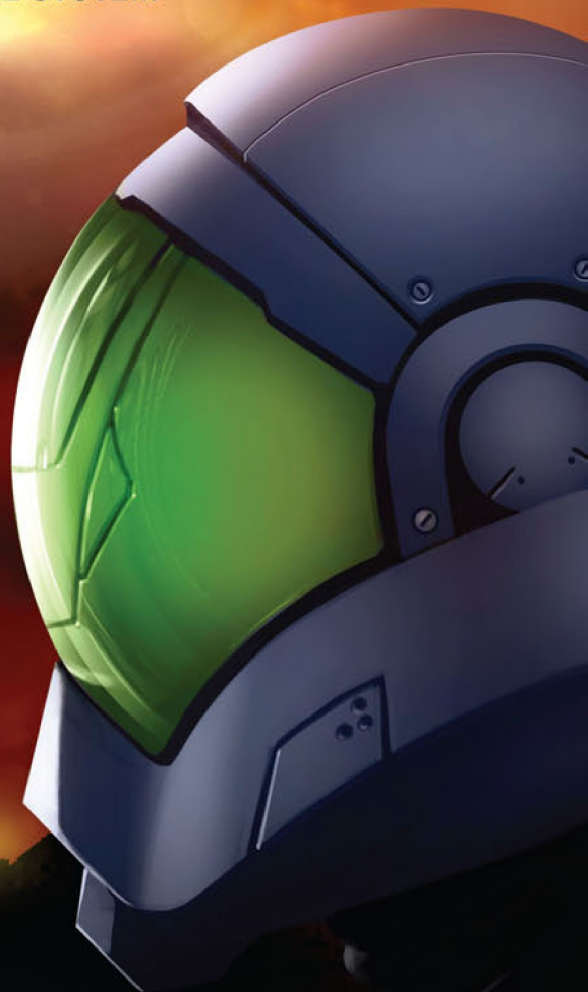
» **56 BLADES FOR BARS**  
...and for barless.





# Two Helis. One Victor.

THE NEW FORCE HELI LASER BATTLE SYSTEM



Go head-to-head in an all-out battle for aerial supremacy with the FORCE® Heli Laser Battle System. You get:

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# Here YOU GO

**I**N ORDER TO MAINTAIN THE HIGHEST EDITORIAL AND PRODUCTION STANDARDS IN THE INDUSTRY, EFFECTIVE IMMEDIATELY, WE ARE REDUCING OUR PRODUCTION CYCLE FROM TWELVE ISSUES ANNUALLY TO TEN. THE TRANSITION WILL OCCUR WITH GREATER TIME BETWEEN ISSUES DURING THE SUMMER MONTHS—THE TRADITIONALLY SLOWER TIME OF THE YEAR BOTH FOR HOBBYIST AND THE INDUSTRY.

## What this means to you

For you our readers, this change will allow us to produce more special features, spend more time with each issue in production, and assure the highest standards for editorial depth, completeness, and accuracy. Subscribers will receive every issue they have paid for. This means that the current subscribers who have paid for twelve issues per year will receive all twelve issues for which they've paid. It will be adjusted automatically and will reflect on your label within an issue or two.

The change will take effect immediately with this issue. Our next issue, the Aug/Sept issue will mark our 60th issue, and to celebrate, we're introducing new layout design. The balance of the year's issues will carry single month issue dates.

We greatly appreciate your business and look forward to many more years of providing you with the absolute best radio controlled helicopter editorial content found anywhere. Speaking of which, this issue is pretty darn good, so get to page turning and start enjoying.

### Mike Velez

Publisher/ Editor-in-Chief  
[mikev@rchelimag.com](mailto:mikev@rchelimag.com)



## CHATTER BOX

WHAT'S YOUR FAVORITE PRO AND/OR CON ABOUT WRITING FOR RC HELI MAGAZINE?



### MIKE VELEZ - Publisher/Editor-In-Chief

**Pro:** Crashes are a business expense.  
**Con:** The internet.



### RYAN KEPHART - Associate Editor

**Pro:** The perks, it almost feels like Christmas every month, well except for the writing part.



### JIM INNES - Editor-At-Large

**Pro:** The people I get to meet and talk with through being associated with the magazine. I get to know many of the amazing people in this hobby through email, funflips, and doing interviews.



### SHAWN KITCHEN - Editor-At-Large

**Pro:** Chicks dig me. It's my story, and I can tell it however I want.

**Con:** Mike quit stocking the editorial fridge with Klondike bars.



### CHUCK BASSANI - Editor-At-Large

**Pro:** Researching the subject matter and learning all there is to know about it.

**Con:** 3000+ miles away from the office, so I can't make it to the photo shoots with the models.



### ART KORAL - Contributor

**Con:** Some topics in Helicopter theory I start writing about dead end and never make press because during the process of researching, I learn how much I don't know instead of validating what I do know.



### AARON SHELL - Contributor

**Pro:** Has to be when I get positive feedback from readers, it's great to know our work is appreciated!

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FLY FREQUENTLY, READ RC HELI MAGAZINE.  
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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).

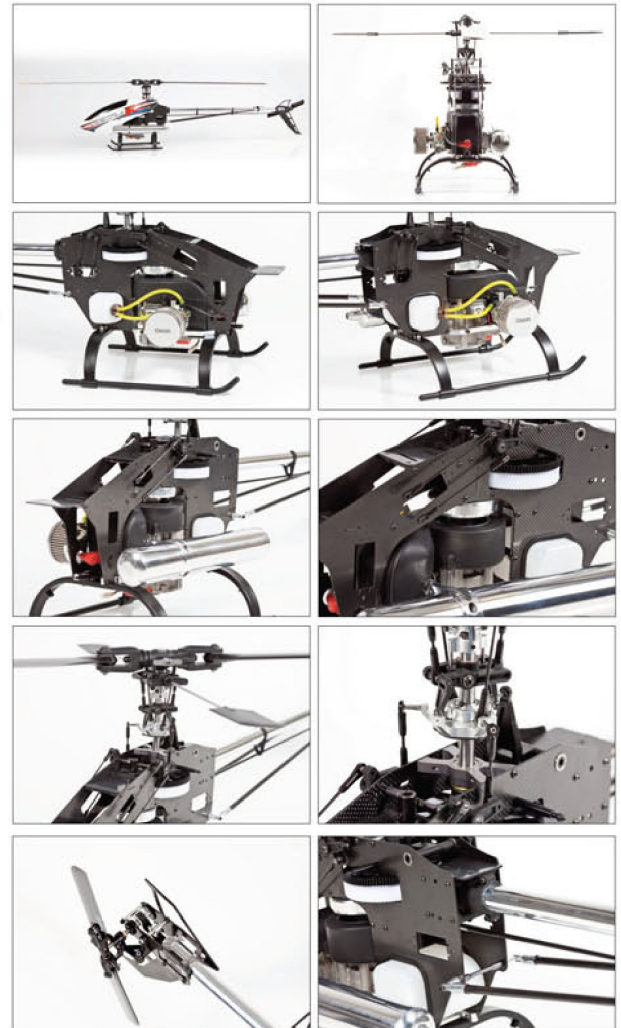
### CN1340C Radikal G30 Carbon kit: .....MSRP \$750

- 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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**NICK MAXWELL**

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**KYLE STACY**

"My runs are strong and consistent from start to finish, regardless where I fly in the country. Engine life is amazing with Rotor Rage—no bearing failures whatsoever!"

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- Greater consistency, gallon after gallon

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# SPEKTRUM AND JR DSMX BULLETIN

Some sporadic reports indicate that some DSMX transmitters are experiencing a backwards compatibility issue that could cause a “hold” on some superseded DSM2 receivers including the AR500, AR6100, AR6100E, AR6110, AR6110E, AR6200, and AR6300. This bulletin does not apply to DSM2 only transmitters. Horizon Hobby is offering a free firmware update that will eliminate the issue. Shipping will also be covered by Horizon. This issue only effects certain production runs so check your transmitters PID located in the battery compartment for the following PIDs.

■ **DX6i/DX5e/DX4e:** HS010, HS011, HH011, HT011, HT012, HE012, HE101, HA101, HA102, HA103, HA104, HA105

**Transmitters with affected PIDs may be found in the following products:** Blade mCP X RTF (BLH3500), E-flite Apprentice 15e RTF (EFL2725), Hangar 9 Alpha 40 DSM2 RTF (HAN4400), Hobbyzone Super Cub DSM RTF (HBZ7400), ParkZone Radian RTF (PKZ4700), ParkZone P-51D BL DSM RTF (PKZ2200), ParkZone F4U Corsair RTF (PKZ4600), Phoenix R/C Pro Simulator 3.0 with DX5e (RTM30R5510/RTM30R55101).

■ **DX8:** HS008, HS009, HH009, HH010, HT010, HE010, HE011, HA011, HA012, HA101, H0102, H0103, H0104, H0105

■ **DX7:** HA103, HA104, HA105

■ **JRP9503:** TM101, TM102, TM103, TM104, TM105

■ **JRP9303:** TM101, TM102, TM103, TM104, TM105

[WWW.HORIZONHOBBY.COM](http://WWW.HORIZONHOBBY.COM)



Great customer service comes to you, not the other way around.



# REALFLIGHT EXPANSION PACK 8

The team at Great Planes has been steadily supplying the simulator gurus with a constant stream of new content for many years. This month RealFlight has released their newest Expansion Pack 8. This expansion adds additional planes, helicopter, and fields to the popular RealFlight simulator. The expansion includes 16 new airplanes including the F14 Tomcat, F9F Panther, Pitts, and Boeing C-17 Globemaster III. Three new helicopters are included with the expansion including the Synergy N5, Thunder Tiger X50B, and Thunder Tiger X50T. New to RealFlight is a Quadcopter that looks similar to the Gaui Quad Flyer we reviewed last year. Three new flying sites include a new obstacle course, San Diego Photo Field, and Austria Photo Field.

Street Price: \$33

[WWW.REALFLIGHT.COM](http://WWW.REALFLIGHT.COM)



# SPIN BLADES MATT BLACK

Are you looking for some new blades that stand out from the rest? Spin Blades has a new blade that will excite both you and your helicopter. These new blades are an industry first matte black finish that is designed for speed flying and 3D. The blades have been tested for over a half a year with 40 prototypes built. The blades are designed to be stable, yet aggressive at the same time. Currently 700mm blades are only available at this time. So if you have a 90-sized helicopter, pick yourself up a pair.

[WWW.SPINBLADES.COM](http://WWW.SPINBLADES.COM)



# ALEES RC



Who is Alees you may be asking? Well if you haven't heard already Alees RC is a brand new company that is created by one of the best helicopter designers in the industry. Charley Stephens has been known for creating helicopter like the Velocity and other great products for manufactures. Now Charley has stepped up to the plate and started his own helicopter company. Not much has been said about Alees, but from what we have heard a new concept design and prototype is underway.





# ALIGN

Conquer Your Heart

## TREX 500

See it  
Feel it  
Fly it

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Awarded the Constructor Championship



### New TREX 500E Super Combo

Specifications:  
Full length: 840 mm  
Total height: 310mm  
Main rotor diameter: 970mm  
Tail rotor diameter: 200mm  
Motor Pinion Gear: 13T  
Main Drive Gear: 162T  
Autorotation Tail Drive Gear: 145T  
Tail Drive Gear: 31T  
Full equipped weight: 1700g  
Drive Gear Ratio 1:12.46:4.68  
Ask your local dealer for  
KX017014



GP780 3D Head Lock Gyro  
(HEG 78001)



RCE-BL70G Brushless ESC w/BEC  
(K10475A)



500MX Brushless Motor 1600KV  
(HML50M02)

### STANDARD FEATURES ON THE TREX 500:

- Light weight design provides awesome flight performance and extreme 3D capability
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- Tail rotor drive belt system
- Fully driven tail autorotation system
- Tail servo boom mount
- Beautiful factory painted fiberglass canopy
- 425D Carbon Fiber Rotor Blades
- RCE-BL70G Brushless ESC w/built in 5-6V step-less adjustable BEC
- 500MX Brushless Motor
- Digital Cyclic Servos DS 510 x 3
- Digital Tail Servo DS 520 x 1
- GP780 Head Lock Gyro x 1



425D Carbon Fiber Rotor Blades  
(H50104)



DS510 Digital Servos x 3  
(HSD51002)

DS520 Digital Servo x 1  
(HSD52001)



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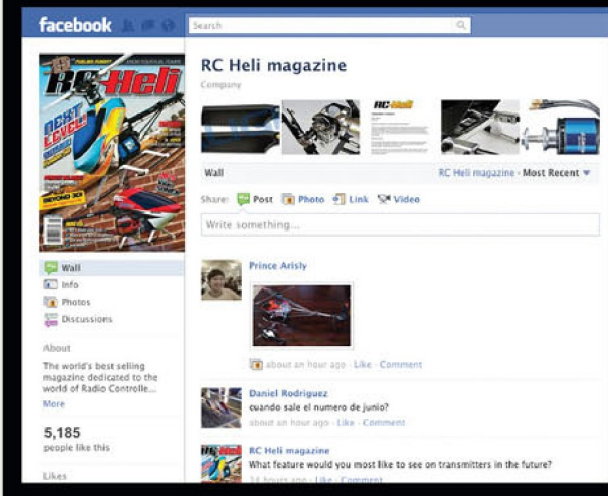
www.alignrcusa.com



## READER FEEDBACK ON facebook

We recently posed the question;

**What feature would you most like to see on transmitters in the future?**



**Clayton Turenne** Hand and thumb warmers.

**Timothy Dawson** Hands Free. This way the radio would work from thought control! Then I will fly as good as I THINK I can!! :)

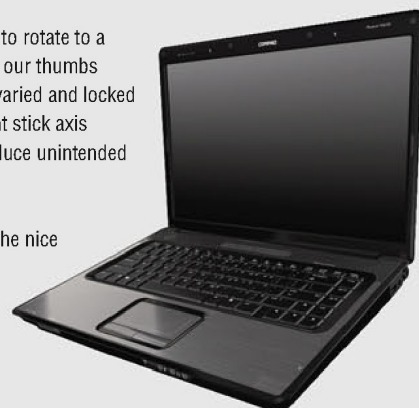
**Oscar Barragan** Beer holder.

**Adrian Tan Kar Yin** The ability to switch the transmitter's LCD screen from normal settings screen to FPV. That way you won't need additional Notebook, equipment or screens. Just flick a switch and fly away like a bird!

**Lau Mon** Yeah, some FBL systems require a laptop for fine tuning, transmitters could feature PC like functions to get rid of the laptop. Or JR and else could sit with FBL system manufacturers to establish common standards so that the FBL unit settings can be performed from the transmitter.

**Steve Ryan** I want the stick axis to rotate to a position that better suits the way our thumbs move e.g - left stick axis can be varied and locked in counter clockwise and the right stick axis clockwise. This would greatly reduce unintended ergonomic interactions.

**Brian Lane** I would like to have the nice red "reset" button on my regular transmitter like my simulator has. Dumb thumb it at the flying field and just hit the red button. Brilliant!



## 4F200LM

3D - RTF - High Simulation - Blue/Silver Color Version -  
3 Carbon Bladed CP- 3-Axis Gyro - CNC Metal Head and Tail

walkera



Dream It Have It  
[www.walkera.com](http://www.walkera.com)

### Features

- Three-blade CP structure, high efficiency and steady flight.
- Three-axis gyro controlled balance system provides accurate flight location.
- High performance brushless motor absolutely features both longevity and power.
- 2.4GHz Dsss technology automatically assigns ID code with strong anti-jamming and high accuracy.

### Specification

- Main Rotor Blade Dia.: 436mm
- Tail Rotor Blade Dia.: 122mm
- Overall Length: 448mm
- Drive Motor: WK-WS-21-004
- ESC: WK-WST-30A-1
- Transmitter: WK-2603
- GYRO: Three-axis gyro
- Battery: 7.4V 1500mAh Li-Po
- Weight: 410g (Battery included)



WK-2603  
Standard Pack



DEVO 8  
Professional Pack



DEVO 12  
Exclusive Pack





# FROM SPORT PILOT TO PRO PILOT

THUNDER POWER RC

FROM SUNDAY FUN TO COMPETITION FLYING AND EVERYTHING IN BETWEEN, THE ALL-NEW G6 SERIES HAS JUST THE LIPO YOU NEED

## The World's Most Advanced LiPo Batteries Yet

*Up to 60% More Power,  
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12C Charge Rates  
and New Low Prices*

Thunder Power RC's exclusive Generation 6 (G6) chemistry delivers the lightest, most powerful, longest lasting and fastest charge rate capable LiPo batteries yet! G6 series batteries offer the highest energy and power density in high-discharge rate capable LiPo technology, weighing less and delivering up to 60% more power than previous and 100% more cycle life than recent generation LiPo batteries. That means more power at less weight for up to an incredible 600+ cycles while also being capable of technology-leading charge rates up to 12C\* for charge times of as little as 5 minutes or less. Available in capacities and configurations from 125mAh to 7800mAh and 1S 3.7V to 10S 37.0V.

*Best of all G6 series batteries are available at our lowest prices ever, are backed by an industry-leading full 2-year warranty, 50% off damage replacement program coverage AND ARE STILL PROUDLY ASSEMBLED AND SUPPORTED IN THE USA!*



### G6 PRO LITE 25C SERIES

#### THE WORLD'S LIGHTEST HIGH-PERFORMANCE BATTERIES FOR SPORT AND COMPETITION USE

The standard by which all light-weight, high-performance LiPo batteries are measured, having won more national and world championships than all other batteries combined, G6 Pro Lite 25C series batteries offer the highest energy density and cycle life delivery available in their class lasting for years of use and beyond. Capable of continuous discharge rates up to 25C and fast charge rates up to 5C\* while delivering up to 20% more power than previous generation batteries.

### G6 PRO PERFORMANCE 45C SERIES

#### AN INCREDIBLE COMBINATION OF PERFORMANCE, POWER AND PRICE

G6 Pro Performance 45C series batteries deliver pro-level performance at continuous discharge rates up to 45C, yet are available at prices up to 40% less than the world-renowned previous generation G4 Pro Power 45C series batteries. They can also be ultra-fast charged at rates up to 8C\* for charge times of as little as 8 minutes or less.

### G6 PRO POWER 65C SERIES

#### THE MOST ADVANCED, MOST POWERFUL AND LONGEST LASTING SERIES OF BATTERIES YET

When your high-power EDF, 3D helicopter or other applications demand nothing but the best, G6 Pro Power 65C series batteries deliver up to 60% more power than previous generation LiPo batteries and up to an incredible 600+ cycles. Their ultra-low internal resistance (IR) also allows them to be capable of ultra-fast charge rates up to a technology-leading 12C\* for charge times of 5 minutes or less.

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Do you remember the old Thunder Tiger Redline 53H? It was one of the first oversized engines on the market for your 50-sized nitro helicopter. Well Thunder Tiger is at it again and producing one of the biggest engines on the market. The Redline 56H features the same great aspects we all loved with the 53H including a heat insulated carburetor mount, and dual needles. So if you are power hungry, and your helicopter feels likewise, the Redline 56H from Thunder Tiger may fill your needs.

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**Displacement:** 0.553 cu in (9.05 cc)

**Bore:** 0.906 in (23 mm)

**Stroke:** 0.858 in (21.8 mm)

**RPM Range:** 2000-21,000

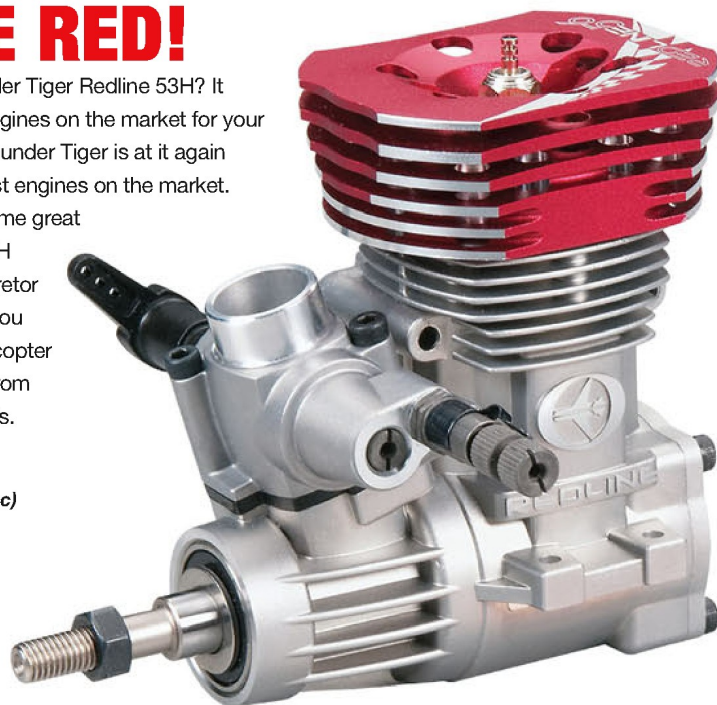
**Output:** 2.23 hp @ 17,500 rpm

**Weight:** 13.8 oz (390 g)

**Includes:** Redline R3 glow plug

**Street Price:** \$229.99

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## GOBBLE GOBBLE

This helicopter sounds like something out of a Spiderman movie, but I think this new helicopter from SAB has much more under its sleeve than any fictional comic book character. The SAB Goblin is a 90-sized electric with the ability to mount up to a 62mm diameter motor. The helicopter is designed using a module style construction that has never been seen before in this industry. The main rotor system, including the servos, motor, and main rotor drive train completely separates from the frame. The tail boom, servo, and belt also remove from the frame in a single piece. Not much is said about this helicopter (in English), but we will keep you informed when we hear more. For now, head over to SAB's website, and check it out. You can also check out a flight video of the Goblin in action.

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## LETTERS

### FRIEND FLY

Dear RC Heli,  
I just wanted to share a story of one heck of a Saturday. My flying buddy (and fellow Mikado Logo enthusiast) Matt and I met up for a mini fun fly this past May. Although we now live 300+ miles apart (due to a move), we packed up our Logos and met at a half way point (luckily my Father lives almost smack in the middle with a 200 acre farm ready for flying).

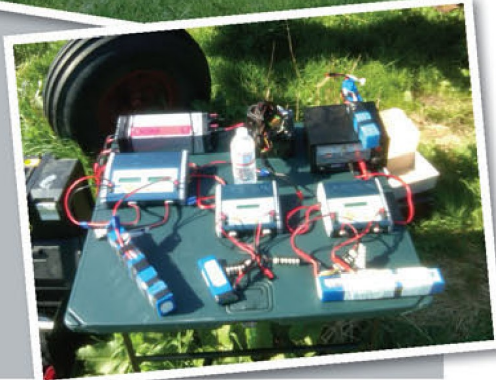
With a generator running and three Hyperion chargers going non-stop, we were able to log 40+ flights between the two of us, as well as get some pretty good sunburn. Our list of helis included a Logo 600se, two Logo 600's, a Logo 400se, a Logo 400, and a mini Protos. The Protos killed the "Logo Only" label

for our funfly, but since it was equipped with a miniVbar it was allowed to fly. All of the Logo's were equipped with Mikado Vbars too (of course).

The day carried a slight breeze that allowed our skin to burn un-noticed, but the sky and temperature were nearly perfect. It was by far the absolute best day that I've ever had in the hobby. Eight plus hours of flying, a bunch of Logo helis, and the company of a great friend (no crashes either, always a bonus). Who could ask for more?

**Ron Kasper**

■ *Sounds like a very good time Ron!*



### TWO YEARS IN THE MAKING

After two years of building, my 500-size scale project is ready' and I want to share it with you and the rest of scale enthusiasts. It's an HK-500 with a BO-105 fuselage from Heliartist, a Hacker A40-10L 8-Pole Electric Turbine Motor, Hitec 225MG servos, KDS Flymentor 3D stabilisation system, Scorpion Commander 90A E.S.C. , Optima 9 receiver, Hitec telemetry system and Aurora 9 for Tx, three sets of navigation lights (two from Heliartist and one from RC-Lights), and scale fittings from RC-Aerodyne and Vario.

The cockpit is from Heliartist, but because the result wasn't what I was looking for I modified the cockpit and added some lights to the main and center console. I also added two NANO Electryfly servos to control the pilot's head and arm. The pilot is Al Pacino from Scarface but with my fashion touch!

The cargo doors are functional and inside are the two of the three sets of navigation lights; the third is under the co-pilot seat and utilizes the lights for the cockpit and the retractable landing light.

The compass on the "dashboard" is functional too. The pilot's door is also functional.

On the co-pilot's seat is the March 2010 issue of RC Heli magazine in which my Blade 400 was machine of the month!

Thanks guys! If you

want you can check my video on YouTube (HK-500 BO-105 (part 6 helicopter ready)). The helicopter hasn't flown yet; I still need to order the batteries! The final step is to order and install the 4-blade rotor head!

**Keep on the great job!**

**Kostas Porichis**

**Toronto Ontario Canada**







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## ROTOR HEAD

### MAN OF FEW WORDS

My Align Trex 500 - All metal, Curtis Youngblood tail blades, JR 770 Gyro, Hitec HS-5245MG on Cyclic, Futaba S9257 on the tail and recently mounted Align carbon boom, all controlled by a Spektrum DX6i.

R.I.C.K (San Diego, Ca)



### CHECK ME OUT!

I wanted you guys to see this. It's the April issue with my Xero-G framed! I hope you like! Thank you!  
Kenneth Salas



### WANT TO SEE YOUR HELI IN THE MAGAZINE?

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

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## FREQUENTLY ASKED QUESTIONS

**Q:** I have used 15% nitro fuel forever. Last week I couldn't find the Rotor Rage 15% locally, so I bought a gallon of the Rotor Rage 30%. At a fun fly this last weekend, I finished off the 15% and started to use the 30%. I would have expected to have to re-tune the needles for the higher nitro. However, the net result is longer flight times with no resetting of the needles. I didn't expect that. I expected higher fuel consumption.

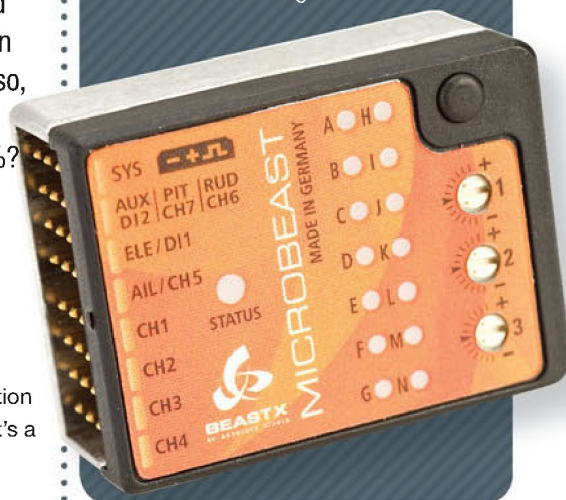
I currently fly a Raptor 60 with an OS Max .61 SFN-H (ABC) with a Perry carb & pump / regulator and I use a Futaba GV-1 governor set to 1800 RPM (about 15,000 motor RPM). The stock fuel tank typically allows for a 12-minute flight—just cruising around, no 3D. I am now getting in excess of 15 minutes per flight—a 20% increase with no changes in the needles. My assumption is the 30% fuel is burning more effectively and the GV-1 is setting a lower throttle position for equivalent power. Was I wrong to expect to use more of the 30% nitro in this setup? Usually, more power equals higher fuel consumption. Maybe I had the needles set too rich in the first place (15%)—so, now the needles are “just right” for the 30%?

**—ticedoff8**

**A:** “My assumption is the 30% fuel is burning more effectively and the GV-1 is setting a lower throttle position for equivalent power.” I would say that's a good assumption. **—Ots**

**Q:** I just converted my T-Rex 600 to flybarless and it fly great. That got me to thinking, has anyone used the flybarless controller on a flybar head? I'm flying a Beast-X and it appears that with the extra stability it would be a great learning tool, especially for learning inverted hovering. **—rafflerback**

**A:** I haven't tried it but I suspect that it could very well be an instant crash. The FBL controller would not get the result it expected from a FB setup. I think it would continue to “correct” trying to get the response for which it was looking. That means I would feel it fighting me as I tried to control its movements. That usually doesn't have a happy ending, but I could be wrong. **—Ots**



**Q:** A friend of mine got a slightly used Raptor 30 V1 and gave it to me to go over. I found a few assembly problems, so I doubt it flew more than five times. But in going over it and redoing the blade grips (including actually putting grease on the thrust bearings that wasn't there before) I have quite a bit of up and down play in the grips after installing them. It almost looks like the bearings are a hair too small in diameter. The retaining screws are tight. Does anyone have a Raptor 30 V1 with a similar issue? My Titan with the bigger grips, bearings, and feathering shaft has no up and down play at all. **—kcgraves**

**A:** Sounds like under-sized bearings or bad dampers to me. Being that it's a V1, they might not have been able to get the original specs or simply had a “close enough” set sitting around and used them instead of the correct ones. **—Skunkworx**



I will have what she is having!



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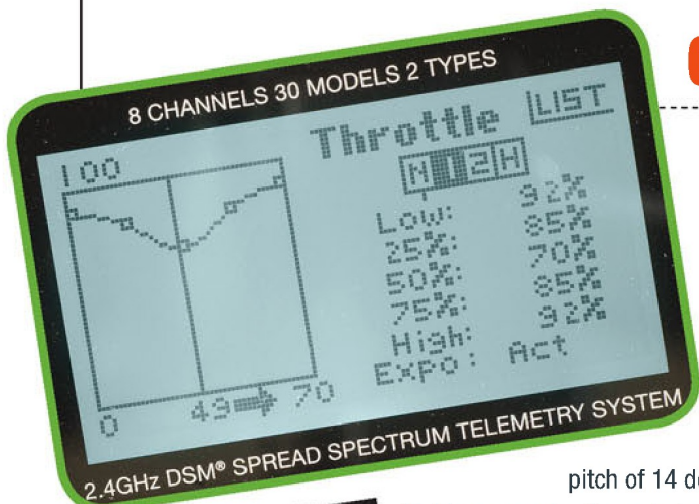
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- Main Rotor Blade Size 600-630mm
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- Tail Rotor Ratio 4.583:1
- Approximate Flying Weight with Fuel: 3.6kg / 7.936 Lbs. (depends on equipment used)





**TIP BY:**  
David Buxton  
Portland, Oregon.

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## GOVERNOR ENHANCED THROTTLE CURVES

**S**OME HELI PILOTS RUN A HIGH HEAD SPEED SO THAT THE BLADES HAVE SOME EXTRA MOMENTUM TO PUNCH THROUGH A MANEUVER. An extreme example from a couple of years ago was a T-Rex 600 pilot running a 2400 rpm head speed and max pitch of 14 degrees. I measured his head speed bogging down to 1800 as he did his highly aggressive “smack down” maneuvers. Imagine having a battery, speed controller, and governor system that could keep that head speed from bogging down. A rock solid head speed of 2100 would probably perform better than doing 2400 bogging down to 1800. Running an average lower head speed means longer flight time (that’s the big payoff), and of course less stress and longer parts lifetime.

For my Vbar pre-compensated governor, what I did was turn down the gain and increase the precomp from the collective and cyclic until my head speed was performing well with very little governor contribution. Then I turned up the governor gain. What fantastic governor performance! My Castle ICE plots the data to prove the point. Precomp on the governor makes a huge difference. Holding a rock solid head speed means that I can turn down my average head speed and get some more flight time. I am guessing that velocity squared wind resistance is a big factor, and as such 10% less head speed should yield more than 10% more flight time.

## BLADE HOLDERS?

**A** blade holder does a lot more than just keep your blades from moving around. The foam blade holder also prevents premature wear and tear on your head components, such as links and mixing arms. Protecting these rotor head parts will keep your helicopter from picking up extra slop. The foam blade holders can also be used as a kneepad for starting and fueling up your helicopter.



## Super Glue (CA) Ball Links

**A**fter you finish building your kit, it’s always a good idea to remove each ball link one by one and add a drop of CA to the threads. This will act as a thread lock and keep the ball link attached to your servo horns or mixing arms. This tip works well for all metal to plastic connections. Do not apply CA to a metal-to-metal connection.



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- RCE-BL70G Brushless ESC
- 600MX Brushless Motor
- Aluminum Tail Boom
- 520 Carbon fiber blades
- 90mm 3K Carbon Fiber Tail Blades



#### Features:

- 3G Programmable Flybarless System
- DS510 (x3) & DS520 (x1) Digital Servo
- 425D carbon fiber blades
- RCE-BL60G 60A Brushless ESC (Built-in 5-6V step-less adjustable BEC)
- 500MX Brushless motor



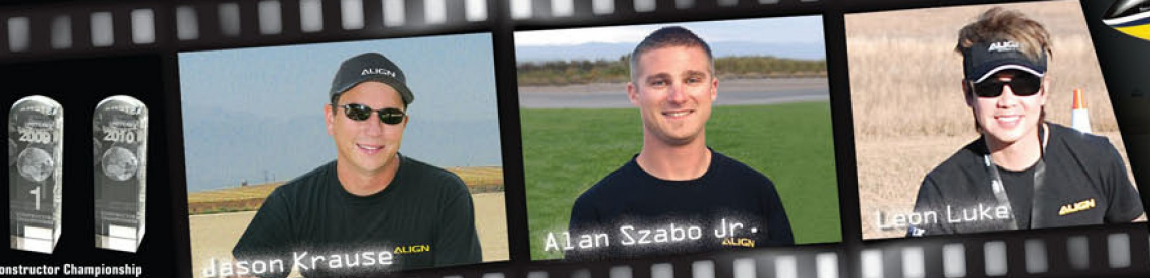
#### Features:

- 325 Carbon blades
- RCE-BL35X 35A Brushless ESC
- 480SP Brushless motor (8700KV)
- DS410M (x3) Metal Gear Digital servo
- GP780 Head lock gyro
- DS620 (x1) Digital servo



#### Features:

- 205D Carbon Fiber main blades
- GP780 Head Lock Gyro
- DS410 (x3) & DS420 (x1) Digital servo
- 37mm 3-4Chum Tail blades
- RCE-BL15X 15A Brushless ESC
- RCM-BL250SP Brushless motor (8400KV)



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# Futaba CGY750 3 AXIS GYRO

Futaba's first flybarless  
control system

**WORDS:** Ryan Kephart



**T**HE TAG LINE STATES THAT THE CGY750 IS "THE MOST ADVANCED 3-AXIS (FLYBARLESS) SYSTEM ON THE PLANET!" We'll test this gyro and see if Futaba has done what they said.

No, the sensor does not light up.

## FEATURES

The Futaba CGY750 features an ultra small gyro sensor paired with an OLED backlit screen and control unit. This gyro also combines Futaba's newest governor software and hardware. The gyro features a dynamic response range of +/- 1200 degrees a second. With the gyro and governor linked to one unit, the CGY750 has the ability to compensate for tail control before the helicopter even

has time to react. This means that the governor can add extra power when performing right pirouettes, or any other time the tail has to hold a little extra during a hard 3D maneuver.

The CGY can support every swashplate type on the market, including 120°, 140°, 90°, and four-servo CCPM setup. The control unit and sensor weigh in at a total of 23 grams, making the CGY one of the lightest gyros on the market; with the addition of the governor,

the CGY750 is the lightest combined unit.

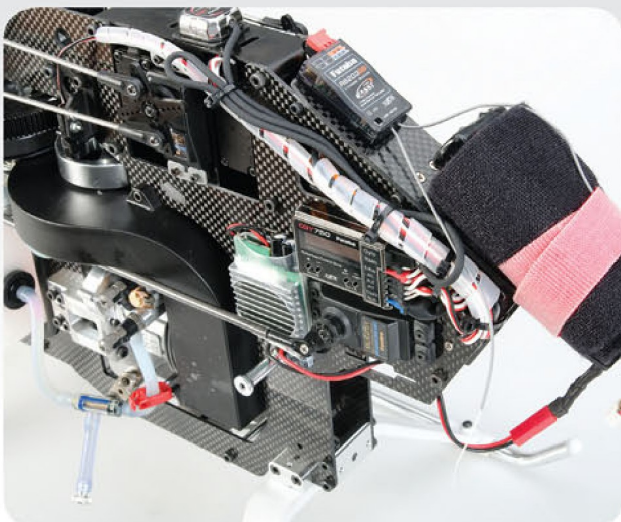
Currently, the CGY750 utilizes the S.Bus wiring system that really simplifies the connection between the gyro unit and the receiver. Futaba has also been working on an S.Bus decoder that will allow the CGY750 to be used with any type of

receiver, but to get the lightest setup, an S.Bus receiver is the way to go.

The CGY also has several program modes, allowing the governor, tail gyro, and swash gyros to be programmed in basic mode, and advanced mode to tweak advanced settings to your liking.

## INSTALLATION

I opted to install the CGY750 on the Synergy N5c, as this helicopter already sported an all Futaba system with brushless cyclic servos. I changed out the Savox tail servo with a brand new Futaba BLS251 and replaced the bulky 12-channel receiver to a new S.Bus R6203SB 3-channel high-speed receiver. I didn't have any problems finding room for this small receiver and gyro control unit. I mounted the control unit onto the side of the frames, and installed a battery and the receiver on the top tray. The small sensor mounted perfectly between the frames. The wires all fit perfectly into the CGY750 and really cleaned up the overall look of the wiring by only using a single line from the CGY to the receiver.







## TESTING

The CGY750 is loaded with features to test, including normal gyro rates, AVCS (head locking) rates, governor, and tail gyro. Each function can be programmed using the basic menu. Each function can also be fine tuned to the pilot's liking using the advanced menus. For this test we wanted to see how well the gyro performed using just the basic menus. The programming for the tail gyro and governor use the already popular GY701 programming, which has proven to be effective and has one of the fastest response rates in the industry. Let's see how the CGY performed with the addition of the flybarless control sensor and programming.

**CYCLIC:** With the preset flight mode set to four, the cyclic felt mildly aggressive like a 3D flybared helicopter would feel. The cyclic was smooth, but quick to respond and stopped well when the stick was released. In normal mode, it felt as if the model was an actual flybared helicopter when flying in fast forward flight. The cyclic required a little amount of pressure to keep the helicopter moving at a consistent speed. In AVCS mode, the advantages of a flybarless control unit took effect. The cyclic was locked in and kept the helicopter at the exact attitude that I placed it in until I applied another input. Overall, the cyclic feel was beyond I could imagine.

**COLLECTIVE:** Unlike other flybarless units, the collective on the CGY seemed to be pretty responsive. Quick collective inputs were instantaneously felt and allowed for aggressive smack down flight. Vertical climbs were straight in both normal and AVCS mode.

**TAIL:** Like the Futaba GY701, the tail performance of the CGY750 sports solid tail performance and pirouette consistency. Throughout the test flights the tail performed exceptionally well without any noticeable blowouts or wagging issues. Overall, the tail was easily set up and performed well without entering the advanced menus. Pirouetting speed was easily adjusted through the radio. The

response was crisp, and every stop was exact, without any lag or bounce back.

**GOVERNOR:** Once again, the governor was setup identically to the GY701. I installed the sensor, programmed the idle and high throttle settings, keyed in the gear ratio, and programmed what I wanted the headspeed to be in all flight modes. The governor did a good job keeping the desired headspeed. It recovered quickly and I noticed how well the governor kept a consistent headspeed when pirouetting. The link from the governor to the gyro made the governor respond faster and allowed the gyro to do its job more effectively.

## CONCLUSION

The CGY is one of the best flybarless control units on the market. Although this is Futaba's first flybarless gyro, it's not their first experience in gyro technology. Futaba is known for their rock-solid tail performance, and now it seems as if they are going to be known for their flybarless control units. Futaba nailed it! **RBL**



### THE GOOD

- small
- lightweight
- perfect control feel

### THE BAD

- Must purchase a decoder to use with other radio systems

### CONNECT

**MANUFACTURER:** Futaba

**WEBSITE:** [www.futaba-rc.com](http://www.futaba-rc.com)

**PART NUMBER:** FUTM0835

**STREET PRICE:** \$320







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### HK-5025 Series

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### HK-5035 Series

2 model for 700 to 800 mm blade Heli's

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# ProTek R/C **PRODIGY 610 DUO PRO CHARGER**

AKA the "Dynamic Duo"

**WORDS:** Chuck Bassani



**T**HERE'S NO ARGUING THE FACT THAT ELECTRIC POWER HAS GONE MAINSTREAM. For those of us engaged in electric power, we have an obligatory task of battery charging and maintenance. As battery technology progresses and 'C' ratings increase (which also tends to raise the acceptable charge current), the power demand placed on your charger ultimately needs to increase along with them.

Purchasing a quality charger that's not only capable of handling a decent number of cells, but is also capable of pumping out a substantial amount current while maintaining cell balance historically has been relatively expensive. Until now ...

## OVERVIEW

Enter the new ProTek R/C Prodigy 610 Duo. This charger is capable of delivering 200 watts of power—times two! Yep, as the name implies, the 610 Duo is, in fact, two 200 watt chargers with built-in cell balancing packed into one compact unit.

Each charge port can handle 1S to 6S Li-ion / Li-Po / Li-Fe, 1S to 18S Ni-Cd / NiMH, and 2V to 24V Pb (Lead) batteries at up to a 10.0A charge rate (so long as the 200W limit isn't exceeded.)

**When charging batteries, three modes of operation are available:**

**BALANCE** – Charges packs to their peak capacity using constant current / constant voltage charge phases. During my testing, individual cell voltages never exceeded 0.02 volts from each other and generally stayed within 0.01 volt.

**FAST** – This mode will charge packs to about 90% of their rated capacity by utilizing just the constant current phase of the charge operation and eliminating the constant voltage charge phase at the tail end of the charge cycle. Note that cell balancing is NOT maintained when using this mode.

**STORAGE** – Charges (or discharges) a pack to its optimal long-term storage voltage level.

For those who wish to cycle their batteries, the 610 Duo supports up to five discharge/charge or charge/discharge cycles.

The really good news is that this charger can be had for under \$150.00. But wait – there's more!

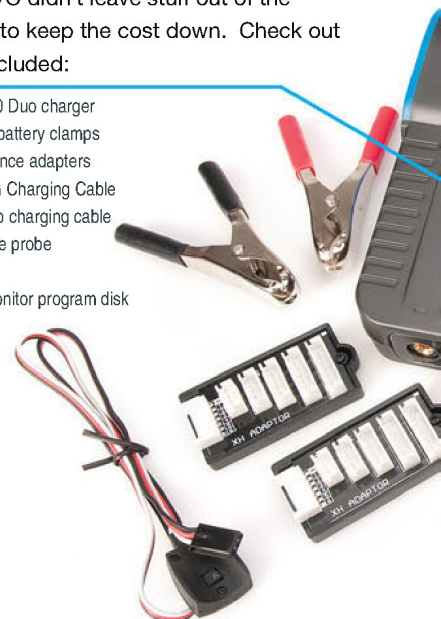
## SPECIFICATIONS

- **Dimensions (L x W x H):** 200 mm (7.9") x 135 mm (5.3") x 57mm (2.2")
- **Weight:** 727g (1 lb. 9.6 oz.)
- **Input Voltage Range:** 11.0 – 18.0V DC
- **Cell Count Capability:** (Li-ion / Li-Po / Li-Fe): 1 – 6, (Ni-Cd / NiMH): 1 – 18
- **Pb Voltage Capability:** 2 – 24V
- **Charge Current Range:** 0.1 – 10.0 A
- **Charge Power Rating:** 2 x 200 watts
- **Discharge Power Rating:** 2 x 25 watts

## WHAT'S INCLUDED?

ProTek R/C didn't leave stuff out of the package to keep the cost down. Check out what's included:

- Prodigy 610 Duo charger
- (2) Plug-in battery clamps
- (2) XH balance adapters
- (2) 18 AWG Charging Cable
- Alligator clip charging cable
- Temperature probe
- USB cable
- Charger monitor program disk





## FEATURES

What immediately caught my attention is that this unit doesn't contain the usual push buttons and adjustment knobs. The 610 Duo features a 'capacitive touch' input system that consists of three 'touch' buttons and a rotary type 'select wheel' that works much like the click wheel on an iPod. The 'select wheel' is used to increase or decrease the selected parameter values and to scroll through the options. There are also '+' and '-' buttons right on the wheel that, when pressed, cause the control to produce a continuous output at a rate which increases the longer the button is pressed. Overall, it's a very user friendly input system that will undoubtedly contribute to a longer service life.

The unit's two-line backlit display is exceptionally readable and one of the

easiest on the eyes that I've seen used in chargers—at any price. The display, however, is shared between the two integrated chargers and must be switched between the two. A dedicated 'CH' button makes this display switching a simple task and an LED on the front lets you know which charger the display pertains to.

Along the front edge of the unit are two sets of banana (charge) jacks, two balance ports, and two temperature sensor ports (one set for each charge port). Also on the front edge you'll find a 'PC Link' port—used for connecting the 610 Duo to your PC for performing PC-based battery analysis. Additionally there's a USB port that outputs 5V at up to 1.0A; useful for charging devices such as cell phones and digital music players. The unit's innards are kept cool by a built-in temperature controlled fan.

All of the charge/discharge parameters are programmable. These include charge current, charge current limiting, capacity limiting, temperature limiting, time limiting, and more. Up to 10 sets of these parameters can be stored and retrieved from internal memory.

## PC BASED ANALYSIS

Included with the charger is a Microsoft Windows based application called 'Charger Monitor'. The application installs easily and the charger connects to the PC via an included USB cable.

The application itself couldn't be easier to use. You simply select the virtual COM port that the driver was installed under, select a filename to save your session to, and then start charging your battery.

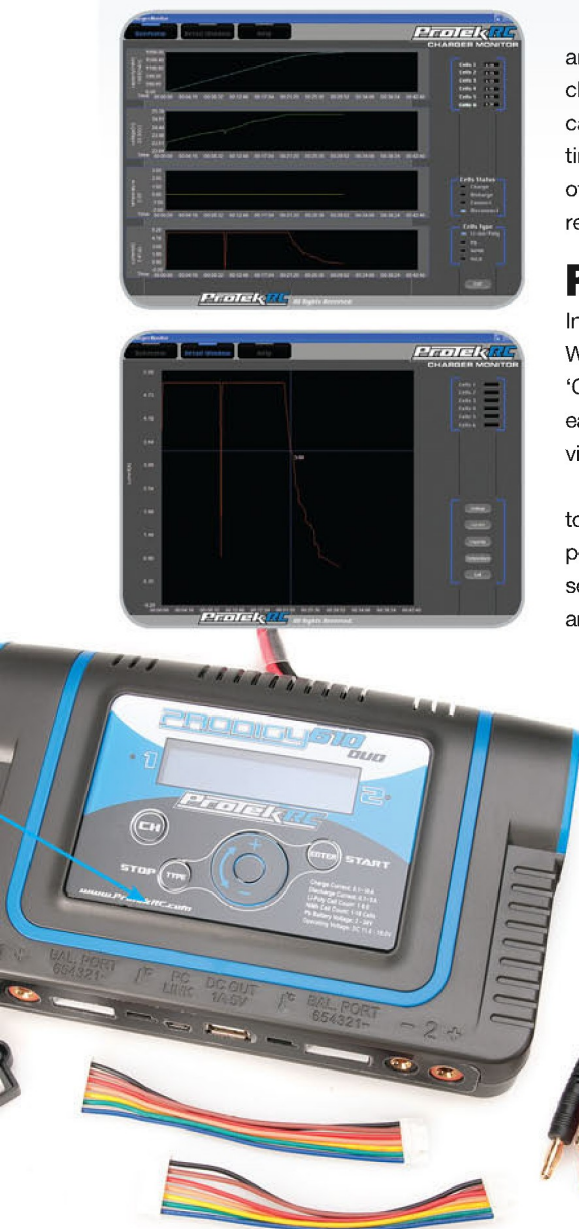
During charging, the monitor displays individual cell voltages, as well as pack voltage, charge current, temperature (if the temperature sensor is attached), and capacity put back into the pack. When charging completes, a file is saved for post analysis (should you desire to go back and look at a later time). One caveat is that the 'Charger Monitor' only works on charger port 1. This of course means that you can only view and maintain logs for batteries that are charged and discharged through that port.

Here is a screen shot of a complete session captured while charging an approximately 30% depleted Turnigy 'nanotech' 6S / 5000 mAh LiPo pack:

The application also allows you to select individual parameters using the 'Detail Window' tab to view it in a larger scale for increased viewing resolution along with a cross-hair that displays values for points on the curve. Here is an example of a detailed view of the charge current:

## CONCLUSION

The Prodigy 610 Duo is more than capable of fulfilling the battery charging and maintenance needs that the majority of us look for in a charger. Given that, along with its compact design and ease of use, I believe that the tables have turned with respect to value vs. functionality. Shelling out the big bucks is no longer a prerequisite for keeping your batteries (and you) happy. Nice going ProTek R/C! **RBL**



### THE GOOD

- Capacitive touch input
- Nice display
- Outstanding value
- Comprehensive functionality

### THE BAD

- PC based analysis only available on charge port 1

### CONNECT

**MANUFACTURER:** ProTek R/C

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

**PART NUMBER:** PTK-8503

**STREET PRICE:** \$149.99





# G-Force 4-IN-1 SPINDLE TOOL

Rotor head  
maintenance has  
never been this easy.

**WORDS:** Ryan Kephart



Nice and easy!

**M**AINTAINING YOUR HELICOPTER CAN SOMETIMES LEAD TO FRUSTRATION WHEN IT COMES TO REMOVING THE MAIN BLADE GRIPS. If you don't know what I'm talking about, then you've probably never applied thread lock to the spindle bolts. When you apply thread lock to the spindle bolts, you can usually remove only one of the blade grips. The other side is usually left attached to the spindle bolt, leaving you with no easy way to remove the other half. You really don't want to use a pair of pliers, as it will mark up the spindle. So what do you use? Thankfully, G-Force has developed an easy way to get that spindle bolt off and reinstalled in a snap with their new 4-in-1 Spindle Tool.

## FEATURES

The 4-in-1 Spindle Tool is constructed from T6-6061 aluminum and CNC machined for the utmost in precision. As you can tell in the picture, the Tool has two sides that are machined with every size clamp needed, including sizes for 450, 500, 600, and 700-sized machines. The 4-in-1 Spindle Tool also has the size of each hole machined next to the appropriate hole. The tool is designed to grip the spindle using a clamping method. This allows the tool to tighten down on the spindle without marking it up or scratching it.

## TESTING

With the ability to use the tool on various helicopters and different sizes of spindles, we wanted to put this little handy tool to the test. All of our review helicopters get a good coating of red thread lock to prevent the spindles from coming

loose during testing and photographs. As such, we went to work pulling out the old 90-sized helicopters and tried removing the spindles. As usual, it took a tremendous amount of force to break the seal from the thread lock on one side. Now it was time for the true test – to see if we can actually break the seal of the second bolt. First, I slid the tool onto the spindle and then clamped it down with the included screw. I then took a grip onto the tool and used an Allen wrench for the bolt. With a strong twist the thread lock broke free and made this once almost impossible task a piece of cake.

## CONCLUSION

The G-Force 4-in-1 Spindle Tool worked exactly as it was designed to and didn't leave a single mark on the spindle. I was pleased with the design and quality of the product and I must say that this tool should be in everyone's tool box. **RECOMMENDED**



### THE GOOD

- Multiple sizes
- Quality tool
- Affordable

### THE BAD

- Only includes one screw for clamping

### CONNECT

**MANUFACTURER:** G-Force

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

**PART NUMBER:** GFA7077

**STREET PRICE:** \$23.00



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# EXHAUST PIPES

Get on the pipe!

WORDS: Ryan Kephart

**A**N EXHAUST SYSTEM IS AN IMPORTANT SYSTEM OF ANY NITRO HELICOPTER. The exhaust system is comprised of an exhaust port from your engine and the exhaust pipe itself. In this segment of Heli Anatomy we will be talking about the exhaust and walk you through particulars of that shiny piece of metal sticking out of the side of your helicopter.

## WHAT DOES A PIPE CONSIST OF?

A pipe can be made from many different materials including steel, stainless steel, or aluminum. Most current pipes are made from aluminum to save weight. Pipes can be made in several ways, but no matter how the pipe was made, every pipe has similar characteristics in common.



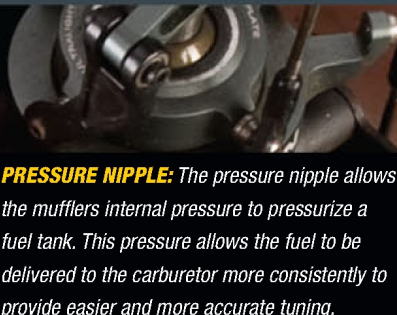
**HEADER:** The header is a way to adapt the muffler to fit the engine. A header can be a part of the muffler or built as a separate piece. High-end pipes usually have a separate tuned header to provide additional power. Some headers like the Youngblood Muscle Pipe have a header that can mount to both a YS and O.S. engines.



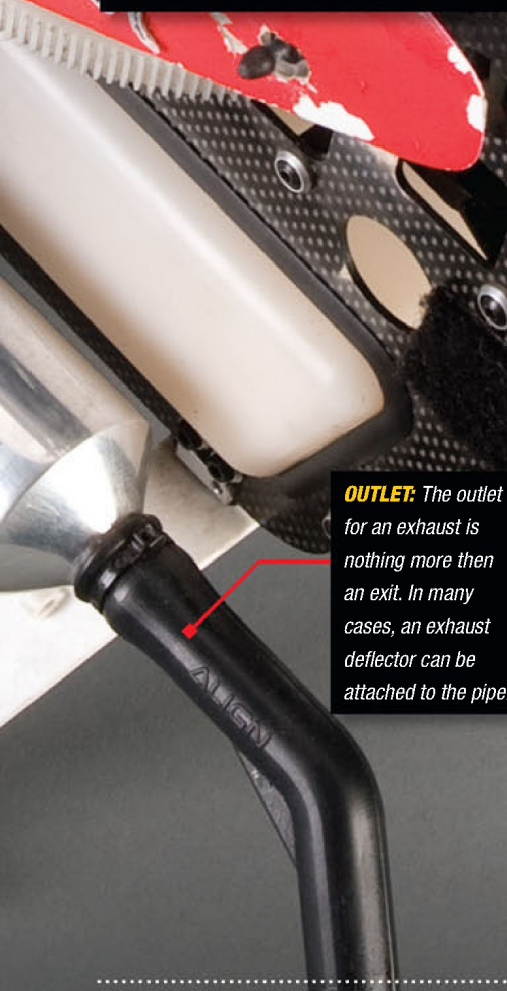
**EXPANSION CHAMBER:** The expansion chamber allows the hot gases to expand and slow in velocity, which reduces the noise level. Depending on the design of the pipe, the expansion chamber can also hold baffles or reflectors to quiet the engine noise, or increase the power by manipulating the pressure waves.







**PRESSURE NIPPLE:** The pressure nipple allows the muffler's internal pressure to pressurize a fuel tank. This pressure allows the fuel to be delivered to the carburetor more consistently to provide easier and more accurate tuning.



**OUTLET:** The outlet for an exhaust is nothing more than an exit. In many cases, an exhaust deflector can be attached to the pipe.

## WHY DO WE NEED THEM?

Mufflers do more than keep the noise down. Many manufacturers will spend countless hours perfecting the way their mufflers perform and how much additional horsepower they can help generate. Aside from the performance benefits, a muffler allows our helicopters to breathe easier. The expansion chamber allows the hot gasses from the engine to expand, which allows our engines to run very consistently compared to an open header.

## SO WHAT IS THE DIFFERENCE BETWEEN AN EXPENSIVE PIPE AND A CHEAPER PIPE?

A basic pipe can be as simple as an expansion chamber with a baffle to restrict the flow. These types of pipes can have multiple plates, but generally offer less performance. A tuned muffler is made of tuned baffles and reflectors that precisely time the pressure waves to maximize engine performance. A performance exhaust system works well for today's powerful engines without adding the huge and somewhat unsightly appearance of yesteryear's "tuned pipes".

## TUNED PIPES

A tuned pipe is a long slender tube that widens at a key point and then tapers off to a small outlet. This specific shape of the tune pipe varies between engine and often times a certain tune pipe is dedicated to a specific brand and size of engine. These pipes are finely tuned to operate within a certain RPM range. This gives the motor the best power at this RPM, but limits how the engine runs at lower or higher RPM. This is where the term "on the pipe" came from. An engine with a tuned pipe runs at optimal performance when it is on the pipe. If the engine does not remain in the specific RPM, a tuned pipe will cause the motor to run roughly. The tuned pipe is still popular in some countries that do not allow high nitro content.

## STANDARD PIPE



## PERFORMANCE PIPE



A little ding never hurts.

# CONCLUSION

When looking for an exhaust for your helicopter, consider what your needs might be. If you are a beginner and have purchased a 30-sized helicopter to practice with and have intent on buying a bigger machine after you have mastered the trainer, then a cheap pipe might work out best for you. Crashes can also damage your muffler, so a cheaper muffler can relieve some of the expense after a bad crash. On the other hand, if you have purchased a helicopter that you can grow with (like the popular 50-size), a high performance exhaust system might be a better choice. **TECH**



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# VELCRO

## Man Made Burr Seed

**WORDS:** Ryan Kephart

**W**hat is commonly known as Velcro is the first commercially marketed company of hook-and-loop fastener. Velcro is an example of trademark name that stuck as a generic term for hook-and-loop.

Velcro was invented in 1941 by the Swiss electrical engineer George de Mestral. George came up with the idea after a hunting trip with his dog in the Alps. Throughout his trip, the seeds from cockleburs kept sticking to his dog's fur and his clothing. When he returned, he took one of the burr seeds and placed it under a microscope. He found that the burr seed had hundreds of little hooks that would stick to anything that had a loop including his dogs fur, clothing, or hair. He then saw the possibility to use this natural engineering to fasten two materials together.



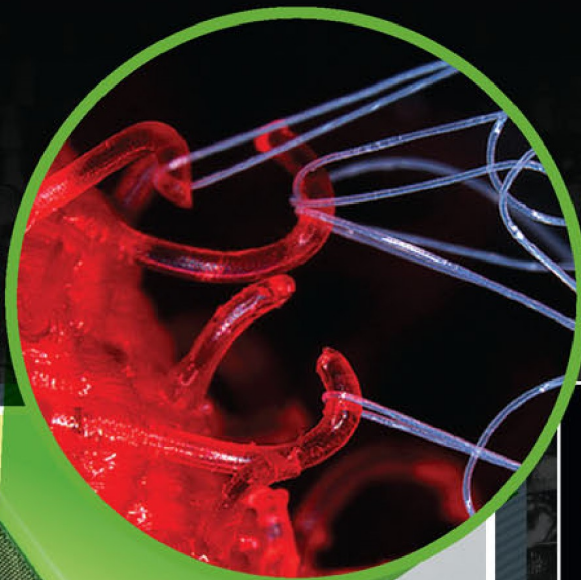
## MANUFACTURING VELCRO

De Mestral took his idea to Lyon, which was the center of weaving at the time. One weaver took his idea and created a cotton version of what we all use today. The cotton version worked but wore out quickly. This lead George to look at synthetic fibers to construct the imitation burr seed. Nylon had been recently invented and George took a liking to its qualities. Through countless trial and errors, he found that when under a hot infrared light the nylon would form hooks that would be perfect for the hook side of the fastener. The discovery was significant, but one problem still troubled George - the ability to mass-produce these results and create the loop side.

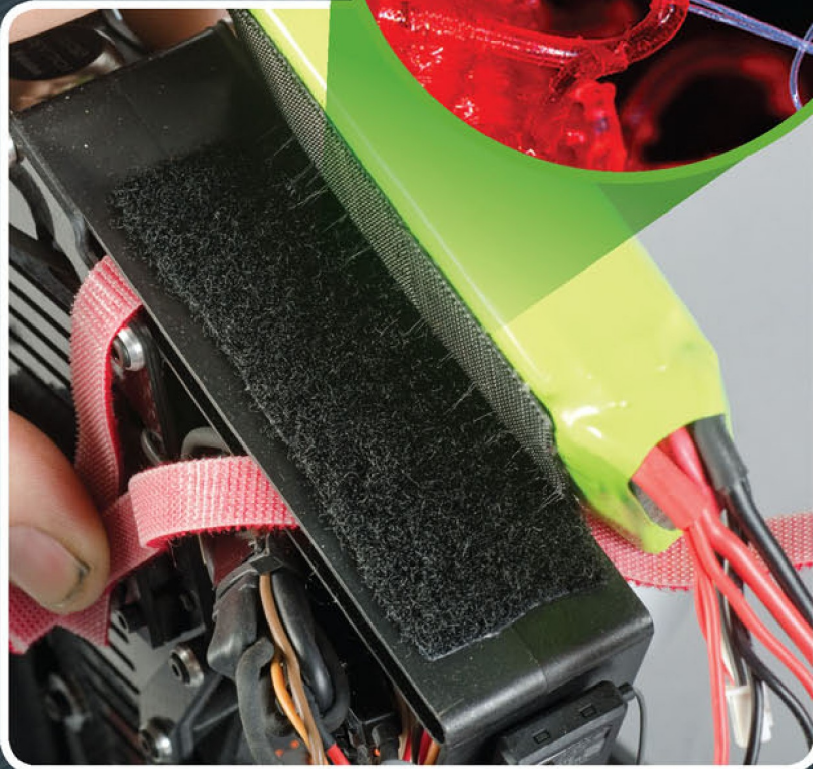
With the use of heat, de Mestral was able to create hoops and then heat treat them so that they retained the shape. This was considered the loop side of the fastener. To create the hook side, he bought a pair of shears and cut the loops. This made a perfect match to the loops, and thus hook-and-loop fastener was born.







Under a microscope you can see that Velcro is comprised of hooks and hoops that lock to one another.



## STRENGTH OF VELCRO

**H**OOK-AND-LOOP FASTENERS MAY SEEM LIKE IT CAN'T WORK VERY WELL, BUT

THINK OF IT THIS WAY: A single ant couldn't build enough resources for a colony, but if you multiply that ant by a thousand you have an army of ants able to thrive and build a colony. Velcro uses these same principles. Thousands of little hooks and loops intertwine and become a single unit. A two inch square piece can support up to a 175lb person. The strength comes from how well the hooks are embedded into the loops. Two rigid surfaces provide the maximum amount of surface area, thus creating the strongest bond.

The background is actually a piece of Velcro.

## HOW DO WE USE VELCRO?

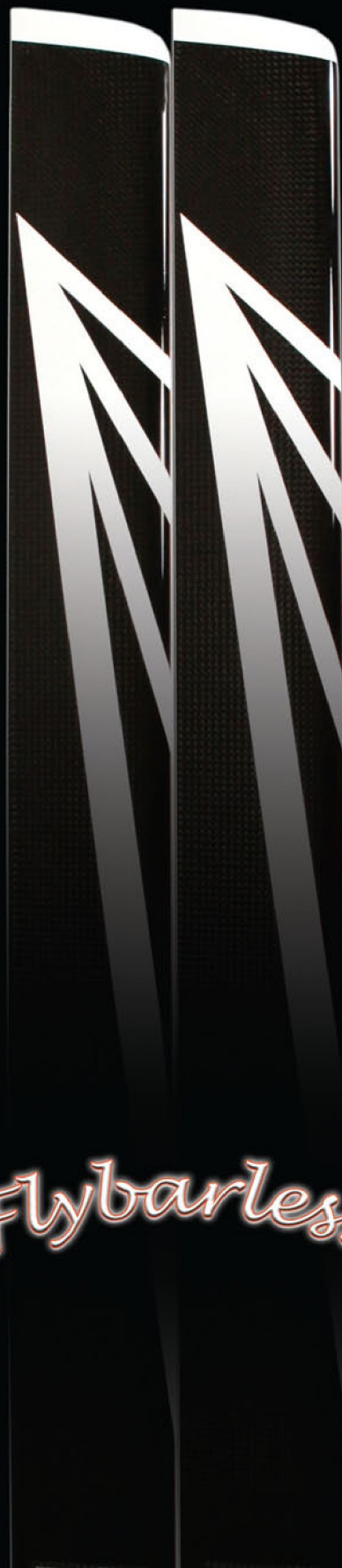
Helicopters, no matter if nitro or electric, can benefit using hook-and-loop fasteners. On nitro helicopters it's used to hold down battery packs, gyros, and other electronic components. Electric helicopters use it on the flight pack, gyro, and other electronic components. Sometimes Velcro is used as a first defense against component movement. Other times Velcro is used as a second line of defense, such as the gyro. Gyros are usually held to the helicopter with double-sided sticky tape, and Velcro is used to make sure that this tape doesn't let go. Flight packs usually use two different styles of hook-and-loop fasteners. A sticky back Velcro is usually placed on the battery tray and the battery, while a second strap form holds the battery down against the sticky backed Velcro. This provides both sliding and separation.



## CONCLUSION

**W**hether you use Velcro to hold down your helicopter components or to hold on your shoe, you can be sure that this little fastener will always get the job done. If you are ever at a fair or amusement park, you may want to check out the ride section. Chances are that you can put on a Velcro suit and stick yourself to a wall! **TRH**





## REGULAR GUY

## REGULAR GUY INTERVIEW

with **RICH DANIEL**

**W**ELCOME TO THIS MONTH'S "REGULAR GUY" INTERVIEW. Each month we interview a relatively unknown pilot who is one of the "good guys" 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 with no 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](mailto:rchelijim@gmail.com).

PILOT **INTRO**

Rich Daniel, this month's Regular Guy, was brought to our attention via one of his students, Dave Sanchez. Dave described the sheer amount of time that Rich gives to mentoring new heli pilots. One thing that really stuck out from Dave's story is the fact that Rich made it a point to call or text Dave on a near daily basis to see how he was progressing with his new nitro bird and to offer help where needed. According to Dave, Rich is constantly helping others at the local flying field. This is something we have come to expect from these true teachers of the hobby.

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

**RICH:** I'm a CPA in Cleveland Ohio. I have been fascinated with RC since I was 12, when I stumbled across a Model Airplanes News magazine in the school library. Soon, I was studying the ads and spending every extra dime on RC equipment—some things never change! Now I'm having fun sharing the hobby with my 7-year old son; we fly everything from gliders to giant scale gassers together.

**RCH: HOW DID YOU GET STARTED IN RC HELIS?**

**RICH:** I had a Kyosho Concept 30 at one time, but with no simulator and no help, I learned to hover and that's all. Every time I put that thing into forward flight it was

a one-way trip. I think it worked out to about \$100 a flight. I eventually beat the thing into oblivion, became frustrated, and gave it up.

I got back into the hobby in a serious way about five years ago after spending an entire summer learning how to hover an airplane. I was feeling pretty proud of myself when my friend, a heli guy, threw down the gauntlet at the field one day with the wisecrack "hovering is the hardest thing for you plank drivers, yet the first thing a heli pilot learns". Not to be outdone, I picked up a Trex 450. This time around was much more successful. I still crashed a lot, but I had a simulator and a whole lot of help and encouragement from the heli guys at the club. It didn't take





long for this part of the hobby to become a complete obsession. I'm up to around a dozen helis now.

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

**RICH:** I'm currently working on something that vaguely resembles a piro-flip after spending a long summer working on inverted backwards flight. I'm also putting a lot of work into connecting maneuvers in a smooth way, really trying to mix up both "big air" and 3D stuff in the same flight. But when I get lazy, nothing beats bashing out tic-tocs over and over again.

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

**RICH:** Fly a lot! Sims are great, but nothing beats the real thing. Find a place close to home or work, and buy a heli that fits your location. You really don't need a lot of space to practice orientations with a small electric. Even the indoor micro electrics are a great tool for keeping your skills up. Flying once or twice a week at the RC club isn't enough!

Fly with a plan. Before each flight, spend a few moments thinking through what you want to accomplish and the order and direction of the maneuvers you're going to attempt. As you master each maneuver, add something new to the mix. It's a building process.

Practice hitting the hold switch until it becomes automatic; a fast reaction can save a ton of money when you get into trouble!

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

**RICH:** It's awe inspiring what these helis are capable of. The technology is amazing and progressing daily. I can fly in winds that leave the planes grounded, and I can find a place to burn up a couple packs just about anywhere. The friends I've made with the hobby are incredible, and it's a hobby my kids can participate in, too. I don't plan on quitting until they pry the transmitter out of my cold, dead hands.

**RCH: THANK YOU RICH FOR YOUR TIME AND DEDICATION TO HELPING OTHERS IN THE HOBBY. ALSO, A BIG THUMBS-UP TO YOU FOR CONTINUING TO PUSH YOURSELF IN YOUR OWN PROGRESS!**

## CONCLUSION

Rich embodies what it means to be a mentor and "good guy" at the field. He's willing to not just get someone in the air quickly, but to show them how the heli is set up and how to practice proper techniques along the way. The fact that he chooses to contact his students outside of regular flying days shows how much he truly cares about their progress in a hobby he has come to love. If you know someone like Rich who has influenced your progress in the hobby, please let us know. Have fun and see you at the field! **TRH**

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# The Ins and Outs of SELLING YOUR HELICOPTER

Making you and your buyer happy

WORDS: Ryan Kephart



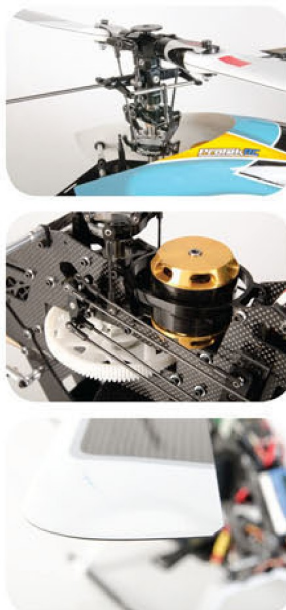
**H**AVE YOU EVER FOUND YOURSELF LOOKING AT ONE OF THOSE NEW SHINY HELICOPTERS ON THE HOBBY STORE SHELF OR ON SOME WEBSITE, but can't seem to muster up the cash to make the purchase? Well, thankfully you probably have an old helicopter that doesn't really get flown much anymore since you're ready to move on to a more advanced heli. This month we'll show you the ins and outs of selling your old helicopter and getting that cash you desperately need.

## CREATING AN IMAGE THAT WILL HELP SELL YOUR HELICOPTER

Before you can sell your helicopter, you'll need to highlight its features to get the buyer interested in purchasing. Taking photos will show the buyers what they're purchasing. You'll want to take some extra time to clean up the helicopter as well as you can, make any repairs necessary, and replace any parts that may be worn out. Set up an area to take your photos that is well lit, without a lot of clutter in the background. Here are some photos of key areas that should be shot and included with the listing.

### Key photos

- 1: Overall ¾ shot
- 2: Close-up of the rotor head
- 3: Close-up of the tail
- 4: Close-up of the servos (if included)
- 5: Close-up of the gyro (if included)
- 6: Close-up of the engine or motor (if included)
- 7: Close-up of the speed control or muffler (if included)
- 8: Close-up of any damage or wear



### » SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

**3.0** **RC-Heli**

### » TIME TO COMPLETE

 **2** Hours

### » TOOLS NEEDED



■ BUBBLE WRAP



■ SUITABLE BOX



■ PACKAGING TAPE



■ PACKING PEANUTS



■ OLD NEWS PAPER



■ BASIC TOOLS



■ PLASTIC GARBAGE BAG



■ EBAY



■ FORUMS

Larry The Cable Guy is into RC Heli's.



## PLACING THE AD

**W**ith the use of the Internet, selling and buying things couldn't be easier. Websites like eBay offer much more than a place to put your helicopter up for sale. When you use eBay, your helicopter is open to buy to the public worldwide. Ebay also offers the ability to use Paypal, which is one of the most secured money transactions on the Internet.

When placing your ad, don't forget to add the pictures and description. Make sure that you use a spell checker before you post. Misspelled words can deter potential buyers. Make sure to note any additional items included with the helicopter. If your helicopter is damaged, make sure to note it and describe what's broken and if it can be fixed. Many people buy helicopters off eBay for parts, so if your helicopter is in bad shape but still has some usable parts on it, you may still be able to sell it.

After placing your helicopter on eBay, visit popular RC helicopter forums like RunRyder, Helifreak, and our own forum at rchelimag.com. Start a new thread and supply a link to your auction on eBay. This will spark up the interest on these websites, and possibly create a bidding war to maximize your profit. You can also place your helicopter as a "Buy It Now" sale. This will ensure that your helicopter will be sold at a price you are comfortable with, but it can also limit the maximum. Try to give the buyer several options for shipping. This will allow the buyer to select a faster shipment method if they're in a hurry, or to save a little money and endure the wait.

## » PREPPING THE HELICOPTER FOR SHIPPING

**T**o prepare the helicopter for shipping, several steps need to be completed to make sure that the package arrives to the buyer without getting damaged in transit. These steps are the same regardless of size, power type, or style of helicopter. Have a rag and a bottle of denatured alcohol ready. Throughout each step, it's a good idea to take a look at the part and clean the hard to reach areas to ensure that no oil residue or dirt has accumulated. You'll also want to have a box that is a little longer than the tail boom assembled with the tail case, some bubble wrap, packaging peanuts, and several large trash bags.

### PARTS REMOVAL

- 1: Remove the canopy, clean it thoroughly, and set it aside.
- 2: Remove the main rotor head and clean the oil residue off the main shaft. Insert the Jesus bolt back into the main shaft and thread the retaining nut until a few threads are exposed beyond the nut. At this time, remove the main rotor blades. If the rotor head is flybarred, you'll want to remove the flybar as well.
- 3: Remove the tail boom assembly from the frames, clean thoroughly, and thread the screws back onto the tail boom mount. Do the same with the boom supports. You may need to remove the tail case and boom clamp from the boom to shorten the length in order to fit inside the box.
- 4: Remove any fuel left inside the fuel tank if you're prepping a nitro helicopter. Make sure to remove every drop to ensure that the package passes TSA inspection.
- 5: Remove the landing gear, clean, and install the screws back onto the mount.





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### PACKAGING

- 1: Wrap the head in bubble wrap and secure it with a piece of tape.
- 2: The rotor blades can now be wrapped together by separating them with a single layer of bubble wrap. Roll the wrap around once on one blade, add the second blade on top, and then wrap the two blades as one. Secure them with packaging tape. You can also tape the flybar to the outside of the bubble wrap.
- 3: Wrap the flybar paddles the same way as the blades.
- 4: Wrap the tail case with bubble wrap and secure it with tape, then place the whole tail boom and case inside a trash bag.
- 5: Place some bubble wrap on the sharp points of the frame. This includes the canopy standoffs, anti-rotation bracket, and any other sharp object. Place the frame inside a large trash bag.
- 6: Stuff the inside of the canopy with some old newspaper so that it doesn't collapse, then wrap the whole canopy in bubble wrap and secure it with packaging tape.
- 7: Place a layer of bubble wrap on the bottom of the box. Place the tail boom along one side. The frame should rest just above the tail boom as close to the tail case as possible. Insert the main rotor head above the tail case. The canopy should be placed away from everything to prevent scratches or excessive weight. Now fill the box with packaging peanuts. The trash bags you used for the tail boom and frame will keep the packaging peanuts out of them, allowing the buyer to easily remove the package.
- 8: Use packaging tape and secure the box using several strips over the middle. It's also a good idea to seal up the seams of the box using packaging tape as well.



### CONCLUSION

Now that you have sold your helicopter and sent it on its way to a proud new owner, you can get ready for your next project. So cash in your earnings and hopefully if you bought a used helicopter, it's packaged just as well as you packaged yours. **RCH**





Castle engineers Jonathan Feldkamp (left), and Richard Hofer (right) with Tim Jones.

Tim Jones Beast: 700mm blades, jaw dropping power, 2300 rpm headspeed. Ballistic performance, governed to +/- 25 rpm by Castle Phoenix Ice controller and software.

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# BLADE TRACKING 101

When two blades become one.

**WORDS:** Ryan Kephart

**T**he term “Tracking your rotor blades” refers to making each rotor blade follow the same plane of travel. When blades are out of track they can cause vibrations and drag. This robs power from the main rotor and can also increase fuel consumption (not to mention shake the helicopter to pieces). It’s not hard to identify if your helicopter blades are out of track. When hovering, you’ll be able to see two blades in a “V” shape. This two-step How To will get you—and your rotor blades—on the right track.

## » SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

**1.0** *RC-Heli*  
MAGAZINE

## » TIME TO COMPLETE



**6** Minutes

## » TOOLS NEEDED



■ BALL LINK PLIERS



■ HANDS



■ BUDDY (FRIEND)

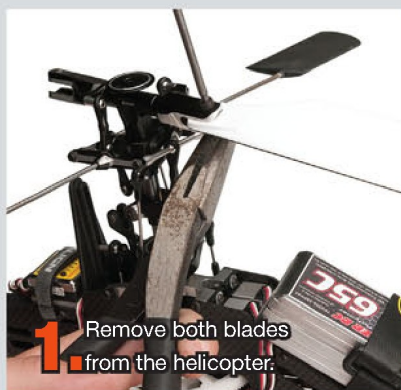


■ TRACKING TAPE



## » PREPPING TO TRACK YOUR BLADES

The first step to tracking your blades is the use of tracking tape. This can be found at your local hobby store or online dealer. Tracking tape is a lightweight, colorful tape that can be applied to the ends of the blades. Some manufacturers include this tape with their blades. Two different colors of varying contrast should be used.



**1.** Remove both blades from the helicopter.

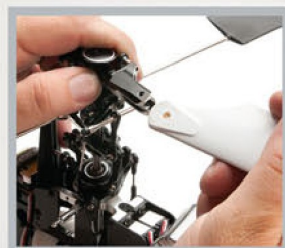
**2.** Place a piece of tracking tape on one blade close to the tip of the blade. The tape should start at the trailing edge, wrap forward and over the leading edge, and finish on the blade's trailing edge on the opposite side of the blade.



**3.** Match the two blades together and mark the location of the tape onto the other blade.

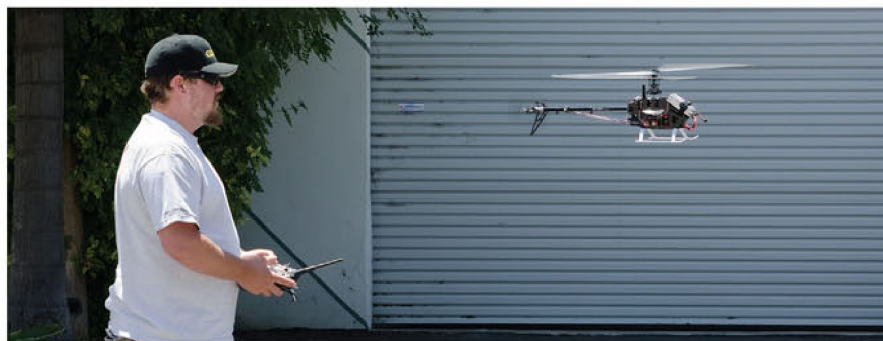
**4.** Apply a different color of tape on the other blade at the location you marked in the previous step. Apply this tape in the same fashion.

**5.** Reinstall the blades.



## » TRACKING YOUR BLADES

For this step you'll need a buddy to give you a hand. As the pilot in command, you should focus on your helicopter and on keeping the blades at eye level. Let your buddy do the focusing on the blades and have them tell you know which blade is higher.



**1.** Tell your buddy to focus on one color of tracking tape.

**2.** Bring the helicopter into a hover with the blade disc at eye level.





**3.** Note which color of tape is higher, and adjust the link to match the other rotor blade. All adjustments should be made to only one blade, or else you'll be "chasing" your blade tracking unnecessarily. The linkages should be adjusted using one turn at a time.



**4.** Retest the helicopter by bringing it into a hover again.

PHOTO BOMB!!!



**5.** Repeat this process until the blades are extremely close. If you can't seem to get them perfect, you can use the PC links that run from the swashplate to the Bell/Hiller arms. These will help you to fine tune the tracking. Use the same steps as above, but adjusting these links.

**6.** Once your tracking is done, land the helicopter and check your collective range with a pitch gauge. Chances are that you have shifted your total pitch range by a degree or two to one size of "zero" pitch. Adjust the swashplate links to your servos to compensate, but make sure that you adjust each link the same amount.

## CONCLUSION

Once your blades are on the right track, you'll notice that your helicopter will fly more smoothly and feel more connected. The power will increase and the drag will be reduced. Next time you are out at the field, take a look at your rotor blades. If they seem out of track, take five minutes and get them rotating ON the right track. **TRU**



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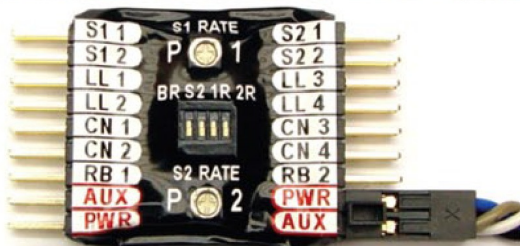
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# Build a Deans JUMPER CONNECTOR

Might as well jump!

WORDS: Aaron Shell

## » SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

# 1.0



## » TIME TO COMPLETE



# 10

Minutes

## » TOOLS NEEDED



■ MALE AND FEMALE DEANS ULTRA PLUG



■ DEANS MICRO CONNECTOR



■ QUALITY 18-20 GAUGE SILICON COATED WIRE



■ SHRINK TUBING



■ SOLDERING IRON



■ "THIRD HAND" TOOL (OR SIMILAR)



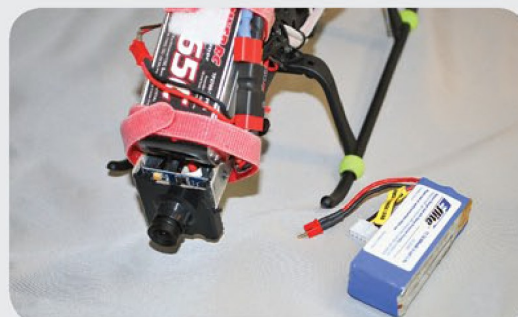
■ HEAT GUN (OR A LIGHTER IN A PINCH)

**A**DDING A BEC OR OTHER COMPONENTS IN PARALLEL TO YOUR HELI'S POWER SYSTEM IS AS SIMPLE AS CONNECTING THE RED TO RED AND BLACK TO BLACK. Sometimes you may gang up the wires and solder them together right onto the connector, or you may end up making a "Y" for the leads to split the power. If you use Deans Ultra plugs on your heli, there is a simple jumper connector you can make to clean up your wiring and simplify adding another component in parallel.

## WHY ADD MORE CONNECTORS?

Sometimes it's more practical to just solder up a Y-connector once and for all. Other times, however, you may want a little flexibility in your system to be able

to unplug components for tests or plug in a new component without having to re-wire your setup. For instance, the most common application for running a component in parallel with your heli's speed control is a BEC. In this case, it may be nice to turn on your heli's radio without having to power up the speed control. Another possible use is adding a wireless video system in parallel off your main pack (if the voltage is appropriate!). Using a plug-in jumper can simplify your setup while also making it easy to add or remove it from the circuit.



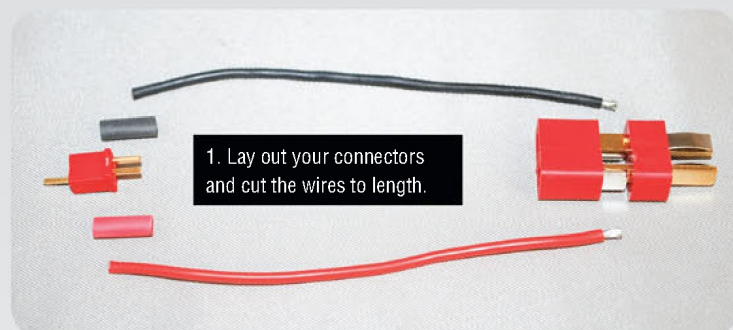


## BUILDING THE JUMPER

One thing which will make this job easy is having a large, flat tip for your soldering iron to deliver the heat. If you use a small tip for precise work, you won't be able to get enough heat to both parts to get the solder to flow.

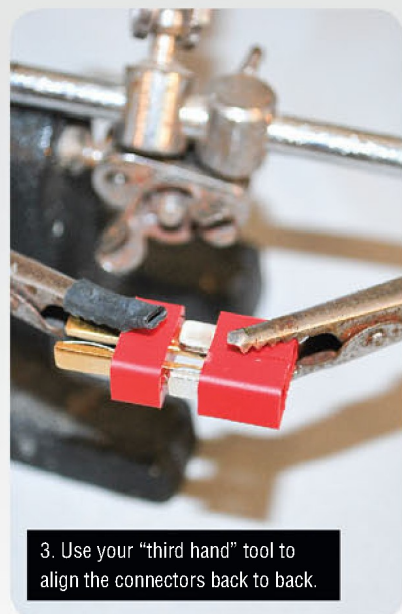


### » STEPS

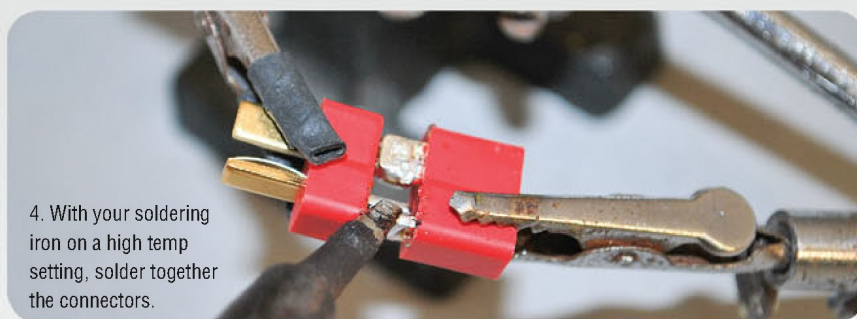


1. Lay out your connectors and cut the wires to length.

2. Tin the backs of the connectors, strip the insulation of the end of the wire, and tin the tip of the wire as well.



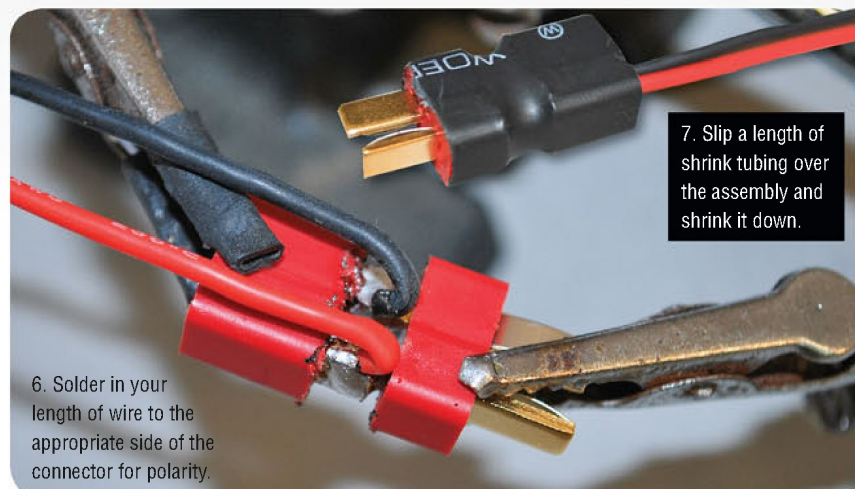
3. Use your "third hand" tool to align the connectors back to back.



4. With your soldering iron on a high temp setting, solder together the connectors.



5. Solder the micro Deans connector to your length of wire, or if you prefer to wire your component (e.g. BEC) directly into the jumper, omit this step and solder your component directly.



6. Solder in your length of wire to the appropriate side of the connector for polarity.

7. Slip a length of shrink tubing over the assembly and shrink it down.

## CONCLUSION

While I don't add a jumper connector to every model I fly, they come in handy when you want to experiment. I've also used them on lighting systems for night flying, adding it permanently to my dedicated night flier canopy. Adding a jumper connector to your setup makes it very easy to tap into your batteries in parallel, and helps clean up your wiring at the same time. **BFL**



# BLADES FOR BARS **AND** BARLESS

A FBL blade overview

**WORDS:** Eric Brandenburg

**F**LYBARLESS HAS BEEN MAKING WAVES FOR SOME TIME NOW, AND ON THE INTERNET FORUMS ONE OF THE COMMON QUESTIONS I'VE BEEN ASKED HAS BEEN THE NEED FOR FBL BLADES ON FLYBARLESS HELIS. This seems to be a common source of confusion for people, and there is a lot of incorrect information floating around. There is also a LOT of marketing hype trying to cash in on the trend, so I'm here to help you see through the smoke and mirrors and get what you need for your particular setup. In some instances, blade choice can make or break a good flying setup, so I'll go through a few of the basic parts of blade design that I feel are critical to choosing the ideal FBL blade you're your machine and flying style.



She could be a new character on Mortal Kombat - "FINISH HIM"

## BLADES **FOR BARS**

In a traditional flybar equipped rotor head, blade choice is much more open than flybarless. Because the flybar and paddles have most of the effect over stability in the head, you can run a wide variety of blades and the differences will be noticeable but not drastic. There are a few key factors for both flybar and FBL blades that tend to make the biggest differences in the overall stability, cyclic speed, and tracking performance at high speed.

The first is the spanwise center of gravity (CG). This is where the blade will balance along the length of the blades. The spanwise CG tends to control how

stable the blades will be in the air. The general rule of thumb is that farther out the CG is from the root of the blade, the heli will be more stable through all maneuvers. On average, most flybar specific blades will tend to favor a CG very close to 50% of the length of the blade, or potentially less to remove some stability from the heli so that you can get quicker cyclic response. By moving the CG closer to the root of the blade, you'll lose some of your stability for things like high speed forward flight or precision hovering. (Picture: Show a blade balanced on something, maybe a razor blade, and put a mark on the 50%

position of the blade measured from the blade bolt hole to the tip)

The next are of interest is the chordwise CG. This is the center of gravity along the chord of the blade, between the leading and trailing edge. The positioning of the chordwise CG is one of the main factors in achieving a "poppy" or "snappy" feel to the model. The general rule of thumb is that the further back from the leading edge, the snappier the head will feel. The downside for moving the CG too far back along the chord is that it will tend to make the heli pitchier. This is especially noticeable in high speed forward flight or precision



flying, as it makes inputs very sensitive around center and any mistakes you make on the stick tend to show more.

On blades designed for a flybar rotor head, there's no real necessity to have a CG position in any particular spot; in most cases the chord wise CG tends to be anywhere from 10-50% the length of the chord. This can make the head tune towards a more locked-in and stable feel for something like an FAI heli to a very responsive 3D smackdown style heli.

The final components that people often consider is the overall stiffness of the blade. In my experience, chordwise flex makes a more noticeable difference than spanwise flex does. The less flex there is along the chord of the blade (you can test by grabbing a blade with both hands and trying to twist it), the more snappy it will feel. This happens because as the blade flexes along the chord, it will tend to feel as though there is less collective pitch when compared to a stiffer blade of the same design. I find that when blades are stiffer they are more predictable, but you have to use more collective management because they will maintain a more true pitch. You may need to reduce pitch slightly, but I find

that the heli will move through the air faster anyway. It will also aid in snappiness off center on cyclic due to the same reason.

Spanwise has similar characteristics; however, when blades are very stiff along the span there tends to be more vibration in

the airframe under cyclic loads. Something like continuous stationary rolls or flips can build up high vibration levels in an airframe with which sensitive motion sensing electronics may have problems coping.



#### CHORDWISE FLEX

You can test this by twisting the blades. The stiffer it is the more snappy the blade will be.

#### SPANWISE FLEX

You can test this by trying to bend the blade in half. This is not as important, but should allow a little flex.



She knows how to do the twist!



# BLADES FOR BARLESS

In a flybarless helicopter, all of these basic characteristics still apply; however, with the addition of a 3-axis and the natural instability of a flybarless rotor head, there are some places that very aggressive blades for a flybar head can cause problems. By tailoring flybar designed blades ever so slightly, the performance of the FBL electronics can be optimized to take full advantage of the locked-in feel that they are made to provide. All flybar specific blades will work, but there can be limits in the performance of the heli overall.

As with a flybar blade, the spanwise CG will control the overall stability of the blades; however, because a flybarless

head is not as stable, the blades must compensate, which is done by moving the CG farther out and closer to the tips. Typically, FBL units fly best with the spanwise CG moved to a position roughly 55% out from the root of the blade, and up to 60-65% for maximum possible stability. This greatly aids in the ability to stabilize the heli mechanically, which allows the FBL unit to run slightly higher gains, and will yield a more stable and locked-in in feel in high speed flight.

Not unlike the spanwise CG, a flybarless helicopter tends to prefer a more stable chordwise CG as well. Ideally, this is positioned as close to the leading edge as possible. The more neutral a blade responds, the less likely it is to cause pitchy behavior in high speed flight. This is somewhat up to personal interpretation; if you aren't looking for the heli to be stable and would rather have as fast and snappy of a cyclic response as you can get, blades

with more flybar like CG positioning may be better suited, although high speed flight performance will noticeably suffer.

The flex properties of a flybarless blade are also very similar to that of a flybar specific blade, however in a flybarless application, a blade with slightly more spanwise flex will help to alleviate vibration going through the airframe from the rotor head. This can be critical for some modern FBL systems in a high vibration environment, such as a 450 size electric or a gasser. What you'll notice from the excessive vibration is that when the rotor head is loaded, the locked-in feel goes away and the heli can tend to drift slightly or become less precise to inputs. It's often better to run a slightly softer blade, as you can use the FBL unit to modify your cyclic response and you'll not have to worry about it feeling "soft" like on a flybar head. This way you can have the best of both worlds.

Ryan looks like HE needs help.

## HELIS THAT NEED HELP

Now that all of the differences have been explained, this is the piece of info that surprises most people. Depending on the size of the heli, you most likely won't even need to worry about having FBL specific blades. In my vast experience in the design of FBL electronics and testing and developing FBL mechanics, there is a trend that I have noticed. On some machines (such as 600 and 700 class), the helicopter is big and heavy enough that it's already fairly stable mechanically without additional electronics. You can fly a 600-size or 700-size heli with no FBL electronics at all, and they actually aren't as crazy fast or unstable as you might imagine. They won't fly nearly as well as the same heli with a FBL unit stabilizing it, but they are flyable.

On the other hand, helis such as a 450 or 500-size (425mm blades) are VERY unstable and twitchy. You can hover them, but to fly around and attempt any aerobatics is very challenging. Helicopters like this are why FBL blades originated. Once you can make the heli somewhat stable mechanically, the FBL unit won't have to work nearly as hard to keep from doing unwanted things like pitch up at high speed.

The main point I would like for you all to take from this is that there are some exceptions, but for the most part there is no "need" for FBL blades on anything but the small electrics we have nowadays. They are slightly different, and you may notice some minute differences on some helis, but they will all work and fly without causing problems. The main purpose of

flybarless blades is to allow the heli to be as mechanically stable as possible in order to get the heli to be as locked-in as the FBL electronics can make it, but if that's not the feel you want out of the helicopter then feel free to experiment with more flybar styled blades and find a happy medium. **TED**





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# Align TREX 500 SUPER COMBO

The 500 just went SUPER!

WORDS: Ryan Kephart | PHOTOS: Jason Boulanger

Lately, Align has been focusing on modifications and improvements to older popular helicopters in their lineup. This month we'll be taking a look at one of these helicopters that received a complete overhaul and received the sought after badge that Align calls the "Super Combo".

## » AT A GLANCE

SIZE:	500
POWER:	Electric
TYPE:	Pod & Boom
BUILD TYPE:	Kit
TAIL DRIVE:	Belt



# FEATURES

To receive the “Super Combo” name, the TREX has to feature everything needed to get the helicopter in the air minus a few selective items that is better for the pilot to choose and purchase separately. The included items include the motor, speed controller, cyclic servos, gyro, and tail servo.

## » MAIN FRAME

**SWASH CONTROL:** The swashplate is controlled by a direct link servo connection arranged for 120° CCPM.

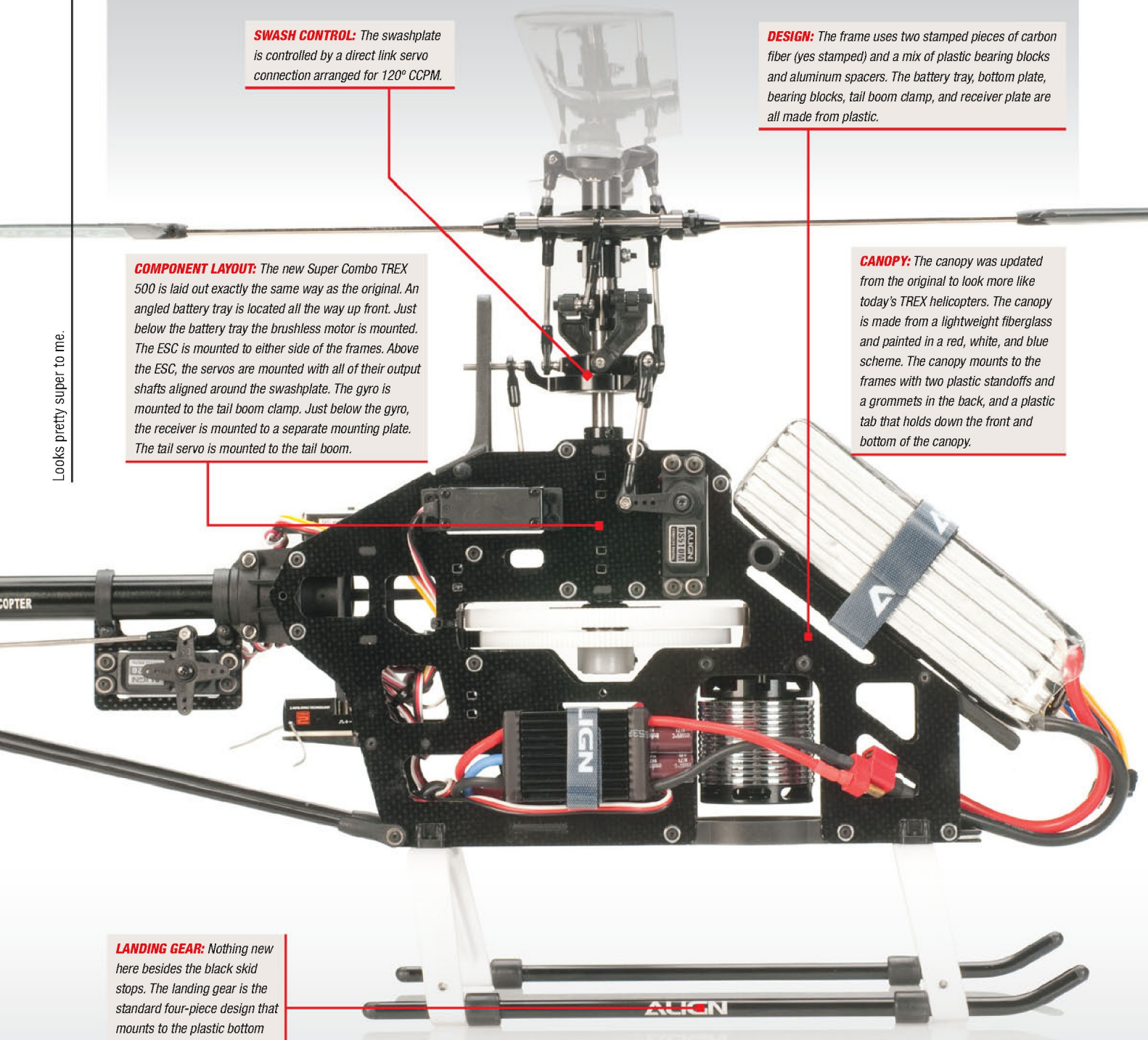
**DESIGN:** The frame uses two stamped pieces of carbon fiber (yes stamped) and a mix of plastic bearing blocks and aluminum spacers. The battery tray, bottom plate, bearing blocks, tail boom clamp, and receiver plate are all made from plastic.

**COMPONENT LAYOUT:** The new Super Combo TREX 500 is laid out exactly the same way as the original. An angled battery tray is located all the way up front. Just below the battery tray the brushless motor is mounted. The ESC is mounted to either side of the frames. Above the ESC, the servos are mounted with all of their output shafts aligned around the swashplate. The gyro is mounted to the tail boom clamp. Just below the gyro, the receiver is mounted to a separate mounting plate. The tail servo is mounted to the tail boom.

**CANOPY:** The canopy was updated from the original to look more like today's TREX helicopters. The canopy is made from a lightweight fiberglass and painted in a red, white, and blue scheme. The canopy mounts to the frames with two plastic standoffs and a grommets in the back, and a plastic tab that holds down the front and bottom of the canopy.

**LANDING GEAR:** Nothing new here besides the black skid stops. The landing gear is the standard four-piece design that mounts to the plastic bottom plate. The skid tubes are held in place with setscrews.

Looks pretty super to me.





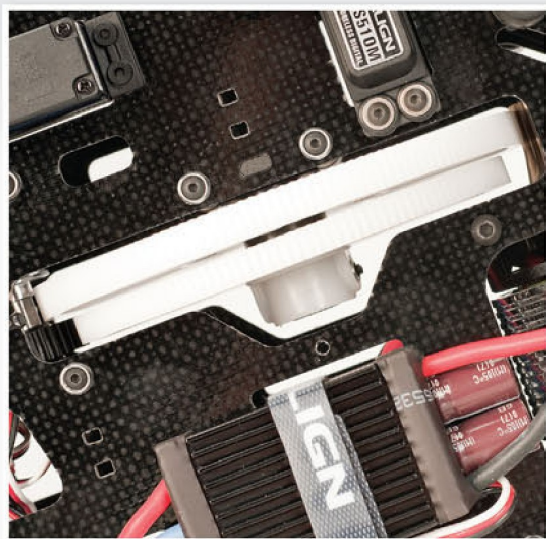
## » DRIVE TRAIN

**MOTOR MOUNT:** The motor is mounted to an aluminum mount that is secured to the frames with four machine screws. The mount incorporates two milled channels to allow the motor to slide in and out from the main gear to set proper gear mesh.

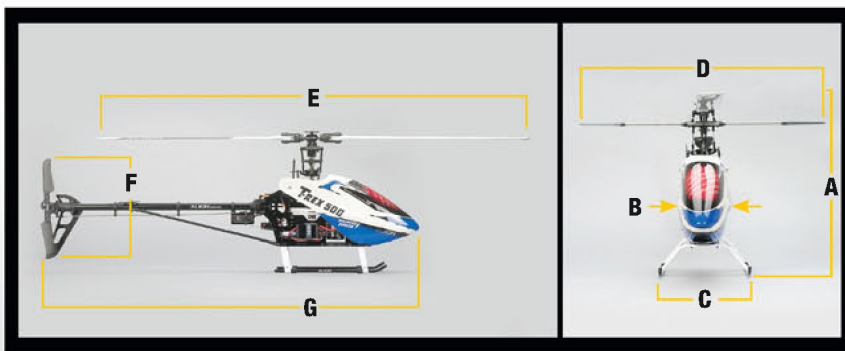
**MAIN GEAR:** The main gear is the same main gear used in the original TREX 500. The white plastic gear is installed on an aluminum hub. The main gear has 162 teeth.

**AUTOROTATION DRIVE:** The autorotation drive is located inside the main gear hub. A one-way bearing locks onto the main shaft for drive, and spins freely when the engine is shut down.

**TAIL DRIVE:** Below the main gear, a large tail gear drives a secondary system. The gear is locked to the main shaft, allowing the tail to be driven during autorotations. The secondary gear system is dual ball bearing supported and ultimately drives the tail rotor using a belt.



“we took this machine right out of the box, built it, and slapped on a popular battery pack and went to town.”



## Align TREX 500 **SUPER COMBO** MODEL SPECIFICATIONS

<b>CLASS:</b>	500 Electric
<b>BUILD:</b>	Kit
<b>BLADE SIZE:</b>	425mm
<b>TAIL BLADE SIZE:</b>	67mm
<b>LEVEL:</b>	Novice-Advanced

### FRAME

<b>MATERIAL:</b>	Carbon fiber
<b>TYPE:</b>	Two-piece stacked
<b>SERVO TO SWASH LINKAGE:</b>	Direct
<b>SERVO SIZE:</b>	Mini

### ROTOR HEAD

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

### TAIL

<b>DRIVE SYSTEM:</b>	Belt
<b>AUTO DRIVEN:</b>	Yes
<b>TAIL PITCH SLIDER:</b>	Single
<b>TAIL BLADE GRIPS:</b>	Plastic
<b>TAIL CASE:</b>	Plastic
<b>BOOM STRUT MATERIAL:</b>	Carbon with plastic ends

### GEARING

<b>MAIN ROTOR TO PINION RATIO:</b>	1:12.46
<b>MAIN ROTOR TO TAIL RATIO:</b>	1:4.68

### WEIGHT

<b>EMPTY:</b>	2 lbs., 1 oz. (920g)
<b>FULLY LOADED:</b>	4 lbs., 3 oz. (1899g)

### DIMENSIONS

<b>HEIGHT (A):</b>	12.25in (210mm)
<b>CANOPY WIDTH (B):</b>	4 in. (102mm)
<b>LANDING GEAR (C):</b>	6.5 in. (165mm)
<b>PADDLE TO PADDLE DIA. (D):</b>	17.75 in (451mm)
<b>MAIN ROTOR (E):</b>	38 in. (970mm)
<b>TAIL ROTOR (F):</b>	8 in. (203mm)
<b>LENGTH (G):</b>	33 in. (840mm)



# FEATURES CONTINUED

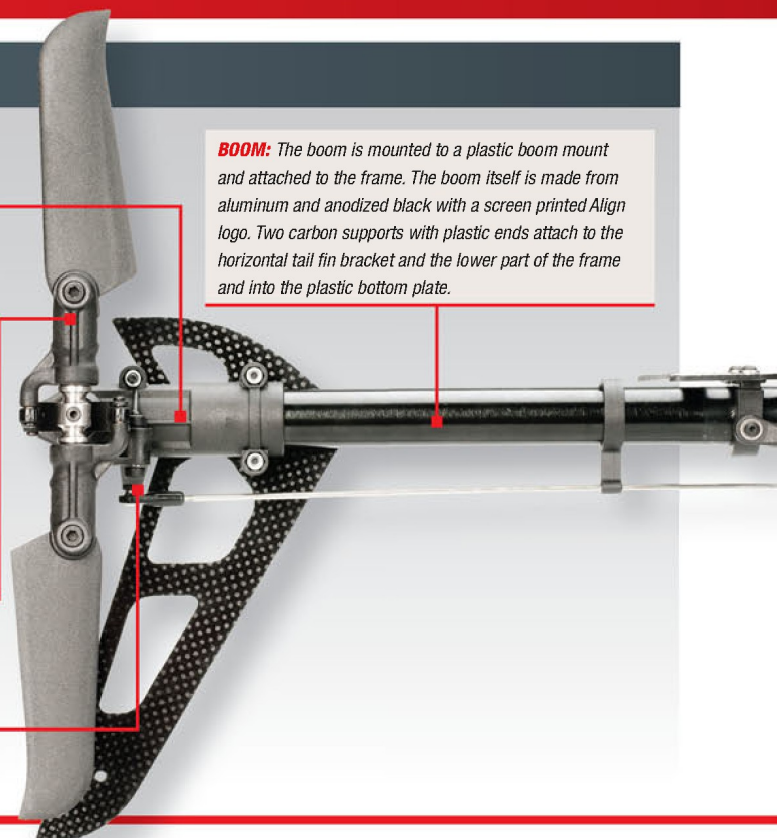
## » TAIL & BOOM



**TAIL CASE:** The tail case is made from injection molded plastic. The mold incorporates the bellcrank standoff and bearing housings. The tail case is comprised of two molded sides that attach together and clamp onto the boom using five machine screws and nylon lock nuts.

**TAIL BLADE GRIPS:** The tail grips are the same as the original, with one ball bearing and a single thrust bearing each. The grips are made from plastic and use a machine screw and lock nut to hold down the tail rotor blades.

**PITCH ACTUATOR SYSTEM:** From the tail boom mounted servo, a metal pushrod is passed through two plastic guides and is attached to a plastic dual ball bearing supported bellcrank. The bellcrank has a single point ball that attaches to the slider. The slider and fork are both made from plastic and ride on a brass bushing. Plastic links are used to attach the slider to the tail blade grips.



**BOOM:** The boom is mounted to a plastic boom mount and attached to the frame. The boom itself is made from aluminum and anodized black with a screen printed Align logo. Two carbon supports with plastic ends attach to the horizontal tail fin bracket and the lower part of the frame and into the plastic bottom plate.

## » ROTOR HEAD

**HEAD BLOCK:** The head block is made from aluminum and mounted to the main shaft using a single 2.5mm screw that also clamps down the head block. The damping is performed by two rubber dampers. Both soft and hard dampers come in the kit.



**PHASING:** Nothing new here to Align helicopters. The steel phasing pins are press fit into the bottom of the headblock and secured using thread locking compound. The phasing is not adjustable on this model.



**BELL/HILLER ARMS:** Made from plastic and dual ball bearing supported, the Bell/Hiller arms are mounted to the plastic flybar seesaw. Once again, no mixing options are available.

**WASHOUT ARMS:** The plastic washout arms are mounted to a metal washout base and supported by two ball bearings. The radius arms are also dual ball bearing supported to the arms. No mixing options are available.





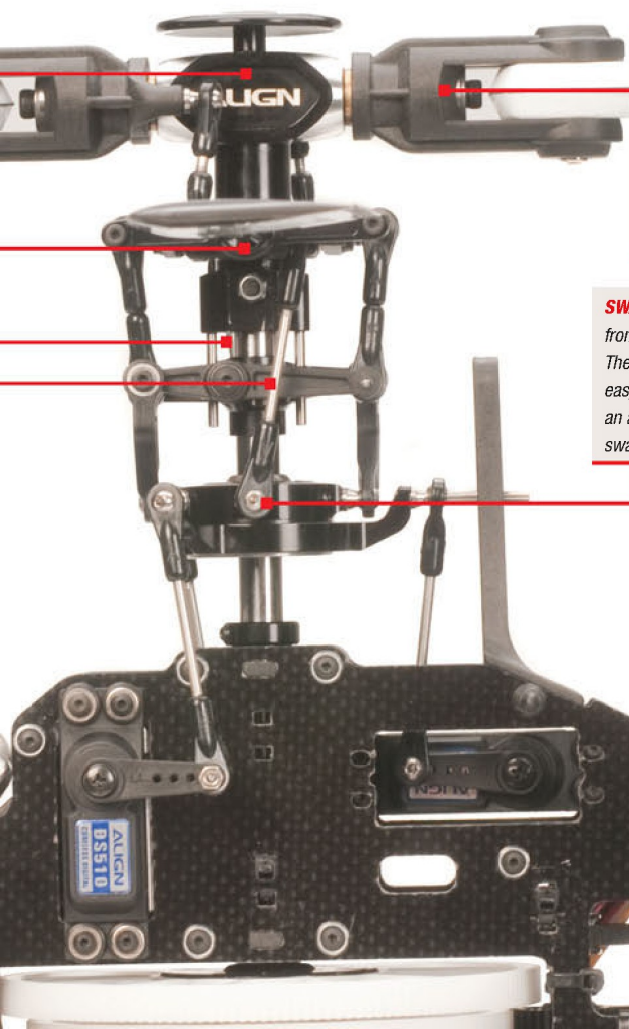
## » INSTRUCTIONS & BUILDING TIPS

### WHEN YOU OPEN THE BOX

Upon opening the box, you'll find that the TREX 500 much like any other Align helicopter on the market today. The box is segregated into multiple boxes that are labeled with components, such as electronics, canopy, and mechanics. Under the boxes you'll find a nicely detailed manual.

### MANUAL AND BUILD

The manual included with the TREX 500 is printed on standard sized paper and bound with staples. The manual does a great job displaying the parts, hardware, and instructions. Detailed part explosions are also printed in the manual to help guide the builder. Building the 500 is quick and easy, and really reminds me of building the TREX 450 Pro on a bigger scale.



**MAIN BLADE GRIPS:** One item that differed from the original is the blade grips. These grips are now made from plastic and are molded with the pitch arms. The grips are supported by two ball bearings and a thrust bearing. A 3mm machine screw is used to secure the blade grips to the feathering shaft.

**SWASHPLATE:** The swashplate is machined from aluminum and has a single ball bearing. The balls are threaded into the swash for easy replacement. A special ball link with an anti-rotation pin is used to keep the swashplate in sync.

## Align TREX 500 **SUPER COMBO** RTF & TEST GEAR

### » TEST GEAR



■ **RADIO:** Spektrum, DX-6i, SPM6610, \$210



■ **RECEIVER:** Spektrum, AR6110, 0.11 oz. (3.35g), \$49



■ **BATTERY:** Thunder Power, 6S 3250mah 45C, THP32506SP45, 18 oz. (521g), \$190

### » SUPPLIED GEAR



■ **CYCLIC SERVOS:** Align, DS510, HSD51002, 0.9 oz. (26g)



■ **GYRO:** Align, GP780, HEG78001, 0.5 oz. (14g)



■ **TAIL SERVO:** Align, DS520, HSD52001, 0.9 oz. (26g)



■ **MOTOR:** Align, Super Power BL500MX, RCM-BL500MX, 7.0 oz. (198g)



■ **ESC:** Align, RCE-BL70G Brushless ESC, K10475A, 2.5 oz. (72g)



■ **BLADES:** Align, 425mm CF, H50069A, 4.2 oz. (120g)

Everything was pretty much supplied.... NICE.



# TESTING

With the Super Combo version and the simplicity of the rotorhead, the TREX 500 Super Combo will fly pretty much the same out of the box as what you see the professionals fly at a funfly. Having said that, we took this machine right out of the box, built it, and slapped on a popular battery pack and went to town.

**HOVERING** • Align did a fantastic job selecting a middle-of-the-road rotor head mixing option. The TREX 500 did well in a hover and actually handled a fair amount of wind with ease. The 500 had a very neutral feel and did not require any expo or dual rates to get comfortable. Overall, it has a more stable feel than a 450 and is well suited for any style pilot.

**Rating: 4**

**FORWARD FLIGHT** • The larger size of the 500 really makes a 450 pilot feel comfortable flying this machine in forward flight. The increased size not only can be seen better, but it also feels more solid and tracks better through the sky. Overall, the TREX 500 is not a fast machine, but it does well enough to get the blood pumping.

**Rating: 4**

**CYCLIC PITCH RESPONSE** • Without the mixing options in the head, the TREX 500 is not the most agile helicopter in cyclic response. It has a good neutral feel and is not overly aggressive. Flips and rolls are clean, well centered, and on axis. Overall, the cyclic is fast enough for some smack flight, and docile enough for precise big air maneuvers.

**Rating: 4**

**COLLECTIVE PITCH RESPONSE** • With the addition of a more powerful motor than the original, the TREX 500 really packs a collective punch. No matter how much collective you input, the TREX 500

is happy to oblige. The collective range is large enough to perform any maneuver in the book, and with this much power there's no reason not to have fun.

**Rating: 4.5**

**TAIL ROTOR RESPONSE** • The belt driven tail did not exhibit any bad tendencies. The tail was smooth and precise and I didn't notice any lag or bounce back caused by the tail belt. The tail had plenty of authority in backwards flight. The included GP780 gyro did a great job of keeping the tail in check, and I was surprised to see how well it maintained a consistent pirouette.

**Rating: 4**

**AUTOROTATION CAPABILITIES** • If you want to practice autorotations, this is probably not the bird for you. The small size and belt driven tail do not allow much room for error. Although this helicopter can auto, it's only slightly better than a 450 in this department.

**Rating: 3**

**POST FLIGHT INSPECTION** • After the long vigorous testing routine, I had a chance to take a close look at the TREX 500 and how it held up. I didn't notice anything out of the ordinary with this helicopter. The ball links were still in perfect condition, and so was the tail belt. I tightened up the tail belt tension once during the testing phase, but this is normal with this style of drive train. Motor temperature and ESC temperature were all in normal operating parameters throughout the testing. I was pleased with the TREX 500 Super Combo and how well each component held up.

**Rating: 5**

## CONCLUSION

Align did a good job combining their servos, gyro, and power system to this 500-class machine. New pilots looking to get a little extra size and still maintain a reasonably priced helicopter will find this TREX 500 a perfect match. **RH**

The new canopy paint looks amazing.





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BE ABSOLUTE STABLE



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The MICROBEAST from BeastX™ is a top-of-class 3-axis gyro system for electric and nitro helicopters. The minimal footprint of the device allows for usage on big 90-class helicopters all the way down to a 250-class helicopter. Housed in a lightweight aluminum composite casing, the sensory system is based on up-to-date MEMS technology for mild to wild pilot needs. Best of all, setup is quick and simple enough to do at the airfield with just the device and a transmitter.

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# TESTING SPECS

## Align TREX 500 SUPER COMBO

Part #: KX017014

Distributor: Assurance

Web: [www.alignrcausa.com](http://www.alignrcausa.com)

Street Price: \$559

Price as Tested: \$798

Build/Setup Time: 10 hours

### PERFORMANCE

MODE FLOWN: Normal, Idle 1, Idle 2

RPM OF EACH

MODE: Idle Up 1: 2200

Idle Up 2: 2700

MOTOR TEMP

(after flight): 120° F

BATTERY TEMP

(after flight): 98° F

FLIGHT TIME: 5-8 minutes

CRASH COST\*: \$50.00

### TEST CONDITIONS

WEATHER: Sunny

TEMP / HUMIDITY: 72° F / 28%

BAROMETRIC PRESSURE: 29.90 in.

WIND SPEED: 5 mph

VISIBILITY: 10 miles

ALTITUDE: 750 feet

### PITCH CURVES

NORMAL: -5, 0, 12

IDLE-UP 1: -12, 0, 12

IDLE-UP 2: -12, 0, 12

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

### REQUIRED TO FLY

Radio transmitter, receiver, speed control, battery, battery charger

### WHO'S IT FOR?

The Super Combo kit is perfect for any pilot looking for a complete package. Many pilots with 450-class helicopters will find the transition into this larger helicopter a breeze, as the TREX 500 can use two of the same packs they used in their 450.

### SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

### + THE GOOD

- All-in-one package
- New motor really packs a punch
- The price is right

### - THE BAD

- Went to plastic blade grips
- Not much else was changed

I think the photographer was looking for a hair cut.





# ***“Unmatched.”***

— Jason Danhaki, Competition-Winning Futaba Team Pilot



#### **BLS255HV**

##### **High-Voltage, High-Speed Servo**

Torque: 167 oz-in @ 7.4V Speed: .08 sec/60°  
Unmatched CCPM/tybarless heli swashplate control.

#### **BLS156HV**

##### **High-Voltage, High-Torque Servo**

Torque: 292 oz-in @ 7.4V Speed: .12 sec/60°  
Awesome giant scale performance.

#### **BLS157HV**

##### **High-Voltage, Ultra-Torque Servo**

Torque: 514 oz-in @ 7.4V Speed: .11 sec/60°  
The new #1 for large scale aerobatics and 3D aircraft.

## ***Futaba introduces brushless, high-voltage servos — and blows all others away in precision and holding power!***

Without using them yourself, Jason Danhaki wonders if you can believe how good Futaba brushless, high-voltage servos really are.

So much power is produced inside those standard-size cases, the BLS157HV needs six bolts to hold it in. And the precision?

“These servos blow away any I have ever flown, providing unmatched performance in consistent transit speed and power delivery,” Jason explains. “With the BLS157HV, Futaba has redefined what today’s giant-scale 3D pilots can expect in servo performance.”

Try the Futaba BLS/HV servos recommended for your application — and believe.



#### **S305HV**

##### **High-Voltage, High-Torque Standard Servo**

Torque: 146 oz-in @ 7.4V Speed: .16 sec/60°  
High-voltage capability in a low-cost, high-torque servo.

# **Futaba**

[futaba-rc.com/I03x](http://futaba-rc.com/I03x)

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# E-Flite BLADE 450 3D RTF

Out-of-the-Box Performer

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

**E**-FLITE IS A COMPANY KNOWN TO PRODUCE PRODUCTS THAT AN EVERYDAY PILOT OR BEGINNER CAN MANAGE.

Their successful line of Blade helicopters have taken “never flown before” customers and changed them into an RC pilot. The Blade 450 3D helicopter takes these pilots into the next level of RC helicopter flight. Two models are available, including an almost-ready-to-fly and a ready-to-fly version, complete with everything you need to get the helicopter in the air. This month we’ll take a look at this new helicopter and show you why Horizon Hobby and E-flite are the leading helicopter choice for beginners.

Striking colors.

## » AT A GLANCE

**SIZE:** 450

**POWER:** Electric

**TYPE:** Pod & Boom

**BUILD TYPE:** RTF

**TAIL DRIVE:** Belt







Let's go for a dip.



# FEATURES

The Blade 450 3D is outfitted with an all-new digital sub-micro servo with increased torque and precision over its predecessor. An all-new gyro has also been outfitted onto the Blade 450 that uses the newest MEMS technology, which provides the best stopping and holding power. These features and much more are packed into the Blade 450 3D and we can't wait to show you the details. Let's check it out.

## » MAIN FRAME

**SWASH CONTROL:** The pitch and roll cyclic servos are directly connected to the swashplate using a ball link connection. The elevator uses a push-pull linkage attached to a bellcrank.

**DESIGN:** The frames are a two-piece molded plastic affair that fit together and encase the bearings and boom. The frames are attached with self-tapping Phillips head screws.

**COMPONENT LAYOUT:** Much like the Blade 400, the servos are arranged with two behind the main shaft and the elevator servo mounted to the battery tray. The motor sits just behind the flight battery with the can facing the rotor blades. The speed controller is mounted to the plastic bottom plate just under the battery. The gyro is mounted on top of the tail boom mount. Just below this mount, the receiver is mounted to the bottom plate. The tail servo is mounted to the boom with two plastic clamps.

**CANOPY:** The included plastic canopy is dyed with vibrant colors and designed with good graphics reminiscent of today's painting trends. The canopy is mounted to the frames with two rubber grommets that press onto plastic canopy standoffs. A tab that slides between the frame and landing gear secures the bottom of the canopy.

**LANDING GEAR:** The landing gear is made of single piece molded plastic. The gear is attached to the frame with four self-tapping screws that thread into plastic ears molded to the frame.

Plastic can sometimes be a good thing.



## » DRIVE TRAIN

**ENGINE/MOTOR MOUNT:** The 420 brushless motor is mounted to an aluminum mount with two machine screws. The mount is then secured to the frames with four machine screws in a sliding channel to allow for gear mesh adjustment.

**PINION:** A brass 10-tooth pinion is included with the RTF and is press fit to the motor shaft.

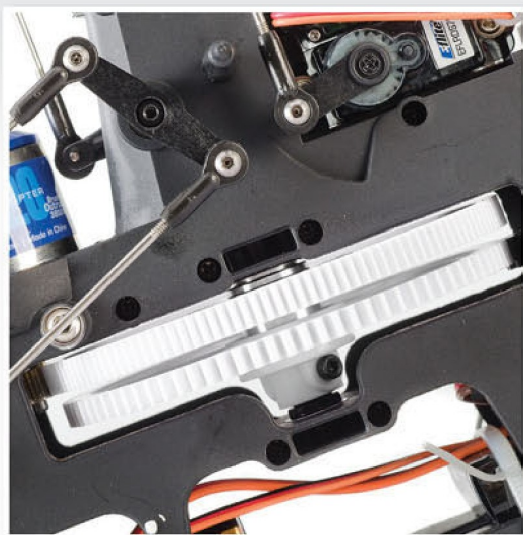
**MAIN GEAR:** The main gear is molded from plastic with lightening holes and extruded supports. The gear is mounted to an aluminum hub that houses a one-way bearing for the autorotation drive.

### AUTOROTATION DRIVE:

A one-way bearing is press fit into the main gear hub. It provides smooth rotation and

allows the tail to be driven during an autorotation.

**TAIL DRIVE:** A main tail drive gear is mounted below the main gear and is attached to the main shaft using a single Jesus bolt. This gear then drives a secondary gear system that is dual ball bearing supported. A belt drives the tail rotor.



“THIS MONTH WE’LL TAKE A LOOK AT THIS NEW HELICOPTER AND SHOW YOU WHY HORIZON HOBBY AND E-FLITE ARE THE LEADING HELICOPTER CHOICE FOR BEGINNERS.”

E-Flite

## BLADE 450 3D RTF

### MODEL SPECIFICATIONS

<b>CLASS:</b>	450 electric
<b>BUILD:</b>	RTF
<b>BLADE SIZE:</b>	325mm
<b>LEVEL:</b>	Novice-advanced

### FRAME

<b>MATERIAL:</b>	Plastic
<b>TYPE:</b>	Two-piece stacked
<b>SERVO TO SWASH LINKAGE:</b>	Direct and push-pull
<b>SERVO SIZE:</b>	Sub-micro

### ROTOR HEAD

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

### TAIL

<b>DRIVE SYSTEM:</b>	Belt
<b>AUTO DRIVEN:</b>	Yes
<b>TAIL PITCH SLIDER:</b>	Dual point
<b>TAIL BLADE GRIPS:</b>	Plastic
<b>TAIL CASE:</b>	Plastic
<b>BOOM STRUT</b>	Carbon with plastic ends
<b>MATERIAL:</b>	

### GEARING

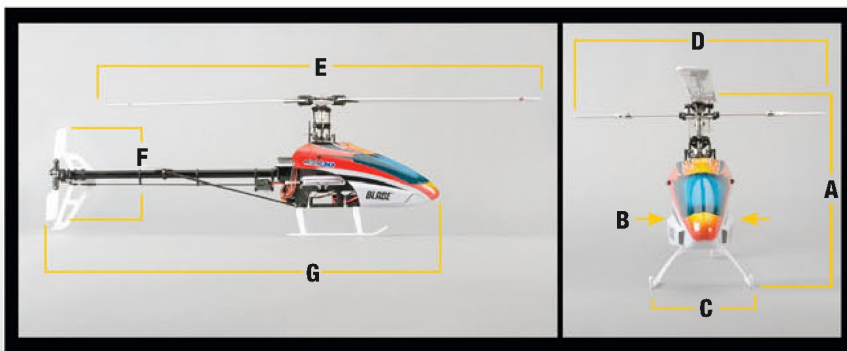
<b>MAIN ROTOR TO PINION RATIO:</b>	1:14
<b>MAIN ROTOR TO TAIL RATIO:</b>	1:4.98

### WEIGHT

<b>EMPTY:</b>	1 lbs., 3 oz. (544g)
<b>FULLY LOADED:</b>	1 lbs., 9 oz. (725g)

### DIMENSIONS

<b>HEIGHT (A):</b>	9.3in (235mm)
<b>CANOPY WIDTH (B):</b>	3.25 in (82mm)
<b>LANDING GEAR (C):</b>	4.75 in (121mm)
<b>PADDLE TO PADDLE DIA. (D):</b>	12.5 in (317mm)
<b>MAIN ROTOR (E):</b>	28.4 in. (721mm)
<b>TAIL ROTOR (F):</b>	5.6 in. (142mm)
<b>LENGTH (G):</b>	25.8 in. (655mm)



Good for intermediate pilots too.



# FEATURES CONTINUED

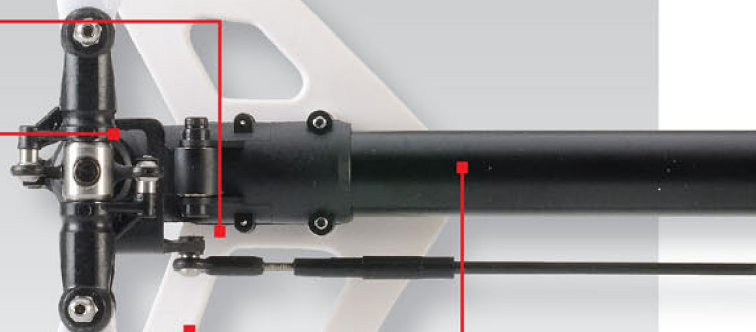
## » TAIL & BOOM



**TAIL CASE:** The case is molded from plastic and reinforced with carbon. The mold includes a standoff for the pitch control and a place to mount the vertical tail fin. The case is mounted to the boom using the tail fin screws that help clamp the tail case. Three additional screws are used to keep the tail case halves together.

**TAIL BLADE GRIPS:** The blade grips are molded out of plastic and supported by two ball bearings each. The grips are attached to the steel tail hub with a machine screw threaded into the spindle. The Blade 450 also includes the "tennis racket effect" mod that allows the tail to operate smoothly at operating RPM.

**PITCH ACTUATOR SYSTEM:** From the tail boom mounted servo, a carbon rod passes through two plastic pushrod guides and is attached to a plastic tail pitch lever. The lever is dual ball bearing supported and connects to the dual-point tail pitch slider. The slider is dual ball bearing supported and has a brass bushing that slides freely on the tail shaft. Two plastic links then connect to the tail grips using a ball linkage connection.

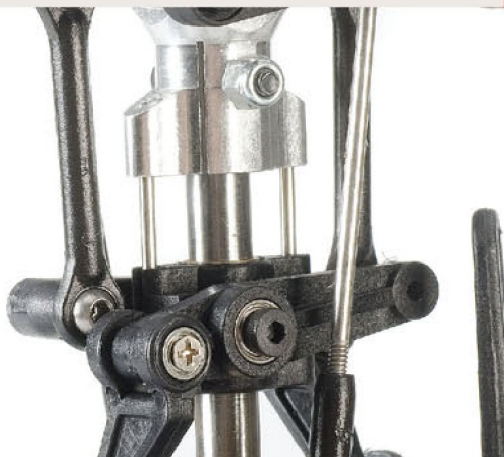


**BOOM:** The boom is anodized black without any logos or etching. It's secured to the frames with a plastic clamp molded into the frames. Two carbon rods with plastic tips help support the boom. The boom is outfitted with a plastic horizontal tail fin.

## » ROTOR HEAD

**HEAD BLOCK:** The head block is machined from aluminum and is mounted to the main shaft with a single Jesus bolt. The head is machined with channels for the flybar as well as bearing blocks. Two rubber dampers are installed on the head block that provide an adequate amount of damping for the rotor blades.

**PHASING:** Phasing is accomplished by two steel pins that are press fit into the head block. The pins are used to keep the washout base in line with the head block.



**BELL/HILLER ARMS:** The Bell/Hiller arms are connected to the main blade grip pitch arms. The arms are dual ball bearing supported and use a single self-tapping Phillips head screw. No mixing options are available.

**WASHOUT ARMS:** The washout arms are made from plastic and supported by two ball bearings each. The arms mount to a plastic washout base that has a brass bushing. Two ball bearings also support the control arm.





## » INSTRUCTIONS & BUILDING TIPS

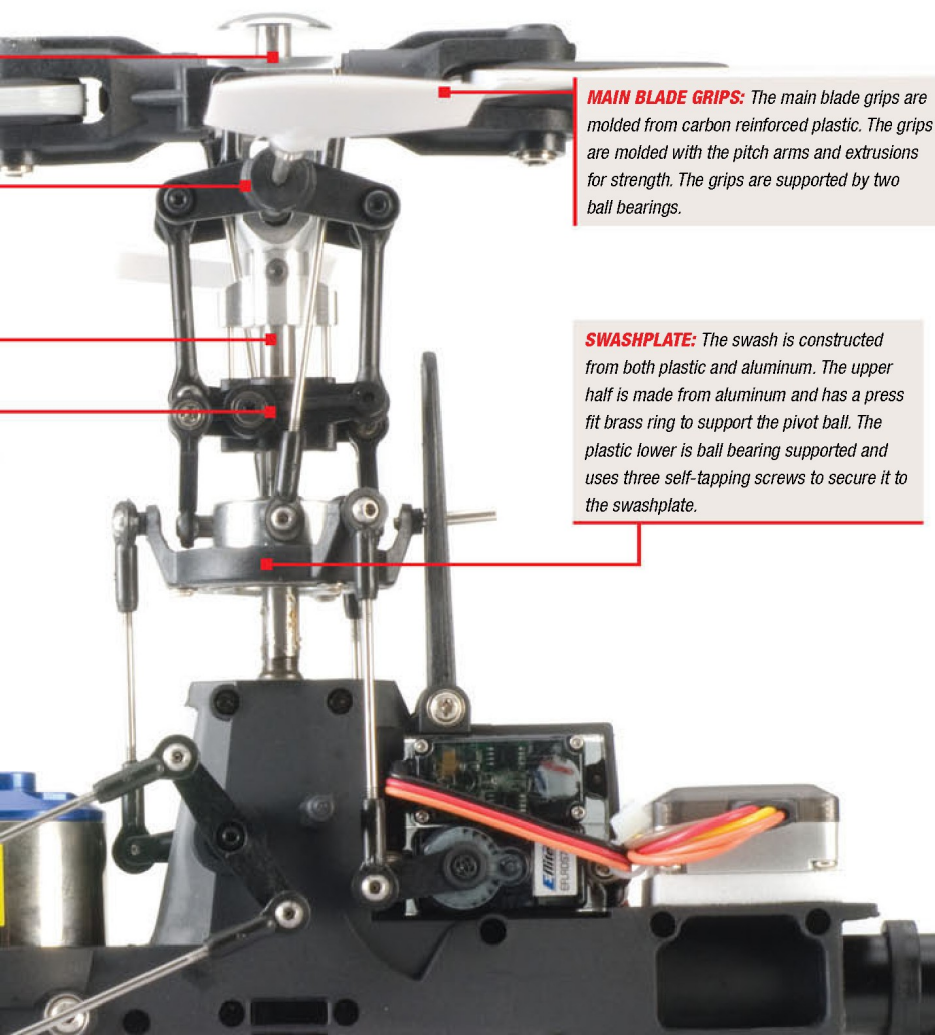
### WHEN YOU OPEN THE BOX

When you open the box you'll find that the Blade 450 3D is totally encased in standard packaging foam. The box has a dual purpose, as you can use it to store and transport your helicopter. The box is well laid out and houses everything including the radio in its own molded section. The manuals are stored at the top of the box for easy access.

### MANUAL AND BUILD

Not much can be said about building the Blade 450 3D. This RTF

heli comes ready to go, with even the programming done for you. Grab the heli, straighten the blades, install the radio batteries, charge the pack, and you're ready. I was in the air within 30 minutes. The manual does a great job showing you how the helicopter works and what you should expect to see. A detailed parts listing is available toward the back of the manual.



**MAIN BLADE GRIPS:** The main blade grips are molded from carbon reinforced plastic. The grips are molded with the pitch arms and extrusions for strength. The grips are supported by two ball bearings.

**SWASHPLATE:** The swash is constructed from both plastic and aluminum. The upper half is made from aluminum and has a press fit brass ring to support the pivot ball. The plastic lower is ball bearing supported and uses three self-tapping screws to secure it to the swashplate.

## E-Flite BLADE 450 3D RTF RTF & TEST GEAR

### » TEST GEAR



■ **RADIO:** Spektrum, DX6i DSMX



■ **RECEIVER:** Spektrum, AR6115e, SPMAR6115E, 0.14oz. (4g)



■ **CYCLIC SERVOS:** E-flite, DS76 Digital, EFLRDS76, 0.27oz. (7.6g)



■ **TAIL SERVO:** E-flite, EFLRDS76T, EFLRDS76T, 0.27oz. (7.6g)



■ **GYRO:** E-flite, G210HL, EFLRG210HL, 0.40oz. (11g)



■ **MOTOR:** E-flite, Brushless 420, EFLM1350H, 1.8oz. (51g)



■ **SPEED CONTROL:** E-flite, 35-Amp Helicopter Brushless ESC, EFLA335H, 0.89oz. (25g)



■ **BATTERY:** E-flite, 2200mAh 3S 11.1V 30C Li-Po, EFLB22003S30, 6.10oz. (173g)



■ **CHARGER:** E-flite, 3S 11.1V Li-Po Balancing Charger, EFLC3115

Let me see what else I need... NOTHING.



# TESTING

We tested the E-flite Blade 450 with stock settings and components. We charged the battery, installed the transmitter battery, and were off and running. The stock settings on the Blade 450 were pleasant and allowed for a wide range in flight performance.

**HOVERING** • The Blade 450 3D hovered extremely well with stock settings both in Idle-up and normal flight modes. The combination of the pre-programmed expo and wooden blades really made the cyclic feel docile. I noticed a little collective floating, but it was manageable. Overall, the Blade 450 3D performed better than I expected in this category.

**Rating: 4**

**FORWARD FLIGHT** • The forward flight characteristics of the Blade were spot on and the tiny bird tracked well. I didn't notice any ballooning or nose dipping. It's not the fastest 450 on the market, but it's fast enough for a beginner or intermediate pilot to have their hands full. Overall, the forward flight was nice, smooth, and predictable.

**Rating: 4**

**CYCLIC PITCH RESPONSE** • With the stock settings and the flybar weights fully extended the Blade 450 3D was docile around center and adequate enough to perform 3D when you wanted. With the weights brought in, the response was much more aggressive and allowed the 450 3D to perform even more advanced 3D maneuvers. I was pleased with the feel and response of the helicopter and I believe it would suit a beginner pilot who is looking for a helicopter that can advance to a new level of flight.

**Rating: 4**

**COLLECTIVE PITCH RESPONSE** • I

mentioned that I noticed a collective float, meaning that during a stable hover without changing my collective input and without wind, the helicopter would drift up and down as if the servos were not holding center. However, this didn't transfer over to forward flight or any other flight mode. The collective had enough response and power to perform many 3D maneuvers. Even piro flips were accomplished easily. I was pleased with the precision of the collective and felt comfortable in all flight modes.

**Rating: 4**

**TAIL ROTOR RESPONSE** • One thing that stands out on the Blade 450 3D compared to the Blade 400 is the tail performance. With the new G210 gyro the tail performed very well and allowed true 3D to be performed without having to worry about the tail blowing out. The response was smooth and accurate and the consistency was perfect, allowing for precise piro flips. I tried everything I could to get the tail to blow out, including fast backwards flight and high collective backwards inverted loops, but the tail held perfectly.

**Rating: 5**

**AUTOROTATION CAPABILITIES** • The

Blade 450 3D is no different from other 450-size helicopters. Although you can perform an autorotation, there is very little rotor energy for floating. You get only one chance to successfully land the helicopter. Overall, it did just as well as any other helicopter in this class range.

**Rating: 4**

**POST FLIGHT INSPECTION** • I didn't notice any abnormal wear. The helicopter was programmed well, and the head settings seemed to be good for an everyday pilot. E-flite took special care with this helicopter by greasing the main and tail shafts, properly tensioning the tail belt, and perfectly meshing the pinion. I was pleased with the helicopter and after noticing that it would only cost 20 dollars plus the cost of blades to fix, I knew this was a great helicopter.

**Rating: 5**



The water is too cold, I am outta here.





**ALIGN**

**Eflite**

**HiTEC**

**THUNDER  
POWER RC**

**Futaba**



**Spartan RC**



**HATORI USA**



**SYNERGY**  
Model Helicopters



**Ely.Q**

**JR**



**WE ARE 3D**

**PHOENIX**  
BRUSHLESS CONTROLLERS



Castle creations is one of the largest manufacturers of electronic speed controls. They are constantly working to bring customers products that are unmatched in quality, design, reliability, and performance at a competitive price. We have a large range of Castle products from the small fully programmable ICE LITE 50 to the monster power Phoenix HV-160. So when you are ready to step up in electric capability, rely on Castle Creations for quality first designed speed controllers, and the money you've saved makes you simply smarter.



**SPEKTRUM** The Leader In Spektrum Technology

We offer a large selection of Spektrum radios including the all new DX8. The DX8 is the most advanced 8-channel system on the market. The DX8's next generation Spektrum Air Ware software, built-in telemetry, Spektrum data interface, and superior ergonomics will completely revolutionize how you fly. It's the only 8-channel that gives you all these advanced capabilities plus the proven speed and precision of Spektrum's 2.4GHz DSMX control.



Get your motors running, and keep them running with Experience RC. A full line of engines, replacement parts, field equipment and accessories await you at Experience RC from the top engine manufacturers like O.S., Y.S., and Novarossi. Experience RC carries a large selection of performance exhaust systems from companies like Hatori, Funtech, and many more. Experience RC is your complete source for all things Nitro.

**EDGE**



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# TESTING SPECS

## E-Flite **BLADE 450 3D RTF**

**Part #:** BLH1600

**Distributor:** Horizon Hobby

**Web:** [www.horizonhobby.com](http://www.horizonhobby.com)

**Street Price:** \$470

**Price as Tested:** \$470

**Build/Setup Time:** 30 hours

### PERFORMANCE

**MODE FLOWN:** Normal, Idle-up 1

**RPM OF EACH** Normal: 2600

**MODE:** Idle Up 1: 2850

#### MOTOR TEMP

(after flight): 92° F

#### BATTERY TEMP

(after flight): 90° F

**FLIGHT TIME:** 7 minutes

**CRASH COST\*:** \$20.00

### TEST CONDITIONS

**WEATHER:** Sunny

**TEMP / HUMIDITY:** 72° F/15%

**BAROMETRIC PRESSURE:** 29.92 in.

**WIND SPEED:** 5 mph

**VISIBILITY:** 10 miles

**ALTITUDE:** 850 feet

### PITCH CURVES

**NORMAL:** -4, 0, 9

**IDLE-UP 1:** -9, 0, 9

**IDLE-UP 2:** -0, 0, 0

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

### REQUIRED TO FLY

Nothing additional is required to fly the Blade 450 3D RTF

### WHO'S IT FOR?

Although the Blade 450 is a 3D machine, beginners will find this helicopter well suited to their needs. It's docile around center, but still provide enough control to perform some 3D. This helicopter would be perfect for someone ready to move up from an mSR or similar helicopter.

### SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

### + THE GOOD

- Good performance right out of the box
- Rock solid tail performance
- Does what the box says

### - THE BAD

- Only includes wooden blades

## CONCLUSION

The Blade 450 3D is an all-around great starter helicopter or upgrade from a micro. The increased sized and updated components really make this Blade stand out from the Blade 400. E-flite did a great job of selecting the perfect mixing ratios and power system for someone looking to start off docile and ultimately end up as a 3D pilot. The design may not stand out much from the Blade 400, but when you look at the performance and included gear on top of affordable parts, you may change your mind. **RHD**





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# ROTOR FRIENDS FUN FLY

## Cutting Grass in the Garden State

WORDS: Dan Goldstein | PHOTOS: Dan Goldstein and Mark Schneider

WE'VE HEARD THAT MOST PEOPLE WHO AREN'T FROM NEW JERSEY THINK THAT IT'S THE ARMPIT OF THE USA. Some of us locals might agree while sitting in traffic on the Turnpike or trying to secure a spot on one of our great beaches (Hint: get there before 8AM). Despite this love/hate relationship most people have with New Jersey, the members of the Rotor Friends RC model club found a luxurious piece of grassy heaven to share with their fellow pilots.



## THE FIELD & **ALL ITS GLORY**

Even though the weather called for intermittent showers on Saturday and a washout for Sunday, since this was a new event at a newly constructed recreational facility just outside of New York City we decided to take the hour ride to check it out.

Upon arrival, the club members assisted with our gear and loaded it all onto a golf cart to drive it over to our spot on the row of tents. The park was a massive 40 acres of open space overlooking the Overpeck

River and Palisades Park. You could even see the Empire State Building jutting above the tree line to the South East.

Massive field, beautiful view... who was going to play with all of this airspace? How about Curtis "The Iceman" Youngblood and a cavalcade of local pilots to paint the sky with nitro smoke and electrons. Team Miniature Aircraft's Mark Schneider and Jeff Molinaro brought out a Fury 55 and Furion 6. Team Mikado's Jan Matros fielded V-Bar equipped Logos. Bill Jackson

of the Collective Pitch Show and Team Align USA put out several Trexes to throw around. Wesley Griffith of A Main Hobbies touted his Miniature Aircraft Furion 6 and Dino Spadacinni of Team Align and Futaba fielded a Trex 700 Nitro.

\$20 bought you a tag to fly, a lunch ticket, a raffle ticket and an event t-shirt; not a bad deal! There was open flying at the multiple, spacious flight stations from 6AM until noon when the pros spooled up.



## WHO WAS THERE, AND WHAT DID THEY DO?

To the delight of the fellow pilots, passersby, joggers and all the weekenders on the Turnpike, Curtis opened up by exhibiting his mastery of model control. He spiked around his Rave 90 like a basketball and mixed in some huge air maneuvers to awe the crowd. Then he took the model abruptly off towards the river, some 100-plus yards away and followed the tree line before turning in towards the flight line. The model came barreling in before flipping forward halfway and shooting upwards just feet from the flight line. The crowd was alive with cheers and wows. For his finale, Curtis took the Rave vertical, almost through the clouds to perform a perfect flipping, inverted auto. Curtis, as always, made an impression.

Jan Matros of Team Mikado pulled up with a Logo 600 V-Bar. He laid up some "big sky" maneuvers and tight aerobatics that really highlighted the Logo's power and nimbleness. The Logo screamed across the field like a bullet! Later in the day, Jan strapped a GoPro HD camera on his model to capture some high-res footage of the flying site. While zooming up and down the flight line, Team Miniature Aircraft pilot Mark Schneider was doing his best to avoid

the view of the Logo by running, ducking and covering along the flight line. Mark is always getting into some kind of fun or hijinks at these events.

Next up was Jeff Molinaro of Team Miniature Aircraft with his flybarless Furion 6. Jeff stretched the legs of his machine and took full advantage of the wide, open space. He smacked the machine around with some hard 3D and showed off its responsiveness and precision. MinAir was quite prevalent and although A Main Hobbies offers many brands of models, the Furion 6 was the choice of their team pilot Wesley Griffith. Wesley drew very smooth, clean maneuvers with the Furion and was quite pleasing to watch.

Dino Spadacinni blew some smoke around the field with his Trex 700 for Team Align. Dino pulled off trimming some of the already super short grass. Wrapping up the demo time was Team Miniature Aircraft and Byron Fuel pilot Mark Schneider. Mark wrung out his Fury 55 and illustrated his mix of smack 3D and smooth, big air flying. Mark laid down some impressive and aggressive flying, his tic-tocs and Hurricanes wowed the crowd.

The pro pilots were fantastic to watch and very down to earth to talk to. While it's easy to remember just the big names, I always like to walk the flight line during an event and check in with the "Regular Joe" local pilots. One pilot who caught my eye down at the end of the flight line was 18-year-old Eddie Calzaretta of Totowa, NJ. Eddie was flying a Trex 600 Nitro exceptionally well for having only been into the hobby for a short period. Eddie's interest in aviation also extends into his schooling. He plans to earn his Avionics and Power plant certification for full-scale aircraft. It's always fantastic to see younger people getting involved in the hobby and see the positive influence it has on their lives and, in this case, future profession.

Another memorable local was the Rotor Friends club President, Paul Swiderski. Paul not only organized this event, pulling strings with the Bergen County Park System to secure the amazing flying site, but he also happens to fly like a pro. Paul has an Align Trex 700 Nitro and a flight line stance of Nick Maxwell. Paul's flying was quite intense and aggressive. I'm sure Nick would have been impressed.

Never mind I will take the helicopter





## IN THE PITS

Throughout the day, I wandered around the pit area to see what sorts of gear people were using. I tallied up 75 models on site by mid-day Saturday. Of those, almost half were Align, followed by Mikado and Miniature Aircraft. Also of note, despite the economical trials and tribulations that many people are enduring, a third of the models on hand were 700-size.

One of the more unique models was a radio control, fully functional CV-22 Osprey designed by Tom Mast of RotorMast.com and owned by Mike Hrischuk of Garnett Valley, PA. This model is licensed by Bell/Boeing, is based off the full-scale Osprey's CAD drawings and is 35" from spinner to spinner. While Mike's model wasn't ready for flying, he explained and demonstrated how the nacelles are fully articulated just like the real aircraft. The full-scale Osprey went through a tremendously expensive and mortally costly development. The model version's implementation took some creative parts mixing, customizing and electronics integration. Fortunately, no one has been harmed in its development other than the rustling up of the excitement-inducing adrenalin.

Everyone loves prizes and there were plenty from the sponsors: Cruzin with RC's, Crispy Critters Hobby Shop, Byron Fuel, Tech-Toys, Grand RC, Heli-Proz, X-Heli, Horizon Hobby, A Main Hobbies, Heli Wholesaler and Great Planes. They raffled off big toys like an Align Trex 700 Nitro kit and Trex 450 SE V2 and some small stuff: two Blade MCXs, Mavrikk G5 blades, Hyperion Li-Po's, shirts, and even a cool V-22 Osprey hat. The raffle went smoothly and there were many happy faces all around!

Unfortunately, the weather moved in and started to drop some rain. While the majority of attendees took off, Curtis put up a fantastic night flight for the stalwarts with his Rave 90 ENV electric flybarless monster. Sunday was more or less a rainout and the club and remaining stragglers packed everything up.



## CONCLUSION

This newly born club garnered approval from the local parks commission to allow a group of RC heli enthusiasts to fly on a multi-million dollar stunning piece of open space in North Jersey. They had one of the most famous headliner pilots christen the field, followed by a captivating show of flying daredevilry by more pro pilots. The club rallied nearly 100 local business sponsors for support. Nearly 60 pilots registered on the first day despite the intermittent rain. The club's members were extremely hospitable and the attendees were sated with open flying and a beautiful view. The event was highly successful, and by the time you read this the Rotor Friends will have laid the groundwork for next year's event to become one of the RC heli "must-see" events in the northeast. **RHJ**



# ANOTHER BLADE BREAKTHROUGH



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See for yourself. Get to [bladehelis.com](http://bladehelis.com) right now to see the mCP X in action and find the Blade retailer nearest you.

### mCP X

- LENGTH: 9.25 in (235mm)
- HEIGHT: 3.65 in (93.0mm)
- FLYING WEIGHT: 1.60 oz (45.5 g)
- ROTOR DIAMETER: 9.65 in (245mm)
- MAIN MOTOR: Brushed (installed)
- TAIL MOTOR: Micro Coreless (installed)
- ON-BOARD ELECTRONICS: Flybarless 3-in-1 receiver/ESCs/gyros unit (installed)
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**RTF** 

# BLADE

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# BRUSHLESS MOTOR RATINGS

and Choosing the Right Motor

WORDS: Art Koral | ILLUSTRATIONS: Dave Palacios

**T**HERE'S A LOT TO THINK ABOUT WHEN DECIDING WHAT COMPONENTS TO PUT ON A HELICOPTER. One of the most difficult components to pick out is the brushless motor. Assuming that reliability and cost are no longer factors, performance is the decision point. What does that mean for an electric motor when so many variables go into realizing the right performance? Weight, operating voltage, kV rating, internal resistance, efficiency, type of winds, size, and other factors all impact performance. In this Heli IQ we hope to make sense out of making the right choice by explaining brushless motor equations, definitions, and ratings that drive performance.

## SOME LIGHT EQUATIONS

**M**otor equations are necessary in understanding motor ratings and specifications. It's not important to use them as it is to understand the relationship between the variables and how they relate to each other.

■ **BATTERY POWER IN** (Equation 1) pertains to the voltage provided by the battery multiplied by the current flowing out of the battery. The battery is always the limiting factor for performance and not the motor. If the batteries have insufficient discharge capability, voltage, or energy content desired, then the desired performance will not be attained.

### Equation 1

*Power In (kW) = Battery Current (I amps) × Battery Volts (V)*

■ **TORQUE** (Equation 2) is equal to force applied to a lever arm, similar to cranking on the end of a tire wrench to get a wheel lug loose. The resultant torque is realized at the lug itself. To turn the motor, electromagnetic force acts against the rotor. The rotor translates that force to the gears.

### Equation 2

*Torque = Distance X Force  
(perpendicular to it)*



It's all about torque



■ **MOTOR RPM** (Equation 3) is determined by knowing the system voltage and the kV rating of the motor. “kV” is equal to the RPMs per volt in a no load condition.

**Equation 3**

$$\text{Motor RPM} = \text{Volts} \times \text{Motor kV}$$

■ **MECHANICAL POWER OUT** (Equation 4) is the power developed by the motor as it spins at RPM. Power is directly related to the speed at which the torque is applied. By measuring both the reaction force on a dynamometer and motor RPM, the power output to the shaft can be determined. What this equation implies is that torque is inversely related to RPM for a given motor power. This is why servo gears start off really small and relatively weak and end up really strong and large at the output shaft. The torque is increased as the gear reduction is increased.

**Equation 4**

$$\text{Power (kW)} = \frac{\text{Torque(Nm)} \times 2\pi \times \text{RPM}}{60000}$$

■ **EFFICIENCY** (Equation 5) is equal to the mechanical power out divided by the electrical power in. Since losses are encountered along the way, it's impossible to have a 100% efficient system. Losses can be categorized as copper, iron, or mechanical losses. “Copper losses” occur from current passing through the motor windings (eq. 6), and the losses increase with the square of the current increases. As more power is needed from the motor, greater current is required (eq 1.).

“Iron losses” refer to the losses that occur in the motor materials due to magnetism. Eddy currents (stray currents) form that creates voltage and therefore additional resistance losses.

“Hysteresis losses” occur from the re-alignment of molecules due to changes in magnetic field, and these also draw down motor energy. This is why high quality motor stators are made of multiple laminations. The laminations not only break up the flow path to reduce eddy current losses, but they also reduce hysteresis losses by making the material discontinuous. The faster the motor spins, the higher the losses due to the increased frequency of the change in magnetic field as the rotor turns.



Motor stator laminations help reduce eddy current and hysteresis losses, increasing motor efficiency.

Finally, the mechanical losses come in part from the strain of having to move the rotor (and sometimes cooling fan) through the air, as well as the friction losses against the bearings.

**Equation 5**

$$\text{efficiency} = \frac{\text{Power In Battery Power In eq. 1} \times 100}{\text{Power Out (Shaft Output eq.3)}}$$

■ **INTERNAL RESISTANCE** (Equation 6) is based on the size and length of the copper wire. Motor stators have slots in them to wrap the wires around. These slots are already maximized in size to stuff as much wire as possible inside them. Motors with several turns have more wire wraps around the motor core, and thus the wire strands must be smaller in cross-section, yielding a relatively higher internal resistance. So why have multiple turns if resistance goes up? Higher turn motors have relatively lower kV ratings, and thus allow you to run higher voltage. With higher voltage, the resulting current is less and the power loss is proportionally decreased based on the square of the current.

**Equation 6**

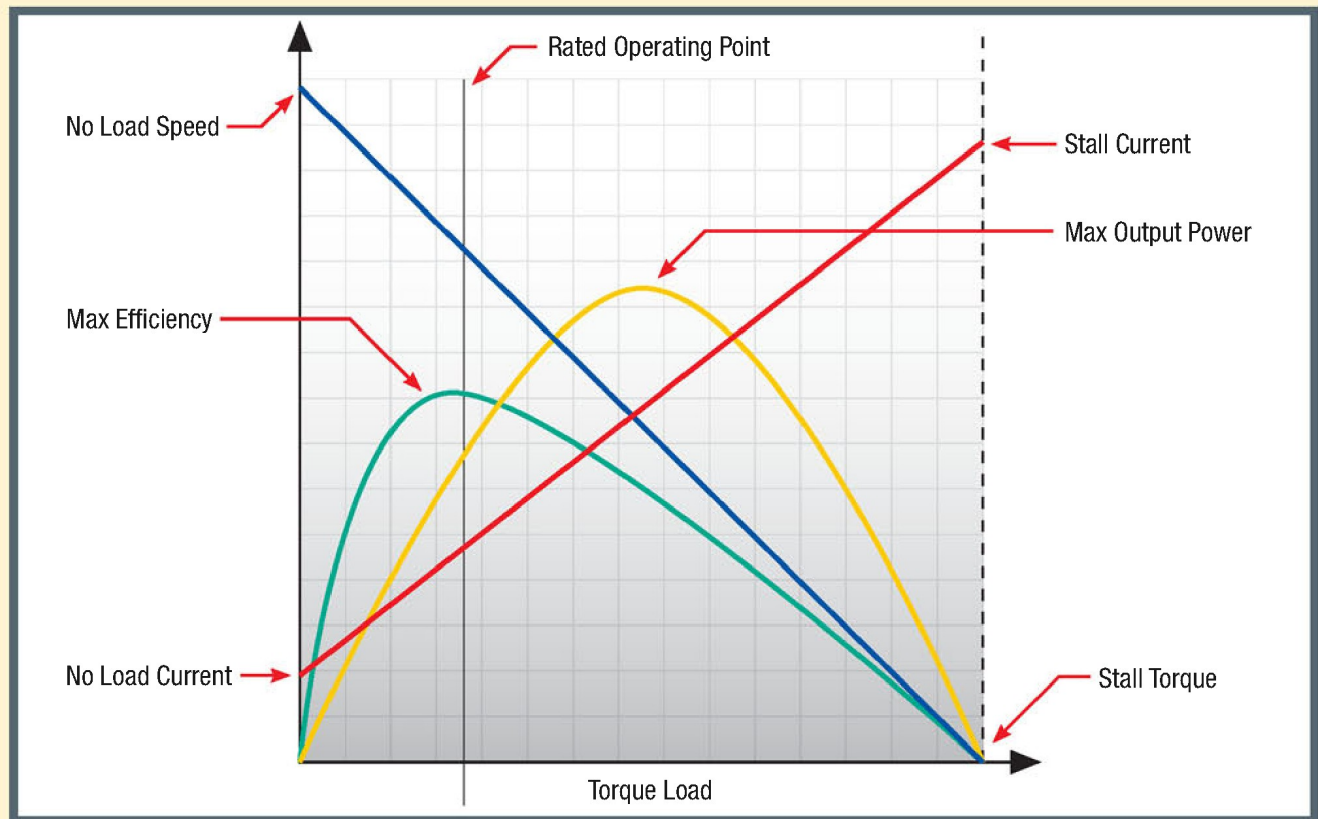
$$\text{Power Loss Due to Resistance(kW)} = I^2 R$$

## MOTOR SPECIFICATIONS AND RATINGS EXPLAINED

■ **NO-LOAD CURRENT** (i.e.  $I_0$  @ xVolts). No-load current is the current required to simply spin the motor at a given voltage without load. The higher the no-load current, the less efficient a motor is when unloaded. Many motor manufacturers publish a no-load current at 10 volts as a baseline for comparison; however, true no-load current occurs at the system's operating voltage and is not necessarily linear in relationship to voltage. No-Load current in itself is not sufficient to determine motor efficiency. Motors with high power output tend to have higher no-load current due to greater mechanical and iron losses from bulkier materials or higher RPMs. These motors may operate more efficiently at high power settings, having much lower copper losses at rated RPM.

■ **MAX RPM:** Maximum RPM may be set based on rotor balance. Destructive vibration may occur when exceeding this RPM. In consideration of motor life, the motor speed should remain below the manufacturer's maximum RPM. Often, motor manufacturers don't publish a max RPM but rather a voltage limit (e.g. 6s) Since RPM is based on (eq. 3) the higher the voltage, the higher the RPM.





This chart is an example of typical brushless motor performance. It displays current (Red), efficiency (Green), power (Yellow), and speed (Blue) as a function of Torque (Horizontal). The motor is tested by steadily going from 0 load at full RPM (left) to full load to the point of motor stall or 0 RPM (right). No load current occurs at the far left and is necessary to keep the motor spinning at full RPM. The Rated (Continuous) operating point occurs just after maximum efficiency. Adding more current from this point increases torque, but also increases motor temperature. Notice how the power curve starts off low at the right and peaks then falls to the left. This is because power is a function of torque and speed. At the far left, torque is low and speed is high and the far right speed is low and torque is high. It's somewhere in the middle of the power curve where peak power occurs.

### ■ RATED (CONTINUOUS) AND

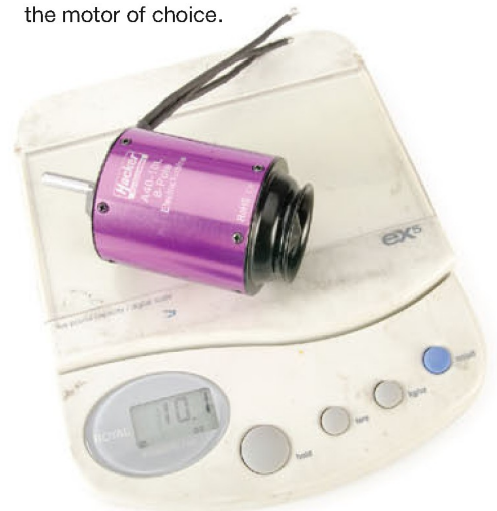
**MAXIMUM POWER:** Continuous power is the power output where the motor can be operated continuously without damaging the motor from excessive heat. It's often given in current instead of power. Simply multiply this current by the voltage to obtain the power rating. Maximum power is often given with a time association. (e.g. 2000 watts for 10 seconds) to allow transient operation. Rated power is usually just after the point of maximum efficiency. Below maximum efficiency, a larger percentage of power is lost due to mechanical losses. A completely unloaded motor operates at 0% efficiency, since 100% of the power is used simply to turn the rotor. Above rated power, losses due to mechanical, copper and iron proportionally increase. Going beyond rated power is limited by operating temperature. A point is reached where operating temperatures can become destructive, causing demagnetization and breakdown

of winding coating and resins keeping the magnets attached to the rotor.

Choosing a motor with max power near the rated power is often desirable when steady state power conditions are wanted, since the motor is sized just right for this condition. Photo helicopters should be sized near rated power since flight time at operating load is more important than maneuvering performance. Aerobic helicopters typically have a wide range of power requirements, and therefore it's important to choose a motor based on maximum power with relatively high efficiency through a range of power settings.

■ **MOTOR WEIGHT:** Weight is probably one of the most overlooked motor specifications. It's easy to make a motor that is efficient and powerful, but it's a real challenge to do this without a weight penalty. With all flying things, keeping weight down is critical and going heavy

will negatively impact performance. There are tradeoffs with choosing a small motor, including increased internal resistance and lower max and continuous power mostly attributed to less cooling capability. The challenge in choosing the right motor is finding the lightest motor that gets you the most power. When comparing motors of a given KV rating and power output, the lightest one with the highest overall efficiency in the range of required power is the motor of choice.





# LEARNING HOW TO PICK THE RIGHT MOTOR

It's difficult to choose a motor simply based on the vendor provided ratings alone. They represent one point of operation, and this point of operation might be different for each motor. The no-load current, internal resistance, efficiency, and power rating are simply one characteristic in understanding motor performance.

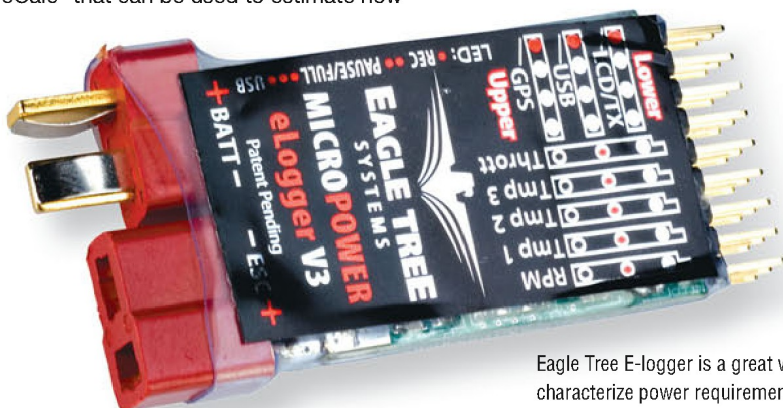
When getting into this hobby, the first choice of motor should be the model manufacturer's recommended or stock motor setup. Field advice from others may be misleading and based on preferences for setup and flying style. Once you understand how to choose a motor based on KV rating, gear reduction, and operating voltage, determining the amount of power required for flight is the next step. A data recorder such as an Eagle Tree is a great tool to determine average and peak power drawn.

After power requirements are determined, a motor can be chosen with


the continuous and peak power required. As explained previously, the motor with the highest operating efficiency and lightest weight at the desired power level should be the motor of choice. Realize that the manufacturer's peak efficiency rating might not necessarily equal better performance if maximum power is desired.

There is a free calculator on line called "eCalc" that can be used to estimate how


the motor will perform based on specific loading conditions. Though it pertains to airplane propellers, helicopters rotors can be simulated. Just input a prop size that will give the desired loadings experienced during flight to simulate that condition. The program will return the efficiency at a specific power draw.



Eagle Tree E-logger is a great way to characterize power requirements in flight.




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**propCalc - Calculator for Propeller**  
The Prop Calculator works with JavaScript.  
Therefore you have to turn it on in your Browser.

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---

**Design Fundamentals:**  
metric units

Battery: (continuous / max. C) - charge state  
LiPo 6000mAh - 35/50C | normal

Controller:  
max 80A

Motor: Manufacturer - Type (Kv in rpm/V)  
NeuMotors | 1910/1.5V (680)

Propeller: Type - yoke twist  
Custom | +5.0°

# serial: 8 S | # parallel: 1 P | Capacity: 6000 mAh

Resistance: 0.0035 Ohm | Continuous Current: 80 A | max. Current: 80 A

Kv (w/o torque): 680 rpm/V | Resistance: 0.02 Ohm | no-load Current: 1 A @ 10 V

Diameter: 9 inch | Pitch: 3 inch | # Blades: 2

Field Elevation: 500 m ASL | Air Temp: 25 °C | Pressure (QNH-ft): 1013 hPa

Resistance: 0.0029 Ohm | Volt per Cell: 3.7 V | Weight per Cell: 167 g

Limit (up to 20s): 2400 W | # mag. Poles: 8 | Case length: 38 mm

Prop Const: 1.31 | Gear Ratio: 1.00 :1

**calculate**

---


**Approx. Values:**

Battery:	Load: 6.5 C	Voltage: 28.82 V	Rated Voltage: 29.6 V	Flight Time*: 9.24 min	mixed Flight Time: 15.7 min	Weight: 1336 g
Motor:	max. Current: 38.98 A	Voltage: 28.68 V	Revolutions: 18975 rpm	el. Power (in): 1118.1 W	mech. Power (out): 1038.16 W	Efficiency: 92.9 %
Optimal Efficiency:	Current: 50.5 A	Voltage: 28.41 V	Revolutions: 18634 rpm	el. Power (in): 1434.67 W	mech. Power (out): 1336.14 W	Efficiency: 93.1 %
Propeller:	Static Thrust: 3261 g	Prop Stall Thrust: 2725.9 g	Revolutions: 18975 rpm	Pitch Speed: 142.2 km/h	Tip Speed: 817.6 km/h	Prop Efficiency: 2.92 g/W

**Warning:**

Notice that the operating point in this calculation occurs at 1038 watts and 92.9% efficiency. Optimal efficiency occurs at 93.1% and even though the operating point is not at optimal efficiency, it's close enough at 92.9%! Numerous loading can be simulated based on voltage and power requirements.

## CONCLUSION

Keep in mind the terms and definitions learned in this Heli IQ to choose the right motor. At a minimum, select a motor that has a max power rating above the power required for flight. Additionally, try to find a motor that is efficient through the entire range of power loading encountered using online calculators. Finally, go with the lightest motor possible that satisfies these conditions. 



# 2011 San Diego **FUN FLY**

Hosted by palomar RC flyers

**WORDS:** Ryan Kephart | **PHOTOS:** Ryan Kephart

IT'S THAT TIME OF YEAR AGAIN, WHEN WE HEAD TO SOUTHERN CALIFORNIA WITH BEAUTIFUL WEATHER AND BLUE SKIES. The San Diego Heli Fun Fly is one of those events where everyone seems to have a good time. This year was no different, as pilots from around the states showed up in their flip-flops and shorts. This year Palomar RC Flyers hosted the event and had plenty of accommodations for both pilot and spectators.







## The Field

The Johnson Field is located near Palomar Mountain, which lies just south of beautiful Fallbrook, California. The field has a huge 600 ft. asphalt runway, four separate helicopter pads located adjacent to the runway, pit area with tables and chairs, and plenty of parking to hold enough pilots for the event. The parking area also offers enough room to park an RV, although the field does not have hookups. The Johnson Field is the home field to several sponsored pilots, including Jason Bell (Team Avant), Justin Barry (Team Avant), and our former Assistant Editor Brandon Updike (Team Avant).



Go Team!





# 2011 San Diego **FUN FLY**

## *The Main Event*

**T**he weekend started off with predictions of rain. As usual, the weatherman was wrong and only the morning was plagued with a little bit of overcast clouds. The weather cleared up around mid-morning and flying was in full effect.

Sponsored pilots from around the United States jumped in and wowed the crowd. The event even brought in “Finless” Bob from HeliFreak, who is known for his how-to videos and builds. Align, Miniature Aircraft, and Avant factory pilots were all there showing off some of their newest moves and helicopters.

There was a little something for everyone, as we even saw some vintage helicopters in the pits and in the air. Scale enthusiast also took to the skies, including Jeff Fassbinder with Align’s new 500-size Cobra, a highly maneuverable MD500, and a carved wood Cobra helicopter by a local pilot. HobbyParts.com also brought out their lineup of models (models = girls).

The field also offered some home cooking for the hungry. BBQ hot dogs and hamburgers with all the condiments were up for grabs. A raffle was also held for the registered pilots. The raffle included batteries, blades, kits, and other helicopter related items.

Not only were there factory pilots there to help out a fellow modeler, but manufacturers like Castle Creations were present to help pilots and support their products. MTA was also in attendance and offered tons of parts. We also spotted Miniature Aircraft’s newest helicopter, the Whiplash. This 90-sized nitro carved through the air and performed well with plenty of power. Tim Jones also showed off the newest .115 nitro engine in a TREX 700. This helicopter was loaded with power, and it seemed that no matter what Tim threw at it, the headspeed would not bog down.

Don't forget your barf bag when you watch that video.

**H**ave you ever wanted to know what it was like to be inside a helicopter while it was performing 3D? Tom Moore from Avant—with the help of local cinematographer Sean Garcia—attached an HD camera to an Avant Aurora and flew a full-blown 3D flight. The video is quite impressive and you should check it out.

[www.youtube.com/  
watch?v=f0DYXaGMrMs](http://www.youtube.com/watch?v=f0DYXaGMrMs)





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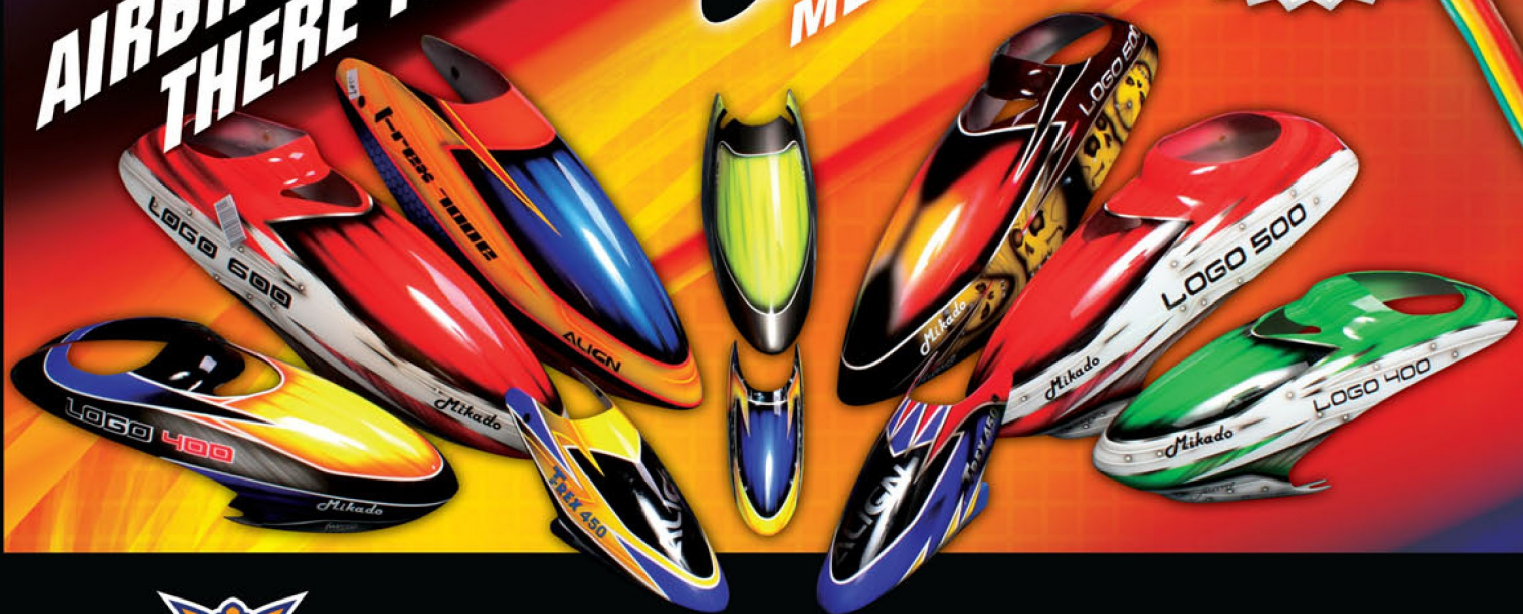
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# 2011 San Diego FUN FLY



## Word from the DIRECTOR:

We had 58 registered pilots, with teams from Align, AVANT, Outrage, Castle and Miniature Aircraft. We also had a lot of "everyday Joes" attending who were flying right next to the pros. All of the factory guys were very approachable throughout the event, and it was great to see them giving flying advice and setup tips to anyone who asked. It's that kind of respect for fellow pilots, no matter what their skill level, that makes these events fun and worthwhile. Having "Finless" Bob there was a real treat for everyone also. He's already posted several videos from the event on HeliFreak.

We generally hold the San Diego Heli Fun Fly in May of each year. This year we did some of the traditional things we've done in the past (like the buckboard BBQ) and some new things (like the video of the morning pilot lineup along the runway) to keep the event interesting for everyone. **-Scott Dedic**



## CONCLUSION

With all the fun and excitement at the 2011 San Diego Fun Fly, I can't wait until next year. This event is so well organized that everything seems to go smoothly, allowing the pilots to just sit back and enjoy themselves. The time of year is perfect here in California and the background setting is beautiful. If you ever want to make a trip out to California for a fun fly this one should be on the top of your list. What could be better than 75-degree weather, a beautiful background flying site, and the great accommodations that the Palomar RC Flyers supply? **RCM**

Ah, sunny California.



# WOULD YOU LIKE TO BE THE **RESIDENT** **DX8 EXPERT?**

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WHEN IT COMES TO **PROGRAMMING?**

**ARE MIXES** SOMETHING YOU'D LIKE TO **KNOW MORE ABOUT?**

.....

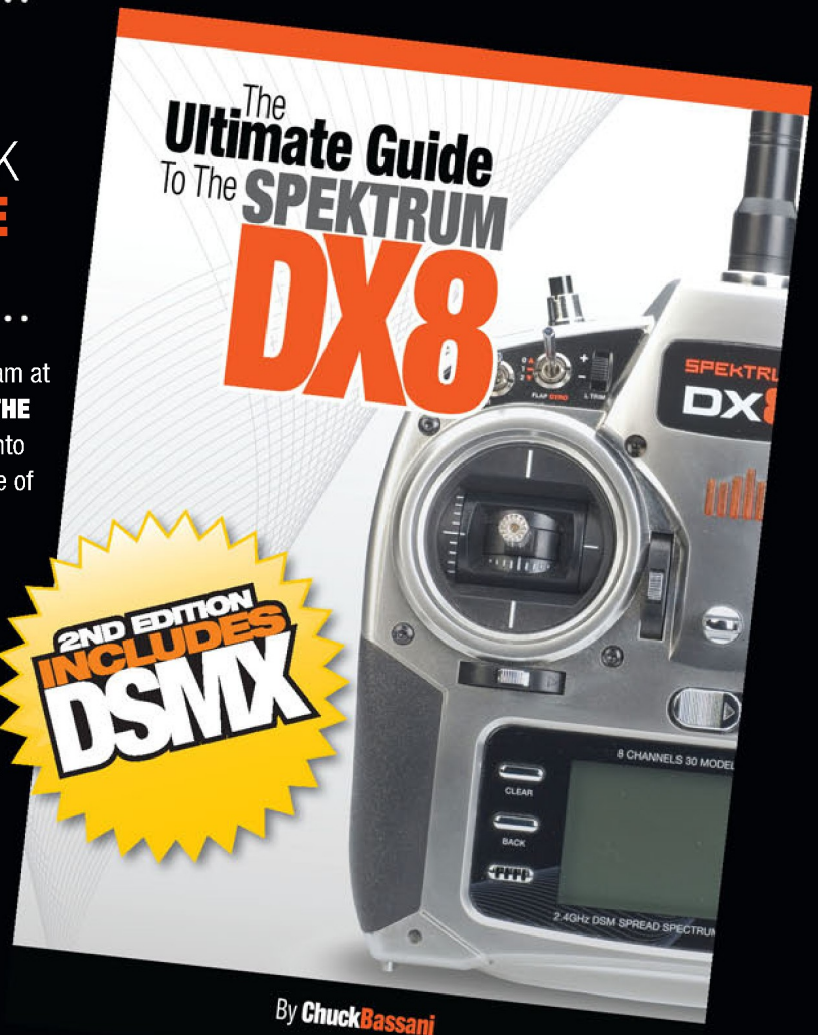
IF YOU ANSWERED 'YES'  
TO **ANY ONE OF THESE**  
**QUESTIONS**, THEN THIS BOOK  
MAY BE **JUST WHAT YOU'VE**  
**BEEN LOOKING FOR.**

.....

**W**ritten by **Chuck Bassani** and published by the team at **RC Heli Magazine**, "**THE ULTIMATE GUIDE TO THE SPEKTRUM DX8**" takes you on an in-depth trip into the features, functions, performance, programming, and use of the Spektrum DX8.

Each and every one of the DX8's '**System Setup**' and '**Function List**' menu selections are broken down in excruciating detail. In fact, this book even documents functions not even covered in the system's "Instruction Manual". Photographs, figures, and screen images are used extensively throughout the book. Installation and setup tips will detail how to get the best possible performance out of the DX8's control and telemetry features.

At the end of the book you'll find "**Step-by-Step**" **tutorials** that will walk you through the complete programming of a basic 4-channel electric trainer airplane, an advanced airplane setup that includes dual ailerons, dual flaps, and retractable landing gear, and a 3D capable nitro powered helicopter. Dual Rates, Exponential, Pre-programmed and General Purpose Compensation Mixes - **they're all covered.**



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# INVERTED LOOP

Exhilarating Fun

WORDS: Ryan Kephart

**W**HILE WORKING ON YOUR 3D TRAINING YOU'VE LEARNED TO DO LOOPS, ROLLS, AND OTHER BASIC 3D MOVES, BUT NOW YOU ARE STUCK AND DO NOT KNOW WHAT MOVE IS NEXT. A basic loop consists of mostly positive collective inputs with a brief negative input at the top. To step it up a notch, an inverted loop can be performed, which is basically the same as a normal loop, but with mostly negative collective inputs. This can be a challenge, as it's hard to break the positive collective habit from countless hours of hovering and normal flight.

## Flight School Training

### BASIC SETUP:

■ As you probably already know, any 3D flight requires your helicopter to be set up with Idle-up throttle curves, and a linear pitch curve that has at least 10 degrees of positive and negative pitch. The inverted loop is performed by starting at a high altitude and moving forward. When initiated, the nose of the helicopter will drop and continue around as you apply negative collective towards the bottom of loop, and then applying more negative collective to begin the upwards portion while applying more forward cyclic to point the nose to the sky.

### HOW TO PREPARE:

■ The inverted loop takes a fair amount of forward speed to make the move look symmetrical. It's a good idea to practice fast forward flight until you are comfortable with the speed. You can also practice extended inverted flight at the top of your normal loops or when you are half way completed with a roll. This will get you comfortable applying negative pitch for an extended amount of time. Another thing that is different from a normal loop and inverted loop is the forward cyclic command required to perform the inverted loop. This can also be tricky when you first perform this maneuver. You can practice the forward cyclic command by performing forward flips at a high altitude.

### THINGS TO LOOK OUT FOR:

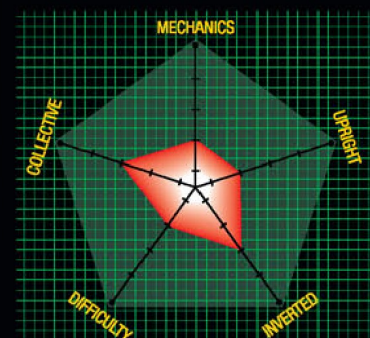
■ As with any fast moving maneuver, there will always be a few things to watch out for. The number one thing is to not panic and freeze up. Freezing up during this maneuver will surely end in a crash. The orientation of the helicopter will try to fool you while performing the inverted loop. Make sure to perform this stunt at a high altitude.

**1** Start at the highest altitude you feel comfortable with. Get the helicopter moving forward at a normal speed.

**5** Increase the negative collective input dramatically to allow the helicopter to climb on the backside of the loop. Continue this input until the nose of the helicopter is pointed strait up.

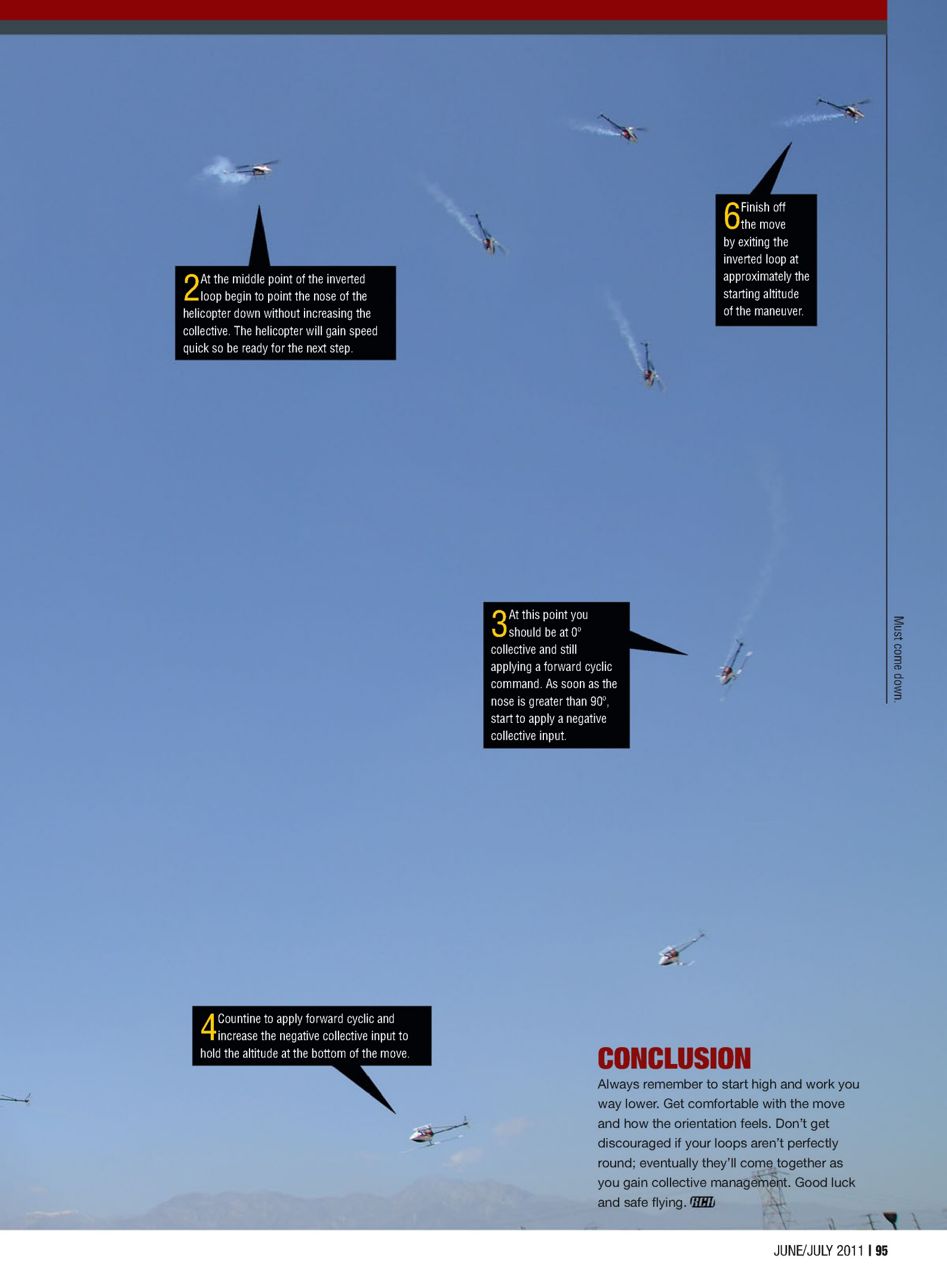
## SKILLS NEEDED

SCALE RATING: GREEN = Easy / RED = Advanced



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





**2** At the middle point of the inverted loop begin to point the nose of the helicopter down without increasing the collective. The helicopter will gain speed quick so be ready for the next step.

**6** Finish off the move by exiting the inverted loop at approximately the starting altitude of the maneuver.

**3** At this point you should be at  $0^\circ$  collective and still applying a forward cyclic command. As soon as the nose is greater than  $90^\circ$ , start to apply a negative collective input.

**4** Countinue to apply forward cyclic and increase the negative collective input to hold the altitude at the bottom of the move.

## CONCLUSION

Always remember to start high and work you way lower. Get comfortable with the move and how the orientation feels. Don't get discouraged if your loops aren't perfectly round; eventually they'll come together as you gain collective management. Good luck and safe flying. **RTHL**

Must come down.



# PRO PILOT FAVORITES

## with Matt Botos

Sponsored by Futaba

WORDS: Ryan Kephart

Matt Botos was a professional pole vaulter.

### Flight School Training

#### THE PIROUETTING LOOP:

■ **RCH:** Hey Matt, what is your favorite maneuver to perform?

**MATT:** The Pirouetting Loop.

■ **RCH:** How and why did you learn this maneuver?

**MATT:** I started learning the piro loop in 2004 when it was assigned as a required maneuver for the Xtreme Flight Championships. Prior to this I had only been performing piro flips. I learned this maneuver by increasing the diameter of my piro flips, eventually making them as large as I wanted.

■ **RCH:** How do you fit this maneuver into your flight routine?

**MATT:** I generally have sections to my routines where I will perform a certain type of flying. I will work a pirouetting loop into my routine while doing other pirouetting maneuvers.

■ **RCH:** What are some things to watch out for while performing this maneuver?

**MATT:** Don't rush down the back side while the helicopter is falling, and know how you are going to bail out of the maneuver in case something goes wrong! Perform this maneuver with adequate altitude, as it can be very scary coming down the backside of a piro loop at low altitude.

■ **RCH:** How would a pilot learn this maneuver?

**MATT:** The maneuver is done by completing a loop while pirouetting. You can practice this by learning to do a loop in all orientations and then slowly transitioning between orientations while performing the loop.

■ **RCH:** Thanks Matt. You can check out Matt Botos flying this maneuver during a flight routine. The pirouetting loop is performed at 1:06 seconds into the video here: <http://tinyurl.com/RCHBotos>

4 Matt also suggests doing loops in all orientations. This will help control the helicopter speed, and transitions between the different orientations.



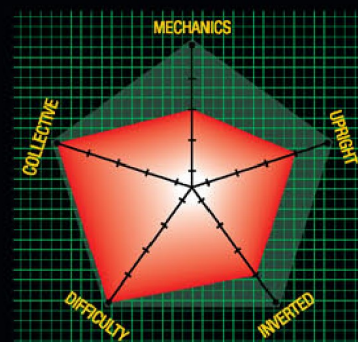
**3** Collective management is key to a successful piro loop. Take your time and feel out the maneuver. Be extremely careful when coming down the backside. Do not freeze up and continue to stir the cyclic.

**2** As the helicopter starts performing bigger piro flips you will notice how a piro loop is performed.

**1** Start out by piro flipping stationary. Then as you learn the piro flip start increasing the size by adding more collective in key areas.

## » SKILLS NEEDED

SCALE RATING: GREEN = Easy / RED = Advanced



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

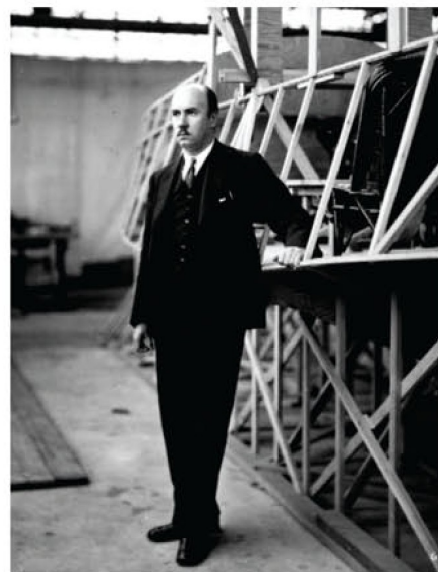


# The Illusive SIKORSKY PRIZE

Can it be done?

WORDS: Ryan Kephart

**T**he Sikorsky Prize is a major competition to the world. The goal is to create a human-powered helicopter that can sustain a person under their own power. In concept this may sound easy, but people have been trying this for years, with only a few people actually taking flight, but without satisfactory results. Let's take a look at this competition and what makes it so difficult.



## HISTORY OF THE SIKORSKY PRIZE

In 1980, the American Helicopter Society created a challenge for any person to create a helicopter that can fly by human motion. A \$20,000 prize backed this somewhat ridiculous challenge to the first person who could successfully fly under their own power for 60 seconds at an altitude of 10 feet. The competition was named the "Sikorsky Prize" in honor of Igor Sikorsky.

Many backyard engineers have tried to accomplish this task, but only two have successfully left the ground under official witnesses. These projects were named Da Vinci III, and Yuri I.

Dr. Paul MacCready is no stranger to human powered flight. Although it wasn't a helicopter he designed, he successfully piloted a human-powered, fixed-wing aircraft and won the Kremer Prize by successfully completing a Figure 8 in 1979. He said, "The reality of a human-powered helicopter is that, with the simple formula for static thrust of a rotor, you quickly find you need a disk diameter of 150 feet or so for serious human-powered helicopter flight. It can be done, but the task is huge, and the dollar prize not worth the time expenditure. There are many more exciting, never-been-done-before challenges that can be accomplished

with much less work." Recently, Sikorsky Aircraft Company decided to boost the bounty on this competition by raising the prize money to \$250,000.

## CLOSE, BUT NOT CLOSE ENOUGH

To date, Professor Akira Naito of Nihon University holds the official world record of human-powered rotor flight. His flight lasted for a duration of 19.46 seconds, at an altitude of 0.65 feet.

## THE PRIZE IS STILL UP FOR GRABS

Although the prize money may not seem like much for the hard work, dedication, and the trials and errors of inventing, Sikorsky believes that individuals are what provides the spark that moves mankind ahead. Since Igor's death, Sikorsky Aircraft Company still strongly believes in the power of a challenge. It's time to ask yourself, are you game? **RCH**





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