

« Can This Device Make All Your Servos "SUPER?" »

RC Heli

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Air It Out!

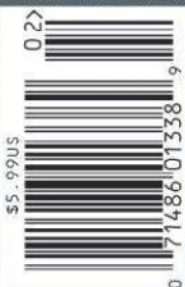
**THUNDER TIGER
RAPTOR 2.4G SC**
DEFINES READY-TO-FLY NITRO

IMPROVE YOUR SKILLS:

- Solve Heat Issues
- Replace a Clutch Liner
- Fly Cuban 8's
- Conquer The Wall of Death
- Figure Out Yaw Control



FEBRUARY 2010 / ISSUE 43



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TREX 450 SPORT

**HIROBO
SDX 50 SWM
GOES LONG!**

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DS0606
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TAS6010D
 2.4GHz 6CH Receiver



PRD-39H (R)
 Powerful helicopter engine

The Raptor 30 2.4GHz Ready-To-Fly

Specifications:

Full length of fuselage:	45.27"
Full width of fuselage:	5.51"
Total height:	15.75"
Main rotor diameter:	49.00"
Tail rotor diameter:	9.3"
Gear ratio:	1:9.55:4.57
Full equipped weight:	6.6 lbs.

Ask your local dealer for TTR4839-F08

FEATURES:

- 2.4GHz 6CH radio programmable system with pitch control, idle up, and throttle hold
- iFHSS: Frequency Hopping Spread Spectrum
- 8 model memory radio
- Head locking gyro
- High speed tail servo
- High performance .39H engine
- Complete line of optional parts available



"Whether you're a season pilot or just considering getting started in the fun world of radio control helicopters, the complete Ready-to-Fly Raptor 30 2.4GHz will enable you to learn orientation and 3D Aerobatics. Make sure your next flight is a success with a proven helicopter that will perform each and every flight."

Jeff Fassbinder
 Marketing/Sales Manager
 ACE Hobby Inc.



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Size: 1.57"x0.79"x1.52" Weight: 2.15 oz

BL 9088

BL 9080

7.4 VOLT RATED
(2 CELL LIPOS)

BL 9088 TAIL Servo 760/560Hz

Speed / Torque

6.0 v : 0.05 / 63.48 oz

7.4 v : 0.04 / 78.53 oz

8.4 v : 0.03 / 91.64 oz

BL 9080 CYCLIC Servo

Speed / Torque

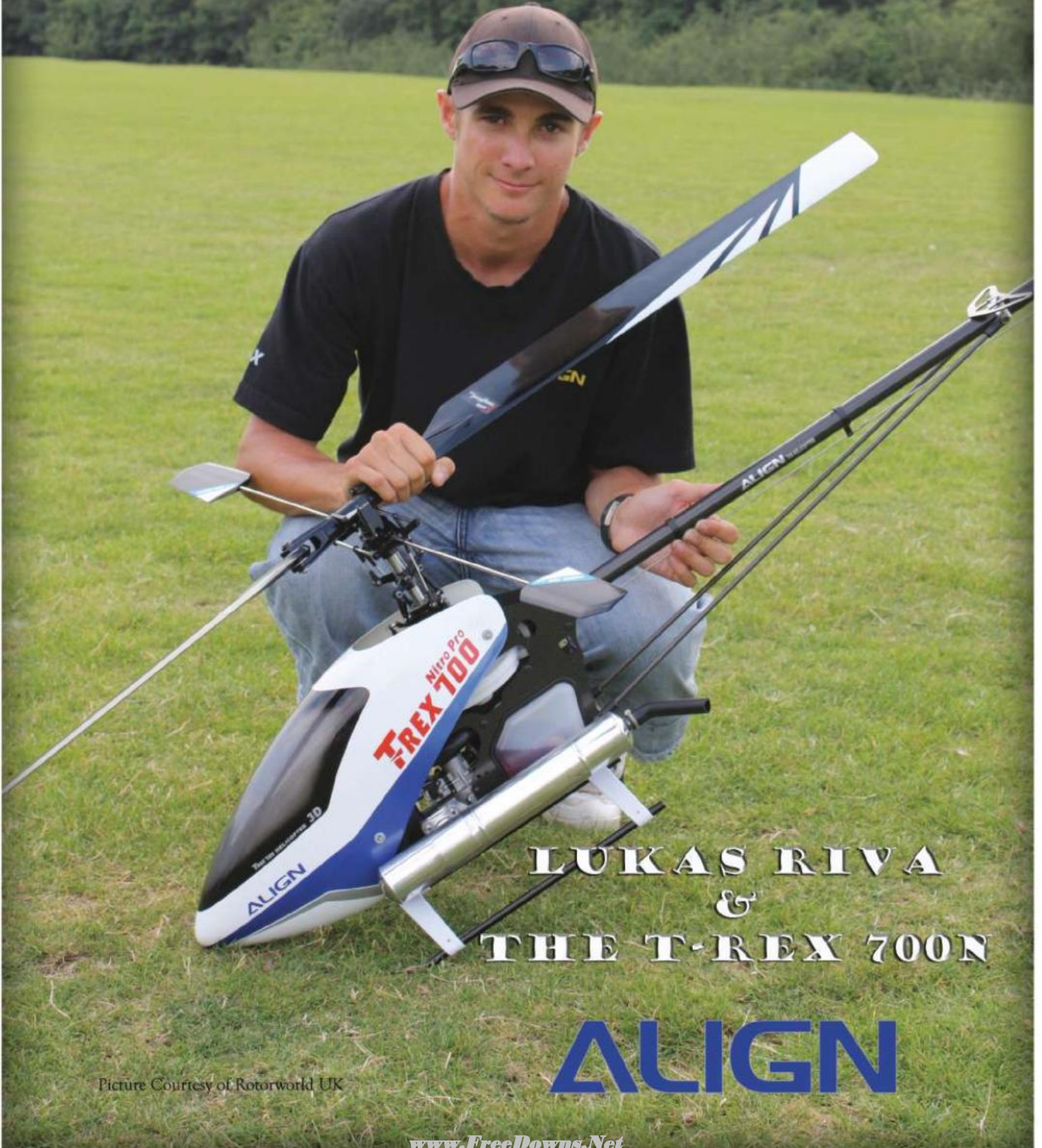
6.0 v : 0.07 / 88.32 oz

7.4 v : 0.06 / 112.35 oz

8.4 v : 0.05 / 132.86 oz

3D MASTERS 2008™

CONGRATULATIONS
TO OUR CHAMPIONS



LUKAS RIVA
&
THE T-REX 700N

ALIGN

Picture Courtesy of Rotorworld UK



JK
Designed by:
Jason Krause

ALIGN

TREX 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 unequalled cooling and horsepower.
- ★ New main gear with one-way bearing design for high torque.
- ★ Ready to fly weight (no fuel) is an incredible 4.2Kg.

Specifications:

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



ASSURANCE

RC distributor

www.alignrcusa.com

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WHAT POWERS YOUR EXCITEMENT?



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

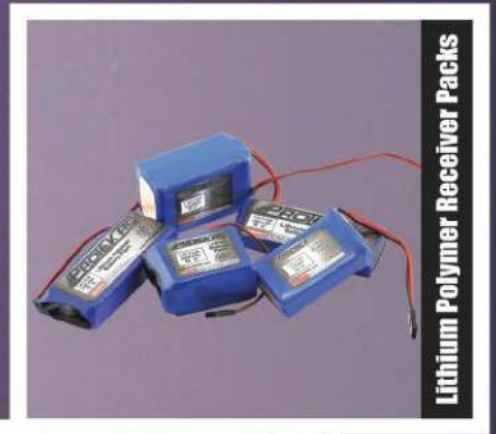
**CRASH PROTECTION
GUARANTEE**
50% Off Replacement
Battery Pack



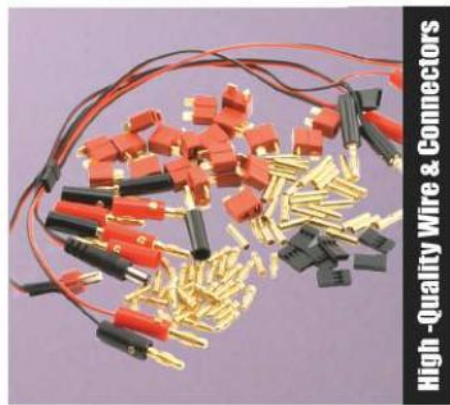
All ProTek R/C Lithium Polymer and Nickel-Metal Hydride batteries are tested in our product lab to ensure accurate "C" Rating, capacity and performance.



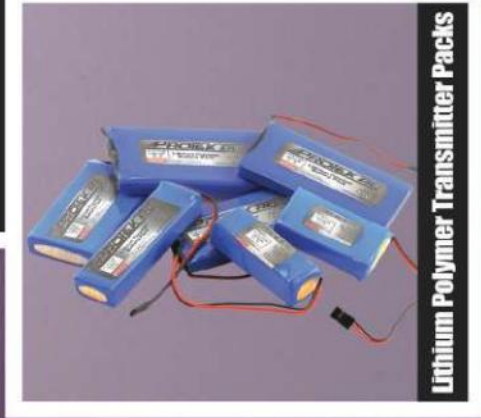
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It NEVER HAPPENED

THIS ISSUE OF RC HELI THAT YOU'RE CURRENTLY READING IS THE FEBRUARY '10 ISSUE, BUT THE PREVIOUS ISSUE WAS THE DECEMBER '09 ISSUE. You didn't miss anything; we skipped an issue. Let me explain. During the second half of 2009 we made a few production changes. With the economy the way it's been, we decided to push deadlines and looked to trim production costs, rather than lay anyone off. Some of these production changes caused some unplanned delays, which put our production calendar further and further behind. In the November issue I addressed this in my editorial. Well, that change in when you would expect a magazine on the newsstand and in your mailbox caused even more problems than we expected (yes, I've been doing this for 15 years now) with newsstand sales and subscribers complaining of not receiving a magazine when they believed they should have. Skipping an issue dated January allows us to get back on track so that you can purchase an issue, or get your subscription issue, BEFORE the issue month, the way it's been for years and the way it should be. Subscribers, don't fret; you won't be shorted an issue in your subscription. We already have adjusted our records to ensure that you receive ALL the issues you signed up and paid for. Please accept my sincerest apology for any confusion this change caused. The new year will bring some pretty exciting things for RC Heli's readers: new articles, a new website, new columns, new shirts and apparel, and lots more will greet you in the months ahead. Thanks for reading and helping to make RC Heli the best RC helicopter magazine around!

Issue Notes

This issue is jam-packed with new product tests for the new year! Chuck Bassini comes through again with the most complete radio review you'll find anywhere as he puts the Futaba 8FGH to the test. He also uses his expertise to test a new device that promises to make your servos faster than they are now. Thunder Tiger's newest offering is a nitro kit that comes "almost" ready-to-fly and can have you up in the air in about 30 minutes. Go behind the scenes at the world's biggest RC helicopter store. Get the long-term report on the Hirobo SDX; replace your clutch liners; and much, much more.



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

Mike's also a firefighter.

CHATTER BOX

IF YOU COULD SKIP ANY SINGLE MONTH, WHICH ONE WOULD IT BE?



MIKE VELEZ - Publisher/Editor-in-Chief
 From this point I'd skip July. That's my birthday month and I guess I wouldn't be getting any older if it weren't on the calendar.



RYAN KEPHART - Associate Editor
 I would skip June, the weather is hot and I rather put more clothes on then take clothes off. BigMan Syndrome!



BRANDON UPDIKE - Editorial Assistant
 I love all the months and I wouldn't skip a single one.



JIM INNES - Editor-At-Large
 January - its very cold in Utah during that month. But, my anniversary and daughter's birthday are also in January, so I probably should keep the month on my calendar.



SHAWN KITCHEN - Editor-At-Large
 January. It's past the holidays, it's too cold to do anything, and it only serves to remind me that I can't enjoy flying helis or riding motorcycles.



CHUCK BASSANI - Contributor
 February - because its too damn cold to fly. Oh wait, that's December and January also.



ART KORAL - Contributor
 November, everyone waits till the end of the year and it's always jump through your rear time to catch up.

ART & PHOTOGRAPHY

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

CONTRIBUTING WRITERS:

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

PRODUCTION/ADVERTISING

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

CHANGE OF ADDRESS & SUBSCRIPTIONS

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 ph: 909.517.3366
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RADIKAL

G20

PETROL ENGINE

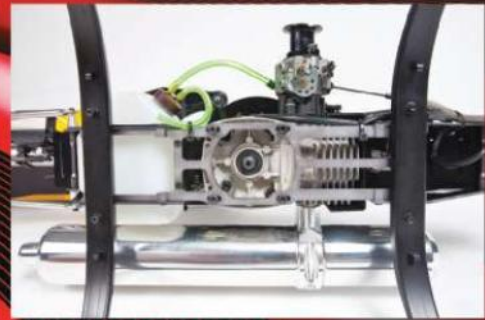
**THE NEXT HOT THING
IN GASSERS IS HERE!**



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

G10 version with LT heli shown.
RotorTech, 943mm Blades and
Tuned Muffler are optional items.

With our experience and knowledge from producing aerobatic and trouble free gasoline powered helicopters, Century Helicopter Products is proud to announce the ALL NEW Radical G20! This highly anticipated helicopter (the smaller sibling of the Predator gasser) is capable of smooth F3C style flight yet has the power and agility for 3D aerobatics. Designed from the ground up with the latest manufacturing framework, we're proud to offer the latest generation of technologies which has been incorporated to produce this G10 and Carbon Fiber framed helicopter powered by the new Zenoah 20cc gasoline engine. With its high torque and its relatively low speed, the Zenoah 20cc offers smooth, vibration free operation. The gas powered engine produces absolutely no smoke offering endless capabilities for aerial photography/videography as well as scale fuselage applications. Whether you are an experienced pilot or just a beginner, the economic flight times and aerobatic flight performance of the Radical G20 is a perfect choice for your first helicopter or a great addition to your current fleet.



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MINIATURE AIRCRAFT

Soon to be released is the new Fury 55. Miniature Aircraft has been working hard to get this new kit out on the market by the time you are reading this issue. At the time of print MA was just putting the finishing touches on everything and should be packaging them up. Keep on the lookout for a full review here shortly.

WWW.MINIATUREAIRCRAFTUSA.COM



Did you get your limited addition at the AMA Show?

SCORPION HK-4225 LIMITED EDITION

 This new motor from Scorpion is designed for the power hungry helicopter pilots that are looking for the most powerful 3D setup for their 600 class electric helicopters. This motor is designed for 10s power systems. This motor can produce peak power up to 5kw for up to 10 seconds. The motor should be available by the time you read this so check out their website to order.

WWW.SCORPIONSYSTEM.COM
WWW.INNOV8TIVEDESIGNS.COM



iCHARGER 1010B+

A Main Hobbies has started to carry some of the newest chargers on the market including the new powerful Protek R/C 1010B+ iCharger. This charger packs a punch and can handle LiPo cells from 2S to 10S. The iCharger includes a built in balancer and can balance charge batteries in series. Adapters can also be purchased to adapt the standard balance ports to any other type of balance tabs. We will be reviewing this 1010B+ in the March issue.

WWW.AMAINHOBBIES.COM



OUTRAGE BRUSHLESS SERVOS

Outrage has been known to make some good looking and flying helicopters. But watch out for outrage is about to dip into the servo market.

The new Torq servos from outrage are brushless motors that can pack a punch. The servos cases are made completely from aluminum and are anodized red to give it some flare. We will surely be installing these servos in an upcoming review.

WWW.OUTRAGERC.COM



ALIGN GP-780 GYRO

It seems like yesterday that Align produced the GP-750, which was included with the 250 and 450 Pro combos, but Align did not stop there. The new GP-780 looks similar to its older brother but offers plenty of new features to put it in a different class. The 780 features better pirouette consistency that uses an intelligent control logic that detects current flying conditions to adjust the dynamic gain. The 780 also feature an increase in tail control starting speed to utilize the high-speed servos that are common today.

WWW.ALIGNRCUSA.COM



SJGD RELEASES V2 FIRMWARE FOR FS600 FLYBARLESS GYRO

■ This new firmware update for the FS600 Flybarless Gyro includes some key features that increase the performance of the gyro. This update optimizes cyclic servo synchronization, increases cyclic servo speed capability for the use of high voltage servos, a torque compensation setting for tail control, and a four-flight mode memory for idle ups. Along with this firmware update SJGD is offering a USB programming cable to program the gyro and update the firmware using your computer.

WWW.SJGD-TECH.COM

WWW.HELIFLIGHTCENTER.COM



FUTABA TM-14 MODULE RECALL NOTICE



To all our readers and pilots alike, Futaba has announced that some TM-14 modules are experiencing some problems. These modules are limited to about two dozen shipped to the U.S. Futaba is concerned about their customers and offer a recall for those customers that received one of these modules. Please take a look at your 12ZA or 12ZH radios that include this module. The serial numbers that are on recall are: 8430001 through 8432345 and 8440001 through 8442504.

2.4GIGAHERTZ.COM/TECHSUPPORT/RECALL-NOTICE-TM14.HTML

This is just the beginning, plenty of new products to come.

NEW RC HELI SHIRTS



Check them out, two new designs for the new year. If you're a member of our facebook fan's page then you got to give your opinion on which designs you wanted to see in 2010. These designs will be limited to the initial production run, so if you see one you like don't delay, pre-order now! Both designs will begin shipping the first week of February.

www.rc-heli-mag.com

Hurray!!!! New shirts. But, I still want a shop towel.

JR GETS A TUNE-UP

Are you looking for a new mid range radio? If you are the JR has just the radio for you. The X9503 uses the same case as the older JR X9303 but packs a few more features that can really make the difference. The new X9503 provides a new backlit LCD screen to provide the pilot with unparalleled clarity for those early morning or late afternoon flights. An extra 20-model memory is included, giving you a total of 50 models that can be stored in the radio. Also included in this new radio is a new timer function that allows you to start your flight timer when you increase the throttle. No more forgetting to turn your timer on and risking those expensive battery packs. Check out this new radio now.

www.jrradios.com



TOTALLY RADIKAL DUDE!

Last issue we reviewed the Century Radikal and have noticed a misprint in the ratings section for Tunability. The rating reads 3.5 and should read 4.5. The Radikal is a very versatile helicopter and can be tuned for any flying style. Along with the head being fully adjustable the gear mesh can be set. Sorry for any confusion anyone may have had.



WIN FOR POSTING!

AlIMYRC.com recently awarded \$1000 cold hard cash to Jim Arner (user FishJunky) for posting on their helicopter forum. Jim's post was randomly picked. AlIMYRC.com still has two more chances for you to win. An post in the Airplane forums will be picked on February 1st, and one in the Car forum will be drawn on March 1st. So even if you're not particularly into cars or planks give it a shot, can't win if you don't post. While you're there check out the site. It's packed with high-quality content, event coverage and some insight from some very well respected pilots.
WWW.ALLMYRC.COM



SPEAKING OF WINNING!

There's still time to win in our HeliDirect Sweepstakes. Turn to page 51 for your chance to win, it's easy. No purchase is necessary but if you want to subscribe while you're at it; by all means! Hurry, all entries must be postmarked by February 28th.



THUNDER POWER WANTS YOUR BATTERIES

Thunder Power, one of the pioneers of RC Li-Po is extending their 50% Off Damage Replacement Program to not only cover Thunder Power batteries but FlightPower as well. The program has some details that you need to be aware of. The offer is only good to batteries within one year of their original purchase date, be ready to show proof. You'll have to complete a form that you can download from their website. You can find out more details on their website.
WWW.THUNDERPOWERRC.COM

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Congratulations Hiroki and Scott!



JR® DSM® Delivers a One-Two Punch at the F3C Worlds

For the 3rd time in a row Hiroki Ito, flying with an X9303, took top honors flying against the world's best at the F3C World Heli Championship. Sharing the podium with Hiroki in 2nd place was Scott Gray who flew with JR's 12X.

The common ingredient in both pilots' performances was the speed, precision and reliability of 2.4GHz DSM technology that allowed them to fly their machines to the edge with complete confidence. The kind of confidence we could all benefit from whether we're flying for trophies or just for fun.



Go to JRradios.com right now to learn more about JR DSM systems and to find a JR retailer near you.

LETTERS & PICTURES

MACHINE OF THE MONTH!

Here are some pictures of my just completed Huey "Hog" heli I made from an RC Aerodyne fuselage kit. I modified the Miniguns, and made the 1/24-scale rocket pods for each side. It's based on TREX 600e Mechanics. The electronics are Scorpion 4025 740KV motor, two Hyperion 4200mAh 4S 35C batteries in series, a Castle Creation HV-85 E.S.C., JR 7703D Gyro, Skookum360 stabilization, JR 12X radio, Hitec 7940TH servos, and a Duralite 7V regulator.

**Mike L.
Davie, FL.**



Fire at will!

FRESH POWDER

This is my TREX 450 sitting on my favorite field in Suffern, NY. It's a serious performer in all weather, although I think this snow might be just a little too deep. She's got Hitec HS-65MG servos all around and a Futaba GY240 gyro. The motor and ESC are stock. The mechanics are a mix of SE, SA and V2 parts; I like to customize. I've been a reader for year now and love every issue.

**Thanks!
Jeff Williams**



THAT'S ME, THAT'S ME!

Hi Guys, here's a picture I've been wanting to send you. It was taken at Apollo field in San Fernando Valley, California. The pilots are myself (khan), and my friends Dennis and Pat.

**Cheers,
Imroze**

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!** **Void where prohibited. Subscription offer is valid for U.S. residents only!**

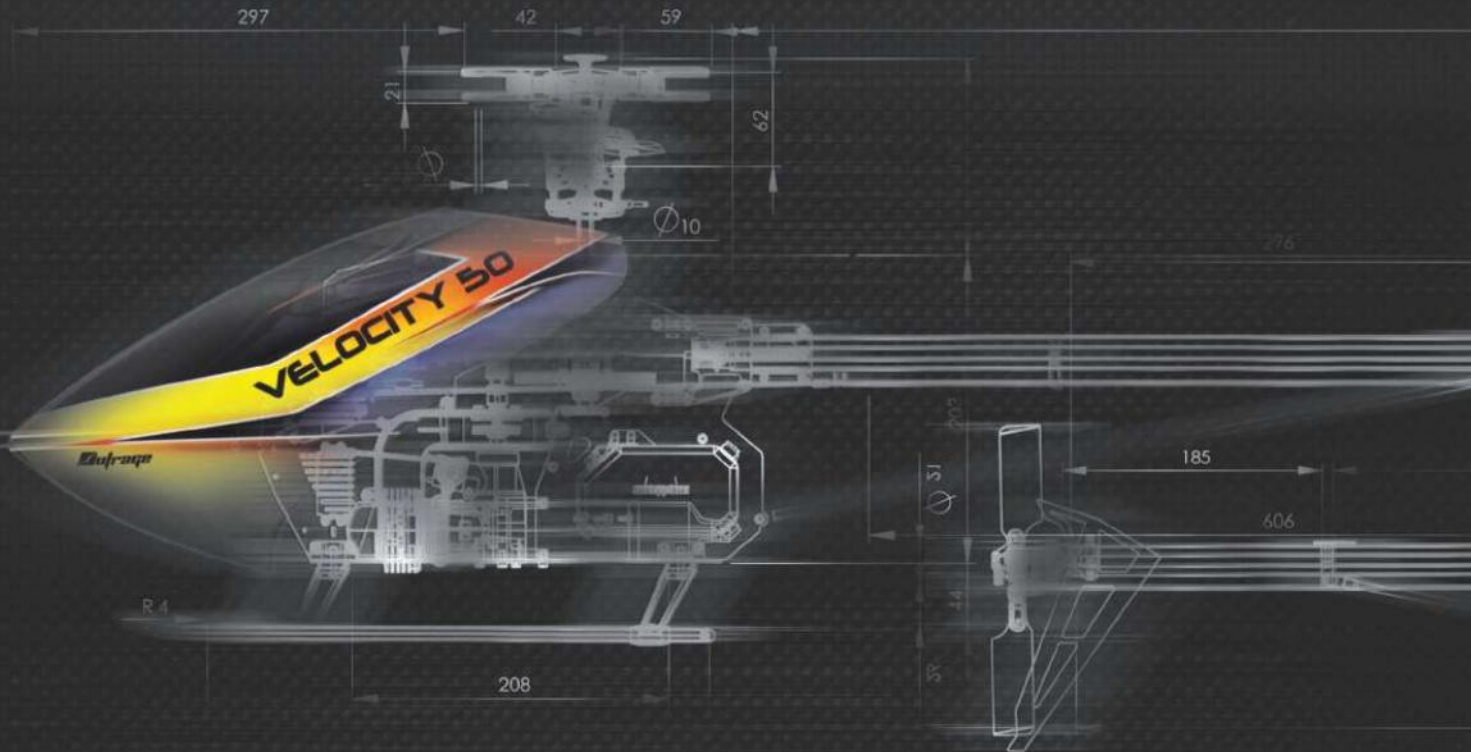
Digital files should be sent to:
feedback@rchelimag.com

Please put "Feedback" in the subject line. If you still want to send film, please send your photos to:

**RC Heli Magazine Attn: Feedback
13401 Yorba Ave, Chino, CA 91710**



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)

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:

www.RaysHeliTech.com



HOLA!

First I must say "Thank you RC Heli" for your magazine. I've been in the hobby for 18 months now and already have three helis! One is the E-flite MCX full glow in the dark upgrade, a Beam E4 Fusuno canopy, Scorpion combo 2221-6 ESC 55amps, Futaba 401 Gyro and servo 9650 for rudder, Maverick CF blades 325mm, A123 battery pack 3cell, and last is a TREX 500 the ESC, and motor are stock, Futaba 401 Gyro and 9254 servo for rudder, 3D CF blades 430mm, A123 6 cell battery pack. The best thing is that my son who is only four years old likes them a lot. He's a heli freak just like his dad. It's a great hobby and allows us to spend time together; we're going to pass this from generation to another.

THANKS:

Roberto Torres Greene
Jason Torres Coll (son)
from Puerto Rico



LIVE OR MEMOREX?

Here is my bird. It is a Copterx 450AE V2. It has HS-65HB's on the cyclic, an Exceed RC 3500kv brushless motor with a 13-tooth pinion, Exceed RC 30 Amp esc, an ESKY tail setup with ESKY 9g servo, ESKY Professional gyro, and a Spektrum DX7 with an AR6100e receiver. I originally had an ESKY Belt CP but dumped it bad and I saw an all metal TREX 450 clone that was cheaper than the crash, so I said "why not" and bought it. I switched the electronics and upgraded some stuff. Next up is a nice tail gyro. Thanks guys for the great magazine. Keep up the fantastic work! Rock on!

Thanks from Southern California,
Tanner Paxton



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



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Our full-line of chargers and balancers includes many of the world's safest and most advanced offerings to date. From LiPo battery balancers capable of being used independently or interfaced with a variety of chargers, to powerful chargers capable of charging and discharging LiPo batteries up to 10S 37.0V along with a variety of LiFe, NiCd, NiMH and lead-acid cells, there's a choice perfect for any battery charging and maintenance need.

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FREQUENTLY ASKED QUESTIONS

Q: I have a few questions about air filters on a helicopter. How many people run an air cleaner on their helicopter engines? Do you really need them? I use to run them, but now I am having problems finding them. **-ticedoff8**

A: "Dirt is just about the worst thing that can happen to your model engine. Dirt causes a lot of damage, because it's an abrasive. It will erode all of the clearances between the moving parts of your engine. Once the parts have been eroded enough, your engine will become difficult, if not impossible, to run." "Model car engines tend to be more susceptible to dirt damage just because they are run in dirty conditions far more often than are airplane or boat engines. Heli engines run a close second because helis spend most of their time in hovering mode, which stirs up everything on the ground beneath them. Even if you're running on or flying off grass, you'd be surprised at how much dirt can get sucked into your engine." **-www.osengines.com**

Ask your local hobby shop about a filter or do an on-line search. Many retailers stock these. **-RKephart**



Check out Issue 41 for a complete How-To on Pitch/Throttle curves.

Q: I am setting up my throttle hold curve and pitch hold curve for the first time, would someone please advise me on what settings I should have?

I have a Raptor 50 Titan, DX7 transmitter and an OS Hyper 50 SX.

Also, when I am moving my swash plate to the extreme corners, to check for binding, I notice my swash hits the frame before the servos are maxed out (binding). How do I correct this issue with a swash that uses individual servos, as opposed to a CCPM heli? **-mccd07**

A: This is another one that I spent a long, long time on when I built my first one. Here is the easy way to do it. Links removed at the moment and servo wheel not screwed on yet. Also, you want the distance from the center of the throttle and carb screws to the link balls on each to be the same. **-kcgraves**

SKILLS

PITCH AND THROTTLE CURVE 101

Barber Lipit

THE PROGRAMMABLE CURVES: USED TO SET UP THE PITCH AND THROTTLE OUTPUT IS NOW NECESSARY CRUCIAL TO OBTAINING PROPER FLYING CHARACTERISTICS. THESE CURVES, THOUGH VISUALLY SEEMED SEPARATELY, ARE ACTUALLY INTERRELATED, AND THE MAIN SIBLING (HEADSPEED) IS THE END RESULT OF THE SUM OF CURVES. KNOWING THE BASIC STEPS INVOLVED IN THESE CURVES IS NECESSARY FOR YOUR SUCCESS IN THE HOBBY.

HOW THESE CURVES WORK TOGETHER

Though pitch and throttle curves are not independent elements, allowing separate controls on the heli, they are intricately tied together in one single pitch throttle curve on your transmitter. Controls over the throttle and pitch are a result, and the combination of throttle and pitch work together to give you the control you need to fly on a heli. If you're not sure, it's best to start with a heli that has a fixed pitch and throttle curve. Once you're comfortable with the basics, you can then try to adjust the curves to your liking.

2.0 **20** **15** **1**

TO TIME TO COMPLETE **15** Minutes

TOOLS NEEDED

- ESCRATOR
- ESCRATOR
- ESCRATOR

LET'S GET STARTED!

STEP 1: Before you start, make sure you have a radio that is set up for the heli you are flying. If you are using a radio that is not set up for the heli, you will need to set it up first. This is a simple process, but it is important to get it done correctly. If you are using a radio that is not set up for the heli, you will need to set it up first. This is a simple process, but it is important to get it done correctly.

STEP 2: The next step is to set up the throttle curve. This is done by adjusting the throttle curve on the transmitter. The throttle curve is a graph that shows the relationship between the throttle stick position and the throttle output. The throttle curve is a graph that shows the relationship between the throttle stick position and the throttle output.

STEP 3: The next step is to set up the pitch curve. This is done by adjusting the pitch curve on the transmitter. The pitch curve is a graph that shows the relationship between the pitch stick position and the pitch output. The pitch curve is a graph that shows the relationship between the pitch stick position and the pitch output.

STEP 4: The next step is to set up the swash plate. This is done by adjusting the swash plate on the heli. The swash plate is a component that allows the rotor blades to move up and down as the heli rotates. The swash plate is a component that allows the rotor blades to move up and down as the heli rotates.

- 1 Put your radio at mid stick and turn on the heli so the servo centers.
- 2 Put the carb at center. There is mark on the OS 50 for center. There should be three grooves; the middle one is half open.
- 3 Measure the distance from the center of the hex screw on the carb arm to the center of the servo (where the screw goes). This is also how long you want your ball link, center to center.

- 4 Line up your servo wheel so it is centered. I can draw a line from a servo wheel hole through the servo screw through another servo wheel hole to the center of the carb screw.
- 5 Loosen the hex screw on the carb arm (there is hole in the shaft — you will need to find something to fit into it for tightening later) just enough so you can move it without moving the arm; it needs to stay on the groove.
- 6 Move the arm until the distance from the top and

- bottom ball screw holes to the corresponding servo wheel holes are exactly the same. (Think like you are going to put on dual links of exactly the same size.)
- 7 Once you get this, tighten down the hex screw while holding the shaft. It may take several tries to get this, as the shaft moves pretty easily when tightening the screw.
- 8 To check, take the link and make sure you can put it on either the top or the bottom without any binding.



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HS-7940TH	0.07	181 oz/in	0.06	222 oz/in	37940S	1.57"x0.79"x1.50"	2.40 oz
HS-7954SH	0.15	333 oz/in	0.12	403 oz/in	37954S	1.57"x0.78"x1.45"	2.30 oz



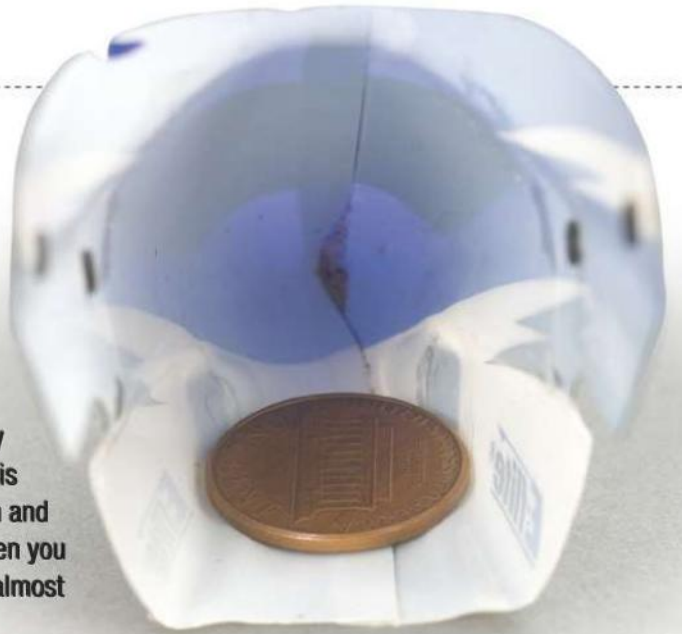
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QUICK TIPS

MAKE YOUR MCX OR S300 FLY FASTER!

So you have mastered your mCX and now you wish it had a little more juice to chase you cat and dog around the house. This quick tip came from necessity and we have found out how it can be done. Tape a penny to the inside of the canopy as far forward as possible. This will make the mCX a little nose heavy. Plug the battery in and trim it out so it does not move forward by itself. Now when you apply forward cyclic, the mCX will take off forward with almost double its original speed.



A penny for your thoughts?

SOLDER ON THE GO

Time and again we find ourselves at the field with a loose wire or a new connection that needs to be soldered without any way of getting the job done. Thankfully, in this day and age portable butane powered soldering irons are available and should be in everyone's flight box. These portable irons range from \$20-40 and can be found at your local hardware store. Make sure to pick up some extra solder to throw in your toolbox as well.



MUFFLER TAP SCREW LOCKDOWN

If you run a nitro helicopter - whether it's a pumped or non-pumped engine - one thing is common on every engine. The muffler has either a pressure fitting or a screw to cap the hole. This screw or fitting has a tendency to see a lot of vibration, causing this connection to back out and cause an air leak. JB Weld can be used to lock this screw down with authority. JB Weld can handle the heat and will keep that screw from falling during the life of the pipe.





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TESTED and RATED

Futaba 8FGH

It's Fasst

WORDS: Chuck Bassani

COMPETITION IS REALLY HEATING UP IN THE RC INDUSTRY, AND IT'S PARTICULARLY HOT IN THE RADIO SYSTEM SECTOR. Manufacturers are somehow managing to pack more and more features into their products while aggressively fighting an all-out pricing war. This is a beautiful thing from a consumer's point of view. I think it's quite remarkable that you can purchase an 8-channel system for under \$500 that includes features, which until not too long ago were only available in pro-class radios.

The 8FG is Futaba's latest offering and is one such system. There's no doubt in my mind that Futaba is definitely going after market share with this baby. I think you'll agree with me when I say that a big check mark unquestionably deserves to go in the features box. But just as important is performance – does the 8FG have that too? Read on, because we're going to find out.



OVERVIEW

The 8FG is in actuality a 10-channel transmitter. It provides eight fully proportional 2048-step resolution channels as well as two digital (on/off) channels. You will, however, need to use one of Futaba's 14-channel FASST receivers should you want to take advantage of the two digital channels, as the system ships with an 8-channel receiver.

Programming features are provided

for helicopters (six swash types), airplanes (four main wing and three tail wing types), and gliders (six main wing and three tail wing types). Internally, the transmitter contains sufficient memory to store the settings for up to 20 models. Underneath the battery cover you'll find the transmitter sports a Secure Digital (SD) memory card slot. By using standard 'off-the-shelf' SD cards with capacities between 32MB and 2GB, you essentially have unlimited model memory as well

as a convenient medium for transferring firmware upgrades into the transmitter.

WHAT'S IN THE BOX

Considering the wide array of model servo requirements, it really doesn't make sense anymore to package (and pay for) servos in radio systems. Servos need to be addressed on an individual basis, so the fact that they're not included with this system is a plus.



The Futaba 8FG Transmitter

And the same can be said for the flight battery, it's also a plus that won't find one of those in here either.

WHAT YOU WILL FIND IN THE BOX IS:

- 8FG 2.4 GHz 8-Channel Transmitter
- HT6F1700B 7.2v / 1700mAh NiMH TX Battery
- R6008HS 8-Channel Receiver
- HBC-2B TX/RX Charger
- Neck Strap
- RX On/Off Switch
- Adjustment Screwdriver
- Manual

TRANSMITTER

When you first look at the Futaba 8FG transmitter, you can't help but notice its exceptionally clean appearance. Ergonomically, it's very comfortable to hold, due to its relatively thin width. If you fly using a neck strap, you'll be glad to know that it balances nicely (it was designed from the start as a 2.4 GHz offering).

PHYSICAL LAYOUT

In the center face of the radio, you'll find the usual joystick and digital joystick trim layout. The power switch is dead in the center. Along the top front of the radio you'll find four 3-position switches and

two variable position controls that emit a single beep on center. At bottom front is a SensorTouch™ input pad and an easy to read 128 x 64 backlit LCD.

Along the top of the radio you'll find four additional switches; two 2-position switches towards the rear on each side and two 3-position switches towards the front. The right rear switch is spring loaded. The antenna can rotate 90 degrees from right to front and bend 90 degrees from straight up to flat

Looking at the back of the radio you'll find a nice carrying handle and two variable position trimmer levers (one on each side towards the top) that also emit a single beep on center. The battery charging jack and trainer port are on the bottom back. On the very bottom you'll find the battery compartment hatch, which contains the battery as well as an SD memory card port.

QUAD BEARING STICKS

The gimbals on this radio are quite nice. I wouldn't exactly put them up there with pro-class feel, but they are exceptional. They are a new design featuring dual bearing-supported axes. The throttle stick

has a smooth plastic cover placed over the detents. This should keep collective inputs smooth and consistent for a very long time. The cover can be moved should you decide to change the stick mode.



A plastic detent cover makes the collective smooth as glass. It can be relocated to the other gimbal should you decide to change the stick mode.

SENSORTOUCH™

The 8FG is the first radio system to feature the SensorTouch™ input pad. Access to each of the programming menus is as quick as double-tapping the menu's corresponding label around the edge of the pad. If a menu has more than one screen, double-tapping the 'S1' label moves you to the next screen. Scrolling through menu items, fields within a menu, and changing field values is as simple as sliding your finger around the pad. Selections are made by tapping the RTN button in the center of the pad. There are some other unique navigation sequences, but you'll get the gist of it.



SensorTouch™ makes programming a breeze.

You'll be a pro on this radio after reading this!

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SYSTEM MENU

The System Menu is used for configuring the transmitter and not for any specific model's settings. From this menu you can set up and view items such as:

THE 'TRAINER' SYSTEM

You'll have the ability to pick and choose which functions and channels the student gets to operate.

LCD AND BACKLIGHT SETTINGS

Let's you adjust display contrast, brightness, and how long the backlight remains on after operating the SensorTouch™ input.

USER NAME

Allows you to enter a unique name and displays it on the transmitter's screen.

HARDWARE

You can set the operational direction of the sticks, switches, trimmer levers, and knobs. The stick mode can also be selected (modes 1, 2, 3, and 4 are all available).

SYSTEM INFORMATION

Displays various system related information such as the Product ID, language, firmware version, and the used and available model memory capacity of the SD card (if present).

LINKAGE MENU

The Linkage Menu is where you'll find the functions used for selecting a model and setting up its general behavior. With the 'helicopter' model type selected, the functions available are:

SERVO

Will display each channel's output position and allow you to perform servo movement tests. This includes a test that moves all servos to their neutral position, which is a quick way to get those output arms optimally oriented during setup.

MODEL SELECT

Used to call up model settings from internal memory or the SD card, assign model names, and copy settings from one model to another.

MODEL TYPE

From here you'll select the type of programming (helicopter, airplane, or glider) to be used for the selected model.

When 'Helicopter' is selected, the swash type is also selected from here.

FREQUENCY

The 8FG supports the FASST '7CH' or FASST 'MULTI' protocols. Which one is used for the selected model is chosen here. The operating area (General or France) can also be selected.

FUNCTION

Controls (sticks, switches, levers, and knobs), trims, and functions are freely assignable to any channel (eight proportional, two digital, and four virtual). You may even assign a single control to multiple channels for parallel operation. Trim rates and trim operational modes (normal and ATL) are also selectable. Any control or function can be assigned to a Virtual Channel. This allows you to mix that function with another channel (or channels) without the function actually consuming a physical channel.

Logic switches are also available for combining two switches to turn functions on/off. The switches can be logically combined using AND (both switches on), OR (either switch on), and EOR (switches in opposite states) logic operators.

SUB-TRIM

The center (or neutral) position of each of the eight proportional channels can be offset. This is used to achieve the optimum mechanical setup.

REVERSE

Set the direction in which a channel responds to control input for each of the ten channels.

FAIL SAFE

On an individual channel basis, you can define how a channel responds to a lost radio signal condition. Options include holding the output at the last

commanded position or moving it to a pre-determined position.

NOTE: in FASST 7CH mode, only channel 3 can be set to move to a pre-determined position, the rest of the channels remain at the last commanded position.

There is also an option to have fail-safe engage when the receiver voltage falls below a minimum threshold. When active, you can set a 'release' switch that can be used to take the receiver out of the fail-safe condition.

END POINT

Set the control travel range on each side of the channel's center position for each of the eight proportional channels. You can also set an absolute 'do not exceed' limit, which is useful for making sure that any active mixing doesn't inadvertently cause linkage binding by overdriving the channel.

THROTTLE CUT

Let's you 'kill' an engine simply by flicking a switch.

IDLE DOWN

Idle Down provides an easy way to hold the throttle in a settable 'idle' position by throwing a switch.

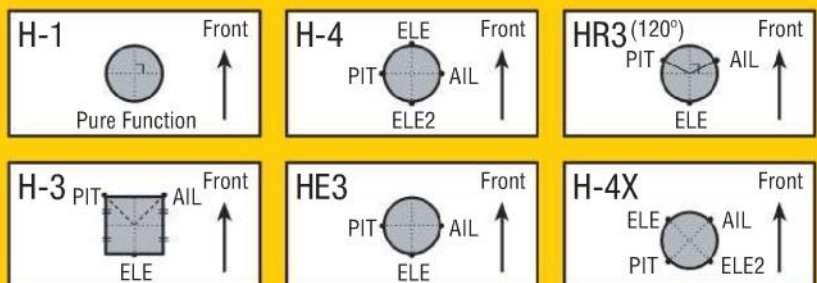
SWASH RING

Effectively performs the same function as a mechanical swash ring. The function limits swash travel when the aileron/elevator stick is moved towards the corners. This will prevent the mechanical interference that may occur when the swash plate is moved to those extremes.

SWASH

The swash function is very comprehensive. It provides the usual aileron, elevator, and pitch AFR settings with a movable neutral point, but also provides a nice set of fine-tuning capability. There's a mixing rate function that is used to help maintain

THE SIX SWASH TYPES SUPPORTED BY THE 8FG.



That is a bundle of swash mixes.

3D Masters Champions

'02 '03 '04 '05 '06 '07 '09



2. Duncan Osbourne

1. Dominik Hägele



3. Eric Weber

Congratulations to:
1. Dominik Hägele 2. Duncan Osbourn
3. Eric Weber on their First, Second,
and Third Place victories at the
2009 3D Helicopter Masters Event.
All three pilots used COOL POWER HELI 30% to power their Helis



a level swash throughout the collective travel and to prevent linkage binding during cyclic input. There is also a speed compensation mix that is used to correct for any control interaction.

■ **STICK TRIM**

Adjust the amount of trim you get with each 'click' of the four digital stick trim switches. You can also set whether the trim settings are common to all flight conditions (modes) or whether separate trim settings are maintained for each flight condition. A trim memory function is also available and allows you to re-center the trim indicator while maintaining the set trims.

■ **DATA RESET**

This provides a quick way to reset all of a selected model's settings to the factory default values. You can also selectively reset just the four digital stick trim memory settings.

MODEL MENU

The Model Menu contains the functions that are used to control a model's flight performance. With the 'helicopter' model type selected, these functions are available:

■ **SERVO**

This is essentially the same function as that provided by Linkage menu's Servo function.

■ **CONDITION**

Up to five flight conditions are available; Normal, Idle-Up1, Idle-Up2, Idle-Up3, and Throttle Hold. Unneeded making sure there isn't a switch assigned to the condition can inhibit conditions. You may also set up 'Condition Delay' on a per channel basis, which is useful for minimizing the sudden jerks that can occur during condition changes. Copying settings from one condition to another is also supported, as is condition priority.

■ **DUAL RATE (AND EXPONENTIAL)**

Individual Dual Rates (0% - 140%) and operational (Exponential) curves (-100% - +100%) for aileron, elevator, and rudder channels can be set for each flight condition or up to five manual (switch selectable) settings for each of the channels.

■ **PROGRAMMABLE MIX**

The 8FG incorporates an extremely flexible programmable mix system. Five

general purpose programmable mixes are available. Each mix can be always on or turned on/off from a switch. You can also choose whether or not to apply the master channel's trim to the mix. The mixing function can follow a linear or customizable 5-point curve. Finally, there is a 'Link' feature that lets you to link the programmable mix to another general purpose or dedicated compensation mix.

■ **FUEL MIX**

Fuel Mix is a dedicated compensation mix that is used to control an in-flight carburetor mixture adjustment. It's a 5-point curve (one for each flight condition) that control's mixture based on the throttle channel's output. There are separate settings for the Throttle Cut and Throttle Hold conditions. The function has provisions for copying settings from one condition to another.

■ **PITCH CURVE / PITCH TRIM**

5-point pitch curves are available for each flight condition. The ability to copy pitch curves from one flight condition to another is supported. 'Hovering', 'High', and 'Low' pitch trims may be individually enabled by assigning them to controls.

5-point curves are fairly common in radios offered at this price point. But considering the wealth of programming available with this radio, this is one area where I believe Futaba could have easily made a great radio even better by implementing 7-point curves.

■ **THROTTLE CURVE / THROTTLE HOVER TRIM**

5-point throttle curves are available for each flight condition (sans Throttle Hold). The ability to copy throttle curves from one flight condition to another is supported. 'Hovering' throttle trim may be enabled and assigned to a control.

■ **THROTTLE HOLD**

The throttle position for practicing autorotations is set in this function. Additionally, the speed at which the throttle servo moves from its current position to the hold position when Throttle Hold becomes active is also adjustable.

■ **SWASH MIX**

Swash Mix is a dedicated compensation mix used to correct for any undesired rolling and pitching tendencies during

INDEPENDENT SPECIFICATION VERIFICATION

■ **FUTABA SUPPLIED**

RECEIVER SPECIFICATIONS:

WEIGHT: 13.5 g / 0.48 oz
SIZE: 24.9 mm x 47.3 mm x 14.3 mm / 0.98" x 1.86" x 0.56"
CURRENT DRAIN: None provided
OUTPUT PULSE AMPLITUDE: None provided

■ **MEASURED RECEIVER SPECIFICATIONS:**

WEIGHT: 13.4g / 0.47 oz
SIZE: 24.9 mm x 47.4 mm x 14.3 mm / 0.98" x 1.87" x 0.56"
CURRENT DRAIN: 75.8 mA (no signal), 44.8 mA (w/signal) – Power source used for this measurement was a fully charged 4 cell, 1450 mAh NiMH battery pack.
OUTPUT PULSE AMPLITUDE: 2.7V



■ **FUTABA SUPPLIED TRANSMITTER SPECIFICATIONS:**

CURRENT DRAIN: None provided

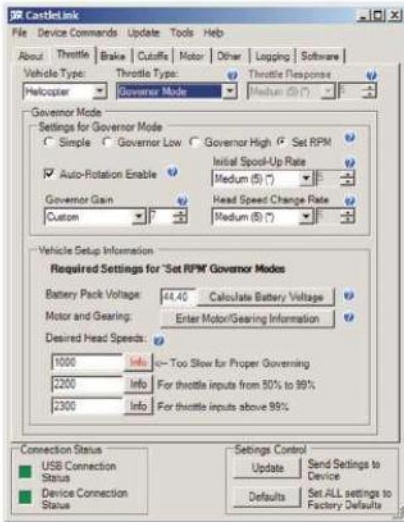
■ **MEASURED TRANSMITTER SPECIFICATIONS:**

CURRENT DRAIN: 196.9 mA (w/back-light off). This should provide about 8 hours of operational use (non-setup use w/back-light off).



What's on the menu today?

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- **NEW** heli software with expanded settings and simplified programming requirements!*
- Direct entry headspeed program allows entry of up to **three** desired headspeeds!
- Simply enter the voltage, pole count and gear ratio to find the correct throttle curve to achieve each of the three headspeeds!



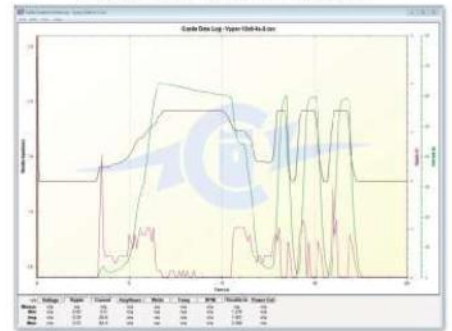
*New software works on most all Castle Phoenix and Phoenix HV controllers, just update the firmware with your Castle Link (sold separately).

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- **NEW Phoenix Ice HV Controllers:**
12s LiPo/50 volts max with onboard data logging!
- **NEW Phoenix Ice Lite Controllers:**
6s LiPo/25 volts max with 5 amp switching BEC and onboard data logging!
- **NEW Phoenix Ice Controllers:**
8s Lipo/34 volts max with 5 amp switching BEC and onboard data logging!

DATA LOGGING



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up to 12s LiPo



PHOENIX ICE LITE SERIES
up to 6s LiPo



PHOENIX ICE SERIES*
up to 8s LiPo

* recommended for heli apps

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cyclic and collective inputs. Separate settings are available for each flight condition or you can assign the function to a switch.

Mixes include aileron to elevator corrections as well as pitch-to-aileron and pitch-to-elevator corrections. You may also choose whether or not to factor in the master channel's trim settings into the mix.

THROTTLE MIX

Throttle Mix is a dedicated compensation mix used to maintain engine RPM during aileron, elevator, and rudder control inputs. Separate settings are available for each flight condition or you can assign the function to a switch. Additionally, you can choose whether the mix affects the entire channel range or works only around the channel's center position.

PITCH TO RUDDER (A.K.A. REVO MIXING)

Revo Mix is a dedicated compensation mix that helps the helicopter maintain its heading during collective inputs. Separate

5-point curve settings are available for each flight condition. The function also provides the ability to copy curves from one flight condition to another.

GYRO

The Gyro function is used to set the gyro's mode of operation and sensitivity. Separate settings are available for each flight condition or you can assign the function to a switch. Additionally, a variable rate control can be assigned to a fine-tuning feature to provide in-flight sensitivity corrections of +/- 20%.

GOVERNOR

The Governor function is used to set governor or limiter RPM. Separate settings are available for each flight condition or you can assign the function to a switch. The settings can be expressed in units of '%' or 'RPM (calibrated for the GV-1)'. Additionally, a variable rate control can be assigned to a fine-tuning feature to provide in-flight RPM corrections of +/- 20% (or +/- 200 RPM when units are in RPM).

TIMER

Two timers are available for each model. They can be set to start and stop using a switch, stick position (with configurable trigger point), or a combination of both. The timer supports a maximum value of 59 minutes 59 seconds, and can be individually set and configured for count up or count down. There's a 'memory' option that maintains the timer's count when the transmitter's power is turned off or a different model is selected.

You can display a second 'Home' screen that displays the timers in a large font by tapping the 'RTN' button on the SensorTouch™ when the standard home screen is visible.

NOTE: Although not part of the 'Timer' function per se, the 8FG also contains separate 'System' and 'Model' timers that accumulate 'System' and individual 'Model' on times since last reset. These timers are not visible if the second Home screen is displayed.

Latency put to the test.

LATENCY & PERFORMANCE

MEASUREMENTS PERFORMED BY JOHN KOS

Separate latency tests were performed for the receiver's 'Normal' and 'High-Speed' modes of operation. The transmitter's frame rate was observed to always be 142.9 Hz (a 7 mSec frame period), regardless of the receiver's configured mode of operation.

WITH THE RECEIVER IN 'NORMAL' MODE:

MINIMUM LATENCY: 10.6 mSec

MAXIMUM LATENCY: 24.8 mSec

AVERAGE LATENCY: 17.6 mSec

The receiver's frame rate in this mode is 71.4 Hz (a 14 mSec frame period). Channels 1 – 6 are output simultaneously; followed by channel 7, then channel 8.

WITH THE RECEIVER IN 'HIGH-SPEED' MODE:

MINIMUM LATENCY: 10.6 mSec

MAXIMUM LATENCY: 17.7 mSec

AVERAGE LATENCY: 14.1 mSec

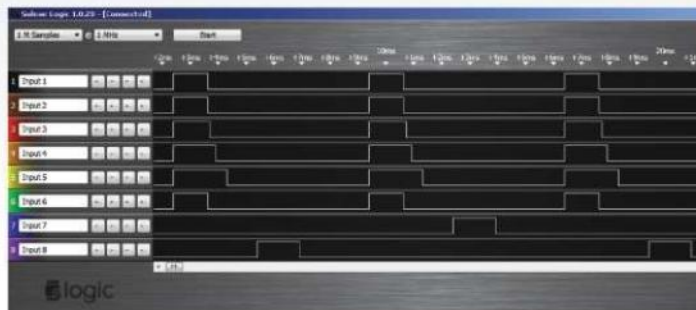
The receiver's frame rate in this mode is 142.9 Hz (a 7 mSec frame period). Channels 1 – 6 are output simultaneously, followed by either channel 7 or 8; their outputs alternating between frames.

Latency measurements for channels 1, 2, & 6 apply to normal (H1) and all CCPM swash types. Aileron and elevator latencies also fell within this range.

Overall performance using CCPM swash types was good, with all three swash channels remaining synced at all times. Pulse widths generally transitioned through a complete change in one frame, but we observed that around 35% of the time, it could take up to four frames with large, instant changes in position.



Receiver channel outputs in 'Normal' mode.



Receiver channel outputs in 'High Speed' mode.

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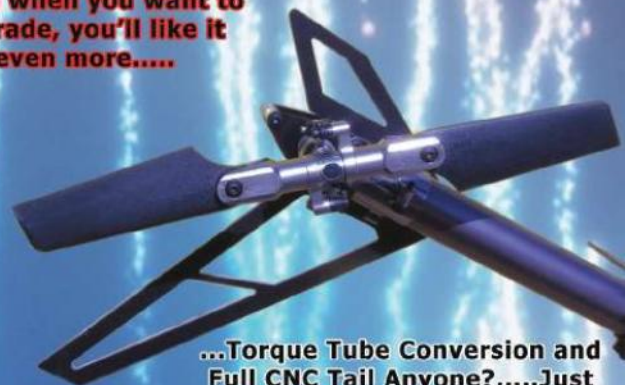
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RECEIVER

Included with the system is a R6008HS FASST receiver. This receiver supports both 'Normal' and 'High-Speed (HS)' modes of operation. In normal mode, all channel outputs produce position pulses at a 71 Hz frame rate. In high-speed mode, channels 1 – 6 will output position pulses at a 143 Hz frame rate; thus limiting them to digital servo and peripheral device (i.e. gyro, governor, ESC) use only. The higher frame rate in HS mode improves latency and may quite possibly produce better servo performance (speed, torque, & holding power) when some older and lower end digital servos are used. Channels 7 and 8 remain at a 71 Hz frame rate in HS mode.

The receiver has eight channel output ports as well as a dedicated battery input port. It also contains a 'data' port, but the manual makes no mention of its intended use.

The R6008HS receiver has a street price of \$139.98. As of this writing, these other Futaba FASST receivers are compatible with the 8FG transmitter:

IN 7-CH MODE:

- R6004FF (4-channel, close-range) \$49.99
- R606FS (6-channel, full-range) Discontinued
- R616FFM (6-channel, park flyer) \$59.99
- R6106HF (6-channel, park flyer) \$59.99
- R6106HFC (6-channel, mid-range) \$69.99
- R607FS (7-channel, full-range) Discontinued
- R617FS (7-channel, full-range) \$99.98

IN MULTI-CH MODE:

- R608FS (8-channel, full-range) Discontinued
- R6014FS (14-channel, full-range) Discontinued
- R6014HS (14-channel, full-range) \$199.98

CONCLUSION

Futaba has truly blurred the line that separates professional and sport class radio systems. When I reviewed the Futaba 10C last year, I thought it set a

pretty high bar based on functionality and value, but now Futaba has raised that bar even higher with the 8FG. At the field it functioned flawlessly.

If you're in the market for a system, you will not be disappointed in choosing the 8FG. I have not been this impressed with a new radio offering since the introduction of the Spektrum DX7. Futaba deserves the performance, programming, and value 'Triple-Crown' with this system. **TRE**



+ THE GOOD

- Clean design
- Very good performance
- Extremely comprehensive programming
- Fast and easy programming navigation and adjustments with SensorTouch™
- Nice backlit display
- Outstanding value

- THE BAD

- 5-point pitch/throttle curves

CONNECT

MANUFACTURER:	Futaba
WEBSITE:	www.2.4gigahertz.com
PART NUMBER:	FUTK8001
STREET PRICE:	\$479.97



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Ikarus AEROFLY PROFESSIONAL PLATINUM

Older yet new to RCHELIMAG

WORDS: Brandon Updike

IN MY YEARS OF FLYING I HAVE LOGGED MANY HOURS ON THE SIMULATOR AND THIS HAS PROVED TO BE VERY EFFECTIVE IN HELPING ME IMPROVE. I started out with Realflight G2 years ago and have since tried many brands of simulators. There have been a plethora of simulators developed and one of the bigger players is Ikarus with their Aerofly simulators. Aerofly has been around for years and has been released in many different versions, with their most well known Deluxe edition being released a couple years back. Now Ikarus offers their entire Deluxe series (Aerofly Pro Deluxe and Add On's 1-5) on one easy to use DVD called the Platinum Edition. We've reviewed many simulators but never got around to Aerofly so I'd like to find out how it stacks up to the rest.



In this simulator you don't have to fight Medusa at the end.

FEATURES

Aerofly comes packaged in a large, decorated box to help house the Windows-based interface. Not all simulators come with a dedicated interface, so it's nice to see Aerofly include one to prevent your transmitter from receiving simulator abuse. Instead of supplying a different disc for all the add-ons, Aerofly decided to format everything in one easy to use DVD. There are 119 different models of all sorts, including 15 helicopters. There are also full-scale airplanes available, which is quite unique and interesting. There are a myriad of airplanes available as well, making it robust for all you plank flyers. There are also 46 different sceneries with 14 photofields.

Ikarus promises realistic flight physics with features such as aircraft breaking apart in flight, great 3D performance, and the minor details such as smoke and retracts. There is also a split-screen mode that allows for

two different people to fly at the same time. You can also make changes to the environment and edit your aircraft to fit your specific needs.

INSTALLATION AND TESTING

Aerofly made things easy by formatting everything to a single DVD which speeds installation. The minimum requirements aren't too bad on Aerofly and anyone with a relatively modern computer should be able to run it. The main thing to remember with simulators is that it's nice to have a dedicated video card to run the program. Integrated video cards (video cards that are integrated with the motherboard) will have a much harder time running the program (if it can run it at all). The machine I used for the review has an AMD Athlon X2 6000+ CPU at 3.0 Ghz, an ATI Radeon HD4850, 2gb of RAM and Windows Vista. Overall, the installation process went smoothly

and after everything was installed I got straight into it.

I looked for a decent looking helicopter and came across the flybarless Mikado Logo 500. The heli loaded up and I was relatively pleased with how it flew in stock form. I was able to perform all 3D flight orientations with pretty accurate physics but the reactions were a little slower than my liking. Before I decided to test out the editing features I played with some more aircraft. They have a Freya Eagle that I enjoyed flying but it had some weird pitching tendencies and other characteristics that I really didn't enjoy. There is a vast selection of airplanes to pick from and they all seemed to fly very well. I'm not an airplane expert by any means but they seemed to fly just right. When flying, I was able to get astronomical 700-800fps with it completely maxed out (60fps is usually considered the ideal frame rate for gaming).

After flying for a bit, I decided to fine tune my helicopter but was



aerofly has plenty of fields to choose from.



Scale, 3D, or training helicopters are easily selected.



aerofly uses photo backgrounds and great graphics to enhance your experience.



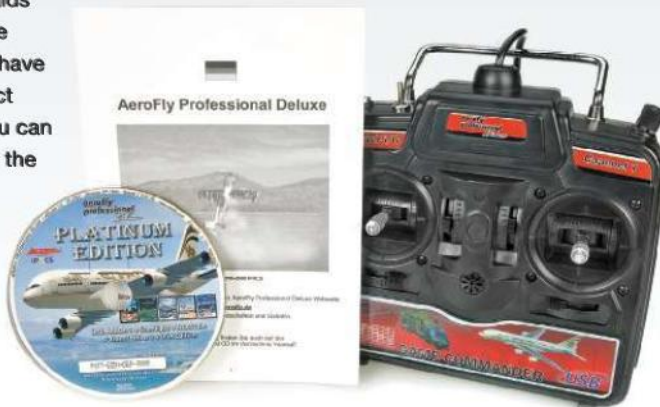
The main load out screen is detailed and shows the model rotating on blueprints.

disappointed to learn that editing functions were very limited. You can edit the basics of each aircraft but when it comes down to really fine tuning what you like you'll find that Aerofly is a bit lacking. The graphics look very good, the aircraft are very detailed, and the photofields look sharp and interact smoothly with the aircraft. I also installed it on my laptop, which just has integrated graphics and was barely able to run it at 15-20 fps with everything on low.

There are some neat features to it, such as training aids and cool full-scale aircraft. You also have the ability to select two aircraft so you can fly them one after the other. There are also numerous camera views so you can adjust it, as you prefer.

CONCLUSION

Overall, Aerofly does a good job recreating the physics of an actual helicopter, but isn't quite the best one out there. The lack of editing features only adds to the fact. However, Aerofly will still do a great job for anyone trying to learn how to fly. Even with my gripes in the physics category it still flies very well and I did enjoy it. It's priced at a mere \$209, making it a good bargain if you're in the market for a new simulator. **TIBL**



THE GOOD

- Nice graphics
- Comes with interface
- Good physics

THE BAD

- Limited editing features
- Limited helicopter selection

CONNECT

MANUFACTURER:	Ikarus
WEBSITE:	www.aerofly.de
PART NUMBER:	IKAZ1001
STREET PRICE:	\$209



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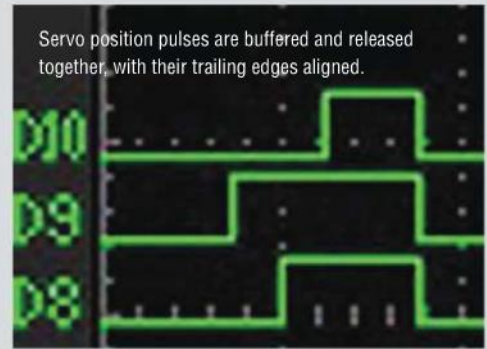
decrease consecutive inserted pulses by 1.0 μ Sec, effectively keeping a more consistent servo movement until it's target position is reached.

One thing to keep in mind is that all digital servos are not created equally. Many of them (and this is especially true of high-end products) do not use the incoming signal's frame rate to regulate the motor's duty cycle. These servos will generally see little to no improvement with respect to speed, torque, and holding ability from the effects of "Overdrive". Also be aware that because of the high frame rate produced by "Overdrive", this device CANNOT be used with analog servos.

! IMPORTANT: As of this writing, the manufacturer has informed me that the Overdrive SX has not been tested with the Spektrum DX7se or Futaba systems using a FASST (High Speed) HS receiver.

TRUESYNC

"TrueSync" is an implementation of servo grouping, which specifically is designed to address control interaction. The device buffers the individual channel pulses received on its three channels and outputs them simultaneously; aligning their trailing edges. This effectively causes all three servos to move at once, as the servo motor isn't energized until the entire pulse is received.



Most servo grouping techniques I've seen generally align the leading edge of the pulses. This keeps the grouped channels very close in timing while at the same time slightly offsetting the start of movement between the three servos. With "TrueSync", all three servos will energize at exactly the same time. This slightly improves control interaction when compared to conventional servo grouping, but it greatly improves it when compared to systems that have no servo grouping at all. However, what this also means is that the instantaneous demand on the power source will be greater. As usual, it's a good idea to make sure your on-board power system is capable of handling the load.

Can't get much more technical than this.

SINBOOST

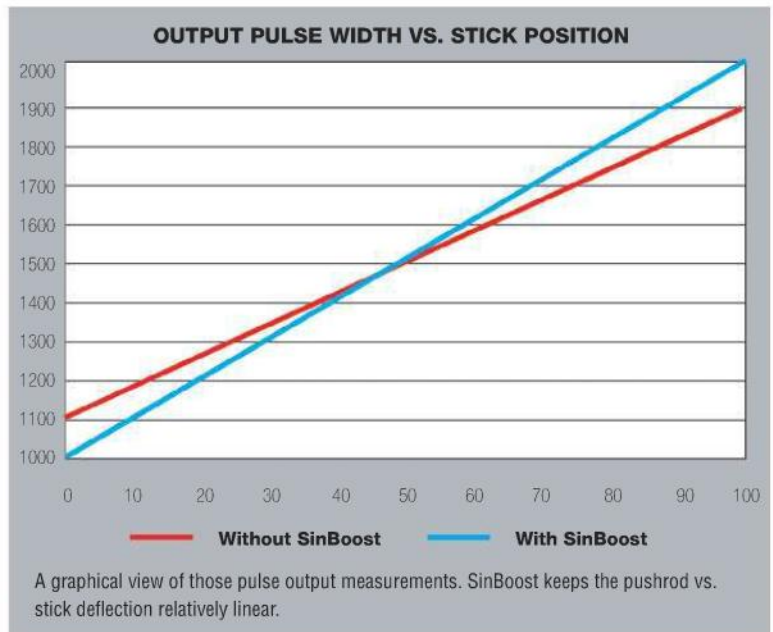
Rotary servo output follows an arc shaped path. What this means is that given equal increments in control stick movement, we get proportionally equal angular increments in servo output (assuming a linear curve). What we don't get (due to the arch shaped path) is proportionally equal increments in pushrod deflection. The amount of pushrod deflection decreases the further away we move from center.

What "SinBoost" is designed to do is to produce pushrod deflection that is proportional to control stick deflection. To do this, it must apply an 'exponential' function to the servo's output. Those of you with Spektrum or JR systems may already be familiar with this technique, as it is available in their "swash" functions. In fact, if you have one of these systems and are using the Overdrive SX, make sure to turn the EXP function in the swash menu off.

Output pulse widths, with and without SinBoost.

I measured the output pulse widths of the throttle channel at various control stick positions using a Spektrum DX7 / AR6100e combination with 100% servo travel and no additional transmitter functions enabled.

WITHOUT SinBOOST		WITH SinBOOST	
STICK POSITION (%)	PULSE WIDTH (μ Sec)	STICK POSITION (%)	PULSE WIDTH (μ Sec)
0	1110	0	1022
5	1150	5	1076
10	1186	10	1135
15	1227	15	1180
20	1270	20	1231
25	1310	25	1275
30	1348	30	1324
35	1390	35	1375
40	1429	40	1412
45	1469	45	1464
50	1507	50	1502
55	1547	55	1554
60	1591	60	1596
65	1626	65	1639
70	1668	70	1668
75	1710	75	1732
80	1752	80	1775
85	1790	85	1823
90	1828	90	1881
95	1869	95	1938
100	1910	100	1992



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PRICE

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FLY WITH STYLE

FLY WITH CANOMOD

As you can see in this graph, without SinBoost – the measured pulse widths were linear. However, with the Overdrive SX plugged in the output took on the classic shape of an exponential function.

I also took some measurements using the rudder channel so I could see the effects of trim with and without “Overdrive”.

The “SinBoost” function of the Overdrive SX is not calculated on the fly, but rather uses a lookup table with entry intervals of 1 uSec. This, of course, improves performance, but the side effect is that calculations must be performed with a known pushrod attachment point. The attachment point used for “SinBoost” is 16.5 mm out from the center of the servo’s output shaft, which is a pretty good average value to use. Naturally, small errors are introduced if the pushrod is attached at other distances.

WITHOUT OVERDRIVE SX

FRAME RATE: 45 Hz
PULSE RANGE (WITH 100% TRAVEL ADJ.):
LOW: 1110 uSec
CENTER: 1500 uSec
HIGH: 1910 uSec

NOTE: 1-click left trim moved center to 1495 uSec,
 1-click right trim moved center to 1505 uSec.

WITH OVERDRIVE SX

FRAME RATE: 250 Hz
PULSE RANGE (WITH 100% TRAVEL ADJ.):
LOW: 1019 uSec
CENTER: 1504 uSec
HIGH: 1990 uSec

NOTE: 1-click left trim moved center to 1501 uSec,
 1-click right trim moved center to 1508 uSec.

Here are the effects of “SinBoost” as published by the manufacturer:

Without SinBoost			
Stick Pos. past center	Angular deflection	Pushrod deflection	Delta pushrod deflection
Center	0.00 °	0.00 mm	n/a
25%	7.5 °	2.15 mm	2.15 mm
50%	15.0 °	4.27 mm	2.12 mm
75%	22.5 °	6.32 mm	2.05 mm
100%	30.0 °	8.25 mm	1.93 mm

With SinBoost			
Stick Pos. past center	Angular deflection	Pushrod deflection	Delta pushrod deflection
Center	0.00 °	0.00 mm	n/a
25%	7.54 °	2.16 mm	2.16 mm
50%	15.11 °	4.32 mm	2.16 mm
75%	23.12 °	6.48 mm	2.16 mm
100%	31.52 °	8.64 mm	2.16 mm

Automobile transmissions have “overdrive.”

INSTALLATION

The included manual (which is very minimal) - as well as the Helix RC web site - doesn’t make any mention of the Overdrive SX’s operating voltage range. I contacted Helix RC and was informed that it will operate on voltages from 4.0v – 18.0v. The servo leads are constructed with premium gauge wire and quality connectors, thus keeping power loss to an absolute minimum, even during periods of high current. This pretty much allows it to be used with virtually all of today’s servos and on-board power sources.

Installation is relatively easy. All you need to do is find a location to mount the device that allows its leads to reach the receiver’s channel output ports. A small square of double sided foam tape holds the device in place. Then it’s simply a matter of unplugging each of one of the swash servos from the receiver and plugging them into the device output leads. The device’s input leads plug into the corresponding vacated receiver outputs.

FLIGHT TESTS

Once again, I employed the piloting talents of Tommy Heffel for flight testing. Tommy installed the Overdrive SX in his Outrage Velocity 50 and uses Align DS610 servos powered directly from a 2S LiPo pack to drive the swash.

To get a good comparison, Tommy first put a few flights in without the Overdrive

SX to establish a good baseline. The unit was then installed and taken out for another round of flights. The fact that we were testing it with a JR X9303 radio meant that we were already familiar with servo grouping (TrueSync functionality) and swash EXP (SinBoost functionality), as it’s built into the radio. So we disabled the radio’s swash EXP function as to not have it interfere with the Overdrive SX’s “SinBoost” functionality.

When I asked Tommy if he thought the device made a difference, his response was “Most definitely!” Specifically, he mentioned a vast improvement in response during maneuvers requiring large collective inputs.

CONCLUSION

My bench testing of the Overdrive SX clearly validated that the device behaves exactly as advertised. But to be honest, both Tommy and I were somewhat skeptical as to whether that would actually translate into any noticeable improvement in flight performance. But after flight testing, the reservations we had were gone. And remember, because we were already used to flying with swash EXP and servo grouping, all of our perceived performance improvement came purely from the “Overdrive” functionality.

Bottom line, if your radio system doesn’t have swash EXP and/or servo grouping functionality, by all means give

the Overdrive SX a go. If it already does (as ours did), it’s still a cost effective way to get first-class performance out of non-premium digital servos. **THEL**



+ THE GOOD

- Nice performance increase
- Simple installation
- Quality construction

- THE BAD

- Depending on system/servos, performance improvements may not be realized
- Instruction manual could be better

TESTED VERSION

HARDWARE: 1.3N
SOFTWARE: 1.73

CONNECT

MANUFACTURER: Helix RC
WEBSITE: www.helixrc.com
PART NUMBER: Overdrive SX
STREET PRICE: \$65

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

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SPEKTRUM

FUEL TANKS

You've got to put it somewhere.

WORDS: Shawn Kitchen | PHOTOS: Jason Boulanger

IF YOU BURN A COMBUSTIBLE FUEL, YOU'RE OBVIOUSLY GOING TO NEED A PLACE TO CARRY IT. On your model helicopter, the fuel tank is the only means you have of keeping a fuel supply accessible to your engine. That is, unless you want to run a 500-foot fuel line to your pit station, but you'll have a heck of a time flying inverted.

Like many other objects on a helicopter, there's not much to a fuel tank, but what's there is there for reason. Let's take a look:

FUEL TANK • Obviously, you're going to need some kind of container to carry fuel. Most fuel tanks are either blow molded or made of two pieces that are melted or fused together. Some will have screw-on caps, while others are designed as a single piece. Plastic is the preferred material, since it doesn't corrode like a metal tank would, it's cheap to make, and doesn't weigh much.

PRESSURE TAP • If all you had was a single tap for the fuel line running to the engine, your heli would never fly for more than a few seconds at a time. As the fuel level would drop, a vacuum would form inside the fuel tank, and the carburetor wouldn't be able to draw fuel against the vacuum. Putting a pressure tap in the fuel tank allows you to attach a line from your muffler or a crankcase pressure vent, which helps to generate positive pressure inside the tank. This allows the fuel to flow more freely to the carburetor.

PICKUP LINE • No, I don't mean the kind that you hear at bars. The pickup line in your tank is a line that's submerged in the fuel and moves around inside the tank as your helicopter flies. By keeping the line submerged in fuel, your fuel delivery to the carburetor is more consistent. If the line were to come out of the fuel bath, your engine would suck air instead of fuel, and sputter to a stop.

Most fuel lines aren't heavy enough to stay submerged in fuel all on their own, so to help weigh it down, you'd need a clunk.

FUEL CLUNK • The clunk is a hollowed-out piece of metal that attaches to the end of your pickup line. Since it's heavier than the fuel and fuel line, it stays submerged in the fuel more easily than the fuel line alone. This decreases the likelihood that your engine will suck air instead of fuel. Why is it called a clunk, you ask? Simple. It makes a "clunk" sound when it hits the bottom of the tank.



» ALTERNATIVE CLUNKS

A basic fuel clunk, while effective, still has difficulties staying fully submerged in fuel all the time. Depending on the design of the tank and the placement of the fuel tap, you can still have problems with the clunk being able to reach all the corners of the tank equally well. When your heli is in an orientation where the fuel clunk can't pick up fuel, your performance will suffer.

As an alternative to a traditional clunk, companies like OMI have designed fuel pickups that are a combination of a clunk and a sponge. Because it's heavier than the fuel (like a traditional clunk), it tends to stay submerged in fuel. However,

it's also wrapped in something that looks like a donut-shaped sponge. This spongy material soaks up fuel and keeps it held close to the hole in the clunk. Even in those moments where your clunk comes out of the fuel bath, the fuel-soaked sponge makes sure that the carb continues to draw fresh fuel rather than air. As a result, your engine's needle settings stay much more consistent throughout a flight.

On their own, sponge-type fuel pickups offer a distinct improvement in fuel delivery. Coupled with a pump and regulator system, they're arguably the best method of fuel delivery on the

market. Sponge-type pickups can be purchased from a number of online retailers, and are quite inexpensive—usually under \$15.



BUNG • Funny name, yes, but an important part nonetheless. On one-piece fuel tanks (those without screw-on lids), you need to have a hole in the tank that's large enough to get the fuel clunk and other pieces in the tank. The problem with a hole that big, though, is the issue of sealing it back up. The bung's purpose is to plug up the hole in the tank while still allowing for a fuel fitting for the feed line. Most of the time, bungs are little more than large rubber grommets, but there is the occasional exception.

On tanks with screw-on lids (like some Miniature Aircraft models), you won't find a bung, since the "guts" of the tank are inserted by removing the lid.

It goes without saying that the hole into which you insert the bung is called the ... well, bungle. I feel an attack of Beavis and Butthead coming on just saying that. Stop giggling.

FEED LINE • This is the line that takes the fuel from the fuel tank to the carburetor. This same line is often used to refill the fuel tank, since it's often easier to disconnect this line from the carburetor than it is to undo the pressure line or the return line.



RETURN LINE (ON SOME MODELS) • Some fuel tanks will have a third tap built in, which is used as an excess fuel return line. On engines that use a fuel pump, there will often be an excess amount of fuel above what the engine needs to operate. This fuel is sent through a bypass line back to the fuel tank so that no fuel is wasted and a constant fuel pressure to the carb can be maintained. Fuel tanks with return taps will have the tap on the bottom of the tank.

CONCLUSION

When you stop to think of the kinds of gyrations that helicopters can go through with modern 3D flight, it's amazing just how reliable our fuel tanks really are. We often take them for granted because of their inherent simplicity, but without them, our helis aren't going anywhere. Well, not the nitro helis, at least. The next time you're doing maintenance on your heli, stop and take a look at the fuel tank and check out the parts. A little preventive maintenance on your fuel system can keep you from the dreaded flameout. **TFL**

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- Entry forms returned that are for entry only and not a subscription order must have a 44¢ US postage stamp placed over the "no postage necessary" box. It is free to enter, but entries without subscription

orders sent in that are not at the sender's expense will not be eligible to win.

- Entries are limited to one per person. All entries must be postmarked by Feb 28, 2010 to be eligible for prizes chosen in March 2010.
- Winners will be selected in a random drawing, and all the decisions will be final. Winners will be notified by mail. Any prizes returned as

undeliverable will be awarded to alternate winners. Chances of winning will be determined by the total number of entries received.

- Taxes on all prizes are the sole responsibility of the winners. No substitution will be made for any prize offered.
- The sweepstakes is open to the public and US residents only. Employees of Think Omnimedia LLC,

HelDirect, Brown Printing, Curtis Circulation, and PCS and their families are not eligible. Sweepstakes is subject to all federal, state, and local laws and regulations. Void where prohibited by law.

NO PURCHASE NECESSARY

A complete list of winners will be printed in the May 2010 issue of RC Heli magazine.

GLOW PLUG WRENCHES

The key to your engine.

WORDS: Brandon Updike

HOW MANY TIMES HAVE YOU GONE TO THE FIELD ONLY TO FIND OUT THAT YOUR GLOW PLUG IS FRIED, and then realize that you forgot the right tool to properly remove it? We've all been there and after that mistake we've all realized how important a glow plug wrench really is. It can never be determined when a glow plug may need replacement. You can have one plug that seems to last forever, or you can run into problems and go through glow plugs like water. Either way, a tool set is never complete without a glow plug wrench.

FUNCTION

The basic concept behind a glow wrench is quite simple. Glow plugs are built with a hex nut in the middle of the plug. This allows it to be tightened and removed with any hex socket tool. Nitro engines use an 8mm glow plug, and a typical socket set unable to properly remove and tighten them.. This is where having a dedicated wrench comes in handy, where a ratcheting socket set does not.



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TYPES OF WRENCHES

STAR

This is perhaps the most widely seen variant of glow plug tool. Most of them come in a traditional cross shape and in a variety of sizes. The most standard one comes with four different sizes of socket heads with each socket at an equal length from the center. The only downfall about this variant is that they're pretty short, making it hard to twist on some helicopters.



T-HANDLE

T-handle socket wrenches are more user friendly because they can be found with long lengths. This allows for the glow plug to be turned without any obstruction. The handle also allows for a solid grip, making application of torque easier on the hand. The only problem with this one is that with such a great length, it cannot be directly applied to the head of an engine on some helicopters. Though rare, the tool must be inserted at an angle, making it almost useless. Despite that, this variant of the glow plug driver will more than likely suit all needs of glow plug removal.



CLASSIC HEX SOCKET DRIVE

This is the socket tool that comes with a handle very similar to a typical screwdriver. A shorter length of driver can be used because typically the handle won't hit the helicopter. However, this can make it harder to apply torque to the glow plug.



FLEX SHAFT DRIVER

I haven't seen this one often but it does exist and is probably my favorite. It's just like a typical hex socket driver, but the shaft is flexible. This allows the wrench to be able to apply the glow plug in more obscured areas. The only problem with this one is that you won't be able to apply large amounts of torque. However, it does tighten the glow plug enough to be sufficient.



TIP: As mentioned before, applying a glow plug can be tough on some helicopters because of angles. One tip we covered in the past is to apply fuel tubing on the glow plug to get the glow plug started in the threads.

CONCLUSION

As you can see, there are many glow plug wrenches to choose from and you can't really go wrong with any of them. Check to see which one is best for your helicopter. The T-handled one is probably your best bet, and if you can find the flex shaft that works better. Just remember not to leave it at home. **REI**



GLOW PLUG WRENCHES

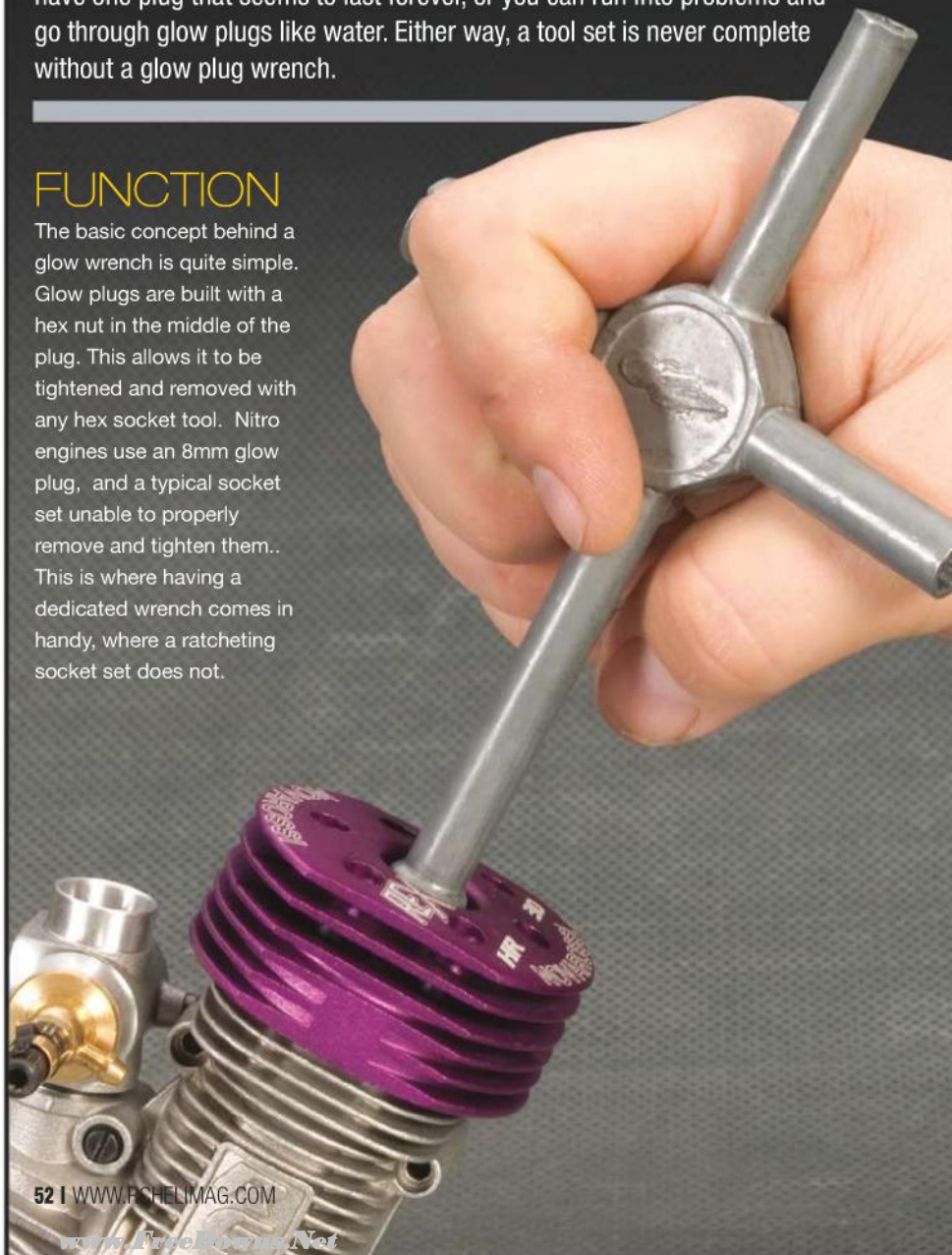
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ELECTRIC HELIS: PROPER PLANNING GOES A LONG WAY

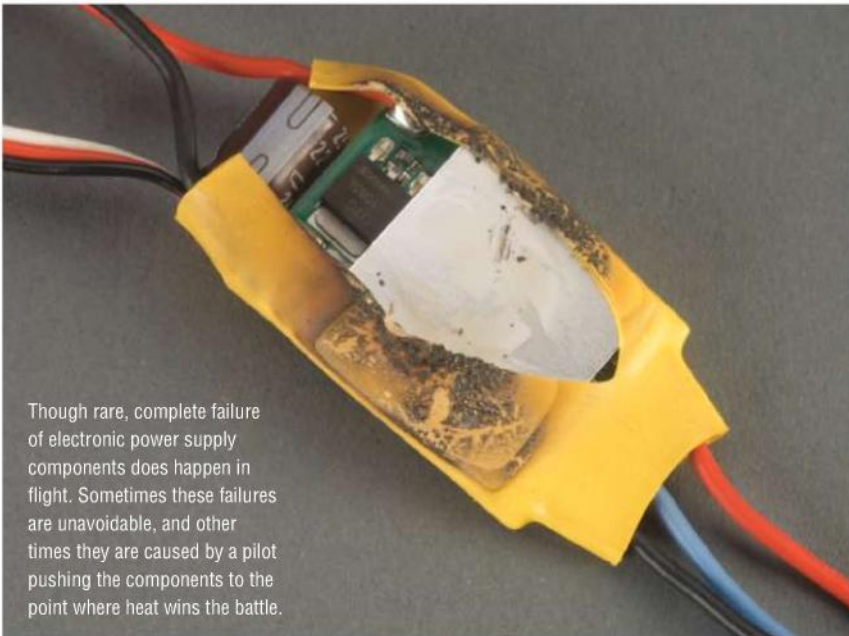
Electric models have three specific areas where heat can be a factor. The motor, ESC, and battery all generate heat while in use and all three items have different ranges and needs in order to keep cool. Electrical current is what powers these models, and it is how the components handle this current (in addition to flight duration) that determines how hot they get.

Ninety percent of the heat concerns with an electric model can be alleviated simply by using electronics that are able to handle the voltage and current that your model will be drawing. Be sure to look at what size of motor, pinion gear, battery, and ESC you will need to get the flight results you are after. A little online research will most likely return a number of proven electronics packages for your helicopter.



More and more electric helis are being sold with included electronics packages that are perfectly mated to each other and work very well together.


Heat can damage electric models in many ways. An ESC that is overloaded can go into thermal shutdown and turn off, cutting power to the model. In rare cases, an ESC will actually “pop” and light on fire from the heat. A motor that overheats can melt the epoxy used to hold its windings and magnets in place, resulting in failure. Of course, we must mention what can happen if a LiPo battery is pushed too far and gets too hot. There are cases when a LiPo will get so hot in flight that it puffs and splits a cell. Once a cell is split and open to the air, it will catch on fire. This results in a completely destroyed model.



Though rare, complete failure of electronic power supply components does happen in flight. Sometimes these failures are unavoidable, and other times they are caused by a pilot pushing the components to the point where heat wins the battle.

These failures are all “worst-case” scenarios and luckily, they rarely happen. The most common type of heat damage on an electric model is premature battery failure due to packs being run too hot. A pack that should last 200 flights may only last 50 if it is pushed too hard.

COMMON ACCEPTED TEMPERATURE RANGES

 Below is a list of the temperature ranges I try to maintain. Most manufacturers in the R/C world do not give specific operating temps, so most of this data comes from combining my own observations, talking with other pilots, and data posted in online communities. These ranges seem to work well in most cases that I have seen.

NITRO ENGINES: 180 to 210 degrees measured at the engine head, near the top of the cylinder. This seems to be a good compromise between longevity and power.



LIPOS: Battery temperature during a flight should stay below 140 degrees. Most of the high “C” batteries we use nowadays have no problem keeping cool when used properly.



ELECTRIC MOTORS:

These can vary a bit depending on manufacturer, but it would seem that even with the hotter running motors you’ll want to keep it less than 200 degrees to maximize motor life. I’ll find most of my hotter motors reading around 150-160 degrees **after a flight**.



ESCS: The cooler the better. Though **most** ESCs can handle high temps, there



is really no reason to have one go higher than 130 to 150 degrees. In fact, most of the modern ESCs are so well made now that they barely get warm when used with the proper motor and battery combo.

Just a little over done.

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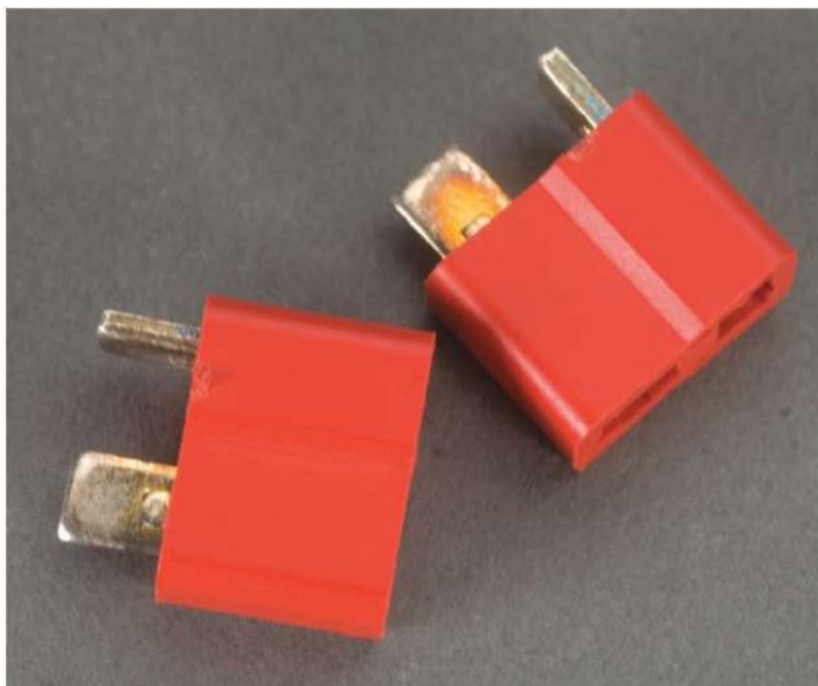
Obviously, we want to avoid any of these conditions in which a component may fail. A few simple tips to keep an electric heli running cool are:

- It is best to spend a little extra on a higher rated ESC. For example, if your model calls for a 60-amp ESC and you plan on flying heavy 3D on that heli, it wouldn't hurt to put a 75-amp ESC in the model instead. The extra headroom will allow the ESC to stay cooler.
- Do not push flight times. The most accepted rule of thumb is to run no more than 80% of the capacity out of a LiPo battery. Run short flights until you find out what kind of time you can fly while still staying under 80%. Getting that last 30 seconds of flight may result in a very hot and over-drawn battery.
- Don't skimp on batteries. The higher "C" rating a battery has, the cooler it is going to run. The "C" rating on the label refers to the continuous amp draw a battery can handle. For most modern 3D models you will need at least a 20C or higher battery.
- Take care of the connectors. The amount of current going through the battery and motor connectors on these models is quite high. You need to clean/replace the battery and ESC connectors regularly so they can efficiently pass energy. A bad connector can become a bottleneck and get hot. I have seen some bad connectors melt together due to the heat.

Electric models have come of age and you luckily do not hear of heat related component failures as often as you used to. I think part of this is due to better made electronics, as well as better educated pilots. A little common sense in your setup and flight times and your electric heli should run nice and cool for many, many flights.



This is an example of a battery that is either being run too long each flight, or being pushed harder than its rated for. A puffed battery like this is at the end of its life cycle and is ready for disposal.



Your battery connectors must be kept clean and in good working order. With the repeated plugging and unplugging these plugs have to deal with, they will loosen up and should be replaced as needed.

CONCLUSION

Heat can be a machine killer, whether you are talking about a computer server farm or a helicopter. As a pilot you need to keep track of how hot your engines, motors, ESCs, and batteries get. Their temperatures can reveal a wealth of information regarding the overall health of your power system. Following a few simple tips is usually all that is needed to keep your heli running nice and cool. See you at the field! *TTHL*

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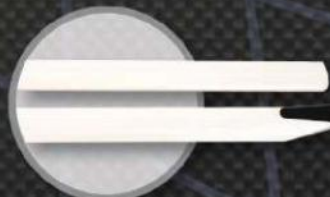
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Patriot Series Carbon
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CLUTCH LINER REPAIR

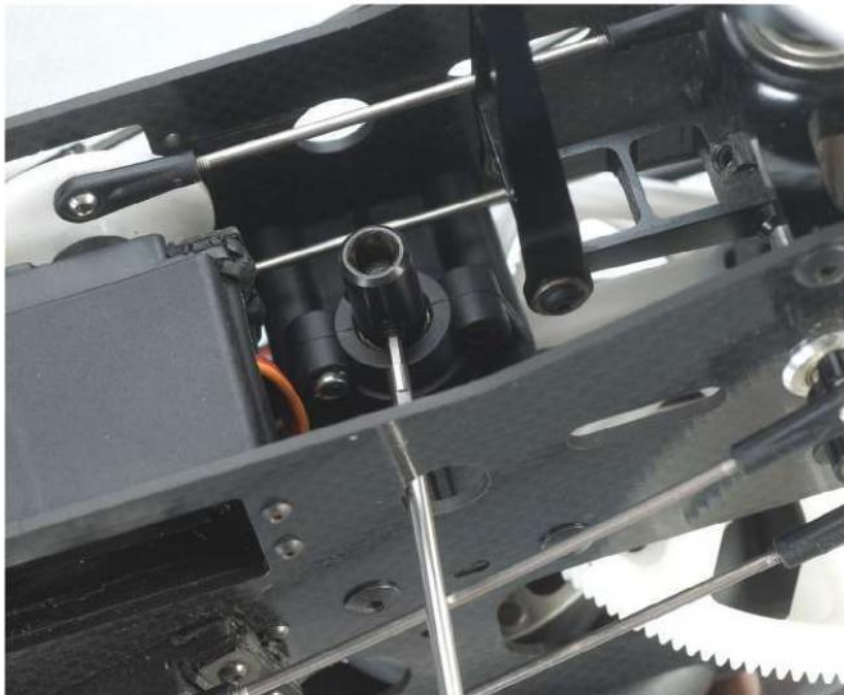
Get a Grip!

WORDS: Ryan Kephart | PHOTOS: Name Here

FROM TIME TO TIME WE FIND OURSELVES IN NEED OF BETTER GRIP FROM OUR CLUTCHES. Whether it's because we had a hot start or the clutch just wore out, everyone who owns a nitro heli will have to replace the clutch liner eventually. Replacing the clutch liner may take more time than just replacing the entire clutch bell, but for some of us who want to save some money and don't feel like throwing away a perfectly good part, this How To is for you.

REMOVING THE OLD MATERIAL AND INSPECTION

Depending on how bad the clutch has been worn, chances are that some material is going to be left in the clutch. In order to find out the wear of the liner and what condition the clutch bell is in, we must remove the clutch bell from the helicopter and inspect the inside surface.



1 Remove the clutch bell from the helicopter. If your helicopter uses a starting shaft you will have to remove the starting coupler to slide the shaft out. At this point you will also want to remove the clutch and possibly the cooling fan from the engine.

» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

2.0 *RC-Heli*

» TIME TO COMPLETE

60 Minutes

» TOOLS NEEDED

- HOBBY KNIFE**
- THICK CA**
- ACETONE**
- PAPER TOWELS**
- COARSE SANDPAPER**
- HEX DRIVERS**
- ELECTRICAL TAPE**
- NEW CLUTCH LINER**
- COTTON SWABS (Q-TIP)**

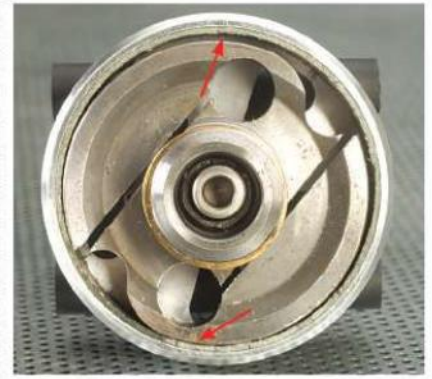
Hot starts = Sinky Clutch



2 Use a sharp hobby knife and carefully remove the old liner material from the clutch bell. Be careful and take your time during this process, it is very easy to slip and cut your fingers. A safer alternative is to use a rag around the pinion and lightly clamp on to the clutch bell using a vice.



3 After most of the material is removed, take some coarse sandpaper and sand the rest of the material off. If there is some residue left on the clutch bell, take a cotton swab soaked with acetone to remove the glue. At this point you can chuck the end of the pinion in a drill and give it a nice once over with the sandpaper and drill. This will create a rough enough surface for the new liner to adhere to.



4 At this point you'll need to inspect the clutch bell and make sure it is not out of round. Place the starting shaft back into the clutch bell and slide the clutch back in. Check the gap around the bell and clutch and make sure it is even. It doesn't have to be perfect, but anything over .010" out of round and the clutch will not perform at its best.

Watch out when sanding with a drill, things can heat up!

INSTALLING THE NEW LINER

Much like installing new tires on your car, a liner must be the right size and texture for it to work properly. Some manufactures offer this material while others don't. Luckily for us, most clutch liners are made from the same material and can be used from one helicopter to the next. If your helicopter's manufacturer does not offer a clutch liner, look to another brand that is similar in size; just remember that you can always cut it down, but you can't add to it if it's too small.

1 Trial fit the new liner inside the clutch bell. If you purchase a liner from another manufacture then chances are it will be bigger than necessary. Wrap the liner inside and mark it where it intersects with the starting point of the liner. Be careful not to bend the liner too much or it will break. Once you have placed the mark, take the liner out and cut it on the outside of the line. This will allow the liner to press up against the other side for a tighter fit. After you have cut the liner, trial fit it again and make sure that the ends touch each other without the liner bowing out. If the liner is too wide and sticks out of the bottom of the clutch bell, take a sharp pencil and draw a mark around the liner using the bell as a guide. Keep the liner installed in the bell for the next step.



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2 Next you will want to wrap your clutch with electrical tape so that the clutch can press against the liner while the glue dries. Wrap the electrical tape around your clutch a few times and install it into the clutch bell, making sure that the clutch is lightly pressing against the liner. If it is not, remove the clutch and add additional wraps until you are satisfied. If your clutch does not fit because the liner you purchased is too thick, you can sand down the liner at this point. It may be easier to chuck the pinion up in an electric drill and slowly take down the material. Don't spin it too fast or put too much pressure on the material. The paper will heat up and can burn your hands.



3 Next, you'll want to prep and glue the liner to the clutch bell. First, remove the trial fitted liner and clean the inside of the clutch bell with some acetone. You will also want to wipe down the side of the liner that you will be gluing. After the alcohol has dried, place a decent sized drop of thick CA to a cotton swab. Run the cotton swab around the inside of the clutch bell as you rotate the swab. This will add a thin layer of glue evenly around the clutch bell. Make sure you get enough to have a good adhesion. Place the clutch liner into the bell and press it against the sides of the clutch bell. Then install the clutch and let it sit overnight.



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Shown Actual Size!



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MONEY WELL SAVED!

Now that you are finished installing a new clutch liner you can see how much it saved you money. The cost of a liner compared to a whole clutch bell is only a fraction of the cost. **TTL**



4 After the glue has set, remove the clutch from the bell and take the tape off. Remove any tape residue from the clutch using the acetone. Trial fit the clutch back into bell and check the clearance between the liner and clutch. The gap should be as thick as a couple pieces of paper. Some manufactures will even give you a gap thickness, which you can check with a feeler gauge.

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Hirobo SDX 50 SWM

Time keeps on tickin'

WORDS: Jim Innes | PHOTOS: Jason Boulanger

HIROBO RELEASED THE SDX IN THE EARLY SUMMER OF 2009. We were able to get our hands on one of the first ones to hit U.S. shores and I have been flying it ever since. The SDX has gained quite a following over the past six months and has become a solid choice in the 50-sized nitro class.

Now that I have over 80 flights on the SDX, we will take another look at the bird and see how it has held up, as well as discuss my overall impressions of the heli so far.

The orange machine is back!



DRIVE TRAIN

The drive train for the SDX is carried over from its predecessor, the Evo. With that carryover comes years of refinement and real world use. As expected, the drive train on my SDX is still running smoothly as always. The clutch and clutch liner are in perfect shape and should last at least another season, and the revised one-way bearing is actually holding up better than those in the Evo's I have previously owned.

TWO THINGS TO NOTE ON MY MODEL ARE THE STOCK DRIVE GEAR AND THE FAN SHROUD:

- The stock black gear is still in good shape, but has worn a little bit over time. If it gets to a point where it causes concern I would replace it with the upgrade Delrin™ gear set from Hirobo (I am not expecting this to happen anytime soon).
- As I mentioned in the initial review, the stock fan shroud does not extend over the engine head. This was not an issue during early summer, but when August came around I found that some more cooling would be helpful. Hirobo offers an add-on shroud extension (part number 0412-338) that helps greatly. Of course, not all SDX owners will need or want this upgrade, but I feel that it will help my TT Redline 53 engine hold a more consistent temperature.



Nice swashplate tip!

ROTOR HEAD

The rotor head on the SDX is one of the most interesting parts of this model. I was initially intrigued by the two-piece head block, the extended length dampers, and the hard mounted spindle pivots. I initially wondered how the two-piece head would hold up over time and I am pleased to report that the entire rotor head is still in perfect shape. All the links, bearings, and other pieces are in good shape. As with the drivetrain, I did find two areas that benefited from extra attention.

First, the stock swashplate on my SDX developed a lot of play between the inner and outer races of the main bearing. This allowed slop between the lower and upper rings. I found a simple fix for this online from RunRyder.com user "MJA". His fix was posted in 2005, but it still applies to the SDX. In order to remove the slop in the stock swash we need to pre-load the bearing by putting four small setscrews through the lower ring, 90 degrees apart. Use a drill with a 2.4mm bit to make four small holes that end at the bearing face. Then install the short 3mm setscrews into the holes, being careful not to strip out the holes. You simply tighten the setscrews evenly and slowly until the slop is gone. The setscrews apply pressure to the outer race of the bearing, taking up the play. Be careful to not go too far or the bearing can become tight.

Second, the stock 4mm blade retaining bolts may bend. The bolts in my kit were only shouldered to about

the middle of the bolt and after some flying I discovered that they were slightly bent. I found that a number of other pilots were experiencing the same thing and the fix is simple, order some of Hirobo's hardened blade bolts (part number 2532-044). My understanding is that the hardened blade bolts are now standard in all current U.S. kits.



TAIL

I have had no issues with the tail on my SDX. The belt, pulleys, bearings, grips, and other pieces are all working well and show no signs of wear. I have not had to do anything to maintain or improve the tail system on this bird. Part of this is due to the heavy-duty tail grips that Hirobo also uses on its Turbulence 90 heli. I expect that the tail assembly will continue to run trouble-free for a long time to come.

OTHER ISSUES

One issue I did not mention above was the sagging landing gear. This has been a common problem with all SDXs; the landing gear is soft and sags too low, allowing the tail fin to contact the ground. Hirobo has recently remedied this issue by reworking the plastic formulation so that the landing gear holds up better under the weight of the helicopter. All new kits from the factory now have the updated landing gear in them. If you want to replace sagging gear on your SDX, the part number is unchanged.

OVERALL IMPRESSION

The rest of the heli is in great shape. All the bearings, links, the fuel tank, and other pieces are holding up well and should require no maintenance except for the occasional cleaning. With the few upgrades and fixes I have made on this bird, I expect it to continue performing well for many flights.

CONCLUSION

Hirobo is no rookie in the model helicopter world. Their many years of experience in this industry give them the ability to create very dependable and well-flying helis. The SDX fits the bill nicely, while still being reasonably priced. This model flies great and has never failed to pass a pre-flight inspection. I expect it to fly well for many years to come. See you at the field! **TRE**

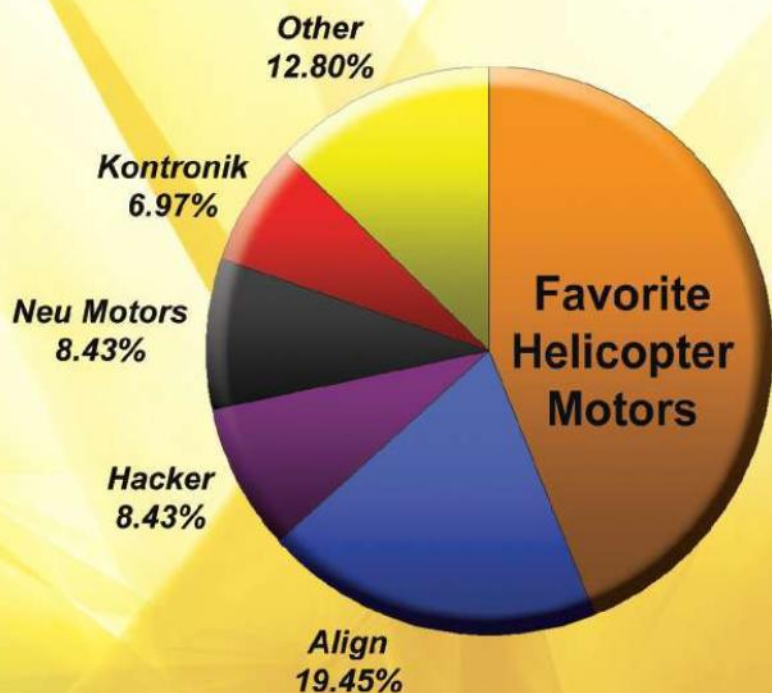




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*For complete details about the survey, please visit www.rcheliresource.com/results-2009-visitors-choice-awards/

MY TRIP TO HELIPROZ

WORDS & PHOTOS: Mike Velez

I had a dream a few nights ago, one of those that's extremely realistic and excites every sense. I found myself in a large room, surrounded by helicopter kits, parts, radios – everything I could imagine that had to do with a rotorhead. Then I was flying one of the kits and came up with an idea for a better fan hub and a few other gizmos that could help improve performance. Before I knew it, I was behind the counter of a hobby shop that specialized in helicopters. As I was helping a customer, the phone rang; it was Joe's Hobby Shop, a few states away, wanting to know if they could purchase some parts and kits from me – I said sure! Then I was flying a Miniature Aircraft kit, like the one I pined for in my youth. Somebody at the flying field then told me “don't worry if you dump it. You own the company.” The alarm struck and I was awakened from this dream. Well, it turns out, it wasn't a dream at all, more like a vision into the life of Chris Nelson, owner of FlyCo, a company you might not recognize by name, but if you're in this hobby, you definitely know it better than you think.

Recently HeliProz, one of the pioneers of RC helicopter retailing, invited me to Billings, Montana for the grand opening of their new facility. Having never been to Billings, or Montana for that matter, I thought it would be a fun trip. Back in October of 2008, HeliProz broke ground on a new facility that would cover 24,000 square feet of space. What could possibly fill up so much space? Keep reading and find out.

The airport in Billings sits up on a cliff.

MONTANA FUN FACTS

- No state has as many different species of mammals as Montana.
- Miles City is known as the Cowboy Capital.
- Montana has the largest Grizzly bear population in the lower 48 and it's the state's official animal.
- Is nicknamed the Treasure State
- The population density of Montana is 6.5 people per square mile; compare this to New Jersey which is 1171 people per square mile.
- Montana's name comes from the Spanish word for mountain.

HOW IT STARTED

HeliProz was founded in November '99 by Eric Hawkinson. He was an avid pilot who had been flying model airplanes since the late 60s. When Eric got into helicopters, he quickly discovered that there weren't any well stocked helicopter shops in his neighborhood, nor online, where he could get all his helicopter needs covered. Eric had worked at a local hobby shop and decided to lease 750 square feet of space and start his own full service 100% helicopter hobby shop – HeliProz. Things grew quickly and, within two years, Eric was forced to double his amount of work space. At about the same time, he launched the Mavrikk brand of accessories to sell through his store. A quick year after expanding to 1500 square feet, things were busting at the seams and the need for more space was desperate. Knock out a wall here; add a mezzanine there, and “poof” – HeliProz, just three years old, had grown to 5000 square feet of space. With the explosion of the Internet, online shopping, and RC helicopters, HeliProz established itself as one of the premier resources for helicopter products around the world.

In the spring of '06, bad news struck the Hawkinson family. Eric became very ill and was diagnosed with Amyloidosis, a very rare disease that occurs when proteins build up in your organs. Eric's prognosis was not good. He joked around with his staff, telling them that if they knew of anyone that wanted to buy a hobby shop, to let them know. Regardless of the outcome of the intensive treatments that Eric would have to endure, he decided it was best for him and his family to sell the company. After undergoing an aggressive bone marrow transplant that summer at the Mayo Clinic in Rochester Minnesota, Eric succumbed to the disease on September 1st, at the way too young age of 48.



Eric getting inverted with one of his favorite machines. This photo appeared in early HeliProz advertisements.

This router cuts out precision pieces from carbon fiber.



Machinists will get weak in the knees when they see this 7 axis bad boy.



HELIPROZ



THE FLYCO ERA

In the spring of '06, when Eric found out about his illness, he put out the call to find a buyer for HeliProz. However, a few years back, a customer of his, by the name Chris Nelson, had solicited him. Chris was a local entrepreneur who, in passing, had mentioned to Eric that if he were ever interested in selling the business to let him know. Well, due to his unfortunate circumstances, Eric gave Chris a call and asked if the offer was still a good one. The two began talking and in June that year, Chris formed FlyCo as a holding company to purchase HeliProz and Mavrikk. Chris brought with him years of experience from running multiple businesses, along with the financial strength to fully execute Eric's original vision. A dedicated, experienced staff, proven track record, and this new enthusiasm would hail in a new era of growth for the small company.

BIG SKY CNC

Big Sky CNC started with the idea of producing machined replacement parts for popular kits. The line started with Raptor 60/90 parts and has grown to cover replacement parts for JR, Align, E-flite, Hirobo, and other kits, along with accessories, tools and more. Big Sky CNC is now housed under the same roof as HeliProz. The line-up of equipment is first class. Being part of a bigger family of companies gives Big Sky the luxury of getting instant feedback from consumers and retail.

HELI WHOLESALER

When Eric ran HeliProz, he had a separate company that would sell Mavrikk and other brands direct to other hobby dealers looking for helicopter specific lines. When Chris took over, he wanted to expand this distribution arm and brought in Jeff Green, who was very well known in the industry for his experience, both behind the counter and as the US face of Hirobo. Heli Wholesaler sells to hobby shops around the country and stocks Align, Miniature Aircraft, and other brands that might not be found from other distributors.

There's a lot to talk about.

RON'S HELIPROZ SOUTH

Based in Texas, Rick's R/C Helicopters was a very well known helicopter retailer that had been around since the early 90s. For years, Ron Lund was actually running Rick's. One day, the ownership decided to close up shop, leaving some of the best people in the business without a job. Ron and Chris Nelson spoke and came together to start Ron's HeliProz South – separate from HeliProz, yet under the FlyCo umbrella.

MINIATURE AIRCRAFT

With retail, wholesale, and aftermarket covered, what was left? A complete helicopter manufacturer, of course. Chris explored the idea of starting from ground zero with a new brand, but realized the time and difficulty this would entail. Tim Schoonard and his crew down in Florida had been making some of the finest model helicopters in the world for decades. Again, it was one of those conversations where Chris had made the offer and, years later, the idea arose again, with Tim and Chris entering into conversation. In '09, Miniature Aircraft was purchased by Fleece and much of the production, packaging, and development is now housed in the new 24,000 square foot facility. Tim travels between Florida and Montana, continuing to do much of the design work in Florida. This new synergy is about to bear fruit with the release of the new X-Cell Fury 55. The new Fury 55 is a clean sheet design with a number of innovative features. Much of the kit, including most of the machined pieces, carbon fiber, and other items, is produced here in the United States.

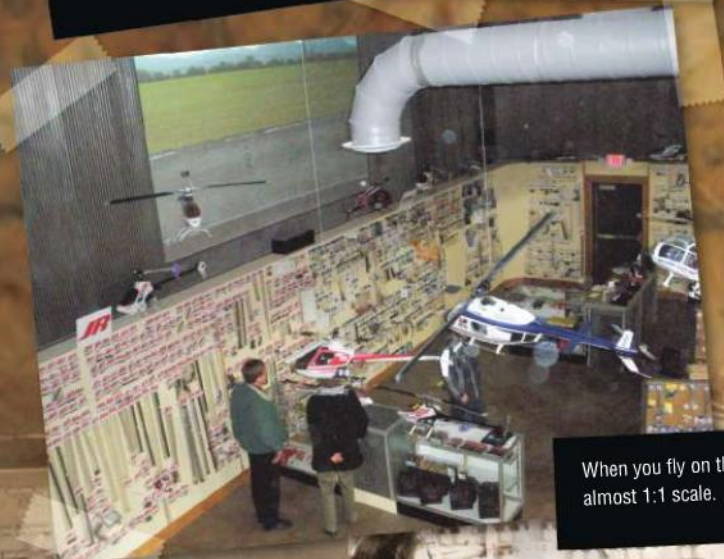


This is the Big Sky CNC operation that also makes parts for MA Fury 55.



Above, the prototype box for the new kit. Right, the crash sculpture.

Looks like I've got some dust on my lens.



When you fly on this sim it's almost 1:1 scale.



The helicopter theme is even carried through in the head.



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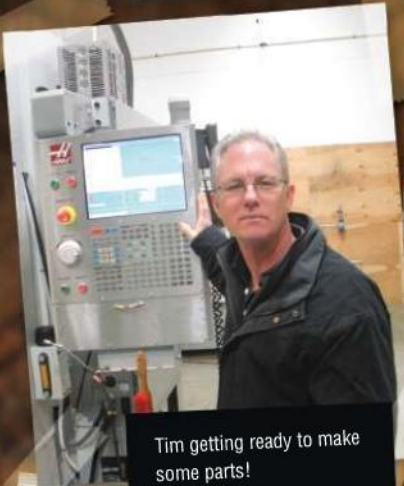
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Jennifer doing her general manager duties with a smile.



Tim getting ready to make some parts!



Kurt playing solitaire. Not really, he's probably working on some TPS report.



Jennifer, Kurt, and Chris Nelson (right) getting ready to cut the ribbon.



These ladies show up when ever there's ribbon to be cut.



GETTING IT DONE

FlyCo employs over 30 people in four different states, but two of the people responsible for bringing much of it together are Kurt Kreiger and Jennifer Hawkinson. Kurt was employee #1, joining Eric back in March of 2000. Kurt was there in the early days, helping Eric grow the business, and has seen each step of the process. Today Kurt is the Sales Manager at HeliProz. In May of '01, Jennifer Hawkinson, Eric's daughter, joined the team. Jennifer not only has been around the business for almost a decade, she brings degrees in accounting, management, and marketing. Jennifer is the General Manager.

CHRIS NELSON

Chris was a RC helicopter pilot (he actually is also a full-sized helicopter pilot as well) and customer of Eric's when the opportunity came to purchase the company. Chris grew up in Billings and graduated in the 80s from Eastern Montana College, now MSU Billings, with degrees in Accounting and Information Systems. These two backgrounds put him in a position between a banker and a computer geek. Early in his career, Chris developed a software program that would allow banks to look over a person's credit report and, based on certain criteria, "instantly" make a decision to approve that loan or not. Today, Chris' Zoot Enterprises works with the world's biggest banks and credit card companies. Chances are that if you have a credit card in your wallet, Chris' company had a little something to do with it. Chris still lives in Montana and visits HeliProz and FlyCo weekly, keeping up to speed on the goings-on of the business. He's a straight-shooting, soft-spoken man who works hard to put the right people in place and lets them run with the ball, so to speak.

Chris promised me to take me up in his heli next time.



PITTS SPECIAL

HOBBYKING PITTS SPECIAL PLUG-N-FLY

The HobbyKing Brushless Pitts Special is as exciting to look at as it is to fly!

The Pitts comes 97% pre-built and will take you around 10 minutes to attach the main wing and include your own receiver.

SPECIFICATION:

Length: 760mm
 WingSpan: 860mm
 Prop: GWS 1047
 Weight: 540g
 Motor: C4038-15 Brushless outrunner 700kv
 ESC: 20A brushless
 Battery: 11.1v 1300mAh 3S1P (Not included)
 Servos: 9g x 3

F4U CORSAIR

HOBBYKING F4U CORSAIR PLUG-N-FLY

The F4U Corsair is accurately moulded and a true representation of the full sized machine. Attention to detail, 20A powerful brushless system, steerable tail wheel and scale looks are what makes this an excellent foame.

SPECIFICATION:

Wing Span: 1000mm
 Length: 835mm
 Motor: C4038-15 Brushless Outrunner 700kv
 Battery: 11.1v 1300mAh 3S1P (Not included)
 Weight: 570g
 Prop: 1160x3
 ESC: 20A brushless
 Servos: 9g x 4



MIG-15 FIGHTER

R/C DUCTED FAN JET PLUG-N-FLY

The HK Mig-15 foame is as much fun to fly as it is attractive. The 30A 64mm ducted fan provides more than enough power and the large intake/exhaust make for rapid acceleration and easy takeoffs.

SPECIFICATION:

Wing Span: 800mm
 Length: 800mm
 Flying Weight: 580g
 Motor: B2040-14L-2 Brushless (4000KV)
 ESC: 30A
 Servo: 4 x 9g
 Battery: 1600mAh 3S1P 20C Lipoly Pack (Not Included)
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4	EZ FLY	Sweden	info@ezfly.se	www.ezfly.se
5	FROGS	France	remi@frogs.fr	www.frogs.fr
6	HeliHover	Spain	info@helihover.com	www.helihover.com
7	HOBBOY J-P	Finland	Myynti@hobbyjp.com	www.hobbyjp.com
8	Model Engines (Aust) Pty, Ltd	Australia	neil@modelengines.com.au	www.modelengines.com.au
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PROUDLY MADE IN KOREA

The Facility

The new facility is pretty amazing. The industrial façade on the outside, with a large "HeliProz" sign, let's you know what's in store. Walk in and it's two stories of helicopter heaven. Every part you can imagine, every kit, radio, gyro, etc. is within your grasp. A giant theater-like flight simulator hangs on the wall, with full surround sound. Foot traffic isn't very heavy; in fact, they don't see too many customers in a normal day, but the guys and girls answering the phones work out of this retail space entering orders, answering questions, and finding the right part for customers that call in. Through the doors takes you into the shipping department, where each day hundreds of orders are picked and packed, ready to ship around the world. According to UPS, HeliProz is the second largest shipper in Billings, a city with its own international airport. Going deeper, you enter into the warehouse. This is truly RC nirvana, full from rafters to the ceiling with helicopters galore. The space is portioned off between inventory for HeliProz and Heli Wholesaler. Hang a right and up the stairs takes you to the Miniature Aircraft headquarters. This is where much of the kit packaging, assembly, testing, and development takes place. This is the ultimate heli workshop. Way in the back is the home of Big Sky CNC. State-of-the-art machinery, some costing as much as a quarter million dollars, churns out precision-machined parts for a number of different helicopter kits including the machined pieces being used on the new Fury 55.

The new building is built atop 20 acres, with plenty of room to fly. Plans are to build a clubhouse that is reminiscent of the tower at the AMA headquarters in Muncie, IN.



This is what heaven will probably look like for many of you diehard heli freaks.

HELIPROZ



Getting the opportunity to visit Billings and seeing all the people behind HeliProz was a great experience. Having known Eric since just before I started the magazine, it's great to see his vision live on and thrive. Special thanks to Jennifer, Kurt, and Chris for their amazing hospitality. *RHL*

Need a part?

2009 Orlando HELICOPTER BLOWOUT!

WORDS & PHOTOS: Chuck Bassani

Those of us involved with RC helis will generally keep a list of 'must attend' events, and now after having attended the 2009 Orlando Helicopter Blowout, this one certainly has made it onto my list. Sans IRCHA, the OHB attracts the largest gathering of heli pilots in the US – this year's edition logged 219 registered pilots (137 of them pre-registering). Every pilot that registered received a commemorative event T-shirt.

Cold in Florida?

EVENT PROMOTION

The beautifully scenic flying site for this year's event is the home of the Remote Control Association of Central Florida (RCACF) and is located in Apopka, Florida, just a few miles north-west of Orlando.

The OHB fun-fly is the brainchild of Bert Kammerer and is hosted by The Orlando Remote Control Helicopter Society (TORCHS) club, with Carey Shurley performing the Contest Director duties. Bert is indisputably one of the most talented and recognized pilots in the business, and a heck of a nice guy to boot! If you ever have the opportunity to meet him, by all means take advantage of it.

Mike Fortin of Inertia RC served as this year's MC. Mike did an outstanding job keeping the crowd entertained and well informed of everything that was going on.

Mike was also responsible for personally passing out what seemed like a never ending supply of sponsor-supplied goodies, including kits, engines, accessories, and T-shirts. Although many of them were dished out as raffle prizes, a good share of them were simply just given away. I'd be surprised if anyone went home empty handed!

Weather wise, Friday was bitter cold (in relative central Florida terms). The sky was overcast and the temperature was in the mid 50's, but with the strong winds I felt like I never left New York. Considering rain was in the forecast and never really materialized, we lucked out. Saturday saw the sun come out and it turned out to be quite pleasant, although it was still rather windy. Sunday was absolutely beautiful.



MC Mike Fortin, CD Carey Shurley, & Event Organizer Bert Kammerer. These guys produced one of the most memorable events I have ever attended.



Mike Fortin: The 'Master'

Tons of goodies were passed out throughout the event. The sponsors were very generous.



I'm guessing this isn't normal attire for central Florida?

To say this event was well attended is an understatement.

THEY PUT THE 'FUN' IN FUN-FLY ...

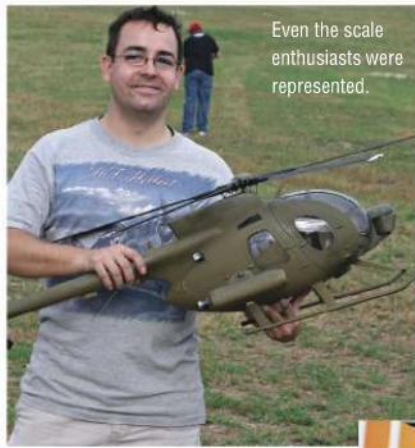
As you'd expect, the pilots had a blast. How often do you get to show off your stuff in front of thousands of spectators? But even if you didn't fly, the OHB was entertaining.

One of the items to be given away was a brand new Align Trex 250 kit. Mike (I'm assuming jokingly) resolved to pass it out only if Frank Columbia crashed. Well, Frank didn't disappoint ...

Having a spotter is important, and you'll be hard pressed to find a better spotter than this?



This palm tree was about 100 yards out in front of the flight line, and apparently quite a few pilots thought it needed trimming.



Even the scale enthusiasts were represented.

Unfortunately we saw a fair share of 'Chicken Dances', and this little guy celebrated every single one of them.



The top raffle prize was this beautiful ready-to-fly Align Trex 700 Limited Edition, donated by Heli Wholesaler and hand built and test flown by Bert himself. John Green from Orlando Florida was the lucky winner.



The sound of 'blade-scraping' could be heard everywhere.



Thanks to Frank's aggressive flying (it was promised if he crashed), the Align Trex 250 kit made it into the hands of some lucky attendee.



'Cool' starts at an early age.

I don't think it was just the chicken dancing.



POWER IS NOTHING WITHOUT

KONTROL

2009 Orlando HELICOPTER BLOWOUT!

EVENTS

ASIDE FROM THE 'FUN-FLY', THE OHB ALSO FEATURED A FEW STRUCTURED EVENTS.

NON-SPONSORED PILOTS 3D CONTEST

First up was a "Non-Sponsored Pilots 3D Contest". Some well know personalities judged this event.

The first round was flown on Friday, with the top three contestants moving into a final round flown on Saturday. The routines were limited to three minutes, and most of them were flown to music. The winner received a nice trophy and \$300 cash. Second and third place winners received a trophy and a gift certificate to Esprit Model.

THE WINNERS OF THE 3D CONTEST WERE:

- **1ST PLACE:** Al Austria
- **2ND PLACE:** Alex Ruiz
- **3RD PLACE:** Joey Scott

AUTOROTATION CONTEST

The Autorotation Contest was held Saturday afternoon. It was an untimed event that was scored on the distance between the nose of the heli and the target spot. Three attempts were scored, and the distances were summed up. Darren Lee won this event.

NOON-TIME DEMOS

The pros were strutting their stuff. Most notable was Matt Botos putting in a few remarkable flights with an electric flybarless speed demon. This heli was flown faster (estimated at over 160 MPH), higher, and further than I've ever seen an RC heli flown before. It was AWESOME, Matt – all I can say is that your eyesight is spectacular!

Nick Maxwell, in his classic style, was pushing the 3D envelope. Ray Nemovi flew his TRex 700 electric conversion, and put in some very impressive flights with it. Oh yea, Bert wasn't too shabby either.



Standing: (Mike Fortin & Bert Nemovi)
The Judges: (Boboy Watts, Matt Botos, Kyle Dahl, Ray Nemovi & Nick Maxwell)



You've gotta see this machine in action, it was unbelievable.





TOP / PROFESSIONAL PILOTS PRESENT

- Bert Kammerer
- Bobby Watts
- Matt Botos
- Kyle Stacy
- Nick Maxwell
- Kyle Dahl
- Marcus Kim
- Danny Szabo
- Henry Caldwell
- Ray Nemovi
- Frank Columbia
- Will Fannin



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FLYBARLESS

2009 Orlando HELICOPTER BLOWOUT!

SOME NEW STUFF TOO ...

WHILE WALKING AROUND, I NOTICED SOME NEW PRODUCT. On Mike Fortin's machine, I spotted an Inertia RC Nano Gyro.



Passing by the Outrage camp, I saw a new electric, the Fusion 50. Access to what was underneath the canopy was off limits, but I'm told we'll have specifics shortly.

SPONSORS

THIS YEAR'S EVENT WAS SPONSORED BY:

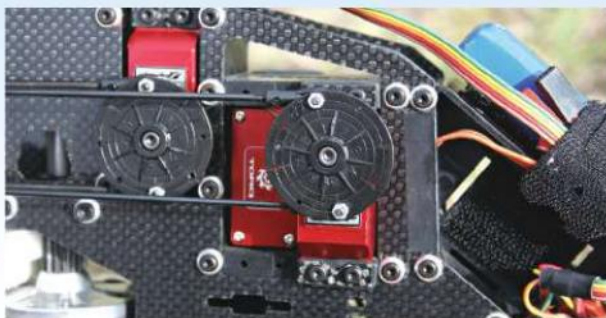
- Heli Wholesaler / Align R/C
- Outrage R/C
- ReadyHeli / Mikado
- Ely.Q
- RCHeliWorks
- Ray Nemovi
- Horizon / JR-Spektrum
- Experience R/C
- Byron Fuels
- Great Planes / Futaba
- Edge Rotor Blades
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- Inertia R/C
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- KBDD
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- Graves R/C
- RC Booya
- Bergen R/C



One of a few casualties of the event.



An unmasked Velocity, however, revealed some new Outrage TORQ servos and Outrage servo output wheels. These are titanium geared, high voltage, brushless motor servos. The BL 9080 servo is designed for cyclic duty and has a speed / torque rating of 0.06 sec / 112.35 oz respectively at 7.4 volts. The BL 9088 is a tail servo with ratings of 0.04 / 78.53 at 7.4 volts. Also notice the nice laser engraving on the bottom of their cases.



And looky here ... Synergy N5 was in the house.



CONCLUSION

Considering this was only the second annual presentation of this event, it was a resounding success – and I predict it has an even brighter future. As I said in the intro, add this to your "must-attend" list. I promise you won't be disappointed. And thanks to the OHB, we no longer have to wait a whole year for a heli pilgrimage.

Happy Flying ... *TEL*

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MINI V-BAR
TECHNOLOGY



Mikado
Model Helicopters

Thunder Tiger

RAPTOR 30 2.4G SC

All in one, just add fuel.

WORDS: Ryan Kephart | PHOTOS: Jason Boulanger

IT HAS BEEN 43 ISSUES SINCE THE BEGINNING OF RCHELIMAGAZINE AND WHAT DO YOU KNOW, WE HAVE NEVER DONE A REVIEW ON A RAPTOR 30. What better way to review this staple of beginner helicopters than with a brand new version made available by Thunder Tiger. The Raptor 30 RTF has all the works to get any beginner pilot up in the air in no time. Let's go over the reliable Raptor and show you what makes this RTF heli a beginner's dream.

A new breed of RTF.





It was cold shooting this heli.

» AT A GLANCE	
SIZE:	30
POWER:	Nitro
TYPE:	Pod & Boom
BUILD TYPE:	Ready To Fly [RTF]
TAIL DRIVE:	Belt

FEATURES

The Raptor 30 is a predominately plastic design that is known to be reliable and easy to work on. This RTF version only requires that you install the tail boom, hook up the linkages, and throw some blades on to get it in the air. The Raptor 30 RTF includes all the electronics and a Thunder Tiger engine.

» MAIN FRAME

SWASH CONTROL: Unlike today's norm, which is usually CCPM, the Raptor uses a mechanical mix control system. This means that the swash has individual servos that control the three functions of the swashplate. For example, one servo controls the aileron, one for the elevator, and one for the collective control the swash.

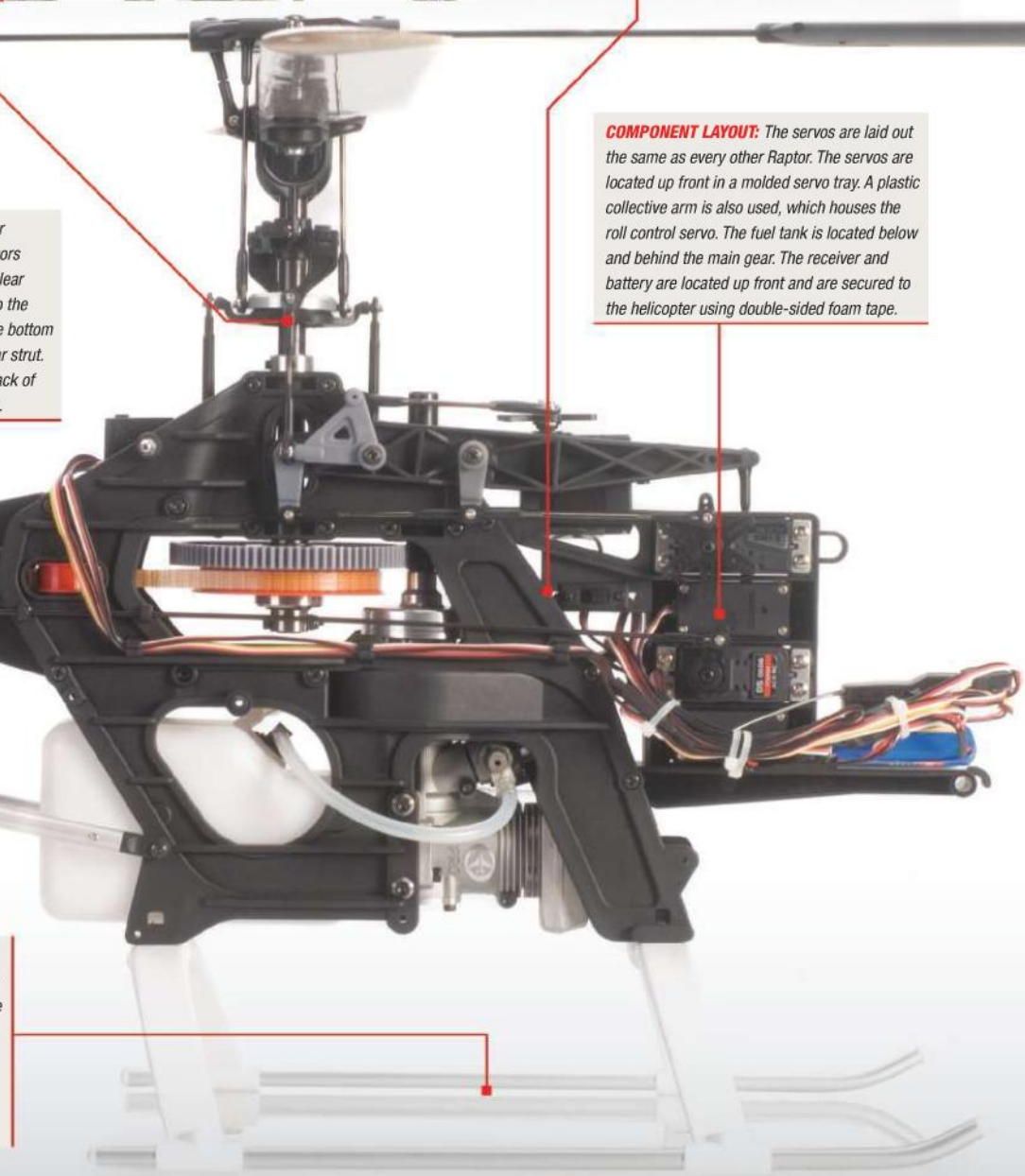


DESIGN: The frame is a composite plastic material that is molded to have every support, bearing block, fan shroud, and mounting point in one simple design. This design has made the Raptor what it is today. Fewer parts allow the Raptor to remain one of the most reliable airframes available.

CANOPY: The canopy on the Raptor 2.4G SC follows its older predecessors with "milk jug" style plastic and a clear windscreen. The canopy attaches to the helicopter using a plastic clip on the bottom that clamps to the front landing gear strut. Two rubber grommets attach the back of the canopy to the frame's standoffs.

COMPONENT LAYOUT: The servos are laid out the same as every other Raptor. The servos are located up front in a molded servo tray. A plastic collective arm is also used, which houses the roll control servo. The fuel tank is located below and behind the main gear. The receiver and battery are located up front and are secured to the helicopter using double-sided foam tape.

LANDING GEAR: The landing gear is comprised of four separate pieces. The struts are made from a flexible, durable plastic and attach to the main frame using four self-tapping screws that thread into the bottom of the plastic frames. Two aluminum skids attach to the struts using four setscrews.



» DRIVE TRAIN

ENGINE MOUNT: The engine is installed on an aluminum mount sized for a 30-sized engine. The mount and engine is then installed to the airframe using four screws that slide through the frames and thread into the engine mount.

CLUTCH: The clutch is mounted to the cooling fan by two screws. The clutch has a one-way bearing pressed into the center that allows the starting shaft to disengage after the engine has started.

COOLING FAN AND SHROUD: The cooling fan is a mix of plastic blades and an aluminum hub. The fan shroud is integrated into the frames and directs the airflow over the head of the engine.

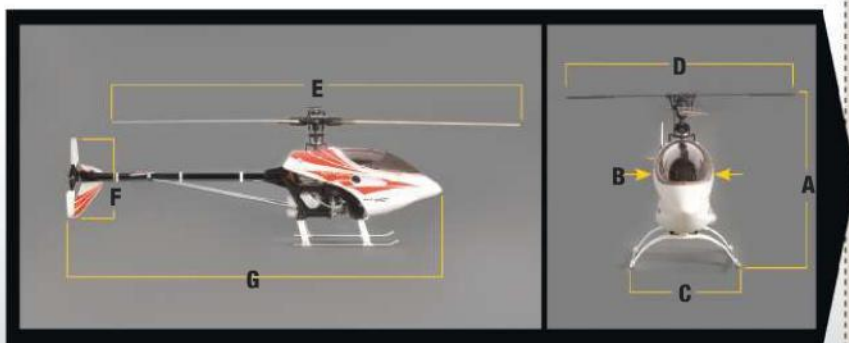


MAIN GEAR: The main gear is made from plastic and is not adjustable for gear mesh.

AUTOROTATION DRIVE: A one-way bearing is pressed into the aluminum hub on the main gear. The tail drive gear is linked to the main shaft and allows for a driven tail autorotation.

TAIL DRIVE: The tail drive uses a simple pulley system. A belt wraps around the main tail pulley and through two idler pulleys that keep the belt straight down the length of the boom. An additional pulley is located at the tail case just before the belt reaches the final tail pulley.

“OVERALL THE RAPTOR IS ONE OF THE MOST RELIABLE AIRFRAMES ON THE MARKET.”



THUNDER TIGER RAPTOR 2.4G SC MODEL SPECIFICATIONS

CLASS:	30-sized nitro
BUILD:	RTF
BLADE SIZE:	550mm
LEVEL:	Beginner

FRAME

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

ROTOR HEAD

GRIPS:	Plastic
HEAD BLOCK:	Plastic
LINKS:	Ball
SWASH:	Metal/plastic
CONTROL:	Mechanical (Std)

TAIL

DRIVE SYSTEM:	Belt
AUTO DRIVEN:	Yes
TAIL PITCH SLIDER:	Single-point
TAIL BLADE GRIPS:	Plastic
TAIL CASE:	Plastic
BOOM STRUT MATERIAL:	Aluminum

GEARING

MAIN ROTOR TO PINION RATIO:	1:9.56
MAIN ROTOR TO TAIL RATIO:	1:4.57

WEIGHT

EMPTY:	N/A
WITHOUT FUEL:	8 lbs., 4 oz. (3,741g)
FULLY LOADED: (includes fuel)	9 lbs., 0 oz. (4,082g)

DIMENSIONS

HEIGHT (A):	15.75 in (400mm)
CANOPY WIDTH (B):	5 in. (127mm)
LANDING GEAR (C):	10 in. (254mm)
PADDLE TO PADDLE DIA. (D):	22.25 in (565mm)
MAIN ROTOR (E):	49 in. (1245mm)
TAIL ROTOR (F):	10.25 in. (260mm)
LENGTH (G):	45.2 in. (1150mm)

FEATURES CONTINUED

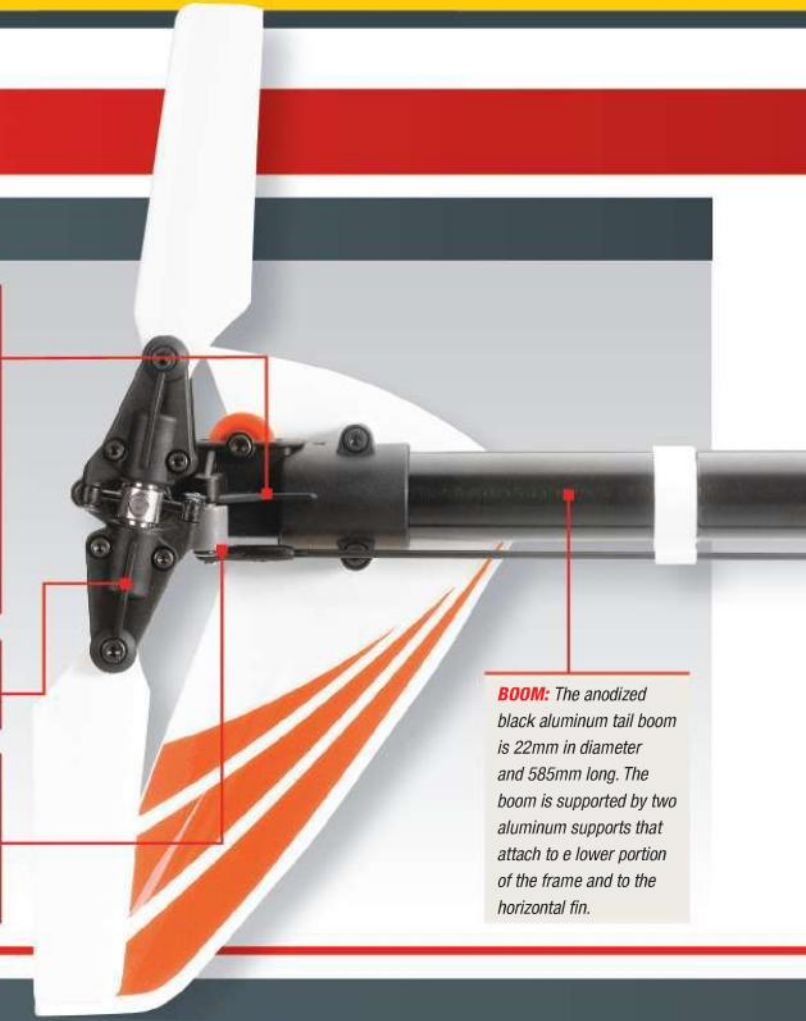
» TAIL & BOOM



TAIL CASE: The tail case is a two-piece split design that has a guide pulley located just before the tail rotor drive pulley. The case is made from plastic and has all the parts needed for the pitch actuating system molded into the design. The tail case clamps on to the tail boom using two screws that also hold the vertical tail fin.

TAIL BLADE GRIPS: The tail grips are dual ball bearing supported. The tail hub is held in place using two grub screws that thread through the base of each tail blade grip and are secured using a nut.

PITCH ACTUATOR SYSTEM: The tail is controlled by a three-piece pushrod that extends from the tail to a coupler. The coupler attaches the front half of the pushrod that is fed through the frames. The pitch slider is connected to a plastic bellcrank using a single ball-type connection. The bellcrank is dual ball bearing supported and is installed to the integrated standoff that's molded into the case. The links are pinned to the fork and screw into the blade grips.



BOOM: The anodized black aluminum tail boom is 22mm in diameter and 585mm long. The boom is supported by two aluminum supports that attach to a lower portion of the frame and to the horizontal fin.

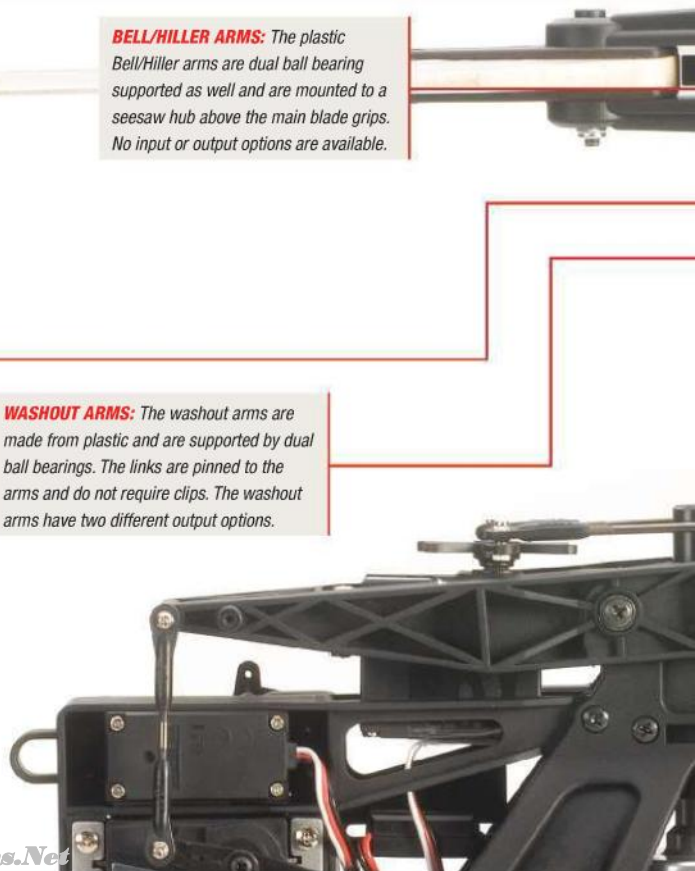
» ROTOR HEAD

HEADBLOCK: The headblock is made from plastic and is secured to the main shaft using a single Jesus bolt. A thick one-piece damper on each side of the headblock performs the damping.

BELL/HILLER ARMS: The plastic Bell/Hiller arms are dual ball bearing supported as well and are mounted to a seesaw hub above the main blade grips. No input or output options are available.

PHASING: Two metal pins are pressed into the plastic headblock and are not adjustable. A plastic washout base slides freely on the main shaft and provides minimal slop clearance on the phasing pins.

WASHOUT ARMS: The washout arms are made from plastic and are supported by dual ball bearings. The links are pinned to the arms and do not require clips. The washout arms have two different output options.



Same proven Raptor, same reliability.

» INSTRUCTIONS & BUILDING TIPS

WHEN YOU OPEN THE BOX

Opening the Raptor 2.4G SC box is unlike any other nitro helicopter you have ever seen. The helicopter is packaged nicely and is secured to the bottom of the box using four zip ties. The helicopter is packaged nicely and is secured to the bottom of the box using four zip ties. The canopy is installed and the boom is separated on the side of the box. Separate boxes are included which house the radio, blades, and other items. The helicopter is fully assembled and ready for flight with just a few basic steps.

MANUAL AND BUILD

Not much is to be said about building the Raptor 2.4G SC. This helicopter comes complete except for the tail and blades. All that is required to get this

helicopter in the air is to install the tail boom assembly and blades. The Raptor includes wooden blades which require gluing on the plastic blade roots, and the tail blades must be installed. The Raptor 2.4G SC includes all the manuals that you would find in the normal kit in addition to the radio and engine manual.



MAIN BLADE GRIPS: The main blade grips are made from plastic composite and are molded with additional support grooves. The grips are also molded with pitch arms. Dual ball bearings and a thrust bearing support each grip.

SWASHPLATE: The swashplate is a two-piece design that has an aluminum inner section and a plastic outer race. The swashplate uses a single ball bearing and has a brass sleeve to retain the pivot ball. The elevator arms pull double duty as anti-rotation guides.

THUNDER TIGER RAPTOR 2.4G SC RTF & TEST GEAR

» TEST GEAR



- **FUEL:** Byron Fuels Rotor Rage 20%

» SUPPLIED GEAR



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



- **RECEIVER:** Ace RC, 6ch 2.4Ghz Receiver, TRS601DD, 0.4oz. (10g)



- **CYCLIC SERVOS:** Ace RC, S1903, A8114, 1.64oz. (47g)



- **THROTTLE SERVO:** Ace RC, S1903, A8114, 1.64oz. (47g)



- **TAIL SERVO:** Ace RC, DS0606, A8130, 2.12oz. (60g)



- **GYRO:** Ace RC, TG7000, A8070, .83oz. (24g)



- **ENGINE:** Thunder Tiger, Pro-39H, TTR9604, 10.22oz. (290g)



- **MUFFLER:** Thunder Tiger, 30-sized Helicopter Muffler

- **BATTERY:** Not yet released

The gear that will get you in the air.

TESTING

We tested the Raptor 30 2.4G SC the way it was intended and with all the stock electronics. We decided to use 20% nitro for tunability and power, but all-in-all we tested this RTF stock. The radio comes pre programmed to give you a pitch range that would be suitable for a beginner. Let's take a look at how the Raptor 30 2.4G SC flew.

HOVERING • The initial few flights were to break in the engine, so some hovering was in order. The Thunder Tiger Pro 39H started right up, but needed to be tuned to get the temperatures in check. I found that the low end had to be richened by a good half turn or more to get the mid range rich enough for break-in. Overall, the Raptor hovered with the best of them. The combination of slower cyclic servos really made a difference in how the helicopter felt in the air. This is a great feature for any beginner pilot.

Rating: 5

FORWARD FLIGHT • Pitching the helicopter forward and picking up speed was just as smooth as a hover. The Raptor flies around with grace and feels right at home. Changes in direction were not as crisp as some 3D setups, but once again this helicopter was designed with the beginner in mind. Forward flight characteristics are well suited for this helicopter and its intended audience.

Rating: 4

CYCLIC PITCH RESPONSE • Knowing a Raptor inside and out tells me that the cyclic speed can be fast if you want it to be. However, this helicopter is nice and slow. This gives you time to react to what is happening and give an input rather than the heli being too fast for the new pilot to correct. This helps a pilot in the beginning stages learn their orientation skills. Overall, the cyclic is responsive enough to fly around and still feel as if you are in complete control.

Rating: 4

COLLECTIVE PITCH RESPONSE • The collective on the Raptor 2.4G SC is very mild. The pitch is set up with the beginner in mind, which allows the helicopter to ascend at a decent rate without bogging the motor. The pitch curve is also set up very mild (-2°) at the

low collective position. This allows the helicopter to descend slowly even if you cut the throttle completely.

Rating: 4

TAIL ROTOR RESPONSE • The included heading lock gyro makes the Raptor's tail handle with authority. The tail does not drift or wander about, which is a key when first learning how to hover. The included gyro allows the pilot to experiment with backwards flight when he is ready. Overall, the tail can handle anything the new pilot can throw at it.

Rating: 4

AUTOROTATION CAPABILITIES • This Raptor is not set up from the factory to be able to autorotate, due to its reduced negative collective range. When you are ready to start practicing an auto, have a fellow helicopter pilot take a look at your setup and adjust the pitch range.

Rating: 3

POST FLIGHT INSPECTION • Going over the Raptor 2.4G SC and inspecting every part shows how well this helicopter is constructed. The tried-and-true airframe will last for hundreds of flights. Overall, the Raptor is one of the most reliable airframes on the market.

Rating: 5

CONCLUSION

This kit is an excellent option for a novice pilot looking to try his hand at nitro, or a first helicopter. From the factory it's set for pedestrian flight performance however with a little TLC can be tweaked for more aggressive flight performance. The new Sky Tech TS6i radio is very nice and has good comfort in hand. All-in-all this is a solid value for anyone looking to get into nitro or RC helicopters for the first time. Reliable, priced right, excellent parts support, and solid performance make this kit a homerun. **TRH**



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TESTING SPECS

THUNDER TIGER RAPTOR 2.4G SC

Part #: 4839-F08

Distributor: Ace Hobby

Web: www.acehobby.com

Street Price: \$599.99 - \$629.99

Price as Tested: \$629

Build/Setup Time: 30-45 Minutes

PERFORMANCE

MODE FLOWN: Normal

RPM OF EACH: Normal: 1800

MODE: Idle Up 1: None
Idle Up 2: None

ENGINE TEMP

(after flight): 225° F

FLIGHT TIME: 15 minutes

CRASH COST: \$40.00 (includes main shaft, tail boom, spindle, landing gear, flybar)

TEST CONDITIONS

WEATHER: Sunny

TEMP / HUMIDITY: 62° F / 37%

BAROMETRIC PRESSURE: 30.34 in.

WIND SPEED: 12 mph

VISIBILITY: 10 miles

ALTITUDE: 675 feet

PITCH CURVES

NORMAL: -2, 5, 10

IDLE-UP 1: None

IDLE-UP 2: None

REQUIRED TO FLY

Fuel, fuel pump, starting equipment

WHO'S IT FOR?

This new Raptor 2.4G SC helicopter is a great starting tool for any beginner pilot looking to get into the hobby. The bigger size makes this helicopter a stable platform to learn on.

SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

THE GOOD

- All in one package
- Setup and ready to go for a beginner
- Very good value
- Excellent parts support
- Durable design

THE BAD

- Older tail design (can be upgraded)
- No remote glow
- Switch did not have a charge port

It is tough flying at higher altitudes.

SKY TECH TS6I

The included radio is no one that is only able to control the Raptor 2.4G SC. The TS6i is a full-fledged radio that can store up to 8 models and three different types including gliders, airplanes, and helicopters. This radio is powered by a rechargeable battery pack unlike most other ready to fly radios, which require your standard AA's. The TS6i operates on 2.4ghz and allows you to fly without the worry of interference. The TS6i is a fully programmable radio that allows you to adjust your pitch curves, throttle curves, end points, expo, D/R, and swash mix, gyro gain, plus much more.





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service our great customers.

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"New TREX" is one of our favorite phrases.





TREX 450 HELICOPTER 3D

Align TREX 450 SPORT

In the mix

WORDS: Ryan Kephart | PHOTOS: Jason Boulanger

AS MANY OF US KNOW, ALIGN HAS ALWAYS BEEN AHEAD OF THE GAME, offering helicopters that perform well and sell for a reasonable price. The new TREX 450 Sport is a good mix between the older SE V2 and the new 450 Pro, which was reviewed several months ago. Align has taken the 450 class of helicopter and has plowed it's way into new design features that make them one of the biggest and best 450 suppliers in the world. Let's take a look at their newest 450 and what changes they made to make an already great helicopter even better.

» AT A GLANCE

SIZE:	450
POWER:	Electric
TYPE:	Pod and Boom
BUILD TYPE:	Kit
TAIL DRIVE:	Belt

It looks like a mix from the V2 and Pro.

FEATURES

The TREX 450 Sport utilized the popular 450 Pro head design (but anodized blue), and the 450 SE V2 frames. Overall, the helicopter looks much like a standard V2 kit but when you look closely you can see the differences.

» MAIN FRAME



SWASH CONTROL: The swash is controlled by a 120° CCPM configuration with direct input linkages.

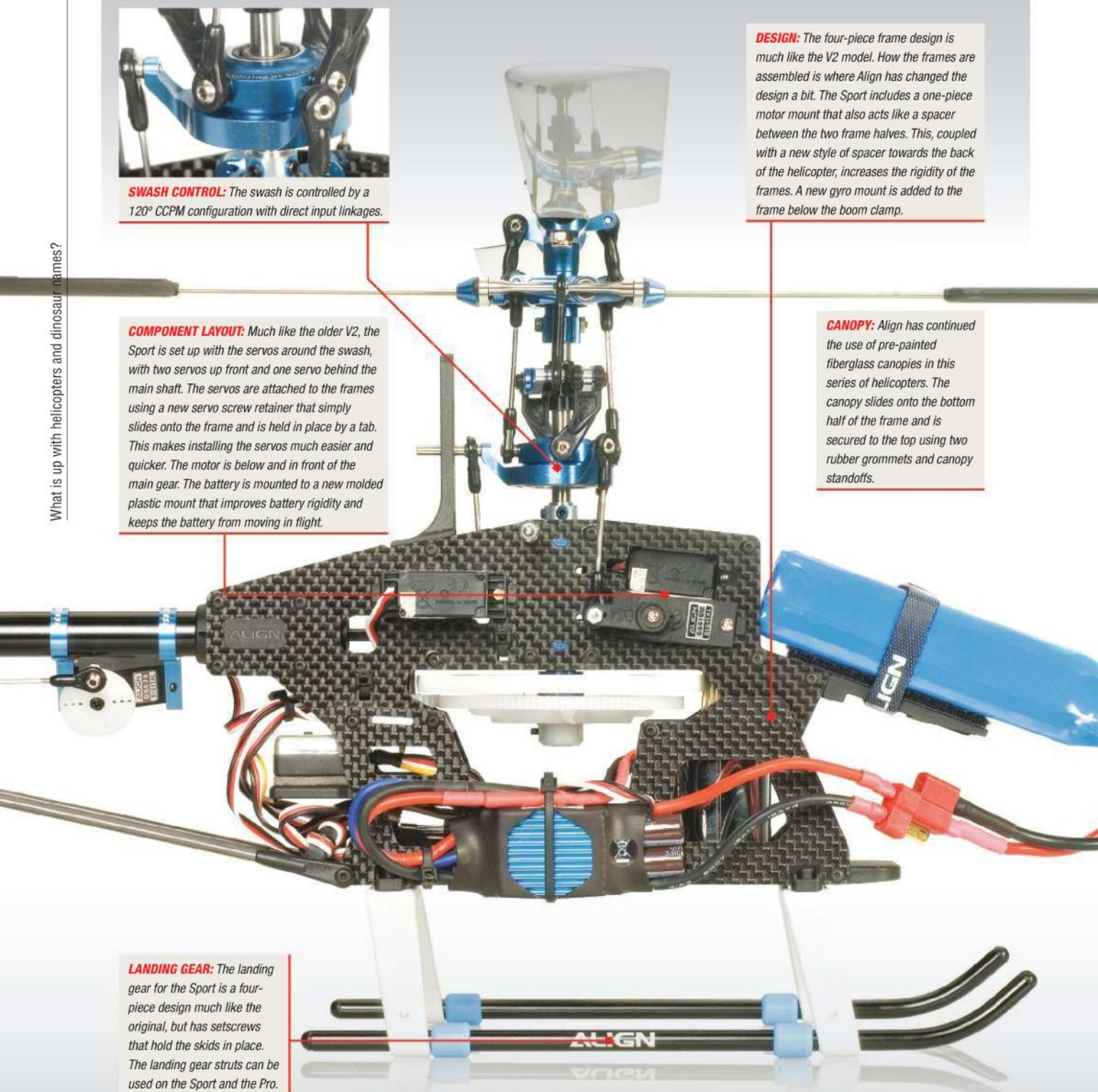
DESIGN: The four-piece frame design is much like the V2 model. How the frames are assembled is where Align has changed the design a bit. The Sport includes a one-piece motor mount that also acts like a spacer between the two frame halves. This, coupled with a new style of spacer towards the back of the helicopter, increases the rigidity of the frames. A new gyro mount is added to the frame below the boom clamp.

COMPONENT LAYOUT: Much like the older V2, the Sport is set up with the servos around the swash, with two servos up front and one servo behind the main shaft. The servos are attached to the frames using a new servo screw retainer that simply slides onto the frame and is held in place by a tab. This makes installing the servos much easier and quicker. The motor is below and in front of the main gear. The battery is mounted to a new molded plastic mount that improves battery rigidity and keeps the battery from moving in flight.

CANOPY: Align has continued the use of pre-painted fiberglass canopies in this series of helicopters. The canopy slides onto the bottom half of the frame and is secured to the top using two rubber grommets and canopy standoffs.

LANDING GEAR: The landing gear for the Sport is a four-piece design much like the original, but has setscrews that hold the skids in place. The landing gear struts can be used on the Sport and the Pro.

What is up with helicopters and dinosaur names?



» DRIVE TRAIN

MOTOR MOUNT: As mentioned before, the motor mount on the Sport is redesigned to incorporate the frame spacer that separates the top half from the bottom. The mount is made from aluminum and has elongated holes to adjust the motor for gear mesh. Four machine screws secure the mount to the frame and two screws attach the motor to the mount.

PINION: The Sport includes a 14-tooth pinion. It attaches to the motor shaft using a single setscrew.

MAIN GEAR: The main gear is made from plastic and has 150 teeth. The gear is designed with fan blades to aid cooling of the electronics. A hub is attached to the center of the main gear, which houses the one-way bearing and helps disperse heat.



AUTOROTATION DRIVE: A one-way bearing is pressed into the main gear hub and links the main tail gear to the main rotor gear. This allows for the tail to be driven during an auto. The hub is secured to the main gear using four machine screws that thread into the main gear. No other bearings are used to support the autorotation drive.

TAIL DRIVE: A secondary gear is used to drive the tail pulley. The pulley is located in line with the tail boom and allows the belt to operate smoothly.

“THE SPORT IS A GREAT HELICOPTER FOR ANYONE LOOKING TO MOVE UP THE RANKS FROM BEGINNER TO ADVANCED PILOT.”

ALIGN TREX 450 **SPORT** MODEL SPECIFICATIONS

CLASS:	450 sized nitro
BUILD:	Kit
BLADE SIZE:	325mm
LEVEL:	Novice-Advanced

FRAME

MATERIAL:	Carbon fiber
TYPE:	Four-Piece Stacked
SERVO TO SWASH LINKAGE:	Direct
SERVO SIZE:	Micro

ROTOR HEAD

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

TAIL

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

GEARING

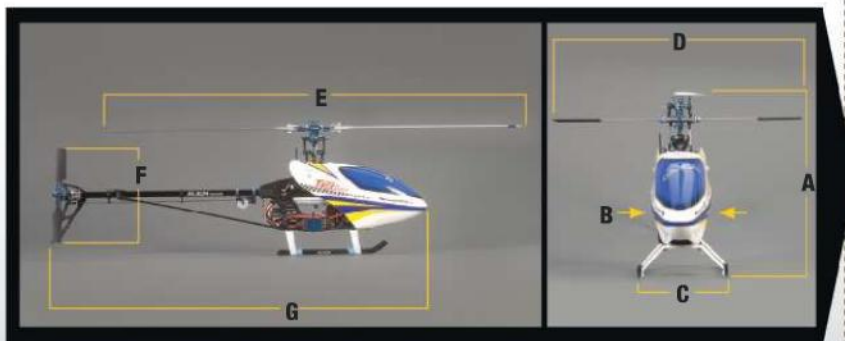
MAIN ROTOR TO PINION RATIO:	1: 10.7
MAIN ROTOR TO TAIL RATIO:	1: 4.24

WEIGHT

EMPTY:	0 lbs., 11oz. (313g)
FULLY LOADED: (includes battery)	1 lbs., 9 oz. (708g)

DIMENSIONS

HEIGHT (A):	8.8125in (224mm)
CANOPY WIDTH (B):	2.5in (63mm)
LANDING GEAR (C):	4.375in (111mm)
PADDLE TO PADDLE DIA. (D):	12.75in (324mm)
MAIN ROTOR (E):	28.25in (718mm)
TAIL ROTOR (F):	6.25in (159mm)
LENGTH (G):	25.125in (638mm)



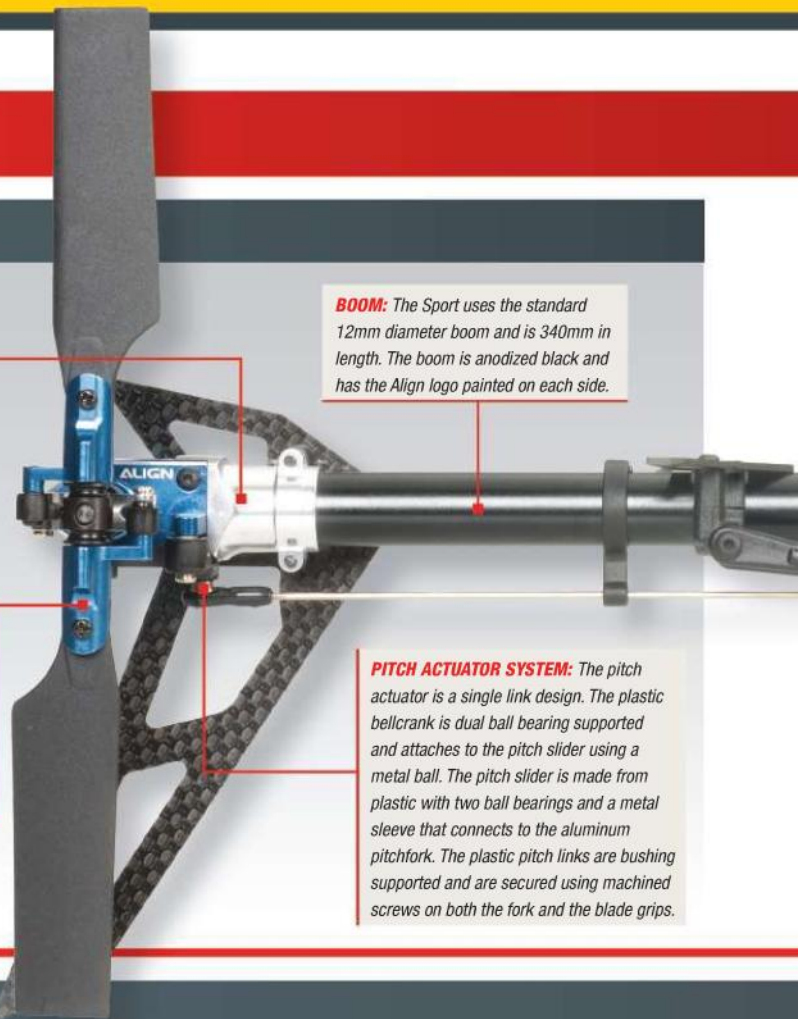
FEATURES CONTINUED

» TAIL & BOOM



TAIL CASE: The tail case has been completely redesigned to better withstand crashes. The case is made completely from aluminum and beefed up to prevent bending. The tail case is comprised of three pieces: the boom clamp and two side plates. One side plate is machined with the pitch actuator standoff, making it stronger.

TAIL BLADE GRIPS: The design of the grips are taken from the Pro but made stronger and larger. The grips have counterweights on each side of the grip to help ease the load applied to the tail servo. The grips are dual ball bearing supported and attached to a one-piece hub using a machine screw. The tail blades are installed using a machine screw that threads into the back part of the blade grip.



BOOM: The Sport uses the standard 12mm diameter boom and is 340mm in length. The boom is anodized black and has the Align logo painted on each side.

PITCH ACTUATOR SYSTEM: The pitch actuator is a single link design. The plastic bellcrank is dual ball bearing supported and attaches to the pitch slider using a metal ball. The pitch slider is made from plastic with two ball bearings and a metal sleeve that connects to the aluminum pitchfork. The plastic pitch links are bushing supported and are secured using machined screws on both the fork and the blade grips.

» ROTOR HEAD

HEADBLOCK: The all aluminum headblock is secured to the main shaft using a single Jesus bolt. The damping is performed using a single damper on each blade grip. The head is machined with a groove cut in the center to allow the flybar to slide through and move smoothly. The headblock is made to withstand crashes better than the Pro, as the T-section is beefed up instead of milled down.

PHASING: Two metal pins are pressed into the headblock and are not adjustable. A metal washout base is used to align the phasing, but some side-to-side slop is noticed. This should not be an issue when the head is spooled up, but we will be sure to look for any phasing issues during the flight-testing.



BELL/HILLER ARMS: The aluminum Bell/Hiller arms are mounted underneath the main blade grips to the flybar seesaw. The arms are dual ball bearing supported but do not offer any input or output options.

WASHOUT ARMS: The washout arms on the Sport are designed a bit different from the Pro. The arms are still dual ball bearing supported but are thicker. The plastic links are dual ball bearing supported and are a bit different in design compared to the Pro. No slop is noticed from the swash to the arms. No output options are available.



This helicopter has the "Blues".

» INSTRUCTIONS & BUILDING TIPS

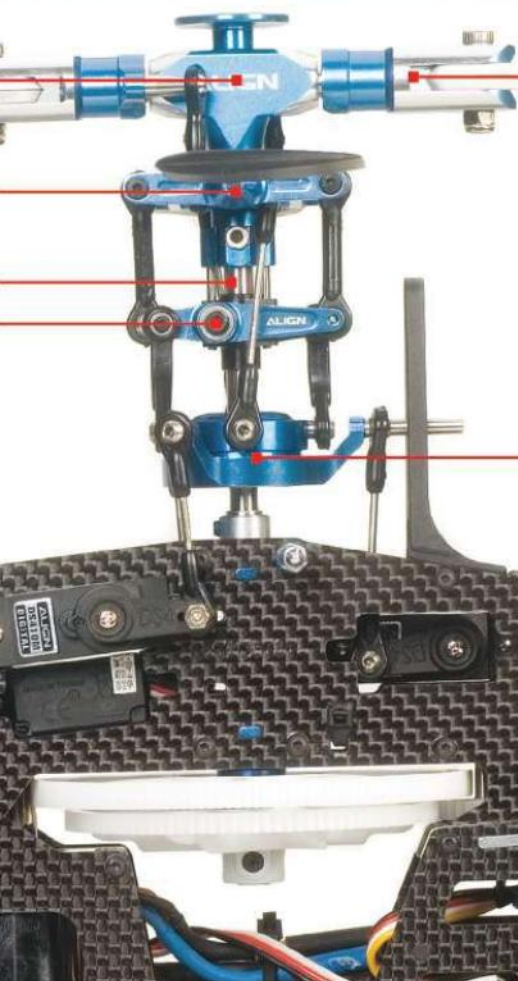
WHEN YOU OPEN THE BOX

Upon opening the box to the TREX 450 Sport, you will find that the helicopter is separated in several smaller boxes. On top of these boxes you will find a full printed manual. No stickers are in the kit, as the Sport comes with a pre-painted fiberglass canopy. The kit includes two types of thread lock and all the tools needed to complete the build. It also includes a blade holder and Velcro to tie down the battery and blades.

MANUAL AND BUILD

The manual that is included with the kit is printed on standard sized paper and has fully detailed building instructions even for the parts

that are pre built by the factory. Exploded views are printed towards the back of the manual to aid in finding replacement part numbers. Building the 450 Sport is much easier than building its previous V2 cousin. The integrated spacers and easy servo screw retainers make this build fast and pain free. Everything on this TREX 450 Sport went together without any modifications and the manual was very easy to understand.



MAIN BLADE GRIPS: The blade grips on the Sport are much larger than the previous SE V2 model, allowing for a bigger overall disc area. The grips are supported by two radial bearings and a thrust bearing in each grip. The grips are a bit different from the Pro but are the same overall length.

SWASHPLATE: The 120° CCPM swashplate is made completely of aluminum except for the ball and rubber seat. The rear linkage ball is integrated into the anti-rotation pin that slides inside a plastic anti-rotation bracket. The bracket is held to the frames using two self-tapping screws.

ALIGN TREX 450 SPORT RTF & TEST GEAR

» SUPPLIED GEAR

-  **■ CYCLIC SERVOS:** Align, DS410M, K10460A, .46oz. (13g)
-  **■ TAIL SERVO:** Align, DS420, K10444A, .46oz. (13g)
-  **■ GYRO:** Align, GP750, KX870017A, .46oz. (13g)
-  **■ MOTOR:** Align, RCM-BL450M, KX850177, 2.68oz. (76g)
-  **■ SPEED CONTROL:** Align, RCE-BL35X, K10304A, 1.16oz. (33g)
-  **■ BLADES:** Align, 325D CF Blade, KU110024, 1.3oz. (38g)

» TEST GEAR

-  **■ RADIO:** Spektrum, DX-7, part number, \$229
-  **■ RECEIVER:** Spektrum, AR6100e, SPMAR6100E, .15 oz. (4.4g), \$49.99
-  **■ BATTERY:** Protek, 11.1v/2200mah Supreme, PTK-LP-2200-3S30, 6.27 oz. (178g), \$65
-  **■ CHARGER:** Protek, iCharger 1010B+, PTK-1010B+, \$180

Nice and easy build!

ALIGN 450 HELICOPTER

TESTING

We tested the new TREX 450 Sport stock with all the electronics that it came with. We opted to use a Protek 11.1v 2200mah 30C pack to make sure we put enough juice into the motor. Setting up the TREX was straightforward and did not require much radio adjustment. I increased the pitch from 60 to 70 on the transmitter to get more range and left the cyclic at 60. My throttle curves were linear for normal mode, 80% flat for Idle 1, and 90% for Idle 2. This gave the TREX a range for both mild 3D and knock-your-hat-off 3D.

HOVERING • Hovering this TREX without the flybar weights is like a mix between the SE V2 and the Pro. It does not quite hover like the Pro but it isn't as squirrely as the V2. I tried adding the flybar weights to the head for adjustment purposes and the Sport smoothed out and was really docile. It is great that Align includes these for beginners, as this really increases the stability.

Rating: 4

FORWARD FLIGHT • Moving on to forward flight without the flybar weights, the TREX 450 Sport was fast and tracked well. Fast banking turns locked in and didn't require much adjustment around the turn. Slow forward flight was stable and very predictable and felt locked in. Never did the Sport feel ahead of the sticks. The combo package with the Align digital DS410M servos really made this helicopter feel easy to control.

Rating: 4.5

CYCLIC PITCH RESPONSE • The cyclic response was crisp and fast during rolls and loops. Precise cyclic stops were spot on and only minimal bobbing was seen when exiting a maneuver. I decided to see how fast the cyclic actually performed by bumping up the swash mix and I was surprised to see how fast this TREX actually performed. After a few flights at this blazing fast cyclic, I backed it down to a more comfortable level. With this much range in cyclic speed, even the pros would be happy to fly this helicopter.

Rating: 4.5

COLLECTIVE PITCH RESPONSE • The TREX 450 Sport packed enough punch for many pilots. Although it didn't seem as responsive as the Pro, the Sport did just fine for the average advanced pilot. The collective felt much like the older V2, as the head would bobble easily when

performing Tic-tocks and other demanding 3D maneuvers.

Rating: 3.5

TAIL ROTOR RESPONSE • The tail on the 450 Sport performed flawlessly with the included GP750 gyro and tail servo combo. The counterweighted tail blade grips made the tail lock in with ease during high speed backwards flight. Overall, the tail performed very well and only hardcore experienced pilots would notice the difference between the shaft driven tail of the Pro and the belt driven tail on the Sport.

Rating: 4.5

AUTOROTATION CAPABILITIES • The TREX 450 Sport is not far from the Pro when it comes to an auto. This helicopter performed autos decently, but some of the energy was taken by the belt drive tension so you needed to commit to an auto.

Rating: 3.5

POST FLIGHT INSPECTION • Going over the helicopter and looking at the individual components you can tell that Align wanted

to make this helicopter robust. Although I did not get a chance to crash this helicopter (thankfully), every part remained tight and slop free except for the phasing which I talked about before flight-testing. The slop that was seen in the phasing did not seem to negatively affect the way the Sport flew.

Rating: 5

CONCLUSION

Overall, the TREX 450 Sport is a great little model that will please a large range of pilots. I have seen many beginner pilots ponder which helicopter they should learn on and the TREX 450 Sport just might fit that bill. The Sport is designed to take some abuse and keep on flying without the need to buy the expensive aluminum parts that might bend in a typical crash. If you are looking to get into the hobby or simply looking for a fun and reliable 450, then the TREX 450 Sport might be for you. *TREX*



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TESTING SPECS

ALIGN TREX 450 SPORT

Part #: KO15076
Distributor: Assurance RC
Web: www.alignrcusa.com

Street Price: \$499
Price as Tested: \$843
Build/Setup Time: 6 hours

PERFORMANCE

MODE FLOWN: Normal, idle up 1, idle up 2
RPM OF EACH MODE: Normal: 1750
 Idle Up 1: 2000
 Idle Up 2: 2250
MOTOR TEMP (after flight): 101° F
FLIGHT TIME: 5 minutes
CRASH COST: \$26.00 (includes main shaft, tail boom, spindle, landing gear, flybar, torque tube)

TEST CONDITIONS

WEATHER: Sunny
TEMP / HUMIDITY: 60° F / 57%
BAROMETRIC PRESSURE: 30.07 in.
WIND SPEED: 8mph
VISIBILITY: 10 miles
ALTITUDE: 650 feet

PITCH CURVES

NORMAL: -5, 0, 10
IDLE-UP 1: -10, 0, 10
IDLE-UP 2: -10, 0, 10

REQUIRED TO FLY

Radio, receiver, 11.1v 2200mah battery, charger

WHO'S IT FOR?

The Sport is a great helicopter for anyone looking to move up the ranks from beginner to advanced pilot. The robust construction and cheap parts really make this helicopter stand out in the crowd.

SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

THE GOOD

- Robust design
- Combo works great
- Flybar weights are included

THE BAD

- A little slop in the phasing

Heli guys do it inverted.



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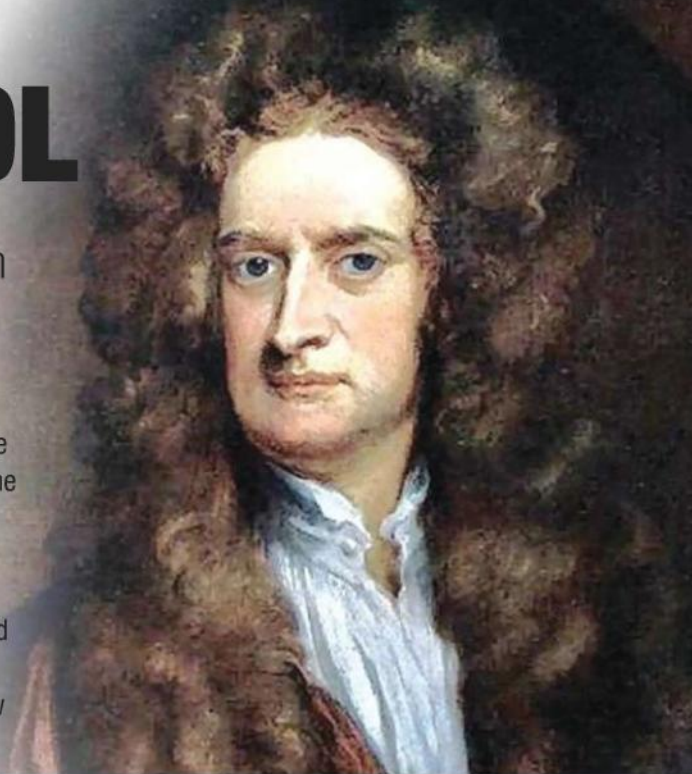


YAW CONTROL

For every action there is an equal and opposite reaction. - Sir Isaac Newton

WORDS: Art Koral | ILLUSTRATIONS: Dave Palacios

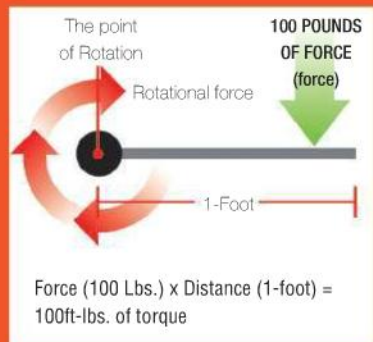
ONE OF THE MOST IMPORTANT FEATURES ON A HELICOPTER IS ITS ABILITY TO MAINTAIN DIRECTIONAL CONTROL and overcome torque. Torque is a consequence of delivering thrust via mechanical coupling to the main rotor. The force required to turn the blades applies an equal and opposite torque to the transmission that is connected to the fuselage. If unchecked, this torque would cause the helicopter to spin whenever thrust is required. Thankfully, helicopters are designed with mechanisms to both counteract torque and maintain directional control. In this Heli IQ we will cover the basics of yaw control and the different methods used to accomplish this.



Newton's third law of motion applies here.

TORQUE DEFINED

Torque is the twisting force acting on a single point. It can be described as a force acting on a lever arm that acts on a point of rotation. Increase the force applied or the length of the lever arm and the torque is increased

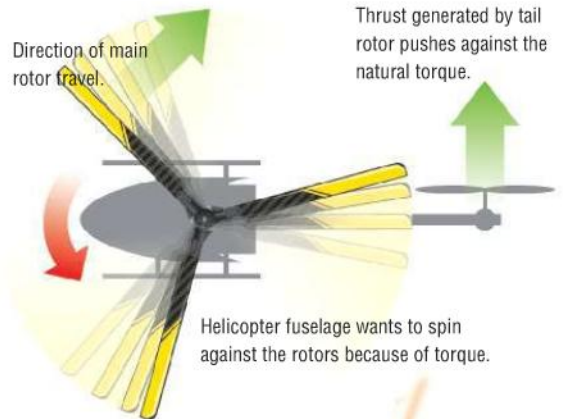


When torque is applied at a specific RPM, power is created. It's the torque applied to the main shaft that provides the power for flight. In doing so, a counteracting torque is applied to the fuselage that will cause it to spin if unchecked by an anti-torque mechanism.

COMMON RC HELICOPTER YAW CONTROL METHODS

TAIL ROTOR YAW CONTROL

The most common method of yaw control in an RC helicopter is with a tail rotor. The tail rotor is mounted a certain distance away from the main shaft on the end of the boom to provide a counteracting torque to the main rotor drive shaft. The tail rotor can be either mechanically coupled to the main shaft or it can be driven separately by an electric motor. When coupled to the main shaft, the tail rotor spins at a rate directly proportional to the main rotor at a ratio of approximately 4.5 to 1. Thrust is controlled via a pitch change slider which changes the pitch of the tail blades to increase or decrease tail rotor thrust.



The pitch slider transmits control inputs that increase or decrease T/R pitch and thrust.

BELT AND GEAR

Belt and gear tail drive assemblies are comprised of a main gear drive that is coupled via gearing to a smaller pulley drive. This design is seen on many helicopters of various sizes. The main advantages of this systems is low cost and ease of maintenance. The tail boom can be easily removed for repair. One drawback of this design is that the pulley system has increased transmission drag which results in a minor loss of autorotation energy.

BELT AND PULLEY

Belt and pulley drive systems have two pulleys, a large one at the main shaft and a small one at the T/R drive shaft connected by a belt. This system is seen on helicopters such as the Mikado Logo and Compass Atom. The main advantage of this system is simplicity in design and reduced weight. Also, belt skip is less likely to occur then in a belt and gear drive and transmission drag is also greatly reduced due to the larger front pulley. The one disadvantage of this system is maintenance and repair. The main shaft has to be removed to replace the tail belt.

SHAFT

Shaft driven tail rotors use bevel gearing and a long shaft inside the boom to transmit rotating motion from the main shaft to the tail rotor. This system has very little transmission drag, making it ideal for autorotation. Because there is direct gear-to-gear contact, skipping never occurs and tail control always feels crisp and connected. Shaft driven tail rotors are very easy to work on because the shaft is indexed by a floating key or dog-bone design. There is no need to remove the main shaft . A drawback to shaft driven tail rotors is that they are prone to stripping teeth if the tail blades come into contact with the ground. The added weight of the drive shaft system is slightly detrimental to overall performance, but is overcome by the low drag of the transmission.

MOTOR DRIVEN

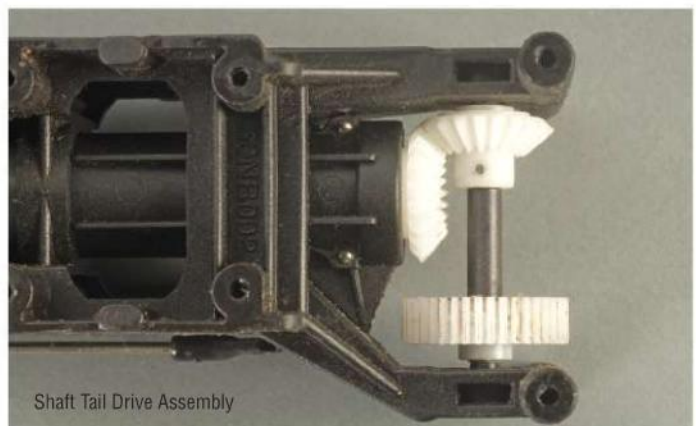
Motor driven tail rotors are usually constant pitch. Motor speed is used to control the amount of thrust generated by the tail rotor. One advantage of this design is a tremendous reduction in cost and weight. Another advantage of a motor driven tail is that during an autorotation tail rotor authority always remains the same. Many low price entry level helicopters such as the Blade CP and MSR use this type of drive. A drawback to a fixed pitch tail rotor is that under varying loads it is susceptible to vortex ring state where the rotor goes into its own wash and becomes ineffective in countering torque.



Belt and Gear Tail Drive Assembly



Belt and Pulley Tail Drive Assembly



Shaft Tail Drive Assembly



Motor Tail Drive

TECH INSIGHT

Autorotation DRIVE

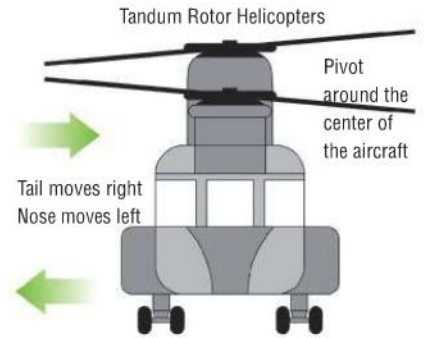
➔ Many RC helicopters include an autorotation drive. An additional gear is used to constantly drive the tail rotor even if power is removed from the main rotor. (redundant) If no additional gear was provided and the tail rotor was driven off the main gear, the tail rotor would stop when the power dies.



Autorotation Hub and T/R drive gear.

TANDEM DIFFERENTIAL CYCLIC YAW CONTROL

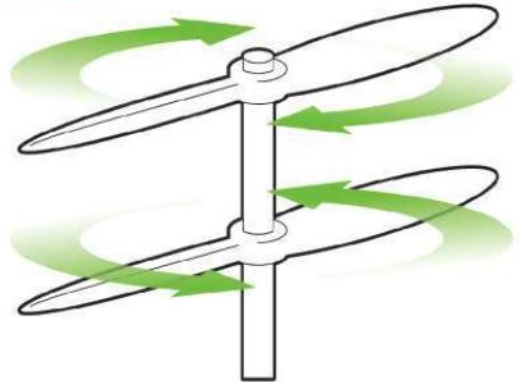
Tandem rotor helicopters have a torque advantage over single main rotor helicopters because each set of rotors turns the opposite direction to each other, thus canceling the torque. However, the net benefit of removing the tail rotor drive is negated by aerodynamic mixing and transmission losses. Yaw control is still required for coordinated flight and maneuvering. In a tandem helicopter differential cyclic control is used for yaw control. Yaw force is created by applying opposite cyclic at the forward and aft rotors.



Both rotor heads tip in opposite direction for yawing motion.

COAXIAL DIFFERENTIAL TORQUE CONTROL

Coaxial helicopters such as the Blade MCX use differential torque to control yaw. During flight both blades turn in opposite directions, canceling out each other's torque. To create a yaw in the helicopter, the speed of one rotor is increased and the speed of the other rotor is decreased proportionally. The speed differential keeps the same net amount of power but a torque imbalance occurs causing the helicopter to yaw.



A change in speed between the top and bottom blades causes a torque imbalance and a resulting yaw.

What ever happened to Ira from Newton's Apple?

CONCLUSION

This Heli IQ sums up the most common methods of yaw control used on RC helicopters: Main rotor driven tail rotors, motor driven fixed pitch tail rotors, tandem rotor helicopters using differential cyclic control, and coaxial rotor helicopters using differential torque control. All these methods of yaw control get the job done and no one method has an overall advantage in yaw control from the rest. I suppose that's why we still see many of these anti-torque and yaw control configurations still being developed today for both full scale and RC helicopters alike. **THL**



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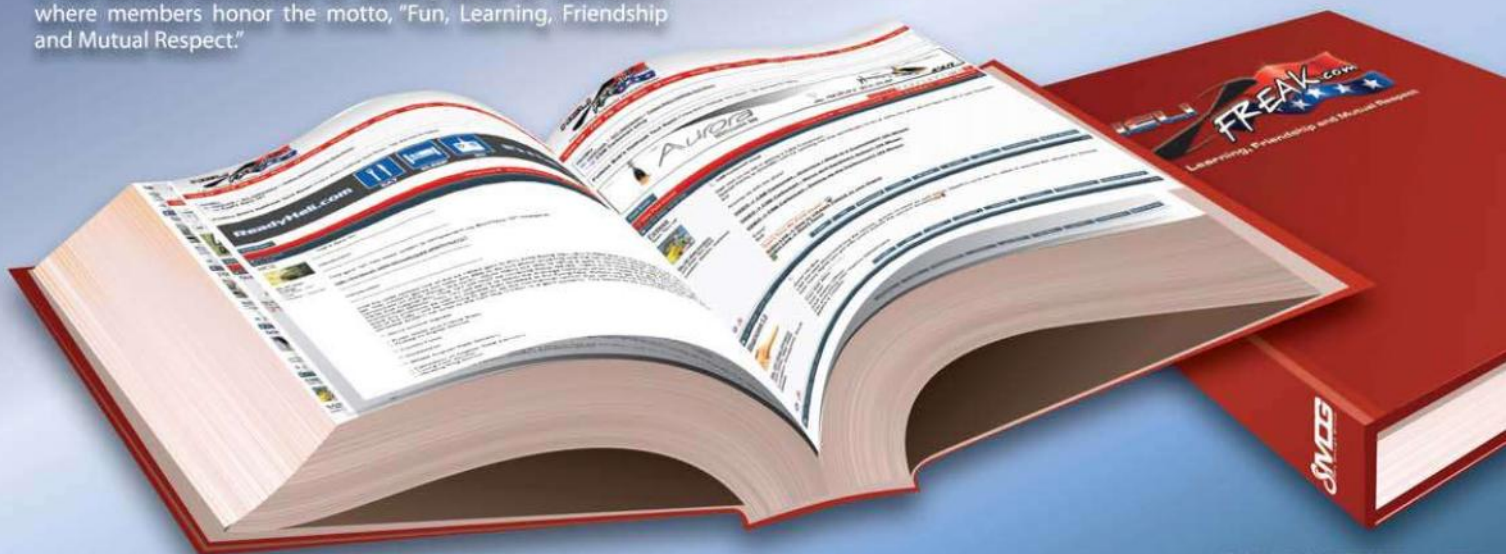
en·cy·clo·freak·ia
en-sahy-kluh-free-key-uh

—noun

1. the ultimate Internet source for articles on a variety of topics relating to RC helicopters, organized into easy-to-find categories and groups covering all branches of knowledge.
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Fun, Learning, Friendship and Mutual Respect



CUBAN EIGHT

Half Loop and Roll

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

THE CUBAN EIGHT IS A LEGENDARY FULL SIZE AIRPLANE MANEUVER THAT HAS FOUND ITS WAY TO THE RADIO-CONTROLLED WORLD. A popular maneuver in the plank side of things, it isn't as widely seen during helicopter flights. There are several different variations of a half Cuban Eight integrated in routines, but no one really performs a true Cuban Eight anymore. It isn't a hard maneuver to perform, but it does have quite a few orientation changes throughout the maneuver. It's an old school move, but it's due for resurgence and can still be challenging. So get your plank side ready to go, as it isn't a move you'll see at your local flying field; instead, you'll see many variations of it.

BABA-LOOOOOO!

3 Once inverted, begin dropping your collective towards center stick.

4 On your descent back to the ground, pop negative collective pitch and a quick right or left cyclic input, to bring your helicopter back to the upright position.

2 Once on the left side of the field, begin pulling back on your cyclic while adding positive collective and begin your looping climb.

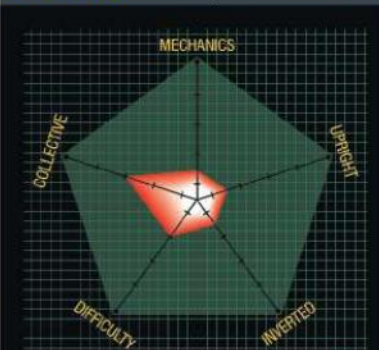
START

1 Start out by flying a fast forward flight across the center line; in this case, right to left.

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.

BASIC SETUP:

- Pretty much any helicopter of any class size will be able to perform a Cuban Eight. It is a relatively old maneuver, so you won't need a hot setup to pull it off.

- Having a quicker setup will always help, but can actually make it a little tricky because you'll be doing pattern style flying; AKA being easy on the sticks
- Faster cyclic control will help with the roll on your descent

HOW TO PREPARE:

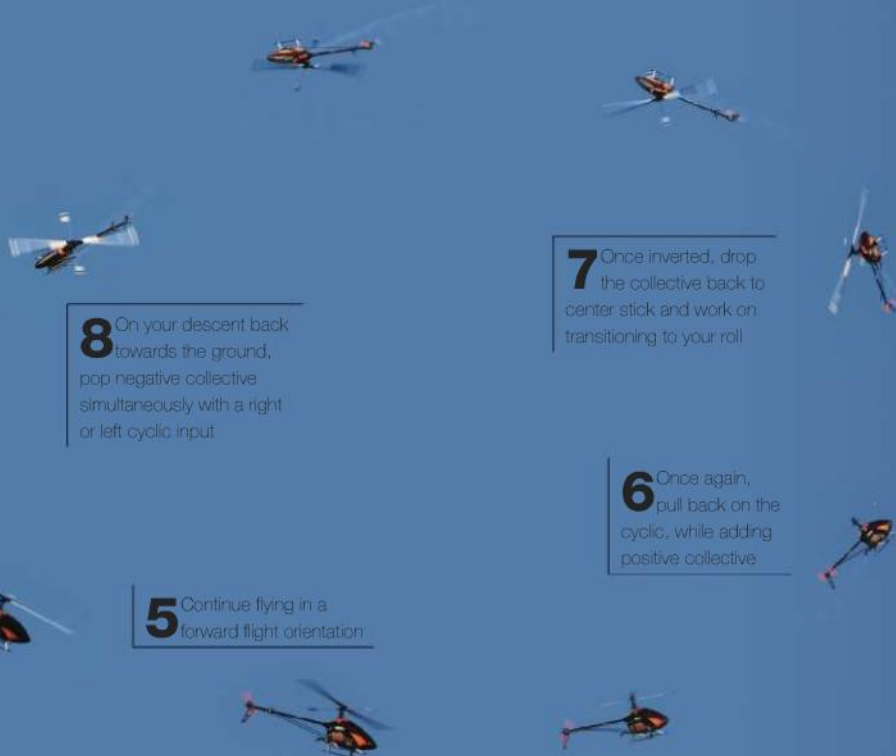
- **THE BEST WAY** to prepare for the move is to practice your rolls and loops
- **WORK ON ROLLING** a specific direction towards yourself and away from yourself
- **BEFORE PRACTICING LOOPS,** make sure that you're able to perform a back flip with relative ease
- **ONCE YOU HAVE THE BACK FLIP DOWN,** work on making it bigger in diameter, to the point where you're doing a large loop comfortably.

- **AFTER YOU'RE COMFORTABLE** with a loop, work on integrating a roll at the top to bring the helicopter back into an upright position

THINGS TO LOOK OUT FOR:

- **WATCH YOUR SPEEDS** – enter the loop fast enough to transition back down towards the ground with enough speed to easily perform your loop
- **HAVE SOME ALTITUDE,** because the roll can take quite a bit of time
- **WATCH YOUR TAIL** – you may have to make minimal tail inputs depending on certain conditions, such as gyro, weather, etc.
- **BABY YOURSELF** through it the first few times when performing it so you don't get ahead of yourself with the increased speeds

Yes, that was a Ricky Ricardo reference.



8 On your descent back towards the ground, pop negative collective simultaneously with a right or left cyclic input

7 Once inverted, drop the collective back to center stick and work on transitioning to your roll

6 Once again, pull back on the cyclic, while adding positive collective

5 Continue flying in a forward flight orientation

CONCLUSION

Surprisingly, the Cuban Eight is a gateway move to several variations that can be integrated in your flight. Perhaps the most popular variant of it is the half Cuban Eight, with random stuff thrown into it for flair. I even believe that the traditional Cuban Eight was a set Maneuver at this year's F3C World Championship. This proves that it may be easy to perform; however, it is very tough to perform with absolute precision. It is still a very respected move, even today. *THL*

THE WALL OF DEATH

The Jesus Bolt Snapper!

WORDS: Brandon Updike | PHOTOS: Carl Hyndman

OUR HELICOPTERS TAKE A LARGE AMOUNT OF ABUSE, as flying becomes more advanced and technical. Perhaps one of the most demanding moves for a helicopter is the Wall of Death. The Wall of Death is a lot like what the name implies, as it violates just about every law of physics when performed. Pretty much, it consists of flying your helicopter as fast as you can in forward flight then pulling up for a sudden stop. Sounds simple, right? Actually, it is easier than it sounds. Once you overcome the fear of really fast forward flight and sudden stops, the maneuver becomes a walk in the park. There are two ways to perform the move, one of which is just merely pulling your helicopter vertical, then stopping its forward momentum. The other is integrating collective timing into your cyclic input to really slam your helicopter to a halt; the latter is looked upon as the proper way to perform it and will be broken down.

BREAKDOWN

It is widely believed that a Wall of Death is merely just pulling back on your cyclic stick and simultaneously popping your collective, until your helicopter is vertical and stops. However, the real way is a little more complicated than that; the proper way to do a wall is to give it some backwards speed before halting your helicopter. So you'll need to transition from fast forward flight to backwards-inverted flight, while losing very little, if any, speed.

5 Level off.



4 Now the next step must be performed very quickly. Begin pushing your cyclic forward until your helicopter is vertical, with the tail down, then pop a positive collective input so your helicopter will suddenly stop. The collective input is going to have to be quick and will probably be a drastic input.





START

1 Start off by flying your helicopter into a large stall turn and transitioning it back down to forward flight.



2 Gain as much velocity as possible.



3 Once you're at midfield, pull back on your cyclic while applying negative pitch (I know that sounds fishy, but it will give your helicopter an almost slingshot like effect, for a harder stop) to transition it into backwards-inverted flight. Your helicopter will look like its flying in the backwards inverted orientation.



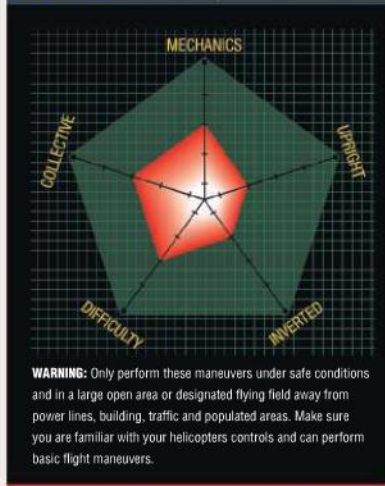
NOTES: when doing the slingshot move, you're going to have to transition from fast forward flight to backwards-inverted flight, effortlessly, with no loss in velocity. This is very hard to perform at first and will take a lot of practice when timing your collective properly with the cyclic.

That is what I call stopping on a dime.

Flight School Training

» SKILLS NEEDED

SCALE RATING: GREEN = Easy / RED = Advanced



SETUP YOUR HELI:

- **YOU'LL WANT TO RUN** a pretty decent 3D setup – sorry, those trusty woodies will most likely have to be swapped out for this maneuver.

- **CHECK YOUR DAMPING** and make sure its stiff, because that can make a world of difference in response time and can prevent a boom strike.
- **HIGHER POWERED SERVOS** are a definite plus as they're able to withstand the hard loads that may be encountered during the duration of the maneuver.
- **MOST MODERN HELICOPTERS** are very 3D capable out of the box and come with a stout head design. Be wary of performing this maneuver with your .30 from 1992.
- **AS ALWAYS**, a properly tuned motor can make or break a maneuver.
- **RUN AN EVEN PITCH RANGE** and get as much pitch out of your head as possible. Having at least 12 degrees of pitch on both ends of the spectrum will help out quite a bit.

PREPARING FOR IT:

- Hopefully, by now you're able to perform back flips with relative ease and feel pretty confident in doing so.
- Work on your forward flight, because you'll need a large amount of speed before entering the maneuver.
- The best way to gain a lot of speed is to perform a large stall turn and gain as much speed as possible on the descent back to the ground. This is a tough feat in itself, but just remember to keep your stall turn in a straight line as much as possible.
- Perform large vertical climbs, while pumping the collective, to help you get comfortable with some of the motions.
- **GOING PARALLEL.** Try to fly parallel to the runway or imaginary flight line.

CONCLUSION

The slingshot technique for the Wall of Death is definitely the harder way to perform it, but by far the most impressive way of doing it. Danny Szabo was the master at it years ago and many pilots have put their spin on it through the years. It's still very impressive and packs quite a punch on your helicopter. So check your Jesus Bolt and your dampers before performing it. *TISH*



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HILLER X-18

The first true VTOL

WORDS: Brandon Uptdike

VTOL AIRCRAFT ARE QUITE UNIQUE AND HAVE BEEN SEEING A FAIR AMOUNT OF USE WITH THE SUCCESS OF THE V-22 OSPREY in recent years. VTOL has been in the works a lot longer than people may think. There were VTOL test aircraft well before the V-22 was even contemplated; one of these was the Hiller X-18. The X-18 was the first true VTOL aircraft to take flight and helped to generate a lot of ideas for future VTOL designs, such as the V-22. Tested in the early 60s, the X-18 proved to be too far ahead of its time and never truly materialized into a successful production helicopter. It did lay the groundwork for what was to come.

SPECS

CREW: 2-3

LENGTH: 63 ft 0 in (19.2 m)

WINGSPAN: 48 ft 0 in (14.6 m)

HEIGHT: 24 ft 7 in (7.5 m)

EMPTY WEIGHT: 26,786 lb (12,150 kg)

MAX TAKEOFF WEIGHT: 33,000 lb (14,850 kg)

POWERPLANT:

1× Westinghouse J34 turbojet engine for pitch control, 3,400 lbf (15.2 kN)

2× Allison T40-A-14 turboprop engines, 5,500 hp (4,100 kW) each

PERFORMANCE

MAXIMUM SPEED: 253 mph (407 km/h)

SERVICE CEILING: 35,300 ft (10,800 m)

BACKGROUND

Following WWII, Stanley Hiller and his design team wanted to utilize VTOL technology because they believed that it presented many advantages versus a typical airplane or helicopter. VTOL is an acronym for Vertical Take Off and Landing. Hiller and his team decided that the best approach to take to make a VTOL-capable aircraft was to make a tilt wing design. This means that instead of just the engines tilting, the entire wing tilts. The main intention for the X-18 was for it to be a cargo aircraft with great versatility because of its tilt wing design. Hiller pitched the idea to the military and gained interest from both the Navy and the Air Force. The Air Force showed greater interest, however, and awarded Hiller a contract for around 4 million dollars to produce a working prototype. The contract called for the best of both worlds – an airplane that could travel around quickly, while maintaining the versatility of a helicopter.

Hiller developed the first prototype from remaining scrap metal to help cut the cost of

the aircraft. The first prototype flew in 1959, with a decent amount of success and flew for a total of 20 times. However the plane was plagued with noticeable aerodynamic problems when the wing was in a tilted position. The tilted wing would catch air and create a large amount of drag. The engines were also not cross-shafted together, meaning that if one went out, the aircraft would most likely crash. This, along with the fact that the propellers didn't have a true pitching mechanism, caused doubts in the program. Since there wasn't any pitch adjustment, the aircraft relied on engine speed changes to pitch up and down. Overall, the negatives outweighed the positives and the program was eventually canceled.

FEATURES

The X-18 was very unique in that it was built using a wide variety of scrap from other aircraft. The engine to the rear of the aircraft was actually from the XFY-1 Pogo – a vertical takeoff experimental airplane. It also used the

Pogo's massive propellers for its two main engines. The fuselage was pieced together using the fuselage of a C-122. The engine to the rear had an exhaust that diverted up or down and maintained pitch control for the aircraft. There were no flaps, but did have ailerons and the airplane was able to tilt its wing using hydraulic controls.

CONCLUSION

Like many other experimental aircraft of the 60s, the X-18 was an excellent idea but the technology wasn't quite there yet. As we have seen in recent years, aircraft manufacturers are revisiting designs of the past and revising them. The spirit of the X-18 lives on in the V-22 as it found success using VTOL, but with tilt motors, not with a tilt wing. **TIBL**



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SPECIFICATION

Model No: NE R/C 312A
Rotor Diameter: 7.40"(188mm)
Overall Length: 8.39"(213mm)
Weight: 1.27oz(36g)
Power System: Φ6mm Motor X 2pcs
Battery: 1-cell 3.7V 110mAh Li-PO

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SOLO PRO

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ULTRA-MICRO SIZE



Model No: NE R/C 260A
Rotor Diameter: 190mm
Overall Length: 207mm
Weight: 0.95oz(27g)
Power System: Motor X 2pcs
Battery: 1-cell 3.7V 120mAh Li-PO



BALANCE SYSTEM FOR REMOTE CONTROL HELICOPTER
1. Invention patent No: 200710170488.2
2. Utility Model Patent No: 200720076261.7

CONTROL SYSTEM FOR SINGLE BLADE REMOTE CONTROL HELICOPTER
1. Invention patent No: 200810036355.0
2. Utility Model Patent No: 200820057528.2

PCT patent of "SINGLE ROTOR MODEL HELICOPTER WITH IMPROVED STABILITY BEHAVIOR".
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