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- » **CENTURY 20 PIECE TOOL KIT**
- » **COMMONSENSE SERVO GAUGE**
- » **ALIGN SUPER STARTER**

OCTOBER 2009 / ISSUE 40



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- Go Wireless With Your Sim
- Go Beyond Basic Radio Tuning

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Me Up**



Innovator

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HELICOPTERS MADE EASY

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

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



Innovator MD530
TTR4720-F05E2



SET-UP AS EASY AS



1 Bind links radio to helicopter



2 Calibrate max travel defined by radio gimbals



3 Set-Up automatic helicopter programming

and it only takes 3 minutes!

Innovator MD530 Specifications:

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

Ask your local dealer for TTR4720-F05E2

PC Software and FMS Simulator (Optional)



A USB link permits setting the helicopter's flying parameters, such as throttle/pitch curve, dual rate, gyro gain, etc..., through a computer running Windows Vista or XP. It can also display alarm messages and detailed status of the onboard ICS system. When an alarm is displayed, it will reveal the detailed contents of the alarm and countermeasures.



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ACEAD1033070



VELOCITY 50



Ultra Compact Frame TECHNOLOGY



Length

: 1220mm

Height

: 378mm

Width

: 203mm

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

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

- Main Gear ratio: 8.6:1 (8.8:1 Optional)
- Tail Rotor Ratio 4.58:1
- Approximate Flying Weight with Fuel: 3.6kg / 7.936 Lbs. (depends on equipment used)

3D MASTERS 2008

CONGRATULATIONS
TO OUR CHAMPIONS



LUKAS RIVA
&
THE T-REX 700N

ALIGN

Picture Courtesy of Rotorworld UK




 Designed by:
Jason Krause

ALIGN

T-Rex 700 Nitro Pro

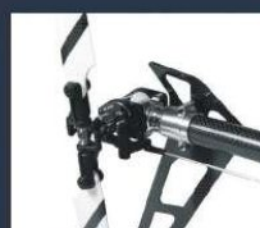


Improved Design:

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

Specifications:

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




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WHAT POWERS YOUR EXCITEMENT?



Supreme Power
**30C Lithium Polymer
Flight Battery Packs**

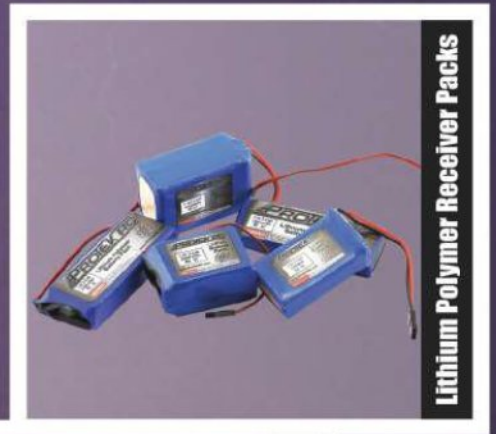
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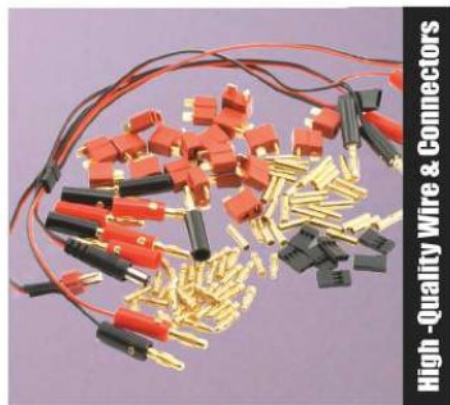
All ProTek R/C Lithium Polymer and Nickel-Metal Hydride batteries are tested in our product lab to ensure accurate "C" Rating, capacity and performance.



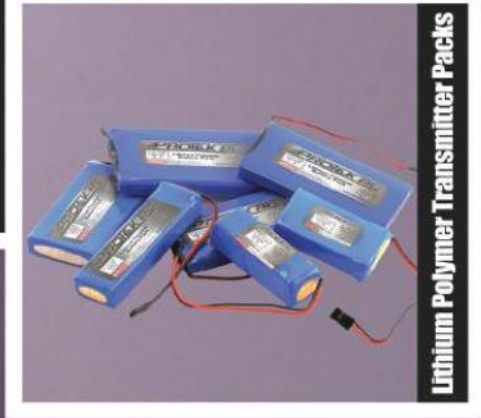
Lithium Polymer Flight Packs



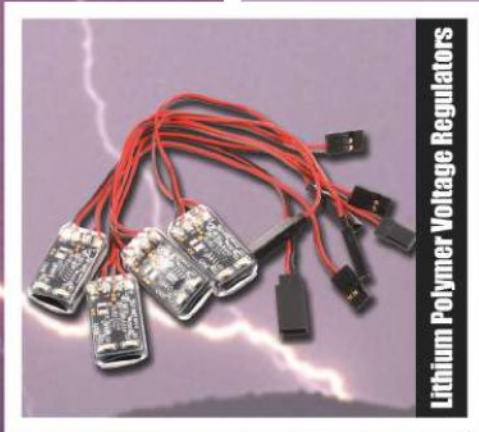
Lithium Polymer Receiver Packs



High -Quality Wire & Connectors



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Lithium Polymer Voltage Regulators



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Competition IS GOOD

SEEMS LIKE A SIMPLE ENOUGH STATEMENT TO UNDERSTAND, COMPETITION IS GOOD. Everywhere we look competition seems to benefit most everyone. In the RC helicopter market competition has created a market where kits just keep getting better and better and the consumer is the big winner. The 50 size nitro category is a perfect example of that. In just the last few years the feature list that seems to be standard on new kits coming out gets longer and longer. The price hasn't changed much, but just like the computer market, the money being spent gets the consumer a lot more bang for their buck. On-line there seems to be more and more helicopter related news websites popping up, this is good for news consumers as well. At IRCHA this year there seemed to be more and more people covering the event to get information on-line as quickly as possible. I was updating our Twitter feed very regularly. In the hobby for example competition makes us better pilots. Whether it's a simple pad hop at a fun fly, or throwing your hat in the ring at a 3D, FAI, or scale competition before you know it the aspect of competition will make you a better pilot or modeler in no time. Even for us, we've never been one to shy away from competition and in the four years we've been around we've had other magazines come and go. The added competition gets a fire under anyone and pushes you to do better. So our hats off to "competition." Long may it live and may we all benefit from it!

Yes, you did read correctly, this issue marks our 4 year anniversary. Thank you to all our readers, contributors, and advertisers for supporting us along the way. It's been a lot of fun and hard work to this point to become the world's best selling RC helicopter magazine. That's an honor we take seriously and will continue to work hard to deliver you the best magazine experience we can for many more years to come.

Thanks again,

Mike Velez

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



No, that's not Mike on the first cover, that's Yama Tanomand and his amazing guns.

CHATTER BOX

HAVE YOU FLOWN IN A FULL-SIZED HELICOPTER? IF SO, HOW WAS IT?



MIKE VELEZ - Publisher/Editor-in-Chief

Site seeing in Kauai, it was awesome. Can't wait to do it again, go to Kauai, or go up in a heli.



RYAN KEPHART - Associate Editor

I have had the chance to fly an R22 on an initiation flight and the instructor took me on top of a flat hill. I was able to hold a stationary hover for about 45 seconds until the helicopter got ahead of me.



BRANDON UPDIKE - Editorial Assistant

Not yet, but I'd like to someday.



JIM INNES - Editor-At-Large

I took a ride in a Bell 47 over Niagara Falls years ago; it was spectacular. I remember all the gauges rattling when it throttled up. I asked the pilot, "This machine looks pretty old, is it safe?" His response, "How do you think it got so old?"



CHUCK BASSANI - Contributor

I took a ride in a Bell 47 over Niagara Falls years ago; it was spectacular. I remember all the gauges rattling when it throttled up. I asked the pilot, "This machine looks pretty old, is it safe?" His response, "How do you think it got so old?"



ART KORRAL - Contributor

Yup, lots of times. And it all depends on who you are sitting next to.



MATTHEW ALLEN - Copy Editor

I've turned down rides in Black Hawks while I was in the Army, they're great machines but the pilots at our post didn't have such a good scorecard against things like the trees and the ground.

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Radio controlled helicopters are not toys. Their use can cause serious injury or death. Always use caution when operating a radio controlled helicopter. The publishers of this magazine can not be held liable for any injuries or damage incurred performing any operations seen in this publication or related medium.

50NX

NEXT GENERATION

**FLIES LIKE
IT'S ON
RAILS**

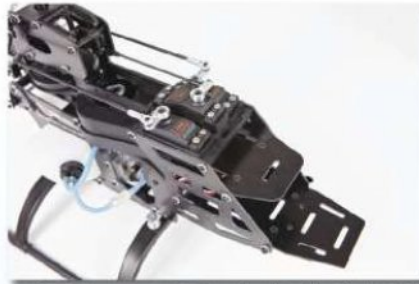


- Length: 47.5"
- Height: 15.2"
- Main Blade: 600-620mm
- Main Rotor Diameter: 53"
- Tail Rotor Diameter: 9.3"
- Engine: .46-.57 2-C
- Bearings: 45
- Gear Ratio: 8.76 to 1

Century Helicopter Product's newest RC helicopter model, the Century 50NX, is a new breed of helicopter. Ideal for beginners new to the hobby, the initial flight characteristics are extremely smooth with a sense of "flies like it's on rails" type of feeling. When setup for the expert pilot, the 50NX becomes a monster in the sky performing the most extreme aerobatics. This kit will exceed your expectations for precision control at an affordable price.



The included CNC machined swashplate has a Teflon coated metal ball retainer for smoothness. The machined main rotor hub, molded into a strong reinforced composite yoke provides long term durability. A possible 28° pitch range is offered to accommodate any set-up requirements.



eCCPM-Electronic Collective/Cyclic Pitch Mixing system offers locked in swashplate control. The 2mm stacked G10 frame insures maximum rigidity.



Break-away tail boom support standoffs provide protection to main frames during a crash. Stainless steel torque-tube drive system with two bearing supports.

"If you like a machine that responds with style and grace, then this 50-sized helicopter is a perfect choice."

"The collective feels locked-in during all flight modes."

"The tail accelerates and stops very smoothly while offering plenty of piro speed for even the most aggressive pilots."
-RC-Heli Magazine

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From "Mild to Wild", the "3D Frenzy" delivers what you're looking for!



lightweight, strong G-10 side frames



metal main blade grips
(optional aluminum head available)



low maintenance belt driven tail assembly



www.jsmodel.com

JS Models TZ-V2
"3D Frenzy"
.50 Size Pro Helicopter Kit

Notes

- * Strong and lightweight G-10 side frames
- * Three point metal mainshaft bearing mounts
- * Metal main blade grips
- * Strong A-Arm style CNC machined elevator linkage
- * CNC machined aluminum engine mounting block
- * Push-pull linkages on all cyclic servos
- * Forward mount engine for easy glow plug access
- * 120° CCPM swashplate
140° available with optional JSS-1634 arms
- * Front mounted radio mounting frame
- * Low maintenance belt driven tail
- * Easily removed, vibration-isolated fuel tank
- * Pre-painted white fiberglass canopy with decals

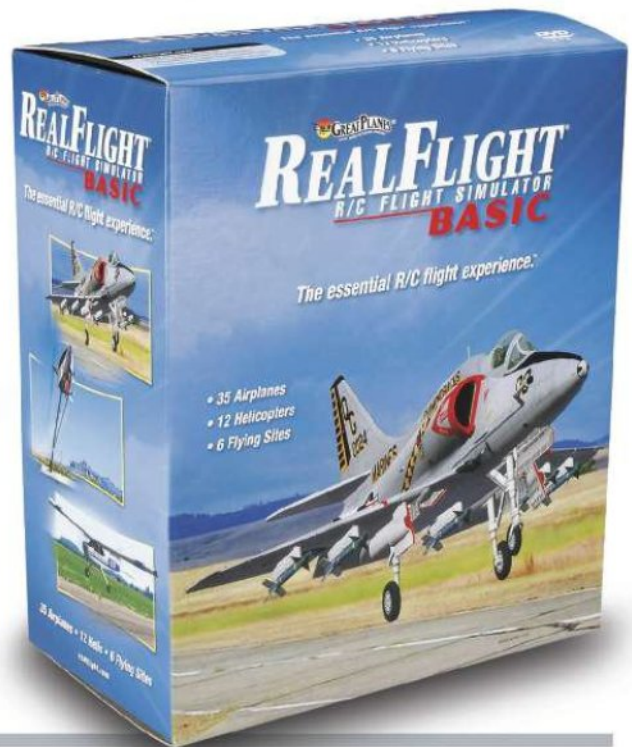
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BACK TO BASICS

Over the years, Great Planes' Real Flight Flight Simulator has become the most popular RC flight sim, and for very good reason. As we enter this holiday season, there's a new version called Real Flight Basic. It features the same simulation engine that the most recent version uses, along with the addition of flight physics that have been fine-tuned over the past eleven years. Real Flight Basic features many of the same aircraft and flying fields found on the current G4.5 and Expansion packs. A basic controller is based on an actual transmitter to give an "at the field" feel. The software comes on a single DVD and requires a Pentium 1 GHz processor and 512 MG of RAM. Of course, the more powerful your computer system is, the more smoothly it will run. The helicopters featured in the software program total twelve, including an Align T-REX 500 EP, MA Furion 450, MA Stratus 90, Synergy N9, and Thunder Tiger Raptor 90SE. The suggested retail price is \$99 and it's available now.

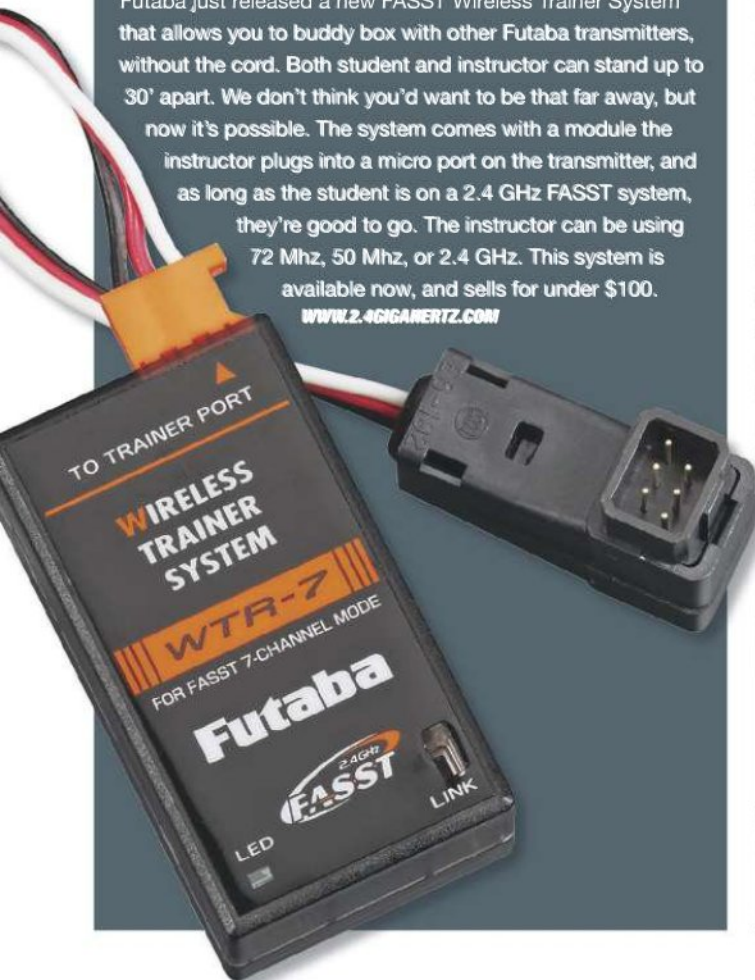
WWW.REALFLIGHT.COM



HEY, BUDDY

Futaba just released a new FASST Wireless Trainer System that allows you to buddy box with other Futaba transmitters, without the cord. Both student and instructor can stand up to 30' apart. We don't think you'd want to be that far away, but now it's possible. The system comes with a module the instructor plugs into a micro port on the transmitter, and as long as the student is on a 2.4 GHz FASST system, they're good to go. The instructor can be using 72 Mhz, 50 Mhz, or 2.4 GHz. This system is available now, and sells for under \$100.

WWW.2.4GHZERTZ.COM



ELECTRIC 700

Well, it's not factory but KDE Direct is now offering a T-REX 700 Electric Conversion kit. The kit includes an aluminum bottom bracket, receiver mount, motor mount, servo mounts, a new metal thrust bearing block, and all the necessary hardware, bearings, and the like, to get you up in the air. As with the other items we've seen from KDE Direct, these appear to be of very high quality and feature some nice machine work. But all of this does not come cheap. The conversion kit is available directly from KDE for just under \$300.

WWW.KDEDIRECT.COM



Basically it's pretty basic.

ALIGN GOES SPECIAL EDITION ON YOU!

Align has just announced new 600 and 700 nitro kits badged with the Special Edition insignia. The 700 features a new tail case, and all of the aluminum pieces are left as raw silver anodized, versus black. The packaging is completely revamped and is available as a combo pack featuring 690D carbon fiber blades, a 2-in-1 regulator combo with Li-Po, 3 DS610 cyclic servos, 1 DS650 tail servo, a GP750 Gyro, and an RCE-G600 governor. You just need an engine, a pipe and a radio. No official word on price yet, but we've seen it on-line for pre-order between \$1100 and \$1200—not a bad price considering everything it comes with. The New 600 SE features many of the same components listed on 700 SE, including all the electronic gear previously listed, and 600D carbon fiber blades. Along with the silver aluminum, the head design is slightly different with an elevator more like that found on the 700, as well as new main gear with one-way bearing design, new paddles, and new tail boom supports. Nothing official on this one yet either, but we've seen it available for pre-order around \$900. Both kits look like great values and should be perfect additions to anyone's heli hangar.

WWW.ALIGNRCUSA.COM



TREX 600 SE



TREX 700 SE



THUNDER TIGER'S UP TO SOMETHING

At IRCHA Thunder Tiger was showing off two new ARF nitro kits. Both pre-assembled, with the radio setup and "almost" ready to go. Both kits include all the electronics you need including heading-lock gyro, 2.4GHz radio system, engine and pipe. Not much left for you to do than to attach the boom, install the batteries and fuel them up. The Raptor 30 2.4G SC comes with a .39 size engine for that little extra power and the Raptor 50 2.4G SC is a little more performance equipped with a Red Line 53H engine and Red Line tuned exhaust. No street price yet, but according to Thunder Tiger they'll be exceptional values.

WWW.ACEHOBBY.COM



PILOT ANYWHERE

If you're like us, you're probably reading this copy of your favorite magazine in your "home library". (You know where I'm talking about.) Well, when you're waiting for your next copy of RC Heli to arrive, there's something else you can do in the library: you can pilot a helicopter! RC Heli Racing (no relation to us) is a new application for your iPhone or iPod Touch. It's pretty basic: you pilot a fixed pitch helicopter through a house,



while racing against the clock to gather coins. It's a simple premise, and the controls are mode 2; believe it or not, the physics aren't too far from a little fixed pitched heli. It will only set you back \$1.99, so at that price, we can't help but recommend it! From iTunes search "RC Heli" and you'll find it.

SCORPION STING

At IRCHA, Scorpion unveiled a brand new HV 130 AMP controller. It's a big boy capable of handling up to 50 Volts! It weights in at 216 grams and features a massive heatsink that should make heat a non-issue. The ESC comes with an infrared programmer and a beautiful wooden box. The new ESC is available for \$260.

WWW.INNOV8TIVEDESIGNS.COM



WHY BE FAST WHEN YOU COULD BE FASTEST?

Spektrum's new DX7se raises the bar for lightning fast heli control.

In the pursuit of even more precise control, heli pilots are looking for an extreme link between their radio systems and control surfaces, and the DX7se offers just that. No other radio system has a lower latency, resulting in a responsiveness that is nearly telepathic without compromising the RF link quality.

The DX7se takes Spektrum's already blazing speed and gives it a shot of adrenaline. Combining an 11ms frame rate with a latency range that's 50% less than our closest competitor¹, the DX7se delivers the absolute fastest air radio on the market with the most consistent response. And that low latency range is attributable directly to Spektrum's unique DSM[®] technology.

The DX7se also boasts ultra-high 2048 resolution, providing astounding precision to go along with its unprecedented speed. The increased resolution of the DX7se makes the difference between stepped control and gliding smoothness, eliminating any notched feelings or hesitation. Control inputs and responses are so smooth, you'll swear that you're flying on a hard-wired connection. And all of this with the incredible range and interference-free control of Spektrum[™] DSM2.

Take the controls and see for yourself.
The DX7se, only from Spektrum.

DX7se Special Edition Tx Only, Mode 1
SPM27311

DX7se Special Edition Tx Only, Mode 2
SPM2731




SPEKTRUM.

www.spektrumrc.com

¹Based on recent third party test information. Available upon request.

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CASTLE CREATIONS NEW ESC'S

We have all become familiar with Castle and their line of ESC's. Three things come to mind when I think of Castle: reliability, functionality, and quality. Castle has continued their historically successful line by adding a whole new style of electronic speed controllers. The new Phoenix Ice and Ice Lite speed controls offer extreme power and reliability with the use of bigger heat sinks and efficient MOSFETs. These speed controls have built-in BEC's and data logging. Both the Ice Lite and Ice BEC's can handle a 5-amp load and have a 6S battery pack. The Ice 50, 75, and 100 amp ESC's can handle up to an 8S pack. Check out the details at the Castle Creations website. The data logging feature has the ability to take sample rates of battery voltage, battery ripple, battery current, controller temperature, input throttle, motor power output, and motor rpm, 10 times per second. The data is stored inside the speed control and can be accessed from the Castle iLink.

ESC ranging in price from:
\$99.95-\$139.95
WWW.CASTLECREATIONS.COM



ALIGN PROJECTS COMING

■ Alan Szabo and Jason Krause have been spending a lot of time running tests over in Taiwan. They've both been seen testing a factory Align flybarless system, as well as the rumored 700-size gasser. As of the time we go to press, neither of these items has been announced officially, but we expect to hear about and see something very soon.

JK's a pretty busy dude. We know because he's on our facebook.

REAL FLIGHT, ARE YOU READY FOR SOME NEW MODELS?

Real Flight G4.5 is expanding once again. This time, we receive three new flying fields and five new helicopters. If you are a fan of the Novus and Axe series of helicopters, then this expansion pack is the right one for you. Expansion Pack 6 includes the Novus CP Nano and the Axe CX micro. Speaking of small, Real Flight has also included the Skyartec Wasp 200XE V4. If small helicopters are not your thing, an RJX Hobby Xtreme 90 is also on the list. This expansion pack includes two PhotoFields, which include the Jefferson Airstrip and Silverton Prairie. Real Flight also added a new water park for those who love the obstacle courses.

WWW.REALFLIGHT.COM



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Ultra Speed

High Voltage, High Speed Performance

7.4V Rated (2 cell LiPo)

0.06 second Speed
222 oz/in Torque
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Supported Output Shaft**
for smooth and precise movement



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High Performance Coreless Motor
optimized for 7.4v operation

High Efficiency Heat Sink
to keep things cool under load

62 High Resolution Programmable Digital Circuit
gives you all the control you need

Model # HS-7940TH • Part # 37940S • Size: 1.57"x0.79"x1.50" • Weight: 2.29 oz

Our all new HS-7940TH Ultra Speed Servo features our industry leading titanium gears, 62 digital circuit and an integrated heat sink to deliver unprecedented speed along with the durability you've come to expect from a Hitec servo. Check out the new HS-7940TH and all the of the other Hitec servos at www.hitecrd.com

The Hitec logo, featuring the word "HITEC" in a bold, sans-serif font with a red swoosh underline.



LETTERS

FULL FLEET

I am a long-time reader, since the beginning, but only a recent subscriber. I thought I would send you a couple of pics of my fleet, before I have to break it up and sell some of my birds to help finance my son's college education. My bride says I have too many, and to a point, she is right. Feel free to edit this e-mail to fit in the mag. My flagship is a T-REX 700, with JR 9303 2.4, 8717s on the swash, G8900 on the throttle with the stock Align Gov. GY 611 with S9256 on the tail. O.S. 91 pumped, with a Hatori Matt Botos pipe, CYE Radix 690s, and Super Stubz. I upgraded the main gear to a Delrin one by Micro Heli. I can't forget the Scott Gray Reactor X powered by a Thunder Power 3850 two-cell LiPo. The TT Titan 50s both

have Kasama tail hubs, O.S. SX 50 Hyper with Cyé MP5 Muscle pipes, and one has an Arizona regulator with a Fromeco Li-ion two-cell pack. One has an awesome canopy in the U.S. flag colors by Arizona Helis Metal head blocks, ultra-lite paddles, and Maverikk G5 Pro wide chord main blades. GY 401 gyros with S9254 servos. They have S9452 on cyclic and collective. One is on my 9303; the other is on my DX7. The Mini Titans have Kasama heads Radix blades, Align CF tail blades, with the JR mini digital servos on cyclic, and DS3400G on Gy 401 tail control. The blade is all stock. Love the mag, it has taught me a lot. Remember to fly safe, and I look forward to seeing my birds in print.

**Paul F. Nelson
Millbury, MA**

RESCUE ME

Hi Guys, I hope you like scale kits, I figured you do so I thought I'd send you some pictures of my e-Flite Blade 400 with a Darthdrk Huey body. Photos were taken at White Oak Hilltop Fliers flying field in Stockbridge, MI. **Have a nice day,
Jeff Green
Lansing, MI**



Ryan has a 20 year old helicopter that can still fly.



THIS OLD BIRD

I have just finished this "1978" Schluter Heli Boy. Of the kits I have built, this was by far the most fun and difficult. The heli community was instrumental in helping find some missing parts. I would like to say thanks for that!

P.S. Thanks to Augusto of (Avant) for letting me talk him out of this kit.

It features a Webra .60, Hitec and Futaba servos controlled by Spectrum radio gear, and a Futaba 401 gyro "for preservation."

**Happy Reader
David Long
San Diego, CA
Palomar RC flyers**



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WE'VE BEEN ALONG FOR THE RIDE

Greetings! Here is our "anniversary submission" to *RC Heli* as the "family tradition."

During last 12 issues, Brandon continued to advance his RC heli flying skills. He was invited to the ALIGN Taiwan Fun Fly last fall. Before Christmas, he was invited to the capital of Sichuan province to put up a demo flight. In the beginning of May, Brandon joined the ALIGN Shanghai Fun Fly and received China Group 2nd place. He was invited to Hong Kong in mid-May to do demo flights. At the end of May, he competed in the China National GaoAn 3D Cup and got 1st place. In August, Brandon represented China at the 2009 FAI F3C Championship held at the AMA fly field in Muncie, Indiana, USA. Thirty-ninth place was a good accomplishment for this 13-year-old boy's first time in an

F3C world championship. The China team got 11th place. The first three winning teams were the USA, Japan, and Austria.

Brandon is the youngest competing pilot and the only pilot competing in both 3D and F3C in China. In December 2008, he received the honor of National Masters Sportsman of China issued by the General Administration of Sports of China. Brandon is now an ALIGN-sponsored pilot. Among his sponsors are Hawk for rotor blades and Bannisi for fuel.

Brandon and our family have enjoyed another 12 issues of exciting RC Heli. The flying goes on, and the RC heli flying crowd in China is also growing rapidly. We enjoy sharing our RC Heli issues with friends and fans. Looking forward to talking to you in another 12 issues and keep up the good work!

**Take care,
Brian Xue**



Man he's come a long way since his first issue

YOU FLY WITH YOUR MOTHER WITH THAT HELICOPTER?

Love the magazine. Here are some pictures of my helis (and kids). The TREX 450 has a Futaba 401, DS285 servos, and stock motor and esc, and the canopy is my first try at painting. I decided to go with the theme after reading all the flak you guys had been taking over the nurse photo. I used canopy picture glue. Okay, on to the other helis. The Raptor 90 is outfitted with an OS 91SZ, has a Futaba 611 gyro and DSS8311 servos, and a Dualsky regulator with two 1500mAh 2S LiPos. The TREX 600 has an OS Hyper 50 and a 401 gyro Dualsky regulator with a single 1500 mAh 2s LiPo and a 3252 servo on cyclic. Thanks again, keep up the good work.

Tracy Downs

■ *Thanks for reading, Tracy, and nice to see a sense of humor. Nice-looking fleet and family.*
Mike



WANT TO SEE YOUR HELI IN THE MAGAZINE?

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

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

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FP



FREQUENTLY ASKED QUESTIONS

Q: In general how tight should the blades be in the grips and at the extreme can it cause tracking problems? - **SAAB-o-matic**

A: The blades should be able to rotate in the grips with mild effort. They should not be so loose that they can flop one way or the other. They should not be real tight either, so they can straighten with rotation. Blade grip tightness, barring extreme values, would not typically cause tracking problems. While tracking problems are usually associated with set-up, any problems in the head with dampers, bearings or missing spacers can also cause problems.
-Ots

Q: Schluterdude was in town working the last couple of days and we flew Monday and Tuesday right after work as we have done in the past when he can visit. He can't travel with his helicopters all the time and I've got about 5 helicopters ready to go at all times so I let him fly whatever he wants of mine when he's here.

We always have a great time and up until yesterday I'm the only one who ever crashed while we were flying together. My T-rex 500 did not have a mechanical malfunction and was in fact working perfectly when in his words "I dumb thumbed it into the ground".

He was quick to figure out the damages, make a list of broke parts, get the replacements costs on line and pay me for the damage. He did that without me saying a word about the crash or us ever discussing what his liability would be if he did crash.

I kind of assumed if I let someone borrow my helicopter I'm taking a chance that they may crash and may not have the money to repair it. IT WAS A VERY BAD CRASH!

Now he and I are both wondering about "Crash Etiquette" when you are borrowing someone's helicopter. What if it had been mechanical and he couldn't prevent the crash? Dead battery, Signal loss, cracked ball link, mechanical failure? And unless someone admits that there was nothing wrong, it's just that my thumbs are, in Schluterdude's words "Mentally Challenged", how do you know whose fault it was?

So let us know what you think about this. There are all kinds of special conditions like asking someone to test fly your helicopter or asking an experienced pilot to ring out your helicopter to review the set-up. I'm sorry if this has been covered before but we haven't seen it and we are interested in everyone's opinion. -Dan

A: Good question Dan and for me it would fall into the "it depends" category. If I ask someone to fly one of my helis and it was not a deliberate crash (on purpose into the ground or something else) I would not expect the person to pay for the damages. Regardless of what happened. Note that I would be doing the asking so it would be someone I knew knows how to fly a heli. If someone begged me to try one them and I knew they could fly I might ask them up front who pays if something happens.

If I crashed someone's heli I would definitely pay or try to even if they argued that it was not my fault because of elec/mech problems. That is the way my Mama raised me, take responsibility for your actions not blame someone/something else.

Depending on the group of people you fly with there is always a general rule of thumb. If someone asks you to fly their helicopter to test it out, the pilot should check over his setup mechanically and electronically to make sure everything looks good and then proceed to fly. If they crash because of mechanical failure then the owner should pay for the damages. If a "dumb thumb" crashes it then the pilot should pay. A pilot wanting to borrow or fly someone else's helicopter the borrower should pay for the damages regardless if it was a mechanical failure or "dumb thumb". -RKephart

Just Released! V10-12, Nitro Helicopters and eCCPM



This DVD features the T-Rex 600 and Futaba 10C radio. It is a three disk set (like V1-3 and V7-9) with a runtime of 4 hours and 55 minutes! Highlights include detailed setup information for the RevMax throttle limiter, and tanks four and five are flown by an extremely talented "young gun!"

See all the details at:

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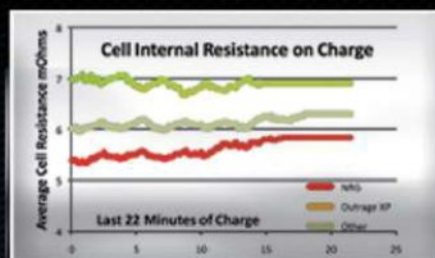


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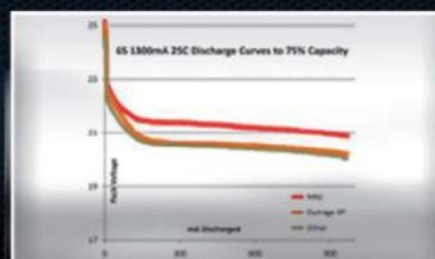
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QUICK TIPS

HOT AND COLD

When rebuilding a nitro engine, it is necessary to remove the cylinder liner from our engines. This task alone can be one that will have you scratching your head and the liner trying to remove it. This one tip will allow the liner and bearings to be easily removed during your rebuild: Remove the carburetor, back plate, and head. Place the engine on a cookie sheet, and place it in a preheated oven set for 350° F for 10 minutes. Wearing a pair of leather gloves, carefully remove the engine, lightly pull the liner out, and remove the piston. Next, slide the crankshaft out. With any luck the rear bearing will come out with the crankshaft. If it does not slide out, place a towel on a table, and lightly smack the **back of the engine until it falls out.** You may have to reheat the **engine in the oven for another 5-10 minutes** for this to work. Next, take a socket the same size as the outer race of the front bearing, and tap the backside until it pops out. To reinstall the bearings and piston sleeve, put the engine case in the oven, and place the bearings and sleeve in the freezer. This will contract the sleeve and bearings and expand the engine case.



Caution objects appear to be HOT!!!!

PREVENT DRY, CRACKED GROMMETS

■ Over time, rubber tends to dry out and crack. Although not much rubber is used on our helicopters, grommets are. These grommets help hold our canopies on our helicopters and keep any vibrations from cracking the fiberglass and paint. Take care of your grommets by rubbing a little silicone lubricant on them every so often. This will prevent the rubber from drying out and cracking. Some pilots use Vaseline, which will work short term to soften them up, but will end up deteriorating the rubber long term.



SAVING THE PUSHROD GUIDES

Crashing a helicopter usually means you are going to spend a pretty penny to get it back up in the air. Saving any and every part that is salvageable after a crash can save you some dough. Pushrod guides are usually CA-glued to the tail boom and can be quite difficult to get off. Place a few drops of acetone on each of the guides, and let them soak for about 5 minutes. This will break down the glue and allow you to remove the guides with ease.



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Five Minutes with

TOM ROLFSON



It's cold in Norway!

Age: 21
Home: Norway

HOW LONG HAVE YOU BEEN FLYING?

I've been flying about seven years, since I was 14.

HOW DID YOU GET INTO HELICOPTERS?

I've always liked helicopters. Before trying a helicopter for the first time, I was into RC sail planes. My first helicopter was a Hirobo Shuttle, and my father was my first sponsor.

HOW LONG INTO YOUR FLYING DID IT TAKE FOR YOU TO GET COMPETITIVE?

I started competing when I was 19. My first 3D was in 2008 in Norway at a competition called 3DX. Before that, I flew in Las Vegas in 2006 at the Fun Fly. I did the pad hop, and that sort of stuff.

WHAT DO YOU DO BACK HOME?

I actually want to come to the United States and learn to become



an actual helicopter pilot. It's much more expensive to learn in Norway. For a job, I work at a gas station and a hotel that's very close to our farm. I live on a farm.

WHO ARE YOUR SPONSORS?

Ace Hobby, Rapicon Fuel, Scorpion Motors, and I just got a V-Bar system from Mikado.

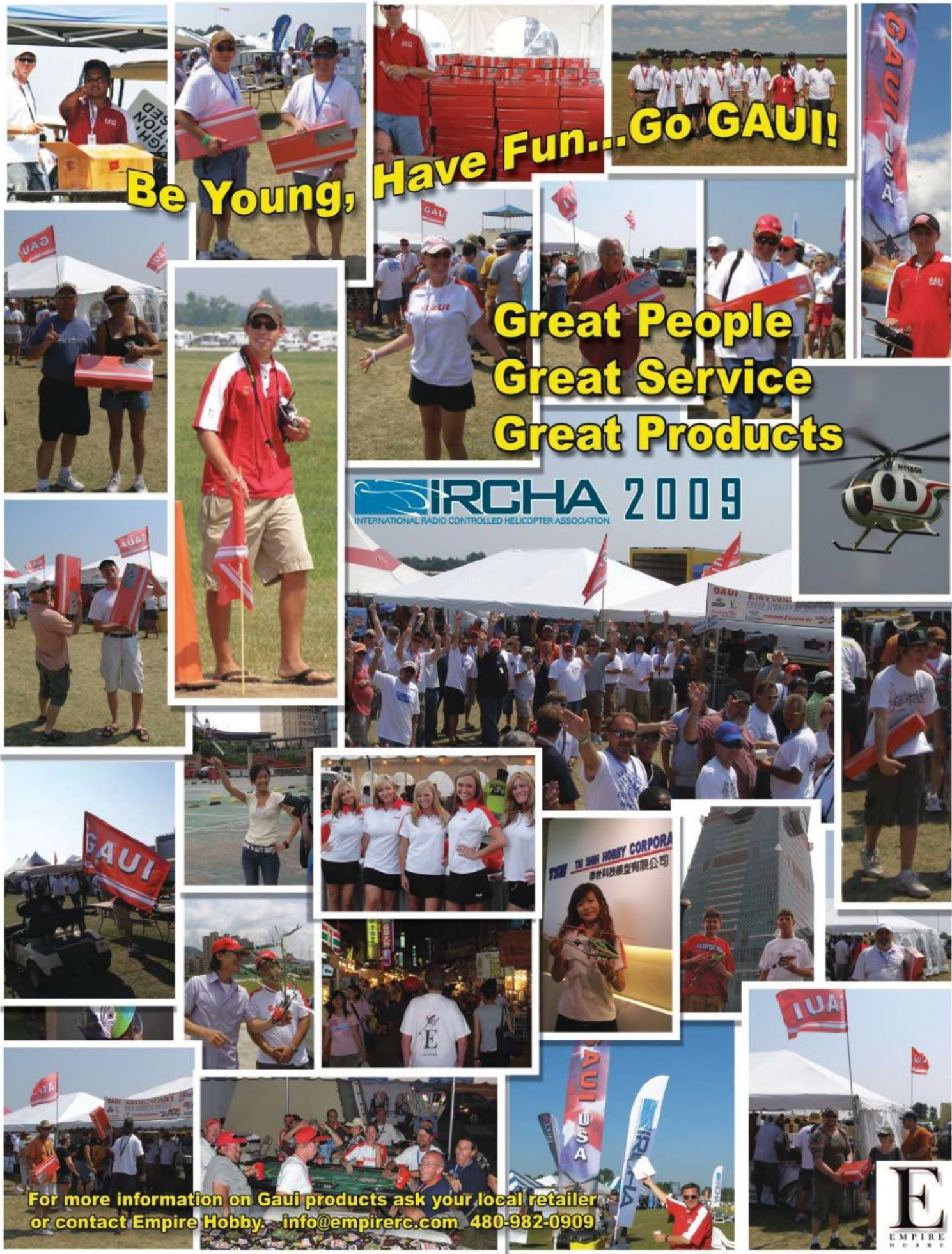
WHAT'S YOUR FAVORITE CLASS OF HELICOPTER TO FLY?

I like to compete with the 90. That's the most fun, but I also like my Mini Titan a lot. It's really fun to fly. Tonight, I'm going to build a Raptor 50 to fly tomorrow (Sunday).

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PILOT INTERVIEW

TOM ROLFSON



WHAT WAS YOUR FIRST CRASH, AND HOW DID IT HAPPEN?

Well, just like most pilots, it was my first kit, that Shuttle. I got the sun right in my eyes, and the helicopter just disappeared. It went down pretty bad, not worth fixing.

WHAT'S THE HELICOPTER SCENE LIKE IN NORWAY?

It's not that popular yet, but it's getting there. We have a local field with about 15 of us who fly 3D. I'm the youngest there, but they're not much older than me. We're a close group.

DOES YOUR FATHER FLY?

No, not really, but he's very supportive. He's paralyzed from the waist down, but he's always helped me learn repairs and things like that.

WHAT'S NEXT FOR YOU?

I'm going to continue with 3D. I enjoy it a lot. I would maybe like to do F3C someday.

WHAT DO YOU DO WHEN YOU'RE NOT FLYING HELICOPTERS OR WORKING? HOCKEY, THAT'S BIG IN NORWAY?

No hockey, it's too cold. I like cars and motorcycles.

BLANK CHECK, WHAT KIND OF CAR ARE YOU BUYING?

It's got to be the Koenig, the Swedish car. For bikes, it would have to be a Yamaha R1.

DO YOU HAVE A BIKE?

Yes.

HAVE YOU CRASHED THAT?

Thankfully no.

WHAT DO YOU LOOK FORWARD TO WHEN YOU COME TO THE STATES?

Definitely the weather. Hopefully, it's in the 80s and 90s when I'm here. I like this weather a lot. Where I live in the East, it's pretty cold. We're pretty close to Oslo. You can look up the temperatures; it's cold.

WHAT DO YOU NOT LOOK FORWARD TO WHEN COMING HERE?

The plane trip, it's a long one.

WHERE DO YOU LIKE TO TRAVEL TO THE MOST?

Definitely here, the States. I like this field the most (AMA).

Well, thanks for the time. TEL

TREX 450 PRO



Specifications:

- Length: 635mm
- Height: 230mm
- Main Rotor Diameter: 710mm
- Tail Rotor Diameter: 158mm
- Motor Drive Gear: 13T
- Main Drive Gear: 150T
- Autorotation Tail Drive Gear: 106T
- Tail Drive Gear: 25T
- Drive Gear Ratio: 1:11.5:4.24
- Weight (w/o power system): 450g
- Flying Weight: Approx. 780g

Radio transmitter and electronic equipment required for assembly:

- Transmitter (6-channel or more, helicopter system)
- Receiver (6-channel or more)
- Pitch Gauge
- 11.1V 3S Li-Po 2000-2200mAh battery

T-Rex 450 Pro Kit

\$427.99 • #KX015073 Includes:

- T-REX 450 PRO Kit
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T-Rex 450 Pro Super Combo Kit

\$595.99 • #KX01074 Includes:

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- 325 Carbon Blades Set
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- (3) DS410M (Metal Gear) Digital Servos
- GP750 Head Lock Gyro
- DS520 Digital Servo

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TESTED and RATED

This month we have a great little line up of products that will surely be a big hit on the market. These well known manufactures have created these products that we here at *RC Heli* know they work well and would complement any pilots toolbox.

Align **SUPER STARTER**

An Align starter?

WORDS: Brandon Uptike

ALIGN HAS HAD A VERY GOOD RUN THE LAST FEW YEARS SINCE THE RELEASE OF THE ORIGINAL T-REX, and nothing seems to be slowing the company down. It has been embarking on just about every venture ranging from a full line of helicopters to engines, electronics and more. Now ALIGN is at it again with its newest creation: the new ALIGN Super Starter. That's right, folks, ALIGN has designed and developed a brand-new starter with the intention to conquer the starter market, as well. Go to any flying field, and you'll be amazed by some of the contraptions that people come up with to power their starters. ALIGN is trying to win with simplicity on the Super Starter, but will it deliver the power to start everything in style?



FEATURES

This little starter is packed with many features, shocking, isn't it? There are two versions of the starter: an airplane version with a typical airplane cone, and a helicopter version with a starter wand setup. Naturally, we're testing the helicopter version. The first thing you'll notice when receiving your starter is the case that it comes in. ALIGN designed a small, plastic, yellow case with a handle to fulfill all your starter transportation needs. There is even a silver plate on the front with your starter's type and serial number engraved onto it. When opening the case, you'll quickly see your starter and the wand fitted perfectly in plastic cutouts. There is a thin layer of foam on the top of the case for extra cushioning when the case is closed. Overall the case seems pretty durable and houses the starter perfectly, so it's a nice touch that helps protect your starter from transportation damage.

Once you open your yellow case, you'll see how small the starter really is. The outer case is small and compact but (more importantly) looks clean with smooth edges and will fit perfectly in your palm. There is rubber placed at the bottom and top of the starter for extra grip to prevent slippage when starting. There is a handy battery-checker to the rear of the starter, which is a pretty nice feature. All you have to do is push the button, and the starter will illuminate a series of lights to inform you of your battery's condition. Right above the battery-checker is the button to run the starter, which will fit perfectly under your index finger when the starter is gripped. Open the hatch on the backside of the starter to find a compartment for a Li-Po battery (designed to fit a 3S 2100 11.1v mAh style pack). There is already a male Deans plug inside, making connection really easy. The starter uses a gear-reduction system instead of a direct-drive format. This allows for the starter to consume less power but still put out large amounts of torque through a system of gears. The starter adapter utilizes a clever two-piece one-way design where there is a one-way bearing in the actual wand itself. It slides over the one-way in the starter coupler where it is screwed together.

The ALIGN starter also boasts some

useful features such as emergency cutoff if the starter is ever overstressed. So if your motor is too flooded, the starter will just merely cut off rather than damaging itself. There is also an overheating cutoff if the starter motor ever reaches temperatures above 80° Celsius. The starter weighs in at a mere 751g with the battery installed. The actual dimensions of the starter are 80 x 60 x 390 mm, so it is pretty small. ALIGN claims that it can start a 50 cc gasser engine and both .50 and .90 size helicopters.

TESTING

After taking it out of the case and playing with it a bit, it was time to test this little guy for performance. The first thing I noticed is that the battery compartment is pretty small, so not all 3S packs will fit. ALIGN's official dimensions for the opening is 112 x 35 x 24 mm. After looking around a bit, I found an old 16c ALIGN pack that fit in the opening without issue. I plugged in the Deans plug, hid the wires and slid the hatch back on it. I had charged the pack before inserting it into the starter, so I decided to test the battery checker and see what kind of reading it would give me. After pressing the button, all the lights lit up to a green level, reflecting that my battery was charged. I then grabbed the wand and slid it over the one way and screwed it down; since the threads go against the torque, you don't have to tighten it too hard. Then it was time for the moment of truth. The first helicopter I tested it on was our new Outrage Velocity 50 with a YS 56 in it. I fitted it in the starter coupler and hit the button, and the motor turned over with ease. It felt smooth in my hand and never felt as if it struggled at all. Now that the starter had passed the .50 size test, it was time to test it on the T-Rex 700 fitted with an OS 91 HZ. I placed it in the starter coupler and once again hit the button, and it turned the motor without any issue. However, on the large .90, there was a noticeable hammering effect in my hand. It is manageable, you just have to make sure you have a good grip on the starter. I tested it on several different helicopters, but the starter never failed me. It doesn't have a large amount of speed, but the torque is more than enough to turn

over any motor. I also tested it on our in house gasser, the Maxum powered with a Zenoah 30.5 cc engine. Once again, the starter succeeded in turning the motor. After numerous trips to the flying field, it has yet to fail me, and the use of a Li-Po makes it even easier to charge and power. I haven't gotten a chance to test the airplane portion of it quite yet, but I'm fully confident that it will perform just as well in the dark side.

CONCLUSION

As I mentioned, this motor has yet to fail me. With a price tag at \$120, the ALIGN Super Starter is quite the bargain compared to other starters in this class. Perhaps the most appealing aspect is the compactness and the clean look of this starter. This, in addition to the ability to use just a 3S Li-Po pack, means that I don't see anything but good things for ALIGN's starter endeavor. What has ALIGN released that hasn't become a hit? Exactly. I'm sure the Super Starter is next in ALIGN's long list of successes. **TRH**



THE GOOD

- Great torque; starts everything
- Use of a 3S Li-Po
- Very compact, clean design

THE BAD

- Hammers on larger engines
- Battery compartment is tight

CONNECT

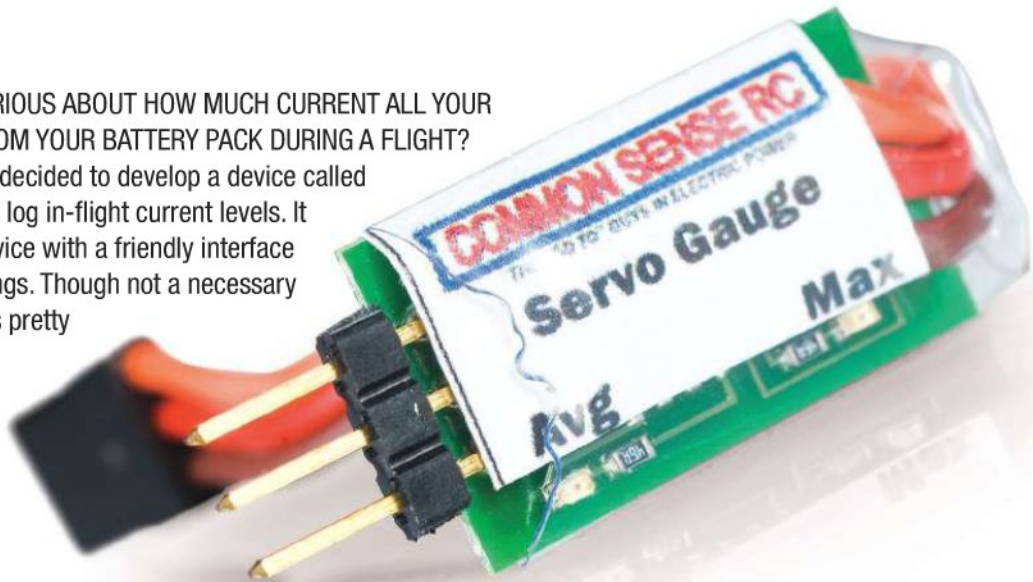
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Common Sense RC SERVO GAUGE

It's Common Sense

WORDS: Brandon Uptike

HAVE YOU EVER BEEN CURIOUS ABOUT HOW MUCH CURRENT ALL YOUR ELECTRONICS DRAW FROM YOUR BATTERY PACK DURING A FLIGHT? Well Common Sense RC decided to develop a device called the servo gauge to monitor and log in-flight current levels. It is a pretty small and simple device with a friendly interface for easily distinguishable readings. Though not a necessary component for many pilots, it is pretty interesting to see exactly how much current your electronics set-up actually draws. Some pilots may find this information invaluable. We put the servo gauge to the test to see how well it performed.



It's little but it works in big ways.



THE GOOD

- Small and lightweight
- Simple to use
- Gives good readings

THE BAD

- Frustrating to count lights

CONNECT

MANUFACTURER:	Common Sense RC
WEBSITE:	www.commonsenserc.com
PART NUMBER:	servogauge1
STREET PRICE:	\$22.95

HOW TO USE IT

The servo gauge comes with a small card that outlines how to use the product. For the most part it is a simple system that is pretty easy to figure out. You start off by plugging the servo gauge into the battery/ESC on one end and plugging the other lead into the receiver. You then turn on your helicopter and proceed to fly as usual. After your flight has been completed, there are two LED lights that blink to indicate the type of current draw your system has pulled. There are three different readings the servo gauge displays: your max current, your average current, and your max current in a 15-second interval. The max current will blink first with the red LED, and you simply count the amount of times it blinks and compare it with the reference chart provided on the instruction card. The max is measured in 100 milliamp increments and goes up to 5 amps. The average will then flash with a green LED light in 50 milliamp increments up to 5 amps. Then both LEDs will flash at the same time to represent your max current draw over a 15-second period. These lights flash in 50-milliamp increments. The reference card supplied only goes up to 15 blinks but can be easily mathematically computed beyond that point.

HOW IT WORKED

Overall the servo gauge seemed to work relatively well. We did several tests with it including bench tests and flight tests, and it never failed to give a reading. Since all of our flights had current draws greater than 15 blinks, it could become quite tedious to count all the blinks. It is also a little confusing when to begin counting initially because the gauge will blink on a continuous loop following your flight (you have to wait for a certain segment to finish blinking before you can start from zero on the next segment). To verify the data, we hooked up our high-end Fluke multimeter inline to the circuit that I was bench testing and found the readings on the gauge to be .15 amps to our Fluke meter.

CONCLUSION

In the end, the servo gauge it is a very simple device that has a simple interface for results. Even though the counting can be tedious work, it does provide a straightforward way of presenting results on such a little device. As I mentioned, it isn't really necessary to have if everything is fine, but if you're troubleshooting a problem or want to verify some data before a possible disaster, it's a really useful tool to have. **RHJ**



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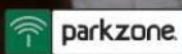
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Century TOOLKIT T&R

If the tool fits

WORDS: Heli Staff

THIS MONTH'S TOOLS OF THE TRADE IS BASED ON THE SEVEN MOST IMPORTANT TOOLS, so what's more perfect than to compliment it with a complete tool kit. Century has developed an all-in-one kit that covers every inch of a helicopter build and then some. Let's take a look at the new Century Heli Tool Box and find out what it includes.



FEATURES

Century offers two different kits, which include a 15-piece set and a 20-piece. Both sets are packaged in an aluminum hard case, making transportation a simple matter. Inside the case, there are three levels of foam, each with specific cutouts for their designated tools. The 20-piece kit comes with just about anything you could ever possibly need in a toolkit. After opening the case, you'll see that there is a piece of foam glued to the lid of the case that contains all the different drivers in the set. You have your classic hex driver set that comes in the typical 1.5, 2.0, 2.5, 3.0, and even 4.0mm sizes. Each hex driver has a different colored anodized handle so it can be easily distinguished. There is also a pair of Wiha 5.0 and 7.0 nut drivers, and a pair of Wiha Phillips head screwdrivers that come in small and medium sizes. Also sharing the top level is a CNC anodized ball link sizing tool, a CNC ball link driver (for assembling ball links), and a unique crank lock tool for your engine. Of course, no tool set would be complete without a bottle of blue thread lock so naturally it is included in this kit.

On the lower level of the case, all the necessary larger tools are fitted in a piece of foam. Perhaps the one that stands out the most is the unique Century pendulum pitch gauge that is pretty easy to use since it displays the reading for you. Gone are the days of squinting one eye while trying to line up your flybar to the pitch gauge. There is also a pair of large curved tipped ball link pliers and a pair of needle-nose

pliers to take care of all your pliers needs. Century also included its easy-to-use ball link-assembling tool for accurate measurements during setup. There is even a glow driver, which helps pilots not to forget it at home or at the field. At first glance, it appeared that these were all the tools included in the kit; however, we learned that there is another level at the bottom. After lifting up the foam containing the pliers and pitch gauge, we found another layer of foam glued to the base of the case. This layer contains the paddle alignment gauges and the charger for the glow driver. There are also more foam cutout opportunities if you ever have the desire to carry anything extra in the case to the field.

CONCLUSION

The new Century toolkit is a pretty impressive set of tools that comes in a very well-organized package. It is relatively pricey, but considering that it comes with pretty much all the essentials, it proves to be quite a bargain. This is especially perfect for any first-time builders looking to buy themselves a nice set of tools to begin building their first helicopter. It can also be an option for anybody who is looking to upgrade their tired tool set. The 15-piece set is a little cheaper but doesn't come with the Wiha set and the glow driver. Overall, this is a very impressive set of tools, and Century did a great job packaging them all together. **T&R**



+ THE GOOD

- Well organized
- Great quality
- Comes with everything

- THE BAD

- Drivers fall out of foam cutouts

CONNECT

MANUFACTURER:	Century Helicopter
WEBSITE:	www.centuryheli.com
PART NUMBER:	CN204NA
STREET PRICE:	\$139.95 (20-Piece) \$109.95 (15-Piece)

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CA GLUE

A bit of a sticky topic

WORDS: Shawn Kitchen

Some of you may be old enough to remember the ads for Super Glue (or was it Crazy Glue?) that showed the construction worker hanging from his hard hat after it had been glued to an I-beam. If any of you grew up around RC airplanes (like I did), you no doubt instantly glued your finger to an airplane at least once. If you ever watched the original Beverly Hills Cop movie, you may remember Eddie Murphy using glue fumes to lift fingerprints from a matchbook. All of these were done with modern CA glue.

WHAT IS IT?

“CA” is an abbreviation for cyanoacrylate glue. There are actually two different chemical types of CA glue: methyl-2-cyanoacrylate and 2-octyl cyanoacrylate. The first type is what we commonly use in model building and industrial type applications, and the second type is used in medical applications as a sort of “synthetic skin” for deep lacerations.

Cyanoacrylate glue found some of its earliest practical applications as a military field dressing during the Vietnam war era. It was used as an emergency measure to stop rapid blood loss so that injured soldiers could be transported safely to a medical facility. It's not for nothing that CA glue bonds your skin so quickly!

One of the chief advantages of CA glue over other types is its rapid curing speed. Cyanoacrylate glue can set in 15-20 seconds (depending on type) and reaches a full cure in a matter of hours or less. As such, CA is often used in settings where rapid building and fast results are desired. CA glue works especially well on non-porous surfaces where other glues may have an adhesion problem.



CA has not changed much in the last two years.

PRACTICAL APPLICATIONS

In hobby circles, CA glue is most commonly used in model airplanes as a rapid adhesive for balsa wood and light plywood, since it has the ability to penetrate into the wood grain and thus provide a strong bond.

In the model helicopter world, the uses for CA glue are a little more limited, but there are still places where it comes in handy. CA makes a good locking compound for bearings when pressed into plastic housings (an area where traditional thread locking compound—designed for metal to metal contact—can come up short). Use caution when using CA on bearings, though, since any overage can wick its way into the bearing itself and prevent the bearing from spinning freely.

CA also comes in handy for repairs on certain plastic components. For example, those who fly the Hirobo Evo 50 may have noticed that after a hard landing, the front section of the frames may break off where the front landing gear bolts on. Since this isn't a load-

bearing surface at all (it just provides a mounting point for the landing gear), there's no sense in buying new frames when you can simply use a bead of CA to glue the broken frame tab back to the rest of the frame. Now you're back in business, and didn't have to shell out any money. The thing you DON'T want to use CA for is any plastic piece that's subject to high loads. For example, you don't want to use CA on any broken plastic rotor head pieces, plastic blade grips, or anything that moves at a high speed. The safety risk is simply too great, so you're always better off replacing with new parts in a high-stress application.

CA can also come in handy for helicopters using carbon fiber frame pieces. Occasionally, you'll find a carbon sheet with a slight delamination near the edge of the sheet. In a situation like this, a thin bead of CA applied to the edge of the sheet can keep the delamination from spreading. However, this should never be used as a

substitute for a broken sheet of carbon fiber, so use caution when deciding which pieces you'll repair, and which pieces you'll replace.

Different viscosities of CA are available, from very thin and fast curing to thicker, slower curing varieties. The thin kinds are good at wicking their way into tight areas, but the trade-off is that you have minimal time to get the pieces properly set. Thicker varieties are better at filling gaps and give more time for properly setting pieces, but don't cure as quickly as the thin types. Choose your priorities and pick your glue.

Cyanoacrylate glue is fast acting in its own right, but for those times when you simply have to get it set up right now, there are CA "kickers" on the market that accelerate the hardening process even more. And for those inevitable times that you glued your own fingers together, dissolving the glue is a simple matter of using some acetone. In other words, break out the nail polish remover and have at it.



JUST SAY "NO" TO SNIFFING

Aside from the problems of becoming too "attached" to your helicopter (and I don't mean emotionally), there is one other consideration when working with CA glue, and it's the issue of fumes. The fumes from cyanoacrylate glue can be irritating to the eyes, mucous membranes, and sometimes the respiratory system. It's best to make sure that you're working in a well-ventilated area when using CA glue. If the room you're in doesn't have good airflow, then just take a few minutes every now and then to walk somewhere else and clear your head.

CA glue is one of those items that you don't use every day, but it always pays to keep a bottle around. If nothing else, you can use it to mend yourself when you cut your finger trimming that bleach bottle canopy. Just don't e-mail us when you glue your finger to the bottle. **TRE**



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SEVEN MOST IMPORTANT TOOLS

Lucky Number Seven!

WORDS: Brandon Updike

1 PITCH GAUGE • Even though some talented people out there are able to eyeball their pitch, there is a gauge for the rest of us (thankfully). A pitch gauge is very important in making sure that you have your head set up properly and don't have an uneven pitch range for a balanced helicopter. Pitch gauges come in various shapes and sizes, so find one that suits you best, and keep it in your box just in case.

2 HEX DRIVERS • This is perhaps the most important set of tools in your toolbox. Hex drivers are used for just about everything. In most modern-day helicopters, all bolts have a hex head on them that makes them easier to tighten and remove. The most common sizes are 1.5mm, 2.0mm, 2.5mm, and 3.0mm. It is very common to see 2.5mm heads on almost all applications on larger helicopters. 3.0mm heads are used for items such as spindle bolts and blade bolts. 2.0mm heads are seen on specific applications that vary from helicopter to helicopter. 1.5mm heads are usually the universal hex driver on micro-helicopters.

4 CUTTERS/DIKES • When doing things such as dressing your wires with zip ties, you'll need a set of dikes or cutters in order to cut the remaining strand. There are many situations where cutting may be needed. Whether it be cutting tape for your gyro or fuel tubing, you'll need to use some sooner or later. Dikes are ideal for cutting thanks to their size and smaller heads that make it easier when cutting around wires.

3 GLOW PLUG WRENCH • Anyone who flies nitro helicopters knows that changing glow plugs is fairly common but can be hard if you don't have the proper tools. A glow plug needs an 8-mm socket in order to be removed. The unique feature of a glow plug wrench is its length, which allows you to unscrew the glow plug from a distance without obstruction. Most plug wrenches can be found at your local hardware store and uses a T-shaped handle.

Organization is next.



SINCE THIS HOBBY REQUIRES SO MUCH BUILDING, NATURALLY THERE IS A WIDE VARIETY OF TOOLS THAT MUST BE OWNED in order to be able to build and maintain a helicopter. Even though there is a vast number of tools that can be used, there are only a core few that are required to get the job completely done. Those core sets of tools are widely seen at every flying field and shouldn't be left out of anyone's toolbox. In this Tools of the Trade, we will break down seven very important tools that will help you build and maintain your helicopter at all times.

5 BALL-LINK PLIERS •

These pliers are a very important tool that makes unpoping and popping ball links together much easier! Even though many of the links in the head can be popped off with your hand, it often becomes a tough task and can get quite annoying. Since tracking adjustment is very common, ball-link pliers become quite handy. Not only can they be used to pop links, but also most of the time they have grooves and cutters integrated into them. The grooves work well for gripping ball-link rods when building links to prevent them from spinning.

7 CLASSIC SCREWDRIVERS • Even though screwdrivers are not as commonly used as hex drivers, you will usually run into something during a build that will either require a Phillips or flat-head screwdriver. Sometimes there's a pesky helicopter that will require a Phillips for the entire build. Phillips are a little tricky to use because using them makes it easier to strip out the screw heads, but they do become necessary on our helicopters, so it is important to have a few in various sizes in your toolbox.

6 NUT DRIVER • RC helicopters use a wide variety of nut and bolt applications, so a nut driver comes in handy for tightening down these applications. Even though pliers can be used in some of these cases, nut drivers prove to be much easier to use in hard-to-reach areas and are just more efficient. The universal size for nuts on a larger helicopter is 5.5 mm, so the 5.5 mm driver is the most commonly used. You'll most likely use an 8 mm driver for the blade bolt nuts on a .90 size, so it will come in handy to have one of those in your toolbox, as well. You might find smaller sizes on micro-helicopters, so look up the sizes in your manual, and get a driver that corresponds with the proper size.



Check out this month's Tested and Rated!

HONORABLE MENTIONS

THINGS THAT ARE NICE BUT NOT NECESSARY

ALLEN WRENCHES



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CONCLUSION

With those seven important tools mentioned above, you should never hit a speed bump if ever a problem arises at the field. You will also quickly learn that those will be the only tools you'll use during all your builds. Even though there are a lot of specialty tools out there, they're more of a convenience rather than a necessity. If the tools mentioned in this article are in your toolbox, then you're already set to go; if not, go out and pick up some new tools. One more thing: don't forget to throw in a bottle of blue thread lock in your field box. (THT)



A sledge hammer could come in handy on those rough days!

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DYE YOUR PARTS

For That Custom Look!

WORDS: Jim Innes | PHOTOS: Jason Boulanger

HAVE YOU EVER BEEN FLYING AND LOST ORIENTATION? Do you have a heli that is all one color and hard to see in the air? Sometimes the parts for a heli are only available in one color (often black or white). This can be an issue if you need your heli to be more visible in flight or just want the model to be unique in appearance. While you could paint or use vinyl to cover much of the heli, some parts just don't take to paint or decals very well. Luckily, there is another option that has been in use by hobbyists for many years: RIT clothes dye.

WHAT IS RIT DYE?

RIT is simply a dye that has been historically used to dye fabrics but has also been found to work well with a number of other materials. It is available in a slew of colors and can be found at your local craft store or even in the supermarket (in the laundry aisle). The best part about RIT dye is that it is inexpensive and permanent. (Depending on where you live, this particular brand of dye may not be available to you, but any similar product will work. If you follow these directions using a different type of dye, you may want to test it out on an old part first.)



Rit Dye comes in every color of the rainbow.

» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED



» TIME TO COMPLETE



» TOOLS NEEDED

-  **RUBBER GLOVES**
-  **HEAT SOURCE (STOVE)**
-  **POT OR PAN** (one that you are not overly attached to)
-  **RIT DYE**

WHAT PARTS CAN BE DYED?

Generally speaking, you can dye almost any type of plastic (and even some fiberglass) on our models. There are some things to consider, though:

- Most plastic canopies are made of a polycarbonate bleach-bottle plastic that just does not take well to dye. In fact, any part that is really flexible tends to not color well
- You can only dye a part darker than its current color (e.g., you cannot dye a black part yellow).
- Be careful if you are thinking of dyeing a critical part such as a main gear, tail fork, etc. The dyeing process can soften plastic. On some parts, such as landing skids, this softening can be a positive thing, while on others it can weaken them for their intended use.
- If you have some broken parts, do tests using them first. The dyeing process is as much an art as it is a science, so any practice you can get will help you yield better results.
- When using an RIT dye, the parts will almost always come out darker than the box color indicates. When you purchase the dye (which can be powder or liquid), get the color that is a shade lighter than what you really want.



Generally, the more flexible a piece of plastic is, the harder it will be to dye.



Crash remains are perfect guinea pigs for trying new color combinations.



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PARTS AND AREA PREP

1 Ideally, you want to dye parts that are still new and have no stains or fuel on them. If you are dyeing parts that have been well used, clean them really well, and remove any marks or oil from them. The same goes with new parts, as they are often coated in a little mold-release agent from the factory. Remove any fasteners, metal, etc., from the parts.



The dye will not take well in areas where oil or other residue is left on a part, so clean things well beforehand.

2 Prep the area where you will be working by making sure you have paper towels, some bleach or other heavy cleaner (for any spills) and some newspaper laid out. I highly recommend a set of rubber/latex gloves unless you want your hands dyed too.

3 Remember, the dye is fairly permanent, so do the process outside if at all possible. Use an outdoor cook stove or side burner if you have one. If you are forced to dye the parts inside, be extra careful. And be sure you use a cheap pot that you will not need to cook food in again.



If you don't have an old pot an empty coffee can will work, just be careful it's going to be very, very hot.

GET THE COLOR TO THE PARTS!

Fill the pot with just enough hot water to cover the parts that will be in there. Put the pot on the stove, and add some heat. When the water is simmering (just before it boils), turn the heat down just enough to hold the simmer. **(1)** Add the RIT dye (I put the whole package in), and stir until it is completely dissolved. It also helps to toss in a teaspoon or so of salt to the mix.

(2) Place the heli part into the solution, and stir occasionally. Make sure the part gets rotated in the pot often so that there is even coverage. **(3)** Every few minutes, pull the part out a little and check the color. Some parts will dye completely in mere minutes, while others may take an hour or more. This is the art portion of the process; you will need to keep checking the part until you are satisfied with the color. **(4)** Once the part is to the desired shade, remove it from the mix, and rinse it off under warm water for a few minutes. Then, let the parts dry on some paper towels. Lastly, take a soft rag, and wipe them down to remove any stray dye. A second rinse with cool water never hurts, either.

Once you are done with the dye, you can save it for later. Just pour the solution into a jar, seal it, and store it away for next time. You can clean your pot, utensils, and any spills with some bleach or other strong cleaner. Do not use the pot again for cooking any food, even if it appears clean enough.



CONCLUSION

Whether it is visibility or a unique look you are after, dyeing helicopter parts is a cheap and simple way to customize your model. The process is straightforward and fast, and the results are permanent. You can almost create any shade you can imagine by experimenting with different mixtures of colors, dye amounts, and soak times. If you have ever considered dyeing some parts, go for it. See ya (and your newly dyed model) at the field! *TTHL*

An old coffee pot works great too.

A HEAD OF OUR TIME



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ADVANCED RADIO PROGRAMMING

Radio Features and Their Interactions

WORDS: Chuck Bassani | PHOTOS: Carl Hyndman

As one progresses in this hobby, programming your radio often becomes second nature. Once you learn how to put a feature (or collection of features) to use, you develop a knack for making the adjustments necessary to produce desired flight behaviors. Getting to that point, however, is not always easy.

When examining each feature singularly, it's relatively easy to appreciate what it has to offer. But when combined, features sometimes interact in ways that make it difficult for you to wrap your head around exactly what's going on.

This month, I'll go over some basic programming features like sub-trim, travel adjust, etc. That's right; I need go no further than the basics to demonstrate feature interactions. I'll start with an explanation of what each feature is designed to do and how it's implemented. Then I'll illustrate how it impacts control resolution and servo positioning. Lastly, I'll give details about when and how certain features may interact with one another.

Sometimes trying to figure out why your programming is behaving a certain way can be confusing.

» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

4.0



» TIME TO COMPLETE



30

 Minutes

Has the confusion sunk in?



IT'S ALL ABOUT THE PULSE WIDTH

A servo has only one job to do, and that is to, on cue, move its output to a precise position and make sure it stays there. The signal that controls servo position is a stream of pulses where the target position is specified by a pulse's width. In the case of PCM and spread-spectrum implementations, the receiver generates these pulses on a per-channel basis after receiving from the transmitter digital values that represent the desired pulse widths.

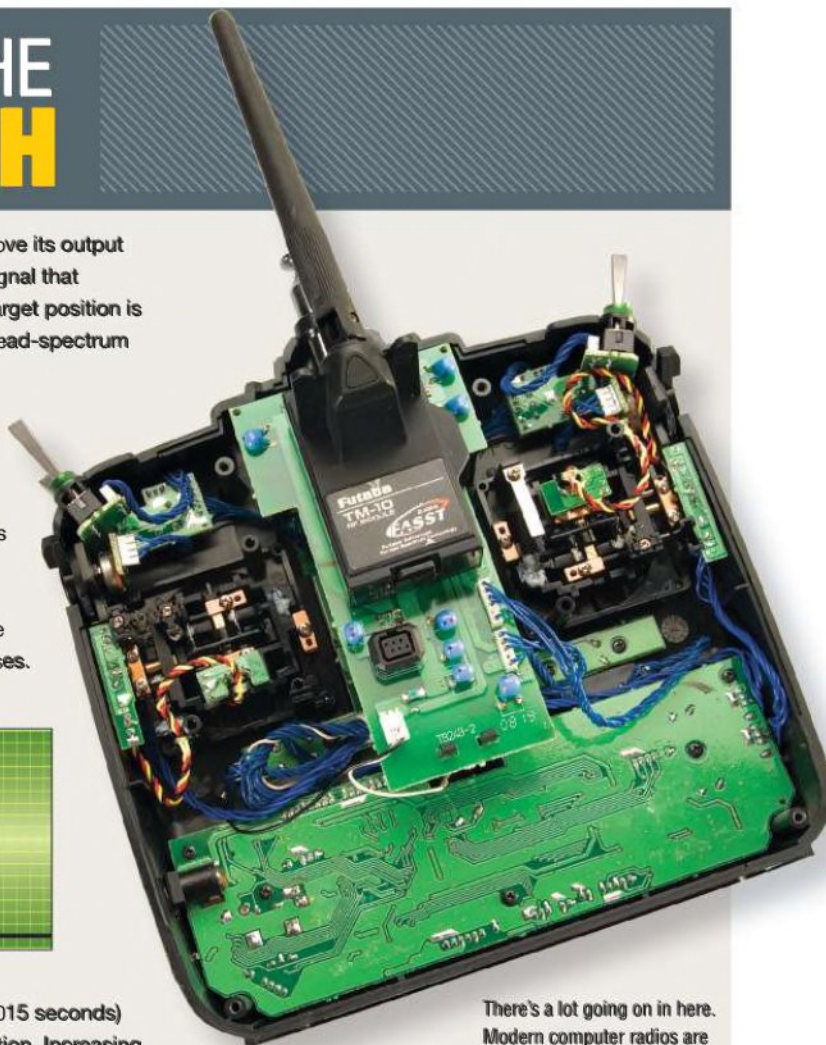
Modern computer radios choreograph servo movement by sampling the transmitter's control positions (sticks, switches, knobs, etc.), and processing those samples, applying algorithms to implement the suite of programming features. But when all is said and done, the end result is nothing more than a constant stream of pulses.

1500 μSEC PULSE TRAIN



This is what the servo sees.

Looking at the pulse itself, a width of 1500 μS (that's 0.0015 seconds) will place the servo's output at its center (or neutral) position. Increasing or decreasing the width results in positions that are either clockwise or counterclockwise from neutral (see sidebar).



There's a lot going on in here. Modern computer radios are a marvel in engineering.

Is it the blue wire or the red?

SYSTEM-DESIGN CONSTRAINTS

How precisely a digital radio system can specify a servo's position is a function of its resolution. Resolution limits the number of discrete pulse width values that the system can produce and is expressed in its number of steps (e.g., 1024-step or 2048-step resolution). Given a pulse width range of 900 μS - 2100 μS, for example, a system with 1024-step resolution can generate pulses in increments of approximately 1.2 μS. However, a 2048-step system can generate pulses in 0.6 μS increments, thus yielding a finer positioning capability than a 1024-step system.

A system's total pulse-width range and resolution are important numbers to keep in mind. They dictate the absolute minimum and maximum pulse widths that can be generated, as well as the absolute maximum resolution any single control can have. As you'll soon see, the upshot of using even the most basic programming features will almost always be a somewhat-reduced control resolution and, at times, a few unexpected results.

ANATOMY OF THE FEATURES

Let's walk through four basic programming features. They are:

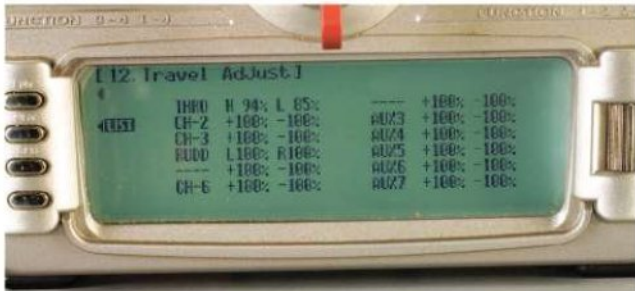
- Travel Adjust (or End Points)
- Sub-Trim
- Dual-Rate
- Exponential



For each one, we'll drive the servo with a single control (stick) and observe the resulting output on its corresponding receiver channel. All compensation and programmable mixes will be disabled, so that pure feature responses can be observed. I'll use a JR X9303 radio system and a JR R921 receiver for the demonstrations, a system with 2048-step resolution. The pulse widths will be measured using the Measure Pulse function of a Bantam e-Station Heli Master.

TRAVEL ADJUST

As the name implies, Travel Adjust is used to control the range of travel on each side of a servo's center position. It's specified as a percentage value. In our JR system, travel can be adjusted from 0% to 150% in each direction. Now, here's the important part: The system's 2048-steps are evenly distributed across the full +/- 150% range. What does that mean? With Travel Adjust at 150%, I measured pulse widths at the control's limits of 911 μ S and 2071 μ S. Those numbers are the absolute minimum and maximum values – and the X9303's limits. Knowing now that the maximum range is 1160 μ S, we can divide it by 2048 steps, thus revealing that the system can generate servo positions in approximately 0.57 μ S increments.



Doing the measurements with default Travel Adjust values of 100%, the pulse widths measured at the stick limits were 1107 μ S and 1893 μ S. Dividing this 786 μ S range by the 0.57 μ S step, we conclude that we now have a reduced usable resolution of approximately 1379 steps – almost a 33% reduction.

SUB-TRIM

We generally use Sub-Trim to tweak a servo's center position. How the Sub-Trim function accomplishes this is simple: The system applies a delta to its calculated output. Building on our Travel Adjust example, we recall that 100% Travel Adjust yields a pulse width range of 786 μ Sec (1107 μ Sec to 1893 μ Sec). In the JR X9303 system, each unit of Sub-Trim applies approximately 1.2 μ Sec of delta. So with +50 units of Sub-Trim dialed in, the neutral position moved from 1500 μ S to 1560 μ Sec, and the stick limits produced outputs of 1163 μ Sec and 1950 μ Sec. Notice the travel range remained pretty much the same but the end points were shifted – which is our first feature interaction.

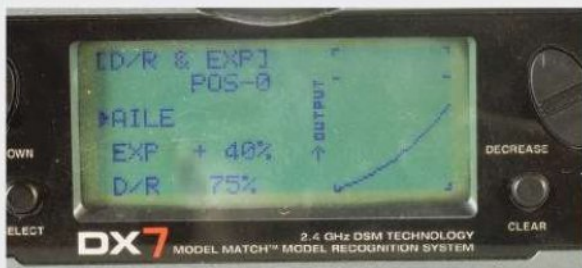


One important aspect of Sub-Trim to be aware of is the absolute travel limits. I'll illustrate this with an extreme example. Dialing in 150% Travel Adjust and +50 Sub-Trim, I measured the expected 1560 μ S at neutral but measured 965 μ S and 2071 μ S at the stick limits. The 965 μ S end seemed reasonable, but what happened to the other end? It was clipped because the system cannot generate an output higher than its absolute maximum value. What we end up with is asymmetrical throws.

Screen shots are a bit tricky to shoot.

EXPONENTIAL

Exponential is designed to decrease or increase authority (sensitivity) around a control's neutral position. It does not alter the overall travel range and therefore does not exhibit any interaction. It does, however, alter the linearity of stick position to servo movement, therefore producing variable resolution (for lack of a better term).



When exponential is used to desensitize control authority, the closer the stick is to center, the lower the control's resolution will be – and this means a greater stick movement is required to produce a given change in pulse width. Resolution increases exponentially (no, pun intended) the further away you are from center.

PULSE WIDTH vs. SERVO POSITION

To help you visualize how pulse width correlates to a servo's output position, the following table depicts approximations of servo deflections for specific pulse widths.

As you can tell from this table, a servo will move about 1 degree for each 10 μ S change in pulse width. A 2048-step resolution system is therefore capable of positioning a servo in 0.057-degree increments. Whether a servo is capable of tracking changes that

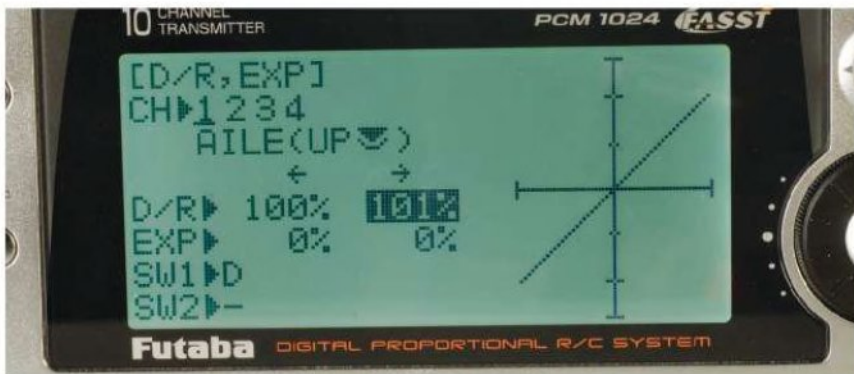
PULSE WIDTH	SERVO POSITION
900 μ S	-60 degrees
1050 μ S	-45 degrees
1200 μ S	-30 degrees
1350 μ S	-15 degrees
1500 μ S	0 degrees
1650 μ S	+15 degrees
1800 μ S	+30 degrees
1950 μ S	+45 degrees
2100 μ S	+60 degrees

Servo position versus pulse width

small is a function of the servo's deadband. Most (if not all) of the servos available today are not.

DUAL-RATE

I personally believe the term Dual-Rate to be misleading, especially since modern radio systems allow you to program three or more rates. The feature was originally designed as Reduced Rate and reduced overall control authority by further reducing the Travel Adjust limits by some percentage. However, today's systems (such as our JR X9303) will often allow this feature to specify an increased rate.



100% Travel Adjust with no Sub-Trim gave us end points of 1107 μ Sec to 1893 μ Sec. Introduce 50% Dual Rate, and the end points move to 1303 μ Sec and 1696 μ Sec, effectively cutting the total travel range in half – and introducing our second interaction. It also further reduced the resolution. We now had only 689 steps over the full stick travel. Conversely, if you use Dual Rate to increase your travel, you'll be increasing control resolution. However, be aware that when using the Dual Rate feature to increase travel, the same limitation exists that we discovered when using Sub-Trim: If your settings cause one or both ends of the travel to exceed the absolute maximum value(s), clipping will occur.

CONCLUSION

Every single one of a radio's channel programming features in some way, shape or form factors into the calculation of the output pulse width (and subsequent servo position). The order in which features are processed and their ensuing contribution to feature interaction is ultimately up to the system designer. For this reason, you shouldn't expect systems from different manufacturers (or sometimes even the same manufacturer) to exhibit the exact same interactions. And although most of these interactions are intentional, they are nonetheless interactions. So knowing the theory behind each function and the possible effects they can have on each other takes you one step closer to being able to use them effectively without introducing unintended (or undesirable) behavior.

Happy flying! **HELI**

en•cy•clo•freak•ia

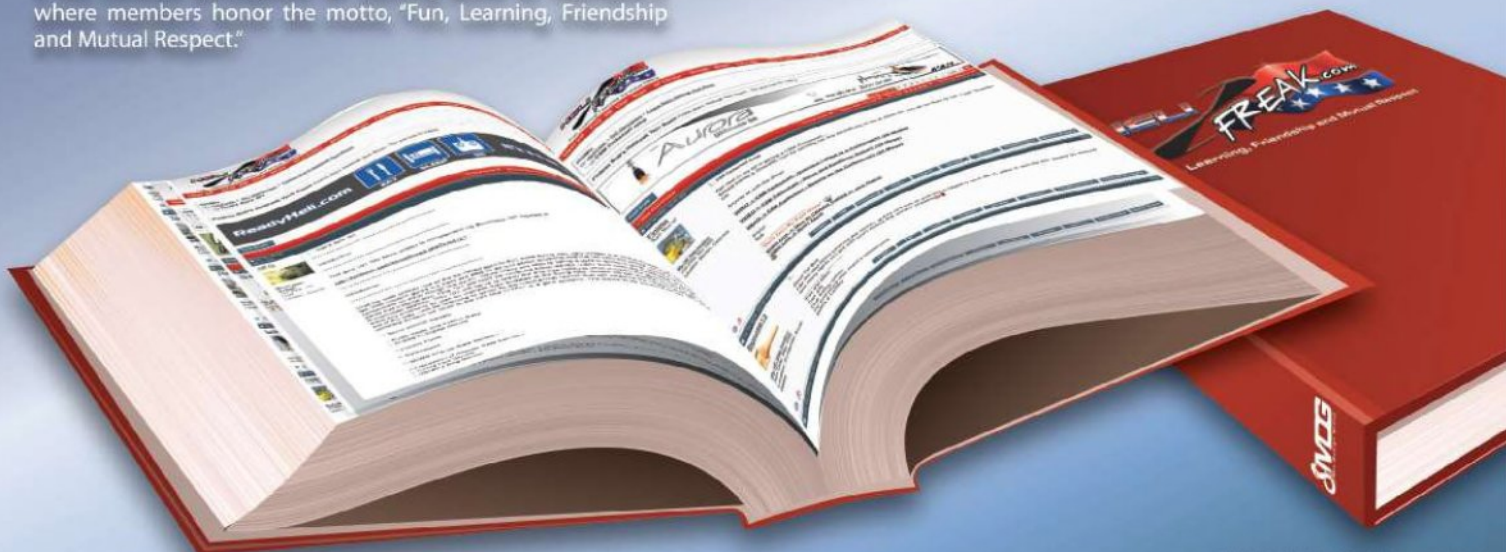
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GOING WIRELESS

Using a JR/Spektrum radio with your simulator.

WORDS: Chuck Bassani

It's an undeniable fact that flight simulators are indispensable tools. And using the transmitter you actually fly with while practicing on the sim has obvious advantages such as instinctively knowing where the switches are and taking advantage of your transmitter's programming. Now you can push that experience to the next level by losing the cord that tethers it to your computer.

» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

4.0 *RC-Heli*

» TIME TO COMPLETE

 **60** Minutes

» TOOLS NEEDED

-  ■ SOLDER AND SOLDERING IRON
-  ■ PHILLIPS SCREW DRIVER
-  ■ WIRE-CUTTER/STRIPPER
-  ■ HEAT-SHRINK TUBING
-  ■ VOLT/OHM METER
-  ■ HOOK-UP WIRE
-  ■ HOOK AND LOOP OR VELCRO™ STRIPS
-  ■ SPEKTRUM WL1000 WIRELESS SIM ADAPTER
-  ■ MIN DIN 4-PIN CONNECTOR (aka S-Video connector)

FLYING THE SIM

Pretty much all of today's mainstream sims include either a custom-built controller or, as is the case with the Phoenix and Reflex products, an adapter that connects the sim to your transmitter. In fact, even those products that do utilize a custom-built controller often include a provision for connecting your transmitter to it.



This isn't how you fly, so why practice this way?



Just a few of the many simulator controllers, adapters, and cables

In order to use your transmitter to fly the sim, you generally connect it to the sim's interface port through an adapter cable. The issue here is a lack of standards for transmitter trainer ports and simulator interfaces. If you happen to be lucky enough to find an adapter cable that connects your transmitter to your sim, then you're in business. If not, you need to get creative. Unfortunately, these controllers/adapters are almost always an integral part of the software's copy-protection scheme, so bypassing them entirely is, by and large, not an option.

Dang wires are trying to attack me!!!!

The WL1000 Wireless Adapter

Enter stage left: the Spektrum WL1000 FS One Wireless Sim Interface adapter. This nifty little device is essentially a six-channel, 2.4 GHz Spektrum DSM receiver that reconstructs a PPM data stream (the typical trainer port output signal). Compatible with all JR/Spektrum 2.4 GHz transmitters, the WL1000 binds to your transmitter just as any DSM receiver does and is exactly what you need to go wireless – if you happen to have the FS One flight simulator.

But what if you don't use FS One? Well, read on – I'm going to show you how to make the WL1000 work with virtually any flight simulator. And, as an added bonus, I will also show you how to

make it work with the Spektrum DX7se, which unfortunately doesn't include a trainer feature.

In order to get the WL1000 to work with other flight simulators, we must do two things: Construct the appropriate adapter cable, and find a way to power it. Physically, the WL1000's interface port is a standard mini DIN 4-pin socket, commonly known in the consumer market as S-video. The connector used on the transmitter end is product-dependent.



LET'S DO IT!

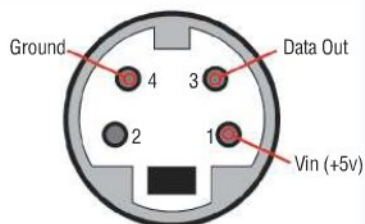
Depending on which flight simulator you have, you'll need to construct a cable that adapts the WL1000 to your simulator's interface. We also want a professional-looking job, so we'll cheat and use the computer to power the WL1000. For demonstration purposes, I'll show you how to make this adapter work with the RealFlight G3.x and G4.x controllers.

CONSTRUCTING THE CABLE

To construct the adapter cable, we need to determine the pin-outs for the WL1000, as well as the controller's external interface. If you're adapting a sim other than the RealFlight, the procedure is similar – you'll just need to research information for the connector and pin-outs for your particular product.

WL-1000'S INTERFACE PORT

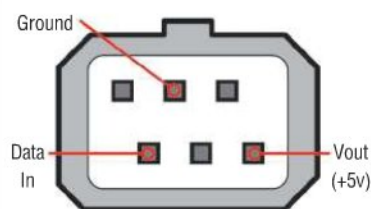
Looking at the side of the case, the WL1000's interface port pin-outs are as labeled in the illustration to the right.



WL1000 pin-outs (mating face of female socket)

REALFLIGHT CONTROLLER'S INTERFACE PORT

The RealFlight controller's interface port is located on the back of the case and utilizes a Futaba micro-square connector. From the factory, it's only wired to accept an input data stream. Later on we'll perform a very simple modification to the controller in order to feed power to the WL1000 through this port. After that mod, the controller port's pin-outs will be as labeled in the second illustration to the right.



RealFlight Controller Pin-Outs (mating face of female socket)

WIRING IT UP

We need to fashion a cable that connects these two ports together. The good news is that you probably already have the cable and connectors on hand. The short adapter cable that comes with the WL1000 can be cut in half. Do this, and presto – you'll have the cable you need with the WL1000 connector end already pre wired! For the other end, we'll reuse one of the Futaba micro-square connectors from one of the adapter cables included with the RealFlight simulator. Just pop open the connector's case and unsolder the wires to remove it from the cable.



The Futaba micro-square connector's case pops open. Unsolder the wires, and remove it.

Do it up.

Now, strip and prepare the wires on the cut end of the WL1000 cable. Remove about 3/4 inch of the cable's outer sleeve, exposing four wires. Strip about 1/8 inch of insulation off of each wire and pre-tin. When soldering the wires to the Futaba connector, use heat-shrink tubing over the connections to prevent shorts from occurring, not forgetting to put the heat-shrink tubing over the wires BEFORE soldering them. The table to the right details the connections.

CABLE-WIRING CHART

FROM: WL1000 S-VIDEO	WIRE COLOR	TO: FUTABA MICRO SQUARE
Pin 1 (Vin +5v)	Red	Pin 6 (Vout +5v)
Pin 3 (Data Out)	White	Pin 4 (Data In)
Pin 4 (Ground)	Green	Pin 2 (Ground)

WHEN YOU'RE DONE, THE FINISHED CABLE WILL LOOK LIKE THIS:



Note – Wire colors in the cable that comes with the WL1000 may vary, so verify with a continuity check. In fact, always perform continuity checks to verify proper wiring before use. Also note that one of the wires isn't used. Cut this wire flush with the cable's outer sleeve.

MODIFYING THE CONTROLLER

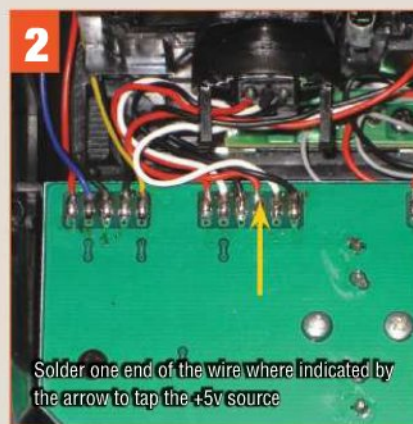
As previously mentioned, the RealFlight controller needs to be modified so it can source the +5v that the WL1000 requires. It's a relatively simple mod; however doing this may void your warranty (legal disclaimer – check). And although this article details the modification to the G4.x controller, the mod to the G3.x controller is essentially the same.

1 Remove the four screws that secure the controller's case back, and take it off. (See photos for reference)

2 There are two circuit boards of concern; the main board (lower board) and the board that hosts the interface port (upper board). The gimbal potentiometers are wired to the main circuit board, and their red wires are at a +5v level. We'll simply install a wire between one of these +5v points and the interface port. The photo to the right shows where you'll need to solder.

3 The other end of the wire needs to be soldered to the back of the interface port. Flip the interface circuit board over to expose the foil side.

4 Make sure you don't introduce any shorts when soldering. Verify with a continuity check. When you're done, flip the circuit board back over and screw the case back together. All that's left to do is to secure the adapter to the back of the controller with some adhesive hook & loop strips and you're done!



Soldering is a prerequisite.

SPEED DEMONS!



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TRANSMITTER SETUP

Before we can test, we need to setup a model memory in your transmitter. I'll use a Spektrum DX7 for this example:

SYSTEM SETUP

Make the following changes:

MODEL RESET

- DATA RESET

MODEL SELECT

- ACRO

MODEL NAME

- SIM

INPUT SELECT

- FLAP: SYSTEM
- FLAP TRIM: INH

FUNCTION SETUP

Make the following changes:

FLAP SYS.

- FLAP
 - NORM: UP 100%
 - MID: 0%
 - LAND: DN 100%

Everything else should remain at their default settings. When setup like this, the '3-Position Switch' will function as the Flight Mode Switch and the 'Gear' switch will function as Throttle Hold. Remember, this is only an example. How you program your transmitter is completely up to you.

REALFLIGHT SETUP

For a quick and simple test, we'll setup the simulator to accept input from your transmitter, but continue to use the simulator's programming. This saves you the headache of having to use a separate model memory for each of your simulator's models.



BINDING

The easiest way to bind is to connect the WL1000 to your controller prior to plugging the controller into the computer's USB port. With the computer powered on, press and hold the WL1000's bind button and plug the controller into the USB port. You should see a blinking LED indicating the WL1000 is in bind mode. You can now release the WL1000's bind button. Next, press and hold your transmitter's bind button and turn it on, keeping the transmitter's bind button pressed until the WL1000's LED stops blinking and stays on solid. This indicates your transmitter is linked to the WL1000.

CONTROLLER SELECTION

To accept input from the wireless adapter, go to the RealFlight menu and select 'Controller'. Under the 'Controller' menu, highlight 'Select Controller' and pick 'Interlink Transmitter 6 channel'.

CHANNEL MAPPING

We need to map the transmitter channels to RealFlight functions. To do this, go to the RealFlight menu and select 'Controller'. Under the 'Controller' menu, pick 'Channel Mapping ...'. This will bring

up the Channel Mapping dialog. Setup the mapping as follows:

- Channel 1: Map to Channel 3 – Throttle
- Channel 2: Map to Channel 1 – Roll (check the Reverse box)
- Channel 3: Map to Channel 2 – Pitch
- Channel 4: Map to Channel 4 – Yaw (check the Reverse box)
- Channel 5: Map to Channel 7 – Smoke (check the Reverse box)
- Channel 6: Map to Channel 8 – 3-pos Switch (check the Reverse box)

CALIBRATION

In order for RealFlight to learn your transmitter's channel ranges, you need to perform the calibration procedure. To do this, go to the RealFlight menu and select 'Controller'. Under the 'Controller' menu, highlight 'Controller Calibration ...'. This will bring up the Controller Calibration dialog. Follow the on-screen instructions.

You're now ready to fly. For the ultimate experience, use a wireless keyboard and mouse to access the RealFlight menu to have a totally un-tethered experience.

CONCLUSION

Improvements to training with a simulator are realized by reducing the differences between the simulation and reality. Hopefully this How-To does just that. Now you just need to remember to keep those TX batteries charged!

Happy Flying (I mean Sim-ing) ... **TCL**

Ryan loves his sim now.



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Besides that, the G370 3D's charms aren't defined only by its toughness. At roughly half the thickness of JR's superb G770 3D, it's equally precise. And in terms of resistance to external forces, the smaller 370's pirouette rate-consistency is absolutely unmatched. Plus it features heading lock and normal modes, along with settings for both electric and glow power.

JR

feel the difference!

And finally, just to make an easy decision even easier, it's covered by JR's 3-year warranty and outstanding service record. The exceptional new G370 3D gyro. It's what you need and it's at your JR dealer's now.

IRCHA JAMBOREE

TWO THOUSAND NINE

WORDS: Ryan Kephart | PHOTOS: Mike Velez

THE IRCHA JAMBOREE IS ONE OF THOSE ANNUAL EVENTS THAT MANY PEOPLE GO OUT OF THEIR WAY TO ATTEND, and this year was no exception. IRCHA Jamboree has grown to epic numbers; this year there was a total of 954 pilots, a number that towered over last year's world record of 780. The IRCHA Jamboree is a must-see event with more than just flying going on. Many vendors and IRCHA members offer fun activities and seminars throughout the event, which really make this more than just a fun fly. This was my first year of attendance at the beautiful AMA field in Muncie Indiana, and I can tell you this: I will never miss another one.

Even heli guys dig tattoos!



AMBOR

ACADEMY OF MODEL AERONAUTICS
MUNCIE, INDIANA



What a horrible poker face.

THE AMA FIELD

The home of the Academy of Model Aeronautics is located in Muncie, Indiana, about an hour and a half from Indianapolis. The field is composed of four main fields with a few smaller fields for smaller aircraft and park flyers. The fields rest on 1,000 acres of fully maintained land that accommodates every niche of model aeronautics. The IRCHA Jamboree takes place on the Red Field, otherwise known as Site 4. Site 4 is a beautifully maintained grass strip that spans nearly half a mile. The flight line consists of more than 10 flight stations overlooking a perfectly groomed grass field with plenty of flying space on each side. The AMA

property is also home to the AMA museum, which houses some of the oldest developed helicopters for RC flying along with some of the original transmitters used to control them. During the IRCHA Jamboree, the AMA field is transformed into a heli heaven that spans the whole property and offers a place for scale, FAI, and 3D pilots to fly simultaneously without any conflicts.



THE RAFFLE JUST GOT BIGGER

Last year the IRCHA Jamboree impressed the pilots with a huge raffle that included some very nice kits (and accessories to boot!), but this year, just as with the pilot numbers, blew last year's raffle to pieces. The raffle included the new Avant Aurora 90 electric fully loaded, the TREX 700, the JR 12X, the Raptor 50 Titan SE, the Ely Q Vision 50, and every other kit and accessory you can imagine.



EVENTS, DEMOS, AND FUN

With the impressive number of pilots and spectators came a host of activities that were entertaining for both. From sunup to late night, pilots put on a show across the half-mile flight line with a mix of pro, intermediate, and beginner pilots just having fun. Golf carts were the main source of transportation across the field and were used by most just to find an open flight station. The main flight station that was located just in front of the booth had a grand stand for seating, which allowed the spectators to sit comfortably while watching the sponsored pilots take to the air and show how well their machines performed. Behind the grand stand was tent after tent filled with every major and minor manufacturer displaying and selling products. Deals were not hard to find, and new products were scattered across the vendor area for people to see. The event kicked off Thursday morning at 9:00 a.m. with open flying, and shortly thereafter Bergen RC offered a ground school to obtain a Turbine Flight Waiver that was followed by testing later that afternoon. Thursday also offered several clinics for beginners to set up their machines and have any questions answered. On Friday, Ace Hobby had a build-off contest to see who could build, set up, and fly a new Raptor 50 Titan SE, and the winner got to keep the just-assembled helicopter. Seminars throughout the weekend included Turbine 101, Spartan Gyros, Scale Helicopters, Tuning Your OS Engine, Skookum Flybarless Setup, and Aerial Photography. The seminars took place in two separate tents and were often shown multiple days just in case you missed one. Contests also took place throughout the events and ranged from drag racing to auto contests and the second annual IRCHA Amateur Nationals (IAN). The IAN is a great opportunity for intermediate pilots to show off their skills against other pilots in their class. It gives pilots a chance to see how competition feels without the fear of getting blown out of the water. The grand prize for the tournament was a sponsorship to the winner. If you were looking for a good time at IRCHA, it was not hard to find. Gauji hosted a fun Texas Hold 'em poker tournament on Friday night for a \$5.00 donation, which included your seat in the tournament and free drinks. Gauji generously donated kits and prizes for the final 10 people left in the game that included 4 Gauji Hurricane 250 V2 kits (which had my name written all over them). I attended the poker party and ended up in third place; lucky me! Following the poker tournament, the fun did not stop. Pilots decked out their helicopters with night gear and proceeded to put on a show for the large group that decided to stick around and have a barbecue while the sky was lit and the music was cranking. A night fly competition took place on Saturday night followed by an impressive fireworks show that included Kyle Stacy and Bobby Watts flying through the fireworks.

Yes, the Avant girls were back in full force.



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SCALE AND VINTAGE MODELS

IRCHA is not just a place for the hot-dog 3D pilot, it's also a place for a more broad range of helicopter owners. Dr. Timothy Dawson was seen hanging around the scale tent where many nice models were on display. These huge models were not just hanger queens, either. Many hours of building go into each of these machines, and the owners take pride in flying them. Many of this year's scale helicopters were turbine powered and really put on a nice show. Indy Apache helicopters also put on a demonstration and showed that even the most detailed scale helicopter will still fly on electric power. Another tent that rested beside the scale tent included some of the oldest still-flying helicopters still around. Many of these vintage helicopters were still using original parts, while others were modified to use modern equipment and electronics.



NEW PRODUCTS SPOTTED AT IRCHA

1. INERTIA RC

Mike Fortin and his team have developed a new 3-axis gyro system cleverly named the Axiom FBL. This flybarless stabilization gyro has an integrated mechanical 90°, 120°, and 140°-CCPM programming and can be updated using a computer's USB port. Not much else was said about this gyro, but we will be sure to give you the full scoop once we get our hands on one.

WWW.INERTIARC.COM

2. TSA MODELS

Since the TSA Models products were located in the same tent as RC Heli, we were able to get a good look at the new Infusion series helicopters. These helicopters are built using the latest 5-axis CNC machines and high-quality aluminum and composite materials. Three helicopters were on display: the Infusion 90 nitro and electric, and the 50 nitro.

WWW.TSAMODEL.COM

3. AVANT

The original Aurora was seen at IRCHA more than two years ago, and now Avant has a new helicopter it has released to the public: the EAurora. This 90-sized electric helicopter utilizes the same programmable head as the Aurora but changes the frame lay out to accommodate batteries and a power system. We will keep an eye out for the release date and let our readers know.

WWW.AVANTRC.COM

4. U-NEAK | DESIGNS

u-neak | DESIGNS is a company that started out making custom-canopy covers for a large line of helicopters. It has now recently started its own custom-painted canopies for the major brand-name helicopters. These painted canopies are painted professionally by a painter who used to paint motorcycles and helmets. Each canopy has its own unique design, and when you purchase a canopy through u-neak | DESIGNS, it includes a Canopy Condom to protect your paint.

WWW.U-NEAKDESIGNS.COM

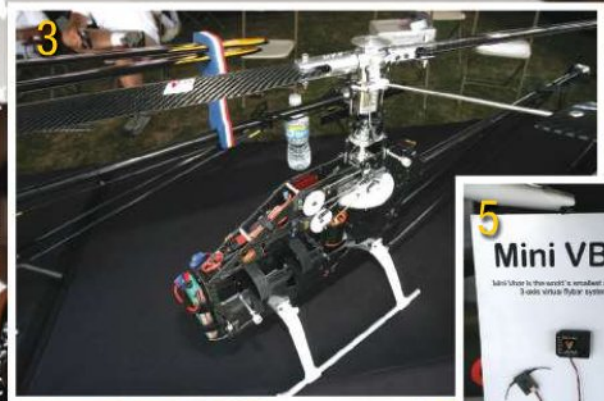
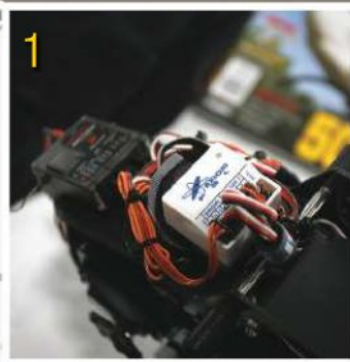
5. MIKADO

Fans of the V-Bar from Mikado will enjoy its newest product on the production line. The Mini V-Bar has the same great features as its bigger counterpart and more. Mikado has teamed up with Spektrum to provide an all-in-one unit that uses Spektrum satellite receivers to control the whole helicopter including the Mini V-Bar. This provides a perfect flybarless system for even the smallest of helicopters.

WWW.MIKADO-HELI.DE

6. O.S. ENGINE AND FUTABA

I am sure all you O.S. fans out there already know about the new O.S. 55HZ engine for 50-sized helicopters, but you didn't see it in person unless you went to IRCHA. The only prototype engine was seen there, and I must say it was gorgeous. This engine uses



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DARRELL BELL

Detroit, Michigan

ANDY PANONCILLO

Muncie, Indiana

FRANK COLUMBIA

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New York

ART HUGHES

Dryden, New York

ALVIN CHAI

Burnaby,
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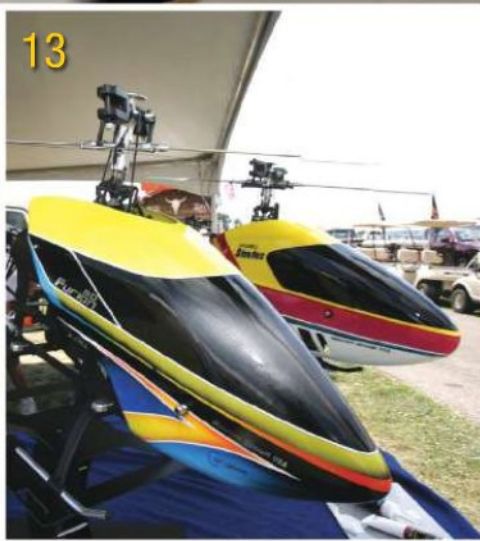
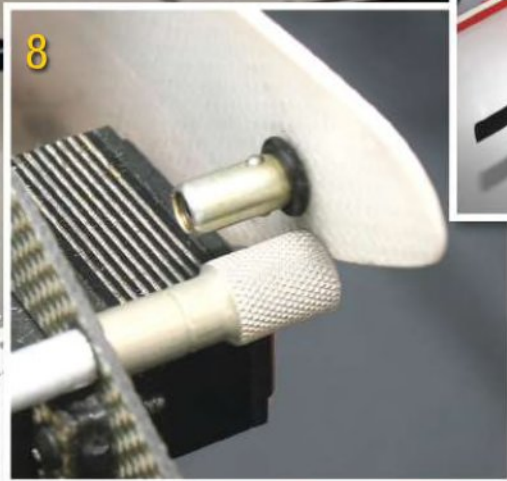
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Fantastic!

a bigger sized carburetor that has a mid-range needle adjustment. The engine resembles its 91-sized brother, the O.S. 91HZ. Futaba also just released a new radio for the masses, the Futaba T8FG 8 channel computer radio. This radio uses a new kind of scrolling wheel that resembles an iPod dial. The screen is back-lit and looks amazing. Expect to see this radio hit the market soon and at an affordable price.

WWW.GREATPLANES.COM

WWW.OSENGINES.COM

WWW.FUTABA-RC.COM

7. ESPRIT

Esprit Model has a new lineup of 450-sized scale helicopters. These helicopters come with pre painted fiberglass bodies with the mechanics. The fuselages on display had the mechanics pre installed, and all that was required was installing the head. The list of fuselages included an Apache, Black Hawk, Cobra, Huey, Coast Guard, Hind, and an MD 500.

WWW.ESPRITMODEL.COM

8. RCBOOYA

Yes, we know, it's kind of a weird name for an RC products manufacturer, but don't let the name fool you. This small company makes canopy posts that are so unique and easy to use you just might want them. These canopy standoffs and clips allow you to remove your canopy with just the push of a few buttons. The clip stays on the canopy and slides off the standoffs.

WWW.RCBOOYA.COM

9. BYRON FUELS

Rotor Rage is taking off, and many pilots have found themselves switching over to this new fuel that not only has a lot of power but also burns cleanly. Byron has also set out to provide one of the best fueling system on the market, and we finally saw the full version at IRCHA. This fueling system has a control panel to switch from fuel to drain along with a secondary power switch. The pump looks to be of high quality, and a prefilter is included. Look for a full review of the E Tanker in an upcoming issue of RC Heli.

WWW.BYRONFUELS.COM

10. TSH GAUI/EMPIRE HOBBY

TSH Gai and Empire Hobby have created some new scale fuselage bodies for the Hurricane 250. These fiberglass fuselages are modeled after the Hughes 500 in several color schemes and are very light-weight. TSH Gai has also made a five-blade rotor head to complement this helicopter along with the G365 flybarless stabilization unit. If you are looking for a flybarless head for a 250-sized helicopter, TSH Gai has you covered. A two-, three-, four- and five-blade flybarless rotor head is now available.

WWW.EMPIRERC.COM

WWW.GAUI.COM.TW

11. Ely.Q SPA

The group over at Ely.Q has been working diligently on a new helicopter in its lineup. Although a prototype was not seen at IRCHA, pictures of it were. This new helicopter is an electric platform and looks pretty promising. Keep an eye on this team for the official release of Ely.Q's new 50-sized electric Vision helicopter.

WWW.ELYQ.COM

12. V-BLADES

What once was lost now is found. V-Blades are back in business and once again manufactured with the high-quality precision to which we have all become accustomed. V-Blades was already selling some 600-mm blades at IRCHA along with some tail blades and paddles. The factory is now back in Nixa, Missouri, and will soon be fully up and running, producing blades for the masses once again.

WWW.VBLADES.COM

13. HELIPROZ

Recently a new relationship has formed between HeliProz and Miniature Aircraft USA. HeliProz has decided to merge MA and relocate the factory closer to the home of HeliProz in Montana. This new division of HeliProz has kept the same great team from MA but backed it up with a heap of product support and customer service. MA was displaying the new Furion 50. The Furion 50 has carbon-fiber frames and a mixed plastic and aluminum rotor head. A fiberglass canopy is included, and whether or

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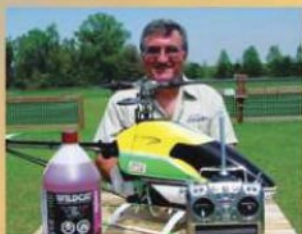
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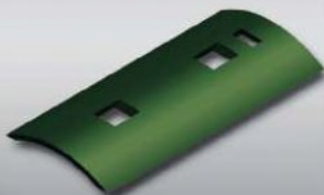
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QUANUM

not it will be pre painted is still in the air. Keep an eye out for this new team to produce some great-looking products in the years to come.

WWW.HELIPROZ.COM
WWW.MINIATUREAIRCRAFTUSA.COM

14. EFLITE/JR

The Horizon booth at IRCHA was a giant hit partially due to the help of a new little helicopter by E-flite. This little helicopter, labeled the mSR, is a small, fixed-pitch helicopter that impressed the many spectators who gathered around the booth to watch it fly. The mSR is stable and can handle light winds with ease. The size makes this helicopter nearly indestructible and so offers beginners a chance to fly a standard helicopter instead of a counter-rotator. JR had the new G370 3D gyro on display. This little gyro offers a compact size and an aluminum case to provide protection for your investment.

WWW.HORIZONHOBBY.COM

15. KBDD

KBDD was known for making those colorful tail blades for our 50- and 90-sized helicopters. KBDD has now been working on paddles and tail blades for the TREX 450 PRO. They gave me a set to try out, and I must say that the cyclic speed increased by double. If you are looking to make your 450-sized helicopter faster, grab a set of the KBDD paddles, and you will have that cyclic speed you have been looking for.

WWW.KBDDINTL.COM

16. THUNDER POWER RC

Thunder Power has been on a nice and steady path to creating new and more powerful battery packs. It seems like it has a new pack at every event we cover. Well, it must have saved the best for IRCHA. The new Thunder Power 45C packs are here. These packs offer the same great reliability and power you expect from Thunder Power. As mentioned before, Thunder Power packs can be charged using their approved chargers up to 6C without any noticeable effect on battery power. These packs have been tested to the max by TP and will be hitting the shelves soon.

WWW.THUNDERPOWERRC.COM

17. OUTRAGE RC

Outrage has not only been working on the Velocity 50 as seen in this issue but some servos to match it. The BL 9080 cyclic servo and BL 9088 tail servo are high-voltage servos that are able to be powered by a two-cell LiPo and include a brushless motor. Both tail and cyclic servos are titanium geared and dual-ball-bearing supported. Outrage is also offering a middle-classed servo with all the same great features as the BL servos but with a coreless motor drive. Keep an eye out for these to hit the market soon.

WWW.OUTRAGERC.COM



That little mSR can handle the wind!



ALL GOOD THINGS MUST COME TO AN END

Asking for perfect weather in Muncie, Indiana, usually leaves you feeling cheated, but this year we could not ask for anything better. The sun was shining, and the air was filled with nitro, but we did not see one drop of rain. IRCHA is an exhilarating experience that I think every helicopter pilot should enjoy. So next year pack up your suitcases and helicopters and head out to the beautiful AMA field. Trust me you will not regret it, and you will help beat this year's record of registered pilots. See you there! **TREX**

Outrage VELOCITY 50

Outrageously 3D

WORDS: Ryan Kephart | PHOTOS: Jason Boulanger

OUTRAGE HAS MADE ITS WAY INTO THE NITRO MARKET with its new Velocity 50. This helicopter is not a converted electric but a complete redesign from the ground up. It was designed and tested by Charley Stephens, who is known for making high-quality upgrades for helicopters. Charley has taken his designs to the next level, producing high-quality kits that not only fly well but are affordable too.

Terminal Velocity!



» AT A GLANCE

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



I think that landing gear is a little dirty

FEATURES

The Velocity 50 features a solid mix of aluminum and carbon fiber. The kit includes a pre-painted fiber-glass canopy painted by Canomod and a nice set of carbon-fiber tail blades. The head is completely made from aluminum and has the ability to adjust to any pilot's needs whether a beginner or super advanced. The Velocity 50 also features an extended boom for increased tail authority to hold the tail rock steady during the toughest maneuvers.

» MAIN FRAME

SWASH CONTROL: The swash is controlled using bell cranks that connect to the servos utilizing a push-pull linkage setup. The bell cranks are positioned to give a 90° connection to the 120° CCPM swashplate. The bell cranks are dual-ball-bearing supported and offer smooth transitions from the servos to the swashplate.

DESIGN: The frame is designed with single-piece carbon-fiber side frames. The frames are separated using aluminum bearing blocks and a mix of aluminum spacers. The frames are spaced out about 32 mm, which gives just enough room for the bearings and engine mount. This keeps the profile thin and allows for better aerodynamics.

COMPONENT LAYOUT: The servos are located high and up front, excluding the throttle and tail servo, which are located just below the main cyclic servos. The fuel tank and engine rest below the main gear and offer a good center of gravity balance. The gyro can be mounted in multiple positions either up front or on the tail-boom clamp. The receiver battery and other radio gear sit up front on dedicated trays.

CANOPY: The canopy on the Velocity 50 has followed in the footsteps of some of the other manufacturers, but it has taken it up a notch. The canopy is made from fiber glass and is pre-painted by Canomod. The clear coat is nice and shiny without any noticeable runs. The paint looks like it has been silk screened, as you can see pixilation in the fades. Regardless, the canopy looks and shines nicely in the air. The canopy is mounted using two thumbscrews up front and two push-on posts in the back. The holes are not predrilled on the canopy and requires a good body reamer. Several molded location marks are barely visible but are not located in the correct location. This requires you to measure and test fit the canopy before you drill the holes.

Frame layout looks quite nice

LANDING GEAR: The four-piece landing gear has a low profile and offers plenty of flexibility for those rough landings. The skids are held in place using four set screws that thread into the struts. The landing gear is mounted to the frame using four aluminum ears that are threaded to accept the landing-gear screws without having to use a nut.

» DRIVE TRAIN

ENGINE/MOTOR MOUNT: The engine is mounted to an aluminum bracket that attaches to the frame using four screws. The holes on the frame are elongated to provide adjustment for gear mesh and centering on the clutch bell.

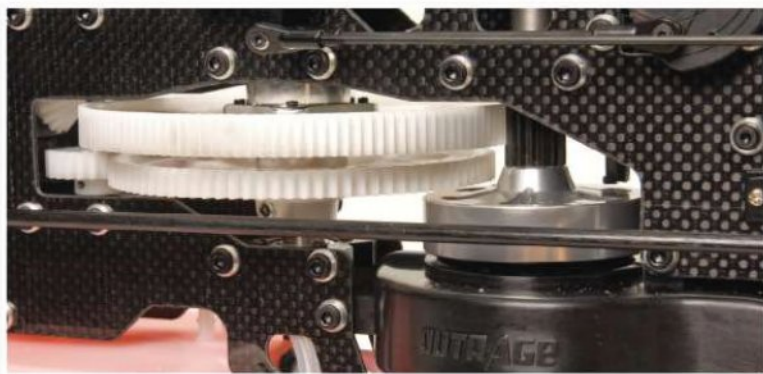
CLUTCH: The clutch is mounted on top of the cooling fan and has a one-way bearing pressed in. The bell is vented with large cutouts to provide cooling and lightening.

COOLING FAN AND SHROUD: The cooling fan is molded from plastic and has angled fins to provide plenty of airflow. The shroud encases the fan and attaches to the frames using six screws that thread into aluminum spacers molded into the fan shroud.

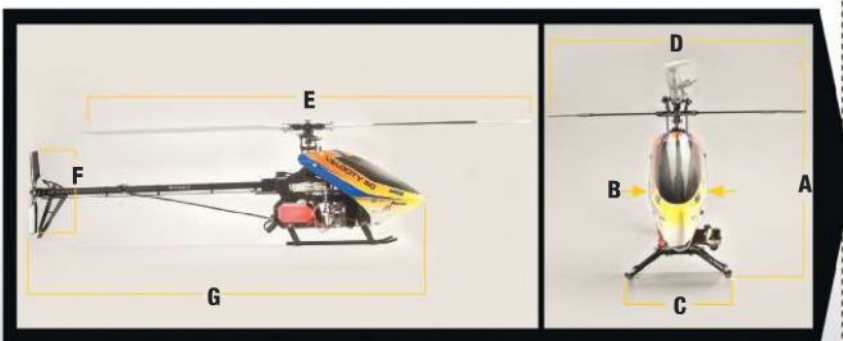
MAIN GEAR: The main gear is machined using durable delrin plastic composite. Lightening cutouts are big, but plenty of plastic is left to provide support for the aluminum hub.

AUTOROTATION DRIVE: The main gear has an aluminum hub that houses a one-way bearing for autorotations. The tail-drive gear is powered during an auto.

TAIL DRIVE: The main tail-drive gear is located below the main gear and is bolted directly to the main shaft. The gear drives a secondary gear shaft that in turn drives the torque tube bevel gears. All the gears are made from delrin to provide the best in performance and reliability.



“BEGINNERS CAN TAKE THIS HELICOPTER FROM THEIR FIRST HOVER ALL THE WAY UP TO EXPERT 3D WITHOUT EVER HAVING TO BUY ADDITIONAL EQUIPMENT TO MAKE IT FLY BETTER.”



OUTRAGE VELOCITY 50 MODEL SPECIFICATIONS

CLASS:	50-sized nitro
BUILD:	Kit
BLADE SIZE:	600-630mm
LEVEL:	Novice to Advanced

FRAME

MATERIAL:	Carbon fiber
TYPE:	One piece
SERVO TO SWASH LINKAGE:	Push-pull bell cranks
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:	Dual
TAIL BLADE GRIPS:	Aluminum
TAIL CASE:	Aluminum
BOOM STRUT MATERIAL:	Carbon

GEARING

MAIN ROTOR TO PINION RATIO:	1 : 8.6
MAIN ROTOR TO TAIL RATIO:	1 : 4.583

WEIGHT

EMPTY:	4lb. 14oz. (2,202g)
WITHOUT FUEL:	7lb. 4oz. (3,288g)
FULLY LOADED: (Includes fuel)	8lb. 2oz. (3,685g)

DIMENSIONS

HEIGHT (A):	15.25in (387mm)
CANOPY WIDTH (B):	4.25in. (107mm)
LANDING GEAR (C):	8in. (203mm)
PADDLE TO PADDLE DIA. (D):	21.25in (540mm)
MAIN ROTOR (E):	54.5in. (1,384mm)
TAIL ROTOR (F):	10.25in. (260mm)
LENGTH (G):	48in. (1,219mm)

FEATURES CONTINUED

» TAIL & BOOM



TAIL CASE: The tail case is made completely out of aluminum and is anodized black. The case is a three-piece design, which includes the body (clamp) and two side plates. The side plates have bearings fit for the tail shaft.

TAIL BLADE GRIPS: The aluminum tail grips are supported by two ball bearings and a thrust bearing like the main grips. The tail grips attach to a center hub that is machined with the spindle on each side. The included carbon-fiber tail blades slide inside the grips, and a bolt passes through the grip and is tightened using a nylon lock nut.

PITCH ACTUATOR SYSTEM: The pitch actuator system is quite unique on the Outrage Velocity 50, it is a three-piece arm that allows the pitch slider to operate smoothly and symmetrically. A tail bell crank link is used in between the mounting post on the case and the pitch actuator. This allows a second pivot point that can move closer or further away from the tail shaft. The pitch actuator system is made completely from aluminum, including the links running to the blade grips. Ball bearings are used to support the entire pivoting axis.

BOOM: The boom is 21 mm in diameter and 720 mm long. The extended boom is anodized in a dull black finish and has an Outrage logo on each side.



» ROTOR HEAD

HEADBLOCK: The head block is made from machined aluminum and is anodized black. The head is designed for an underslung fly bar and has a head button. The head attaches to the main shaft using a single Jesus bolt that slides through the main shaft and also clamps down the head block. Dampening is performed using a single-piece rubber damper with a spindle that free floats between the grips. The grips attach to the spindle using a screw that threads into the end of the spindle.



PHASING: Phasing is accomplished by two steel pins that are pressed into the head block. The pins slide smoothly into the machined slots on the washout base and provide zero slop.



BELL/HILLER MIXER: The Bell-Hiller arms are mounted to the pitch arms on the blade grips and can be mounted in three different positions. The arms are dual-ball-bearing supported and have two input options and three output options.

WASHOUT ARMS: The washout arms are aluminum anodized black and have two output options. The arms are dual-ball-bearing supported, as are the swashplate links.



Aluminum Tail Grips are Nice!

» INSTRUCTIONS & BUILDING TIPS

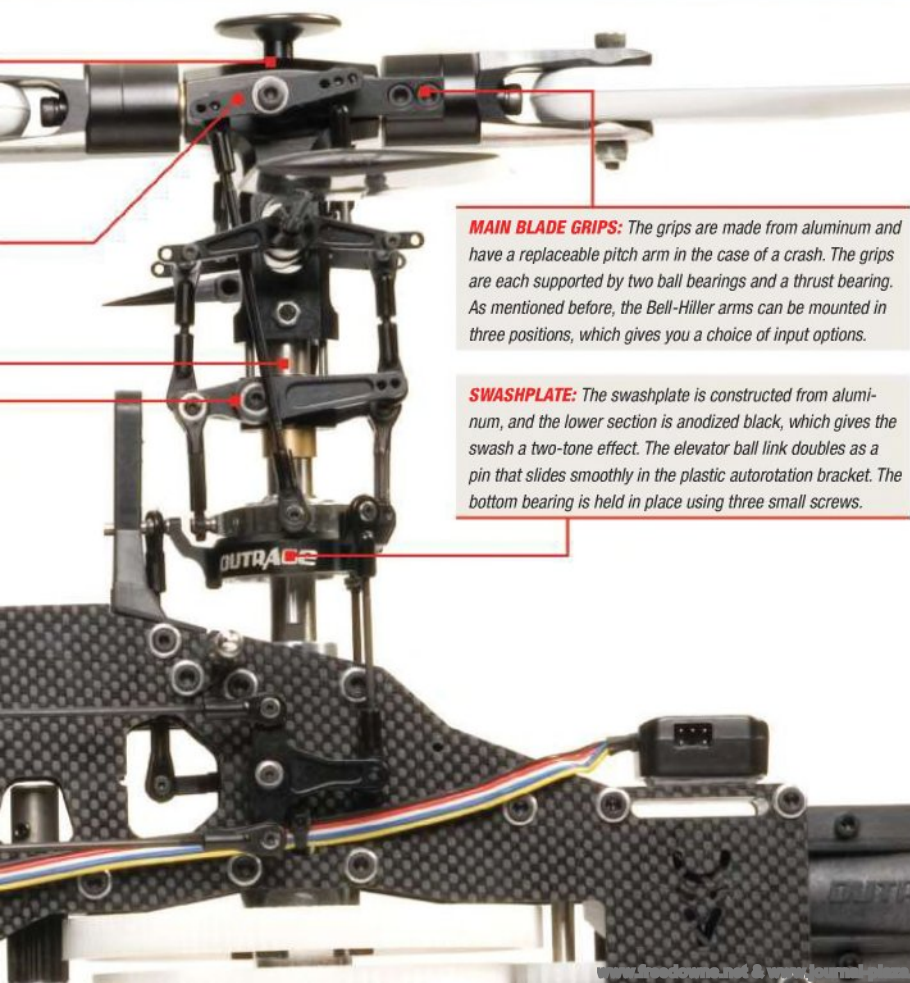
WHEN YOU OPEN THE BOX

Before opening the box to the Outrage Velocity 50, you notice that the company has taken the time to create a clean design that is eye-catching. Looking inside is no different: The kit is packaged cleanly and neatly with parts individually bagged according to the manuals' step numbers. The canopy is protected well using bubble wrap. The kit includes a nice muffler that is packaged separately in its own box.

MANUAL AND BUILD

The manual includes easy-to-follow drawings that show exactly where every part is located. The manual also shows exploded views of the

components that were preassembled at the factory. The build went smoothly, and the Velocity took shape relatively quick. The only section that was a bit difficult was drilling out the holes for the canopy grommets. The canopy hole locations that were in the mold were off and produced a gap at the bottom of the frames, so measuring the locations, drilling, and reaming the holes in the correct locations was the most difficult part of the build.



MAIN BLADE GRIPS: The grips are made from aluminum and have a replaceable pitch arm in the case of a crash. The grips are each supported by two ball bearings and a thrust bearing. As mentioned before, the Bell-Hiller arms can be mounted in three positions, which gives you a choice of input options.

SWASHPLATE: The swashplate is constructed from aluminum, and the lower section is anodized black, which gives the swash a two-tone effect. The elevator ball link doubles as a pin that slides smoothly in the plastic autorotation bracket. The bottom bearing is held in place using three small screws.

OUTRAGE VELOCITY 50 RTF & TEST GEAR

» SUPPLIED GEAR

MUFFLER: Outrage, Hyper Rage 50, HR1099-XLT, 6 oz. (170g)

» TEST GEAR

RADIO: JR, 12X, JRP12TX, \$1249

RECEIVER: Spektrum, AR7100R, SPMAR7100R, 1.14 oz. (32.5g), \$220

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

THROTTLE SERVO: Hitec, HS-7965MG, 37965S, 2.18 oz. (62g), \$95

TAIL SERVO: JR, DS8900G, JRPS8900G, 2.1 oz. (59g), \$139

ENGINE: YS, YS 56, Prototype, 14.25 oz. (404g), not yet released

FUEL: Byron, Rotor Rage 30, \$34

GYRO: Inertia RC, Inertia 860, 652357, .54 oz. (15g), \$170

RECEIVER BATTERY: Outrage, 2500mah 2S, OX-PRX-25002, 3.9 oz. (110g), \$35

BLADES: SWE, CF 620mm, SWE-620DC, \$92

TESTING

We tested the Outrage Velocity 50 with some of the most common used gear in a 3D setup. We thought that the combination of high-voltage Hitec servos and the Spektrum AR7100 that provides unregulated voltage to the cyclic and regulated voltage to the throttle and gyro should make this helicopter responsive and agile. We also put the new YS 56 motor to the test using 620 mm blades on this 3D machine. Lets see how well the Outrage Velocity 50 performed and how it stacked up to today's 3D machines.

HOVERING • The Velocity 50 in a hover was agile yet very manageable. The limited slop in the head really made this helicopter feel locked in. Small inputs were all that was required to keep this helicopter in a locked-in hover. Even with the most aggressive settings on the head, the Velocity felt right at home. Opting to change the head to a more stable setting would give the Velocity an even more stable feel for the beginner.

Rating: 4.5

FORWARD FLIGHT • Forward speed and agility are fast and accurate. The Velocity is a fast machine that cuts through the air at a rapid pace for a 50-sized machine. The bigger blades and longer tail boom allow the Velocity to track through the air on rails. Once the nose is dipped and the helicopter gains speed, the Velocity is locked in and does not have any tendencies to pitch up or down.

Rating: 5

CYCLIC PITCH RESPONSE • The Velocity 50 shines when it comes to the cyclic. The crisp and fast reaction of the Velocity really makes 3D maneuvers look fast and accurate. Rolls and flips are right on axis without any noticeable interactions. I set the head up for an aggressive setting, which gave the helicopter plenty of response and speed to handle any 3D maneuver. That being said, there was still one more setting I could have selected to make this helicopter even faster and more responsive. Switching to a more stable head setting makes the cyclic calm down to a nice and easy cyclic response, perfect for the beginner or a pilot who is ready to do some mild 3D but still wants stability throughout the flight.

Rating: 5

COLLECTIVE PITCH RESPONSE • With the power of the new YS 56 and the bigger 620 mm blades the collective was fast and poppy. I ran a 26° total pitch range on the Velocity, which gave this helicopter a quick response and agile feel. The head was

set up aggressively to allow quick pitch changes. These settings were extremely noticeable during 3D maneuvers that require quick collective inputs. Switching to a more stable setting on the head gave the Velocity a completely different feel. The collective became locked in and stable. Hovering was increasingly more stable, as the collective did not need to be feathered to find the sweet spot.

Rating: 5

TAIL ROTOR RESPONSE • The extended tail boom and included carbon fiber tail blades give the Velocity 50 one of the best-responding tails for a 50 class machine. The tail pitch slider offers a slop free tail system, and it really shows in the air. The tail is locked in during all aspects of flight. Pirouetting maneuvers are easily accomplished and are consistent throughout the flight. Outrage used the right tail-gear ratios to give high loading maneuvers that slow down the head speed enough tail authority to remain constant even with the engine bogging.

Rating: 5

AUTOROTATION CAPABILITIES • The autorotation system on the Velocity is much like that of any other 50-sized helicopters. The rotor head disengages from the engine drive smoothly and retains enough energy

throughout an autorotation. With the ability to use up to 630 mm blades, the Velocity can float as if it were a 90-sized helicopter.

Rating: 4.5

POSTFLIGHT INSPECTION • Going over the helicopter and inspecting every bolt and plastic link, I found that the Outrage Velocity 50 was still in perfect working order. When I built the helicopter the links seemed a bit on the snug side, but after a couple dozen flights the links had all worn in and felt as smooth as butter. The dampening did not wear out and still felt as good as new. Overall, the helicopter held up to the abuse we threw at it and continued to fly just as well, if not better, than when it was brand new.

Rating: 5

CONCLUSION

With the wide range of abilities that are available in the head programming the Velocity is one of the most versatile 50s on the market. It's easily among the best 50s I've ever flown. Beginners can take this helicopter from their first hover all the way up to expert 3D without ever having to buy additional equipment to make it fly better. Outrage has done a fantastic job creating its first nitro helicopter, and we look forward to any new helicopters that Outrage has on its platter. *TBL*



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UFO Series products adopt 2.4G spectrum technology and with excellent operation function. Integrated design of 3D gyro provides precise locating in air. Quarto motors drive make unimaginable stable flight and bring you more fun. Main rotor blades are specially protected by arc-like carbon fiber which effectively ensures safety.



UFO-B2

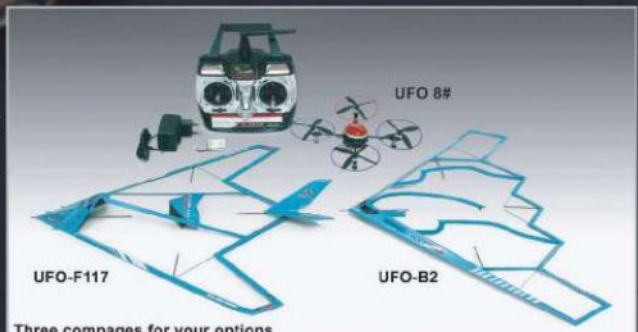
UFO-117

Specification:

- Main Rotor Dia. : 80mm
- Overall Length: 230mm
- Overall Width: 230mm
- Main Motor : 0720RN
- Battery: 3.7V 400mAh Li-Po
- All-up Weight: 40g (Battery included)
- Transmitter: WK-2401
- Receiver: RX2418
- Gyro: 3D Gyro

Features:

- Quarto motors drive and highly simulated fuselage of 117/B2 make unimaginable stable flight and bring you more fun.
- Modularized design features convenient maintenance at low cost.
- Integrated design of 3D gyro and attitude control provides precise locating in air.
- Flight time will be up to 9 to 11 minutes on a 3.7V 400mAh LiPo.



Three compages for your options

TESTING SPECS

OUTRAGE VELOCITY 50

Part #: KRV501
Distributor: Heli Direct
Web: www.helidirect.com, www.outragerc.com

Street Price: \$549.95
Price as Tested: \$2,999 (without engine)
Build/Setup Time: 14 hours

PERFORMANCE

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

RPM OF EACH MODE: Normal: 1700
 Idle Up 1: 1850
 Idle Up 2: 1980

ENGINE TEMP (after flight): 225° F

FLIGHT TIME: 7 minutes

AVERAGE CRASH COSTS*: \$39 (boom, flybar x2)

* MSRP of landing gear, main shaft, spindle, flybar, and tailboom.

TEST CONDITIONS

WEATHER: Mostly Sunny

TEMP / HUMIDITY: 100° F / 15%

BAROMETRIC PRESSURE: 29.73 in.

WIND SPEED: 14 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, battery, 50-sized engine, main rotor blades, three matching cyclic servos, throttle servo, gyro, tail servo, governor, fuel, starting equipment

WHO'S IT FOR?

The Outrage Velocity 50 is a great machine for anyone looking for the ultimate in versatility. A beginner can take this helicopter from first flight to 3D with just a few adjustments in the head. Even a pro or expert flyer will find the Velocity 50 has plenty of response and then some.

SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

THE GOOD

- Programmable head
- Prepainted canopy
- Includes a pipe
- Carbon-fiber tail blades are included

THE BAD

- Removing the fuel tank requires splitting the frames
- Canopy grommet locations are off

Lower!!!



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500-Class is poppin' now!

ARK X-500 PRO

ARK Not ARC

WORDS: Dan Goldstein | PHOTOS: Carly Hyndaman & Jason Boulanger

It seems that as the hobby grows larger, there has been an uprising of new companies pushing their line of helicopters. We have seen companies from all areas of the world but more specifically several companies have risen from Asia. Ark is another up and coming company from Asia trying to get their foot in the door by offering affordable helicopters of all class sizes. Ark's new X-500 is a simple and affordable design that can be a hit if the reliability is there as well. We put the X-500 through its paces to see if it can deliver.

» AT A GLANCE

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

FEATURES

The new ARK X-500 Pro features an autorotation tail drive, a dual-pined tail rotor pitch slider, and a frame layout for micro servos.

» MAIN FRAME



SWASH CONTROL: 120° CCPM with machined aluminum bellcranks connecting the two side inputs to the cyclic servos with one pushrod. The center point on the swash is directly connected to the servo.

DESIGN: The airframe sides are constructed from four stamped aluminum pieces. The motor mount is also stamped aluminum. The main shaft bearing blocks are plastic. The battery tray is located on the front of the upper frames and has angle adjustment provisions via four Phillips screws. A dedicated gyro mount is located above the frame's tail boom clamp.

COMPONENT LAYOUT: The battery mounts on an articulated plastic plate forward of the aluminum frames. The motor is mounted under and forward of the main gear. Two CCPM micros servos are mounted forward of the main shaft and stacked horizontally. One CCPM micro servo is mounted vertically aft of the main shaft. The ESC is mounted either ahead of the motor on a lower tray or on the side of one of the lower frames. The receiver mounts to the rear lower plastic tray. The gyro mounts aft of the main shaft on a dedicated platform.

CANOPY: The kit includes a white plastic canopy and tinted windscreen that you must trim to fit. The included graphics sheet is not pre-cut and requires careful cutting with sharp scissors. The canopy attaches to the frame via two stand-offs just aft of the main shaft.

LANDING GEAR: The gear consists of two plastic struts and metal skid pipes. A M1.5 Allen set screw is used to secure the skid pipes into each leg of the struts. CA glue is used to secure the skid caps in place.

I think the elevator needs some sub-trim ...

» DRIVE TRAIN

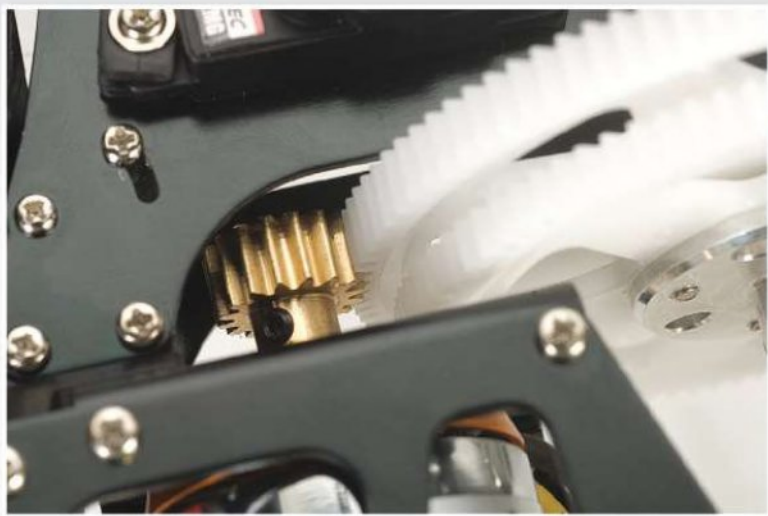
MOTOR MOUNT: The motor is easily adjusted for accurate gear mesh once installed in the frame via two screws. The motor is mounted forward of the main shaft.

PINION: The motor has a 4-mm motor shaft. A 16-tooth, 1.0-module pinion is included.

MAIN GEAR: The plastic main gear is 105-tooth and 1.0-module.

AUTOROTATION DRIVE: The one-way bearing is press-fit into an aluminum sleeve that is screwed to the main gear.

TAIL DRIVE: The tail is belt-driven by a gear assembly that meshes with a second lower gear on the main shaft.



“There is a lot of hidden potential in the X-500, which may prove to be a bargain for some.”

ARC X-500 PRO MODEL SPECIFICATIONS

CLASS:	500 Electric
BUILD:	ARF
BLADE SIZE:	425mm
LEVEL:	Novice to Intern.

FRAME

MATERIAL:	Aluminum
TYPE:	Stacked
SERVO TO SWASH LINKAGE:	Direct
SERVO SIZE:	Micro

ROTOR HEAD

GRIPS:	Plastic
HEAD BLOCK:	Metal
LINKS:	Ball
SWASH:	Metal
CONTROL:	120° CCPM

TAIL

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

GEARING

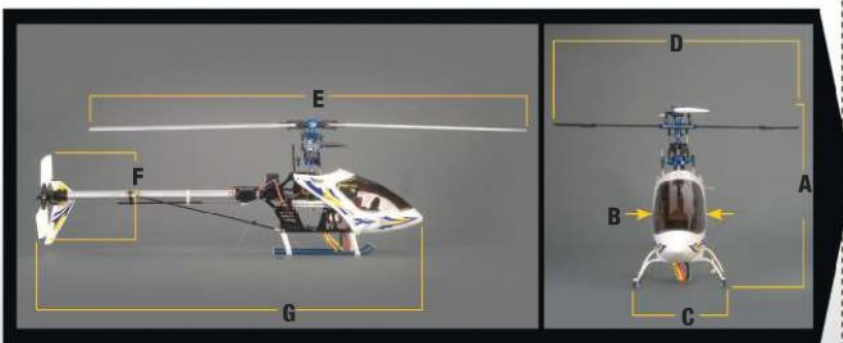
MAIN ROTOR TO PINION RATIO:	1 : 6.56
MAIN ROTOR TO TAIL RATIO:	1 : 5

WEIGHT

EMPTY:	1 lb. 11 oz. (770g)
FULLY LOADED: (Includes battery)	2lb., 13 oz. (1300g)

DIMENSIONS

HEIGHT (A):	11.2 in (285mm)
CANOPY WIDTH (B):	2.25 in (57mm)
LANDING GEAR (C):	5.5 in (140mm)
PADDLE TO PADDLE DIA. (D):	15.7 in (400mm)
MAIN ROTOR (E):	37.2 in (945mm)
TAIL ROTOR (F):	7 in (180mm)
LENGTH (G):	32.2 in (820mm)



FEATURES CONTINUED

» TAIL & BOOM

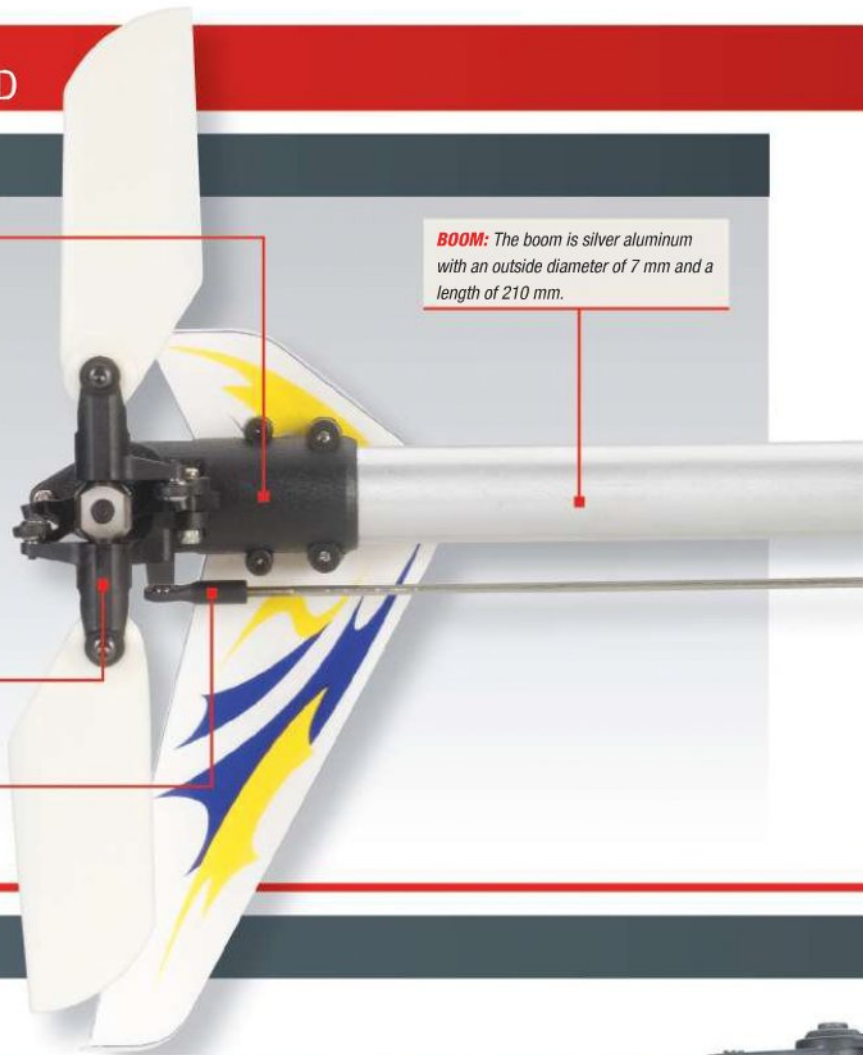
TAIL CASE: The tail case is constructed of plastic.



BOOM: The boom is silver aluminum with an outside diameter of 7 mm and a length of 210 mm.

TAIL BLADE GRIPS: Plastic blade grips contain radial bearings.

PITCH ACTUATOR SYSTEM: All components are supported by bearings. This model utilizes a dual-pin actuator for bind-free control of the pitch slider.



» ROTOR HEAD

HEADBLOCK: The head block is one piece of machined aluminum. It uses a single jesus bolt for attachment.

BELL/HILLER ARMS: The arms are constructed of metal.



PHASING: Phasing is nonadjustable.

WASHOUT ARMS: The washout-arm assembly utilizes an aluminum base and mixing arms with pinned plastic radius arms. Dual radial bearings support each mixing arm.



Belt Drive is always trusty!



» INSTRUCTIONS & BUILDING TIPS

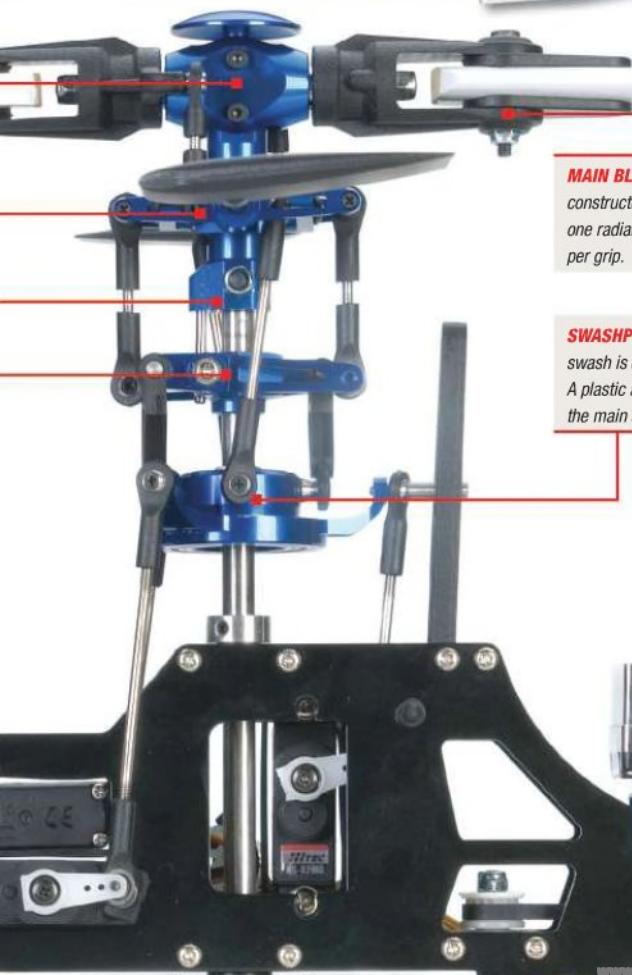
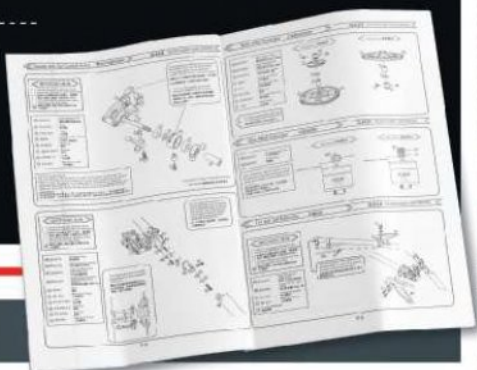
WHEN YOU OPEN THE BOX

This kit comes 85% preassembled from the factory. While it adds a bit of time to the build, I always make it a point to check the factory's work for safety and piece of mind. In doing so, you'll want to make sure to apply thread lock to all metal-to-metal fasteners, ensure that the bearings are all smooth, and check that everything is tightened properly. I did find several key fasteners were lacking thread lock! This kit does not include any electronics.

MANUAL AND BUILD

The included instruction manual is primarily a collection of parts diagrams. If this is your first helicopter, I recommend getting assistance from someone with

more model building experience, since the manual doesn't illustrate or convey the majority of key points required for successful assembly. You'll need to use a high-quality Phillips screwdriver to ensure you don't strip the soft screws. The included wood blades' weight was within .1 of a gram of each other, had identical span-wise center of gravity, and balanced perfectly. Overall, the model went together quite easily with no remarkable hindrances.



MAIN BLADE GRIPS: Main-blade grips are constructed of plastic and are supported by one radial bearing and one thrust bearing per grip.

SWASHPLATE: The 120-degree CCPM swash is constructed of machined aluminum. A plastic antirotation guide is attached aft of the main shaft.

ARC X-500 PRO RTF & TEST GEAR

» TEST GEAR



■ **RADIO:** Futaba 10CH, 10 channel 2.4 GHz radio, \$649.98



■ **RECEIVER:** Futaba R617FS, 7 channel 2.4 GHz rx, 9.8 grams, \$99.95



■ **SERVOs:** Hitec, HS2MG, micro analog servos, 19 grams, \$21.99



■ **SPEED CONTROL:** Tahmazo Pro.C Max6018-3s, 651150053, 60 amp, up to 6S, 49 grams, \$120.60



■ **MOTOR:** BP Ultimate Brushless Motor, U2814-6, 1300kv Outrunner, \$34.95



■ **BATTERY:** Enerland PolyQuest XQ2, 3S1P 2500 30C, 145 grams, \$89.95



■ **GYRO:** Walkera, WK-GX02, 23 grams, heading hold, \$84.95



■ **CHARGER:** Hyperion Duo, 360 watts, 10 amps 2 x 6s, \$270



■ **BLADES:** 425 mm wood blades, included

TESTING

Given the power system that was supplied, this helicopter setup is geared more towards the beginner than the 3D master. Since this helicopter has such a great price tag, it can serve as a great helicopter for newcomers to step up to the plate and use before moving onto a bigger helicopter. So this review will correspond with that setup to see how well-suited it is for the beginner and the capabilities it may have when upgraded. The motor that was used for testing is a smaller 1300 KV BP Hobbies motor that doesn't put out a ton of power but is well-suited for sport flying. The Tahmazo speed controller used a 3S setup rather than the 6S setup typically seen in a 500-sized helicopter.

HOVERING • Overall, this helicopter was pretty solid in a hover. After initial liftoff, I noticed that it wasn't really sensitive, which made it easier to keep it in one spot. The collective was a little jumpy, especially when the wind picked up. It was easy to maintain the hover, but I felt that I had to compensate with the collective more than I really liked to. The helicopter trimmed well and is well-suited for the average Joe to learn hovering orientation.

Rating: 4

FORWARD FLIGHT • The helicopter had a real conservative feel in forward flight and did quite well. After taking it out to a large field, I opened up the flying a bit and began doing several circuits. It felt quite stable and kept a good heading throughout my figure eights. It was able to handle high speeds without any issues and carried itself through turns without losing any momentum. Flying it in heavy winds was a little tricky, but it was very manageable and not impossible unlike other helicopters that are this lightweight. The forward flight experience with the X-500 was quite pleasant.

Rating: 4

CYCLIC PITCH RESPONSE • The stock setup that was supplied with the X-500 made the cyclic speed very soft and not aggressive. It makes sport flying possible with ease, but any kind of 3D flying becomes hard. Keeping the sport flying setup in mind, the cyclic setup is ideal for the helicopter and does a great job being predictable for the learning stages. With lighter paddles and 3D carbon blades, the helicopter opens up quite a bit, and 3D flight then becomes much easier. Even though it is possible to perform flips with the stock setup, it will get your heart pumping until it is completed because of its relative lack of speed.

Rating: 3.5

COLLECTIVE PITCH RESPONSE • With the conservative power setup, there wasn't a whole lot of collective authority. It can be hard to manage at times because the collective isn't always there when needed even in basic flight. When flying around the helicopter performed well with a higher head speed, but don't count on doing any collective intensive maneuvers with it. A larger motor will help the collective authority, but understand that the motor mount area is on the small side, which limits possible power combination setups. Though it wasn't its strongest point, the X-500 does have potential to have respectable collective authority.

Rating: 3.5

TAIL ROTOR RESPONSE • The tail didn't do all that bad in basic flight and always managed to hold its ground. There were wags every once in a while, but we were able to overcome some initial deficiencies by adjusting the gyro. The Walkera gyro isn't a top-of-the-line gyro by any means; however it did its job well, holding the tail steady throughout several flying orientations.

The X-500 uses a common belt design that allows the tail to be more durable when beginning to upgrade their setup.

Rating: 3.5

AUTOROTATION CAPABILITIES • The X-500 actually performed quite well in autos. With the 500 class helicopters, you never know what you're going to get when it comes to autorotation performance. However, even with the wood blades, the X-500 was very manageable throughout the entire autorotation. There isn't a large amount of head speed during the flare, but there is enough to perform a basic high altitude auto and land it smoothly. I am happy to report that I was able to perform several autos without any issue whatsoever.

Rating: 4

POSTFLIGHT INSPECTION • We logged several flights on the X-500 while mostly performing basic sport-type flying and very moderate 3D. The helicopter held up without any problems and proved to be a fun little daily flyer at the field. With regular inspections after each day of flying I was



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Align
Muscle Pipe
Thunder Tiger
Zimmerman



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

Starting Systems

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Batteries
Battery holders



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

Batteries

Lipo
Lipo Tx Batteries
NiCd
NimH



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Hobbico
Align
Futaba



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SAB
Align
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MAH
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What sets the Voltmagic apart from other voltage monitors is it's ability to tell you what your lowest voltage was on your last flight, which is the most important information a voltage monitor can give you. It is customizable for your needs, whether you are using a 4 cell NiCd or a 2S Lipo. 20 voltage ranges to choose from.

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TESTING SPECS

ARC X-500 PRO

Part #: ARK-5001
Distributor: BP Hobbies LLC
Web: www.bphobbies.com

Street Price: \$175
Price as Tested: \$1,614
Build/Setup Time: 2.5 hours

PERFORMANCE

MODE FLOWN: Normal, Idle Up 1 and 2

RPM OF EACH MODE: Normal: 2000
 Idle Up 1: 2100
 Idle Up 2: 2150

MOTOR TEMP (after flight): 130° F

BATTERY TEMP (after flight): 110° F

FLIGHT TIME: 5 minutes

AVERAGE CRASH COSTS*: \$23

* MSRP of landing gear, main shaft, spindle, flybar, and tailboom.

TEST CONDITIONS

WEATHER: Sunny
TEMP / HUMIDITY: 70° F / 67%
BAROMETRIC PRESSURE: 29.89 in.
WIND SPEED: 5 mph
VISIBILITY: 10 miles
ALTITUDE: 56 feet

PITCH CURVES

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

REQUIRED TO FLY

Radio transmitter, receiver, gyro, battery, battery charger

WHO'S IT FOR?

The ARK X500 is a great little helicopter for the beginner that is looking for a stable mild but larger helicopter.

SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

THE GOOD

- Assembles quickly
- Inexpensive kit and parts
- Solid performer

THE BAD

- Thread lock not thoroughly applied by factory
- Tail pitch slider can disengage at extreme servo throws
- Limited battery size fits

able to stay on top of any problem that might have arisen after long-term abuse on the helicopter.

Rating: 4

CONCLUSION

There is a lot of hidden potential in the X-500, which may prove to be a bargain for some. Even though it is geared towards the beginner market, it may be seen as a value for the more advanced pilot to test out different power systems. Though we never ran a power-intensive setup on the helicopter, we are pleased to report that the helicopter is more than suited for a beginner who is trying to find a great bargain helicopter. Once we have more time with the helicopter, we will be able to test other power systems in it and see how well it holds up to harder flying and long-term abuse. Despite its minor flaws, the X-500 has the potential to be another hit bargain helicopter on the market, but only time will tell. *TRE*





Main Rotor: 37.5 in
Length: 32 in
Weight: 26 oz

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- Control system AVCS (Angular Vector Control System) designed for model helicopters
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Palm RTF Coaxial Helicopter (Double Blades)
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CHALLENGES OF VERTICAL FLIGHT

How model designers still strive to overcome them today.

WORDS: Art Koral | ILLUSTRATIONS: Dave Palacios

IN THE EARLY 1900S, ACHIEVING VERTICAL FLIGHT WAS NO SIMPLE TASK. At the time only steam engines were available, and no one really knew for sure how to control a vertical-flight aircraft. Five primary challenges had to be addressed in order to make helicopters a reality: understanding the aerodynamics of vertical flight; developing a suitable engine; reducing structural weight; counteracting rotor torque; and providing stability and control.

The birth of the helicopter came as a result of overcoming these challenges. Those challenges still exist today in designing both full-scale helicopters and RC helicopters alike. Though achieving vertical flight has become relatively straightforward, ideal performance continues to be coveted. In this Heli IQ we will discuss how inventors overcame these challenges and how model designers today still face these challenges as they strive for ideal performance.

UNDERSTANDING THE AERODYNAMICS OF VERTICAL FLIGHT

Before modern rotary-wing theory developed in the early 20th century, early experimenters were guided by intuition more than anything else. The use of intuition can be evidenced as early as 400 B.C. with the invention of the Chinese top. It was believed these tops were invented by observing the whirling motion of seeds falling from trees. The seeds' auto-rotative nature allowed them to be carried far by winds. Intuition guided Leonardo da Vinci to draft a vertical flight aircraft concept with his famous aerial screw. Thomas Edison went a few steps beyond intuition to conduct blade performance testing using an electric motor mounted to a rotor to analyze the power required to achieve vertical flight. It wasn't until the early 1900s that a true understanding of rotary-wing flight started to develop using more descriptive mathematical models.

The design of RC helicopters and their advancement is similar to the early development of helicopters. RC helicopter design has evolved by intuition and iteration. Each year, manufacturers such as ALIGN and Thunder Tiger improve their products with upgraded airframes, blades, and electronics. In the case of blades, designers look to make blades perform better by increasing their delivered thrust during hard maneuvers, eliminating flutter, and reducing servo load.



1483:
Leonardo da
Vinci's aerial
screw

The Chinese top



(A) The new EDGE flybarless blades have been designed specifically for flybarless applications balanced perfectly across the feathering axis.

(B) The CY stick bangers are designed with low inertia for fast cyclic response.

(C) The wide-chord Mavrikk G5 blade is designed with thin blade tips to reduce profile drag. A wide chord is used to allow high pitch angles without stalling. The blades are also very light, which reduces inertial loads.



Spin it like a helicopter.

» DEVELOPING A SUITABLE ENGINE

Before the 20th century, a small, powerful motor was not available. With the advent of the steam engine, power was not so much an issue; however, weight certainly was. In 1840 W.H. Phillips built the first self-powered unmanned helicopter that used steam. Phillips' aircraft was significant because it didn't use stored energy such as bowstrings to deliver power, but the overall weight-to-power ratio of steam engines made sustained flight impossible.

Model-engine designers continue to improve engines to provide maximum horsepower at the lightest weight. Due to innovations in the past five years such as lithium batteries and brushless motors, electric flight now offers remarkable horsepower with sufficient flight endurance; a combination that will satisfy the needs of every model enthusiast.



In 1878, Enrico Forlanini built a steam-powered model that was able to fly for 20 seconds at a height of 40 feet.

The Neu 1706 motor can deliver more than **1.5 hp** at only 160 grams.

The O.S. Engines .91HZ-PS F3C/3D competition helicopter engine weighs only 635 grams and delivers an impressive 3.4 hp.



COUNTERACTING ROTOR TORQUE

Due to the action-reaction laws of physics, whenever you apply a torque to a rotating object a counter-torque is experienced. Helicopters are unfortunately burdened with these laws. Early designs consisted of two counter-rotating blades. Inventors probably believed that counter-rotators would be the most efficient way to counter torque with the least impact to flight endurance. *Note: Research has demonstrated that all flight efficiencies gained by two or more rotors are offset by aerodynamic mixing and transmission losses. There are other advantages to counter-rotators such as hovering in wind, stability, and ground clearance.*



In 1907, the Paul Cornu helicopter may have been the first tethered man-powered machine. It used counter-rotating rotors to eliminate torque.



Breaking with traditional thought, Igor Sikorsky designed a helicopter with a tail rotor. Unfortunately a suitable motor was not available at the time to make it fly.

REDUCING STRUCTURAL WEIGHT

The first internal combustion motors were made of heavy cast iron. Early rotor blades and fuselages were built of canvas and wood and had very low structural strength, and aluminum was not commercially available until 1890. Helicopters have become relatively stronger with reduced weights as time passes. The introduction of aluminum, plastics, and composites such as fiberglass, carbon fiber, and Kevlar has allowed enormous gains in structural strength while decreasing gross weight.

Unlike full-scale helicopters, model helicopters have evolved rapidly in their structural designs. They can be flown without significant safety margins being built into them since there is no human occupancy. Most model helicopters on the market incorporate carbon fiber, plastic, or light-weight aluminum in their construction. Due to the rapid improvement in kit design and materials, they have evolved to be able to handle the most demanding 3D maneuvers without failure.



The MSHeli Protos is the lightest in its class thanks to a light canopy, frame, and head assembly.

JR Z9100T

Torque: 300 oz/in @ 4.8v
370 oz/in @ 6v

Width: .83in

Length: 1.59in

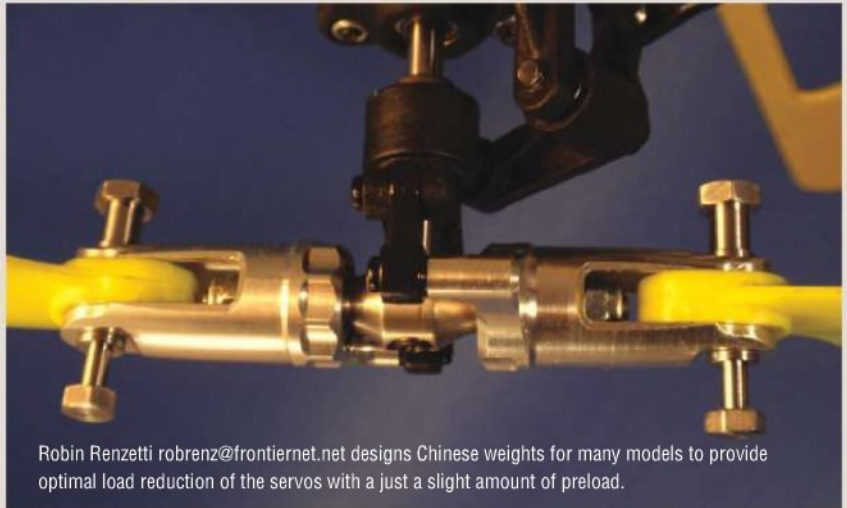
Height: 1.57in

Weight: 2.36oz



Da Vinci had it down, if only he could see helicopters today.

Model designers still struggle with overcoming torque. RC helicopters operate at a within a range of RPMs and servo loading. During hard 3D maneuvers, piro consistency may falter due to changes in torque and aerodynamic interference. And it seems the smaller the helicopter, the harder it is to lock in the tail. Designers strive for optimum tail-rotor blade design and speed ratios. Advances in servo capability and gyros have significantly improved the performance of models, and the recent introduction of Chinese weights has provided reduced servo loading and increasing tail-holding power.



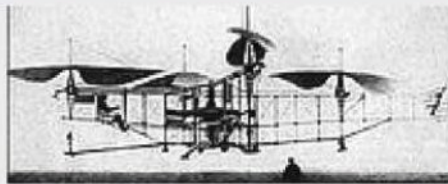
Robin Renzetti robrenz@frontiernet.net designs Chinese weights for many models to provide optimal load reduction of the servos with a just a slight amount of preload.

PROVIDING STABILITY AND CONTROL

Before the 1900s, very little knowledge of how to provide stability and control existed. Some of the first untethered helicopters used quad-rotor designs. Differential collective pitch was used for control. Igor Sikorsky was one of the first inventors to develop the idea of cyclic control and the use of a swash plate. He also designed one of the first single-rotor helicopters.

Early helicopters also lacked stability. Luckily, Arthur Young invented the Bell stabilizer bar and Stanley Hiller Jr. invented the Rotomatic flybar. The flybar was an innovative solution that offered stability without negatively impacting maneuverability. And now many modern helicopters incorporate electronic-stability systems using gyros and servos to augment control inputs.

RC helicopter designers strive to improve stability and agility. Flybars have evolved in design to offer complete tuneability for the beginner or advanced modeler. And now the emergence of flybarless technologies is leading the way for ultimate stability and control without a decrease in agility. The flybar may someday become obsolete.



In 1924, the FAI awarded Etienne Oehmichen a prize for his quad-rotor machine for flying a 1 km pattern carrying a 410 pound payload. This was one of the first controlled free-flight helicopters.



Igor Sikorsky's V-300 pioneered the single-rotor concept with cyclic and collective pitch for control and a tail rotor used for yaw.



The Bell-Hiller flybar is still used today on RC helicopters. The Aurora's flybar offers some of the most precise tuning available.



Flybarless heads are much simpler in design. The complexity is in the electronics.

THE CHALLENGES WILL CONTINUE

The challenges of designing the perfect helicopter still exist today. Blade designers continue to look for ways to improve aerodynamics for increased performance, maneuverability and endurance. Motor engineers strive for creating the lightest, most powerful and efficient motor they can. Air frames are continuously being improved with fewer, stronger and lighter components. And, the race for the best Flybarless system is now underway. The push to design the optimum model helicopter is part of what makes this hobby so much fun. As a hobbyist we want the latest invention that overcomes the challenges of vertical flight in the best way. *TBL*

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BASIC FLIPS

This is a flip not a loop.

WORDS: Brandon Updike | PHOTOS: Carl Hyndman

ANY 3D PILOT WILL TELL YOU THAT THE FIRST TIME YOU ATTEMPT A MANEUVER WILL PERHAPS BE ONE OF THE MOST NERVE-WRACKING EVENTS IN YOUR HELI CAREER. However, we all have to start somewhere, and for the most part we all start with a basic flip. We've all been there – practicing on the sim for hours then applying what you have worked so hard for in real life. The flip is an easy maneuver that makes it a great move to open the door to 3D flying. The hardest part is gaining enough courage and doing it. But once you successfully pull off your first flip, you'll find yourself addicted and trying to expand your flight catalog with even greater variety. In this Flight Skills, we'll give you a step-by-step on how to do a flip.

When done right it looks like a coin flip.

THE BREAKDOWN: FORWARD FLIP



START

1 Fly your helicopter into a stationary tail in hover (make it around 100 feet in the air in case you get in trouble).

2 Once level, add a positive collective input simultaneously with a forward cyclic input. Make sure your forward cyclic input is as straight as possible.

3 When your blade disc begins tilting toward the ground, begin dropping your collective stick toward the center at an easy rate.



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.

TIPS AND TRICKS:

- Remember to keep your flip as straight as possible.
- Time your collective properly with the flips, or you'll end up bogging your motor.
- Have decent cyclic speeds, or it will be very hard to perform.
- Make sure you have your helicopter set up with an even pitch range.
- Check to see that your clunk line doesn't bind when inverted.

WATCH OUT FOR:

- **WATCH YOUR ANGLE** – always be ready to make the proper corrections.
- **IF THE TIMING ON YOUR COLLECTIVE IS A LITTLE OFF**, it can result in disaster. Don't apply collective too early, and don't apply it too late – or you might crash straight into the ground.
- **PAY CAREFUL ATTENTION** to how your tail will react when under a load; be sure to take the proper steps in ensuring that your tail is set up properly.



4 Once your helicopter is inverted, drop your collective stick towards the negative area until your helicopter begins to create lift once again.



5 Now add a quick negative collective input timed simultaneously with a forward cyclic input to bring your helicopter back into an upright orientation.

Once your helicopter is upright, center your collective stick, and ease it back into a hover.



CORRECTION FACTOR

Make any proper corrections. (When the skids are facing you, right tail input moves your nose to the right and left tail moves the nose to the left.)

Make any necessary corrections when your helicopter is inverted. Remember, it will be in the nose-in orientation. Forward cyclic input raises your nose, back input drops it, left cyclic moves it to the right, and right cyclic moves it to the left. Right rudder input moves your nose to the right, and left input moves it to the left.

CONCLUSION

After you have mastered the flip, you'll be able to enjoy endless opportunities in 3D flight. This is just the first step that will get your foot in the door. It will be nerve-racking the first time you try it, but once you get it down, it will become second nature. Good luck, and have fun. **TRH**

JACKKNIFE

That's not a knife... this is a knife.

WORDS: Brandon Updike | **PHOTOS:** Carl Hyndman

JACKKNIFING IS THE ACCIDENTAL FOLDING OF AN ARTICULATED VEHICLE OR A VEHICLE PULLING A TRAILER. This is usually caused by the brakes slamming, which causes the trailer to whip out from the back. In the RC heli world we have our very own jackknife, which consists of the helicopter flying in a tweaked knife-edge orientation that resembles the folding of a truck. Jason Krause invented it many years ago, and many pilots have added it to their routines since. When performed to perfection, it is one of the most impressive maneuvers in the hobby because it takes up a large amount of space with grace.

THE BREAKDOWN: JACKKNIFE

6 Hold it for as long as possible, and right before you're about to hit the ground, catch the helicopter with a right cyclic input and negative collective input so you're in the inverted orientation. Continue with business as usual.

5 Once in a knife-edge position, center the collective so your helicopter flies as long as possible in that orientation.



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.

HOW TO PREPARE FOR IT:

- Work on your forward flight because your ability to get large amounts of speed is key to performing this move flawlessly. Speed is absolutely everything during the maneuver.
- Be comfortable with quick rolls and holding your helicopter in a knife-edge position. A good way to practice this is performing a four-point roll while flying with large amounts of speed and seeing how long you can hold the knife-edge orientation.

- Work on adding a quick left-tail input and a quick right-cyclic input at the same time on the bench.
- Be able to perform a good stall turn first to help you build up large amounts of speed.

WATCH OUT FOR:

- **WATCH YOUR SPEED;** the faster you go, the better it will look.
- **WATCH THE ANGLE ON YOUR TAIL.** If you put too much of an angle on your tail, your helicopter will just merely fall out of the sky. You want to put just enough of an angle so you can easily distinguish that the knife-edge is a little tweaked.
- **TIME YOUR COLLECTIVE** when you pop into the knife-edge; don't forget to drop it back down to center stick. This will allow the helicopter to hang all the way down the runway.
- **DON'T LEAVE IT** in the jackknife position for too long because you might be unable to save it in time. Once you get better, you'll find yourself pushing it to the very last second possible.
- **LIKE EVERYTHING ELSE,** it's all about the timing, so work on your timing high in the sky before you decide to bring it low above the runway.

4 This part is instrumental: You'll need to pop a quick right cyclic, positive collective and left-tail movement simultaneously until your helicopter corkscrews in a knife-edge position.

START

1 Fly your helicopter into a stall turn as high as you can go to gain as much speed as possible on your descent.

2 When descending, pull into forward flight as seamlessly as possible while keeping your nose down to maintain your speed.

3 Build as much speed as you possibly can until you get to the left-center area of the field.

CONCLUSION

The jackknife is an oldie but goodie. It looks easy on paper, but when you first attempt it you quickly realize that it is actually a little tricky. Timing the three inputs all at once can be hard, but once they are timed perfectly, you'll be performing jackknives that will fly half the length of the runway. It is a move not seen too often anymore, but it is still one of the best-looking maneuvers in the 3D world. I think it is due for a comeback! **THL**



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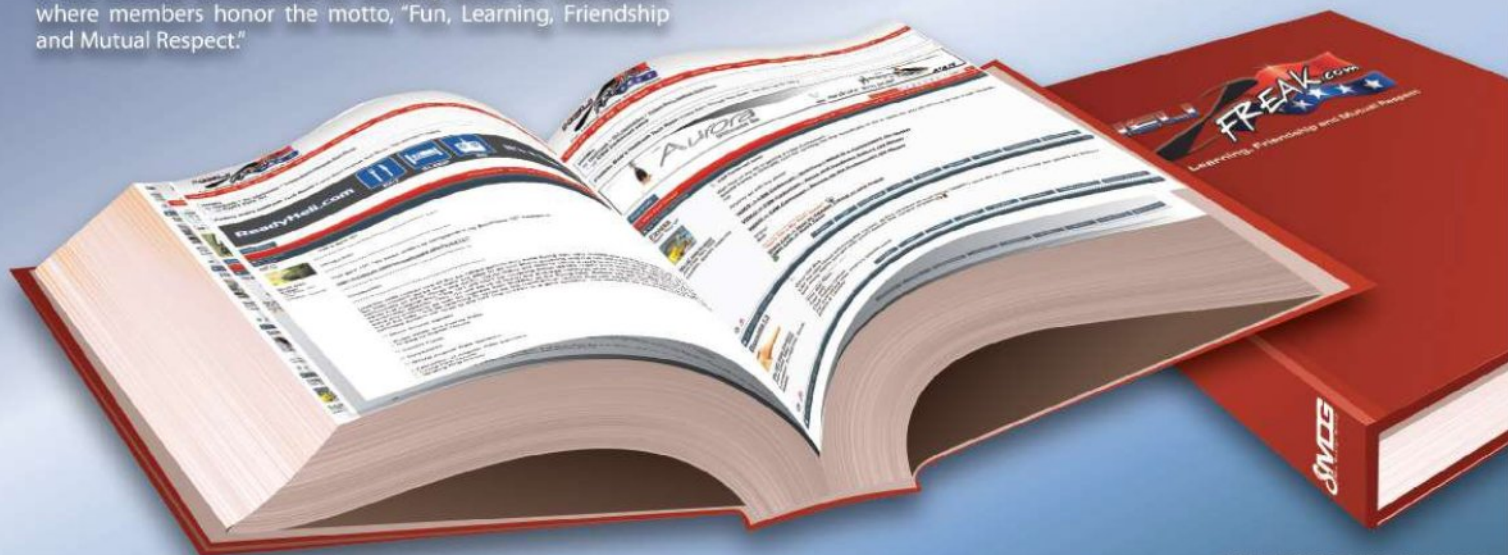
en-sahy-kluh-free-key-uh

—noun

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4. the ultimate atmosphere for learning about RC helicopters, where members honor the motto, "Fun, Learning, Friendship and Mutual Respect."



Fun, Learning, Friendship and Mutual Respect



It's like Star Wars in fast forward.



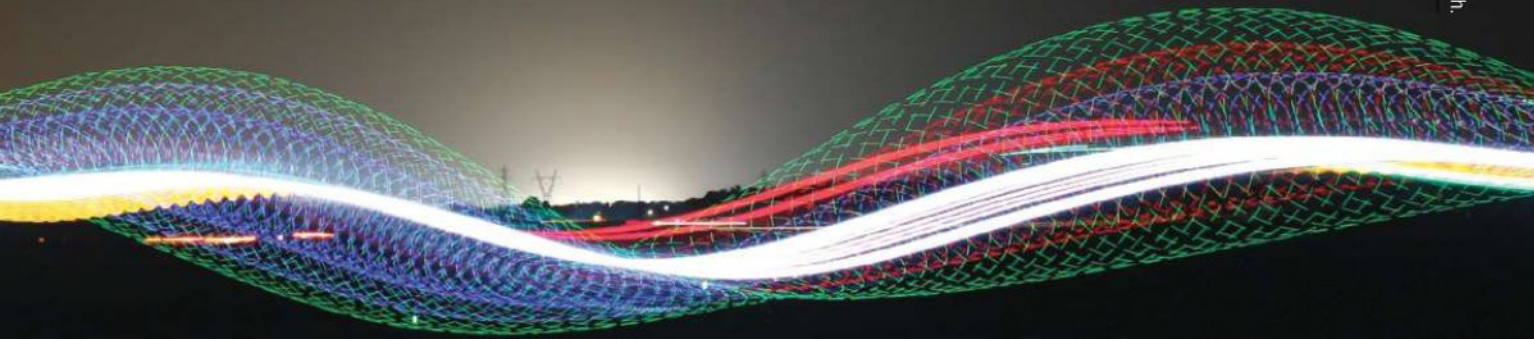
LIGHT UP THE NIGHT SKY

Saturday night at IRCHA saw some of the best flying you'll ever see in the dark.

Photo: Mark Fadely



Those are stars up high.



Yes there is a propeller for boosting forward flight speed.



SPECS

CREW: 2 pilots: 1 pilot, 1 copilot/gunner
LENGTH: 54 ft 8 in (16.66 m)
ROTOR DIAMETER: 51 ft 3 in (15.62 m)
HEIGHT: 13 ft 8.5 in (4.18 m)
EMPTY WT: 12,215 lb (5,540 kg)
LOADED WT: 18,300 lb (8,300 kg)
MAX TAKEOFF WT: 25,880 lb (11,740 kg)
POWERPLANT: 1x General Electric T64-GE-16 turboshaft, 3,925 shp (2,930 kW)

PERFORMANCE

MAX SPEED: 212 kn (244mph, 393km/h)
CRUISE SPEED: 195kn (225mph, 362km/h)
RANGE: 1,063 nmi (1,225 mi, 1,971 km)
SERVICE CEILING: 20,000 ft (6,100 m)
RATE OF CLIMB: 3,000 ft/min (15.23 m/s)

ARMAMENT

GUNS:

- 1 nose turret with either an M129 40-mm (1.57-in) grenade launcher or an XM196 7.62x51-mm machine gun and
- 1 belly turret with an XM140 30-mm (1.18-in) cannon

HARD POINTS: 6
ROCKETS: 2.75-in (70 mm) FFA rockets
MISSILES: BGM-71 TOW missiles

AH-56 Cheyenne

With rear thrusting rotor

WORDS: Brandon Updike

BACKGROUND

Like many other full-size helicopters in the past, the AH-56 was solely designed to meet Army requirements. The Army needed a fast and heavily armed helicopter for an escort and attack role. The Cheyenne was uniquely designed with an innovative tail and wings to give it more of an airplane look rather than that of a true helicopter. It was developed for the Army's Advanced Aerial Fire Support System competition. Lockheed Martin Corporation penned the initial design and submitted its design plans to the Army. Sikorsky Aircraft Corporation was the only other company to give Lockheed a little competition, as it designed a similar thrusting-tail system. In the end, the Army selected Lockheed to begin building prototype models for testing. Testing began with two prototype models and some problems, which were quickly addressed. The demonstration were rather impressive, as the Cheyenne proved to be able to speed up and slow down without pitching the nose thanks to its innovative tail design. The Army was so impressed it decided to award Lockheed

a contract for 375 models to enter service by 1972. However, the project hit a speed bump when one of prototype models crashed when the rotor struck the fuselage, resulting in the death of the test pilot. The investigation found that there were excessive pilot-induced oscillations that caused the rotor to strike the helicopter. Lockheed addressed the problem but struggled when more problems arose. It began falling behind on its timeline, and ultimately the Army ended the contract and halted production of the AH-56.

FEATURES

The Cheyenne was called a compound helicopter because of the way its design integrates both helicopters and fixed-wing aircraft. The first thing you'll notice is the uniquely designed tail system that allows you to thrust the aircraft forward. There is a pusher propeller to the rear of the helicopter that allows for thrust and a typical tail rotor to maintain tail stability. There is also a wing that can improve forward flight and relieve some of the lift load from the actual main rotor itself. The main rotor is a rigid rotor head and

provides extra stability. With this system, the Cheyenne is able to reach speeds of 200 knots. The helicopter is heavily armed, as it has gun locations under the belly and the nose. There are six hard points located on the underside of the wings that are used to fire several types of missiles.

CONCLUSION

The AH-56 is another innovative design in history that failed to really pick up steam and become a success. Now all that is left is four prototype models that are all on display in various areas throughout the country. Even though the Cheyenne never gained ground, there are still design plans for a thrusting-tail design on helicopters today. The X-49 developed by Piasecki Aircraft Corporation on a Blackhawk airframe uses many of the same concepts of the Cheyenne. It is currently being tested for the Army to see if it can be useful in modern warfare. Even by today's standards, the Cheyenne remains an example of clever engineering and thinking outside of the box to achieve an innovative helicopter design. **THI**



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0.95oz(27g)



0.95oz(27g)

SoloPro



210A packed with aluminum case

Features

- Includes everything needed to fly there's nothing extra to buy
- 100% factory-assembled, test-flown and ready-to-fly
- 4-channel transmitter equipped with 2.4GHz
- Flight time 8 minutes
- Recharge time 30 minutes
- Innovative airframe design and electronic components offer incredible durability and precise control for excellent maneuverability
- Coaxial, counter-rotating rotor head design for unsurpassed stability and easy to flight

Model No: NE R/C 210A

Weight: 0.95oz(27g)

Rotor Diameter: 7.40"(188mm)

Power System: Φ6mm Motor X 2pcs

Overall Length: 8.39"(213mm)

Battery: 1-cell 3.7V 110mAh Li-PO

LATEST 2.4GHz
Invention Patent Transmitter



Allow Mode convertible only by Antenna

2009 New Products

The latest invention real fixed-wing airplane very suitable for beginner



2.4GHz 4CH

Size:450x500x150mm
Wingspan:500mm
Weight:80g Motor:N120
Battery:7.4v,250mAh
Flight time:8-10 minutes
Flight distance:300-350m



2.4GHz 3CH

Size:380x500x90mm
Wingspan:500mm
Weight:65g Motor:N60
Battery:7.4v,200mAh
Flight time:8-10 minutes
Flight distance:300-350m



2.4GHz 4CH

Overall Length:355mm
Rotor Diameter:380mm
Weight:185g
Battery:7.4v,600mAh,
10C Li-PO battery
Power System:180 motor,N30



Patented product(s), counterfeiting not allowed

Patented No.
ZL 2008 2 0057528.2
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FAST FORWARD

Break Away from the Ultra-Micro™ Heli Pack
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BLADE[®] mSR

Blade, the #1 name in electric heli excitement, introduces the incredibly fast and agile Blade mSR. Weighing less than an ounce, but boasting the speed and agility of a much larger machine, the fixed-pitch single-rotor Blade mSR is just as at home zipping around the backyard in a light breeze as it is cruising around the living room.

At the heart of the Blade mSR's spine-tingling performance is a unique Bell-Hiller rotor head design that provides the kind of responsiveness you would expect of a single-rotor heli but with a

measure of positive stability similar to a coaxial heli. This blend of agility and stability makes it the ideal "next step" for someone ready to move beyond a coaxial heli, such as the Blade CX3 or Blade mCX.

Go to E-fliteRC.com right now and take the interactive Blade mSR tour. Not only will you get details on the technology going into this groundbreaking little heli, but you'll get to see video of it in action as well.

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HORIZON

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