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RC Heli

THE WORLD'S BEST-SELLING RC HELICOPTER MAGAZINE

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» **THUNDER TIGER** RAPTOR 50 2.4G SC

» **E-FLITE** BLADE SR

» **ALIGN** 3G TREX 700 3G FLYBARLESS SYSTEM

MAY 2010 / ISSUE 46

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- UNDERSTAND RADIO PERFORMANCE
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Gear Ratio:	8.5:1:4.56
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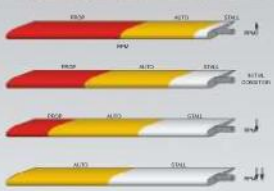
Don't forget to order your RC Heli T-shirt today.

UNDER THE SCOPE

ROTORHEAD

REGULARS



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Buyer BEWARE

TIMES ARE STILL TIGHT OUT THERE. MANY OF US HAVE HAD TO CHANGE OUR DAILY HABITS TO COMPENSATE FOR THE UNCERTAINTY THAT WE'VE HAD TO FACE. If you're reading this magazine then chances are you still have the expendable income needed to support a hobby like radio controlled helicopters. I've had quite a few hobbies in my lifetime, some much less expensive, some much more. But when you factor in the satisfaction both on the bench and in the air that RC helicopters bring I think it has an excellent return on investment. With all that said it's important to be a smart shopper. But being a smart shopper doesn't always mean going with the cheapest option out there. Call me old fashion but I still believe that you get what you pay for. When making a purchasing decisions do some research. If we review it and say it's a good investment then you can bank on that. When we review product we look at it from the prospective of the customer, as if we were spending our own hard earned cash. In addition to our advice go on-line; seek out reviews on specific products. Forums like Heli Freak and Run Ryder are great resources for information. But take what's being posted with a grain of salt. It's human nature to justify our purchases to make ourselves feel better about a decision. This could translate into an overly glowing assessment of a product that might not be warranted. The other side of the coin is someone bashing a product for a really petty reason. Often times you'll find a consensus on whether a product, or retailer is a worthwhile investment. Ask buddies at the field for their experiences with stores and products. I'm also a fan of brand names. No, not because I want a little alligator on my shirt, but because brands usually have a good reputation and someone to fall back on if you have problems. This is especially important in a hobby like ours where safety is an issue. If someone has a bulk of batteries for sale at a price that's too good to be true do you really want that potential disaster sitting in your garage while you're sleeping at night? Or a pair of blades spinning around you at 2000 RPM that might have been produced from suspect material? Stick with companies that you can pick up the phone and talk to a live person on the other end that can answer questions about the product you're buying. More reputable companies get that reputation for good reason, so stick with names that you can research and trust. My dad always used to tell me that every dollar you "waste" is a dollar you'll never earn back no matter how much you make. Whether you've got a big budget (always nicer) or a tight one you can enjoy this hobby more when you're an educated shopper. So read up and be a smart shopper.

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

Does Mike really own a *Shake Weight*?

RC Heli magazine

CHATTER BOX

WHAT'S YOUR WORST PURCHASING DESISION?

MIKE VELEZ - Publisher/Editor-In-Chief
The Shake Weight, remind me not to use in public.

RYAN KEPHART - Associate Editor
My gigantic Chevy Truck. Ya it looked cool, but it sure could suck down the fuel.

BRANDON UPDIKE - Editorial Assistant
That Panda Express I had before my finals. Food poisoning for the loss.

JIM INNES - Editor-At-Large
A new Ford Mustang in 1999. The car was small inside, expensive, and lacked any real power the name carries with it.

CHUCK BASSANI - Editor-At-Large
Some electronic dohickey that wasn't very fast.

ART KORAL - Contributor
A motorcycle for commuting, I owned it one month and sold it. I realized my need for speed would eventually kill me in rush hour traffic.

SHAWN KITCHEN - Copy Editor
Microsoft Windows. Any version, take your pick. Do I really need to explain why?

ART & PHOTOGRAPHY
Art Director
Dave Palacios
Art Department Manager
Joanna Buono
Senior Staff Photographer
Carl Hyndman
Staff Photographer
Jason Boulanger

CONTRIBUTING WRITERS:
Dave Yost, Mark Madsen, Dr. Tim Dawson, Dan Goldstien, Mark Fadely

PRODUCTION/ADVERTISING
Production Director
Bob Mackey
Advertising Account Exec
Zary Lahouti
Circulation Managers
Tom Ferruggia
Circulation Assistant
Sonya Velez

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THINK

RADIKAL G20

PETROL ENGINE

"THIS GAS HELICOPTER IS A PERFECT OPTION FOR A PILOT LOOKING TO GET THE MOST OUT OF FLIGHT TIME WITHOUT HINDERING FLIGHT PERFORMANCE."
-RC Heli Magazine

G10 version with LT head shown. RotorTech 640mm Blades and Tuned Muffler are optional items.

Length: 1366mm
Height: 381mm
Width: 260mm
Main rotor diameter: 1435mm
Tail rotor diameter: 262mm
Main rotor blades: 600mm-660mm
Tail rotor blades: 95mm
Flight time: More than 30 mins w/ consumption of 300 ml
Weight complete w/ electronics and engine 4500g

"THE HELICOPTER FEELS LOCKED IN AND FLIES WITH AUTHORITY AND REMINDS ME OF A .60 SIZE NITRO MACHINE."
-Model Airplane News

"THE RADIKAL G20 WILL DO EVERYTHING A NITRO 50 WILL DO RIGHT UP TO 'HARD/ CRACK' TYPE 3D."
-AllThingsThatFly.com

Since it's introduction, the Century Radikal G20 has dominated the 3D aerobatic gasoline performance market. Designed from the ground up with the latest manufacturing framework, we're proud to offer the latest generation of technologies which has been incorporated to produce this G10 and Carbon Fiber framed helicopter powered by the new Zenoah 20cc gasoline engine. The assembly goes together with ease and is simple to maintain yet doesn't sacrifice flight performance that you may expect from a gasoline powered helicopter. Whether you are an experienced pilot or just a beginner, the economic flight times and aerobatic flight performance of the Radikal G20 is a perfect choice for your first helicopter or a great addition to your current fleet. Don't take our word for it, listen to what others are saying about our Radikal G20.

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ALIGN'S NEW TOYS

There's been a lot of buzz about the new Align helicopters being tested by Alan Szabo Jr. in Taiwan. It seems that the Align train isn't showing any signs of slowing down as they make their way back to the electric scene. Align has both a dedicated T-Rex 700e and a new T-Rex 550 in the works. There have been numerous videos online of the new helicopters in action.

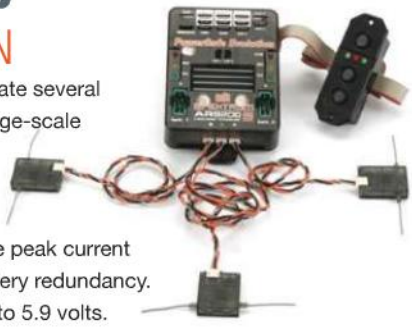
WWW.ALIGNRCUSA.COM
WWW.HELIWHOLESALER.COM

SYNERGY N5

Matt Botos recently announced that he has received the production kits for the upcoming Synergy N5. At the time of this writing, he is building the kits to make sure that they meet the quality standards he has set. This kit has been generating quite a buzz and is getting closer and closer to completion. Matt and the Synergy team have been hard at work to get this kit out and we're sure they won't disappoint.

WWW.MATTBOTOS.COM

SPEKTRUM AR9200
POWERSAFE EVOLUTION



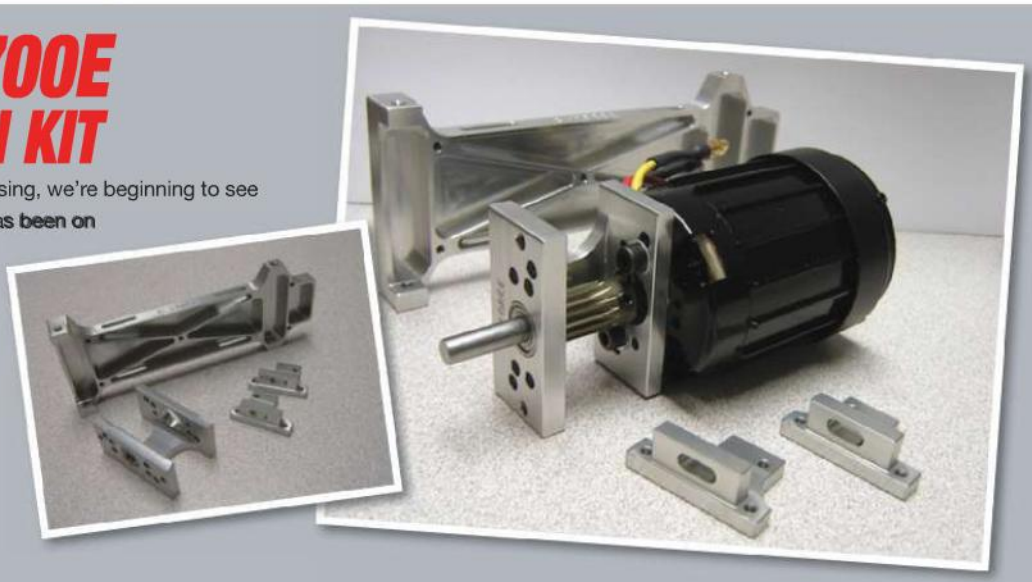
Spektrum has developed a receiver to operate several high-power servos safely. Designed with large-scale airplanes and jets in mind, this receiver also appeals to scale helicopter pilots who use a large amount of onboard electronics. The new receiver able to handle peak current loads of up to 20 amps along with dual battery redundancy. It's also able to regulate each battery input to 5.9 volts.

WWW.SPEKTRUMRC.COM

G-FORCE 700E CONVERSION KIT

With the popularity of the 700e rising, we're beginning to see more conversion kits. G-Force has been on the aftermarket scene making parts for Align helicopters. Now they have a full CNC aluminum conversion kit designed to fit all 90-class electric motors. The brackets fit in the stock frame holes and do not require any modifications.

WWW.GFORCEHELI.COM



Smart Fly now has some competition.

BEASTX MICROBEAST

Flybarless systems are all the rage nowadays, and now there's a new name to remember. A German company - BeastX - has designed their own 3-axis gyro called the Microbeast. Much like the V-Bar, it's able to process radio inputs with the use of a Spektrum satellite receiver. It has a USB interface with the ability to fine-tune itself on the computer. They do advertise, however, a simple interface for easy-to-use adjustments that can be performed at the field. Not many people are using the system yet, so not much is known.

WWW.BEASTX.COM

ELY-Q FLYBARLESS

Ely-Q has been releasing products at a steady pace. They have recently announced that they will be making a flybarless system. They released the CNC drawing of the head and it looks promising. Not much is known about the system yet, but we'll keep you posted as we get additional information.

WWW.ELYQ.COM

COMPASS ATOM 6HV

Compass is releasing a 600-sized electric heli that can fly using a 12s battery pack. You'll have the ability to choose a single 12S pack or two 6S packs in series. The 6S packs can range from 2600 mAh to 3300 mAh. This allows previous 500 class flyers to reuse their packs for the new 600. The helicopter is made of carbon fiber and CNC machined aluminum.

WWW.COMPASSMODEL.COM

O.S. will also be offering a conversion kit for your current 91HZ.

NEW O.S. 91 HZ-R

OS has a new engine in the works that takes a different approach from past designs. The overall motor is the same, but the carburetor has been redesigned. It's now similar to YS motors in that it uses a fuel pressure regulator. This allows for more consistent fuel flow and a better overall operation. The system has been tested by top pros and is expected to be released sometime in the spring.

WWW.OSENGINES.COM

RCX COVERAGE

Los Angeles County Fairplex
Pomona, California
March 20-21, 2010

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

Southern California has two major annual expos: the AMA Expo and RCX. The RCX is more of a general RC event that houses a wide range of hobbies including helicopters, airplanes, boats, cars, and even die cast models. The event is located in Pomona, CA at the Los Angeles County Fairplex. RCX focuses mainly on the RC car industry with a huge RC car track and a whole building dedicated to vendors. In another building an area is set up for aircraft. Toward the back of the building RCX has an indoor flying area for small helicopters and planes to put on demos.

OUTSIDE

This year Tim Jones flew a TREX 700 in an open area just outside of the building. As the noise and smell of the nitro filled the air, a big crowd of people gathered around to see things that they never knew were possible. This sparked the interest of many people.

RCX also had several food and drink stands for people to purchase their favorite beverage and get some grub. A mini plane was also on display outside the aircraft building, giving kids a chance to hop in and have their picture taken. Another interesting sight was a helicopter instructor offering his services for hire. This hard working instructor teaches people how to fly using his own equipment. I'm sure this guy was busy after the crowd saw the 3D demo.

Is that Brandon with a sign on his back?

ESKY STATEMENT

Don't Be Fooled!

It's come to our attention that counterfeit ESKY brand products are being sold by unscrupulous vendors. These fake and shoddy products are not only causing a negative impact on our image of our commitment to quality, but threatening the safety and rights of ESKY consumers and users. To protect the lawful rights and interests of the authorized ESKY distributors and vendors as well as ESKY consumers and users, ESKY Co., Ltd makes the statement as below:

Please locate your local distributors or vendors from ESKY official website www.esky-sz.cn www.twf-sz.com ESKY confirms that distributors publicized on ESKY official website are authorized distributors of ESKY original products. As for those unpublicized distributors and vendors, ESKY will check their distributor's qualifications within 3 months since the date of issuing of the statement. Only passing our distributors and vendors qualifications then will they be publicized on our official website. Your cooperation of eradicating ESKY fake products will be greatly appreciated.

In order to help consumers to authenticate genuine ESKY products and to take more efforts in fighting against the fake products, ESKY Crop is introducing new laser technology to mark an additional ESKY registered trademark on the surface of spare and accessory parts. All the parts sold after December 23rd, 2009 are laser marked with the additional ESKY registered trademark. For the convenience of all the consumers to authenticate the ESKY products, especially the tiny parts, please browse the Anti-Fake page on our website to check for the exact spots of our trademark on those tiny parts. It may require using magnifying glass to check the laser-marked trademark because those trademarks may be smaller than 1mm.

Please find your local distributor from official ESKY website www.esky-sz.cn

NANO

NEW

Length: 128mm
Height: 47mm
Main rotor diameter: 210mm
Weight: approximately 60g

TANDEM ROTOR

NEW

Length: 251mm
Height: 153mm
Main rotor diameter: 210
Weight: approximately 145g

A300

NEW

Length: 380mm
Height: 180mm
Main rotor diameter: 340mm
Weight: approximately 230g

LAMA V4

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

BIG LAMA

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

HONEY BEE 2

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

HONEY BEE CP3

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

READY TO FLY

ESKY 900

Your Professional Choice ESKY

Length: 845mm
Height: 311mm
Main rotor diameter: 929mm
Body weight: approximately 850g

KIT Version

BELT-CP CX

NEW

Your #1 Ready To Fly Source 3D Pro

Length: 650mm
Height: 230mm
Main rotor diameter: 680mm
Weight: approximately 670g

BELT-CP V2

Your #1 Ready To Fly Source 3D Pro

Length: 650mm
Height: 230mm
Main rotor diameter: 680mm
Weight: approximately 670g

READY TO FLY

HONEY BEEKING3

Your #1 Ready To Fly Source 3D Pro

Length: 550mm
Height: 200mm
Main rotor diameter: 600mm
Weight: approximately 390g

READY TO FLY

Digital Servos7.5g

2.4GHz Receiver

2.4GHz ET6X

Please find your local distributors from ESKY official website www.esky-sz.cn

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86-0755-81728009 WWW.ESKY-SZ.CN

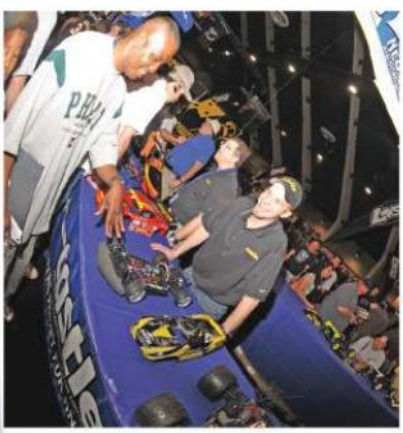
INSIDE

Inside the building we saw several new products scattered around. If you were looking for general hobby items this was the place to be. Special tools, batteries, and other items could be found with a single glance. Some of the more helicopter related vendors were there, too.

Can we say FISH EYE.

GREX is a company that knows no matter what kind of aircraft you fly, paint is needed. Grex had a nice booth displaying their newest airbrush. This Tritium V2 airbrush features a comfortable grip and trigger style action. The paint is drawn in by a centered gravity feed. This gun has a wide range of use with a single tip, allowing the painter to get up close for fine work, as well as further back for heavier application.

CASTLE CREATIONS set up a booth and displayed all of their speed controllers and motors. A friendly staff was also on hand, answering questions and giving advice on programming.



INNOV8TIVE DESIGNS also displayed and sold their motors. Scorpion also revealed their newest line of inrunner motors that were displayed on a digital picture frame.

CONCLUSION

RCX has been getting bigger and bigger every year. Next year we all hope to see more helicopter related vendors. This year proved to RCX that RC helicopters have a big following. We look forward to covering next year's event. RCH

Servos You Want From The Name You Trust

Spektrum's value packed helicopter servos give you a great servo at a great price, plus the peace of mind that comes from going with a name you know you can trust. Both have extremely quick transit times and the precision of digital amplifiers. There's one for any of the most popular heli classes, from 500-size electric mini helis to high-end .90-size 3D machines.

Go to spektrumrc.com right now to see the entire line of new servo solutions from the most trusted name in radio control and find a retailer near you.

Servo Part Number	Application	Torque @ 6V	Speed sec/60° @ 6V	Weight	Gears	Motor / Bearing
H5000 SPMSH5000	500 size	64 oz-in 4.6 kg-cm	.11	0.9 oz 26.0 g	Nylon	Coreless / Dual
H6040 SPMSH6040	50-90 size	167 oz-in 12 kg-cm	.08	1.8 oz 52.4 g	Titanium	Coreless / Dual

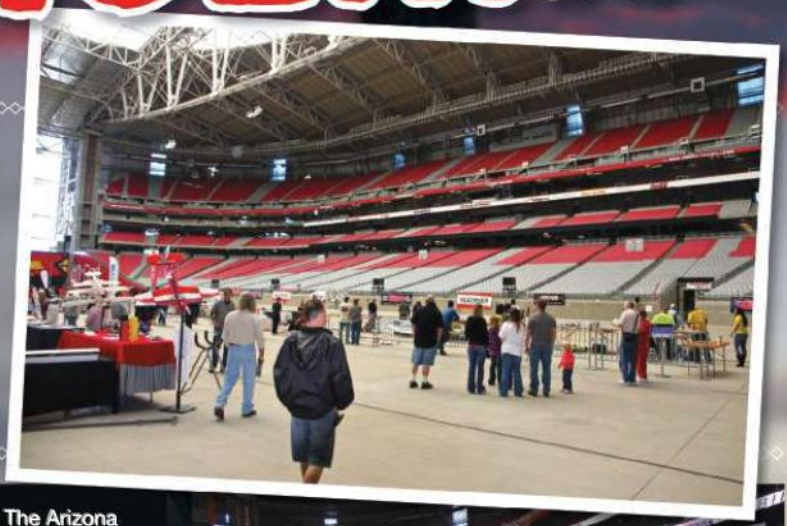
Spektrum makes finding the right servo for the job easy with application icons right on the package.

SPEKTRUMRC.COM

SPEKTRUM

Electric Expo in PHOENIX

WORDS: Bob Bayless | **PHOTOS:** Eric Stevens



This was the third year for the Electric Expo. The venue is the University of Phoenix Stadium, otherwise known as the home of the Arizona Cardinals (no lack of flying space here!). The roof is over 400 feet high. There was flying activity going on continuously. There were also a great variety of vendor booths present.

Batter up!

There were other aspects of modeling represented. The Arizona Big Train Operators had a display of Garden Scale railroading. The International Plastic Modeling Society (Craig Hewitt chapter) had displays of models and there were several people building models and answering questions. The work they do is amazing. Car racing was represented and Desert Armor Korp was showing off their RC tanks.

The Tuskegee Airmen were represented with a booth. They had shirts, hats, and books for sale. You could also meet a few of the remaining members of the squadron. They are outstanding gentlemen, and it was an honor to meet real American heroes in person.

Electric models have really come a long way. The variety and size of models available now is mind-boggling. Remember when the best you could do was a 3-minute flight only if there was no wind? Times surely have changed. Electric helicopter performance has, in many ways, exceeded their fuel powered cousins. I think electric models are the future and may be the answer to the loss of flying fields due to noise complaints.

I went looking for new items and I didn't have to look very hard. Gorilla Bob's booth had a nifty battery balancer. You can get it in two versions, with or without a volt meter. It doesn't have a "regular" connector; it has pins which plug into any battery balance connector except for Thunder Power (and an adapter is available for that application). It will balance up to six cells at once. This company has many more interesting products at low cost. (www.gorillabobsrc.com)

Vegas or Phoenix....We went to both!

Thunder Power was showing their new charger. It will charge two 8-cell packs at a time. Both channels have a balancer, too. Check out their new 45C Li-Po packs while you're at it. (www.thunderpowerrc.com)

Inov8tive Designs displayed all the new Scorpion motors. They also have an interesting assortment of other products (www.innov8tivedesigns.com)

Programming cards for speed controls are becoming more common, and Castle Creations was showing their new one. It works virtually identically to the Castle Link. It's handy, fits in a toolbox, and is lighter than a laptop computer. They were also demonstrating the latest features of the Castle Link software. For example, if you use the governor feature on your helicopter, you can evaluate different gear ratios and get an idea of motor performance before you program the speed control. (www.castlecreations.com)

Gaui had their new 255 heli for show. Jerry Short of Team Gaui was showing it to me, but I couldn't talk him out of it. Darn!!

I liked the MD500 conversion for the Gaui 200. It looks great and is very nicely made. The nose is held in place with magnets and locating pins. The conversion kit appeared to include the Gaui 5-blade head, too. (www.empirerc.com)

AZ Chopper Cam demonstrated their heli camera ships. There was a prototype for a fully autonomous camera platform equipped with a 3 Gaui helicopters. It uses GPS for navigation, has a 75 to 80 lb. payload and gets 13-minute flight times on three 5S, 5000 mAh battery packs. They plan to go to 8000's. The head speed is around 1000 rpm. It will be sold as a turnkey unit at approximately $10,000. You can see a tail rotor in the pictures. It is powered by a brushless motor and is variable pitch. Two of the three rotors operate counter-clockwise and one rotor operates clockwise. This leaves a minimal torque effect and is the reason for the tail rotor. RC Foam really had a great selection of carbon, foam, and balsa. Great prices too. (www.rcfoam.com)

Endless showed their carbon canopies for the McX and the MSR. Check your local hobby shop or get them to order them for you.

There was a lot going on all of the time. Various factory pilots flew demos and there were contest events, too. Along the sideline of the stadium was an open flying area for all the registered pilots.

Thanks to Jack Burnside, President of Empire Hobby, and all of the Empire crew, volunteers, and companies for making this an enjoyable event. Next year's event is already in the planning stages, so make sure to put it on your calendar.

LETTERS

NEED A MECHANIC?

Hey guys, here's a picture of my son "fixing" my Mikado Logo 600 for the Feedback section of the magazine. I get 3000-watt peaks and about 5.5 minutes of smooth 3D on the 12S 2650mAh packs at 2000 RPM.

Specs are: Vbar 4.0, Spektrum AR6200, Futaba 9452's on cyclic, Futaba 9256 on tail, Edge 603 FBL, KBDD tail blades, WR 14S BEC, Scorpion 4035-500, Mod 1.0 Gearing, 12T pinion, 12S 2650-3000mAh, Castle Phoenix HV 45, and Spektrum DX7 transmitter.The flying weight with 12S 2650mAh pack is 7.7 pounds. Thanks,

Matt Crooks
Pottstown, PA

GOOD GOING BRUCE

I would like to remark on your Editorial entitled, "Raising Awareness", and also on your recent interview with Mr. Bruce Jenner.

Everybody seems to be so excited because of the "great, positive exposure" that Mr. Jenner has brought to the world of RC helicopters through his reality show. However, I am of the completely opposite opinion. I feel that Mr. Jenner has done more irreparable harm to the hobby, in one careless episode of "Keeping Up With The Kardashians", than any other single person or event has ever brought to the hobby.

By naming a $3000 price tag for the purchase of an RTF nitro heli on a TV show that is popular with women across the U.S., Mr. Jenner has shot down the possibility of thousands of RC heli enthusiasts (mainly husbands) ever having a chance of buying a helicopter.

If Mr. Jenner, with all his money, can't sneak an RC heli purchase past his wife, what are the chances that the rest of us mortal men, (with average incomes), will ever be able to buy one? My wife saw the episode and now questions every single RC purchase I make with careful scrutiny and criticism. This never happened before Mr. Jenner's price-dropping trip to the most expensive hobby shop in Calabasas, CA. This episode has, without a doubt, negatively impacted my ability to purchase RC products, as well as the number of days I now fly each month. A couple of my flying buddies are experiencing the same thing. OK, I am still going to fly RC, but now my wife is busting my chops about it all the time, when before she didn't give a care because she hadn't a clue as to how much money I was spending on my hobby.

I am willing to bet that literally thousands of future RC helicopter sales have been forever lost because of Mr. Jenner's careless TV stunt. While I am sure that there are plenty of turn-key, high-end, nitro heli/radio combos out there that you can waste $3000 on, the bulk of us "Average Joe's" look for Internet specials, buy our heli's in far less expensive kits, build them ourselves, and outfit them with affordable motors, radios, and gyros for a fraction of that price tag. Yes, I still paid major bucks for my Nitro TREX 600, but I did it at less than a third of the price of Jenner's ridiculous RTF heli purchase.

Mr. Jenner's National TV exposure of RC heli's, (without naming prices), might have otherwise been a good thing for the hobby, but unfortunately, I feel it has done more harm than good.

I challenge you to post my comments here. I am willing to bet my TREX 600N that I am not alone in my horror and disappointment in Bruce Jenner's careless comments, and how that has negatively impacted our hobby. And I am sincerely

ARE YOU MORE AEROBATIC THAN A FIRST GRADER?

I would like to point out an error in your magazine, March 2010 issue on page 54. On the left side of the cubes it reads in the arrows pointing upwards "decreasing density, decreasing pressure, decreasing altitude." I do believe the last one is in error. It should be "increasing altitude."

Anyway, I would like to tell you that your magazine and your website is awesome. I get lots of info and tips from both. My 6-year old son always looks forward to checking the mailbox in anticipation of the new issue. The two of us are hooked on the heli hobby. In December of '09 he flew for the first time without a buddy cord and now flies solo. He does roll, flips and inverted flight. Our fleet consists of four helicopters: an E-flite CX2, Trex-500, Raptor 90 and Raptor 90 SE.

By the way, this is the first magazine that I've read from front to back without missing a page. Thanks for the excitement!

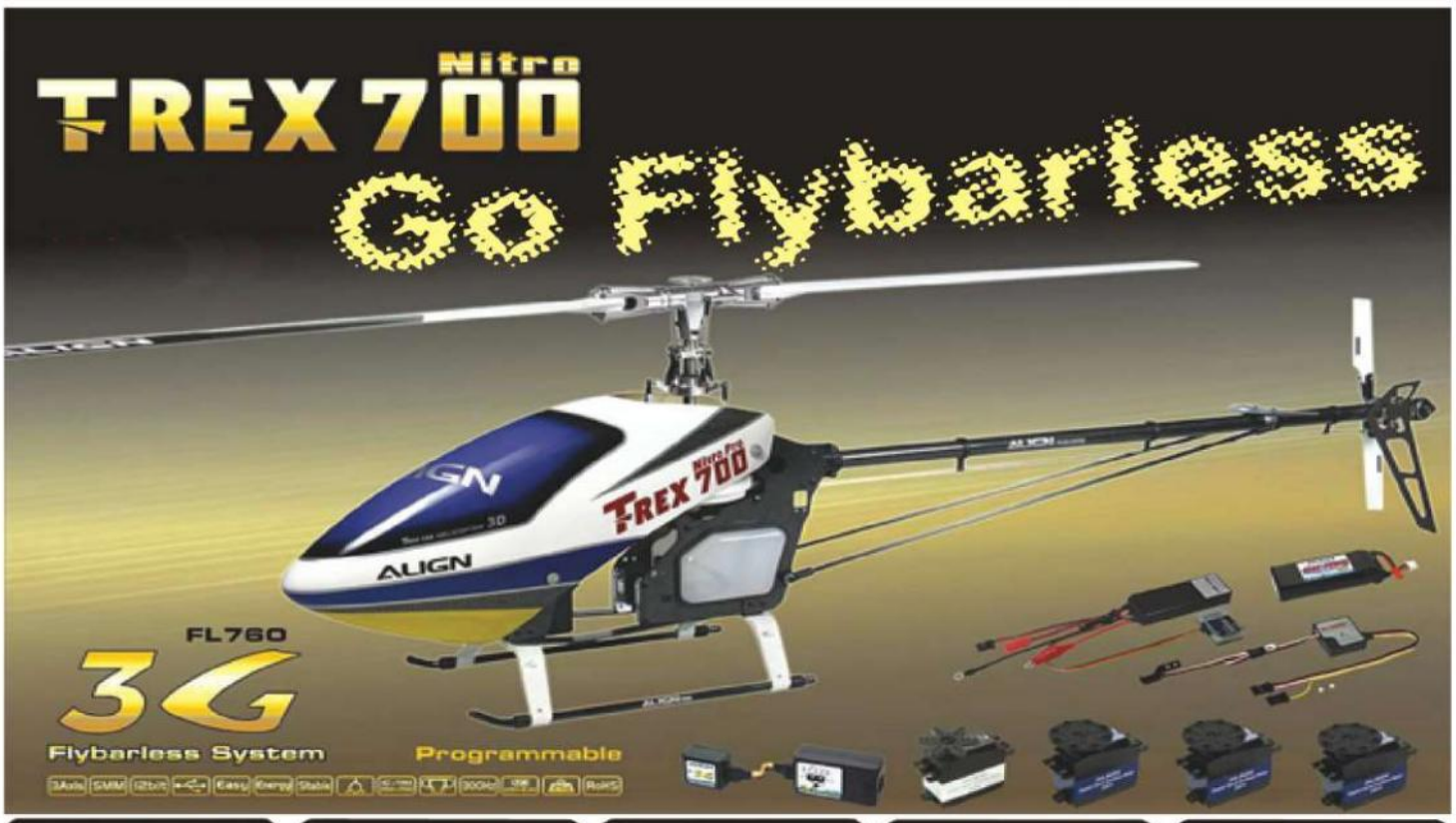
André and Karel van Grieken
Miami, Florida

Hi André,
Great pics. Wow, that's some great flying at any age. Yes, you are correct, the caption on that photo is mismarked. The copy in the text directly above is correct. Sorry for that if it caused any confusion. Obviously you figured it out.
Mike

Who's your favorite Kardashian?

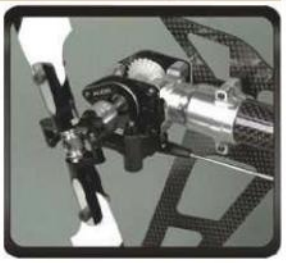
Nitro TREX 700

Go Flybarless









Design Features:

*Simple and light weight design provides awesome flight performance.
*+-14 collective pitch is possible for extreme 3D performance.
*Heavy duty tail thrust bearings.
*Clutch, Fan and Bell assembly provide a very smooth operation even at high RPM.
*Forward mounted tail servo helps to keep exhaust oil from entering servo also improves the CG.
*Battery tray designed for easy and clean radio gear installation.
*Fuel Tank Capacity 630c.c.
*Heavy duty tail with thrust bearings.
*Torque Tube driven tail for incredible 90 Sized performance.
*Rigid frame design that can also handle hard crashes without damage.
*Super engine cooling system very efficient airflow to provide unequaled cooling and hourspower.
*New main gear with one-way bearing design for high torque.
*Ready to fly weight(no fuel) is an incredible 4.2Kg.

Specification:

*Length: 1335mm.
*Height: 450mm.
*Main Blade Length: 690mm.
*Main Rotor Diameter: 1562mm.
*Tail Rotor Diameter: 281mm.
*Motor Pinion Gear: 20T.
*Autorotation Tail Drive Gear: 150T.
*Drive Gear Ratio: 8.2:1:4.54(E:M:T)
*Flying Weight: 4.35kg

Accessories:

*T-REX 700 Nitro 3G Kits Set x 1
*690D Carbon Blades x 1set
*RCE-G600 Governor x 1
*2 IN 1 Voltage regulator combo x 1
*Flybarless System x 1set
*DS650 Digital servo x 1
*DS610 Digital servo x 3

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hoping that in the future Mr. Jenner can refrain from naming prices while representing the RC heli community.

Thank you for your time and consideration,

Sincerely,
Joseph Horswell
Ojai, CA

Hi Joseph,

Thanks for reading; I hope you enjoy the magazine. Radio controlled helicopters are not an inexpensive hobby. Mr. Jenner's price estimate on the show was on the higher side of the spectrum but not completely inaccurate. Just like any hobby, there's a range of how much someone can spend. You can get into golf with at $99 set of clubs from Wal-Mart or you can go all out and spend thousands on a Callaway set. Times are tight for many of us; it's great that you're being a wise shopper and there's never a good reason not to be. Having said that, I think that the exposure on the show was a great thing for the hobby. Sure, there may be a few people who would shy away from the price. But like I mentioned before, this is not an inexpensive hobby. It can be enjoyed on a budget and anyone with an interest sparked by seeing his helicopter on the show could easily find out that there's a price range.

There's no way to know for sure, but my guess is that more people are now aware of RC helicopters than before the show. From that total exposure, a certain amount will seek out more information and will possibly get into the hobby. Mr. Jenner was not being unreasonable and I believe he did much more good for the hobby than harm. As for things at home, I have been married to a beautiful woman for more than a dozen years I sympathize with your situation. Having your wife "busting your chops" cannot be a fun thing. My advice would be to sit down with your wife and explain to her the joy that your hobby brings you. That it is very therapeutic, and allows you an outlet and probably is much cheaper than marriage counseling or therapy.

Mike

RELY ON THUNDER POWER RC

When Power, Cycle Life, Reliability and Value Matter...

Since 2003 more pilots and drivers have chosen the #1 in Performance and Reliability for long-lasting power and performance over any other brand. And now Thunder Power RC is proud to announce **exclusive Generation 4 (G4) chemistry** that offers a realm of power delivery, cycle life delivery and ultra-fast charge rate capability never before seen. G4 series batteries offer up to **40% more power, 6-times better cycle life and the ability to be ultra-fast charged at rates up to 6C*** with no discernable loss of power or cycle life delivery. G4 cells are built using the highest quality Japanese-made materials, including the latest in super-fine substrate (nano) technology to offer the lowest possible internal resistance for the most performance and lowest cost per cycle. Plus Thunder Power RC batteries are **still proudly matched, assembled and supported in the USA** and backed by an **industry-leading full 1-year warranty and 50% off damaged battery replacement program coverage.**

G4 Pro Lite V2 20C Series Batteries

The world's lightest, high-performance batteries for sport and competition use. Offering the highest energy density and cycle life delivery available in their class, G4 Pro Lite V2 20C series batteries are proven performers with batteries lasting years and upwards of 400 – 500+ cycles. Capable of continuous discharge rates to 20C and fast charge rates up to 4C* while delivering up to 20% more power than previous generation batteries. Available in capacities from 250 to 6600mAh and configurations from 1S 3.7V to 10S 37.0V.

G4 Pro Power 30C Series Batteries

An excellent combination of power, performance and price, G4 Pro Power 30C series batteries are proven by world-renowned pilots and independent testers to deliver 300+ cycles in a wide variety of powerful airplane, EDF, 3D helicopter and other applications. Able to deliver up to 30% more power and 5-times more cycle life than previous generation batteries at lighter weight than most other lesser performing G3 20C to 35C batteries. Available in capacities from 320 to 5000mAh and configurations from 1S 3.7V to 10S 37.0V.

G4 Pro Power 45C Series Batteries

The world's most advanced, most powerful and longest lasting series of batteries – ever! G4 Pro Power 45C series batteries are the pinnacle in performance for high-powered airplane and helicopter applications. Delivering up to 40% more power, 6-times more cycle life (proven 300+ cycles even when charged at rates up to 6C) and ultra-fast charge rate capability up to 6C* means they surpass all other batteries on the market today. Available in capacities from 325 to 6500mAh and configurations from 1S 3.7V to 10S 37.0V.

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Offering the highest capacities and maximum value for backyard bashers and weekend racers, G4 Sport Race 25C series batteries are the best choice for maximum run-time while also being a potent threat on the race track in 'spec' and 'stock' racing classes. They also last up to 4-times longer than other brand batteries and can be charged at rates up to 4C* for fast charge times of 15 minutes or less. Available in capacities from 2700 to 8000mAh and configurations from 2S 3.7V to 4S 14.8V.

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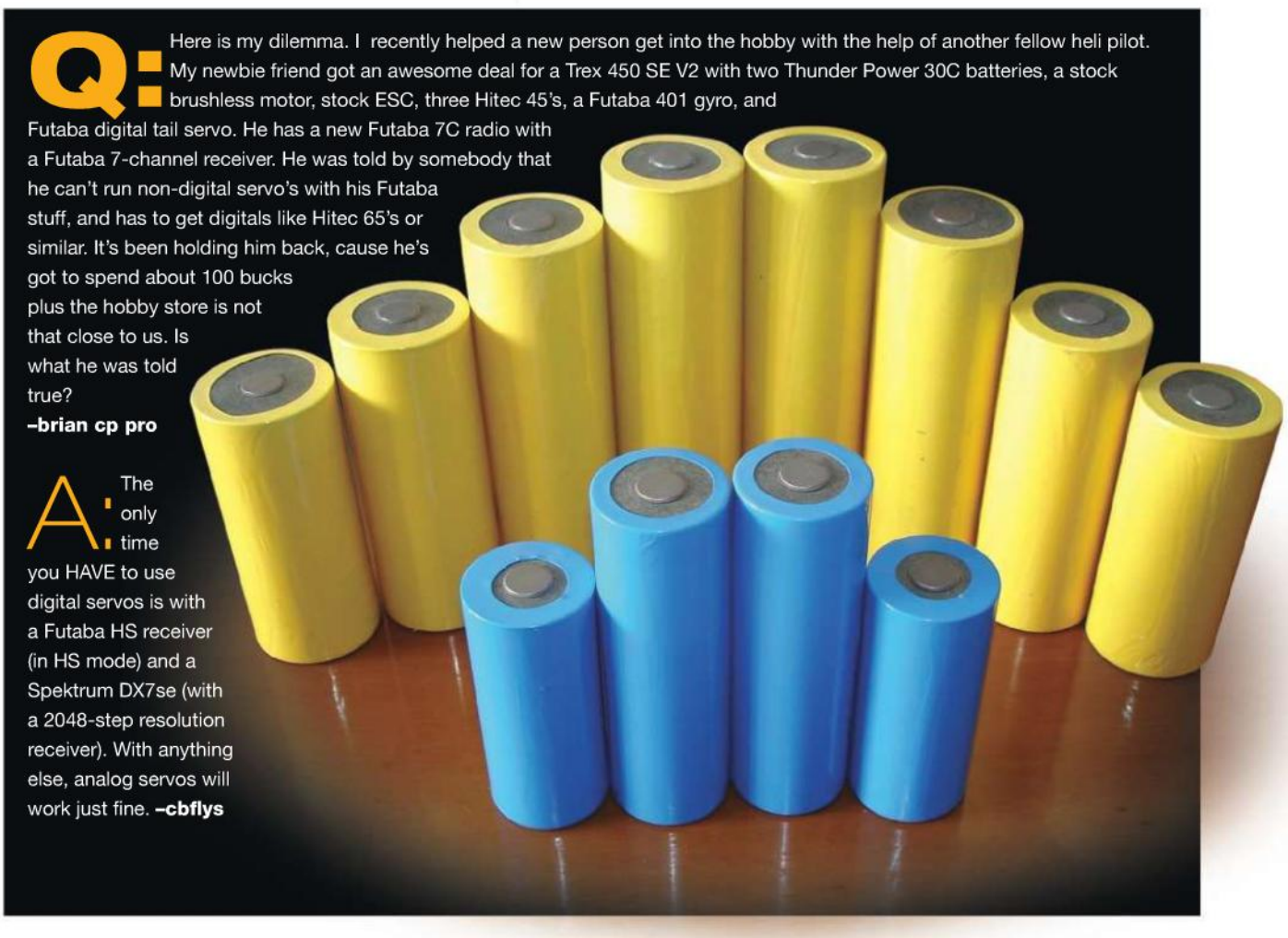
FREQUENTLY ASKED QUESTIONS

Q: I am getting new Raptor 50 Titan SE. I just bought four DS610's and a DS650/ GP750 gyro combo. The servos are rated at 6V. I want to use an unregulated Hyperion G4 life04 2100mAh battery and use a step-down transformer to the tail servo. The battery has a nominal voltage of 6.6V, but drops to about 6.4V under load and holds there for a while. Is any one doing this, and if so, is it working out okay? **–dwoodworker**

A: You will be fine. If a servo is rated for 6V, then it's rated for a NiCad or NiMH setup, and in both cases they have around 7.0V or more when fully charged. The reason you can't use an unregulated LiPo battery is that they have a fully charged voltage of around 8-9V and only go to 7.2v when getting near the end point of their charge. **-Dark**

Q: Here is my dilemma. I recently helped a new person get into the hobby with the help of another fellow heli pilot. My newbie friend got an awesome deal for a Trex 450 SE V2 with two Thunder Power 30C batteries, a stock brushless motor, stock ESC, three Hitec 45's, a Futaba 401 gyro, and Futaba digital tail servo. He has a new Futaba 7C radio with a Futaba 7-channel receiver. He was told by somebody that he can't run non-digital servo's with his Futaba stuff, and has to get digitals like Hitec 65's or similar. It's been holding him back, cause he's got to spend about 100 bucks plus the hobby store is not that close to us. Is what he was told true? **–brian cp pro**



A: The only time you HAVE to use digital servos is with a Futaba HS receiver (in HS mode) and a Spektrum DX7se (with a 2048-step resolution receiver). With anything else, analog servos will work just fine. **–cbflys**

Jump on our forum if you want your questions answered in FAQ.

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LENGTH : 1220MM
HEIGHT : 378MM
WIDTH : 203MM

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QUICK TIPS

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ENGINE REBUILDING TIP

Last issue we went over rebuilding nitro engines and recently found a new tip to make your job easier. If you find removing the cylinder sleeve difficult, stuff a small rag into the exhaust port so it sits over the piston and the rest of it hangs out the exhaust port. Rotate the crankshaft and the cylinder sleeve should pop up and be easily removed. This tip can be seen in Episode 1 of Smack Talk featuring Bobby Watts and Bert Kammerer.

Scrub A-Dub-Dub has been in several issues already!

NEED TO STEP DOWN?

Step-down units are frequently used in conjunction with voltage regulators to reduce the voltage going to the tail servo. Many manufactures offer these step-downs, but you can make your own for a fraction of the price. A diode can be used to lower the voltage by .7 volts. Take a servo lead extension and cut the red wire. Then solder a 1N4001 diode between the two ends, making sure the white ring of the diode is closest to the servo side. The diode can be found at any decent electronic supply store like Radio Shack. Place some shrink tubing over the connection and you've made yourself a step-down unit that only cost you about $1.50.

SCRUB A-DUB-DUB

If you look at a full scale helicopter, you will notice that the blades are usually a dull black or white color. Most of today's blades come in a high gloss finish that doesn't look like real rotor blades. To remedy this glossy appearance, take a piece of Scotchbrite and give your blades a good once over. The Scotchbrite will cut into the glossy finish and create an authentic matte finish for your scale helicopter.

MAKE YOUR BLADE LAST LONGER

Hobby knives are used frequently in building RC helicopters. Blades can quickly become dull from simply being exposed to the environment. To prevent blades from becoming rusted, coat them with a light coating of oil after use. This barrier will prevent the blades from becoming rusted, thus prolonging the life of the blade.

GROMMET INSERT INSTALLATION TOOL

This tip from Chad Sackman of Rancho Cucamonga, CA will have you installing those pesky brass inserts on your servos in no time with very little effort. Most helicopter owners have a set of hex drivers. Find a driver that will slide inside the brass insert but not all the way down. Then, simply press the brass insert into the servo grommet. You will notice that it is a lot easier to get the driver in than your finger.

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Autorotation Tail Drive Gear: 41T
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Fuel Tank Capacity: 490 cc
Main Frame: Carbon Fiber 2 mm

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UPGRADE YOUR EXPERIENCE

WHY SHOULD I GO TO A FUNFLY?

And what should I take with me?

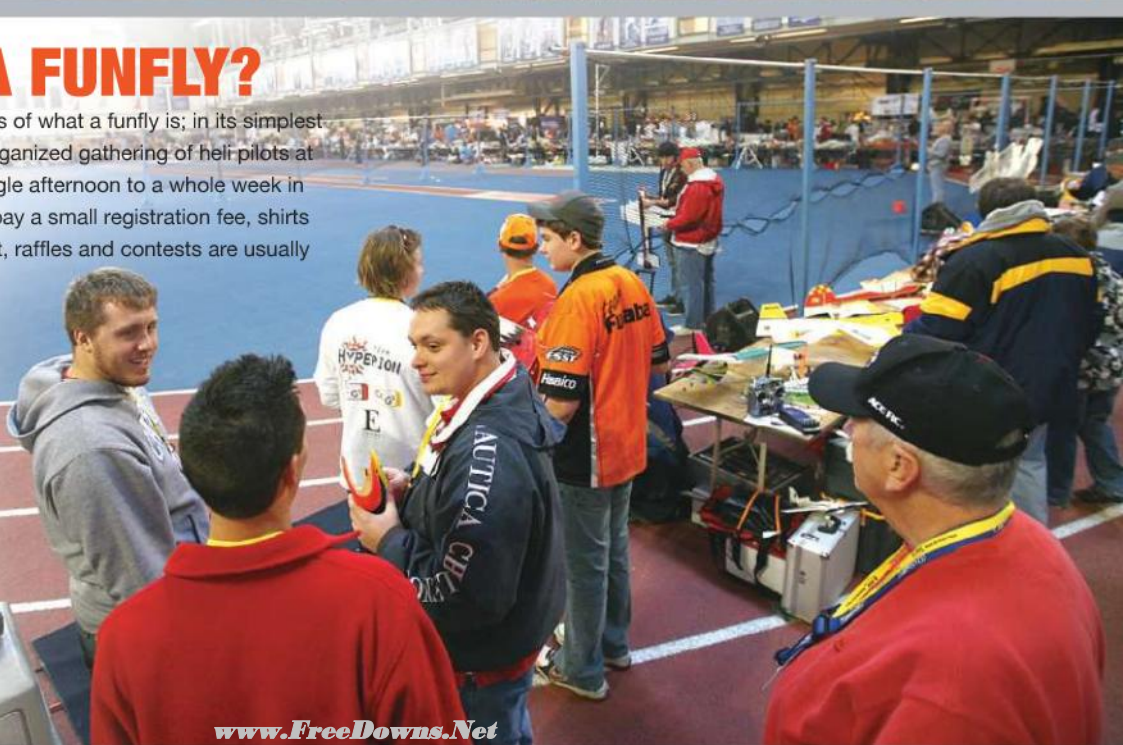
WORDS: Jim Innes | **PHOTOS:** Staff

If Hollie went to FunFly's would you go?

A "funfly" is as much a part of the RC helicopter hobby as rotor blades. In just about every season, all around the world, funfly events are taking place. I know that many beginning pilots can be intimidated by the amount of talent found at a funfly, but I see these events as an inseparable part of this great hobby.

WHAT IS A FUNFLY?

Most of you know the basics of what a funfly is; in its simplest form it's a scheduled and organized gathering of heli pilots at a field. It can last from a single afternoon to a whole week in some cases. Pilots usually pay a small registration fee, shirts are often made for the event, raffles and contests are usually held, and there is always good food available. Amongst all this, the most important aspect of a funfly is getting people together in one place to talk and fly helis for as long as the event allows.



WHY SHOULD I GO TO A FUNFLY?

The word "fun" is not part of the term "funfly" by accident. The main reason funflys are successful is that they provide a great environment for heli lovers to enjoy their hobby with other addicts. Funflys can be some of the greatest experiences you will have in the hobby. If having fun is not enough reason, there are plenty more benefits to attending a funfly:

■ **FLYING.** The biggest benefit to a funfly is that the field is reserved solely for the event and there is usually loads of time for you to fly. A good weekend of flying at a funfly can be more than most pilots get in a month at their own field. The extra practice time is fantastic!

■ **YOU GET TO WATCH OTHER PEOPLE FLY.** Every pilot is different and has a unique style to how they fly, and a funfly is one of the best venues to see a variety of these styles in one place.

■ **YOU GET TO MEET OTHER HELI PILOTS.** Heli pilots are generally great people, and if you start attending certain funflys regularly you end up making some pretty good friends along the way.

■ **LEARNING, LEARNING, LEARNING.** Heli pilots love to talk helis, and it's especially rewarding to teach a new pilot something they didn't know before. Funflys are a great place for a pilot to learn more, whether it's about heli setup or how to execute a certain maneuver.

■ **NEW EQUIPMENT.** Vendors will often have their sponsored pilots debut or demonstrate their latest creations at a funfly. If there's a new "must have" item on your list, there's a good chance that you can get a closer look at one of these events.

I am sure there are more reasons than I listed here, but the point is simple: A funfly is great experience for pilots of any level and if you are able to attend one, you should.

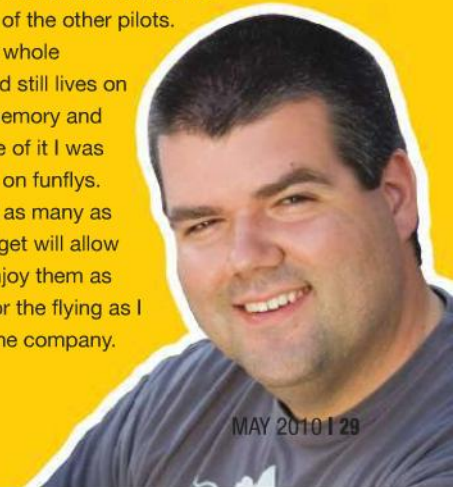
MY FIRST FUNFLY EXPERIENCE

Some months after I re-started flying in 2004 (after a two year break) I was at the LHS getting some parts and I heard someone there mention a local heli club. I talked to him, got directions, and the next day I was at their field. Over the next five months, I worked on the basics with the help of the more experienced pilots in the club. That October, I went to my first helicopter funfly in Logan, Utah. I had to talk myself into taking my helicopter with me.

Jason Krause and Todd Bennett were at the event and had put on a flight school during the days prior to the funfly. The moment I arrived, I saw Todd buddy-boxing a friend of mine and I was amazed how well my friend flew just having someone like Todd there as a backup. I knew I was in for a treat that weekend.

I spent the next two full days living and breathing helis. I went through more fuel than I can remember, laughed a lot, learned so much that I had to start writing things down, and ate fantastic food. I witnessed night flying for the first time and was instantly hooked! I saw Todd safely bring back a heli in the darkness just using the blinking led of the GEM battery level indicator after the glow rope failed and the night blades were disabled by a blade scrape. Near the end of the weekend, I was the lucky winner of a new radio, blades, and a kit from the raffle, much to the chagrin of the other pilots.

That whole weekend still lives on in my memory and because of it I was hooked on funflys. I attend as many as my budget will allow and I enjoy them as much for the flying as I do for the company.



We know we would definitely be there.

ARE NEW PILOTS INVITED?

Many times I have heard new pilots say that they are going to come to a funfly, but that they're not planning on flying. One of the biggest reasons is that they are scared to fly in front of so many people, especially if a popular or pro-level pilot is in attendance. Other new pilots do not want to hog the flight line with their "simple" hovering.

Let's alleviate some of these fears. When you are out there hovering, don't be concerned that you are "wasting" the time of the more experienced pilots. We were all new pilots at some point in time, and most of us were helped by someone else along the way. All of those pro-level pilots that you see started out as a new guy trying to hover. Because we all started from the same place, there is an innate desire in heli guys to help each other out. We need new pilots at the funflys; we love to see a person mastering the hover or tackling circuits for the first time.

Also, there is no better place to get one-on-one help than at a heli gathering. You can ask every single pilot at an event for help and nearly every one of them will jump at the chance to pitch in. Take advantage of the opportunity to get help at a funfly. I have seen so many people completely master things at a funfly that they had been struggling with beforehand. Putting in the extra flight time and asking for help makes all the difference.

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NOW THAT YOU ARE GOING, WHAT TO BRING WITH YOU?

Okay, so hopefully you've decided to attend a funfly in the near future. What should you bring with you? The answer depends mainly on how much room you have in your vehicle.In addition to bringing as many helis as you can (always good to have a crash backup), I usually bring the following:

- **A CANOPY/SHADE, TABLE, AND CHAIRS.** You should definitely bring these items to set up a "home base" at the event.
- **ALL YOUR TOOLS AND SOME OF THE SETUP TOOLS** you normally don't take to the field. You never know if someone may need to borrow a soldering iron, dial indicator, or other setup tool.
- **SPARE PARTS, IF YOU HAVE THEM.** You may save the weekend for someone who needs that "one particular part" to get flying again.
- **PLENTY OF WATER, SNACKS, SUNSCREEN, ETC..** You don't want to get burned or run out of energy.
- **I HATE TO SAY IT, BUT YOU SHOULD BRING SOME CASH.** You can find fantastic deals on things at funflys in addition to the raffle tickets and food, and having some cash on hand will help.
- **PREPARE FOR ANY TYPE OF WEATHER** by bringing a jacket and throw some warm clothes in the vehicle just in case.

Of course, you don't need to bring everything listed above, but I have found that so often you need the one thing you left at home, so now I bring everything I can reasonably take with me, as much for me as for the other pilots.

That is a lot of stuff to take to a fun fly.

CONCLUSION

Funflys are amazing. It's as pure as that. Nowhere else can you get such a broad **range of pilots, helicopters, and** flying styles together in one place. A funfly also allows you to fly much more than you can when the pressures of regular life are present. A funfly is a mini-vacation from the regular world, a place where you live and breathe RC helis for the entire weekend. Whether you are the newest or most experienced pilot in the world, a funfly is sure to be a great experience for you. RCH

Align 3G 700

Flybarless Conversion

WORDS: Ryan Kephart

The 3G is suitable for all of Aligns helicopters.

WHAT CAN I SAY ABOUT ALIGN? NOT LONG AGO, THEY WERE AN UPSTART COMPANY THAT INTRODUCED A HELICOPTER THAT **WAS A BARE BONES KIT WITH** SOME UNIQUE FEATURES. **Since then, Align has** developed a number of great components and new helicopters in almost every size range. This month we reviewed the TREX 600 Nitro Pro 3G, which uses Align's first flybarless electronic stabilization unit. We also converted our TREX 700 using Align's conversion kit.

FEATURES

The Align 3G flybarless conversion kit for the TREX 700 features a 3-axis gyro system and all the components to convert your 700. A new headblock, blade grips, pitch arms, links, and swash follower complete the head. Align also includes servo wheels for both JR and Futaba servos, along with a setup block that allows you to check the pitch of the blades using your old flybar. The head is made from aluminum and includes new ball bearings and a set of thrust bearings. The head is assembled at the factory. The linkage rods are much different from the original links, as these links are made from a stronger material. The gyro utilizes SMM (Silicon Micro Machines) sensors, which are seen on today's top-shelf gyros. They can also be updated with new firmware through a PC interface adapter, which is sold separately. Do you have a high voltage setup on your 700? No need to worry here, the 3G can handle it with its input voltage range of 4.5 – 8.4 volts.

INSTALLATION

Align includes a detailed manual with the conversion kit. The first order of business is to remove all the old head components. Next, you'll install the new head, which involves sliding the follower over the main shaft, followed by the headblock which is attached with a Jesus bolt and two additional bolts that thread into the main shaft. I opted to check the head by removing the blade grips to make sure that everything was properly assembled. I did find that the thrust bearings didn't have much lubrication and the cup side of the bearing was facing the wrong way. I greased the bearings and reassembled the head, making sure to apply some thread lock to the spindle screws.

The next step was to install the gyro unit. This was a simple process, as the TREX 700 had a GY611 gyro, which uses a separate control unit similar to the Align G3. I mounted the sensor in place of the 611's sensor with the included gyro tape and then plugged the servo wires into the unit, and the wires from the unit to the receiver. The sensor must be mounted in a certain orientation, so make sure that you check the manual for the specifics. The conversion kit also includes two different length wires for the sensor so you can mount the control box in any convenient location.

The next step is programming, and Align has made this process simple. The 3G is programmed in the same fashion as Align's GP750 and GP780 gyros. From start to finish, the programming only took about 20 minutes and from then after I could go through the programming in five minutes.

The conversion comes in two colors, black and silver.

TESTING

After programming the 3G unit, I made sure that everything was operating in the correct direction. I flew the 700 and the first thing I noticed was how well it held its position. No trim was necessary and wind did not seem to affect the helicopter very much.

I began with some nice, smooth circuits and noticed how well it tracked. As I became more comfortable with the flight characteristics I progressed into 3D flight. The first thing I noticed was an elevator bobble when I was aggressive with the cyclic. I landed and did some adjustments to the gain pots, and gave it another go. The bobble was minimized, and soon enough I was adjusting to the new way the 700 was flying. The 3G system felt very fast on the cyclic and collective. The response time was faster then I could have ever imagined, and felt quicker than other systems I have used in the past. Collective pops were noticeably faster, and the overall feel was more aggressive. The power of the 700 feels almost unstoppable now. After logging in several flight hours with this system, I must say that I am pleased with the performance and have not encountered any problems.

CONCLUSION

If you're looking for the ultimate in 3D performance, then a flybarless system is right up your alley. It's not cheap, but the 3G conversion is a great add-on to your 700, as it includes everything you need to get the job done. With a little setup knowledge and the will to fly, anyone can get into the flybarless era of modeling. Don't be afraid to give it a try, it is a lot easier then it sounds. HH

THE GOOD

- Includes everything you need
- Tail works amazingly well
- Increases drivetrain efficiency

THE BAD

- Slight bobble that can be minimized
- Will hurt your wallet a bit

CONNECT

MANUFACTURER:	Align
WEBSITE:	www.alignrcusa.com
PART NUMBER:	AGNHN7093
STREET PRICE:	$450

Align 3G 700

Flybarless Conversion

WORDS: Ryan Kephart

The 3G is suitable for all of Aligns helicopters.

WHAT CAN I SAY ABOUT ALIGN? NOT LONG AGO, THEY WERE AN UPSTART COMPANY THAT INTRODUCED A HELICOPTER THAT **WAS A BARE BONES KIT WITH** SOME UNIQUE FEATURES. **Since then, Align has** developed a number of great components and new helicopters in almost every size range. This month we reviewed the TREX 600 Nitro Pro 3G, which uses Align's first flybarless electronic stabilization unit. We also converted our TREX 700 using Align's conversion kit.

FEATURES

The Align 3G flybarless conversion kit for the TREX 700 features a 3-axis gyro system and all the components to convert your 700. A new headblock, blade grips, pitch arms, links, and swash follower complete the head. Align also includes servo wheels for both JR and Futaba servos, along with a setup block that allows you to check the pitch of the blades using your old flybar. The head is made from aluminum and includes new ball bearings and a set of thrust bearings. The head is assembled at the factory. The linkage rods are much different from the original links, as these links are made from a stronger material. The gyro utilizes SMM (Silicon Micro Machines) sensors, which are seen on today's top-shelf gyros. They can also be updated with new firmware through a PC interface adapter, which is sold separately. Do you have a high voltage setup on your 700? No need to worry here, the 3G can handle it with its input voltage range of 4.5 – 8.4 volts.

INSTALLATION

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MANUFACTURER:	Align
WEBSITE:	www.alignrcusa.com
PART NUMBER:	AGNHN7093
STREET PRICE:	$450

Outrage **TORQ BL SERVOS**

A new competitor in the servo market

WORDS: Ryan Kephart

OUTRAGE RC HAS BEEN KNOWN TO MAKE SOME GREAT PRODUCTS that not only fly well but look great. Outrage devotes a lot of their time to produce products of high quality and workmanship. This month we'll take a close look at their newest product, the Torq BL Series Servos.

Adamantium gears are soon to come.

THE GOOD

- Nice aluminum case
- Titanium coated gear train
- Fast operation

THE BAD

- A little on the heavy side

CONNECT

MANUFACTURER:	Outrage RC
WEBSITE:	www.outragerc.com
PART NUMBER:	BL9080
STREET PRICE:	$140

FEATURES

The Torq brushless servos feature a highly polished, CNC machined aluminum, red anodized case. The case is well machined and integrates the mounting tabs on the upper section. The case is O-ring sealed, which prevents debris or moisture from entering the delicate electronics. The BL series servos are capable of handling voltage directly from a 2-cell LiPo pack, giving the user a wide range of voltage options. As you may have noticed, the "BL" indicates that the servos are powered by a brushless motor. The motor is controlled by a digital controller and offers reliable operation. The gears on these servos are titanium coated and provide excellent durability and strength.

Opening the servo, we see that the first two gears are helical cut, which provides slop-free operation and better power transfer. The output shaft is dual ball bearing supported.

SERVO SPECIFICATIONS

Voltage	SPD (60°)	TRQ (oz/in)	TRQ (kg/cm)
6.0	0.07	88.32	6.37
7.4	0.06	112.35	8.10
8.4	0.05	132.86	9.58

SIZE: 1.57x0.79x1.52 in
WEIGHT: 2.15oz / 60.95g
OUTPUT SUPPORT: Dual ball bearing
GEAR TRAIN: Titanium coated
MOTOR: Brushless
VOLTAGE RANGE: 5.2v – 8.4v
HORNS USED: Futaba

TESTING

I opted to install these servos in the Logo 600 we reviewed and have been flying them since the first flight. The servos fit perfectly into the frames. The first thing I noticed about the Outrage Torq BL servos is that they were fast. I immediately noticed the locked-in feel and quick response when moving the sticks. I ran the servos at a regulated 6.0 volts.

I have been flying the Logo 600 for over three months and I have not noticed any problems with the servos. They are still operating strong and I have not seen any slop in the gear train. Overall, these servos perform well and are a nice addition to any helicopter. The lightning quick response with LiPo voltage and dependable brushless motor should give you years of performance. RCH

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Quanum TELEMERTY SYSTEM

On board voltage displayed!

WORDS: Ryan Kephart

WITH THE INTRODUCTION OF TELEMETRY SYSTEMS IN THE RC CAR INDUSTRY, it's a wonder that we haven't seen much of this technology in aircraft... until now. Hitec developed a telemetry system for their Aurora radio and so far it can only display the voltage of the receiver pack. Quanum has taken this one step further and provided accurate voltage for any radio.

One day telemetry will be included with every radio.

FEATURES

The Quanum Telemetry System is a 2.4ghz transmitter and receiver combo that can display both the total voltage and individual cell voltage of a LiPo pack. The voltages are displayed on a 132x64 mm high-contrast LCD screen. The main unit houses both the screen and receiver, along with the antenna. Two buttons are located on top of the display to turn the unit on and off, and bind the receiver to the transmitter. The display also houses a rechargeable battery that is charged by a USB port on the side. Quanum included both a USB cable and a car adapter to charge your telemetry system. The unit also provides an alarm for low voltage, which gives you plenty of time to land and switch out battery packs.

The telemetry transmitter is no bigger then a pack of gum. It has pins that stick out of one end, which allows you to connect a standard balance tab for up to a 6-cell pack. On the other end of the transmitter is a giant antenna about the size of a normal 2.4 GHz transmitter. Quanum also offers an aftermarket antenna that is similar to the traditional receiver antennas on Futaba's 2.4ghz receivers. The stated range of this telemetry system is 1km+, or over a half a mile.

THE GOOD

- Excellent range
- Works with all radios
- Can handle up to 6-cell LiPo pack

THE BAD

- Included antenna is a bit oversized
- Adapter needs some modifications to fit certain 2.4ghz antennas

CONNECT

MANUFACTURER:	Quanum
DISTRIBUTOR:	Hobby King
WEBSITE:	www.quanum-rc.com www.hobbyking.com
PART NUMBER:	Q001
STREET PRICE:	$70

INSTALLATION AND TESTING

Installing the unit to your helicopter is a simple procedure. After plugging in the battery to your helicopter, simply attach to the balance tab to the pins on the telemetry transmitter and place the transmitter close to your battery. Velcro can be used to keep the unit from moving around. To install the display, Quanum includes an antenna adapter that clamps on to your existing antenna. The adapter includes a pivot point to adjust the angle of the telemetry system. The display attaches to the adapter by means of a two-point latch. As easily as it was installed, it's just as easy to remove.

We tested the unit on two different helicopters—one nitro and one electric—and found the info to be more then valuable. On the electric helicopter it allowed us to keep track of the pack voltage during flight and land when the alarm sounded. This made triggering timers obsolete. Overall, the unit worked flawlessly and we never lost reception. We tried this out both on Futaba and Spektrum 2.4ghz radios and it did not have any compatibility problems.

CONCLUSION

Do you need to know your pack voltage? Do you ever run your packs down too far during a flight? If so, then a telemetry system is right for you. Quanum has the answer and for an affordable price. RCH

CARBURETORS

High Carb Diet

WORDS: Brandon Updike

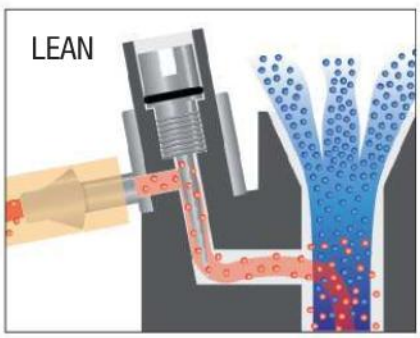
REGULATING BOTH AIR AND FUEL INTAKE IN AN INTERNAL COMBUSTION ENGINE is a vital function to keep it running. This has been done traditionally with carburetors, although fuel injection has become the norm in many areas. Since the model heli industry has not mastered fuel injection technology, we still use carburetors.

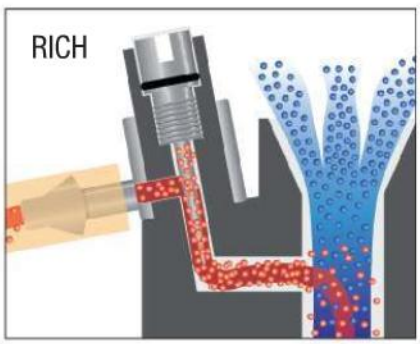
» WHAT IS A CARBURETOR AND WHAT DOES IT DO?

An internal combustion engine works by the controlled combustion of both air and fuel in the engine cylinder. In order to support healthy combustion, the engine must ingest a specific ratio of both air and fuel. Too much fuel and your engine will run rich, if you starve it of fuel your engine will run lean, possibly damaging the motor. This is where the carburetor comes in. Carburetors can both regulate incoming fuel coming from the fuel tank and the air intake with the use of a throttle servo.

HOW IT WORKS

The carburetor is connected to both the throttle servo and fuel lines. The throttle servo opens and closes the carb barrel, which regulates how much air is allowed into the intake. The flow of air through the carb barrel creates a venturi effect which allows the engine to "suck" in the fuel. However, this fuel needs to be regulated and that is where the carb needles come into play. The needle creates a restriction which meters the amount of fuel that's allowed to pass. Opening the restriction (by turning the needle counter-clockwise) allows more fuel to pass, resulting in a richer fuel/air mixture. Closing the restriction has the opposite effect of leaning the mixture. Adjusting the needles allows the pilot to compensate for atmospheric conditions and keep the engine running at optimal performance.





ADJUSTING OUR NEEDLES

Depending on the type of engine you have, there may be just a high-end needle or both a mid-range and high-end needle. Engines also have a low-end needle on the opposite side for the mixture at idle. The needle adjustments correspond to what speed the engine is spinning. The high-end needle controls fuel mixture during high throttle applications (think big moves or maneuvers that require brute force). The mid-range needle is used to fine tune throttle response at mid and low stick (for example, when you're coming off a move and letting your helicopter settle back down).

A good way to tune your motor is to set the needles at factory settings during break-in. Generally, the manual will call for a rich setup, most likely 2 ½ turns out (or to the left) on the high-end needle. After a few tanks of running rich, begin to slowly lean out the mixture by going in on the needle (turning to the right). A commonly used tuning method is to perform full-throttle climbouts while watching the exhaust trail and listening to the sound of the engine. Once you get to the top of your climb, make a quick stop by dropping the collective to mid stick. Check to see if the helicopter loses its smoke or makes a raspy sound. A raspy sound will mean that the mixture is lean. If you begin losing smoke on your climb out, the helicopter is leaning out so richen the high-end needle. If it sounds like the engine is bogging and there is a lot of smoke, the mixture is too rich and will need to be leaned out slightly.

Pay attention as you reduce the collective to mid stick. If it sounds like the helicopter is over speeding and there's very little smoke, the mid-range mixture is too lean. If it feels sluggish when you drop your stick, the mixture is too rich and will need to be leaned out a couple of clicks. Only go a couple clicks at a time until you find the perfect balance of power, sound, and smoke output.

PUMPS

Some carburetors have a pump system that keeps the fuel delivery pressure consistent over a wide range of engine speeds. This allows for more consistent needle settings. YS is well-known for their pumped and regulated motors and OS has a pump system of their own on their larger engines.

CONCLUSION

Properly adjusting the carburetor is a difficult skill to master when setting up your helicopter. After some practice and understanding the basics of air and fuel ratio you'll begin tuning your motors without much trouble at all. RCH

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SNAP RING PLIERS

Don't lose that tiny circular spring!

WORDS: Ryan Kephart

"Snap rings" or "circlips" are a few names for a special retainer that some helicopters use to prevent lateral movement of a certain part, but which permit the part to rotate freely. There are two basic types of snap rings, external and internal. This is determined by whether or not the snap ring fits on the outside or inside of a tube. One thing that these snap rings have in common is the way they are removed, which brings us to this month's Tools Of The Trade topic: Snap Ring Pliers.

There is always the right tool for the job.

WHAT ARE **SNAP RING PLIERS?**

Snap ring pliers are a tool with two small metal tips that fit into holes on each side of a snap ring. The pliers can simply be two metal arms with a pivot point, or a complex tool, which utilizes a spring and reversing mechanism to either spread or compress the snap ring. Some of the multi purpose pliers come with several different tips that simply plug into the business end of the tool. Tips are available in both 45° and 90° bends to allow the tool to reach awkward positions. The handles are usually coated with rubberized plastic to ensure a positive slip-free grip.

WHERE ARE **THEY USED?**

Snap rings are found in many places throughout a helicopter. Often times a snap ring is used to hold a pin in place on control linkages. On some helicopters like the Fury 55, the spindle is held in place using two snap rings, one on each side of the headblock. Engines also use a type of snap ring known as a wrist pin retainer. This snap ring prevents the wrist pin - which connects the piston to the connecting rod - from slipping out and possibly damaging the cylinder sleeve. Snap rings can also be found in some bellcranks that link the servos to the swashplate. Certain helicopters even use a snap ring on the main shaft to hold the main drive gear in place.

SNAP RING PLIERS **STEP-BY-STEP**

To install snap rings there are a few basic steps, lets go over how to use these specialized pliers.

1 Examine the snap ring and determine what size the holes are that the tool grips?

2 Locate the proper end and install the correct size bits on the snap ring pliers.

3 If the snap ring is installed on the outside of a shaft, make sure your pliers are setup to expand the snap ring. If the snap ring is on the inside of a tube, set your pliers to contract.

4 Place the snap ring on the bit end of the pliers.

5 Carefully spread the snap ring apart just enough to fit over the shaft of which it is to be installed.

6 Slide the snap ring to the groove and release the pressure allowing the snap ring to settle in the grove.

Ryan's pliers look a bit rusty.

CONCLUSION

If you do not have a pair of snap ring pliers already, this tool can become a lifesaver. Often time's pilots will try to use a screwdriver or other random tool, only to find that the snap ring sprung off and was lost in the abyss. Having the right tool for the job is the only way to go and will prevent you from having to stop everything for the sake of a small clip. HHL

THREADING A TAIL BOOM

What to do after your boom goes bang

WORDS: Matthew Allen | **PHOTOS:** Ryan Mills

It's inevitable, you're going to crash. And when you crash, the odds overwhelmingly indicate that you've bent or broken your tail boom. Be it the feared blade strike or the tail-first crash that leaves the kind of carnage that would baffle even the most astute CSI agent, your boom is going to look like a banana, a candy cane, or a boomerang.

During repairs, threading the drive belt through the tail boom can be frustrating. Things can easily become twisted and the orientation is easily distorted. In this section of Skills I'm going to show you a method to thread a belt through the boom that works every time.

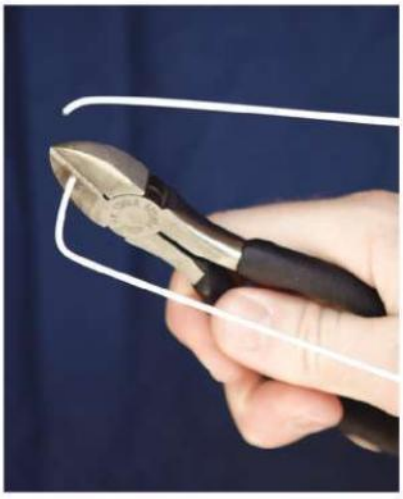
Coat hangers have become more then just a garment holder.

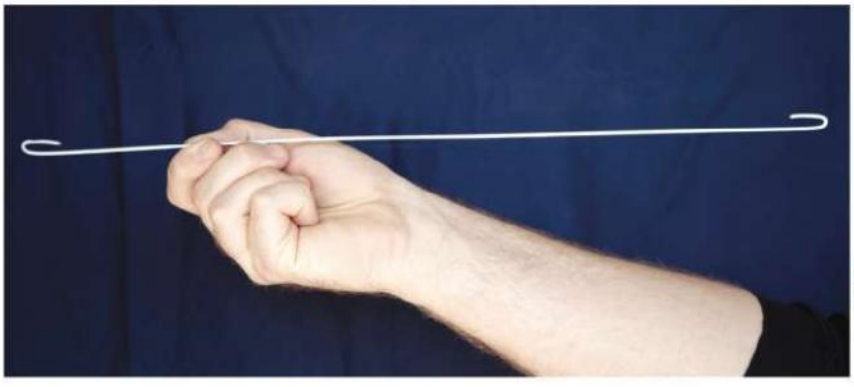
MAKING YOUR TOOL

First, you'll need to make a simple tool to both thread and orient the belt. Get yourself a metal clothes hanger or a section of 2mm metal rod. The hanger will work with most 500-size models and smaller.

Make a mark on the hanger about an inch beyond the bend on each side. Use wire cutters and snip the hanger at the mark. If you're repairing a larger bird, measure the tail boom and use that measurement plus two inches on each end of the hangar.

Bend the excess into a flat hook at each end. It's important that the curve is small enough to easily slide through the boom and also that the opening is wide enough to accommodate the belt.





» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

1.0 RC Heli

» TIME TO COMPLETE

10 Minutes

» TOOLS NEEDED

- WIRE CUTTERS
- PLIERS
- ALLEN WRENCHES
- METAL CLOTHES HANGER OR 2MM ROD
- ZIP TIES

Now that you've made the tool, it's time to revisit your pile of post-crash parts. As a matter of preference, I like to repair the other sections of the heli first and thread the tail boom last. The next steps assume the rest of your model is assembled, including the tail rotor assembly.

I prefer to work from the left side of the heli, as shown in the pictures. Set the various other parts on the table where they would go on the boom. Carefully map out the order that you'll need to mount the various parts to the boom. Will they slide onto the boom before or after you insert it into the frame? Will you need to hold the belt in place while you mount or assemble other items? After a few boom replacements you'll have the process down.

1 Hook one end of the rod on the belt. Make a note if you prefer to hold the belt with the tool's hooks facing up or down, and hold it that way every time.

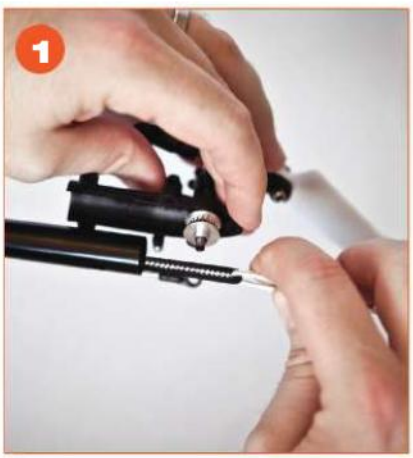
2 Slide the rod and belt through the boom until you can grab the other hook with your right hand.

3 Pull the rod through until the belt comes out the other side, always making sure the orientation of the hooks hasn't changed. With this simple method, even if you're unsure and think you may have twisted the belt, it takes only seconds to slide it back out and do it again.

If you weren't able to slide the boom into the frame whilst threading the belt, holding on to the rod, balancing the helicopter, holding your breath, doing your taxes, and walking the dog, that's okay. Many booms have pre-drilled holes at the end. Once you have the belt through the boom, thread a zip tie through the hole, then through the belt, then out the boom and secure the zip tie. Now you're hands-free.

The other super keen thing about this rod tool, besides doubling as a back scratcher and tripling as a marshmallow roaster, is that it will also thread through, around, and between the tail housing. All helis need to have the belt rotated ½ turn to place it on the shaft; the model's assembly manual will specify which direction.

Loosely attach the rest of the tail housing and any other remaining parts. Gently pull the boom and tail rotor assembly to tension the belt. Rotate the main blades to ensure that the belt is operating smoothly and without any odd noises or binding. If there are odd noises, it's likely that the belt wasn't properly seated on the tail drive gear inside the frame, so simply push the boom and tail rotor assembly back toward the frame and use the slack to get the belt on track with the gear. If there is binding, it's likely that the belt somehow became twisted and you can simply repeat the process with ease.



Ensure that the tail rotor is rotating in the proper direction. If they aren't, you probably just rotated the belt the wrong way during the half turn. No big deal – just remove the housing and flip it the other way.

CONCLUSION

If all is well, tighten down the parts on the tail section and get back in the air! So – how did you do? Less profanity? Less time spent redoing your hard work and robbing you of precious flight time so you can crash and do these steps again? I hope this tool and these little tricks have helped to make your heli experience a better one. RCH

DECIPHERING RADIO SYSTEM PERFORMANCE

What do the specs really mean?

WORDS: Chuck Bassani & John Kos

A post man had a dangerous job back in the day!

THIS MONTH LET'S TALK ABOUT RADIO PERFORMANCE. There are many factors that determine how well a system is going to perform. Just to be clear, 'performance' in the context of this article pertains to how quickly the system operates (commonly referred to as 'latency'), how precisely it can specify a desired position (a.k.a resolution), and how well it can keep servos in sync that are assigned to the same function (servo sync/grouping). Although these aspects of performance don't necessarily have anything to do with each other, sometimes design decisions made in one area will impact the others.

» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

1.0 RC Heli

» TIME TO COMPLETE

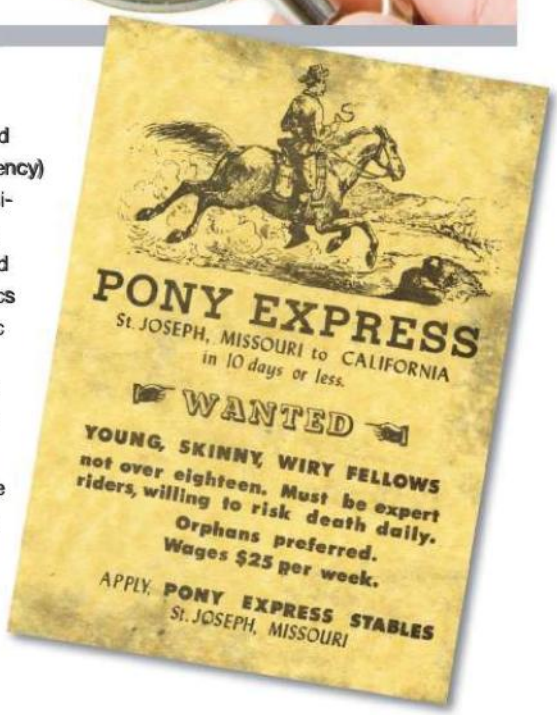
00 Minutes

» TOOLS NEEDED

- A BRAIN

LATENCY

Every radio system (transmitter and receiver) introduces a delay (or latency) between the user's inputs and position commands sent to the servos or other electronic devices plugged into the receiver. The characteristics of this latency can have a dramatic influence on the overall 'feel' of the user-machine connection. The main characteristics of a system's latency are not only the minimum and maximum latency, but also the spread between these two values.



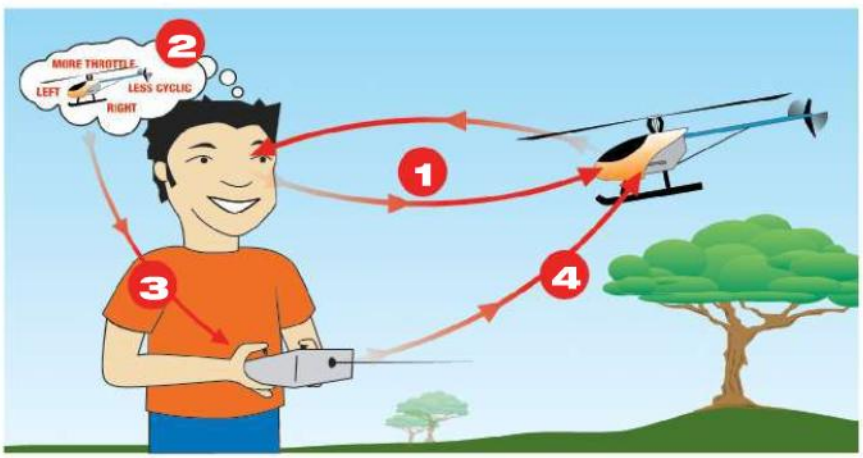
Even way back when – people didn't want to put up with latency.

To put this in perspective, if one assumes that 200 milliseconds is a reasonable eye-hand reaction time, a slow radio system (say 50 - 70 mS) can account for up to 35% of the eye-hand-servo command reaction time. A fast radio system (10 – 20 mS) can lower that number to about 5% of the latency in the same control loop. This 30% delta (fast to slow variation) in the control loop latency is unarguably significant.

To the user, a fast radio system typically results in a machine that feels 'well connected' while a slow system used in the same exact machine results in a 'mushy' feel. Users who are accustomed to a slower radio system and switch to a faster system often comment that the machine feels more alive, precise, and responsive - even when nothing but the receiver was changed on the machine itself. The 'connected' machine simply feels as if it does what you tell it to do while the 'mushy' machine requires a more concerted leading and compensation effort.

The spread between the minimum and maximum latency of a given radio system also has an effect on this 'feel'. While the human mind is amazingly adept at compensating for a consistent latency and can make very accurate predictions based on that latency (such as hitting a fast ball or stopping a watch at exactly 1.00 seconds), it doesn't do nearly as well when the latency is inconsistent. An example of what a large latency spread can cause is inconsistency in attempts to stop the motion of a machine in specific, precise orientations.

The minimum and maximum latency and the spread between those values work together to affect the overall feel. For example, a system with the lowest minimum latency but a large delta between the minimum and the maximum latency may not feel as good as a system with a slightly higher minimum latency but a tighter spread between minimum and maximum. Fortunately, the faster radio systems also tend to have lower spread as well.



Controlling your helicopter is a big loop. 1. You visually see what your helicopter is doing. 2. Your brain processes the control you want to apply. 3. Your brain tells your fingers what to do. 4. The transmitter communicates with the receiver and servos. From there the loop continues until touch down.

HOW LATENCY **IS MEASURED**

Latency measurement is performed by injecting a signal at the potentiometer of the stick, wheel, or trigger such that the radio believes the control is being moved. The injected signal can either be free-running or synchronized to the system's operation. Observing the receiver output reveals the system's latency characteristics.

RESOLUTION

How precisely a digital system can specify a position is referred to as 'resolution'. A system's resolution essentially determines the number of discrete position values that the system can represent, and is expressed in 'number of steps' (i.e. 512, 1024, 2048-step resolution).

Servos, gyros, throttle governors, etc., all use a 'pulse width modulated' signal generated by the receiver to specify position.

The typical pulse width limits used by today's devices are on the order of 900- 2100 µS (microseconds). Systems featuring 1024-step resolution, for example, are capable of generating pulse width increments of approximately 1.17 µS. (We derive this by dividing the overall pulse width range of 1200 µS by the number of steps.) Likewise, a system capable of 2048-step resolution can generate pulses width increments on the order of 0.59 µS, yielding much finer positioning capability.

What may not seem obvious is that as resolution increases, so does the amount of binary digits (or bits) that must be transmitted. A 1024-step resolution system requires ten bits to specify the position of a single channel, whereas a 2048-step resolution system needs eleven. In this example, a one-bit increase may not seem like much, but it is actually a 10% increase in the amount of data that must be transmitted. Multiply this by the number of channels a system supports and you can start to realize why an increase in resolution can potentially have a negative impact on a system's latency.

Chuck is really a machine , with a positronic brain.

For synchronized operation, a receiver output (typically the leading edge of channel 1) is used as the sync signal. The delay between the sync signal and the stick movement command is then varied while observing the pulse train from the receiver channel to find the point at which the change in pulse width varies between the minimum possible latency and jumping to a subsequent frame. The time delta between the stick movement command and the first pulse with the new pulse width is the latency.

In the free-running mode, data is collected via a computer based logic analyzer which is then analyzed to pull out the minimum and maximum latency. Since the stick movement command is not tied to the timing of the system, the input occurs at a different relative system time on each occurrence which, in effect, is like using the synchronized analysis with a different delay setting every time. Both directions of input are analyzed, which provides additional test points. Results can also be verified via the synchronized method.

On most systems, missing the minimum latency simply delays the pulse width change to the next frame and thus the maximum latency is the minimum latency plus one frame time. However, on other systems, the change varies between the minimum and up to three frames later. On one common air system, no change occurs at all for a minimum of three frames. In applications such as eCCPM, some systems can change all three channels in one frame, whereas others take multiple frames to effect change on all three channels.

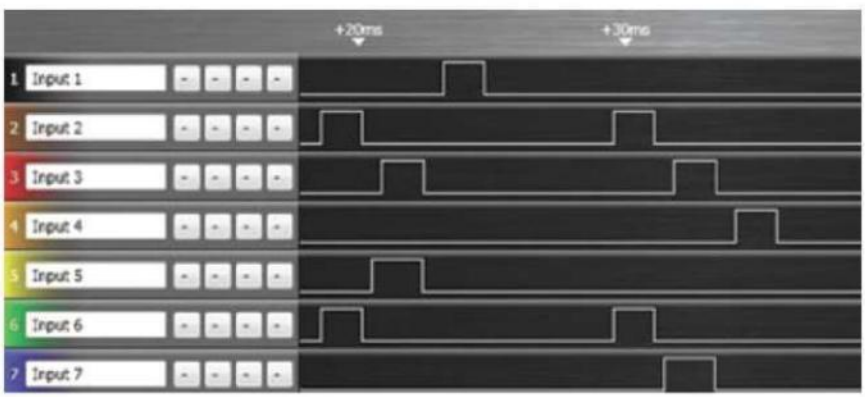
CHANNEL GROUPING

Another technique to improve performance is called 'Channel Grouping'. Take swashplate control in an eCCPM heli as an example. Three channels are required to implement that function. Channel grouping ensures that the receiver will output the position pulses for each of these channels in rapid succession (or possibly even simultaneously). This is essential when it comes to minimizing control interaction.

To illustrate, consider a 3-servo eCCPM setup where the aileron, elevator, and pitch servos work in unison to move the swashplate. As a collective input is given, the three servos must move in concert for the swashplate to remain level during its travel. If the channels are transmitted sequentially and these servos are driven by channels 2, 3, and 6, then you can see where there is a greater time delay between the position updates going to channels 3 and 6 then there is between channels 2 and 3. And you can certainly appreciate the delay between channels 2 and 6.

A system implementing Channel Grouping may re-order these channels such that 2, 3, and 6 come out in succession. Systems may even buffer the outputs until two or three channel positions are received, then output them simultaneously. Furthermore, systems containing a large channel count may not be able to send position updates to every channel in every frame. It could take two or more frames to get all the channels updated. Systems such as this will generally implement some flavor of channel grouping to ensure that the grouped channels are transmitted in the same frame.

This is an over-exaggerated photo of what happens when collective input is given on an eCCPM setup when servo-grouping is not implemented.



Here is an example of channel grouping as witnessed on a Spektrum AR7000 receiver driven by a Spektrum DX7se transmitter. Note that the swash channels are 2, 3, & 6. You can see that channels 2 & 6 are output simultaneously, immediately followed by channel 3.

CONCLUSION

One can certainly argue that latency is not the defining, limiting performance factor based on the accomplishments of today's top pilots. But hand over a faster radio system to any of those pilots and they'll instantly tell you that they feel a difference, specifically with regards to how 'connected' they feel with their model. That perception is not only limited to the pros - it's been felt by beginners doing something as "simple" as hovering a helicopter.

BOTTOM LINE • it is always better to reduce the latency in a control loop. Choosing the right radio system with the best possible latency is definitely a step in the right direction.

Happy Flying ... RCH

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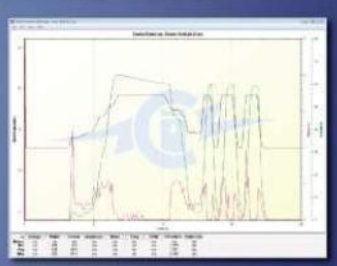

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REPAIR A FIBERGLASS CANOPY

Don't toss it, fix it!

WORDS: Aaron Shell

Fiberglass canopies offer one key advantage: the best surface on which to apply your favorite paint scheme. Although they weigh a little more and they don't usually offer the option of a clear windshield, the fiberglass canopy is generally considered the best looking option for your RC heli, especially once you add a super trick custom paint job. On the downside, the fiberglass canopy can be prone to cracking from vibration, and if you crash them, they are almost certain to take some level of damage. Fear not! RC Heli magazine to the rescue! In this article I will present the basics of repairing your fiberglass canopy, prepping it for paint, and getting you back in the air with minimal investment.

A crash usually happens on a fresh canopy!

» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

5.0 RC Heli Magazine

» TIME TO COMPLETE

2 Hours

» TOOLS NEEDED

- DENATURED ALCOHOL AND SPRAY BOTTLE

- CLEAN RAG

- 30 MINUTE EPOXY OR FINISH CURE EPOXY

- MIXING CUPS, STIR STICKS AND MICRO BALLOON FILLER

- PRIMER AND PAINT

- MASKING TAPE

- THIN CA

IS IT TOO FAR GONE?

There is a certain point when all is lost and it will take more effort than it's worth to try to make a repair. There is also a threshold with minor damage where you may be better off just accepting small imperfections. Determining what to do with your canopy is the first step. Here are some suggestions.

WHAT IF...

- **...YOU'VE DAMAGED IT TO THE POINT WHERE THE CANOPY IS SPLIT AT THE SEAM?** You'll have much more structural work to do. Maintaining the correct shape may present a challenge.
- **...THE CANOPY IS MISSING LARGE SECTIONS OF GELCOAT?** It will be a more challenging repair.
- **...THERE ARE LONG CRACKS IN THE PAINT AND GELCOAT?** These may be better left alone, depending on the level of perfection desired and how much repainting you want to do.
- **...THE CANOPY IS BROKEN AROUND THE CANOPY MOUNTING AREAS?** It will likely present a challenge to get the canopy to both look and function properly.

By now you should have some idea if it's worth it to you to make the repair, or simply pick up a new canopy and start from scratch. For the sake of this article, we'll cover two different levels of repairs. The first one is an example of very minor repairs, and the second is an example of more comprehensive damage.

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MINOR DAMAGE

First, you have to determine whether to strip the canopy around the cracks or repair them. Should you decide to strip the canopy and properly repair the damage with epoxy and filler, you will have much more painting to do. If you decide to repair the cracks, you can use thin CA, but you need to be aware that the CA will seal the exposed fibers, making a full repair in the future not as practical. For the purpose of this repair, we wanted to preserve the detailed paint job, so we elected to seal the cracks with CA to prevent them from propagating and the paint chipping off.

TO REPAIR THE PAINT JOB, FOLLOW THESE STEPS:

1. Clean canopy thoroughly.

2. Using a thin tip on a bottle of thin CA, wick a small amount of CA into the cracks, making sure to press the paint back down in any areas where it was lifting.

Follow the CA with a rag soaked with debonder. You can use this rag to catch CA runs and also to wipe the outside surface to prevent the CA from "frosting" the areas around the crack. Make sure to test the debonder on a corner (or on a piece of scrap material) to make sure it won't dissolve your paint.

Just hope the damage is minor!

RAPTOR 50 CANOPY WITH MODERATE DAMAGE

For this canopy, the gelcoat had cracked off parts of the canopy entirely, exposing the fiberglass weave underneath. With this much damage, the only option for repair is to replace the gelcoat, sand it to match, and repaint the damaged area. (The subject of prepping and painting canopies was covered in depth in a three-part series by Dave Yost in issues 7, 8 and 10.)

1. The first step is to make sure that the canopy is clean. Use denatured alcohol in a spray bottle to make sure that any dirt, oil, or mold release agent is removed.

2. Smooth out and clean up the areas around the damage. Use rough grit sand paper to smooth the edges of the gelcoat around the perimeter of the damaged area. If there are any areas where the paint and/or gelcoat are lifting away from the surface, make sure to either clean under the area and glue it back down with epoxy, or break it off back to the point where the gelcoat is still secured to the canopy.

3. If the damage is significant enough to weaken the canopy, cut several pieces of fiberglass cloth (1-6 oz. per square yard, depending on the size of the heli and how bad the damage is) and lay them up on the inside of the canopy with either finishing cure epoxy or 30-minute epoxy.

Congratulations Hiroki and Scott!

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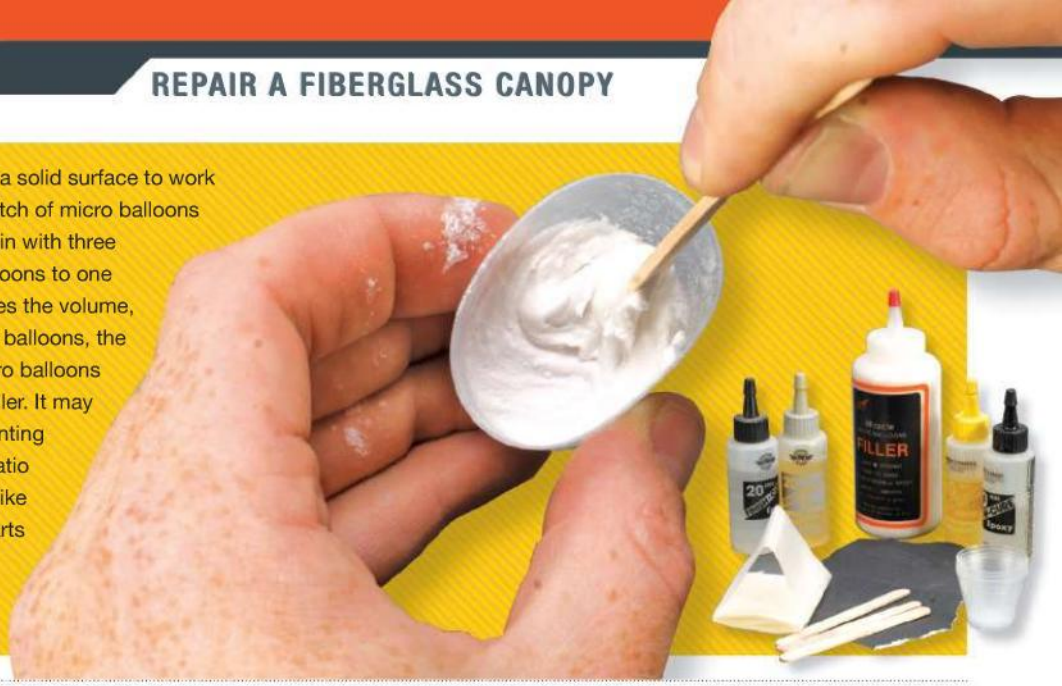
4. Once you have a solid surface to work on, mix up a batch of micro balloons and epoxy. Begin with three parts micro balloons to one part 30-minute epoxy (three times the volume, not the weight). The more micro balloons, the easier it is to sand, but less micro balloons will result in a stronger, harder filler. It may be helpful to do some experimenting here to help you decide which ratio of micro balloons to epoxy you like best. Make sure to mix equal parts epoxy (a gram scale that goes down to .1 grams will make this job easy and precise).



Epoxy should be thinned using rubbing alcohol.

5. Use a Popsicle stick, paint stick, or something similar to apply the micro balloon/epoxy mixture. Try to smooth over the surface, and make sure that the filler conforms to the canopy contours. Don't worry about making it perfect; it will settle and smooth itself out. Just make sure that there is enough material in all areas and no low spots.

6. Wait until the epoxy fully cures before doing anything else. Keep your mixing cup to check if the epoxy is fully cured. Thirty-minute epoxy sets in 30 minutes, but will take much longer to fully cure; 12-14 hours is not unheard of. The curing time will vary greatly with the ambient temperature; the hotter it is, the shorter the curing time.

7. When the filler is cured, sand it flush with the surface, starting with coarse grit (250) and progressively moving to a fine grit (600). If you want to have as smooth a surface as possible, you can do final sanding with fine grit wet sandpaper. Make sure to keep the surface wet when you are wet sanding.

8. If you are doing a repair job around a grommet mounting area like we are, use a moto tool with a sanding bit to shape the recess where the grommet mounts. Thin the area sufficiently to allow the grommet to fit, but not so much as to weaken the area.

FACTORY TEAM PILOTS

CRAIG OKU
Mountain View, California

DARRELL BELL
Detroit, Michigan

ANDY PANONCILLO
Muncie, Indiana

FRANK COLUMBIA
Port Jefferson Station, New York

ART HUGHES
Dryden, New York

ALVIN CHAI
Burnaby, British Columbia

JEFF PFEIFER
Bolivar, Missouri

GARETT OKU
Mountain View, California

MITCH MAROZAS
Chicago, Illinois

MICHAEL WILSON
Scarborough, Ontario

ADAM TURNER
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BEN STORICK
Las Vegas, Nevada

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9. Mask off the repaired area, leaving space around the repair. Prime the surface. Remove the masking after the primer has cured and sand the edges of the primer to blend in.

10. Mask a wider area for the color coat, leaving room to blend the color further than the primer. Try to apply the paint evenly across the repair, then blend the paint into the original paint job.

11. After painting the repaired area, remove the masking and apply a clear coat over the entire area in order to blend the clear coat into the original clear coat. If you never had the canopy clear coated you could do the entire thing now or simply skip this step.

Wow, nice job Aaron!

ALL BETTER

It is not always practical to try to salvage your canopy, but many damaged canopies have life left in them. It really boils down to how much work you want to put into it. With time and patience, a repaired canopy cannot be distinguished from a fresh one. Something else to remember is that if your repair turns out functional but not pretty, you can relegate it to practice or use it as a night-flying canopy. Next time you crash a fiberglass canopy, take a second look at it before throwing it in the trash bin. It may prove to be more practical to repair it than you first thought. RCHL

E-Flite BLADE SR RTF

Sharpest Blade yet!

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

E-flite continues to make getting into this hobby easier and easier. They've made counter-rotators trendy with their mCX and made fixed pitch helicopters fun with the mSR. Those kits proved to be fun to fly for pilots of all skill levels. E-flite has also found success with larger, more capable 3D helicopters like the Blade CP Pro.

E-flite has gone back to the drawing board and developed a new variant of that class of helicopter called the Blade SR. E-flite has been on a roll with their last few helicopters, so let's take a look at the SR and see how it compares.

» AT A GLANCE

SIZE:	Micro
POWER:	Electric
TYPE:	Pod & Boom
BUILD TYPE:	Ready To Fly (RTF)
TAIL DRIVE:	Motor

FEATURES

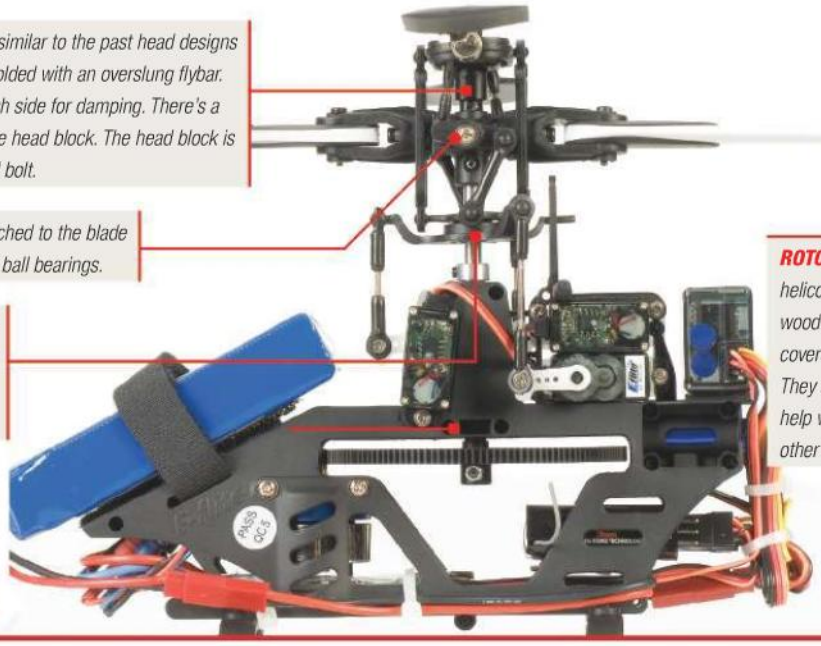
This helicopter comes Ready-To-Fly in true E-flite fashion. Everything is plastic and the heli equipped with 3 servos, a gyro and even a Spektrum 6100e receiver.

» ROTOR **HEAD**

HEADBLOCK: *The plastic rotor head is similar to the past head designs of the Blade series. The head block is molded with an overslung flybar. The head uses one rubber O-ring on each side for damping. There's a flybar sleeve that bolts onto the top of the head block. The head block is pinned to the main shaft using a nut and bolt.*

CONTROL: *The Bell/Hiller arms are attached to the blade grips. They use plain bearings instead of ball bearings.*

SWASHPLATE: *The plastic swashplate uses a typical anti-rotation guide behind the main shaft. There is very little play considering that it's a plastic swash.*

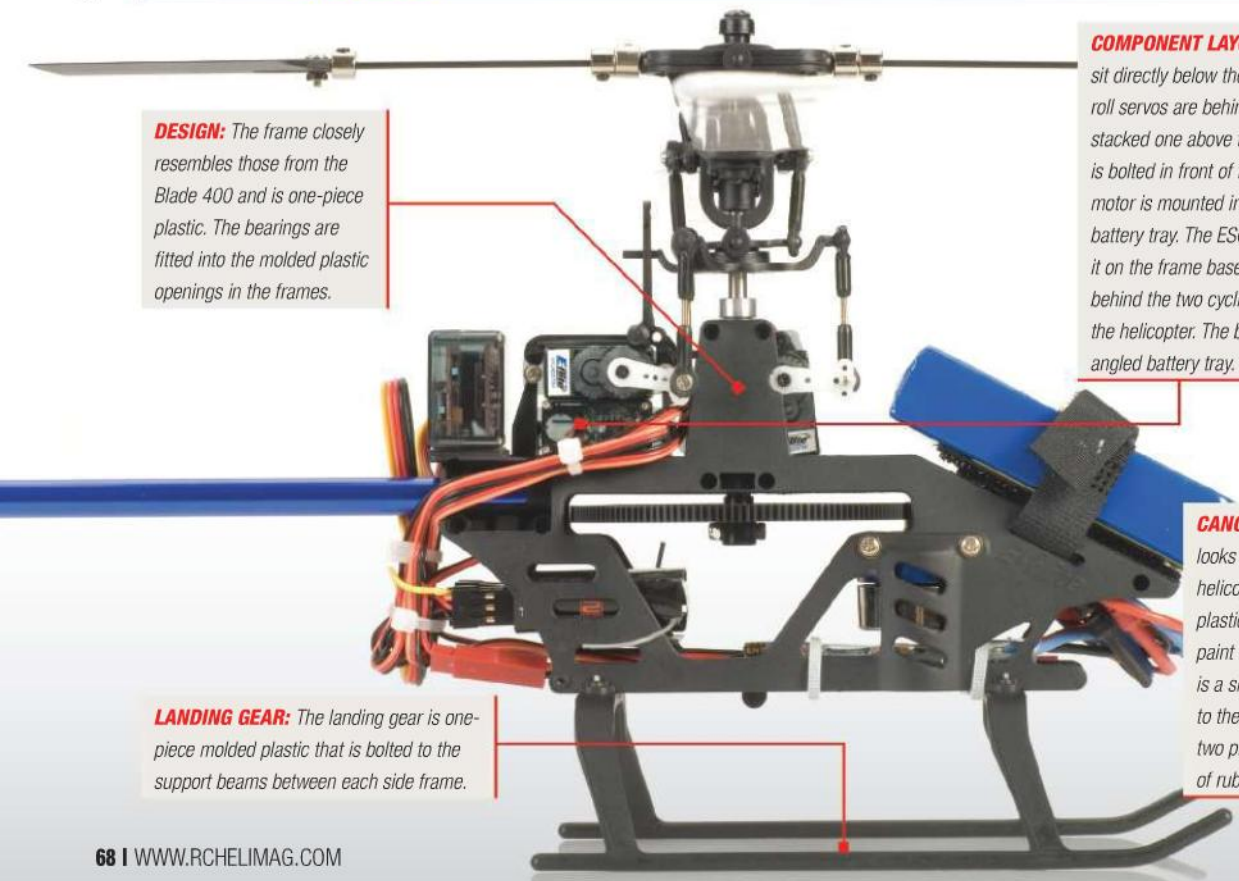


ROTOR BLADES: *The helicopter comes with wood blades that are covered in a white finish. They are taped off to help with tracking and other adjustments.*

A whole new frame for the Blade.

» MAIN **FRAME**

DESIGN: *The frame closely resembles those from the Blade 400 and is one-piece plastic. The bearings are fitted into the molded plastic openings in the frames.*



COMPONENT LAYOUT: *All of the servos sit directly below the swashplate. The roll servos are behind the main shaft and stacked one above the other. The pitch servo is bolted in front of the main shaft. The motor is mounted in an opening behind the battery tray. The ESC is zip-tied right below it on the frame base. The gyro is mounted behind the two cyclic servos on the back of the helicopter. The battery is strapped on the angled battery tray.*

CANOPY: *The canopy looks very similar to E-flite helicopters of the past. It's plastic with a blue and white paint scheme. The windshield is a smoked color and is glued to the canopy. It mounts on two plastic posts with the use of rubber grommets.*

LANDING GEAR: *The landing gear is one-piece molded plastic that is bolted to the support beams between each side frame.*

» DRIVE TRAIN

MOTOR MOUNT: The motor is screwed to a plastic motor mount with elongated holes for adjusting gear mesh. The frames are actually molded around to fit the motor with a clean look.

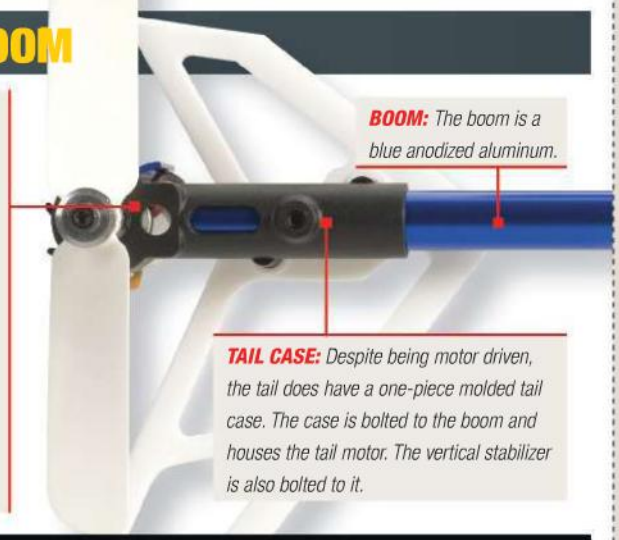
PINION: The brass pinion is pinned to the motor output shaft. It meshes well with the main gear for smooth movement.

MAIN GEAR: The main gear is just a one-piece plastic unit that's pinned to the main shaft. Its only duty is to mesh with the pinion and spin the rotor head.

TAIL DRIVE: The helicopter has a motor driven tail, so there isn't a true tail drive assembly. The tail motor wire runs through the boom and plugs into the gyro.

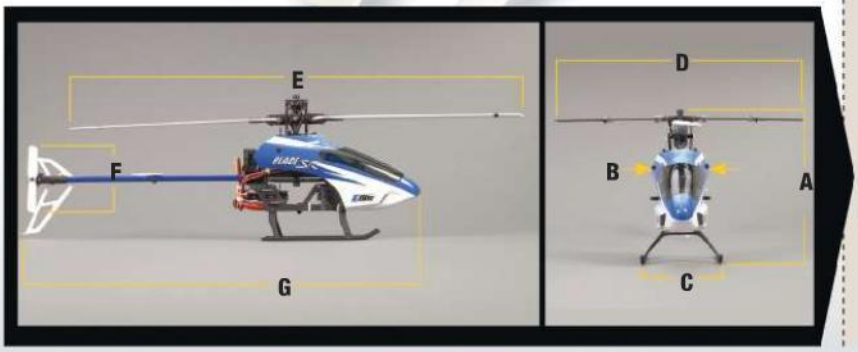
» TAIL & BOOM

TAIL ROTOR SYSTEM: *The tail motor resembles the one from the Blade CP Pro V2. It uses the same redesigned propeller that is more compact and has better control. The motor itself is pretty lightweight and has a heat sink to reduce overheating. The tail blade screws to the motor using a unique collar and bearing design.*



BOOM: *The boom is a blue anodized aluminum.*

TAIL CASE: *Despite being motor driven, the tail does have a one-piece molded tail case. The case is bolted to the boom and houses the tail motor. The vertical stabilizer is also bolted to it.*



E-Flite
BLADE SR RTF
MODEL SPECIFICATIONS

CLASS:	450 Electric
BUILD:	RTF
BLADE SIZE:	552mm
LEVEL:	Novice-Intermediate

FRAME

MATERIAL:	Plastic
TYPE:	One Piece
SERVO TO SWASH LINKAGE:	Direct
SERVO SIZE:	Micro

ROTOR HEAD

GRIPS:	Plastic
HEAD BLOCK:	Plastic
LINKS:	Ball
SWASH:	Plastic
CONTROL:	120° eCCPM

TAIL

DRIVE SYSTEM:	Motor Driven
AUTO DRIVEN:	No
TAIL PITCH SLIDER:	N/A
TAIL BLADE GRIPS:	N/A
TAIL CASE:	Plastic
BOOM STRUT MATERIAL:	N/A

GEARING

MAIN ROTOR TO PINION RATIO:	1:5.3
MAIN ROTOR TO TAIL RATIO:	N/A

WEIGHT

EMPTY:	0 lbs., 5 oz. (155g)
WITHOUT BATTERY:	0 lbs., 10 oz. (280g)
FULLY LOADED: (includes battery)	0 lbs., 13 oz. (360g)

DIMENSIONS

HEIGHT (A):	19.10in (176mm)
CANOPY WIDTH (B):	2.25 in. (57mm)
LANDING GEAR (C):	3.5 in. (89mm)
PADDLE TO PADDLE DIA. (D):	11.25 in. (286mm)
MAIN ROTOR (E):	21.75 in. (552mm)
TAIL ROTOR (F):	3.20 in. (82mm)
LENGTH (G):	19.10 in. (485mm)

It can cut through butter

TESTING

Even though I've grown past the RTF stage, I still enjoy flying all of them and comparing them against each other. I rate each RTF based solely on their intended audience. With the SR, I'm hoping to see a great sport flyer that can cover the very basics of 3D flight. E-flite has always been really good out of the box, and I'm hoping that this one will be no exception.

HOVERING • After charging the pack, I took it into a hover and immediately noticed how stable the helicopter was. Considering that the flybar had both inward and outward weights, I was expecting it it to be pretty docile. There was a minor breeze in the air and this heli was able to handle it without much issue. The tail drifted a little bit, but after a few clicks on the radio I was able to keep it centered.
Rating: 4.5

FORWARD FLIGHT • I took the SR out to a large field to see what it can really do. I immediately went into to some fast forward flight circuits and was happy to see that the helicopter flew very well. It was stable and I was able to keep it under control no matter what speed I was flying. Similar helicopters will get pitchy as the speed increases, but the SR stayed dialed-in as I flew through many hard circuits.
Rating: 4.5

CYCLIC PITCH RESPONSE • After seeing the weights on the flybar, I knew that this helicopter was going to have cyclic pitch response directed towards the beginner. The cyclics are pretty sluggish, but it is mild 3D capable. You just need to build up some speed when entering maneuvers. I had no problem flipping the SR in its stock configuration and I even enjoyed some low inverted hovering. Overall, it wasn't bad and it's a good balance for people who are starting out hoping to advance into some moderate 3D.
Rating: 4

COLLECTIVE PITCH RESPONSE • Out of the box the helicopter is set up with very little negative pitch. This makes flipping your helicopter over a little tough at some points. After a few adjustments you can easily make the pitch range symmetrical so it's no big deal. Overall, the collective response is suitable. It's perfect for sport flying and is good enough to do the basic flips and rolls.
Rating: 4

TAIL ROTOR RESPONSE • Despite having a motor-driven tail, the SR's tail control is actually pretty good. It locks in pretty well in a hover and can take a decent amount of load without blowing out. I was satisfied with how it performed in all areas of flight. I've never been a fan of motor-driven tails, but this one performed pretty well. After a while the tail will start to drift on you, but with some minor trim adjustments it can be fixed.
Rating: 4.5

AUTOROTATION CAPABILITIES • This helicopter isn't suitable for autorotation purposes and will not be scored in this category.
Rating: n/a

POST FLIGHT INSPECTION • E-flite has always made durable helicopters, and this carries on the tradition. I had a few mishaps after getting too low and the helicopter had no damage at all. It can take some abuse and the overall build and finish of it is very good. Nothing to complain about here.
Rating: 5

CONCLUSION

This is another solid offering from E-flite. E-flite has been making good quality small helicopters for a long time now and once again have made a quality product that's excellent for beginners and has the performance to match. For what you get with the $200 price tag, I'd have to say that this is a really good deal for anyone looking for a bargain helicopter.

TESTING SPECS

E-Flite BLADE SR RTF

Part #: EFLH1500
Distributor: Horizon Hobby
Web: www.horizonhobby.com

Street Price: $199
Price as Tested: $199
Build/Setup Time: 0 hours

PERFORMANCE

MODE FLOWN:	Normal, idle up 1
RPM OF EACH MODE:	Normal: 1500 Idle Up 1: 1650
MOTOR TEMP (after flight):	155° F
FLIGHT TIME:	7 minutes
CRASH COST:	$15.00

TEST CONDITIONS

WEATHER:	Sunny
TEMP / HUMIDITY:	83° F/ 135%
BAROMETRIC PRESSURE:	30.34 in.
WIND SPEED:	2 mph
VISIBILITY:	10 miles
ALTITUDE:	675 feet

PITCH CURVES

NORMAL:	-4, 0, 6
IDLE-UP 1:	-8, 0, 8
IDLE-UP 2:	-0, 0, 0

SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

THE GOOD

- Fly's Great
- Good Quality
- Cheap Price Tag

THE BAD

- Flybar Weights

REQUIRED TO FLY

Hands with thumbs

WHO'S IT FOR?

Anyone wanting a beginner heliopter for cheap

This is the Dinosaur issue of RC Heli.

Align TREX 600N PRO 3G

The new and improved 600

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

It has been some time since we reviewed the TREX 600N. Since then, Align has refined the 600 into a completely new machine with all the features that every pilot wanted in the older design. This month we'll take a close look at the new TREX 600N Pro 3G and see what this machine has to offer compared to the last generation TREX.

» AT A GLANCE

SIZE:	50
POWER:	Nitro
TYPE:	Pod & Boom
BUILD TYPE:	Kit
TAIL DRIVE:	Torque Tube

Who would win a battle between a TREX and a Raptor?

FEATURES

The 600 feature a similar design to the original but with a few extra bells and whistles. The kit includes the new 3G flybarless head and electronic stabilization system, an all aluminum head, carbon fiber boom, and torque tube.

» MAIN **FRAME**

SWASH CONTROL: *The TREX 600N Pro uses a 120° CCPM system that is controlled by three matched cyclic servos that are included with the kit. Aluminum bellcranks are used on a push-pull system. Two bearings support each bellcrank.*

DESIGN: *The carbon fiber frame halves are identical to the original TREX 600, but what has changed is the design of the spacers and additional supports. The bearing blocks are now made from machined aluminum and have a separate aluminum plate that locks down the bearings. Reinforcement carbon parts are doubled in critical areas, giving the skids extra support without stressing the carbon frames. The bottom main shaft bearing block is still made from plastic, but this bearing does not see stresses like the top two.*

CANOPY: *The new TREX includes a pre-painted fiberglass canopy. The canopy mounts to the helicopter using the same method as the original with two rubber grommets on the top and a single clip on the bottom that latches to the landing gear. The canopy standoffs are now made from aluminum and have a bigger diameter backing to provide more support for the canopy.*

COMPONENT LAYOUT: *The components of the new TREX 600N are much like the original. The cyclic servos are mounted up front with the exception of the elevator servo. The engine is placed in front of and below the main gear. The fuel tank sits behind the engine. The radio gear - including the regulator, governor, battery, and gyro system - are all located up front and protected by the canopy.*

LANDING GEAR: *The landing gear design is the same as the original except for the color of the skids. The four-piece design attaches to the frames using four machine screws that thread into aluminum blocks. The skids slide through the struts and are secured by four grub screws.*

Look closely and you will se the quality improvements Align has made!

» DRIVE TRAIN

ENGINE MOUNT: The engine is mounted to the frames using two aluminum mounts on each side of the engine, which then attach to the frames using four machine screws. The engine is attached to the mounts with four additional screws.

CLUTCH: The clutch system is identical to the original design and uses plastic bearing blocks and two ball bearings. A starter shaft runs through the pinion and clutch bell, which then engages the clutch. The clutch has a one-way bearing that is press fit and allows the starting shaft to spin freely after the engine has been started.

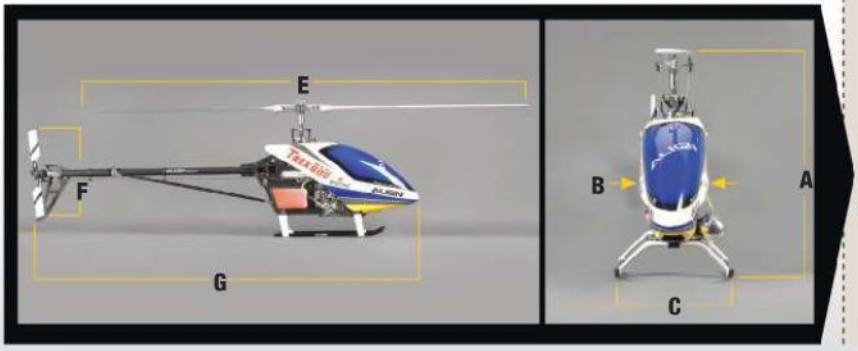
COOLING FAN AND SHROUD: The cooling fan is molded plastic and attaches to the engine first. The fan has an aluminum hub, which slides over the crankshaft and is locked in place using a clamp and the engine nut. The shroud is also molded from plastic and extends all the way down to the bottom of the cylinder head. The shroud mounts to the frame using two self-tapping screws on each side of the frames.

MAIN GEAR: The main gear is identical to the original. The fan is machined with lightening holes and supports. An aluminum hub is attached to the main gear using four machine screws.

AUTOROTATION DRIVE: The autorotation drive is accomplished by a one-way bearing that is press fit into the aluminum main gear hub. Other than the main shaft bearing blocks, no other bearing is used to support the hub. The tail drive gear is locked to the main shaft and allows for a driven tail during autos.

TAIL DRIVE: The main tail gear drives a secondary gear that has a ball bearing supported shaft that runs to a bevel gear. The bevel gear meshes with another gear that drives the torque tube.

"The TREX 600N Pro 3G is a great little machine that has been refined-and the proof is in the pudding."



Align TREX 600N PRO 3G MODEL SPECIFICATIONS

CLASS:	50-size
BUILD:	Kit
BLADE SIZE:	600-620mm
LEVEL:	Intermediate-Adv.

FRAME

MATERIAL:	Carbon fiber
TYPE:	Two-piece
SERVO TO SWASH LINKAGE:	Bellcrank, push-pull
SERVO SIZE:	Standard

ROTOR HEAD

GRIPS:	Aluminum
HEAD BLOCK:	Aluminum
LINKS:	Ball
SWASH:	Aluminum
CONTROL:	120° CCPM

TAIL

DRIVE SYSTEM:	Torque Tube
AUTO DRIVEN:	Yes
TAIL PITCH SLIDER:	Single
TAIL BLADE GRIPS:	Aluminum
TAIL CASE:	Aluminum
BOOM STRUT MATERIAL:	Carbon

GEARING

MAIN ROTOR TO PINION RATIO:	1:8.5
MAIN ROTOR TO TAIL RATIO:	1:4.5

WEIGHT

EMPTY:	5lbs 4oz (2,395g)
WITHOUT FUEL:	7lbs 3oz (3,265g)
FULLY LOADED:	7lbs 13oz (3,543g)

DIMENSIONS

HEIGHT (A):	15.75in (400mm)
CANOPY WIDTH (B):	5 in. (127mm)
LANDING GEAR (C):	8.125 in. (206mm)
PADDLE TO PADDLE DIA. (D):	N/A
MAIN ROTOR (E):	53 in. (1,346mm)
TAIL ROTOR (F):	10.125 in (257mm)
LENGTH (G):	46 in. (1,168mm)

The 3G system is included with this kit.

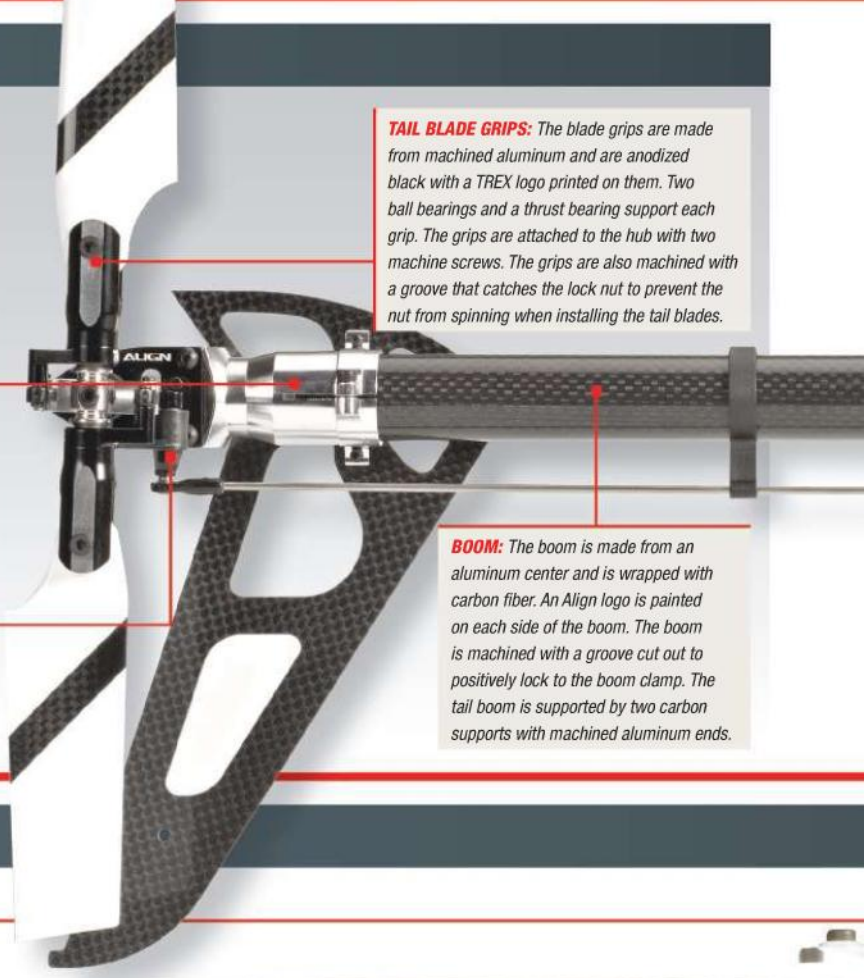
FEATURES CONTINUED

» TAIL & BOOM

TAIL CASE: *The tail case is an open design and attaches to the tail boom using a clamping method. The plates are made from aluminum and have bearings that support the tail shaft. One aluminum spacer is used at the rear of the plates to finish off the tail case.*

PITCH ACTUATOR SYSTEM: *The tail servo is located up front underneath the canopy. A pushrod connects to a bellcrank that connects to the tail pushrod. Two plastic pushrod guides help keep the pushrod straight down the boom. The pushrod then connects to a plastic bellcrank that is supported by two ball bearings. The bellcrank attaches to an aluminum post that is attached to the tail case. The bellcranks operates a plastic tail pitch slider that has a brass bushing and an aluminum pitch fork. The links that connect to the blade grips are bushing supported and attach to the grips and fork using machine screws.*

TAIL BLADE GRIPS: *The blade grips are made from machined aluminum and are anodized black with a TREX logo printed on them. Two ball bearings and a thrust bearing support each grip. The grips are attached to the hub with two machine screws. The grips are also machined with a groove that catches the lock nut to prevent the nut from spinning when installing the tail blades.*



BOOM: *The boom is made from an aluminum center and is wrapped with carbon fiber. An Align logo is painted on each side of the boom. The boom is machined with a groove cut out to positively lock to the boom clamp. The tail boom is supported by two carbon supports with machined aluminum ends.*

» ROTOR HEAD

HEADBLOCK: *The headblock has also been beefed up from the original. The block is designed for use in a flybarless setup. The block is attached to the main shaft with a single Jesus bolt that also clamps the block to the main shaft. The headblock is made completely from aluminum and also has an aluminum head button.*

MAIN BLADE GRIPS: *The main blade grips have been completely redesigned for a flybarless helicopter. The grips are made from aluminum and have a pitch arm that is longer and thicker then the original. The ball connection also extends further and keeps the link parallel with the main shaft. Two ball bearings and a thrust bearing support each grip. The grips attach to the spindle with two 4mm machine screws. The damping is done with a single piece damper on each side of the headblock.*

SWASH FOLLOWER: *The swashplate follower is a three piece design and is mostly made from aluminum except the plastic links. The links are attached to the arms with machine screws and are supported by two bearings each. The arms are also dual ball bearing supported. The swash follower is locked to the main shaft using one of the screws that attach the arms to the base.*

Did you know that you can get a flybar conversion for this kit!

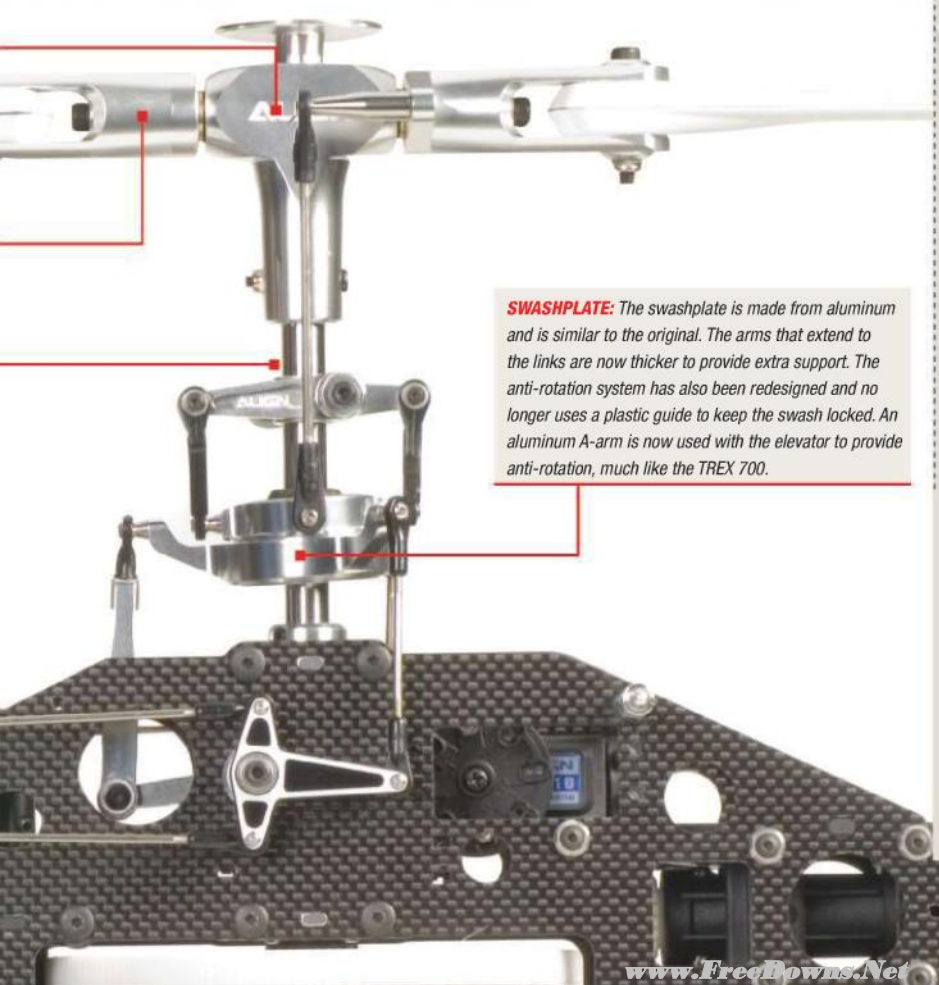
» INSTRUCTIONS & BUILDING TIPS

WHEN YOU OPEN THE BOX

Opening the box to the new TREX you will find it is much different from the original. The box has separate individual boxes neatly arranged inside. The boxes are all printed indicating what each box contains. The parts and canopy are all well protected with plastic bags and a snug fit. Overall the box quality and packaging is all well done.

MANUAL AND BUILD

The build on this TREX is like most Align products. The manual did a good job guiding me along the way, and the helicopter went together fast and easy. Align also included a full manual for the 3G system.



SWASHPLATE: *The swashplate is made from aluminum and is similar to the original. The arms that extend to the links are now thicker to provide extra support. The anti-rotation system has also been redesigned and no longer uses a plastic guide to keep the swash locked. An aluminum A-arm is now used with the elevator to provide anti-rotation, much like the TREX 700.*

Align TREX 600N PRO 3G RTF & TEST GEAR

» SUPPLIED GEAR

- **CYCLIC SERVOS:** Align, DS610, K10425A, 2.0oz. (56g)

- **TAIL SERVO:** Align, DS620, K10421A, 1.95oz. (55g)

- **GYRO:** Align, FL760, part number, 0.95oz. (27g)

- **GOVERNOR:** Align, RCE-G600, 385003, 0.30oz. (8g)

- **BATTERY:** Align, 7.4V 1900mah 40C, HBP19001, 3.50oz. (99g)

- **REGULATOR:** Align, RCE-B6T, HE50H10, 2.0oz. (56g)

- **MAIN ROTOR BLADES:** Align, 600D CF Blades, H60184

- **TAIL BLADES:** Align, New Carbon Fiber Tail Blade, H60128-1

» TEST GEAR

- **RADIO:** Spektrum, DX-7se, SPM2731, $319

- **RECEIVER:** Spektrum, AR7600, SPMAR7600, 0.45oz. (13g), $130

- **THROTTLE SERVO:** Hitec, HS-7975HB, HRCM7975, 1.86oz. (53g) $85

- **ENGINE:** Align, 55H, HFE55H02, 14.75oz. (418g), $300

- **FUEL:** Byron, Rotor Rage 30%, $34

- **PIPE:** Funtech, B320 3D Muffler 50-55 size, 711320, $109

The supplied gear is no low end package!

TESTING

We tested the new TREX 600 Nitro Pro with the included equipment and an Align 55H engine with a Funtech 3D 55 pipe. This combo puts out the power, now lets see if the 600 can take it.

HOVERING • Hovering with an ESS is like hovering a trainer. The helicopter just sits there and does not really drift around at all. I did notice that sometimes when you start to spool up the helicopter, a flybarless system feels a little weird around takeoff. Overall, the 600 was rock steady in a hover without any complaints.
Rating: 5

FORWARD FLIGHT • When cruising around in forward flight, the TREX 600N with the 3G system was fast. I did notice a little pitchiness when really laying into the collective, but the gyros seem to snap it back. Overall, the helicopter tracks well and curves through the turns without a hitch, all except for the little amount of pitch that is noticed in fast forward flight.
Rating: 4

CYCLIC PITCH RESPONSE • The cyclic on the 3G TREX 600N is unbelievably fast and responsive. When you want cyclic, it's there! Without a doubt, this is one of the fastest cyclic response helicopters on the market. When you are smooth on the sticks, the helicopter tracks well and feels very locked in during Hurricanes and Funnels.
Rating: 5

COLLECTIVE PITCH RESPONSE • Unlike other manufacturers, the collective with the 3G feels extremely fast. This is another section where the 600 excels. Collective pumping maneuvers feel crisp and locked in. When slowing the collective down for precise maneuvers, the collective feels perfect as you're descending in a tail slide or cruising around in normal flight.
Rating: 5

TAIL ROTOR RESPONSE • Arguably the most important part of any helicopter is the tail. Align has done a great job with their 3-axis system, and I must say that the tail did not blow out during anything I could throw at it. The response was there throughout the flight and the tail would stop exactly where I wanted it to without any bounce back or overshooting. However, I noticed an inconsistency on the piro rates during flights with high wind conditions. This is somewhat expected, but some gyros seem to be better then others.
Rating: 4

AUTOROTATION CAPABILITIES • Without the drag of a flybar, the TREX 600 can really auto well. The drive system is nice and smooth, allowing for extended autos. Headspeed was easily generated during the descent and even if you slowed the head down, you can speed it back up without a problem.
Rating: 5

POST FLIGHT INSPECTION • Going over the helicopter after the rigorous flight testing, I was pleased to see that every part seemed to be in great shape. I noticed some wear on the skids, but this is totally normal for a nitro machine flying on pavement. Overall, I am very pleased with this helicopter and how Align has produced a quality machine.
Rating: 5

CONCLUSION

If you are looking to get into a flybarless helicopter, why not just buy a whole new kit? The TREX 600N Pro 3G is a great little machine that has been refined since the first 600, and the proof is in the pudding. This lightweight machine can perform with the best of them and parts can be found almost anywhere. RCH

Take me home mountain road.

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TESTING SPECS

Align **TREX 600N PRO 3G**

Part #: KXD160NPN
Distributor: Heli Wholesaler Inc.
Web: www.heliwholesaler.com

Street Price: $1,070
Price as Tested: $2,013
Build/Setup Time: 13 hours

PERFORMANCE

MODE FLOWN:	Normal, Idle 1, Idle 2
RPM OF EACH MODE:	Normal: 1850 Idle Up 1: 1950 Idle Up 2: 2100
ENGINE TEMP (after flight):	185° F
FLIGHT TIME:	7 minutes
CRASH COST:	$55

TEST CONDITIONS

WEATHER:	Sunny
TEMP / HUMIDITY:	75° F/ 34%
BAROMETRIC PRESSURE:	30.34 in.
WIND SPEED:	6 mph
VISIBILITY:	10 miles
ALTITUDE:	700 feet

PITCH CURVES

NORMAL:	-6, 0, 13
IDLE-UP 1:	-13, 0, 13
IDLE-UP 2:	-13, 0, 13

REQUIRED TO FLY

Radio, receiver, engine, pipe, fuel, starting equipment.

WHO'S IT FOR?

The new TREX 600N 3G addition is a a great machine that can suit any pilots needs. Perhaps you want to try out flybarless, this helicopter is the way to go.

» SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

THE GOOD

- Includes gyro and servos
- Easy build
- Nice quality

THE BAD

- Canopy clip is still a bit tough to get on

Yes it can go inverted.

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Looks like a pissed off bee!

Thunder Tiger RAPTOR 50

A RTF Raptor 50

WORDS: Mark Madsen | **PHOTOS:** Carl Hyndman

I'm sure most pilots are familiar with the Thunder Tiger Raptor. A large portion of the helicopter community has owned some type of Raptor over the years. It was the helicopter that really opened the doors of this hobby to a wider audience. Raptors have always been an affordable, well flying, and reliable line of helicopter. It was a combination that netted Thunder Tiger a lot of sales. Now that Thunder Tiger has a new helicopter on the horizon, they've decided to release their trusted airframes in RTF form. RTF's have been hit or miss with me, but this one is a little different because I know the design is capable. The big question is: how well do the supplied components compliment it?

No that is not real carbon fiber on the windscreen.

» AT A GLANCE

SIZE:	50
POWER:	Nitro
TYPE:	Pod and Boom
BUILD TYPE:	Ready To Fly [RTF]
TAIL DRIVE:	Belt Drive

FEATURES

This is the same classic Raptor airframe that we've known for years. It's completely ready to fly and outfitted with Ace electronics. It also comes with an aluminum head block and flybar cage assembly. It includes a fully functional, 6-channel, 2.4 GHz computer radio.

» MAIN **FRAME**

SWASH CONTROL: *The Raptor has always been known for its mechanical control design. Instead of all three servos working together, each control axis has a dedicated servo used solely for that input.*

DESIGN: *The frames are a two-piece plastic design and are unique even to this day. Everything is molded into the frames, so there is no need for bearing blocks and the frame also works as a fan shroud for the engine.*

COMPONENT LAYOUT: *The servos are stacked vertically on the servo tray in the front of the helicopter. The roll servo is mounted in the large plastic collective arm. The receiver and battery are mounted all the way in the front on their own tray.*

CANOPY: *Thunder Tiger recently started supplying a fiberglass canopy on some of their 50-size kits. This one is no exception; it comes with their redesigned fiberglass canopy that is pre-painted in a yellow and black scheme. There are four aluminum stand offs that allow the canopy to be screwed to the helicopter.*

LANDING GEAR: *The landing gear is a two-piece white plastic design with individual skid pipes. The landing gear bolts directly to the frame.*

This Raptor comes with a Redline.

» DRIVE TRAIN

ENGINE/MOTOR MOUNT: The engine mounts to a single aluminum motor mount which is secured to the frame with six screws. The motor can easily be dropped after removing the screws and pulling it out from the bottom.

CLUTCH/PINION: The clutch bolts to the cooling fan hub and works inside a polished aluminum clutch bell. There is also a one-way bearing pressed into the clutch, which allows the start shaft to operate correctly.

COOLING FAN AND SHROUD: As mentioned before, the frame is molded in a way that precludes the need for a conventional fan shroud. The fan has an aluminum hub, but the fan blades are plastic. There is a governor magnet holes molded into it.

MAIN GEAR: The main gear is gray plastic. It is a solid one-piece design with no lightening holes in it.

AUTOROTATION DRIVE: The white tail drive pulley is pinned to the main shaft with a Jesus bolt. The one-way bearing is press fit into the main gear and is driven during an autorotation.

TAIL DRIVE: The belt wraps around the tail drive pulley and keeps its tension thanks to the two red pulleys pinned to the frame.

"I LIKE THIS BUNDLE PACKAGE TT IS DOING, AS IT WILL MAKE IT EVEN EASIER FOR NEWCOMERS TO ENTER THE HOBBY."

Thunder Tiger RAPTOR 50 MODEL SPECIFICATIONS

CLASS:	50 sized nitro
BUILD:	RTF
BLADE SIZE:	600mm
LEVEL:	Novice-Advanced

FRAME

MATERIAL:	Plastic
TYPE:	Two-piece
SERVO TO SWASH LINKAGE:	Bellcranks and pitch arms
SERVO SIZE:	Standard

ROTOR HEAD

GRIPS:	Plastic
HEAD BLOCK:	Metal
LINKS:	Ball
SWASH:	Metal
CONTROL:	MPM

TAIL

DRIVE SYSTEM:	Belt drive
AUTO DRIVEN:	Yes
TAIL PITCH SLIDER:	Dual point
TAIL BLADE GRIPS:	Plastic
TAIL CASE:	Plastic
BOOM STRUT MATERIAL:	Metal

GEARING

MAIN ROTOR TO PINION RATIO:	8.5:1
MAIN ROTOR TO TAIL RATIO:	4.56

WEIGHT

EMPTY:	5lbs 5oz (2,450g)
WITHOUT FUEL:	7lbs 8 oz(3400g)
FULLY LOADED:	8lbs 4 oz (3740g)

DIMENSIONS

HEIGHT (A):	15.74in (400mm)
CANOPY WIDTH (B):	4.75 in. (120mm)
LANDING GEAR (C):	10 in. (254mm)
PADDLE TO PADDLE DIA. (D):	22.5 in (572mm)
MAIN ROTOR (E):	52.95 in.(1345mm)
TAIL ROTOR (F):	9.29 in. (236mm)
LENGTH (G):	48.30. (1220mm)

Raptors are actually birds!

FEATURES CONTINUED

» TAIL & BOOM

TAIL CASE: *The plastic tail case is a two-piece design that is built around the belt. There is a toothed pulley on the output shaft that allows the belt to grab and spin it. There is also a red pulley pinned to the top of the case above the belt for extra tension. Each side of the tail case has a bearing in it for smooth movement for the output shaft.*

BOOM: *The aluminum boom is 26 inches in length, and 22mm in diameter.*

TAIL BLADE GRIPS: *Each plastic grip comes with two radial bearings each. It is mounted to the hub with the use of nuts that thread to the hub itself. A simple nut and bolt design are used for the tail blades.*

PITCH ACTUATOR SYSTEM: *The pushrod is controlled from the tail servo mounted on the boom. It is attached to a gray bellcrank bolted to the tail case. The bellcrank has two bearings in it. The other side of the bellcrank pops onto a ball that is screwed to the pitch slider. The links are pinned to the tail blade grips.*

» ROTOR HEAD

BELL/HILLER ARMS: *The Bell/Hiller arms are aluminum and contain no input options. They are mounted to the flybar seesaw.*

HEADBLOCK: *This RTF Raptor 50 comes with an aluminum head block. The head uses a single 3D damper on each side. The head block is bolted to the main shaft with a Jesus bolt.*

PHASING: *Phasing pins come out of the head block and slide into the aluminum washout base with little slop.*

WASHOUT ARMS: *The plastic washout arms have dual bearings in them. There are two input options. The washout links are pinned to the arms.*

Thunder Tiger is a relative of the Liger.

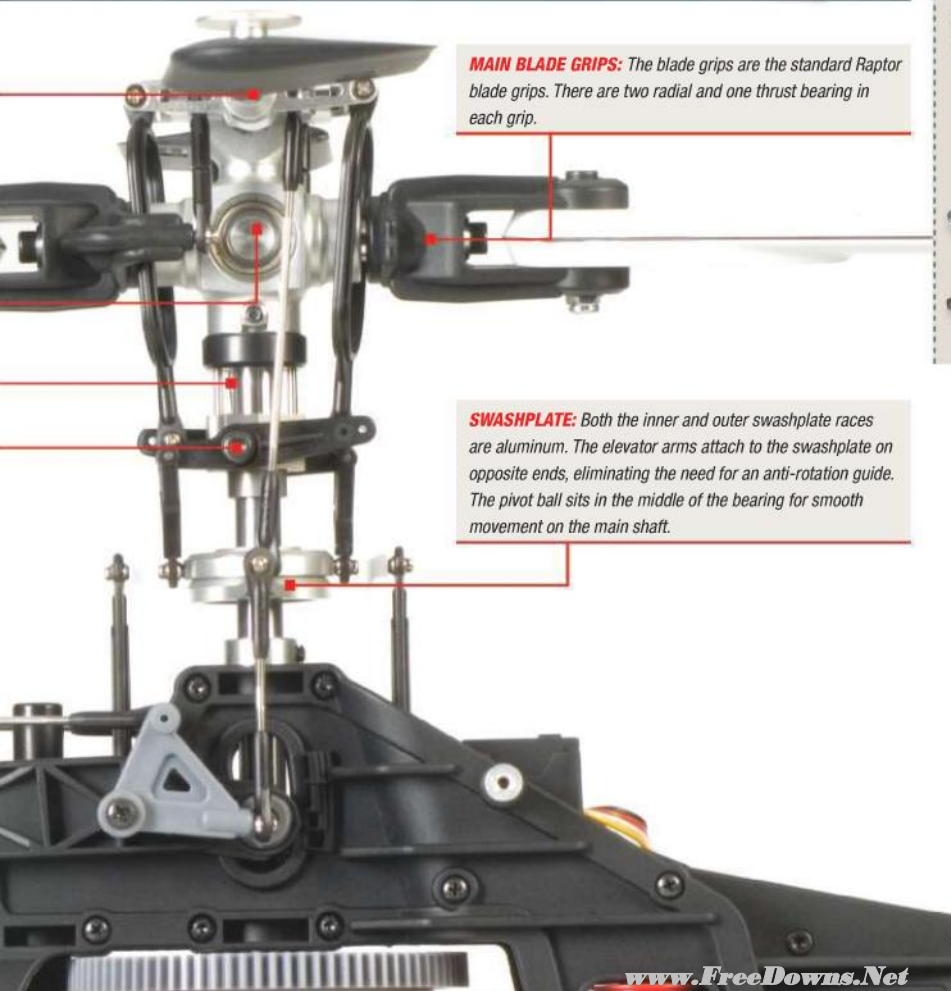
» INSTRUCTIONS & BUILDING TIPS

WHEN YOU OPEN THE BOX

The Raptor 50 RTF comes in a large box with the tail boom disconnected. The helicopter was zip tied to the bottom of the box and was held in place very well. I am pretty confident that it will take a lot for this helicopter to receive shipping damage.

MANUAL AND BUILD

All I had to do for the build was put the tail boom on and attach the blades. This was very easy and took about 10 minutes. The kit is supplied with all of the necessary manuals if you ever run into trouble. The transmitter manual was well done and made programming the radio an easy experience.



MAIN BLADE GRIPS: *The blade grips are the standard Raptor blade grips. There are two radial and one thrust bearing in each grip.*

SWASHPLATE: *Both the inner and outer swashplate races are aluminum. The elevator arms attach to the swashplate on opposite ends, eliminating the need for an anti-rotation guide. The pivot ball sits in the middle of the bearing for smooth movement on the main shaft.*

Thunder Tiger
RAPTOR 50
RTF & TEST GEAR

» SUPPLIED GEAR

- **RADIO:** Ace RC, Sky Tech TS6i, 8608

- **RECEIVER:** Ace RC, TRS601DD, AQ2257, .40oz. (11g)

- **CYCLIC SERVOS:** Ace RC, S1807MG, 8120, 1.80oz. (51g)

- **THROTTLE SERVO:** Ace RC, S1807MG, 8120, 1.80oz. (51g)

- **TAIL SERVO:** Ace RC, DS0606, 8130, 2.20oz. (62g)

- **GYRO:** Ace RC, TG-7000, 8070, .90oz. (25g)

- **ENGINE:** Thunder Tiger, RL-53HX, Exclusive, 13.4oz. (380g)

- **BATTERY:** Ace RC, 4.8v 1600mAh NiMH, 2982, 3.90oz. (108g)

- **MUFFLER:** Ace RC, Red Line Pipe, Exclusive, 6.5oz. (186g)

- **MAIN BLADES:** Thunder Tiger, FRP Main Blades, 9.65oz (273g)

Rawwwarrrrrr

TESTING

Even though I consider this to be a higher end RTF kit, I knew there were going to be limitations. Before each review, I set expectations for what I think each helicopter should fly like for its intended audience. With this release, I believe TT was aiming for the beginner to intermediate pilot. I expect this setup to get a pilot through the beginning stages of learning and then some.

HOVERING • After charging the batteries with the supplied charger, I was ready to take the helicopter out. I wanted to fly it like a true RTF, so I checked only the basics (control surfaces, etc.) to make sure everything was working properly. I was happy to see the Redline engine start right up. After getting it off the ground, the helicopter felt pretty solid but the tracking was a little off. There was also a little drift in the tail, so I had to make some adjustments in the radio. After adjusting the tracking and some minor trim issues the helicopter felt solid. It had that familiar Raptor feel in the air.
Rating: 4

FORWARD FLIGHT • Having started in this hobby with a Raptor, I was always happy with how they flew in forward flight. I left the engine rich and decided to fly some circuits. I quickly remembered my old Raptor days, as this one flew just as well as my old ones. It tracked very well and was predictable at all times. The docile setup from the factory made controlling this helicopter a breeze.
Rating: 4.5

CYCLIC PITCH RESPONSE • I wasn't expecting really fast cyclic response with this helicopter. Before testing I was expecting TT to setup this helicopter conservatively in order to reach a broad audience. The helicopter flew just as predicted. The servos that come standard aren't too quick and are matched with heavier paddles. Even though the cyclic is a little slow, it makes the heli a solid sport flyer. I was able to perform numerous 3D maneuvers without too much issue. Overall, I was pleased with the setup.
Rating: 4

COLLECTIVE PITCH RESPONSE • I was happy to see this helicopter come with a TT Redline 53. They've always made good power and this helicopter was no exception. After breaking it in, I decided to lean out the mixture. After making a few mixture and radio adjustments, I was happy to see the helicopter make good power and fly more aggressively. The helicopter is held back somewhat by its components, but overall it flew well.
Rating: 4

TAIL ROTOR RESPONSE • The tail rotor was drifting from the first flight. After making some adjustments I was able to get it under control, but there were still some weird tendencies. Overall, the shortcomings of the gyro limited the helicopter when it was really pushed. However, it was one of the better flying RTF tails I've yet to fly. This tail setup will carry you a long way until you're ready to upgrade.
Rating: 4

AUTOROTATION CAPABILITIES • I had to program the throttle hold before I even did my first auto, which was kind of a bummer. After that, the helicopter autorotated just like it should without any issue. There was quite a bit of headspeed at the flare before landing. Overall, it wasn't bad with the stock blades.
Rating: 4.5

POST FLIGHT INSPECTION • Raptors are a durable helicopter and can seemingly be flown forever. Even though this one was already assembled from the factory, everything stayed intact and I didn't run into any issues during my testing period. I was happy to see that all the components were neatly wired and everything seemed to be well assembled.
Rating: 5

CONCLUSION

Anyone who's ever owned a Raptor knows that it's a good flying helicopter. There are many former and current Raptor pilots out there for a reason. I like this bundle package TT is doing, as it will make it even easier for newcomers to enter the hobby. Overall, it isn't a bad setup at all and it will last you a long way. Once you begin to start really advanced flying you will see the drawbacks of the budget setup, but most pilots have a long way to go before that point.

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TESTING SPECS

Thunder Tiger **RAPTOR 50**

Part #: 4853-F08
Distributor: Ace Hobby
Web: www.acehobby.com

Street Price: $950
Price as Tested: $950
Build/Setup Time: 5 hours

PERFORMANCE

MODE FLOWN:	Normal, idle up 1
RPM OF EACH MODE:	Normal: 1800 Idle Up 1: 1950 Idle Up 1: N/A
ENGINE TEMP (after flight):	185° F
FLIGHT TIME:	7 minutes
CRASH COST:	$40.00

TEST CONDITIONS

WEATHER:	Sunny
TEMP / HUMIDITY:	75° F/ 34%
BAROMETRIC PRESSURE:	30.34 in.
WIND SPEED:	6 mph
VISIBILITY:	10 miles
ALTITUDE:	675 feet

PITCH CURVES

NORMAL:	-5, 0, 9
IDLE-UP 1:	-11, 0, 11
IDLE-UP 2:	N/A

REQUIRED TO FLY

Fuel, Starting equipment

WHO'S IT FOR?

Anyone wanting a good bundle to get you into the larger helicopters.

» SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

THE GOOD

- Classic design
- Good performance out the box
- TT Redline engine included

THE BAD

- Electronics will limit you down the road

An all in one package for a great price!

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-Flying Weight: 248gg (8.7 oz)
-Driven system: 2X 180SH carbon brushed main motor
-Servo: 2X 8.5g servos (speed 0.11sec/60o(4.8V);
torque 0.30kg/cm(4.8V);
dimension 17.5X6.5X21.5mm)
-Battery: 7.4V 800mAh Li-Polymer
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UNDERSTANDING AUTOROTATION

The theory behind it all.

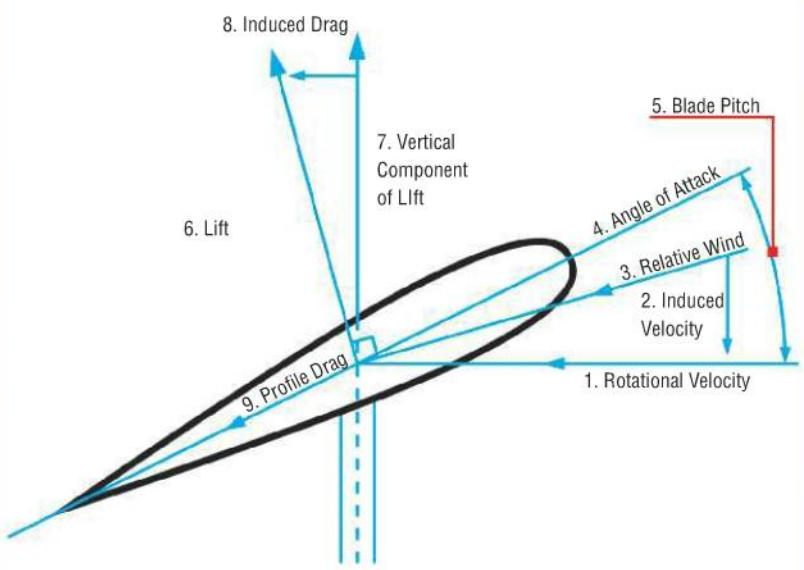
WORDS: Art Koral | **ILLUSTRATIONS:** Dave Palacios

THE FIRST STEP IN LEARNING ABOUT AUTOROTATION IS TO UNDERSTAND THAT ROTOR BLADES ARE ROTARY WINGS. We can all imagine an airplane flying without a motor (glider), but it's a bit more difficult to visualize a helicopter doing the same. By recognizing that each blade is a wing that acts like the wing of a glider, autorotation is more comprehensible. The blade element diagram can be used to understand the forces acting on the blade during an autorotation.

Warning: Diagrams can be confusing.

» BLADE ELEMENT - NORMAL POWERED FLIGHT

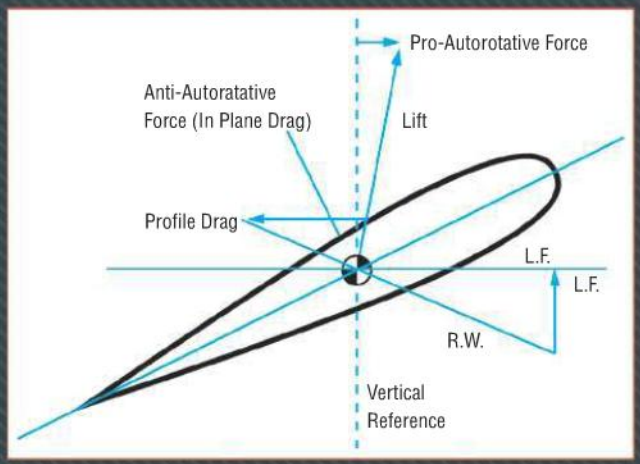
The blade sees a combination of rotational flow **(1)** and downward induced flow **(2)** called relative wind **(3)**. The angle of attack (4) is the angle formed between the relative wind and the chord line, and the pitch angle **(5)** is formed between the rotor plane and the chord line. Lift **(6)** is the total aerodynamic force perpendicular to the relative wind. For a helicopter in hovering flight, the lift vector is tilted aft. The lift vector can be broken into two components: a vertical component **(7)**, which is the total force that generates vertical lift, and the rearward component called the induced drag **(8)**, formed by the acceleration of air mass (downwash) and the energy spent in the creation of trailing vortices. Induced drag must be overcome to develop lift, and power is required to the rotor system to overcome this drag. The remaining vector on the blade element diagram is profile drag **(9)**, a result of air friction acting on the blade element.



These are the forces acting on the blade airfoil during normal flight.

BLADE ELEMENT AUTOROTATION

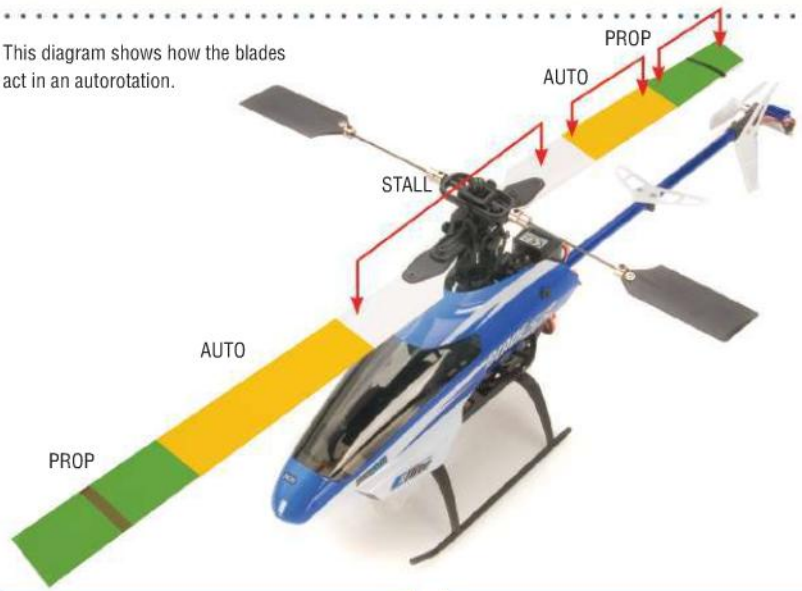
Once the engine selects the most convenient time and place to cease working, the power required for flight, now autorotative flight, must come from another source. This energy comes from potential energy (gravity) as the helicopter loses altitude. The rotor will initially slow down, feeding on its own rotor inertial energy. Lowering collective will stop the decay. The increasing upflow of air through the rotor system reverses airflow. With the lift vector always perpendicular to the relative wind, induced drag reverses as the lift vector is tilted forward, providing a pro-autorotative force that turns the rotor head. A component of profile drag (in-plane drag) acts in opposite direction to the pro-autorotative force.

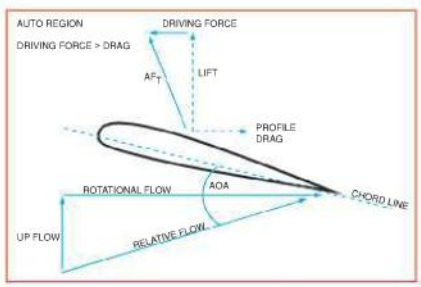


THE AUTOROTATIVE REGIONS OF THE BLADE

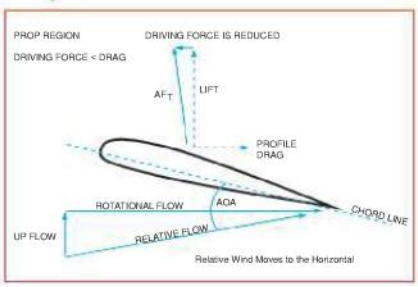
As the rotor blades travel around the arc, each part of the blade sees a different relative wind—from lowest velocity at the hub, to highest velocity at the rotor tip. This is because the rotor tip has to travel farther in the same period of time as the part of the blade near the hub. During an autorotation the rotor blade sees three different regions: prop, auto, and stall region.

This diagram shows how the blades act in an autorotation.

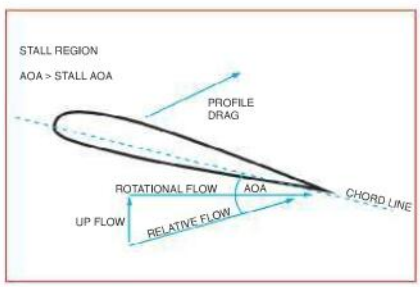




AUTO REGION - Rotational speed combines with induced flow, shifting the relative wind below the rotor plane. Notice that the lift vector is tilted forward, providing a pro-autorotative force. This region is increased and shifted toward the blade tip at higher pitch settings, decreasing rotor rpm and slowing the sink rate.



PROP REGION - Relatively high rotational speed at the outer portion of the rotor disk combines with induced flow, shifting the relative wind towards the horizontal. Notice the lift vector is tilted more vertical than forward, providing less pro-autorotative driving force. In this region, the profile drag is the largest and causes greater anti-autorotative force. This region is increased with lower pitch settings and higher rpms, thus reducing the auto region, resulting in a faster sink rate.

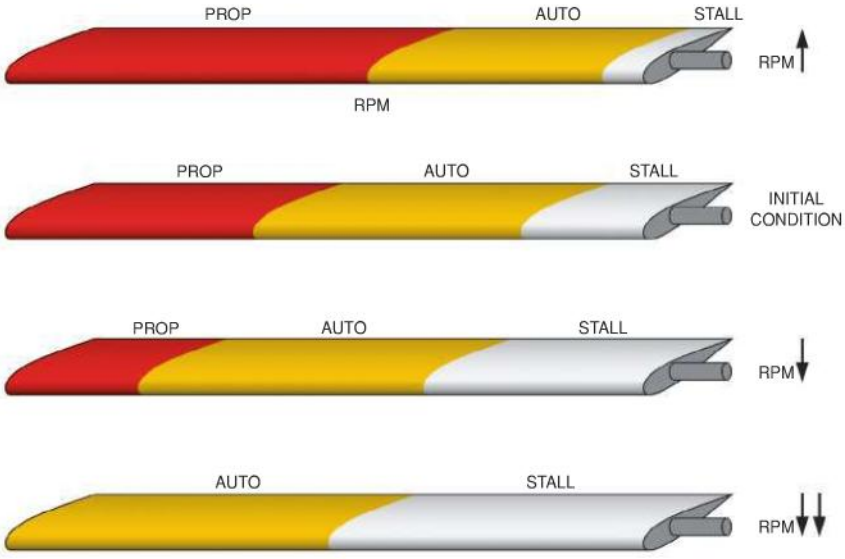


STALL REGION - The stall region is at the blade root, where rotational flow is reduced to the point where lift is not generated and profile drag dominates. As pitch angle is increased, rotor rpms are reduced and the stall region increases across the blade, reducing the auto region and prop region.

Remember I warned you.

PUTTING IT ALL TOGETHER

As blade pitch and rpm changes, the three regions change across the blade. It is very important that during an autorotation, pitch angle and rpm are controlled for the most practical use of the blade regions.



AUTOROTATION ENTRY

When the motor decides to quit at the most inconvenient time, the lift vector is pointed aft, quickly slowing the rotor head without the motor to overcome the induced drag. The pilot quickly lowers the collective to decrease the stall region on the blade.

DESCENT

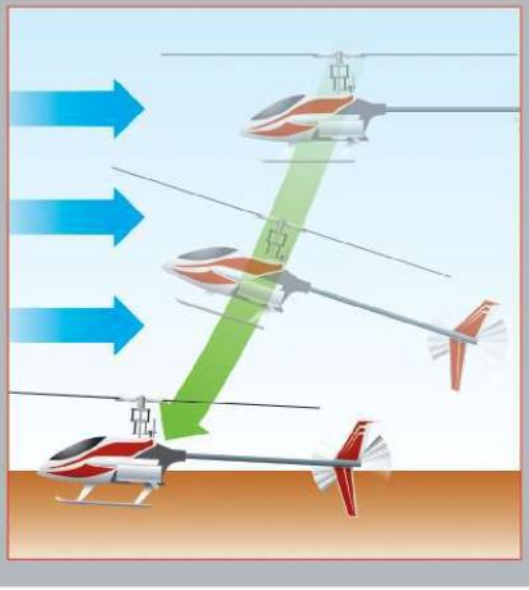
During the descent, the pilot starts to control the pitch of the blades in order to adjust the amount of prop and auto region. If the pilot wants more lift, he adds collective, slowing the rotor head and increasing lift. For a higher sink rate, the pilot decreases pitch, increasing rotor rpm. This balancing act is optimized in order to find a suitable rate of descent that will get the pilot to the desired landing point.

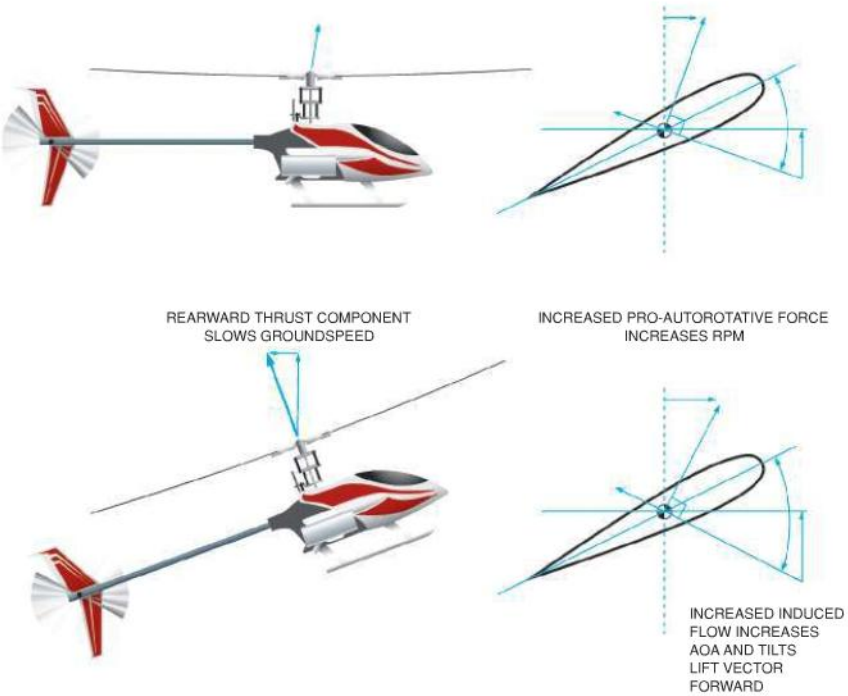
FLARE

Getting close to the ground, the pilot trades airspeed for rotor head power by flaring, increasing the reversed induced flow through the rotor head, increasing the lift vector, and tilting it more forward, causing a higher rotor rpm.

TOUCHDOWN

As airspeed is traded, the helicopter starts to settle. At this point the pilot trades energy from rotor inertia into greater lift. Hopefully the pilot didn't go too deeply into the bank account of rotor energy. Before the blades stall, the helicopter should settle safely on the ground.





The Flare just before touchdown slows forward speed and increases headspeed for a soft touchdown.

CONCLUSION

I hope this took some of the mystery out of autorotation. By adjusting pitch you control the direction and magnitude of the relative wind, lift vector, and pro-autorotative force. Proper collective management through the decent, flare, and touch down will save you from buying a new set of skids and will result in a magnificent crowd-pleasing auto. RCH

PHOENIX

FEBRUARY 26-28, 2010

WORDS & PHOTOS: Jim Innes

FUN IN THE SUN

Fun under the sun

THIS YEAR MARKED THE 14TH ANNUAL ITERATION OF THE ARIZONA ROTARY MODELERS SOCIETY PHOENIX FUNFLY. This funfly has become one of the longest running heli events in the west, and with good reason. I was able to attend this year's funfly and really get to know the pilots at the event. While being in the midst of top-notch people, I was also audience to some world class flying. After spending such a great weekend in Phoenix, it was easy to add this funfly to my travel calendar for next year!

FUNFLY

Pro pilots always seem to gather around at these events.

THE LOCATION IS HARD TO BEAT

Phoenix, Arizona is well known as a destination for retirees and those looking for some sunshine. The warm weather and beautiful desert scenery are also perfect for RC helicopter enthusiasts. The funfly is held at the Sun Valley Fliers field in north Phoenix. The field is in a large valley surrounded by mountains and hills, giving a great backdrop to the flying. The field features a large runway (there were eight pilot stations available all weekend), fully covered pits with great workbenches, a large built-in grill for cooking, and new for this year is AC power in the pits for all of the electric guys. It is a fantastic field to fly at!

GREAT PEOPLE

The funfly this year had 45 registered pilots, a smaller number than normal. It appears that the forecasted rain scared off a number of pilots. In the end, they missed out on a great weekend. The rain held off until very late Saturday night, leaving both Friday and Saturday with beautiful flying weather.

There was a fantastic array of flying styles demonstrated throughout the weekend. There were beginners learning a stable hover, precise and smooth scale pilots, and competition level 3D guys all in one place. Out of the 45 pilots, there were at least 10 sponsored pilots, including: Jason Krause, Jason Bell, Ray Nemovi, Kyle Dahl, Ben Storick, Tim Jones, Devin LeBlanc, Colby Kurtzman, Justin Barry, and Thomas Moore. All of these pilots put on fantastic demo flights throughout the weekend.

Another thing to note is the overall great attitude of everyone present. I was able to visit with a large number of pilots at the event and I had a great time talking helis with every one of them. Of course, as expected, heli guys were often seen helping each other out with repairs and at the flight line.

Let's see; sun, fun, flying, and great people - Phoenix had it all.

The raffle prizes were fantastic and CanopyFX was on hand with a great selection of canopies and other goodies!

THIS FUNFLY FOCUSES ON THE FUN

When I spoke with Eric Stevens, the CD for this event for the past ten years, I understood one of the reasons this event is so much fun. Eric, Bob, and the other ARMS guys are very nice and laid back people and you can tell that their intent with the event is to give the pilots a fun weekend. My note to them is: "Mission Accomplished".

The eight flight stations at the field were open for the entire event, closing briefly only for the noontime demos on Saturday. I don't remember seeing a pilot waiting to fly; there was always an open station to fill. This event is a great one to get in a bunch of practice time! The addition of power to the pits meant that the electric guys were able to fly all day long, which many of them did.

As I walked the flight line throughout the weekend, I was able to enjoy wonderful 3D flights by a number of accomplished pilots at one end of the field, and then watch some great scale flying at the other end. The flying was non-stop and the crashes were few. I commented to Eric that next year I might leave the camera at home and plan to bring my helicopters instead!

Throughout the afternoon on Saturday, Eric and his crew would announce raffle prize winners. The event sponsors really came through this year with some great items, such as a Trex 450 Pro, Mini G gyro, Blade 400, Canopy FX canopies, gift certificates, etc. Speaking of Canopy FX, they had their shop on-site selling canopies, helis, batteries, spare parts, and other miscellany, all at fantastic event discounts for the pilots in attendance (I picked up a new Hyperion pack for my Protos, as the price was hard to resist).

There was a PA system in place for the event that played good background music throughout the weekend. During lunch every day, a number of ARMS/Sun Valley club members were in the food area serving fantastic burgers and hot dogs to the hungry pilots and spectators. On Saturday night some pizza was brought in to feed everyone before the night flying began. A handful of pilots put on some fantastic night flights, and Yuri Higuchi of XFC fame put on a fantastic night flight with his large Composite Extra 3.1m airplane powered by a Desert Aircraft 150 engine! Yuri also put on a daytime demo with the plane that left the crowd in awe.

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INTERESTING HAPPENINGS

Throughout the weekend a number of fun things were happening. Jason Bell took a brand new Blade SR from the box, binded (bound?) it to a DX7, adjusted the links and showed off the little heli. It was quite capable in 3D flight, the gyro held very well, and the wind did not affect the tiny machine as much as I thought it would. Jason also performed some inverted blade scrapes with the bird.

Kyle Dahl was seen practicing inverted take-offs and landings with a Trex 450. He would set the bird on its head and spool it up quickly to get the tail blades up and take off, then he would land on the head. Needless to say, the takeoffs and landings weren't always successful, but they provided some great entertainment and laughs for the crowd.

During the autorotation contest on Saturday afternoon, contestants were given the option of landing on the runway or landing on a cable spool. Some pilots opted to try out the spool. Amazingly, not much damage was incurred during the contest, but fun was had by all. In the end, Thomas Moore took the auto crown for this year.

Lastly, Jason Krause took a 50-size scale MD500 and performed aerobatic flights with it. It was fun to see a scale bird doing fast inverted passes, tic-tocs, loops, rolls, etc. That's something you don't see everyday.

CONCLUSION

I first attended the Phoenix funfly in 2006, and while a lot has changed in the hobby since then, I am happy to report that this event has maintained its laid back and fun atmosphere through all the change. As I talked with pilots, I found that many of them have this funfly marked on their calendar every year, and who can blame them. The people were great, the flying superb, the field spectacular, and the weather worked out well. If you can make it to this event next year, go for it. You will have a great time! See you there!

Krause's 3D Scale demo and Kyle Dahl's inverted landings and takeoffs were highlights of the weekend.

Where there is sun, there will be shade.

Eric Stevens has been contest director for a decade now. He and his crew do an great job!

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Fabulous Las Vegas

Fun Fly

March 12th - 14th

Sin City here I come.

WORDS: Ryan Kephart | **PHOTOS:** Ryan Kephart & Sean Williams

IT IS THAT TIME OF YEAR AGAIN, WHERE WE PACK OUR HELIS AND ELVIS COSTUMES AND HEAD TO THE BRIGHT LIGHTS OF LAS VEGAS. This year the event has changed and no longer has a dual purpose like we have seen in the past. Last year, Align hosted a competition along with the usual casual fun fly setting. This year, Align decided not to put on the competition and instead supplied the pilot raffle with three great kits - the 700, 600 3G, and a 450 Pro. If you get tired of flying, there are always the casinos or those fabulous Vegas shows!

The Main Event

The Las Vegas Fun Fly is held at Bennett Field in Henderson, Nevada on a well-maintained asphalt runway. The event was hosted by the Las Vegas Radio Control Club and coordinated by Rockie Roper who has been running the show for several years.

The event started early on Friday morning as groups of people from all over the States poured in. By noon the event had already registered 80 pilots and the numbers were growing by the minute.

The field had five flight stations and plenty of room for even the "big air" guys to fly around. Each station was marked with an orange cone and had a pilot or two waiting their turn to get a piece of the sky. Friday ended well with the sun fading away as Jack Dunkle (JMD models) got one last flight with his scale machines.

Saturday morning we were back at the field and the number of pilots who rolled in the night before had doubled. The field was littered with helicopters and pilots couldn't wait to enjoy the beautiful weather. Unfortunately, once again the weather decided to take a turn for the worst. As the afternoon approached so did the wind, which gave us a nice gentle breeze around 15-30 mph. This discouraged a lot of the newer pilots but did not scare most of the big name guys. The pro pilots took to the skies, giving all of us a chance to see how well helicopters can perform in the wind.

One great thing about the Las Vegas Fun Fly is that there are no scheduled noontime demos that take up the entire field for an hour or longer. This event allows the sponsored pilots and the manufacturers to demonstrate their products at will, as most of the time the center stage is littered with the pros taking turns showing off their sponsored helicopters. This keeps the field open and really enhances the whole fun fly feel.

How many Auroras can you spot?

Pro Pilots Spotted in Las Vegas

Pro pilots from around the world attended this year's event. Nothing is more enjoyable than watching a skilled pilot put a helicopter through its paces in their own special style. Some are heavy on the low-down smack 3D and others like big air moves that track through the sky with style and grace. This gives spectators a true sense of what these helicopters are capable of and how well they can perform different flying styles.

- NICK MAXWELL
- BOBBY WATTS
- BERT KAMMERER
- CURTIS YOUNGBLOOD
- ALAN SZABO JR.
- DANNY SZABO
- KYLE DAHL
- BEN STORICK
- BRANDON UPDIKE
- MARCUS KIM
- MIKE FORTIN
- JASON BELL
- SEAN WILLIAMS
- LEON LUKE
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Danny Szabo's dog Spike is scared of the UFO!

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Vendors, New Products, and Raffles

Although the event was hindered by strong winds, that didn't stop vendors from opening shop. Many vendors strapped their products to the tables and continued to show off their products during the three days.

HeliProz packed up some products and headed down from Montana, offering many pilots a chance to fix their crashed helicopters on the spot. They also held a nice raffle in which they gave away a new MA Furry 55 with a $1000.00 gift certificate to outfit the new helicopter.

Byron Originals also contributed to this raffle and included a case of 30% nitro fuel. They also had a booth displaying their fuel and tankers (NOTE: carriers?) along with Bert Kammerer giving out samples of their new Master Blend fuel. This new fuel contains a lower viscosity oil that aids engine tuning.

Alongside Byron was a new company with an interesting fuel carrier. ABC R/C Hobbies have designed one of the most unique and useful fuel containers on the market. The A to B fueler is a plastic tank with a polyester/nylon cover. The fueler is equipped with an electric fuel pump, battery compartment, fuel connections, and two different handles. Look for the product scope in next month's issue for the details.

The event also held a pilot's raffle where every registered pilot was given a raffle ticket for a table of products, which included kits, engines, tools, fuel, parts, T-shirts, and gift certificates.

I won an Excel hobby knife in the raffle.

Conclusion

The Las Vegas Fun Fly is one of those events that you have to attend at least once. The Las Vegas Radio Control Club does a great job and offers grandstands for the viewers and covered canopies for everyone. What better way to see the pros fly and get a chance to fly along side of them than in Vegas? Although the weather hasn't cooperated the last few years, I look forward to next year. I'll see you there next year, just look for the guy with a camera and RCHELI garb! RCH

GETTING INVERTED

◆ FABULOUS LAS VEGAS FUN FLY ◆

Talent comes in many forms.

PHOTOGRAPHER: SEAN WILLIAMS

Sean is a talented young individual that can not only take photos, as seen here, but can really lay it down when it comes to flying. Sean has been an editor for rcheliresource.com and has covered events for us such as the Visalia event last month.

Curtis Youngblood was on the flight line showing off his newest creation, the Rave 90.

Kyle Dahl and a few other pilots from Mikado were showing the smooth fast flying features of the Mikado Logo 600 combined with the latest V-Bar software.

Compass Model pilots took to the air with one of their newest helicopters, the Atom 6HV.

Some have multiple talents like Sean Williams.

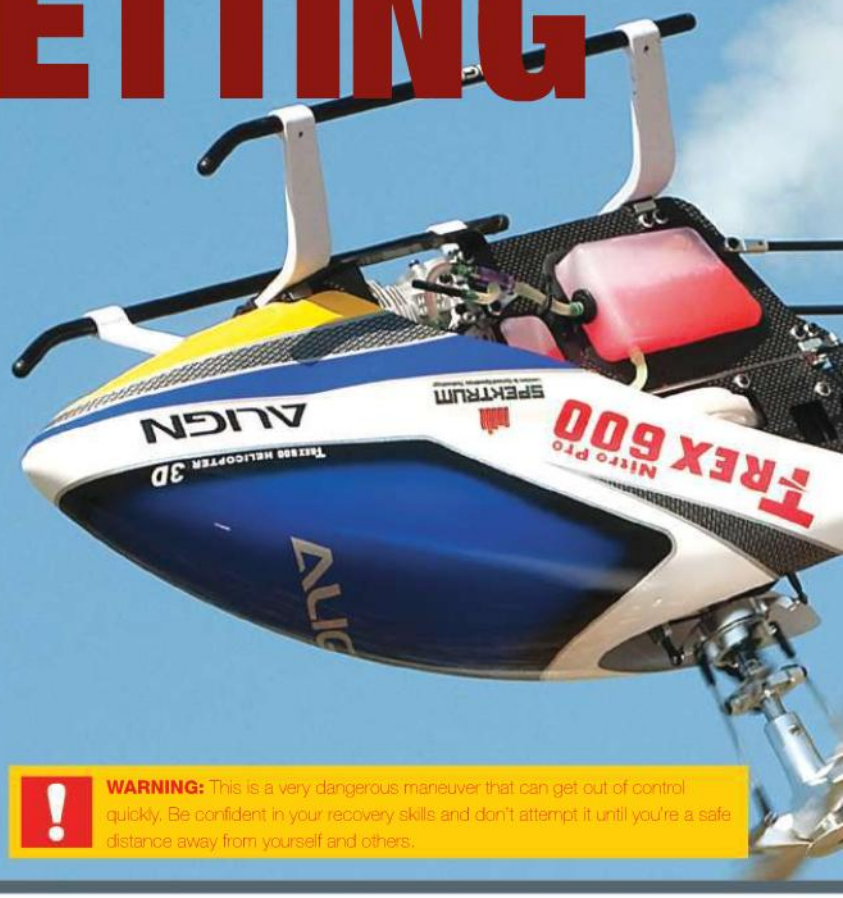
PIROUETTING FLIP

Caution Do Try This At Home

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

Good move to learn if your tail blows out!

THERE ARE MANY RC HELI MANEUVERS THAT SEEMINGLY DEFY THE LAWS OF PHYSICS. One that stands out above the rest is the Pirouetting Flip. This is a move that will guarantee a spectator's jaw to drop when they see it for the first time. After witnessing the Pirouetting Flip for the first time at my local flying field in 2003, I was determined to teach myself how to do it. Like many others, I quickly learned that this was a very hard maneuver to learn. The concept is surprisingly simple, but the execution is much more difficult.



WARNING: This is a very dangerous maneuver that can get out of control quickly. Be confident in your recovery skills and don't attempt it until you're a safe distance away from yourself and others.

WHAT IS A **PIROUETTING FLIP?**

As the name implies, a pirouetting flip consists of a continuous forward flip while pirouetting. The flips must be even and the helicopter has to be parallel to the ground in both the inverted and upright position (that means no crazy half flips with a pirouette thrown in). The integration of both the forward flip and a pirouette must be seamless so that the maneuver flows smoothly in all orientations.

CHAOS VS. **PIROUETTING FLIP**

A Pirouetting Flip is often misclassified as a Chaos during helicopter discussions. They are two very different maneuvers that are similar in appearance. Invented by Curtis Youngblood, the Chaos is a pirouetting flip that flips in all orientations. For example, a regular pirouetting flip is just a front flip while pirouetting. The Chaos, on the other hand, is not only a front flip but also flips to the side, towards the pilot, and flips to the other side, almost like a four-point Pirouetting Flip. It is very complicated and rarely seen.

You need cat like speed and reflexes to keep this move under control.

RIGHT VS. LEFT

Most people pirouette by moving their rudder stick to the left. This allows your helicopter to pirouette with the torque, allowing a little more tail authority and less binding. I pirouette to the right. When moving your stick to the right, your helicopter will go against the torque of the main rotor and - in theory - be robbed of some tail authority. I've never felt any problems pirouetting to the right, so I really think it comes down to personal preference. The best way is to do it both ways so you can be a technical mastermind.

THE STIRRING MOTION

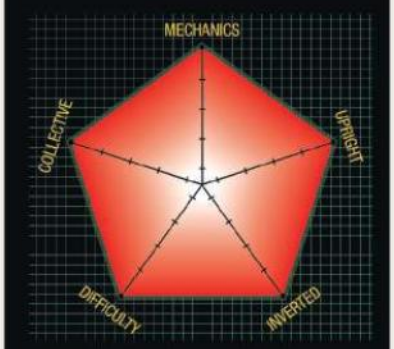
As I mentioned before, the Pirouetting Flip is a simple concept. In theory, all you do is make your tail input and stir your cyclic stick with a simultaneous collective input. If you make a left tail input, you'll stir the cyclic stick clockwise. If you make a right tail input, you'll stir your stick counter-clockwise.

What do I mean by "stirring the cyclic stick"? Imagine grabbing your cyclic stick in your palm and moving it in a circular motion. You'll be doing that for the duration of the maneuver.

Flight School Training

» SKILLS NEEDED

SCALE RATING: GREEN = Easy / RED = Advanced



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

TIMING:

■ **The secret of this move is in the timing.** Timing your stirring motion, tail input, and collective input requires constant adjustments to keep it centered and on axis. Even though stirring your cyclic stick doesn't sound difficult, the timing is what will get you. After you figure out the tendencies of the helicopter and get your timing down, the move will become second nature.

SETUP:

■ **Contrary to popular belief,** you really don't need a high-end setup to perform this maneuver. I've seen videos of Curtis back in '93 performing this maneuver, and have managed to do it on my old Raptor 30 back in the day. However, if you're still rockin' that old mechanical gyro that takes 30 minutes to spool up, then it's time to upgrade. A modern heading hold gyro will help out tremendously. With a consistent pirouette rate, it makes tail inputs much easier. It also allows you to have greater control of the tail. You don't need blazing fast digital servos, but you'll want something with a decent amount of speed. The better your components, the less you'll have to fight the timing. You can do this with a bare bones setup, but you'll find yourself babying the helicopter through the entire move to make it look good.

PRACTICE:

To practice this move we'll break it down into stages to help you prepare.

■ **STAGE 1:** Work on pirouettes in both the upright and inverted position. You'll want to be able to pirouette confidently in a stationary position with total control. This will allow you to know what inputs to add in all orientations.

■ **STAGE 2:** Perfect the front flip. Be able to perform a front flip continuously without losing any altitude or bogging the motor. You want to keep the flip in one spot, so work on making the proper corrections to keep the helicopter from drifting.

■ **STAGE 3:** Integrate a half pirouette into your flip. For example, when flipping forward make a quick tail input to bring the into an backwards inverted hover. You'll then pull back on the stick to flip the helicopter back over. Make another quick tail input until once again the tail is facing the ground, and when you level off you'll be back upright with the tail facing you.

STAGE 4: Once you have Stage 3 mastered, continue to do the same thing but this time work on consistency. Continue to do your half pirouettes with the flips until it's a continuous motion. You'll begin to find yourself slowly stirring your cyclic stick. This is the foundation of a consistent pirouetting flip.

Stirring the cyclic is like churning butter.

BREAKDOWN

1 Start out with your helicopter in a consistent pirouette in a stationary hover.

2 When your nose begins to turn back towards the front, start putting a forward cyclic input and positive collective input to begin your flip.

3 Start stirring your cyclic stick to level off your helicopter into an inverted orientation (clockwise if you piro to the left, counter-clockwise if you piro to the right).

4 By the time your cyclic stick is at the bottom you should be at an inverted orientation, so compliment it with a negative collective input.

5 Once again, time the flip back over so that the helicopter flips away from you by continuing to stir your cyclic stick with a negative collective input.

6 Once your cyclic stick comes back towards the top, your helicopter will once again begin to level off. Augment these inputs by bringing your collective stick back towards the top.

NOTE: Depending on your orientations, you will have to adjust the rate and the amount of throw you apply on your cyclic stick. You'll have to really feel your helicopter and know what inputs will help correct it. Once you have the motions down you'll be able to consistently stir your cyclic stick with minimal corrections because your timing will be perfect.

CONCLUSION

The Pirouetting Flip is a legendary maneuver. It will always get the crowd pumped up when performed perfectly at low altitude. Good luck and fly safely. RCH

Brandon thinks he is the most popular pilot at a fun fly!

Mi-28

Russia's Attack Helicopter

WORDS: Brandon Updike

After the United States developed the AH-64 Apache, the Russians felt the need to design an attack helicopter of their own. The Russians had previously used the Mi-24 as their main attack helicopter. They wanted to design something more nimble and practical, designed solely for attack purposes. The Mi-24 was both a transport and an attack helicopter. Due to its large size, it was able to transport up to eight troops. The Mi-28 was intended to cut down on the large airframe of the Mi-24 to make a sleek and agile design. Several designs were explored and didn't really start taking form until the early 80's. After the project began building steam, the Soviets opted to go for the Ka-50 Black Shark to fill their attack roles. The Mi-28 then took a back seat and wasn't resurrected until the late 80's.

BACKGROUND

The Mi-28A was developed and early test flights began. But once again, it was deemed an unimportant project with the Ka-50 already in the fleet. It made a comeback in 1996 with a night variant. This new version had several upgrades but never went into production because of funding. It wasn't until 2003 that the Russian government felt the need for a cheaper, more aggressive attack helicopter. In 2006, the Russian government decided to back the production of the Mi-28 after 20 years of so called "development". They expect to deliver at least 300 helicopters by the year 2015.

FEATURES

The Mi-28 has a 5-bladed rotor system with swept tips. The blade is made of several materials including wood, Kevlar, fiberglass, and titanium. The fuselage is a light alloy and resembles an Apache

helicopter. It has state of the art avionics for navigation and other tactical duties. It is powered by two Kimlov turboshaft engines that sit in pods on top of the fuselage. The landing gear is non retractable and has a separate wheel to the front along with a tail wheel.

CONCLUSION

After many years of development, the Mi-28 is now beginning to see production. By the time 2015 rolls around there will be a sizable amount of Mi-28s in Russia's air fleet. If funding continues, the Mi-28 is a helicopter that will be around for many more years. TH!

SPECS

CREW: Two - pilot and weapons operator
LENGTH: 17.01 m (55 ft 10 in)
MAIN ROTOR DIAMETER: 17.20 m (56 ft 5 in)
HEIGHT: 3.82 m (12 ft 6 in) (without radar)
MAIN ROTOR AREA: 232.4 m² (2,500 ft²)
EMPTY: 7,890 kg (17,394 lb)
LOADED: 10,400 kg (22,930 lb)
MAXIMUM TAKEOFF: 12,100 kg (26,700 lb)
POWERPLANT: 2x Klimov TV3-117VM turboshafts, 1,640 kW (2,200 shp) each

PERFORMANCE

MAXIMUM SPEED: 377 km/h (218 mph)
RANGE: 460 km (286 miles)
SERVICE CEILING: 5,750 m (18,900 ft)
RATE OF CLIMB: 816 m/min (2,680 ft/min)
MAIN ROTOR LOADING: 45 kg/m² (9 lb/ft²)
POWER/MASS: 0.31 kW/kg (0.19 hp/lb)

ARMAMENT

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