50-SIZE GASSER! It's Coming Soon

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NOVEMBER 2009 / ISSUE 41

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- Setting Up Your Pitch and Throttle Curves
- Install Electronics
- Fly the Tail Slide

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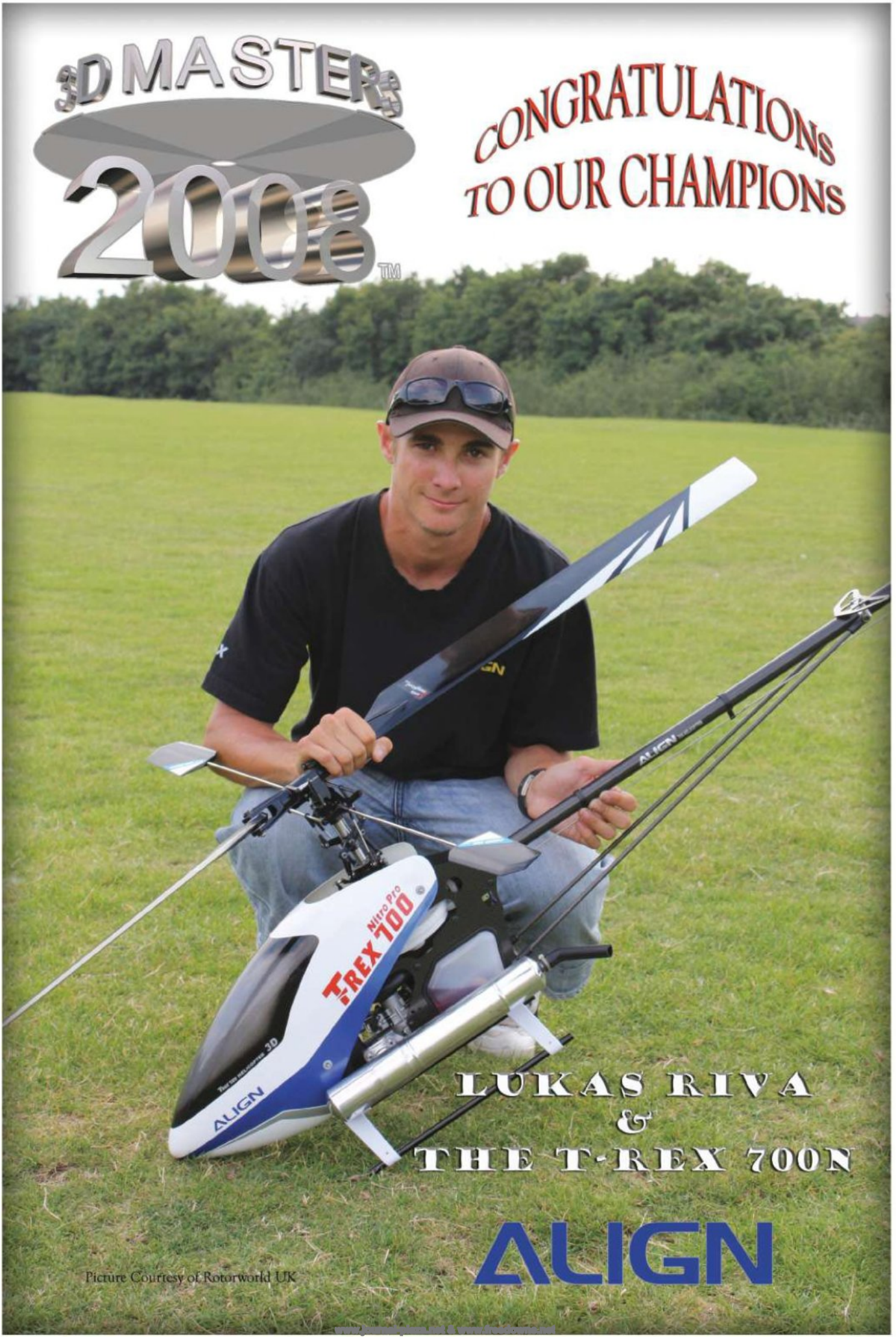
- Main Rotor Blade Size 600-630mm
- Main Rotor Diameter: 1355mm -1415mm

- 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)

www.outrangerc.com


3D MASTERS
2008
CONGRATULATIONS
TO OUR CHAMPIONS
LUKAS RIVA
&
THE T-REX 700N
ALIGN
Picture Courtesy of Rotorworld UK

Designed by:
Jason Krause

ALIGN

T-REX 700 Nitro Pro

Improved Design:

★Simple and light weight design provides awesome flight performance.
★+-13° collective pitch is possible for extreme 3D performance.
★Heavy duty tail with thrust bearings.
★Clutch, Fan and Bell assembly provide a very smooth operation even at high RPM.
★Forward mounted tail servo helps to keep exhaust oil from entering servo also improves the CG.
★Battery tray designed for easy and clean radio gear installation.
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★Heavy duty tail with thrust bearings.
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★Super engine cooling system very efficient airflow to provide unequaled cooling and horsepower.
★New main gear with one-way bearing design for high torque.
★Ready to fly weight (no fuel) is an incredible 4.2Kg.

Specifications:

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



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Shown Actual Size.

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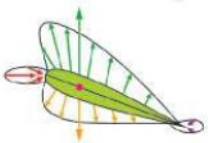
NOVEMBER 2009 / ISSUE FOURTY-ONE

TESTED AND RATED

ROTORHEAD

REGULARS



FEATURES

ON THE COVER: Flys like a much bigger bird, the E-flite mSR gets up close and pesonal with Jason's lens.

Yup, contents is condensed this month.

TESTED

» HOW-TO'S

RC Heli (ISSN 1559-7903) is published monthly by Think Omnimedia LLC at 13401 Yorba Avenue, Chino, CA 91710, tel: 909-517-3366. Subscription rates are $24.99 for 12 issues (one year), $49.99 per year for foreign airmail, $29.99 for Canada and Mexico. Periodicals Postage paid at Chino, CA, and additional mailing offices. Postmaster: send all address changes to RC Heli PO Box 469063, Escondido, CA 92046-9488. Printed and produced in the U.S.A.

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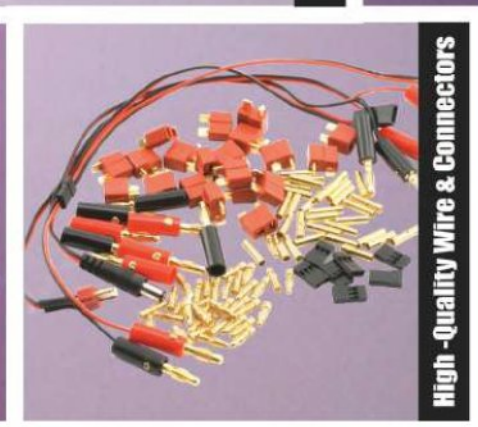

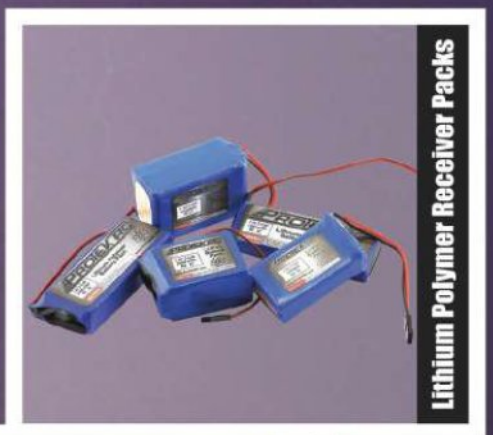

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What's NEXT?

WELL THE YEAR IS QUICKLY FINISHING UP AND THE QUESTION I ALWAYS LIKE TO POSE IS "WHAT'S NEXT?" In this month's News Century unveiled the new Radikal 600 size gasser. Ours is on the way and will be in next month's issue. I think it's a good idea. There are a lot of advantages to gas; long flight times, easier engine tuning, readily available supply of inexpensive fuel. This could be a great idea for the pilot who's not looking to tear it up with some crazy 3D but wants the advantages previously listed. Recently O.S. unveiled a .50 size engine that looks as if in production they could modify it for use inside a helicopter like the Radikal. This new size of gasser won't grab headlines in competition or anything like that, but my suspicion is that over the next six months they'll be common at many fields around the country. Speaking of fuel, this month Ryan had the pleasure of traveling to Ida Grove, Iowa to visit Byron Originals. They're the makers of Rotor Rage fuel and have been in the fuel business for years. It was a pretty interesting trip and one that he shares with us in this issue.

Last month we changed some things around in production that caused a delay in the mailing of our subscription issues. There was a delay that we did not account for in the production changes. I sincerely apologize to those of you who received your issues much later than normal. From now on expect to receive your subscription issues by the first week of the issue month. So for instance, this issue is November; you should have received it by the first week of November. Now that does very slightly geographically speaking so if you see someone on-line reporting that they've received their subscription issue yours should be there soon.

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

Sure, blame the post office.

RC Heli magazine

CHATTER BOX

WHAT WILL YOU BE ASKING SANTA FOR THIS YEAR?

MIKE VELEZ - Publisher/Editor-In-Chief
An inside man at the post office to make sure everything gets delivered on time.

RYAN KEPHART - Associate Editor
A plane that loops the loop, me I want a hula hoop.

BRANDON UPDIKE - Editorial Assistant
A shorter commute.

JIM INNES - Editor-At-Large
Just health and happiness for the family. But hobby related, I am definitely asking for a JR 11X radio and perhaps a new heli to fly with it.

CHUCK BASSANI - Editor-At-Large
World peace ... and maybe a set of JR DS8717 servos :)

ART KORAL - Editor-At-Large
Three healthy babies. We just found out there is a third!

MATHEW ALLEN - Copy Editor
A pony, a JR X9303, a day warm enough to fly in 2 feet of snow, and socks.

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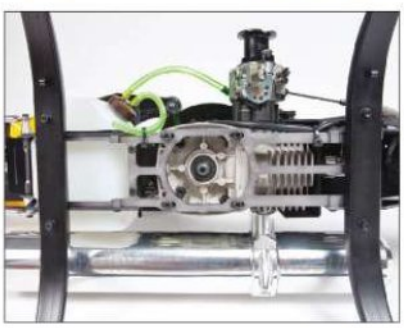
CENTURY'S NEW 600 SIZED GASSER

With the flood of 50 sized helicopters on the market it was only a matter of time before someone came up with a gas-powered version. Century has taken the role of creating the first production gasser in this class and labeled it as the Radikal. The Radikal was designed from the ground up and features a push-pull CCPM swash-plate and frames made from G10 or carbon fiber. The Radikal's frames are also very easy to work on with the help of a special joint that allows the front half to separate from the back. This frame design allows easy access to the 20cc gasoline fueled engine made by Zenoah. Century has also designed its own pipe to fit the engine and the helicopter without having to use the generic box muffler. Wide cord 620mm and 640mm Rotor Tech blades will also be available for this model. Several models will be available depending if you want to opt for carbon fiber or G10. The kit is also available in a LT (light) version, and a HD (heavy duty). The light version uses a beefed up 50-sized head and the heavy duty utilizes a 90-sized head.

Street Price: $499 - $950

WWW.CENTURYHELI.COM



We predict more companies to enter this market.

KONTRONICS IS READY

Kontronics is a name you might not be familiar with however for years they've been making some of the best brushless motors and ESCs on the planet. To this point they've been a little difficult to find. That's about to change. The Kontronics brand is now available through the popular on-line retailer Ready Heli. Ready Heli has promised to import a large share of Kontronics available product line so be on the lookout for those recognizable red cans to be showing up in helicopters across the country.

WWW.READYHELI.COM

ELY-Q IS EXPANDING

With the help of world-class pilot Danny Szabo, Ely Q is ready to kick it in gear and is now expanding on their already popular Vision 50 helicopter. Despite some minor setbacks, Ely Q was able to refine their Vision 50 and release it with a very affordable price tag of $250. Since the Vision proved to be a hit, Ely Q is now ready to release their new Vision 50 Competition, which is a beefed up version of the Vision 50. The Competition comes with all carbon fiber frames and a CNC aluminum head. Ely Q is also on the heels of releasing their new 50-sized electric helicopter, the Vision 50e Competition. Also be on the lookout for the Vision 90 sometime in the foreseeable future.

JR'S NEW FLAGSHIP RADIO THE 11X

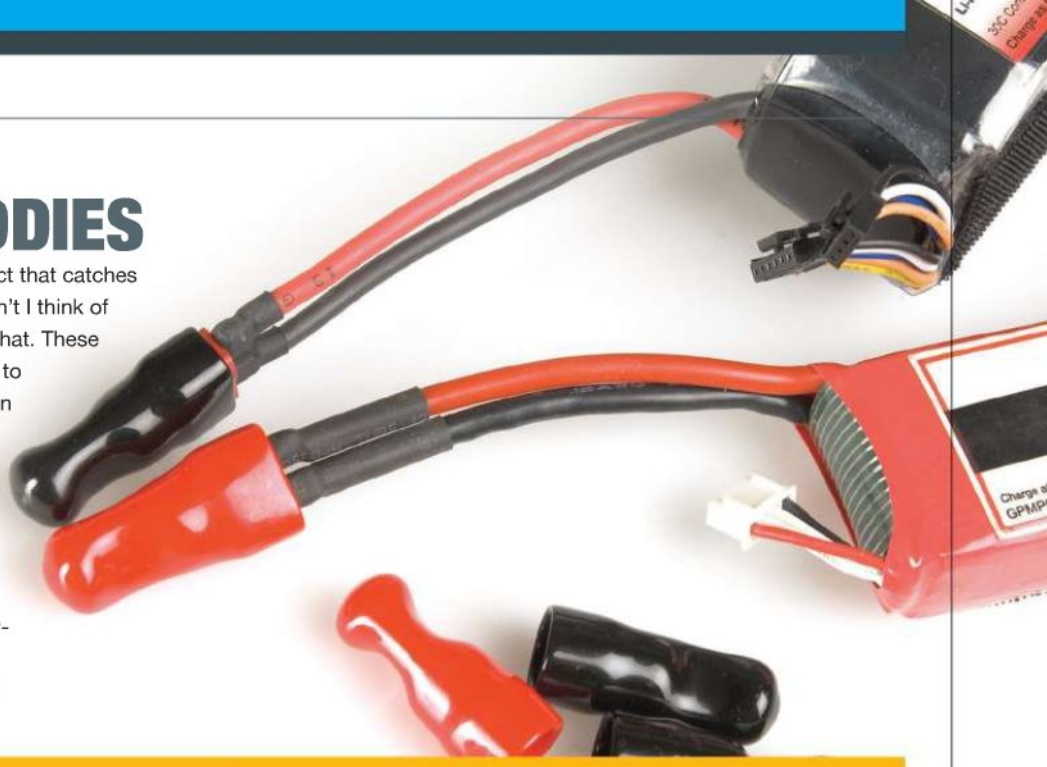
JR recently unveiled their newest creation, the 11X transmitter. First impressions lead us to believe that this will be one sweet radio. There's a link to a promotion video found on our website. We are eager to get the details of this radio and will keep you posted when new information comes in.

BATTERY BUDDIES

Every now and then, we run into a product that catches our eyes and we tell ourselves, "Why didn't I think of that?" Well, Battery Buddies are exactly that. These little caps fit over your Deans-style plugs to prevent short-circuiting. The caps come in several colors to allow visual inspection of battery status. Red caps indicate your pack is charged, and when finishing up a flight, replace the cap with a black cap to indicate the pack is dead. The caps can also be used for other applications such as exhaust plugs, glow-igniter caps, and carburetor plugs.

Street price: $5 for 6 caps (3 red/3 black)

WWW.BATTERYBUDDIES.COM



! CLARIFICATION!

Recently we reported on Miniature Aircraft being purchased by HeliProz. Technically that was an incorrect statement. Miniature Aircraft was acquired by Flyco which happens to be the parent company of HeliProz, Ron's HeliProz South, Big Sky CNC, and HeliWholesaler. Miniature Aircraft kits and parts are available now at your favorite rc heli shop. For dealer inquiries/service, contact HeliWholesaler at link provided below.

We apologize for any confusion this may have caused.

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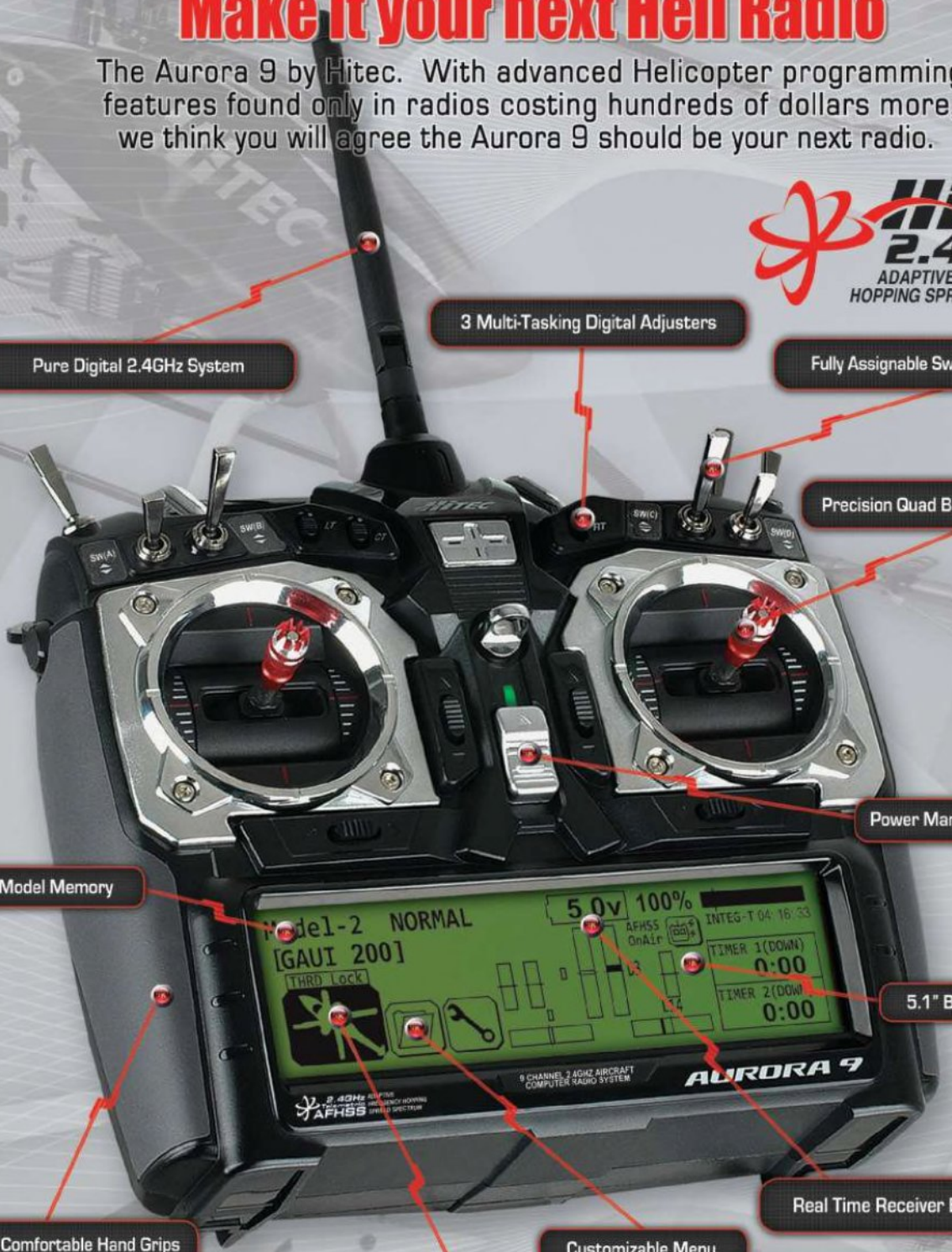

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AURORA 9 FEATURES

HELI Programming Features

- 6 Swash Types
  - 90° Type: 1, 3 and 4 Servo
  - 120° Type: 3 Servos
  - 140° Type: 3 Servos
  - 180° Type: 2 Servos
- Quick Select Model Options (Governor, Needle Control, Fuel Mixture)
- 7 Point Pitch Curve **
- 7 Point Throttle Curve **
- Throttle Cut
- Gyro Sensitivity **
- Needle Control **
- Swash to Throttle Mix **
- Rudder to Throttle Mix **
- Fuel Mixture **
- Throttle Hold ***
- Swash Mix (Swash Rate/Calibration) ***
- Revolution Mix **
- Governor **

Standard Programming Features

- 9 Assignable Control Channels
- 3 Model Type Programming (ACRO/GLID/HELI)
- 30 Model Memory
- 20 Character Model Name
- 8 Flight Conditions with 10 Characters
- Fail-safe
- Channel Function (Customize Channel Assignment and Control Input)
- EPA
- Dual Rate & Exponentials **
- Sub-Trim
- Servo Reverse
- Servo Speed (Up to 25 sec in Each Direction) **
- Servo Monitor & Test
- 8 Programmable Mixes (5 - 2-Point and 3 - 7-Point Curves) *
- Trainer w/Selectable Student Control
- Modes, 1,2,3 or 4 Plus 2 Custom
- 2 Customizable Timers / Switch or Throttle Activation Plus 1 Integral

GLIDER Programming Features

- 9 wing Type (6 Main Wings, 3 Flying Wings)
- Five Tail Type (Main Wing: Normal, V-Tail, Ailevator) (Flying Wing: 1 or 2 Rudder)
- Quick Select Model Options (Motor, Retracts Gear, Airbrake)
- Motor Control (Switch on/off) *
- Airbrake
- Airbrake to Elevator Mix *
- Aileron to Rudder Mix *
- Elevator to Camber Mix *
- Rudder to Aileron Mix *
- Aileron Differential **
- Aileron to Flap Mix *
- Launch Mode *
- Camber Mix *
- Flap Control **
- 3 x Gyro Sensitivity (ex: AILE/ELEV/RUDD) **
- Butterfly *
- V-Tail *
- Delta Mix *
- Ailevator *

ACRO Programming Features

- 9 Wing Type (6 Main Wings, 3 Flying Wings)
- Five Tail Type (Main Wing: Normal, V-Tail, Ailevator) (Flying Wing: 1 or 2 Rudders)
- Quick Select Model Options (Dual Engine, Retracts, Airbrake, Fuel mixture)
- 7 Point Throttle Curve **
- Throttle Cut
- Idle Down
- Fuel Mixture **
- Airbrake
- Airbrake to Elevator Mix *
- Aileron to Rudder Mix *
- Elevator to Camber Mix *
- Rudder to Aileron Mix *
- Aileron Differential **
- Aileron to Flap Mix *
- Camber Mix *
- Flap Control **
- 3 x Gyro Sensitivity (ex: AILE/ELEV/RUDD) **
- Snap-Roll (4-Way Multi Directional Switching) *
- V-Tail *
- Delta Mix *
- Ailevator *

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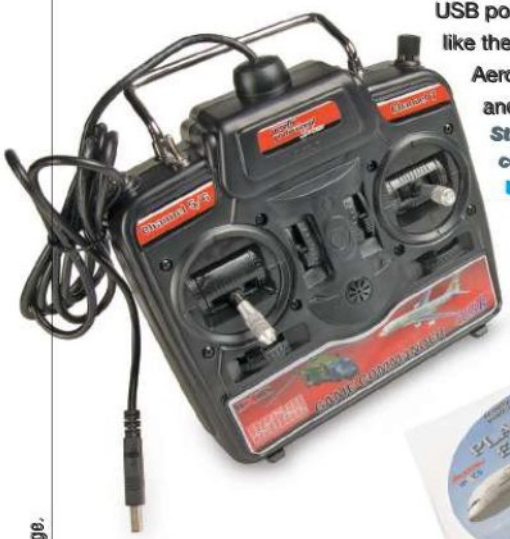
AEROFLY PROFESSIONAL
TAKES IT UP A NOTCH

IKRAUS has been in the hobby industry for quite some time now, and it is no fly-by-night company. For years, IKARUS has had the AeroFly Professional Simulator on the market; now the company has taken it to a new level by offering a platinum addition. The addition includes the AeroFly Professional Deluxe simulator along with five add-ons. The box also contains a simulator radio that interfaces with your computer via a USB port. The add-ons include popular helicopters like the Mikado 600 and the Hirobo Sceadu. The AeroFly simulator can be purchased for both PC and MAC computers.

Street price: $229.00 with game commander controller

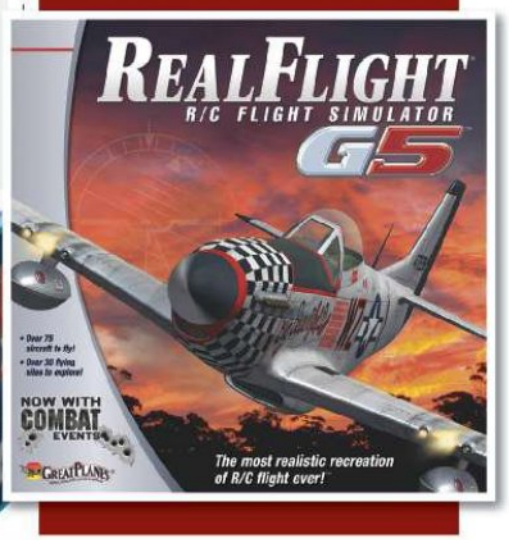
WWW.AEROFLY.DE



REALFLIGHT -G5-

Well, you have already probably guessed that it is the new RealFlight G5. The RealFlight team has been working hard since the release of G4.5 and has come up with a totally new version of its product. The G5 features an all-new multiplayer competition in which you can challenge up to 31 other pilots in a competition of skill and daring. A new profile and point system is also offered where other pilots can look at your score and compare points. Yet another new feature is war! Yes, I said it: Planes and helicopters can be outfitted with streamers, paintball guns, machine guns, and rockets. Players will be able to battle over 30 new flying sites and several additional aircraft. Keep an eye out for this to hit the market in late October with a price around $199.00.

WWW.REALFLIGHT.COM



GREAT PLANES OFFER

A NEW PACKAGE FOR BEGINNERS

Great Planes, Heli-Max, and RealFlight are all companies known to make excellent trainers for beginner pilots. Why not mix them all together, and see what comes up? Well, Great Planes has done just that and has come out with an updated flight-training system. The Axe EZ helicopter comes with the full version of RealFlight G3.5, which includes a model you purchase on the software. It also offers a plane version that includes a Cessna 182.

Street price: $259.99

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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.

Accessories

Our ever-growing line-up of premium accessories offers a variety of innovative products that deliver incredible value and convenience. From industry-first, individual-cell-voltage-monitoring electronic speed controls, to power supplies, balance connector extension leads, adapters and more, we offer the perfect solution for a wide variety of needs.

Rotor Blades

The unique carbon fiber and foam core construction of our premium quality rotor blades offers incredible stiffness for unbelievable stopping power and response. Available in sizes from 325mm to 600mm in length, there's a set of rotor blades perfect for your favorite 400/450, 500 and .50/600-sized helicopter that not only offers incredible performance, but incredible value too.

Insane Foamies Aircraft

Insane Foamies is a Thunder Power RC brand that offers aircraft models from some of the world's leading pilots and designers. From lightweight, competition-proven models built using 3mm foam, to a variety of durable and easy to fly models constructed from 6mm foam, there's a model for almost any pilot–from Sunday sport flyer to competition pilot and everyone in between.

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LETTERS

I live in Australia and I would like to buy some RC HELI stickers and a T-shirt is there any way I can pay for them with Pay Pal or something? I get every copy of the mag and would love to put a few stickers on my helis. Thanks for putting my pic in your mag it was a bit of a shock to see it in there, thanks heaps! I've got my son Blair Cunningham already started on Phoenix sim. He's 19 months and I'm showing him how to fly starting young, he will have it in no time.

Thanks heaps guys,
Nick Cunningham

Hi Nick, glad to see you're getting your little guy started early. You can go to our website, www.rchelimag.com and order a shirt and pay by PayPal. We throw some free decals in every order. Thanks again!

YOU BOO BOO

Just thought I would point out an error on page 89 of the September issue of RC Heli mag A gyro sensor measures angular acceleration, and not angular velocity, which would be very, very hard to do.

Thanks and Regards
Daniel J Méssem

Good eye Daniel, you're correct. That should have read "acceleration" rather than "velocity."
Mike

I'D LIKE TO THANK THE ACADEMY

My name is Shane Scaletta, I'm a 33 year old resident of Queen Creek, AZ. Here I am with my TREX 450 SE V2, she has a Futaba GY401 gyro, carbon fiber blades, Tenergy battery and custom canopy. I am a new pilot and would like to give big thanks to all my new friends at Sun Lakes Air Modelers Club, Greg at Remote Control Hobbies for his ongoing patients, Realflight G4.5 and RC Heli magazine for introducing this kind of excitement into my life.

WE'RE *UPPING* THE ANTE!

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NRG

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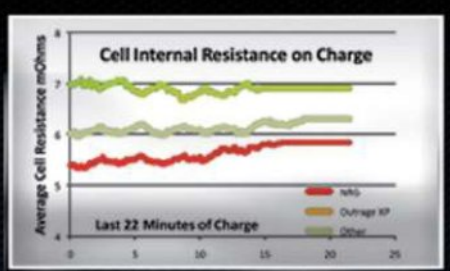
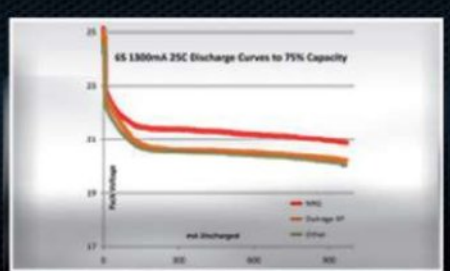
25C | 30C | 35C | 40C



The NRG pack demonstrates lower cell internal resistance on charge. We have found this correlates with lower discharge internal resistance and hence better current and voltage delivery and lower operating temperatures.



Under high discharge loads, the NRG packs consistantly demonstrate higher voltage than the competition.

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DEALER INQUIRIES WELCOME

FREQUENTLY ASKED QUESTIONS

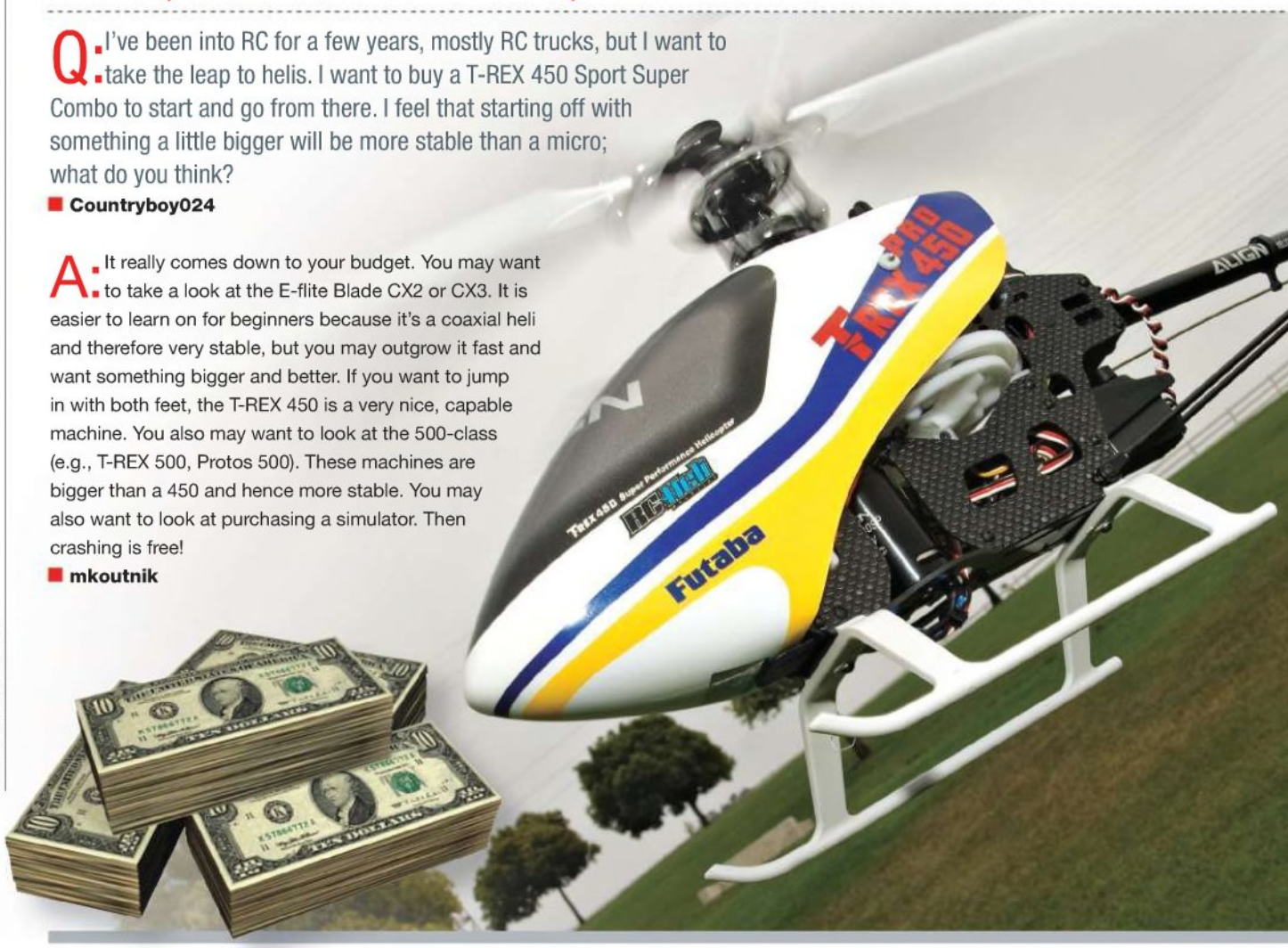
Q. I've been into RC for a few years, mostly RC trucks, but I want to take the leap to helis. I want to buy a T-REX 450 Sport Super Combo to start and go from there. I feel that starting off with something a little bigger will be more stable than a micro; what do you think?

■ **Countryboy024**

A. It really comes down to your budget. You may want to take a look at the E-flite Blade CX2 or CX3. It is easier to learn on for beginners because it's a coaxial heli and therefore very stable, but you may outgrow it fast and want something bigger and better. If you want to jump in with both feet, the T-REX 450 is a very nice, capable machine. You also may want to look at the 500-class (e.g., T-REX 500, Protos 500). These machines are bigger than a 450 and hence more stable. You may also want to look at purchasing a simulator. Then crashing is free!

■ **mkoutnik**

Show me the Hamiltons!



Q. I currently fly electric with CCPM, and in my DX6I radio the swash configuration is 120 deg. I am interested in getting a 50-size nitro, and one of particular interest is the new TT Raptor SE with redline engine, muffler, blades, and governor. It is an MPM, so my question is about the swash-type selection in the radio. I will probably get new radio with at least seven channels so that I can use the governor, but I am a little confused about the set-up. Also, I wonder if it is suitable for my first large nitro heli.

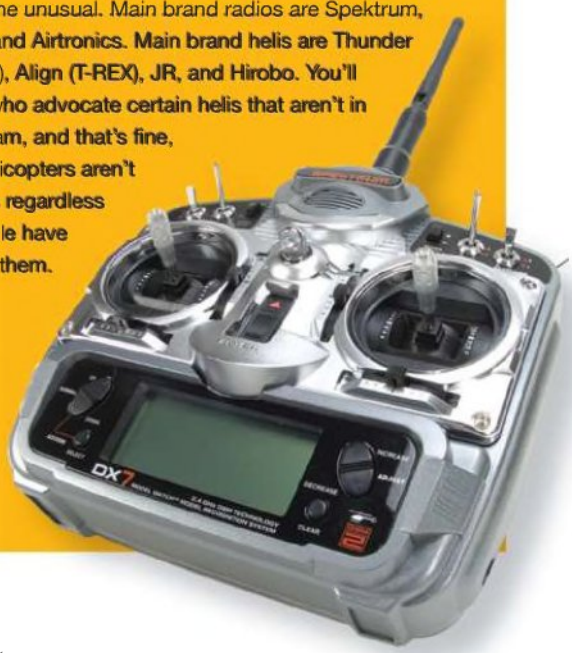
■ **dwoodworker**

A. The Raptor 50 Titan SE would be a great nitro helicopter. I started nitro with the Raptor 50 Titan 2 1/2 years ago. It is a great helicopter. It is not, however, CCPM: It is a mechanical mix, so the three servos do not work together like CCPM. On the radio you set the swash type as one servo. A seven-channel or better radio would be best.

■ **kcgraves**

Whatever radio or heli you get, just stick with main-branded stuff. Avoid the unusual. Main brand radios are Spektrum, JR, Futaba, and Airtronics. Main brand helis are Thunder Tiger (Raptor), Align (T-REX), JR, and Hirobo. You'll find people who advocate certain helis that aren't in the mainstream, and that's fine, but those helicopters aren't for beginners regardless of what people have to say about them.

■ **OTS**



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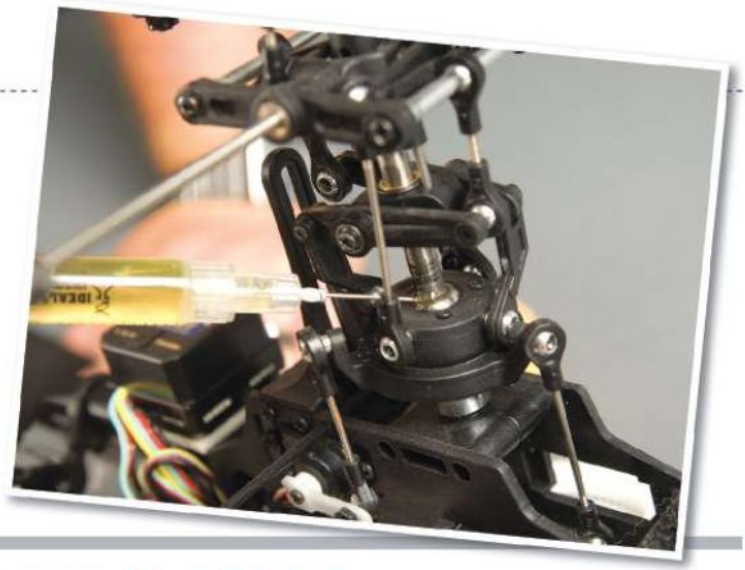
QUICK TIPS

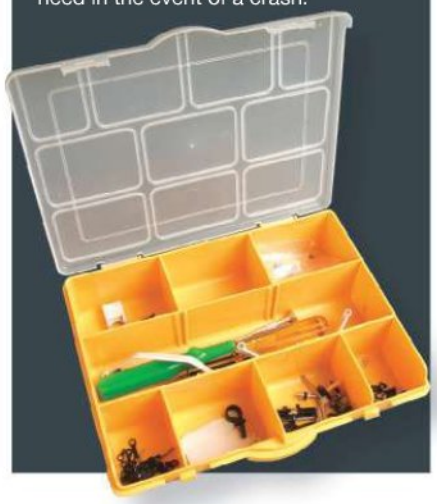
PRECISION OILER

Oiling our helicopters up often leads us wiping off a ton of extra oil. This is not only wasteful but can also cause a dirty mess. Hypodermic needles can become a useful tool when converted to an oiler. Grind off the sharp needle until the point is no longer sharp. Then, simply suck up the oil, and apply a small drop to the areas needing lubrication. Replace the cap on the syringe, and you have a small, portable oiler that you can throw in your toolbox.



SMALL HELICOPTER MEDIC KIT

250-sized helicopters are becoming popular, and it seems that most every helicopter pilot owns a small helicopter rather than a Blade MCX, MSR, TREX 250, or Gaui 200. These small helicopters have little parts that go with them, and oftentimes those little parts can break. A simple tackle box organizer or screw organizer can make storing those spare parts convenient and clean. Certain dividers can also be removed to store extra blades and tail booms depending on the size of the organizer. You can even throw in that special tool that you only use for the helicopter, and you will have a quick and easy field box that will have everything you need in the event of a crash.



HELI HANGER

Garage space is something that every man loves to have and just can't get enough of. This tip will help get your helicopters off the ground and stored close to the ceiling and out of the way. This will not only make your garage look cleaner but will give you that extra room so you can still park your cars in the garage. Select an area in your garage where you would like your helicopter to be positioned. Keep it as close to a wall as possible. This will allow the helicopter to be lifted and tied off without the rope getting in the way. **1.** Next, anchor a pulley to the ceiling either using a drywall hook or a hook that you can screw into one of the studs. Take some rope, pass it through the pulley, and judge the length of the rope so your helicopter can be disconnected and removed at a comfortable height. Also make sure the rope is long enough to tie it off on the wall using an anchor tie. **2.** Install either one or two S-hooks to the end of the rope, and squeeze down the side that comes in contact with the rope. **3.** Next, mount the anchor to the wall, and tie off the rope. **4.** Place the blade grips to the helicopter on the S-hooks, and lift up the heli.

Helicopter blood is yellow!!!!

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Unlike ordinary .50s that deliver only 120° eCCPM mixing geometry, the SDX provides both 120° and 135° options for unprecedented precision and rock solid control.

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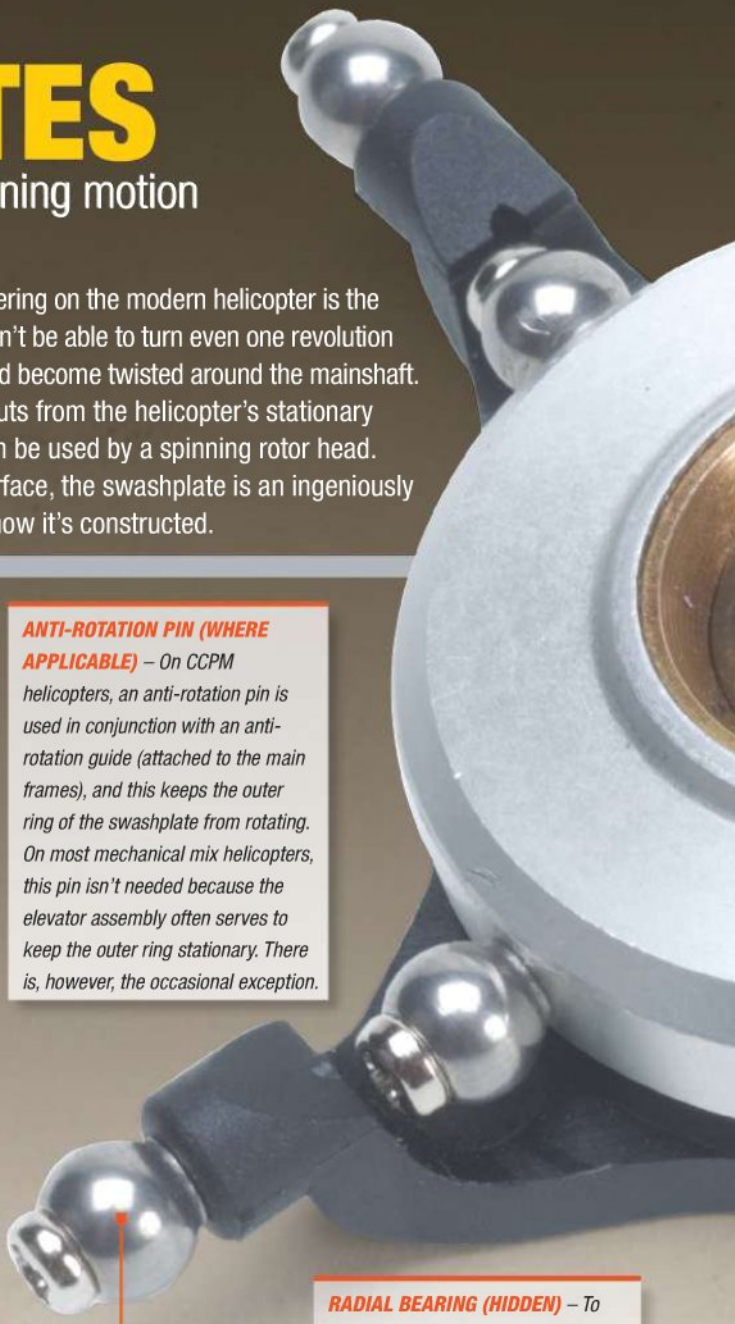
SWASHPLATES

How to convert linear motion into spinning motion

WORDS: Shawn Kitchen

An often overlooked but highly important piece of engineering on the modern helicopter is the swashplate. Without the swashplate, a helicopter wouldn't be able to turn even one revolution on the rotor head because all of the head linkages would become twisted around the mainshaft.

The job of the swashplate is to take the linear control inputs from the helicopter's stationary control system and convert them into a control input that can be used by a spinning rotor head. While that may sound like a complicated prospect on the surface, the swashplate is an ingeniously simple piece of hardware, once you understand a bit about how it's constructed.



MAINTENANCE

Thankfully, there isn't a large amount of maintenance involved with a swashplate. Since there are only seven basic parts, there's simply not much that can go wrong. The modern swashplate is largely an "install it and forget it" affair, but there are a couple of things you can keep an eye on.

A periodic inspection for overall smoothness is a good place to start, since a worn or pitted bearing can cause RF interference and make for gritty operation. If the radial bearing has gone bad for any reason, you'll most likely need to replace the swashplate entirely, since the tools necessary to replace the bearing are usually not part of the average modeler's collection.

For swashplates that have the adjustment setscrews mentioned in this article, an occasional check for slop can be helpful as well. If any slop is noted in the swash assembly, tighten the setscrews a quarter turn at a time until the slop is taken out. Don't overtighten the setscrews, because doing so can slightly deform the bearing and can actually degrade the operation of the swashplate.

On helicopters with a CCPM control system, it's helpful to check the anti-rotation pin for signs of wear or fatigue. Some helicopters like the Miniature Aircraft Stratus use a radial bearing on the anti-rotation pin, and this bearing rotates as the pin moves up and down in the anti-rotation guide. In this type of setup, make sure that the bearing is solidly mounted to the rest of the swashplate assembly and the bearing is spinning smoothly.

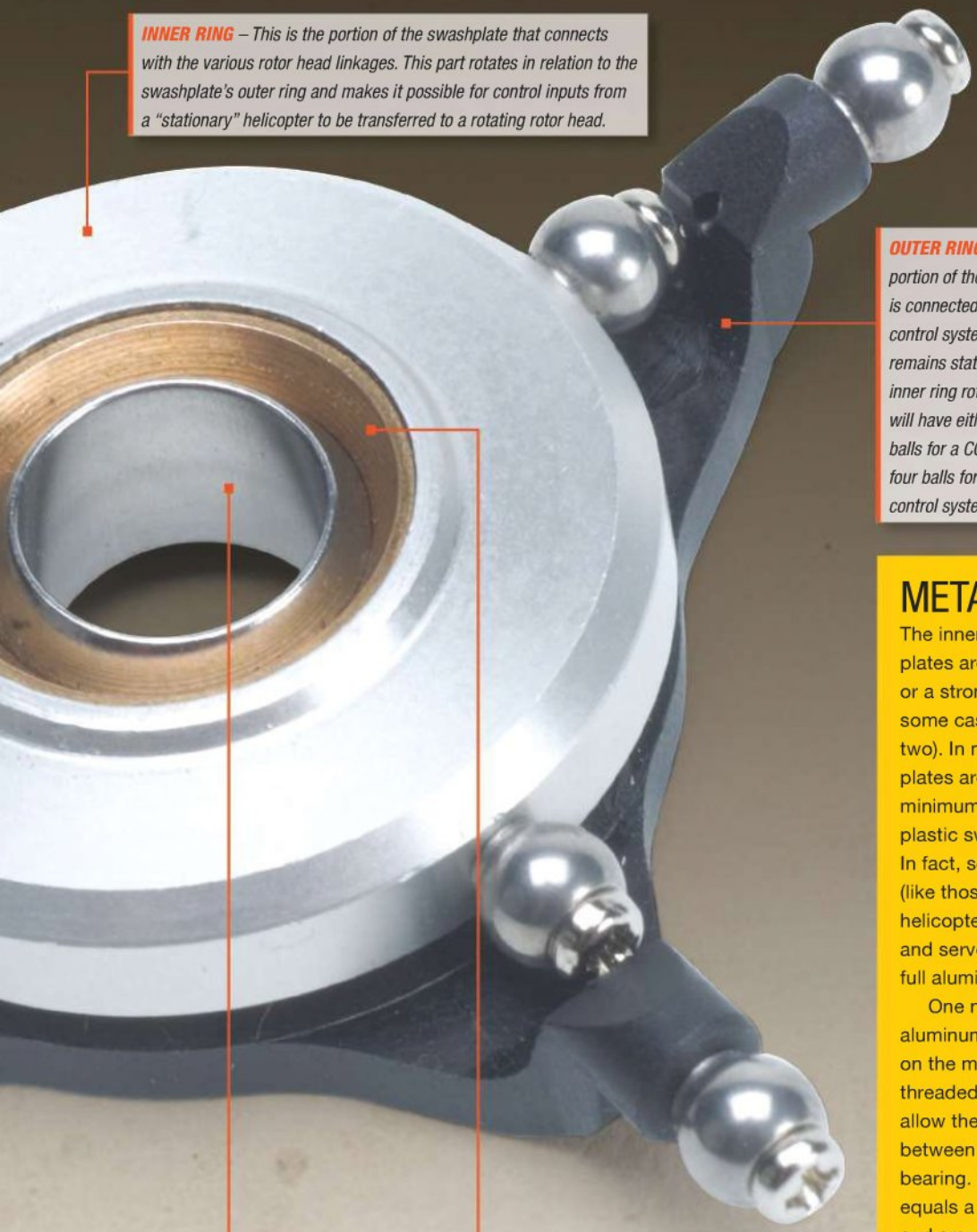
Aside from those three items, simply keeping the swashplate clean can result in years of trouble-free operation. Use a cotton swab to clean any accumulated grit off the inner and outer rings, and wipe down the swashplate after any kind of crash to make sure that no dirt has worked its way into the assembly. Don't use any kind of solvents or cleaners; a simple dry wipe-down and re-oil with 3-in-1 oil will suffice.

ANTI-ROTATION PIN (WHERE APPLICABLE) *– On CCPM helicopters, an anti-rotation pin is used in conjunction with an anti-rotation guide (attached to the main frames), and this keeps the outer ring of the swashplate from rotating. On most mechanical mix helicopters, this pin isn't needed because the elevator assembly often serves to keep the outer ring stationary. There is, however, the occasional exception.*

CONTROL BALLS – These control system attachment points are of the same variety as those used in several other places on the helicopter. Plastic ball links are snapped onto the control balls, thus a physical connection is made.

RADIAL BEARING (HIDDEN) *– To provide smooth, precise rotation of the swashplate, a single large-diameter radial bearing is used. The inner ring assembly of the swashplate is pressed into the inner race of the radial bearing, and the outer ring of the swashplate is pressed around the outer race of the bearing. This allows the two swashplate rings to rotate in relation to each other.*

Swash Buckler?



INNER RING – *This is the portion of the swashplate that connects with the various rotor head linkages. This part rotates in relation to the swashplate's outer ring and makes it possible for control inputs from a "stationary" helicopter to be transferred to a rotating rotor head.*

OUTER RING – *This is the portion of the swashplate that is connected to the helicopter's control system. This part remains stationary, while the inner ring rotates. The outer ring will have either three control balls for a CCPM system, or four balls for a mechanical mix control system.*

METAL VS. MOLDED

The inner and outer ring of swashplates are made of either aluminum or a strong, engineered plastic (or in some cases, a combination of the two). In most cases, plastic swashplates are used to keep the cost to a minimum, but that's not to say that plastic swashplates aren't any good. In fact, some plastic swashplates (like those used on some Hirobo helicopters) are very well designed and serve as a viable alternative to a full aluminum unit.

One notable advantage to a full aluminum swashplate is that many on the market have setscrews threaded into the outer ring that allow the pilot to remove any slop between the ring and the radial bearing. Less slop in the swashplate equals a smoother control system, and smoother is better.

CONCLUSION

The modern swashplate is a simple piece of machinery, but it's vitally important to the operation of a helicopter. Whether you're flying a mini electric helicopter or a 20-pound scale model, the swashplate is one of the foundations of a smooth, effective control system. So take care of it, and it may likely outlast the rest of the helicopter!

UNI-BALL - *Also referred to as an "eyeball" or a "spherical bearing," the uni-ball is shaped like a steel ball with a hole drilled through it. This ball fits over the mainshaft and allows the swashplate to move up and down on the shaft for collective inputs, as well as tilt side to side for cyclic inputs.*

SLEEVE – *While not a very technical name, this sleeve mates with the uni-ball in a sort of ball-and-socket arrangement, and is pressed into the inner ring of the swashplate. The sleeve mates the uni-ball with the rest of the swashplate assembly and allows the swashplate to pivot on the uni-ball, as described earlier.*

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SPEKTRUM

www.spektrumrc.com

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

REAMERS

Reamer? I don't even know er!

WORDS: Ryan Kephart

AT ONE POINT OR ANOTHER, YOU WILL REPLACE YOUR HELICOPTER'S CANOPY WITH A NEW FIBERGLASS OR PLASTIC ONE. Most of the time, you will find that you will have to drill out the holes for the canopy grommets. Drill bits work but can tear up your canopy and leave you with a messy hole. Worse yet, drills can walk and cause you to drill the hole in the wrong location. Tapered reamers are the solution and can come in handy when replacing your canopy or enlarging a hole that is on the tight side.

HOW TO USE A REAMER

Using a reamer is no harder than drilling. Locate the correct center point of the hole you want to ream. Most canopies have a small dimple already molded in that makes this process even easier. **(1)** Place the sharp tip of the reamer in the center, and apply a small amount of pressure as you twist the reamer. (Usually reamers only cut one way, so take a look at the directions to make sure you twist the reamer in the correct direction; most of these tools cut while rotating clockwise.) **(2)** Once the reamer starts to cut into the material, back off on the pressure, and let the cutters do the work. Too much pressure can cause the reamer to cut too deep and gouge the material. **(3)** Some reamers also have markings along the taper indicating what size hole is made when the hole reaches that depth. Take a look at your manual for the suggested size of hole, and then look at the reamer for the correct size. If the size you are looking for is not stamped into the reamer, you can use a pair of calipers to find the correct size and place a mark with a permanent marker. When sizing the hole, keep in mind that you can always take more off but never put some back. So ream out the hole a little small at first, and then check the fit of the grommet. If it is too tight, simply take the reamer, give it a few more turns, and try it again. Repeat these steps until you get a perfect-fitting grommet.

REAMERS FOUND AT YOUR LOCAL HOBBY SHOP

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PART NUMBER: HZ050
PRICE: $19.99

This reamer is made from alloy steel to reduce wear and distortion. It features bore diameter indicators, as well as an aluminum alloy safety cap. The handle is made from aluminum and can store accessories and screws.

CANOMOD PRO BODY REAMER

PART NUMBER: CAT-007
PRICE: $22.99

This taper reamer is made from alloy steel and has a knurled handle for exceptional gripping power. A cap is provided to protect the sharp, tapered reamer.

PRO-LINE BODY REAMER

PART NUMBER: LXWKW1
PRICE: $33.99

This large reamer is constructed from aluminum. This tool includes an aluminum cap to protect it.

CONCLUSION

Body reamers can be purchased at most hobby stores. Although you might not be able to find it in the helicopter section, make sure to check in the car section. (RC-car drivers use body reamers to drill out holes in car bodies.) You will find that not only are tapered reamers relatively inexpensive but they produce a much cleaner hole that will keep your grommets tight. RCH

There are a lot of bad jokes just waiting to happen.

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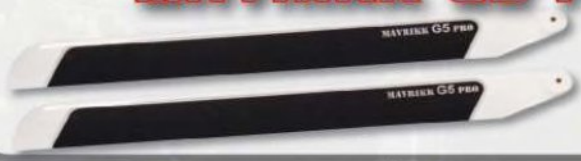

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E-Flite Blade 400 3D - RTF #141000 ..... $469.99
E-Flite Blade 400 3D - PNP #141321 ..... $279.99

GYROS

JR G370 3D DS3500G Combo
#101370
$224.99

Align GP750 - #870016 ..... $159.99
Align GP750/DS620 Combo - #387015 ..... $220.99
Align GP750/DS520 Combo - #870018 ..... $199.99
Align GP720/DS420 Combo - #870254 ..... $180.99
Inertia 860 Gyro - w/Programmer #652357 ..... $169.99
Spartan DS760 Gyro - #7034448 ..... $170.99
JR 770 Gyro - #101770 ..... ~~$189.99~~
JR 770/8900G Combo - #101801 ..... ~~$299.99~~
Logictech 6100/6100G - #138370 ..... $284.99
Logictech 2100T/LTS3100G - #138520 ..... $109.99
Solid G - #143200 ..... $195.00
Mini-G - #143259 ..... $179.99
Futaba GY401 Gyro - #109280 ..... ~~$149.99~~
Futaba GY401/9254 - #169840 ..... ~~$229.99~~
Futaba GY520 - #109288 ..... $199.99
Futaba GY611/S9256 - #109397 ..... $359.99

SIMULATORS

Phoenix R/C Simulator
#121212
$179.99

RealFlightt G4.5 - #148752 ..... $199.98
RealFlight G3.5 - #148030 ..... $109.99
Reflex XTR2 Ultimate - For JR, #601508 ..... $199.99
Reflex XTR2 Ultimate - for Futaba, #601505 $199.99
FS One Simulator - #152000 ..... $99.99

NITRO ENGINES

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#147250
$199.99

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OS .91 HZ w/Pump - #147239 .. $424.99
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TESTED and RATED

Kill two birds with one stone

Helo Controls
GYRO / GOV
BEST OF BOTH WORLDS

WORDS: Jim Innes

Exciting times are upon us in this hobby, especially in regards to electronics. The current trend seems to be combining some or all of the electronic components that our models need, an act that saves space, wiring issues, and of course money. The new Gyro/Gov from Helo Controls is one of the latest gadgets of this type on **the scene,** and it puts the gyro and governor fu**nctions into one unit.** Let's take a look!

FEATURES

The Gyro/Gov has all the features of both a pro-level gyro and governor in one box. The gyro is fully adjustable for every element, including the gain, endpoints, yaw rate, braking level for both ends, etc. It can be set up to work with normal and super-narrow pulse-width servos on both the tail and the throttle. A unique feature of the Gyro/Gov is that the unit, since it houses both the gyro and governor, can adapt the gyro gain during flight to compensate for RPM changes. Since the power of the tail fluctuates with RPM changes, moving the gain level with the RPM results in consistent tail authority in all maneuvers.

The governor is also fully configurable, which allows the user to set the gear ratio, gain, and a different governor for up to three flight modes. The Gyro/Gov offers an RPM limiter functionality in addition to the regular governor control; setting it is completely up to you and your flying style. Also, the Gyro/Gov is compatible with the vast majority of the RPM sensors used by other governors on the market, so if you already have a sensor in place, it will most likely work without modification.

One of the greatest features of the Gyro/Gov is its menu system. When the LCD panel is connected, this system allows you to set almost every conceivable parameter in the unit with a nifty multi-directional joystick on the case. Up to eight different models or configurations can be stored in the unit, which makes it possible to use a single Gyro/Gov in multiple helis if you so desire.

The case for the Gyro/Gov measures 2 3/8 x 1 1/2 x 1/2 inches, which makes it roughly the same size as a nine-channel receiver. A row of pins runs along the top edge, and the case is labeled clearly for

each connection. Another feature of the Gyro/Gov is that it is internally dampened and forgoes the need for special gyro tape. In fact, the manufacturer recommends simply strapping the unit down and using Velcro to secure it.

INSTALLATION AND CONFIGURATION

Installing the Gyro/Gov is pretty straightforward. The unit, like all gyros, needs to be mounted perpendicular to the main shaft and with the top of the unit facing up or down (it cannot be mounted on its side). Since the Gyro/Gov is larger than most gyro-only units, you may need to mount it somewhere other than the usual gyro tray. I should mention here that the downloadable manual for the Gyro/Gov is roughly 30 pages long and covers everything from magnet installation down to each and every menu in detail. It is a fantastic manual, which is something you rarely get to say about a gyro or governor instruction sheet.

The helis that I used in testing, a JR Vibe 50 and a Hirobo SDX 50, both already had governor sensors installed, so once I plugged in all the connections to the Gyro/Gov I was ready to go right into configuration. Configuration is covered very well in the manual, so we won't go into detail here. My only tip about configuration is to take your time, follow the order of the menus, and be sure to use the Set-up Verification menu with each flight mode to make sure things are set as you intended. The default settings for the gyro and governor gains and braking functionality work well, and you may not even need to change them. My only small complaint about programming is that with the joystick on the base unit instead of the LCD panel, you need to find a visible place to rest the panel instead of holding it, as you need a hand for the joystick and the other hand to move the transmitter sticks on occasion. The good news is that this will be taken care of with the next version of the Gyro/Gov (read more about the next version below).

TESTING

I was able to test the Gyro/Gov for more than a month in two different models. Once I had things configured properly, I was able to do a lot of flying using this unit. My first reaction to the gyro was thinking how fast the piro rate was yet how crisp and clean the stopping power was as well. I actually decided to slow down the overall piro rate a bit for my flying style; being able to do so with a menu item is a neat feature of this unit. The gyro holds extremely well in all forms of flight. and it is quite consistent moving the tail in both the clockwise and counter-clockwise directions. Tail slides and backwards flight presented no issues either. I found the Gyro/Gov's gyro side to be just as good as the pro-level unit it replaced.

The governor side initially didn't hold as tightly as I wanted near mid-pitch, but this was quickly solved by raising the governor gain a little. I tried both the limiter and the regular governor styles and liked them both; I ended up using the limiter, as it worked best for me. The governor is accurate, holds well, and reacts quickly. Just like with the gyro side, once I had it configured, the governor worked very well. One thing I should mention is that the Gyro/Gov is sensitive to engine-tuning issues. Make sure you tune your engine correctly before enabling the governor for best results.

Both sides of the Gyro/Gov worked exactly as advertised, properly filling in the shoes of the two units it replaced.

CONCLUSION

The Gyro/Gov from Helo Controls is truly a pro-class gyro and governor all in one. With so many configuration options, it can be set up to suit any level of pilot. I also like the idea of fewer components to mount and wire up on the helicopter. The price is very reasonable, too, considering the two units it replaces. Units like the Gyro/Gov keep me hoping that the current trend of affordable multiuse components continues. Have fun, and see you at the field! RCH

THE GOOD

- User can configure just about everything in the device
- Gyro and governor both hold very well
- Can be mounted with normal tape or Velcro
- Affordable

THE BAD

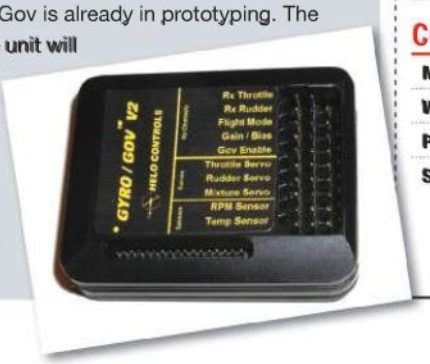
- A smaller box would be nice
- Would like joystick on LCD
- Might be easier to install with end pins instead of top pins

CONNECT

MANUFACTURER:	Helo Controls
WEBSITE:	www.helocontrols.com
PART NUMBER:	#GYRO/GOV
STREET PRICE:	$199 for unit only $225 for kit with LCD $245 for full kit (LCD, governor sensor, magnets, brackets and jumper wires)

V2 IS ALREADY ON THE WAY!

When I was speaking with James at Helo Controls during this review, he let me know that the V2 version of the Gyro/Gov is already in prototyping. The new Gyro/Gov will add mixture control, and the unit will be smaller, as well (in fact, it will weigh 38 percent less than the V1). But perhaps the greatest update in the V2 model, in my eyes, will be the moving of the joystick from the unit itself onto the LCD panel. This will make programming an easier process. Look for more info on the V2 in a future issue of RC Heli.



IDon't mount it sideways!

SwitchGlo
PRO IGNITER

Leave your igniter at home

WORDS: Ryan Kephart

HOW MANY TIMES HAVE YOU GONE TO START YOUR HELICOPTER ONLY TO FIND OUT THAT YOUR GLOW DRIVER IS DEAD and the engine will not start? Have you ever left your glow igniter at home on the charger? Chances are you have had to borrow one or run back to the house to grab your igniter just to get in a few flights. All that is about to change: SwitchGlo will reinvent the way you start your helicopter, and you will never have to worry about forgetting your glow igniter again. This month we are taking a look at the new SwitchGlo Pro, which offers additional features that go above and beyond the original SwitchGlo we have all seen before.

FEATURES

The SwitchGlo Pro features a compact design that houses everything it needs to ignite your glow plug. SwitchGlo has changed the voltage input to accept a wide range of voltage (from 4 volts to 9). This means that you can buy just one unit for all your needs. Previous versions required a specific SwitchGlo depending on the voltage you were running on your system. They also required that you had an open channel on your radio, but the new Pro is a stand-alone unit that can be used even without an extra channel on your radio (by using a push-button switch that activates the igniter). A built-in servo reverser can also be used for Y-harnessing off an unopened channel. The SwitchGlo unit weighs in at 25 grams including the pigtail that attaches to the glow plug and engine. The pigtail uses a quick disconnect on the body, which allows you to remove it without having to unscrew the ground wire. This feature also allows you to easily replace the pigtail if the wires should ever be damaged. The SwitchGlo Pro can also be programmed to automatically shut off after 12 seconds or one minute. This gives you plenty of time to start your engine and walk it out to the flight line without fear of the engine shutting off. SwitchGlo Pro can also be programmed through your computerized radio to come on during a low throttle setting. This makes a wide range of applications possible, including airplanes that have an inverted engine. Another great feature of this small unit is the ability to see if your glow plug is functioning properly without having to remove it to check the coil: SwitchGlo included a buzzer that allows you to hear if the unit is working and the glow plug is lit. If the glow plug burns out, the SwitchGlo emits a short tone and then becomes silent. This verifies that the unit is working but the glow plug is dead.

TESTING

I had a chance to not only bench-test the unit but install it in many different nitro helicopters, including 50- and 90-sized birds. The SwitchGlo Pro provided enough power to start every engine I threw at it. The additional features really made this automatic glow igniter shine. Stubborn idling motors remained running for an extended amount of time allowing a smooth transition to mid-stick. The audible alert was really helpful when starting the helicopter because I knew the helicopter was hot and ready to start. I set up the radio programming several ways, which was also really helpful and safe. The programming even allows you to set it up to only glow if the throttle is at idle. This prevents hot starts and the possibility of burning up your clutch. I also set up the push button switch on a few helicopters. The button worked flawlessly, but it seemed a bit fragile to me. The connector that is pressed in the SwitchGlo is a bit on the weak side, so be careful when installing this button. I even had a chance to try the SwitchGlo on an inverted mounted engine on an airplane. At first it was a bit difficult to start the engine. After several attempts and adjusting the low-end needle, the engine started flawlessly every time.

THE GOOD

- Small and lightweight
- Sealed unit
- Easy to use

THE BAD

- Glow seems a little weak on some applications
- Push-button switch connector feels a bit weak

CONNECT

MANUFACTURER:	SwitchGlo
WEBSITE:	www.switchglo.com
PART NUMBER:	N/A
STREET PRICE:	$64.99

CONCLUSION

The SwitchGlo Pro is a great little product that can help every helicopter during the starting process. The unit is lightweight and compact, which allows it to be used on any nitro helicopter big or small. This well made sealed unit will provide years of easy starts without the fear of residue seeping into the circuit board. If there were one thing I could change on the unit, it would be the ability to adjust how much current is going to the glow plug. I found that some of the glow plugs I used just didn't seem bright enough, but all in all it started the engine every time. RCH

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EMPIRE HOBBY

INSTALL ELECTRONICS

Electric Edition

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

ELECTRICS ARE GETTING BIGGER AND BIGGER EVERY YEAR. Most RTF or ARF helicopters fall into the electric category. These small, compact helicopters often leave hardly any room for your electronics, and the wires end up looking like a bird's nest scattered across your small electric heli's frame. This "How To" is to help you install your electronics in electric 450-sized and smaller helicopters.

Put it in before you put it up.

» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

1.0 RC Heli

» TIME TO COMPLETE

60 Minutes

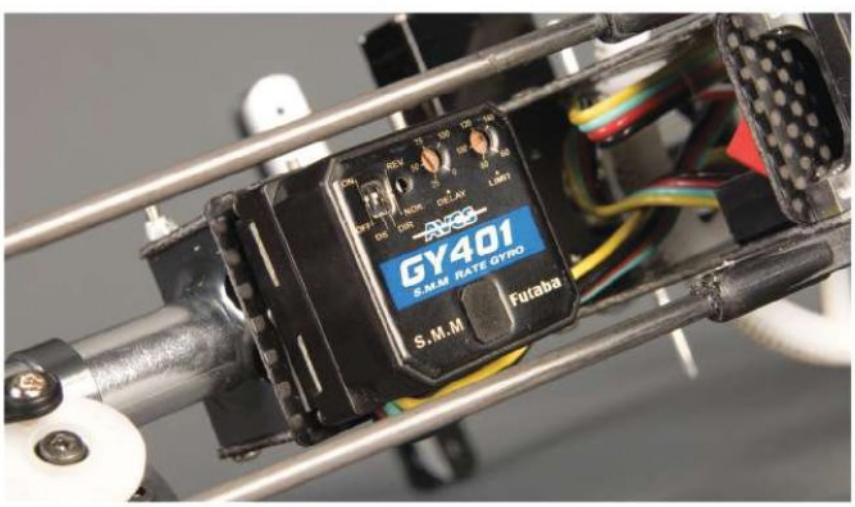
» TOOLS NEEDED

- DOUBLE STICK TAPE
- ALLEN WRENCHES
- ZIP TIES
- SOLDERING IRON AND SOLDER

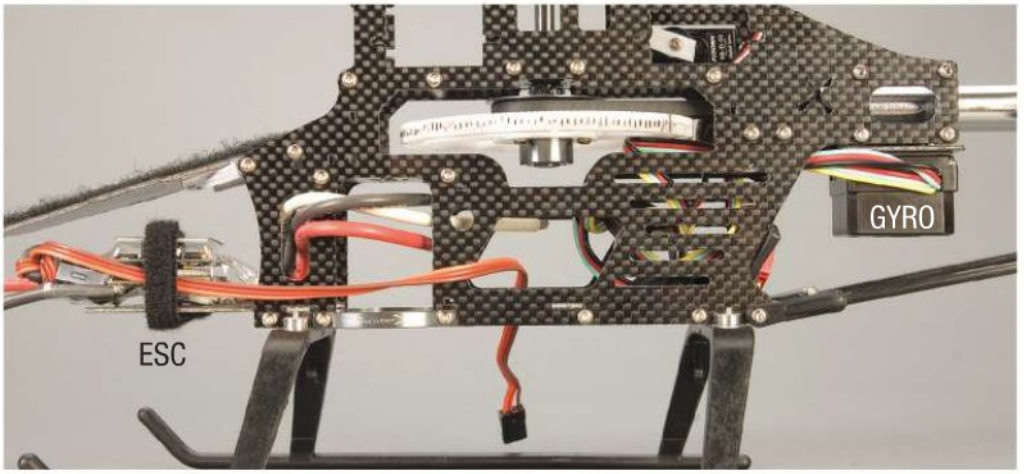
GYRO AND ESC INSTALLATION

The step I started with is by far the most important step in installing the electronics. The two components work great individually, but can become a big problem if they interfere with one another. Not all speed controls are built the same and can cause some interference with the gyro, which causes the tail to act erratically. Keeping these two components as far away from each other as possible is a must and will ensure that your ESC does not interfere with the gyro.

1 Take a look at your helicopter and mount the gyro in the correct spot according to the manual. If the manual does not suggest a location, mount it on a flat surface that is perpendicular to, and along the same vertical axis as, the main shaft.

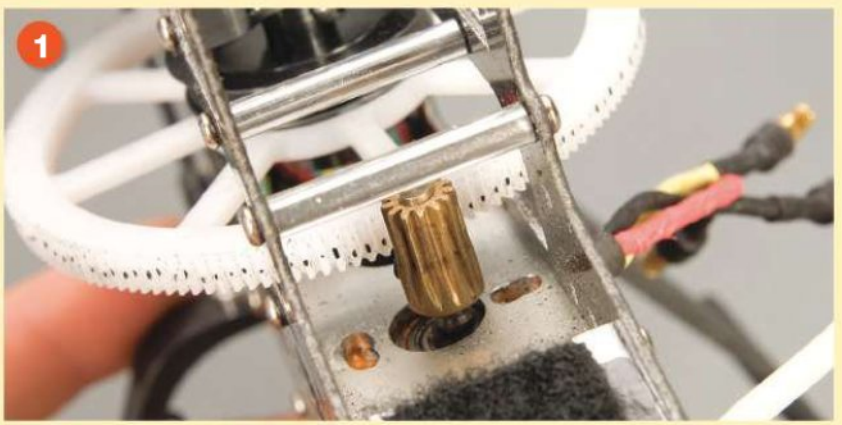


2 Next you will want to find a spot on the frame as far away from the gyro as possible. This location has to be in a place where the wires from the motor can reach the ESC. Once you've located it, use a piece of servo tape to lock down the speed control. This should be enough to hold it down, but if there is a place to strap it down also with Velcro, do so at this time.

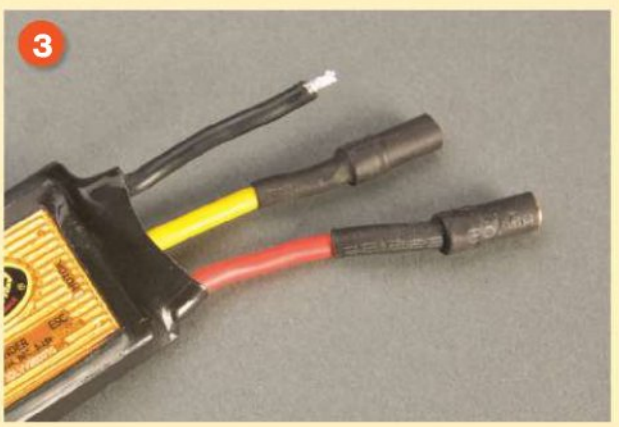


MOTOR **INSTALLATION**

The motor is easy to mount and should be second in line before mounting the servos. Sometimes servos can make installing the motor a bit difficult if they are above the motor screws. Place the recommended pinion on the motor and lightly secure it. Trial fit the motor onto the motor mount and adjust the pinion to the right height. Remove the motor and put a drop of thread lock onto the setscrew holding the pinion.



Install the motor back onto the mount but do not tighten the screws just yet. Adjust the gear mesh by placing a strip of paper between the pinion and the main gear. Press the motor up against the main gear and tighten the screws (don't forget the thread lock!).



After adjusting the mesh you will want to connect the speed control wires to the motor. Don't worry about which one goes where at this point; we will go over that later. If the wires are too long and cannot be tucked away, this would be a good time to shorten the leads coming from the ESC. Clip the wire to the desired length and solder the female bullet connectors to the wires. Use shrink-wrap tubing on the connections so the connectors cannot touch each other.

This is your simple guide :)

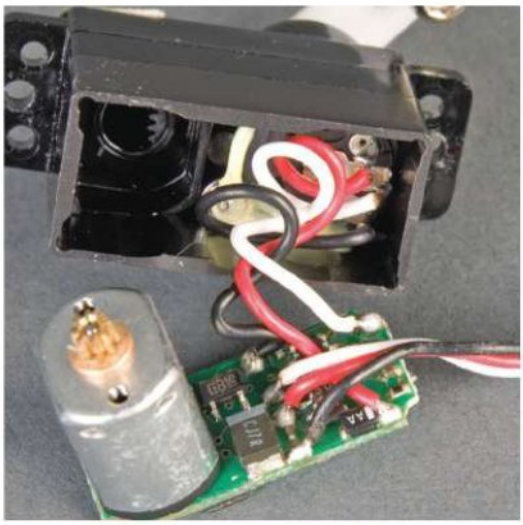
RECEIVER INSTALLATION

Installing the receiver is much like installing one on any other helicopter, but in case this is your first time we will walk you through it. Most small electric helicopters use a CCPM mix to control their rotor head, so we will guide you through this process. The right servo should be plugged into the receiver's aileron port. For JR radios this is channel 2, and for Futaba it's channel 1. The left servo should be plugged into the auxiliary 1 channel, or channel 6 on Futaba. The front or rear servo (some servos are in front of the swashplate and others in the back) should be plugged into the elevator channel, or channel 3 on Futaba. The tail servo should be plugged into the gyro and the leads from the gyro should be run to the receiver. If your gyro has a remote gain then you will have two leads coming out. Usually the gain wire connector will be a different color from the other one, or the wire will have only one lead. The rudder lead coming off the gyro should be plugged into the rudder channel, or channel 4 for Futaba. The gain wire will be installed in the gear channel port, or channel 5 for Futaba. After your wires are all plugged in, either Velcro the receiver down or use double-sided foam tape to secure it to the helicopter's frame. Stay tuned for CCPM radio programming in next month's issue of RCHELI Magazine. After you are finished installing the servo leads, plug in your flight battery and place the helicopter onto the ground. Give it only enough throttle to enable you to see the motor operating. If the blades are spinning backwards or not spinning at all, shut down the helicopter and reverse the positions of two of the three wires coming from the speed control. This will reverse the motor and allow it to rotate in the correct direction.

You don't need to open up your servo to install it.

SERVO INSTALLATION

When installing the servos keep in mind where the wires are going to run. Wires can clutter up a clean-looking heli in a hurry. Some servos come with really long leads and others come with short ones. Consider where you want to mount your receiver when installing the servos. This will give you a good idea of how long your wires should be and where you are going to route them. Take one servo at a time and figure out if its wire is long enough or too long. If it's not long enough you will have to purchase a servo extension. On a small heli a three-inch extension is usually enough. If the wire is too long this might be the best opportunity to shorten the servos by removing the back plate, shortening the wires, and then re-soldering them to the circuit board.



If you are uncomfortable doing it this way you can cut a section of the wire out, solder the wires back together, and use shrink-wrap to cover the connection.

If soldering is not your forte then layer the wire and secure it using an electrical zip tie.

Once your servos are in place, route the wires to the receiver location. Use zip ties to ensure that the wires do not rub on any parts where they shouldn't, such as the main gear or motor.

CONCLUSION

Installing the electronics in an electric helicopter is not much different from installing them in a nitro. The space and room the frames have to offer are the only disadvantage that manes them harder to install than on a big bird. With any electric helicopter it is a good idea to learn how to solder. If you want to freshen up your soldering skills, or want to learn "How To," take a look at September 2008 issue 27. I hope this article helps you install your gear in your first electric heli. RCH

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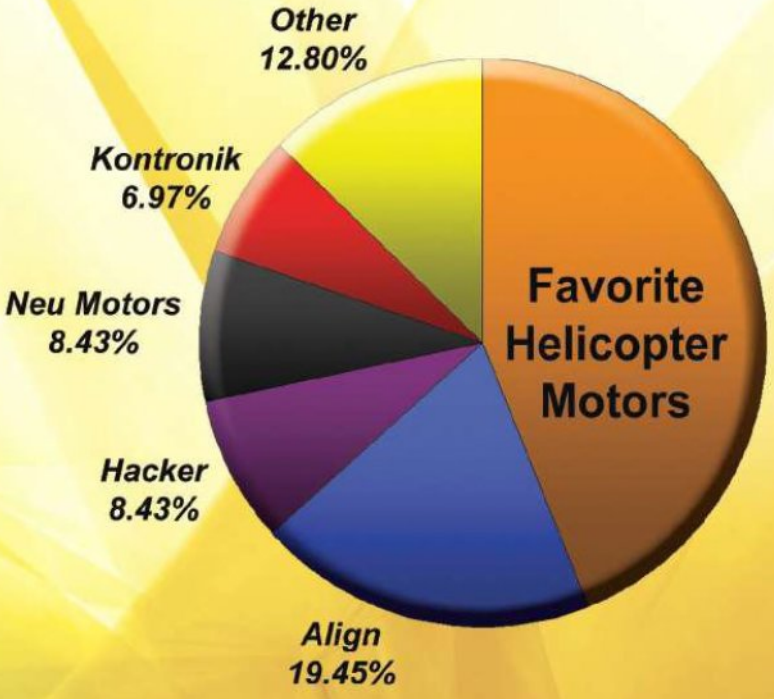

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*For complete details about the survey, please visit www.rcheliresource.com/results-2009-visitors-choice-awards/

PITCH AND THROTTLE CURVE 101

Batter Up!

WORDS: Jim Innes | **PHOTOS:** Carl Hyndman

THE PROGRAMMABLE CURVES USED TO SET UP THE PITCH AND THROTTLE OUTPUT IN OUR MODELS ARE CRUCIAL to obtaining proper flying characteristics. These curves, though usually viewed separately, are actually intertwined, and the main rotor head speed is the end result of this concert of curves. Knowing the basic steps in setting up these curves is necessary for your success in the hobby.

» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

2.0 RC Heli magazine

» TIME TO COMPLETE

15 Minutes

» TOOLS NEEDED

- PITCH GAUGE
- RADIO
- TACHOMETER
- BALL-LINK PLIERS

HOW THESE CURVES **WORK TOGETHER**

Though pitch and throttle curves are two independent functions affecting separate channels on the helicopter, they are inherently tied together in two ways: the throttle stick on your transmitter controls both the throttle and pitch on a model, and the functions of throttle and pitch must work together in order to control how fast the rotors spin on a helicopter. If either output is out of sync, the head will either rotate too slowly or too quickly. Since the radio curves ultimately determine the output of both these functions throughout their range, it is crucial that these curves are set correctly.

The whole purpose of your radio curves is to get a consistent head speed from the main rotor.

CURVES MADE SIMPLE

We will go through our pitch- and throttle-curve set-up as if we were setting up a new model together. There are a few things to talk about before we start setting up these curves.

- We will be setting our pitch curves in their simplest form and in what I have observed as the most widely used manner. The natural mid-stick of the throttle stick will initially result in zero degrees pitch and half-throttle at the carb or ESC.
- We will rely heavily on initial mechanical set-up to make radio set-up simple and versatile.
- We will assume that you are using a computer radio that allows you to program the curves independently for each flight mode. Additionally, we will set things up as if no throttle governor were in use on the model; the curves will control it all.

LETS GET STARTED!

PITCH CURVE STEPS

STEP 1: Set up the helicopter's rotor head at a neutral state so that, when the swashplate is at the center of its range, the main blades have zero pitch, and all control arms are parallel and level. The same is to be said of the servo arms: The throttle stick should be centered and the curves left at their default (0 percent at the bottom, 50 percent in the middle, and 100 percent at the top).

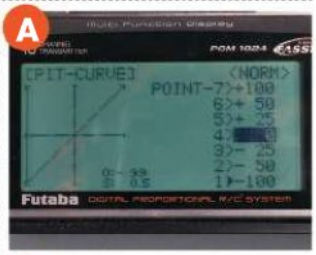
STEP 2: Mechanically set both your upper and lower pitch to the maximum value you want using the endpoints/swash mix. For example, if you will be using 12 degrees of pitch for autorotations and that is the max pitch you will run, adjust pitch until you get 12 degrees on top and bottom stick.

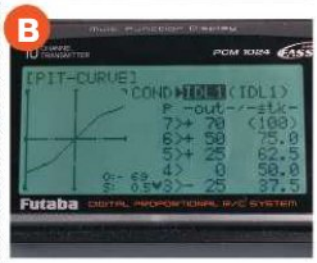
STEP 3: Adjust the pitch curve for each flight mode to tell the radio the pitch output you want at each stick position. For example, if you're using 12 degrees for autos, you may want to run 10 degrees in other flight modes. To do so, simply lower the top point of the pitch curve for that mode until your pitch gauge reads 10 degrees. Then raise the lower point of the curve to get the negative pitch set to -10 degrees. Leave the rest of the curve points where they are. Of course, if you will be using the same pitch range in all flight modes, you should end up with a straight 0, 50, and 100 percent line as your pitch curve for all your flight modes. Some pilots do not like to run at full negative pitch in normal mode because it leaves an opportunity for the helicopter to descend far too quickly, especially if there is a panicked lowering of the stick. This is simple to adjust: Simply raise the lowest point of the curve until you get to about -2 degrees or so.

By setting up the heli so that things mechanically are centered first, you have made it so your pitch curve can be used at will to change the actual pitch output of the model without needing any further adjustments.

A computer radio, like that on the left, is almost a requirement to fly a helicopter, though some RTF models and fixed-pitch helis do come with non computer radios.

As mentioned in previous articles, it is important that you mechanically set things up so that everything is zeroed out at mid-stick. Doing this makes setting up your curves a breeze.



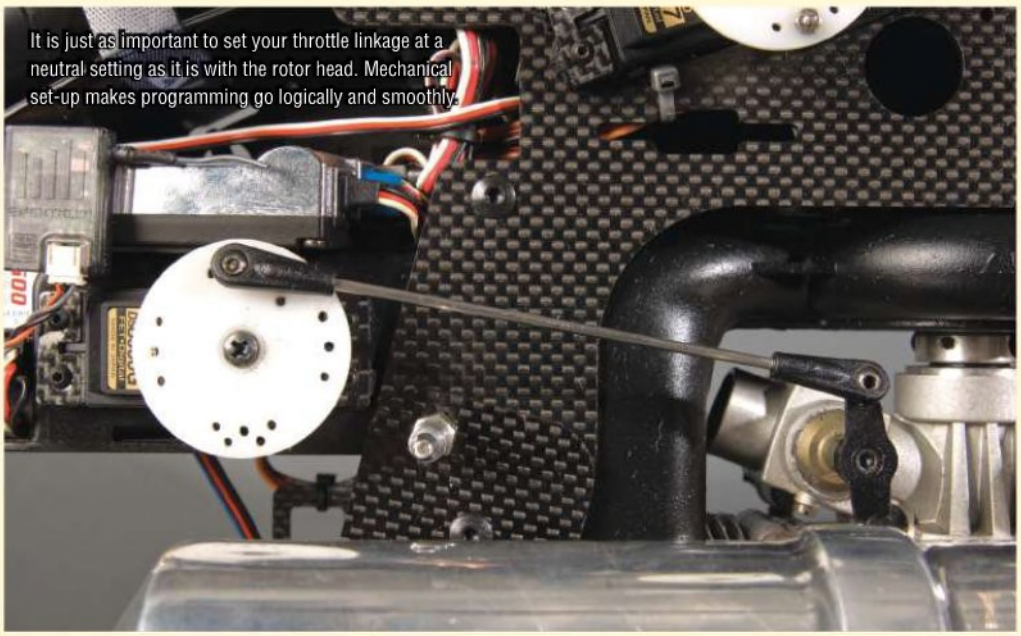


Above is a straight line pitch curve like the one used for throttle hold in our example **(A)**. It is a linear curve covering the full mechanical range of the model. The next picture **(B)** shows a slightly modified curve for cases where the pilot wants to have a slightly lower pitch range in one flight mode but still have full range in the others.

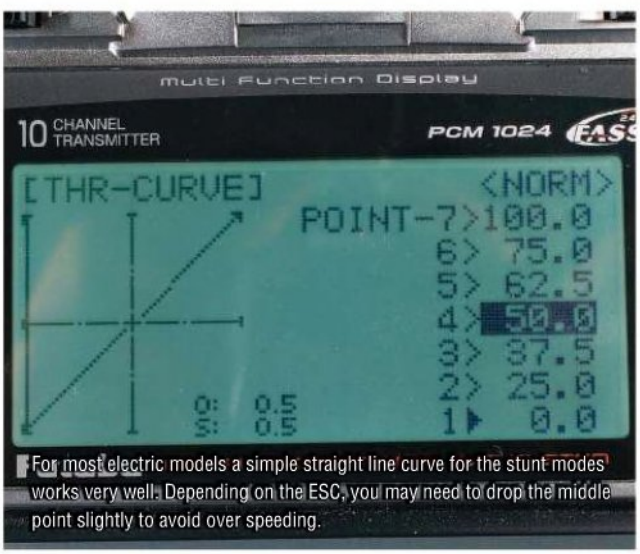
Helicopter manuals sometimes give you basic throttle and pitch curves.

THROTTLE CURVE STEPS

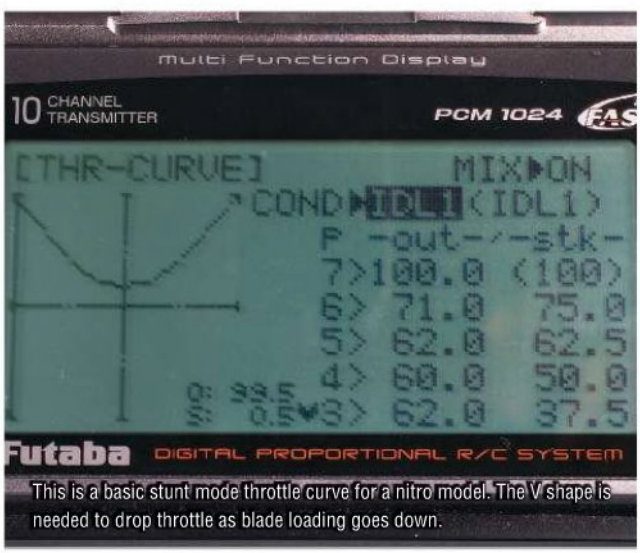
STEP 1: Just as with the pitch set-up, first set up your throttle so that low stick (with the trim down) results in a closed carburetor/low throttle on the ESC. Mid-stick should result in 50 percent throttle at the carb. or ESC, and of course max throttle should result in a wide-open carb. or full output at the ESC. This is all done with the throttle curves left at their initial 0, 50, 100 percent straight line.


It is just as important to set your throttle linkage at a neutral setting as it is with the rotor head. Mechanical set-up makes programming go logically and smoothly.

STEP 2: Unlike pitch curves, you cannot get your throttle curves set to their exact final spot on the bench; some flying is needed to tweak them. But you can get them close to where they are needed right now. In this case, electric and nitro helicopters need to be treated differently, so we will discuss each of them separately in this section:



For most electric models a simple straight line curve for the stunt modes works very well. Depending on the ESC, you may need to drop the middle point slightly to avoid over speeding.



This is a basic stunt mode throttle curve for a nitro model. The V shape is needed to drop throttle as blade loading goes down.

- ELECTRIC: For the most part, electric helicopters can be set with a simple straight-line throttle curve that is set to the same level all the way across. For example, set the low point in your normal mode to zero, and then take every point after that and set it to 80 percent. That means that at low stick the motor shuts down, but at every other point it is running at 80 percent of its max speed. In that same example, set the stunt modes to 90 percent all the way across (including at low stick). Lastly, verify the throttle hold and that the motor does indeed cut off when in that mode.

- NITRO: I initially set my normal mode throttle curve so that when I am running 5 degrees of pitch, my throttle is roughly 50 percent open. I then set the other points on the curve so that it is a smooth slope to that point with a gradual ramp-up afterwards. I usually max my throttle to about 80 percent in normal mode as I only use that mode to start the heli, take off, or practice smooth, slow flying. Stunt modes should initially have their curves set up into a V shape, with 100 percent at both end points of the curve and 50-60 percent at the middle point. Of course, throttle hold should be set so that the engine goes to idle when enabled.

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STEP 3: The last part of throttle curve set-up happens at the field and uses a tachometer. You will need another person for this step unless your ears are really tuned to correlating the noise of your model with the RPM range it is running. Simply put the model into a hover, and ask someone to check the RPM of the main rotor using the tach. If the head is running too quickly or slowly, lower or raise the throttle curve point at hover a little to get to the proper speed. Do the same in stunt modes. Go through some maneuvers, and be sure to go to zero pitch to listen for overspeeding. If you notice overspeeding when near mid-stick, simply lower the middle point of the throttle curve, and try again. It is at this stage that you can enable other points in the curve to fine-tune the points between the middle and end points if needed.

The only way to really verify that your throttle curves are appropriate for your model is to fly it and measure the head speed. Tweak the curve points as needed to get a consistent head speed.

THE CONCERT IN ACTION

The process of setting pitch and throttle curves is quite simple, but skipping this process or just guessing at head speeds can result in disaster. This is especially true if your curves allow the rotor to overspeed to the point where the blades are thrown off the model. Look at the relationship between your throttle and pitch curves the same way you would view the relationship among artists in an orchestra. While each instrument is independent and unique, they are all needed to create the desired music. If one is out of tune, the end result suffers. Keep the music of the rotor disc consistent and in harmony by properly arranging the points on the radio curves, and you will be rewarded with a heli that is a joy to fly. See you at the field!! RCH

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$3.79

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BYRON FUELS Factory Tour

Castles and knights! Are we going medieval?

WORDS & PHOTOS: Ryan Kephart

Byron the Dragon Slayer!

Company History

Necessity is the mother of invention is the phrase that comes to mind when I think of Byron Originals. The company was incorporated in 1975 to design, produce, and market giant-scale airplane kits. The market at the time did not have giant-scale kits for the average flyer, and the kits that were available required you to have a background in machinery to produce a final product. Luckily, Byron Godbersen, the founder of Byron Originals, had a love for airplane kits like no other, and he saw this problem. He also wanted the hobby to grow and reach out to the average flyer. Out of this, Byron Originals was born, producing kits that included everything needed to finish the plane. The majority of Byron Original kits were scale reproductions of the popular WWII aircraft including the Corsair, Mustang, and Thunderbolt. Other popular aircraft, such the Pitts Special and Christen Eagle biplanes, were also kited in this form. Ever since those early planes, Byron Originals has been a big name in our hobby and has continued to prove its quality and dedication. Byron Fuels came about during the demonstrations of their big 1/5th-scale airplanes. Byron Originals was looking for a fuel that was consistent and of good quality, but a reliable source could not be found. Godbersen decided to venture into the fuel market instead of just bottling up a generic fuel and labeling it as their own; he decided to throw out the book and set forth on an epic research and development process to create a fuel of quality and consistency that could match his company's high quality standards.

Fuel from birth to bottle

Godbersen's goal was to produce a fuel with a lubrication package that exceeded all others in protecting engines and that had the good effects of castor without the bad such as carbon deposits and varnishing. In collaboration with John Klotz of Klotz Performance Products, Godbersen was able to come up with a blend that provided all the protection we need without leaving behind carbon deposits. Byron uses a special blend of castor and synthetic oils that has been rigorously tested using the roughest conditions possible. Rotor Rage is 100% synthetic lubrication. The R&D team ran their fuel through several banks of 20 engines running more than five gallons of fuel in each engine in an environment of high humidity and high temperature. After each test, the engines were stripped and inspected for wear and corrosion. Adjustments to the blends were made and tests were carried out until the company found a blend that was up to its standards. The result was a blend of fuel that they say is entirely different than any other brand.

How does it work?

1 Methanol and nitromethane are stored in three gigantic tanks.

2 Another tank stores nitrogen that creates a moisture-barrier blanket on top of the nitromethane and methanol.

3 A senior employee calculates the blend and quantity of fuel needed and then inputs this into a computer that mixes the fuel with precision.

4 Pumps feed the methanol and nitromethane into a blending tank where a loop system blends the oils and nitro. A second mechanical paddle also keeps the fuel blended throughout the tank as a secondary line of defense.

BYRON FUELS Information

Location: Ida Grove, IA

Blends created at plant: 33

Gallons per day: 3,000 (can be increased on demand)

5 The fuel is then pumped through a filter and into a gravity-feeding tank that sits above the six fueling nozzles. The fuel then passes through another filter just before it is released into bottles.

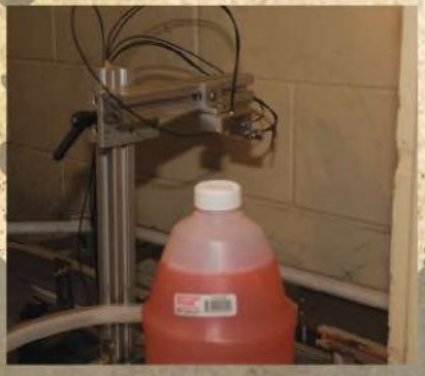
6 Bottles are loaded on a conveyer belt and labeled with a bar code and the type of fuel blend (which includes the nitro content and oil content).

Bert Kammerer and Rotor Rage

During the course of my trip, I was able to sit down with Bert Kammerer and ask him a few questions about Byron and Rotor Rage. Kammerer said that Rotor Rage is like no other fuel he has ever used. When using it, his engines seem to have more power than ever before. The great thing about this fuel, he says, is that he can run 16 gallons through his engine and take it apart to find the engine still looks like new. Additionally, the bearings last longer using Rotor Rage fuel, and he has never seen any carbon build up on the pistons. According to him, Rotor Rage is ahead of the competition, and he is proud to be sponsored by this great company.

7 Bottles move down to the line to a fueling station where six bottles are simultaneously filled with the freshly blended fuel. The fuel has not seen any air until this point and only comes into contact with the air when passing from the nozzle to the bottle.

8 The six bottles move down the line to an automatic-capping machine that precisely spins the cap to the bottle. The caps have a foil seal inside them with a special adhesive that is sealed down the line.



9 The bottles then pass through a cap inspector to make sure the caps are on tight and straight. If a cap is crooked, the bottle is then rejected to a rotating platform that an employee monitors.

10 They then go through a labeling machine that adheres the company's logo, safety warning and information to the bottles.

On this episode of how it's made.

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11 The fuel bottles then pass through another cap inspector before they reach the ultra-sonic induction-foil sealer. This machine vibrates the foil ring and seals it to the bottle for an airtight seal that is also moisture-proof. This seal also prevents any fuel from leaking out during shipping.

12 The bottles are then released on a spinning platform, from which several employees grab and place the bottles in the shipping boxes. The boxes are specifically designed to provide adequate protection during shipping.

Byron quality ensures fresh fuel

From the bottle to the way the nitro is stored, Godbersen has created a product that will arrive in your hands as fresh as the day it was blended. The fuel bottles were designed with a special high-molecular material that requires 20 years at a constant temperature of 100ºF and a constant humidity of 100 percent before allowing 1 percent of moisture to pass through. The methanol that is brought in by Byron is strictly monitored before it is transported to its fuel plant. High standards for purity and moisture are always in effect. Before the shipment is unloaded, a second test is drawn from the tanker to ensure a quality product. Once the tanker has pumped out the nitromethane and methanol, Byron adds a blanket of nitrogen on the top of the liquid to provide a moisture barrier. When the liquid is dispensed, nitrogen is added to keep any air and moisture out of the holding tanks. The fuel is mixed using programmable computer blending and a high-velocity loop-blending pump. The nitromethane and methanol are added first. These materials are then pumped through a high velocity loop while the remaining ingredients of oil and other additives are injected into this loop. The blending tank can hold up to 2,000 gallons per batch.

Conclusion

Ida Grove, Iowa, is like nothing I have ever seen before. Driving the two hours from the Omaha, Nebraska, airport to Iowa was quite the trip. Rolling hills and small towns were along my path, and none of them had that big-city feel to them. I had to keep wondering to myself, Is Ida Grove really going to be a manufacturing city with a fuel manufacturer and huge buildings and tons of traffic? I couldn't have been further off. Ida Grove is a small little town driven by Byron Originals. The company almost single-handedly created a booming economy for the town. A unique feature of the town, also inspired by Byron, is its medieval-castle theme. Castles and medieval statues pepper the town. Additionally, Byron Originals is also the home of the popular Striking Back film. This film used all 1/5th-sized aircraft, boats, and vehicles to reproduce or reenact the battles of WWII. This trip was more than I ever expected, and I want to thank everyone in Ida Grove and Byron Originals. RCH

Byron does much more than fuel

Until I went to Iowa, I thought that Byron just made fuel and a few accessories; what I didn't know is they have created products that are necessary for many niches. Byron Godbersen was also very involved in marine boating. Byron has a sister company by the name of Midwest that creates boating trailers and other items like hoists that lift boats and jet skis off the water. Byron Originals also created molded steps for spas and hot tubs as well as other products. The bottom line is that Byron is much bigger than just its role in our hobby we love.

Miniature golf anyone?

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JS Models TZ-V2 FRENZY

Ah, The days of summer.

WORDS: Chuck Bassani | **PHOTOS:** Chuck Bassani and Jason Boulanger

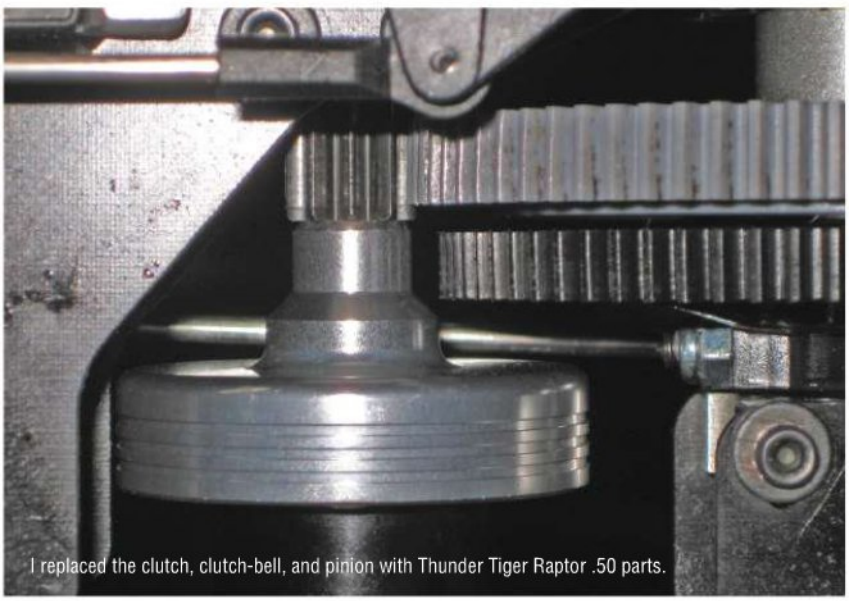
WHILE BROWSING VARIOUS ONLINE FORUMS, I NOTICED THAT THE JS MODELS TZ-V2 3D FRENZY HAS GATHERED QUITE A FOLLOWING. Unquestionably (and as pointed out in my initial review), its appeal is a direct result of its value. But, also as pointed out in my review, its performance is quite impressive. Now we're going to take a look at how it has held up.

I put quite a few flights on this baby this past summer. Although I haven't kept a real count, I'd say there are at least 50 flights behind it. So now, for the sake of reporting on its durability, it's time to break it down and give it a good inspection.

I really enjoy flying this heli.

DRIVE TRAIN

CLUTCH-BELL: Back when I first assembled this heli, I wasn't able to get the stock clutch-bell/pinion assembly to run true. A-Main Hobbies was quick to send replacement parts, but they were only marginally better than the originals. I played around with it and dialed it in the best I could. And even though it isn't as true as I would like it to be, I must say that the heli so far hasn't exhibited any noticeable vibration, nor have I had any issues resulting from engine-speed vibrations (such as fuel foaming, screws loosening up, etc.). But, being a perfectionist, I couldn't leave it as it was.



I replaced the clutch, clutch-bell, and pinion with Thunder Tiger Raptor .50 parts.

Following my breakdown inspection, I found the culprit: the pinion. It literally wobbled on the high-point balancer. I decided to replace the clutch, clutch-bell, and pinion with Thunder Tiger Raptor .50 parts. These were, for the most part, drop-in replacements. The only thing I needed to do was machine about 5 mm off of the top of the Thunder Tiger pinion to get it to fit into the starter-shaft bearing block. With this combination, I ended up with less than a .0005 in run out. Then I was satisfied.

AUTOROTATION DRIVE: I need to report that, just before my breakdown, I began to experience over revving on hard climb-outs. During inspection, I noticed the one-way bearings had begun to wear into the main shaft.

One-way bearings wore into the main shaft and caused the main gear to slip during hard climb-outs.

Had I had waited any longer to service this, I probably wouldn't have been able to get the main shaft out without cutting it, most likely destroying the main shaft's radial bearings in the process. When I called A-Main Hobbies to inform them of this, I was provided an updated auto-hub assembly that uses a single one-way bearing in place of the original's two-bearing design. Apparently there were alignment issues with the two-bearing design that caused the problem I was experiencing. This new hub assembly, coupled with a new harder main shaft, is now standard equipment in all new kits. And just in case you're wondering (as I was), you can't just replace the bearings with the longer, one-piece bearing. The new bearing does not have the same outside diameter, so the new hub is machined accordingly to accommodate the size change.

TAIL DRIVE: My original plastic tail-drive pulley was ever so slightly out of round, which caused somewhat subtle yet annoying tail behavior. Many users have reported this very same problem. During the original build, I had replaced that pulley with the available metal upgrade. This, along with replacing the soft, plastic tail blades with a carbon-fiber set, made for an improvement that was nothing less than outstanding. I've been advised that the new kits now contain an updated plastic pulley.

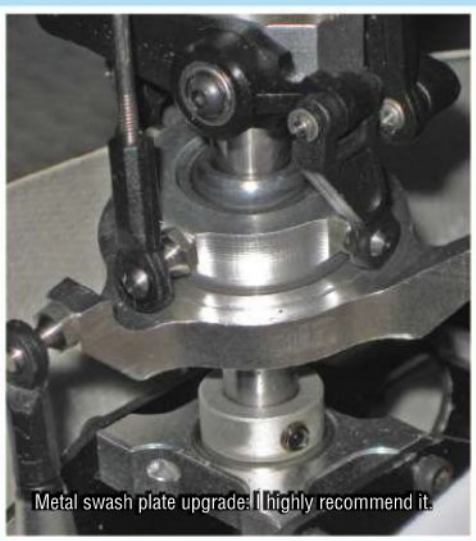

After I upgraded the tail-drive pulley, JS Models fixed the out of round issue.

ROTOR HEAD

All of the rotor head parts above the swash plate have held up quite well. There is no play in any of the washout or mixing arms. The washout base shows no evidence of wear. The main blade grips are still nice and tight, and the tracking remains dead on. Even the dampeners still appear to be in great shape, although while I had it apart, I did replace them.

I would like to mention that I find the lack of a head-button makes stopping the rotor rather difficult. Adding one would require drilling and tapping a hole, as well as finding a button with a boss to accommodate the curved surface at the top of the head. Hopefully, JS Models will make a change here.

SWASH PLATE: The original swash plate was beginning to show signs of play in the bearing; and it really wasn't all that tight to begin with. I can't say I noticed any change in response resulting from this. A-Main Hobbies did provide me with the metal swash plate upgrade, which I must say works a lot better. You can especially see an improvement in the way the machine performs axial rolls. I highly recommend this upgrade.


Metal swash plate upgrade: I highly recommend it.

Continued on page 96.

E-flite BLADE MSR

A Stable Ultra micro

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

E-FLITE AND ITS BLADE SERIES OF HELICOPTERS ARE KNOWN AROUND THE WORLD FOR GREAT-FLYING HELICOPTERS AT LOW COST. After the success of the Blade mCX, E-flite has released its next helicopter in this same size category. The Blade mSR is an ultra micro helicopter with the same advantages of a lightweight counter-rotator, but it has the ability to fly like a standard helicopter. Let's take a close look at the mSR and find out how well this little helicopter can perform in both durability and performance.

» AT A GLANCE

SIZE:	Ultra micro
POWER:	Electric
TYPE:	Pod and Boom
BUILD TYPE:	RTF, BNF (Bind and Fly)
TAIL DRIVE:	Motor

You have never seen such a small heli fly so good.

FEATURES

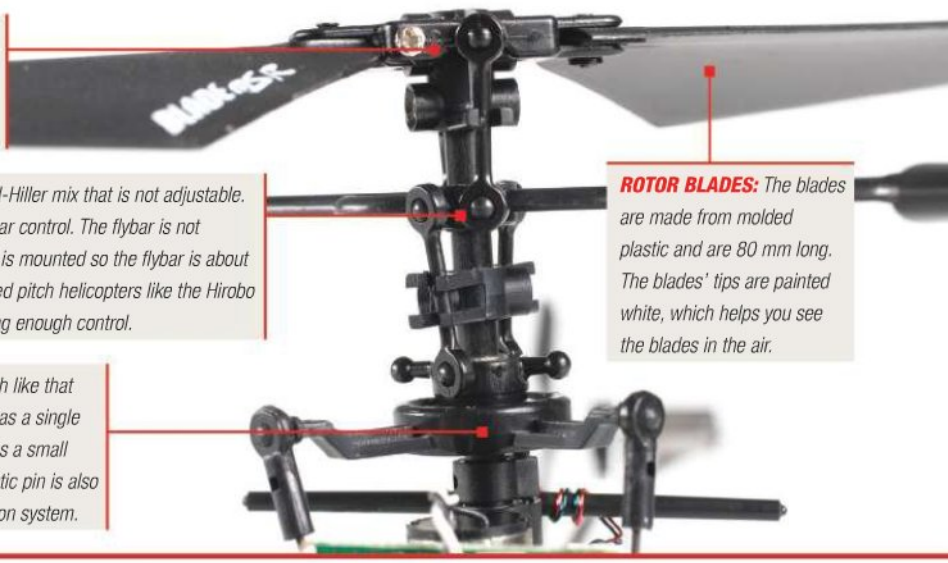
The Blade mSR features an all-in-one package that includes a battery charger that can charge up to four mSR batteries at one time. The batteries can also be used in the mCX. The mSR also features a 5-in-1 unit that handles the cyclic, throttle, rudder, gyro, and dual rates. The RTF and BNF versions come with the charger, and the RTF also includes a DSM2 transmitter.

» ROTOR **HEAD**

HEAD BLOCK: *The head block is a single, molded plastic piece that is attached to the main shaft using a small screw. Two small O-rings are used for dampening, along with a couple of brass washers.*

CONTROL: *The Blade mSR is controlled using a Bell-Hiller mix that is not adjustable. What makes this control system stand out is the flybar control. The flybar is not positioned at 90º to the main rotor blades; instead it is mounted so the flybar is about 15º from the blades. This has been seen in other fixed pitch helicopters like the Hirobo Quark. This offers a stable platform while still allowing enough control.*

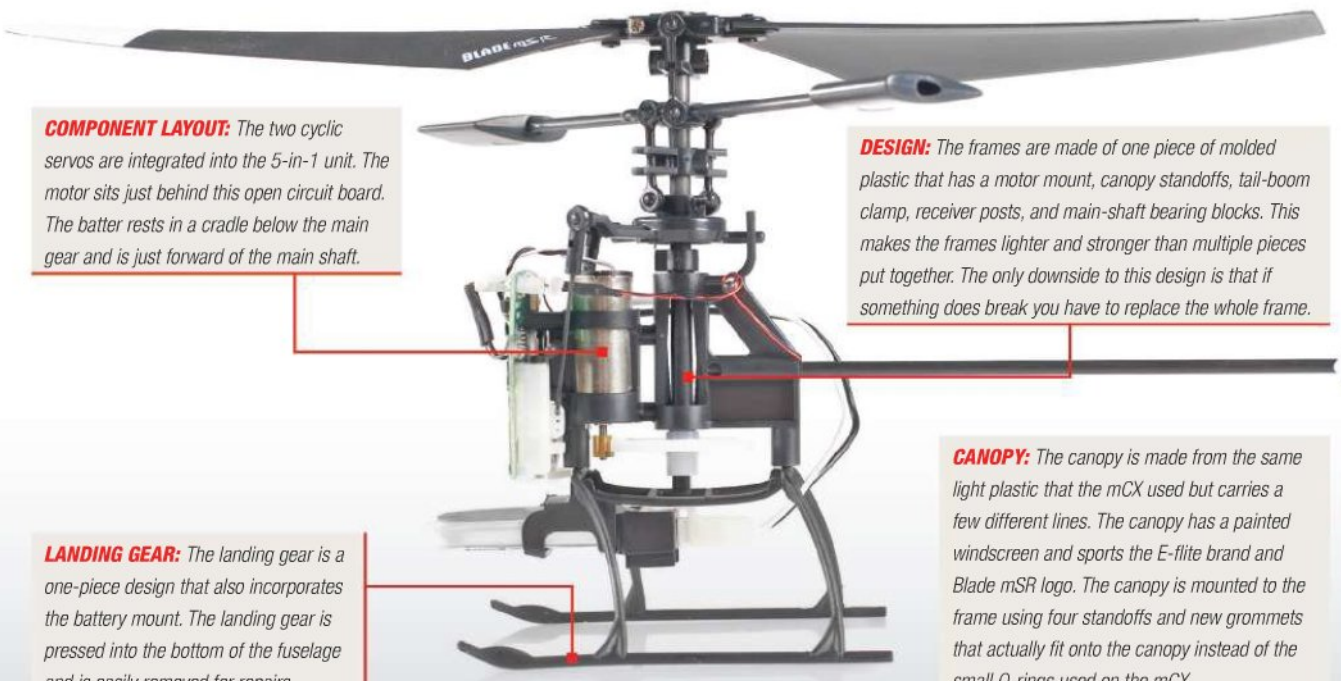
SWASHPLATE: *The swashplate on the mSR is much like that of the mCX. It is completely made from plastic and has a single ball bearing on the lower half. The upper section uses a small aluminum ball to allow the swash to freely tilt. A plastic pin is also molded into the swash and is used for the anti rotation system.*



ROTOR BLADES: *The blades are made from molded plastic and are 80 mm long. The blades' tips are painted white, which helps you see the blades in the air.*

» MAIN **FRAME**

COMPONENT LAYOUT: *The two cyclic servos are integrated into the 5-in-1 unit. The motor sits just behind this open circuit board. The batter rests in a cradle below the main gear and is just forward of the main shaft.*



DESIGN: *The frames are made of one piece of molded plastic that has a motor mount, canopy standoffs, tail-boom clamp, receiver posts, and main-shaft bearing blocks. This makes the frames lighter and stronger than multiple pieces put together. The only downside to this design is that if something does break you have to replace the whole frame.*

CANOPY: *The canopy is made from the same light plastic that the mCX used but carries a few different lines. The canopy has a painted windscreen and sports the E-flite brand and Blade mSR logo. The canopy is mounted to the frame using four standoffs and new grommets that actually fit onto the canopy instead of the small O-rings used on the mCX.*

LANDING GEAR: *The landing gear is a one-piece design that also incorporates the battery mount. The landing gear is pressed into the bottom of the fuselage and is easily removed for repairs.*

Plastic fantastic!

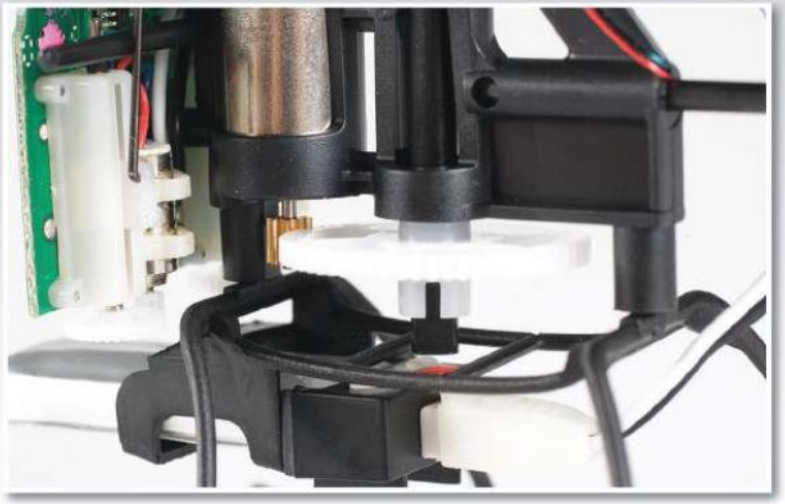
» DRIVE TRAIN

MOTOR MOUNT: The motor mount is molded into the frame and holds the motor using a drop of silicone or glue.

PINION: The brass pinion is pressed on the motor and cannot be adjusted for gear mesh.

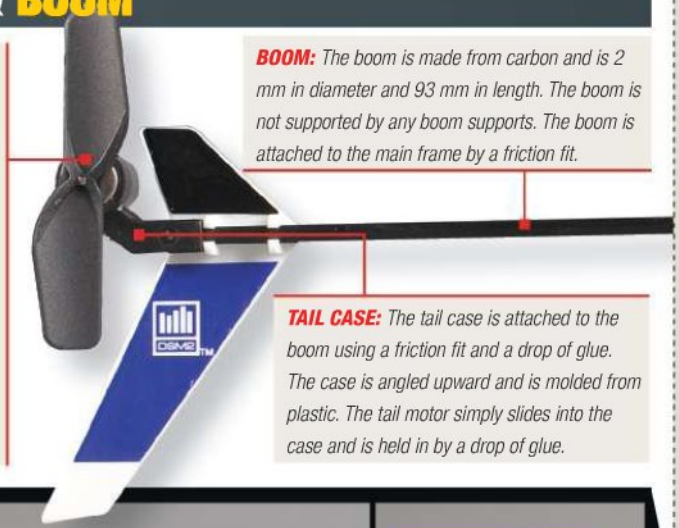
MAIN GEAR: The main gear sits below the frames and is keyed to fit the main shaft.

TAIL DRIVE: A small tail motor that spins the rotor directly drives the tail. The wires run through the tail boom.



» TAIL & BOOM

TAIL ROTOR SYSTEM: *The motor-driven tail is a direct-drive rotor. The wires run through the backside of the tail case and through the inside of the boom. The wires plug into the 5-in-1 unit using a small electrical connector.*



BOOM: *The boom is made from carbon and is 2 mm in diameter and 93 mm in length. The boom is not supported by any boom supports. The boom is attached to the main frame by a friction fit.*

TAIL CASE: *The tail case is attached to the boom using a friction fit and a drop of glue. The case is angled upward and is molded from plastic. The tail motor simply slides into the case and is held in by a drop of glue.*

E-Flite
BLADE MSR
MODEL SPECIFICATIONS

CLASS:	Ultra micro Electric
BUILD:	RTF/BNF
BLADE SIZE:	80 mm
LEVEL:	Novice, Intermediate

FRAME

MATERIAL:	Plastic
TYPE:	One Piece
SERVO TO SWASH LINKAGE:	Direct
SERVO SIZE:	Built into 5-in-1

ROTOR HEAD

GRIPS:	Plastic
HEAD BLOCK:	Plastic
LINKS:	Ball and Z bends
SWASH:	Plastic
CONTROL:	Fixed pitch

TAIL

DRIVE SYSTEM:	Direct Drive Motor
AUTO DRIVEN:	N/A
TAIL PITCH SLIDER:	N/A
TAIL BLADE GRIPS:	N/A
TAIL CASE:	Plastic
BOOM STRUT MATERIAL:	N/A

GEARING

MAIN ROTOR TO PINION RATIO:	1 : 8.125
MAIN ROTOR TO TAIL RATIO:	1 : 1

WEIGHT

WITHOUT BATTERY:	.85 oz. (24g)
FULLY LOADED: (Includes battery)	.95 oz. (27g)

DIMENSIONS

HEIGHT (A):	4.7 in (120mm)
CANOPY WIDTH (B):	1.45 in (37mm)
LANDING GEAR (C):	1.7 in (45mm)
PADDLE TO PADDLE DIA. (D):	3.9 in (100mm)
MAIN ROTOR (E):	7 in (180mm)
TAIL ROTOR (F):	1.43 in (36.5mm)
LENGTH (G):	7.9 in (200mm)

E-flite sells a red canopy and fin for the mSR.

TESTING

Going into testing, I was expecting this helicopter to be twitchy and very unstable. I didn't even think about taking it into the wind until I actually experienced the way the mSR flew. I never thought such a small, fixed-pitch helicopter could ever fly this well, and the mSR left this advanced flyer with a smile every time I flew this little wonder.

HOVERING • The mSR was designed to be a stable helicopter that can hover hands-off. In no-wind conditions indoors, I was able to set the transmitter down on a table and just let it fly on its own. The mSR handles much like a mCX in this category as long as you are easy on the sticks. The tail rotor did not move or drift, which allows even the first-time flyer an easy connection to the helicopter.
Rating: 5

FORWARD FLIGHT • Applying forward cyclic from a hover, the mSR gradually accelerated into forward flight. Don't let the little machine fool you; this small helicopter is fast for its size. The tracking is pretty good for such a small helicopter, but it does tend to drift to one side a bit, so some cyclic input is required to keep it in a straight line. Right-hand turns are very easy to accomplish, and the tail follows through nicely. Left-hand turns are a bit on the tricky side, as the tail does not seem to follow through as well. I used negative expo on the left-tail input to help smooth the tail out, and it seemed to improve quite a bit.
Rating: 4

CYCLIC PITCH RESPONSE • The mSR has two settings that you can adjust at the swashplate to increase or decrease the cyclic response. On the docile settings, the mSR's cyclic response was moderate, giving it smooth controls throughout the cyclic range. When I switched to the advanced settings, the cyclic responded much faster and gave an advanced flyer the ability to change directions much more quickly. Overall, the cyclic felt mild but had enough authority to perform as you wished.
Rating: 4

COLLECTIVE PITCH RESPONSE • Rating a fixed-pitch helicopter for collective-pitch response is more like rating motor-acceleration response. The little, brushed, coreless motor has plenty of power for this small helicopter. The throttle response is very smooth and allows the helicopter to descend without shutting the motor completely off.
Rating: 4

TAIL ROTOR RESPONSE • After experiencing countless motor-driven tailed helicopters, I was a bit skeptical on how well the mSR tail would be. After flying the helicopter around I was a bit shocked by how well the tail handled. I was able to perform tail-down funnels without the tail ever blowing out. Only during high-speed, backwards flight did the tail ever give me fuss. The gyro on the mSR held very well and only needed a few clicks of trim toward the end of the flight.
Rating: 5

POSTFLIGHT INSPECTION • During hours of flight time on the mSR and a few encounters with random trees and boxes, the mSR performed amazingly. Not one part was worn out or broken. The lightweight design and crash-resistant plastic held up even when I hit an object at full speed. (The kit also includes some extra parts in case it ever does break.)
Rating: 5

CONCLUSION

Overall, the mSR is a great little helicopter that is fun to fly no matter what skill level you are at. This little helicopter can even be used to teach your kids or friends to fly a helicopter without the fear of the helicopter breaking on first impact. To test this theory, I had some of my coworkers give the mSR a try, and within minutes after their first few crashes they had the mSR up into a hover. If you are looking for a first-time helicopter or just something to have fun with, the mSR is a great choice. Surprisingly I was even able to take the mSR out into the wind and play with it outside. Mild wind conditions did not seem to affect the helicopter much, and it was actually quite fun to open it up and cruise through the open sky at full speed. RCH

The mSR will fit in your glove box.

FACTORY TEAM PILOTS

CRAIG OKU
Mountain View, California

DARRELL BELL
Detroit, Michigan

ANDY PANONCILLO
Muncie, Indiana

FRANK COLUMBIA
Port Jefferson Station, New York

ART HUGHES
Dryden, New York

ALVIN CHAI
Burnaby, British Columbia

JEFF PFEIFER
Bolivar, Missouri

CRAIG MARTIN
Deland, Florida

GARETT OKU
Mountain View, California

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TESTING SPECS

E-flite **BLADE MSR**

Part #: EFLH3080 (BNF), EFLH3000 (RTF)
Distributor: Horizon Hobby
Web: www.horizonhobby.com

Street Price: $179 (RTF), $149 (BNF)
Price as Tested: $179 (RTF), $299 (BNF)
Build/Setup Time: 15 minutes

PERFORMANCE

TEMP OF MOTOR:	80° F
TEMP OF BATTERY:	85° F
FLIGHT TIME:	6 minutes

TEST CONDITIONS

WEATHER:	Overcast
TEMP / HUMIDITY:	61° F/64%
BAROMETRIC PRESSURE:	29.88 in
WIND SPEED:	5 mph
VISIBILITY:	5 miles
ALTITUDE:	675 feet

REQUIRED TO FLY

The RTF does not require any additional items. The BNF only requires a DSM2-compatible radio such as the Spektrum or JR brand of 2.4-ghz transmitters.

WHO'S IT FOR?

The mSR is a good little helicopter for anyone looking for an ultra micro electric. A first-timer will also find that this helicopter is forgiving and easy to fly, yet flies like a conventional helicopter.

"THIS LITTLE HELICOPTER CAN EVEN BE USED TO TEACH YOUR KIDS OR FRIENDS TO FLY A HELICOPTER WITHOUT THE FEAR OF THE HELICOPTER BREAKING ON FIRST IMPACT."

SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

THE GOOD

- Resilient to crashes
- Stable
- 2.4 ghz

THE BAD

- Tail does not have enough authority to the left

Even our Art Director Dave was able to hover the mSR around.

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LA 3D

2ND ANNUAL FUN FLY
OCTOBER 8TH - 11TH 2009

WORDS & PHOTOS: Ryan Kephart

THE LOS ANGELES 3D HELICOPTER FUN FLY WAS HELD AT THE WIDE-OPEN APOLLO XI FIELD NEAR HOLLYWOOD, CALIFORNIA. The event was hosted by the Valley Flyers, who have held many successful helicopter events over the years. This event took over the LA Classic a few years ago and moved the date to late in the year, which proved to be a really smart move. The weather was cool and the wind was calm. This combination brought pilots from all over California and nearby states to enjoy this three-day event.

That's one big RC!

EXTRA! EXTRA! READ ALL ABOUT IT!

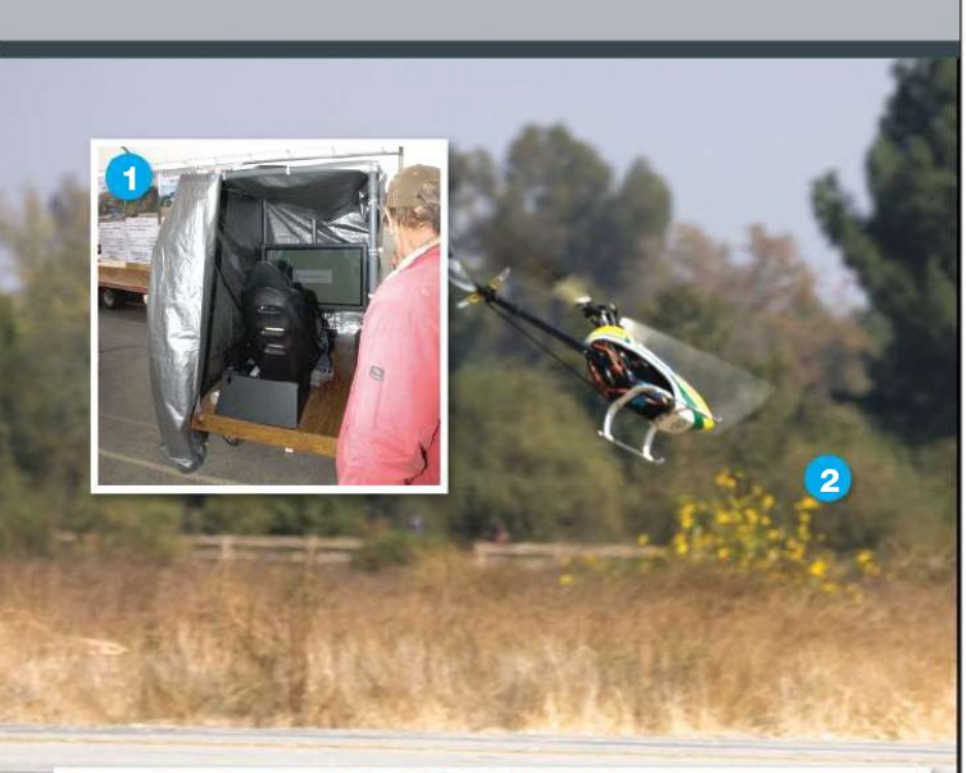
Last year the LA sheriff's department's Sikorsky 3H-3D Sea King flew overhead while the crowd watched this massive helicopter flying. This year the department topped that feat by landing this massive helicopter right on the flight line and taxiing it to the left side of the field. The heli shut down and the spectators could go right up to it and take a look around. The pilots and crew chief gave a speech about the Sea King and then answered questions about it and the duties it performs.

1 **Rotor F/X had a booth set up near the U Control flying site** offering pilots and spectators a chance to jump into a simulator and fly a helicopter from the first-person viewpoint. The simulator was set up just like a real helicopter, with a center joystick and a collective stick with a twist throttle. Also on display was a fuselage of the popular heli cycle, which was featured in our Fullsize column a few months ago.

2 **With the help of the directors and the friendly folk of the Valley Flyers,** this event held a couple of extra activities so the pilots could take a break from the everyday 3D they always perform. A top speed contest was held during the event with the winner, Kyle Dahl, flying a Logo 600 at 83 mph. A pick-up and rescue competition also took place, in which a pilot had to pick up a bucket with his helicopter's skids and place it onto a makeshift aircraft carrier made of wood and cardboard.

3 **Still not tired after a day of flying? Well, no worries;** pilots and spectators alike stayed until the break of dawn, flying during the night with their helicopters lit up more brightly than the lights in Vegas. That's right; the guys at LA3D also held a night fly both Friday and Saturday nights.

4 **Vendors at the event donated products to a raffle** that was held on Saturday. Those products included a Raptor 50 Titan, a KME 60 engine, a Trex 600, a Blade 400, Byron fuel, and many gift certificates. With this event's population growing, the raffle prizes are getting bigger and better every year; so next year stop on by and fly for a bit… You might just be a winner!
(Pic 9413)



BIG NAMES = BIG MOVES

Because it was held same week as another event in Switzerland, hosted by Lucas Riva, not every pro pilot could make it to LA3D. Switzerland didn't take all the pros, though; several very talented pilots put on a show for everyone to see. This year the featured pilots showed off while the Sea King was parked alongside the runway. What better backdrop for the spectators than a small nitro-powered heli tearing up the sky in front of a massive, full-sized helicopter?

THOMAS MOORE is one of the Avant Team's newest pilots. This kid can really rock the show and is a great asset to Team Avant.

REGGIE ROGERS, JR. took a Trex 700 to the air and performed some nice, big air maneuvers mixed with a little smack down. This kid knows how to fly and is not afraid to prove it.

JEFF FASSBINDER and Rob from Gyro Hobbies put on a scale demo using Thunder Tiger's new Huey and Rob's old faithful Hirobo Cobra.

JASON BELL flying the new E Aurora Ultimate 90. This helicopter was tearing up the sky with lots of power. The flight was a bit on the shaky side because of a bent main shaft caused by a crash earlier in the week.

BEN STORICK showed off how well the TZ 3D Frenzy flies in a capable pilot's hands. This helicopter was running a new YS 56 engine and some super-fast servos. Ben also flew a demo flight with a TREX 600 with the new KME 60-sized engine, which uses a standard 50-sized case with 60-sized internals.

RAY NEMOVI flew his TREX 700 with a conversion kit that he helped create to convert the 700 to electric power. His 700 was running a Neu motor and looked just as powerful as, if not more powerful than, a standard 90-sized nitro.

KYLE DAHL flew his flybarless Mikado Logo 500 with style and grace. Flybarless systems seem to be the norm nowadays, as over a dozen such helicopters were scattered across the field.

TIM JONES flew the famous Beast powered by a Castle Creations motor that can produce around 10 horsepower. Unfortunately, a minute into the flight the Beast experienced some technical difficulties.

HOPE TO SEE YOU NEXT YEAR!

As the event wound down I got some flights in with my TREX 700 and a new canopy that my buddy, Chad Sackman, had painted. The event was a great success and if you missed it, I must say you missed one of the best Southern California fun flies of the year. Even if you are a scale pilot, don't let the name fool you; scale pilots brought out their most prized possessions, including a Huey that was decked out with machine guns and a crew of four. I hope to see a lot of you next year and surpass the record number of pilots who attended this year. RCH

Compass ATOM 500

UP AND ATOM!

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

COMPASS HAS RISEN TO BECOME A WELL-KNOWN PLAYER WITH THE SUCCESS OF ITS KNIGHT LINE OF HELICOPTERS. With the popularity of the Knight 50 3D, Compass is now beginning to expand its products to a full line of helicopters. What better way to expand than by tapping into the rapidly growing 500-sized market? Compass has integrated many elements from its bigger brother into its newest creation, the Atom 500. It's no secret that the 500-size market has exploded in recent months, so now it is harder than ever to be successful. However, if Compass plays its cards right, it might have a chance to duplicate the success of the Knight 3D.

Those hills are dry

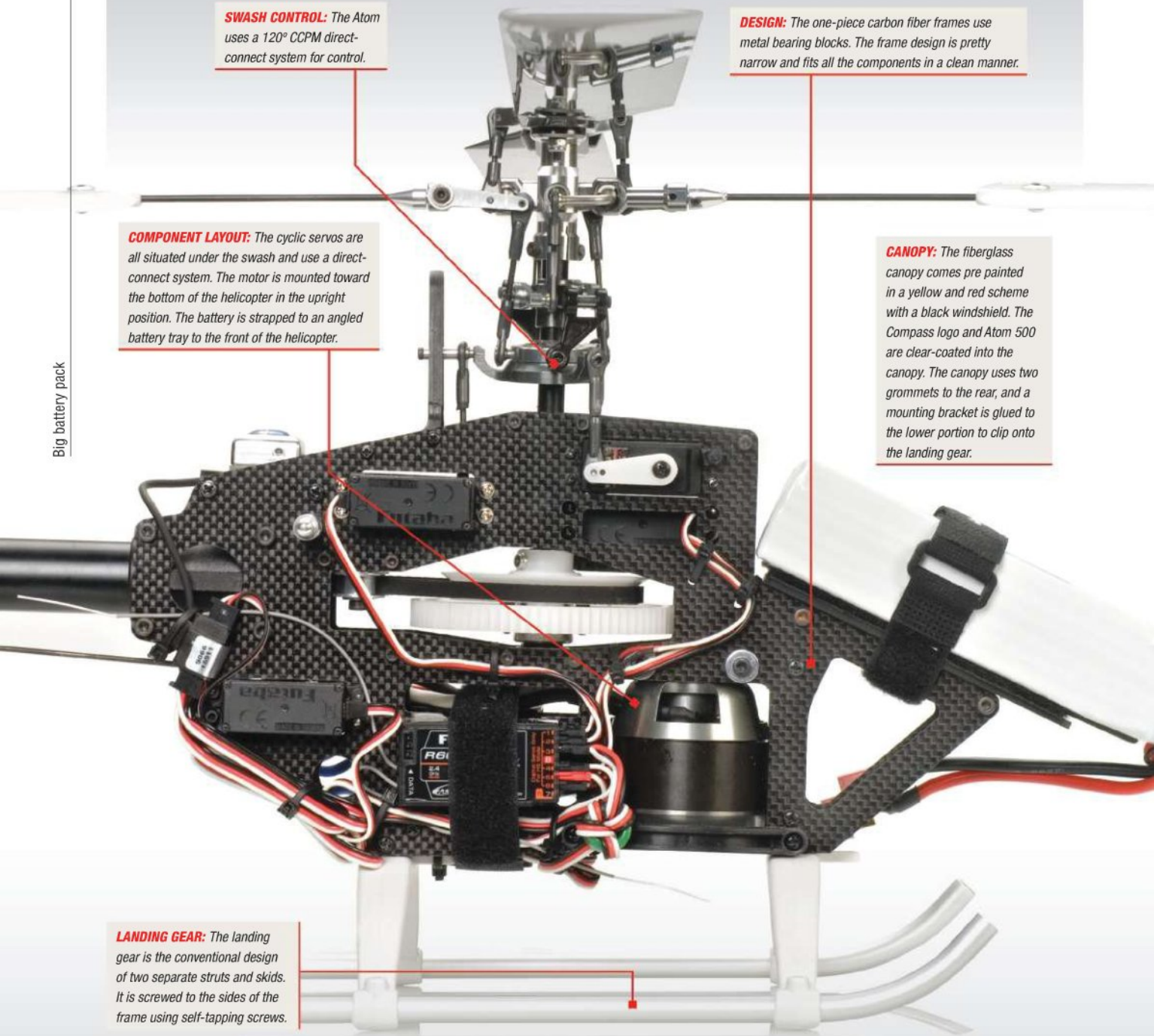
» AT A GLANCE

SIZE:	500
POWER:	Electric
TYPE:	Pod and Boom
BUILD TYPE:	Almost Ready To Fly[ARF]
TAIL DRIVE:	Belt

FEATURES

The Atom 500 comes with an all-aluminum head and carbon-fiber frames. It is a very sleek design with a wide-diameter tail boom. Since the tail boom has such a large diameter, it eliminates the need for boom supports. The helicopter's major components come pre assembled.

» MAIN **FRAME**



SWASH CONTROL: *The Atom uses a 120° CCPM direct-connect system for control.*

DESIGN: *The one-piece carbon fiber frames use metal bearing blocks. The frame design is pretty narrow and fits all the components in a clean manner.*

COMPONENT LAYOUT: *The cyclic servos are all situated under the swash and use a direct-connect system. The motor is mounted toward the bottom of the helicopter in the upright position. The battery is strapped to an angled battery tray to the front of the helicopter.*

CANOPY: *The fiberglass canopy comes pre painted in a yellow and red scheme with a black windshield. The Compass logo and Atom 500 are clear-coated into the canopy. The canopy uses two grommets to the rear, and a mounting bracket is glued to the lower portion to clip onto the landing gear.*

Big battery pack

LANDING GEAR: *The landing gear is the conventional design of two separate struts and skids. It is screwed to the sides of the frame using self-tapping screws.*

» DRIVE TRAIN

MOTOR MOUNT: The motor mounts on an aluminum mount and can only do so in the available designated holes. However, you can adjust the mesh with the elongated holes on the frame to which the mount is bolted.

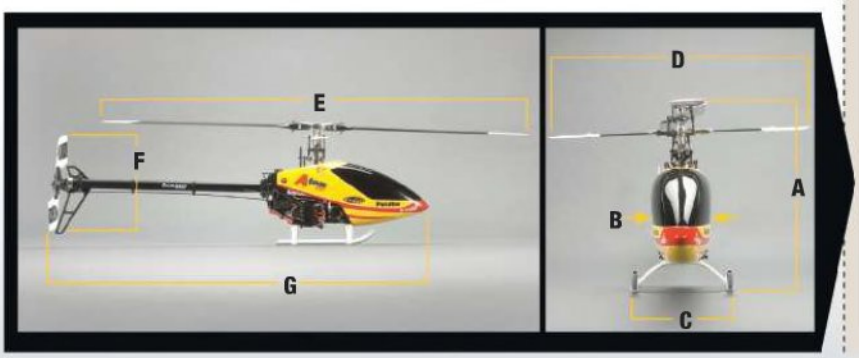
PINION: The brass pinion is fitted on the motor-output shaft and tightened down using a setscrew.

MAIN GEAR: The plastic main gear has the one-way bolted into it and features fairly large lightening holes.

AUTOROTATION DRIVE: The autorotation drive is the classic one-way bearing and sleeve design where the one-way is pushed into the one-way sleeve. The tail is driven during autos.

TAIL DRIVE: There is a tail pulley gear (located above the main gear) that meshes with the belt when tension is applied. There are pulleys toward the back of the helicopter that helps keep tension in the belt.

"THIS HELICOPTER LEAVES A LOT OF ROOM FOR POSSIBLE FUTURE UPGRADES, WHICH MAKES IT ATTRACTIVE FOR PILOTS WHO LIKE TO EXPERIMENT WITH DIFFERENT SYSTEMS."



COMPASS ATOM 500 MODEL SPECIFICATIONS

CLASS:	500 Electric
BUILD:	ARF
BLADE SIZE:	350mm
LEVEL:	Novice - Advanced

FRAME

MATERIAL:	Carbon fiber
TYPE:	One piece
SERVO TO SWASH LINKAGE:	Direct connect
SERVO SIZE:	Mini

ROTOR HEAD

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

TAIL

DRIVE SYSTEM:	Belt drive
AUTO DRIVEN:	Yes
TAIL PITCH SLIDER:	Dual point
TAIL BLADE GRIPS:	Plastic
TAIL CASE:	Metal
BOOM STRUT MATERIAL:	None

GEARING

MAIN ROTOR TO PINION RATIO:	1:8.9
MAIN ROTOR TO TAIL RATIO:	1: 4.7

WEIGHT

EMPTY:	3lb., 1oz. (1,406g)
FULLY LOADED: (includes battery)	4lb., 0oz. (1,814g)

DIMENSIONS

HEIGHT (A):	11 in (279.4mm)
CANOPY WIDTH (B):	3.25 in (82.55mm)
LANDING GEAR (C):	5.75 in (146mm)
PADDLE TO PADDLE DIA. (D):	9.5 in (241.3mm)
MAIN ROTOR (E):	37.75 in (958mm)
TAIL ROTOR (F):	8.25 in (209.5mm)
LENGTH (G):	29 in (736.6mm)

Canopy comes pre-painted

FEATURES CONTINUED

» TAIL & BOOM

TAIL CASE: *The aluminum tail case slides into the boom and uses a system of screws to pin it there. There is only one pulley in the tail case that keeps the tension on the belt. The tail case is one piece.*

BOOM: *The aluminum boom is 508 mm in length. The diameter is 22mm.*

TAIL BLADE GRIPS: *The plastic tail blade grips contain two radial bearings on each side and come in two halves. The grips bolt together and can be taken apart.*

PITCH ACTUATOR SYSTEM: *The tail pitch system is pretty standard and utilizes a plastic arm that attaches to the push rod. It is molded with the tail pitchfork to allow movement across the tail-output shaft.*

» ROTOR HEAD

HEAD BLOCK: *The aluminum head block uses a Delrin damper on each side. There is also a rubber O-ring that is fitted in the center of the block for extra stiffness. There is a Jesus bolt that keeps the block to the main shaft.*

BELL-HILLER ARMS: *The Bell-Hiller arms are unique because the screw mounts on the end of the arm rather than the center. It is mounted on the flybar seesaw and is dual-bearing supported. There is also a slight delta angle when centered (rather than a perfect straight line).*

PHASING: *The phasing is unique in that there is only one phasing pin, which is actually attached to the washout rather than the head block. Despite only having one phasing pin, there is very minimal slop in the head.*

WASHOUT ARMS: *The aluminum washout bearings use dual bearings and have no other output options. The link utilizes a screw for attachment to the washout.*

The Torsion's are signed!

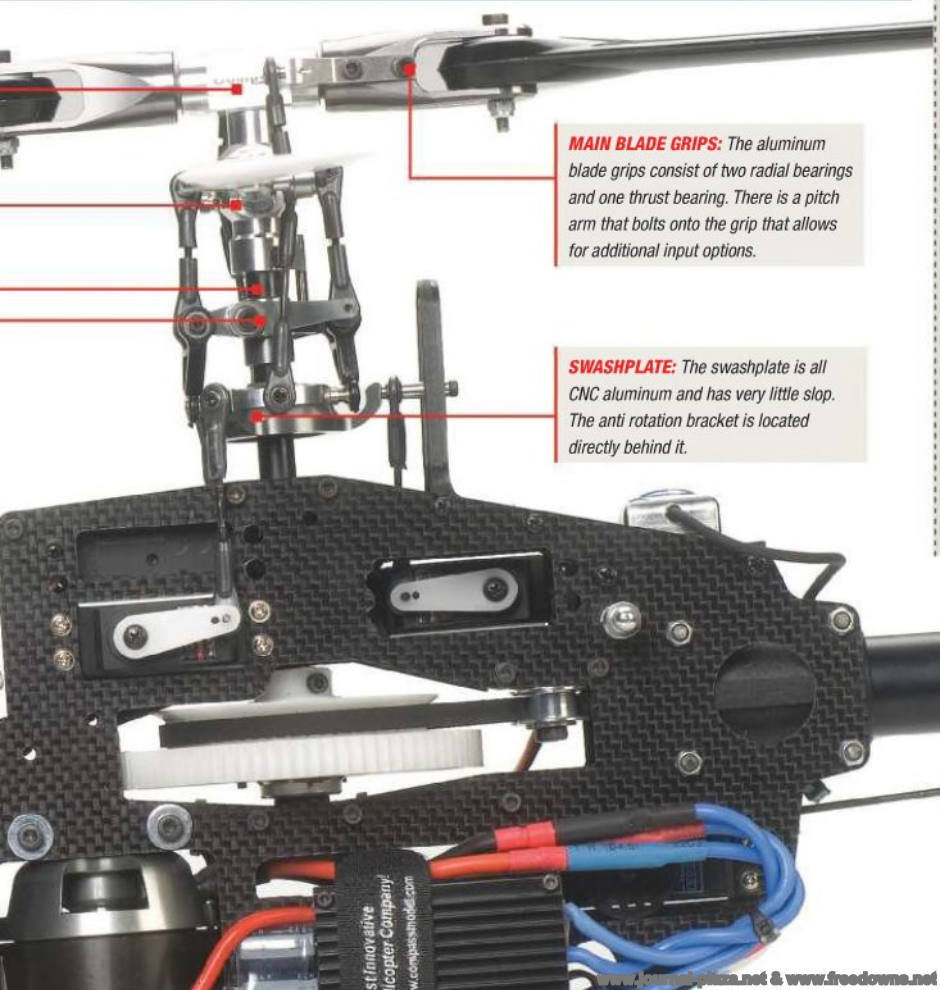
» INSTRUCTIONS & BUILDING TIPS

WHEN YOU OPEN THE BOX

The helicopter comes in a bright yellow box that is covered with photos of the Atom. Everything is packaged nicely, and all the major components come pre assembled. The head came wrapped in bubble wrap, and so did many other important components. The canopy was also wrapped in foam protection.

MANUAL AND BUILD

Every major component comes already assembled in the box. I advise that you check every bolt to make sure that it has thread lock applied to it. There is no thread lock applied to the spindle bolt, and the kit includes a disclaimer asking you to apply some to it. The build went smoothly, and there weren't any hiccups along the way. The manual does call for the links to be cut down, however, I found that the size the links came in out of the box were well-suited and measured fine. The manual corresponds with the build as an ARF, so it is lacking in the finer details but overall is suitable.



MAIN BLADE GRIPS: *The aluminum blade grips consist of two radial bearings and one thrust bearing. There is a pitch arm that bolts onto the grip that allows for additional input options.*

SWASHPLATE: *The swashplate is all CNC aluminum and has very little slop. The anti rotation bracket is located directly behind it.*

COMPASS ATOM 500 RTF & TEST GEAR

» SUPPLIED GEAR

- **MOTOR:** Compass Model, BL Atom Motor, C5016

- **SPEED CONTROL:** Compass, 60A ESC

» TEST GEAR

- **RADIO:** Futaba, T8FG, FUTK8001, $479.99

- **RECEIVER:** Futaba, R6008HS, FUTL7639, .48 oz (13.5g), $139.98

- **CYCLIC SERVOS (3):** Futaba, S9650,.92 oz (26g), $59.99 ea.

- **TAIL SERVO:** Futaba, S9257, .92 oz (26g), $59.99

- **BATTERY:** Common Sense RC, 6S 35C 2600 mAh Li-Po, 6S2600-35, 14.8 oz (419g), $199.95

- **GYRO:** Futaba, GY520, FUTM0810, .243 oz (6.9g), $179.99

- **CHARGER:** Thunder Power, 1010C, $199.95

- **BLADES:** Torsion, 430mm, TB0430, 2.36 oz (67g), $61.95

TESTING

Having flown a number of different 500s in the past, I enjoy making a comparison among the different makes. At first glance, the Atom seems to be a rigid design and should be able to perform relatively well. I was satisfied with the quality and the simple build, so I went into the testing portion with relatively high expectations. We used all high-quality Futaba equipment and the new Futaba TF8G and Torsion main and tail blades. The price tag is a little on the high side, but it does come with a motor and speed controller, so it is comparable to other helicopters of the same class.

HOVERING • This heli had some trim issues that I was never really able to eliminate. I would trim it out, but after a few minutes of flying, the helicopter would go out of trim again. It wasn't a drastic change, but it was noticeable. Odd trim tendencies aside, the helicopter otherwise hovered well. It felt like a typical helicopter in its class and almost had a heavier feel to it. This allowed it to be a little more stable and predictable.
Rating: 4

FORWARD FLIGHT • The Atom can really pick up some speed and fly. It gets a little twitchy on the faster flights, but at lower speeds it's quite smooth. A helicopter of this size feels a little more stable than a 450 but not quite at the level of a 50-sized helicopter. Since I was running a fast cyclic set-up, I had to be on the sticks more than normal to keep it steady in forward flight. This is not so much the helicopter's fault but rather due to the type of set-up I like to run on my helicopters. Even with the fast set-up, the Atom didn't disappoint in forward flight.
Rating: 4

CYCLIC PITCH RESPONSE • Combined with the Torsion blades, the Atom had very respectable cyclic speeds. I was able to flip and roll on a moment's notice with barely any noticeable strain on the helicopter. Whenever I needed to make a quick input, the Atom was always there to respond. It's not the fastest 500 I've flown in terms of cyclic, but it still maintains a very respectable speed nonetheless.
Rating: 4.5

COLLECTIVE PITCH RESPONSE • The stock motor in the Atom puts out good, smooth power but isn't ballistic like some other set-ups in this class. Out of the box, though, the power set-up does an excellent job with the Atom's collective authority. Collective intensive moves were performed without much strain on the system, which was able to pull through the hardest of maneuvers. We flew the Atom using various battery set-ups, each of which gave us a different feel in the air. However, the helicopter naturally came alive with some 35C packs we had lying around. Overall, the collective authority was very respectable for a stock set-up.
Rating: 4.5

TAIL ROTOR RESPONSE • The tail wasn't perfect but was able to perform well under hard flying. I had some wagging problems and had to play with the gyro gains for a little bit until I got it to a manageable level. When there was a heavy load applied to the tail, it sometimes blew out, which gave me a scare. With some more adjustments and fine-tuning, I was able to get the tail flying pretty well but not quite where I wanted it. Overall, however, the tail held well through backwards flight and other heavy loads. There was a good amount of authority during pirouetting moves, which makes it a solid performer. The GY520 was rock solid as usual and really kept the tail in check after we played with the settings for a bit.
Rating: 4

AUTOROTATION CAPABILITIES • The Atom auto rotates well enough, but it's but not great by any means. Auto rotating a 500-sized helicopter has always been tricky, and this one is no exception. You pretty much have barely enough head speed to complete a flair at the bottom end of an auto for a smooth landing. It keeps you on your toes.
Rating: 3

POSTFLIGHT INSPECTION • The helicopter is still together in one piece, which is always a great sign. I am very pleased with how this helicopter took the abuse I threw at it. From the beginning I really went off on it, and it didn't skip a beat. As with any helicopter, be sure to stay on top of maintenance to keep your heli flying safely in the sky.
Rating: 5

The stock motor holds it own

TESTING SPECS

COMPASS ATOM 500

Part #: Z-500E
Distributor: Common Sense RC
Web: www.commonsenserc.com

Street Price: $499.95
Price as Tested: $2,002
Build/Setup Time: 8 hours

PERFORMANCE

MODE FLOWN:	Normal, idle up 1, idle up 2
RPM OF EACH MODE:	Normal: 2650 Idle Up 1: 2900 Idle Up 2: 3000
MOTOR TEMP (after flight):	90° F
FLIGHT TIME:	4 minutes
VERTICAL G FORCES*:	not available
MAX FORWARD SPEED:**	not available

TEST CONDITIONS

WEATHER:	Sunny
TEMP / HUMIDITY:	90° F/ 15%
BAROMETRIC PRESSURE:	29.73 in.
WIND SPEED:	5 mph
VISIBILITY:	10 miles
ALTITUDE:	700 feet

PITCH CURVES

NORMAL:	-9, 0, 9
IDLE-UP 1:	-11, 0, 11
IDLE-UP 2:	-11, 0, 11

** Average taken from 3 test. Tested by going from a hover to 10° pitch climb out with idle up headspeed, recorded with using an Eagle Tree Flight Data Recorder with G-force expander*

*** Average taken from 2 upwind and 2 downwind passes. Recorded using Eagle Tree Flight Data Recorder with GPS expander.*

REQUIRED TO FLY

Radio transmitter, receiver, all required servos, gyro, battery, battery charger

WHO'S IT FOR?

Anyone looking for a solid 500-sized helicopter.

SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

THE GOOD

- Flies well
- Durable
- Good stock power system

THE BAD

- Manual is lacking
- Trim issues

No flippin boom supports!!

CONCLUSION

The Atom 500 is a good flying helicopter and is another solid, simple design thrown into this growing market. It is priced reasonably well when compared to its competitors, so it does have some potential to be a hit. The stock power system is good but not great; it definitely has enough power to get the job done but may leave some wanting more. This helicopter leaves a lot of room for possible future upgrades, which makes it attractive for pilots who like to experiment with different systems. Overall, the Atom is a durable, solid flyer, and anyone who decides to invest in one will probably be satisfied. RCH

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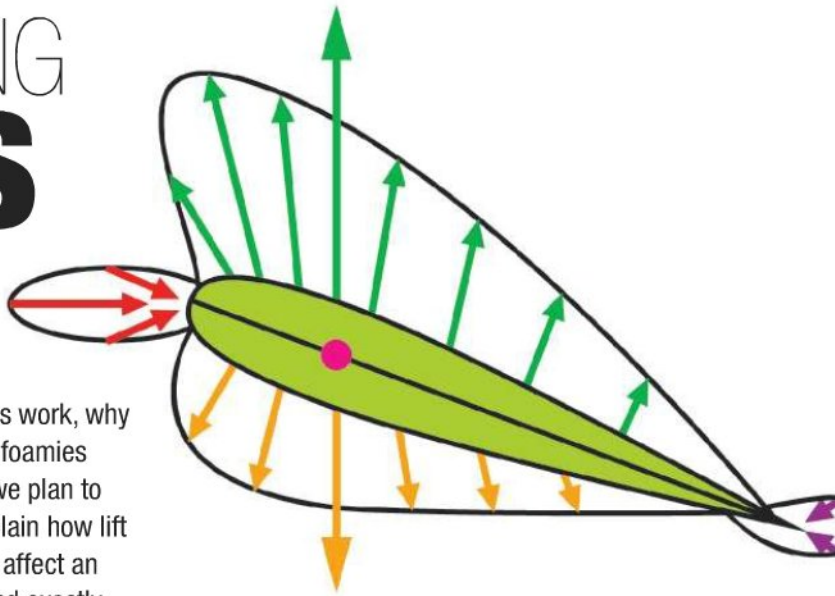
UNDERSTANDING AIRFOILS

Explaining their shape and why symmetrical airfoils generate lift

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



Many pilots often have wondered how airfoils work, why symmetrical airfoils generate lift, and why foamies with no airfoil can fly at all. In this Heli IQ we plan to answer these questions and more. First we will explain how lift works. Then we will explain how the forces of drag affect an airfoil. Finally we will put it all together to understand exactly why airfoils are shaped the way they are.

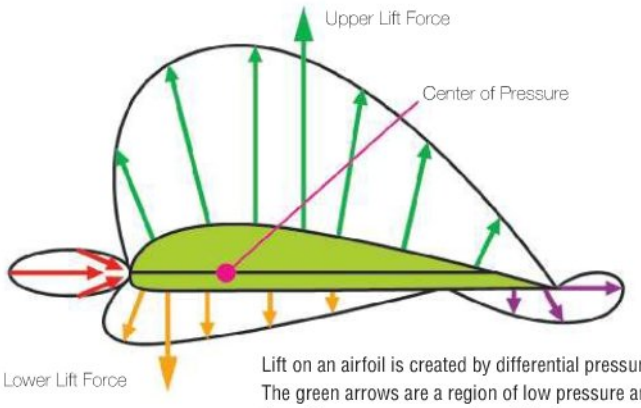
I don't know if the graphs make it easier or not.

! A NOTE OF WARNING TO THOSE AERODYNAMICISTS OUT THERE: *this Heli IQ is not a PhD thesis on lift theory. It is simply a conceptual explanation of general subsonic, incompressible, laminar flow around an airfoil that does not take into account variations in flow that arise from transitional and turbulent conditions.*

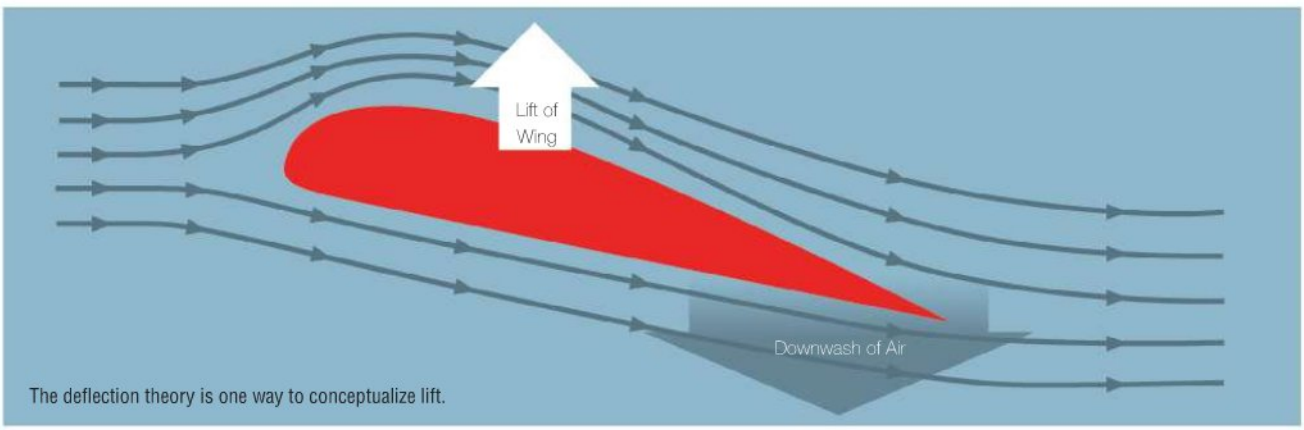
LIFT

From the most basic perspective of forces acting on a rotor blade or wing, differential pressure acts across an airfoil. With higher air pressure on the bottom of an airfoil than on the top, the net result is a force that counteracts an aircraft's weight.

The question that often follows is how does this pressure differential arise? One way to think about it is by the deflection of air moving downward. Large volumes of air simply is pushed downward, creating high pressure on the bottom and lower pressure on top. The net lift can be calculated using Newton's Third law, which says that for every action there is an equal and opposite reaction, action is the downwash and the reaction is the lift of the airfoil.



Lift on an airfoil is created by differential pressure. The green arrows are a region of low pressure and the yellow arrows are a region of high pressure.

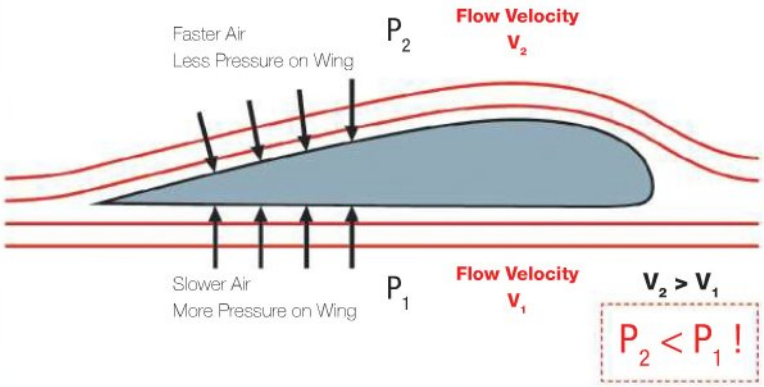


The deflection theory is one way to conceptualize lift.

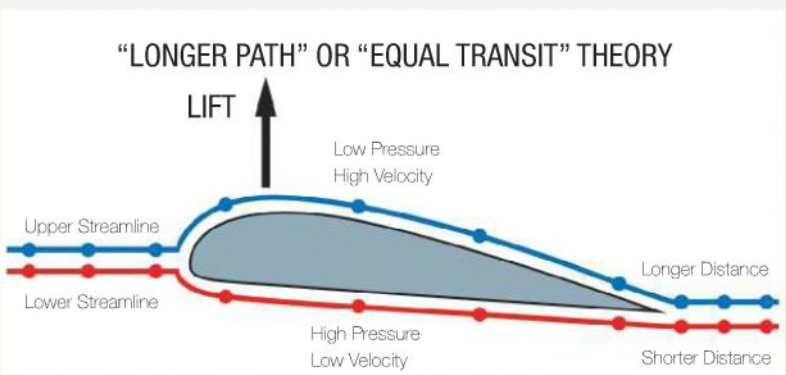
BERNOULLI'S EQUATION

A MORE ANALYTICAL METHOD OF UNDERSTANDING LIFT IS GIVEN BY BERNOULLI'S THEORY:

$$P_1 + \frac{1}{2} pv_1^2 = P_2 + \frac{1}{2} pv_2^2$$



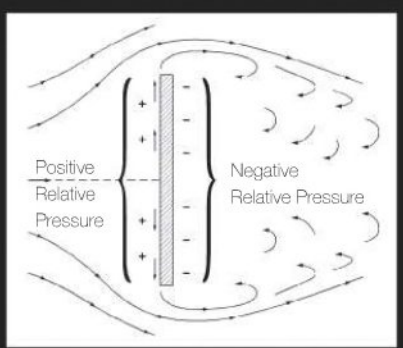
His equation basically states that velocity and pressure are inversely related,The higher velocity fluid on top creates a lower pressure relative to the slower velocity fluid on the bottom. In the case of an airfoil, the air that is directed over the top travels farther than the air over the bottom, causing the former's velocity to be higher than the latter's. One erroneous method often used to explain lift is the equal transit theory. The theory basically describes the motion of two air particles that start at the leading edge of an airfoil together. One air particle travels over the top while the other travels over the bottom. By equal transit time both particles arrive at the trailing edge together and therefore the velocity of the top particle must be higher because it travels a farther distance. This differential velocity is the reason for the differential pressure that causes lift. There are many flow phenomena such as span wise flow and circulation that dispel this theory and often times the velocity over the top is substantially higher then the velocity on the bottom. What can be taken away from this general theory is that differential velocity is associated with the differential pressure that causes lift.



Though the equal transit theory is not 100% accurate, what you can take from this explanation is that for a certain angle of attack, air over the top of an airfoil definitely travels faster than air over the bottom, the associated differential pressure gradient, causes lift.

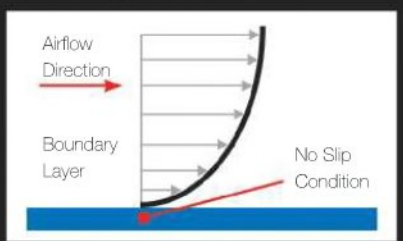
DRAG

Before we can tie the theory of lift into understanding an airfoil we have to review the basics about drag. We will discuss two major causes of drag: pressure and shear forces (friction). To illustrate what these forces are we can use a flat plate. If the plate's area is normal to the airflow the velocity of air hitting the center of the plate essentially goes to zero, and a high-pressure area exists in front of the plate (stagnation point). The air then pushes over the edge of the plate, separates and creates a vacuum on the back side. The combination of the stagnation point and the subsequent separation results in a drag force that acts against the plate.



The plate experiences drag forces because of the high-pressure stagnation point in front and the vacuum caused by the airflow's separation in the wake.

Now let's take the plate and turn it parallel to the airflow. The air that is closest to the plate in direct contact is in a no-slip condition at zero velocity. Within fractions of an inch the air's velocity reaches the free stream velocity. This region is called the boundary layer and shear forces, just like the viscous forces experienced when you slide an Oreo cookie's two halves apart, act against the plate.



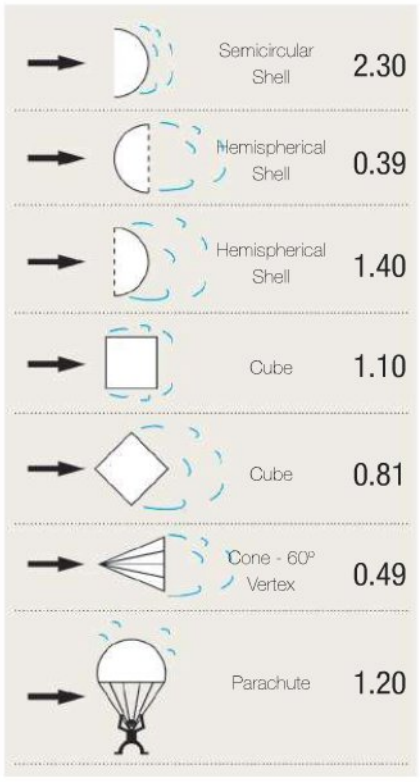
A parallel flat plate experiences frictional drag as a result of the shear forces over its surface.

Oh and now you give me formulas!

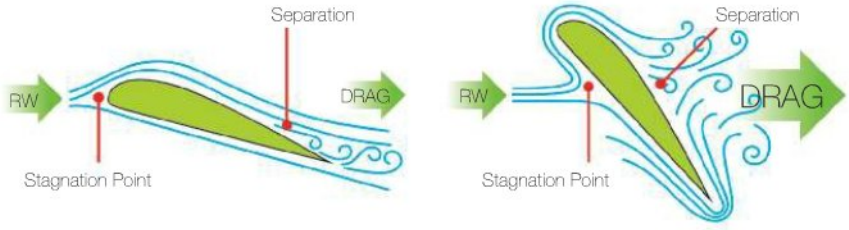
THE PURPOSE OF AN AIRFOIL

With a basic understanding of lift and drag we now can explain an airfoil's purpose. In order to generate lift by differential pressure the airflow over an airfoil has to flow smoothly in a laminar fashion without stopping or departing. Just like it would on a plate that is normal to the airflow, if the flow stops or departs, high-differential pressure forces exist. All objects immersed in a fluid experience drag to some extent. The trick is to minimize this as much as possible.

Now let's look at an airfoil at a certain angle of attack. The oncoming air has no choice but to hit a stagnation point where it must go to zero velocity. It then moves over the top and bottom of the airfoil. From this point forward the airfoil is designed to do everything it can to prevent separation and keep the air attached to it. The smooth, rounded surfaces over the top and bottom offer a gentle transition that essentially minimizes separation. Even though shear stresses exist from the airflow over the skin, the much higher pressure differential forces are minimized. At a certain angle of attack, however, separation is unavoidable, and the airfoil stalls.



This chart shows coefficients of drag for various bodies. Notice how blunt objects with sharp edges tend to cause flow separation and high coefficients of drag. The more streamlined they are, the lower their coefficient of drag.



The top airfoil exhibits a stagnation point close to its leading and trailing edges. Drag forces are smaller than those acting upon the stalled airfoil below.

COEFFICIENT OF DRAG IS RELATED TO THE REYNOLDS NUMBER, WHICH IS A DIMENSIONLESS QUANTITY USED WHEN ANALYZING FLUID FLOW.

It characterizes fluid of a given viscosity, density and velocity as it relates to a characteristic length scale such as the diameter of a sphere immersed in moving fluid. Low Reynolds numbers are associated with laminar flow; high Reynolds numbers are associated with turbulent flow. As airflow becomes turbulent (i.e., high Reynolds number) the coefficient of drag might decrease; and the lift is also reduced because of the flow field's random nature.

$$Re = \frac{pVL}{\mu}$$

V is the mean fluid velocity (m/s)

L is a characteristic length-scale, such as the length of the objet that the flow is going through or around (m)

μ is the dynamic viscosity of the fluid (kg/ms)

p is the density of the fluid (kg/m^3)

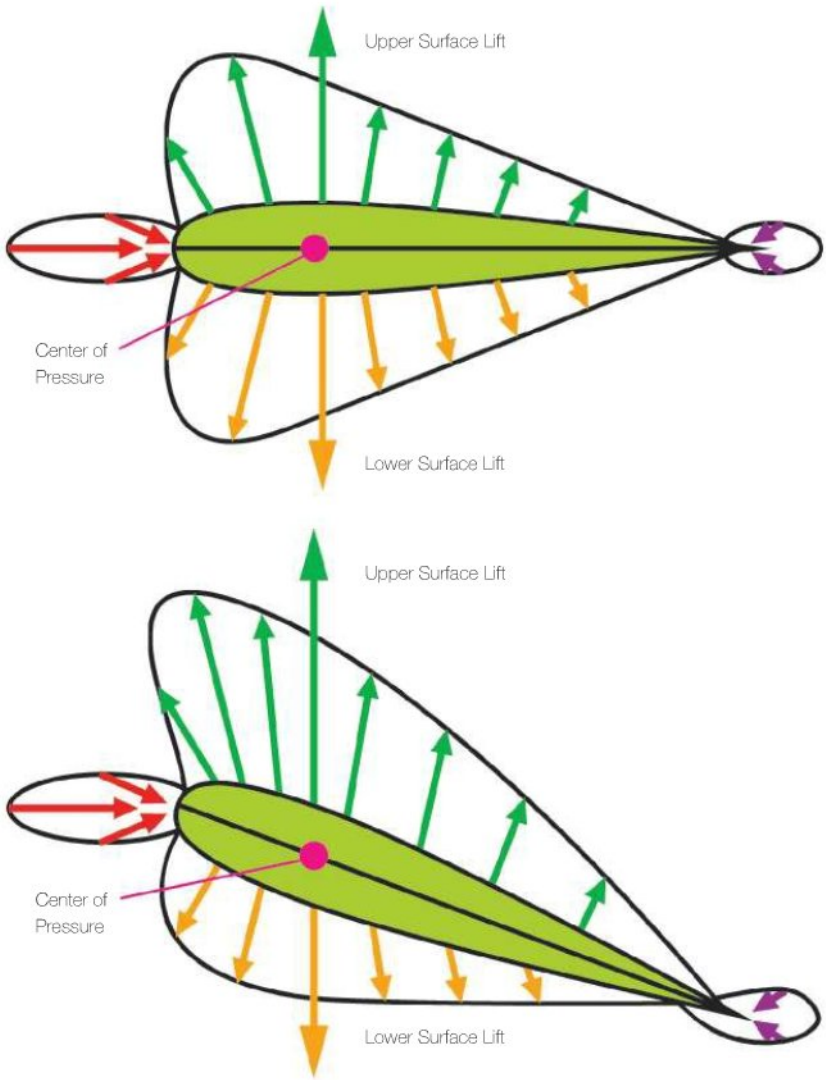
HOW DOES A FLAT-WINGED FOAMY GENERATE LIFT?

A foamy's airfoil has no shape; it is simply a flat plank. Its shape does not contribute to different velocities on the top and the bottom. The angle of attack, however does. With the airfoil tilted upward relative to the flow field, the air must travel farther over the top than the bottom, generating lift. One thing about flat-winged foamies is that they fly really slowly. When the airspeed is reduced, the slow air has little momentum and can flow a long way along the airfoil without separating. At increased airspeeds the flow behind a foamy's airfoil separates sooner then a shaped airfoil. The sooner the onset of separation the higher the drag.

Everyone loves formies!

HOW DOES A **SYMMETRICAL AIRFOIL** GENERATE LIFT?

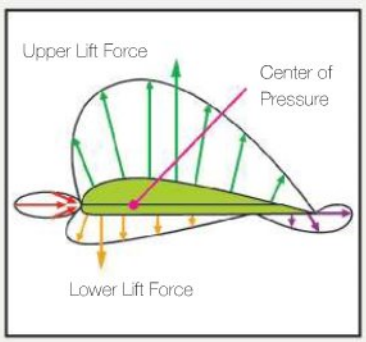
A symmetrical airfoil has the same shaped camber on both sides of its chord line. Just like a foamy, the angle of attack causes the airflow to have different velocities over the top and bottom. The significant difference between a foamy's wing and a symmetrical airfoil is that at high angles of attack and high airspeeds, flow separation is minimized because of the airfoil's shape.



With the symmetrical airfoil at a 0° angle of attack (top), no lift is generated. With an angle of attack (bottom), lift is generated.

WHAT'S THE **ADVANTAGE** OF AN ASYMMETRICAL **AIRFOIL?**

Unlike a symmetrical airfoil, an asymmetrical airfoil can generate lift at a zero degrees pitch angle. This streamlined shapegives a higher lift force when compared to a symmetrical airfoil at the same angle of attack. Most full-scale helicopters use asymmetrical blades for this reason. The reduced drag offers highly efficient operation. And as you know, 3D helicopters do not use asymmetrical airfoils because of their inverted flight. All the benefits gained in upright flight would contribute to tremendous drag when inverted.



With a zero degrees pitch angle an asymmetrical airfoil generates lift while offering a streamlined shape.

CONCLUSION

In summary, differential pressure across an airfoil generates lift. Bernoulli's theory says that the relative higher velocity airflow over the top of an airfoil causes a relatively lower pressure on the top than on the bottom. Drag forces that act against an airfoil are also created by differential pressure and shear stresses. An airfoil's purpose is to provide a gentle transition for airflow at various angles of attack, generating lift and minimizing flow separation, thus reducing drag and achieving efficient flight. RCH

I feel like I am in physics class.

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COLLECTIVE MANAGEMENT

Be Easy On Them Sticks

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

This is the key to success

PERFORMING EVERY 3D- AND FAI-STYLE MANEUVER PERFECTLY ALWAYS COMES DOWN TO ONE THING: collective management. Collective management is arguably the most important factor in all maneuvers that you'll ever perform. Putting in proper-stick movements seems relatively simple, but timing those movements with good collective control is a tough task that takes many hours of practice. Oftentimes people will ask why their helicopters have a hard time performing maneuvers such as the tic-tock, and usually the answers always come back to their thumbs. Even if your overall stick movements are accurate, applying too much or too little collective will ruin just about any maneuver and instead show ugly side effects. In this Pilot Skills, we will discuss the proper steps to managing your collective properly.

WHY COLLECTIVE MANAGEMENT IS IMPORTANT

The secret to flying a good 3D or competition routine is to minimize your collective inputs as much as possible for fluid movements during and in-between each move. Often when people watch videos of their favorite pilots, they overlook the pilots' ability to keep their motors in the proper power band throughout the entire flight and rarely, if ever, bog their motor. Having good collective management is easy on your motor, your helicopter, and just looks good in the air. When using good collective management, you'll notice that your helicopter will feel more agile in the air, and you won't have to resort to useless remedies like increasing your head speed or leaning your motor out past where its supposed to be. Additionally, these habits can easily cause damage to your equipment and might even be dangerous to yourself and others. People oftentimes believe that jamming their sticks during collective intensive maneuvers will make their helicopter respond more quickly, but this couldn't be further from the truth. Using some of the tips listed in this article, you'll quickly learn that the smaller the inputs you use, the better.

TIPS AND TRICKS FOR BETTER COLLECTIVE MANAGEMENT:

- Keep your collective stick centered as much as you possibly can. The bottom line is that when your helicopter is at 0 degrees, it will not load the motor and oftentimes will just hang, in a sense. This gives your motor an opportunity to catch up and regain its head speed. So when doing a full collective maneuver with directional changes, instead of jamming the stick the other direction, pop it the other direction and drop it back to center stick to allow the head speed to catch back up.
- Keep inputs as minimal as possible. This is arguably the most important component to having good collective management. Now, I know the feeling of excitement pilots can get urges them to jam the collective sticks during maneuvers. However, this feeling is your worst enemy. Be easy on that collective stick, and never go from one extreme to the other because, for the most part, that means bad news. A good example I like to use is the tic-tock maneuver. When a pilot is first attempting the maneuver, he will have a tendency to jam the collective stick back and fourth while his helicopter falls helplessly out of the sky. Surprisingly, you don't have to make much collective inputs at all for this maneuver; in fact, once you perfect the maneuver you'll find your collective stick around the middle during the move's duration.
- Timing everything is also very important to proper collective management. You may not add a lot of input during a certain period of your maneuver, but your timing might be completely off, which can cause your motor to bog anyway. The combination of perfect timing and conservative inputs is perfect and will take a lot of time to master, but with enough practice it will become second nature.
- If you hear your motor bog, let off the collective. That's pretty self-explanatory.
- Run a safe and healthy head speed, and take all the proper measurements to tune your engine properly. Oftentimes, pilots will try to overstress their equipment to overcompensate for their poor collective management. This generally brings nothing but problems and for the most part doesn't help you improve.
- It is very easy to bog the motor during pirouetting maneuvers, and, if too much collective input is applied, you might even lock up your tail. Be careful during pirouetting maneuvers or fast backwards flight because if collective is applied at the wrong time or too much is applied, it can spell disaster and danger.

CONCLUSION

Granted, there will be several instances where full collective input needs to be applied. However the ways you're able to utilize that input and mix it with nice and easy inputs is what separates the good pilots from the inexperienced. I don't feel that collective management can ever be perfect, but there are some pilots out there who manage their collective to almost perfection. It really comes down to practice, stick time, and (more importantly) being in tune with your helicopter. Know your helicopter's limits, and really feel it through the maneuvers; it will be the first to tell you if you're overworking it. Just remember to fly safe, and be easy on those sticks. HCI

This and special magical powers

TAIL SLIDE

DROP IT LIKE ITS HOT!

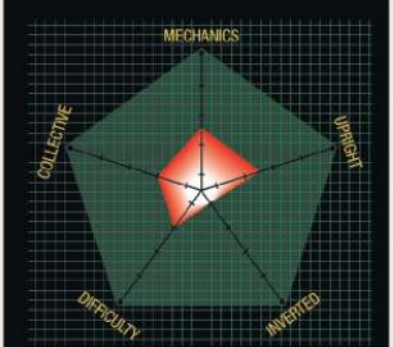
WORDS: Brandon Updike | **PHOTOS:** Jason Boulanger

THE TAIL SLIDE IS ARGUABLY ONE OF THE MOST RISKY AND SCARIEST MANEUVERS IN THE HOBBY. Intentionally dropping your helicopter from the sky to the point of terminal velocity is a little nerve-wracking. And the icing on the cake is how low you drop your helicopter before pulling out: Anyone can pull out of a tail slide 20 feet above the ground, but what separates the men from the boys is being able to pull out inches from the ground or sometimes even hit the ground without crashing. In this flight school we'll break down the proper inputs and steps to perform a tail slide. Before you know it, you'll be pushing your heli to the limit and finding yourself doing several variations of tail slides.

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.

BEFORE YOU START:

- Hopefully, by the time you're ready to start attempting some tail slides, you are fairly comfortable with all your orientations and have begun doing at least moderate 3D flight.
- Be sure to have a high-end heading hold gyro, or you'll quickly learn that flying toward the ground at high speeds tail-down is quite hard. Having a good gyro is important because it will keep your tail in place and prevent it from whipping out under a heavy load.
- A governor or limiter will keep your helicopter from overspeeding during your descent. Without one, you'll find your helicopter will most likely overspeed and risk possible damage to the motor.
- Everything will happen in a timely manner, so make sure that you have good reaction speed or you'll find yourself flying straight into the ground.
- The more advanced your setup is on the helicopter, the easier the maneuver will be since it is very demanding on your machine.

HOW TO PREPARE FOR IT:

- The best way to prepare for the tail slide is to perform mini-tail slides at a very high altitude.
- When climbing, practice pulling back on your cyclic until your blade disc is facing you, then drop your collective to center stick, and let it drop a few feet.
- After dropping a couple feet, add some forward cyclic input simultaneously with a positive collective input.
- Keep doing this until you have the basic motions down.

CORRECTIONS

- Your helicopter will want to do all kinds of weird things while it's descending, so be prepared to make very minimal corrections to make sure your helicopter descends in a straight line.
- If your helicopter is drifting, the best way to correct for this is tail input. If the tail is drifting off to the right, make a right rudder input on the stick and vice versa.
- If you pull back on your cyclic, it pushes the tail away from you and brings the nose toward you, and if you push forward on the cyclic, it pushes the nose out and the tail toward you. This is important to remember in order to keep a perfect 90° line all the way to the ground.

START

1 Get into a hover high in the air, about 100 feet.

2 When ready, pop the collective, and pull back on your cyclic stick until your tail is pointing straight toward the ground.

3 Center your collective stick so your helicopter descends in a straight line.

4 Make any necessary corrections (your helicopter will want to stray away from its line as its speed increases).

5 Once approaching the ground, bail out by either 1) gradually easing your forward cyclic and positive collective inputs for a smooth transition or 2) abruptly increasing your forward cyclic and positive collective inputs for a quick stop.

We pulled out a little high on this one

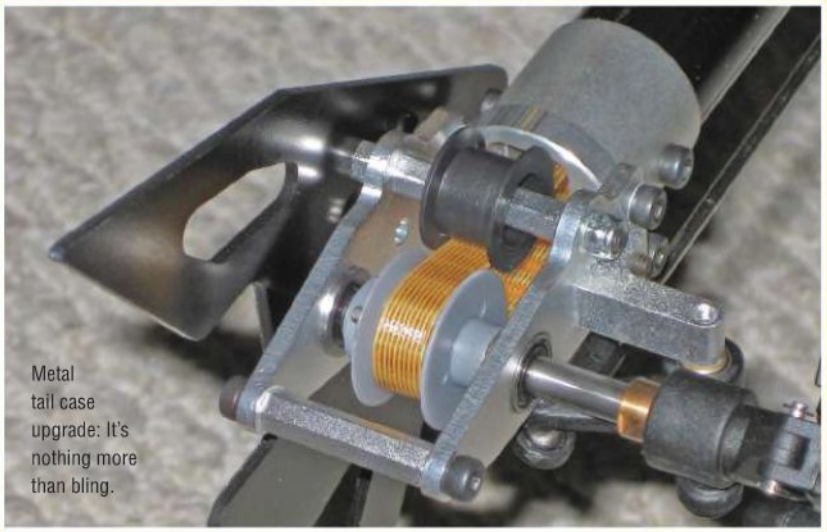
CONCLUSION

The tail slide is just flat-out impressive and will generate a large amount of interest from the crowd. It isn't hard at all and really comes down to how well you can handle your nerves and fear. It also will test how well you can time your helicopter's descent so that you don't watch it lawn-dart into the ground. Start your bailouts high in the sky, and, as you improve, work on getting it lower and lower to the ground. Before you know it, you'll be bailing out inches off the deck. RCH

Continued from page 59.

TAIL

TAIL CASE: Although the tail original tail case has held up just fine, A-Main Hobbies also provided me with the metal tail case upgrade. The tail rotor shaft shims provided with that upgrade weren't sufficient for aligning the pulley with the center of the tail boom and also left an undesirable amount of axial play. If you decide to go for this upgrade, make sure you pay close attention to getting that shaft shimmed correctly. As far as performance goes, I haven't noticed any difference.



Metal tail case upgrade: It's nothing more than bling.

Some parts look a lot like Raptor's.

OVERALL IMPRESSION

The high-wear parts like bearings, ball links, and shafts all have what I consider to be normal wear. None of them (with the exception of the main shaft, as explained above) require replacement. The gears and the tail drive belt show no sign of wear. The tail pitch slider is still silky smooth, as well. This heli has held up remarkably well.

After installing the upgrades that I've detailed in this long-term review (most of them now standard with new kits), this heli flies every bit as well as helis costing twice as much.

CONCLUSION

As with most new kit introductions, this kit has had its issues. JS Models and A-Main Hobbies have done an excellent job of supporting this product and so far have been quick to address all of the known issues. And although the price has increased slightly from its original introductory price, the refinements have made it an even better bargain. Even the canopy has been beefed up (and I saw nothing wrong with the original). I plan to continue flying this machine regularly and will continue to recommend it highly. RCH

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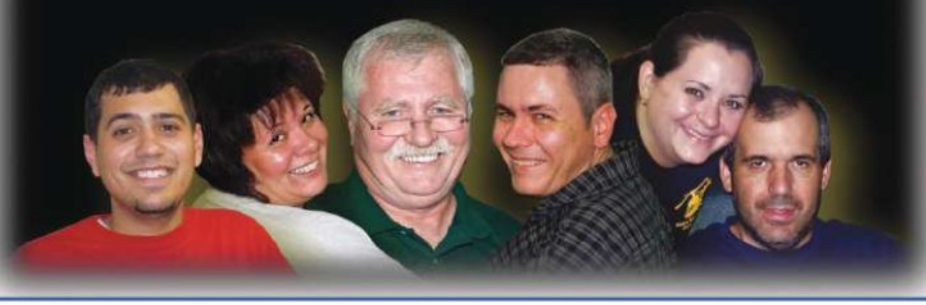

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A129 MANGUSTA

THE MONGOOSE

WORDS: Brandon Updike

The Mangusta just sounds tough

SPECS

CREW: 2: pilot and weapon systems officer
LENGTH: 12.28 m (40 ft 3 in)
ROTOR DIAMETER: 11.90 m (39 ft 1 in)
HEIGHT: 3.35 m (11 ft 0 in)
DISC AREA: 444.9 m² (4,789 ft²)
EMPTY WEIGHT: 2,530 kg (5,575 lb)
MAX TAKEOFF WEIGHT: 4,600 kg (10,140 lb)
POWERPLANT: 2× Rolls-Royce Gem 2-1004D (license-built by Piaggio) turboshafts, 664 kW (890 shp) each
PROPELLERS: four blade rotor

PERFORMANCE

MAXIMUM SPEED: 278 km/h (148 knots, 170 mph)
CRUISE SPEED: 229 km/h (135 knots, 155 mph)
RANGE: 510 km (275 nm, 320 mi)
FERRY RANGE: 1,000 km (540 nm, 620 mi)
SERVICE CEILING: 4,725 m (15,500 ft)
RATE OF CLIMB: 10.2 m/s (2,025 ft/min)

ARMAMENT

GUNS: 1× 20 mm (0.787 in) three-barrel gatling-type cannon (500 rounds) (only CBT version)
ROCKETS: 4 pods with
- 38× 81 mm (3.19 in) unguided rockets or
- 76× 70 mm (2.75 in) unguided rockets or
- 12.7 mm machine gun-pod

MISSILES:
- 8× AGM-114 Hellfire or BGM-71 TOW anti-tank missiles
- 4-8× AIM-92 Stinger or Mistral anti-aircraft missiles

BACKGROUND

Attack helicopters have always had a sleek look to them that just makes them seem flat-out mean. The Italians have their own attack helicopter, and it is no exception to that rule. With a name like Mangusta you know this helicopter means business. Mangusta means mongoose, which is a pretty tough animal.

The A129 was originally developed by Agusta and primarily designed as a defense weapon for the Italian army against tanks. The Mongoose was drawn up in 1978 and took its first flight in 1983. It proved to be a hit within the Italian army and soon went into full production. At that time, many countries throughout Europe were in the market for their own attack helicopters and considered the A129. This interest persuaded the Italian government to beef up the Mongoose and improve on its existing design to make it more competitive. Even though there was general interest in the Mongoose, most countries decided to go with the United State's Apache design. The plans for improving the Mongoose were then scrapped, but the A129 continues to be an important component in Italy's military arsenal.

FEATURES

The Mongoose looks similar to all the other attack helicopters found around the world. It has a 70 percent composite airframe that is able to resist some gunfire. It was designed with a four-bladed rotor head that uses composite blades with blade tips that emit very little noise. The rotor blades are surprisingly strong and are able to withstand gunshot from 12.7 mm ammunition and even some 23 mm shots, as well. The two crew members sit in a typical attack-helicopter configuration and have the luxury of an advanced avionics system. The Mongoose is able to carry a large number of weapons that makes it quite deadly to its opposition. It can carry a wide variety of missiles or a combination of different missiles. There is also a large, 20-mm turret cannon mounted to the front of the helicopter under the nose. The two turbine Rolls-Royce engines supply power and allow the helicopter to reach high speeds and maintain high agility.

CONCLUSION

To this day, Italy remains the only user of the A129 Mongoose. Nonetheless, the country was finally able to develop a long-awaited upgraded version to the proven A129 airframe: the T-129. It features many minor upgrades and a good amount of improvements in the weapons systems. The T-129 was developed and produced by the Turkish Aerospace Industries primarily for the Turkish Army, however Agusta Westland remains a primary partner in the endeavor. The Italians produced 60 original A129s and they will continue to see flight time for years to come. RCH

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Flight distance:300-350m

2. 4GHz 3CH

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

2. 4GHz 4CH

Model No: NE R/C 311A
Rotor Diameter: 7.40"(188mm)
Overall Length: 8.54"(217mm)
Weight: 1.2oz(34g)
Power System: Motor X 2pcs
Battery: 1-cell 3.7V 110mAh Li-PO

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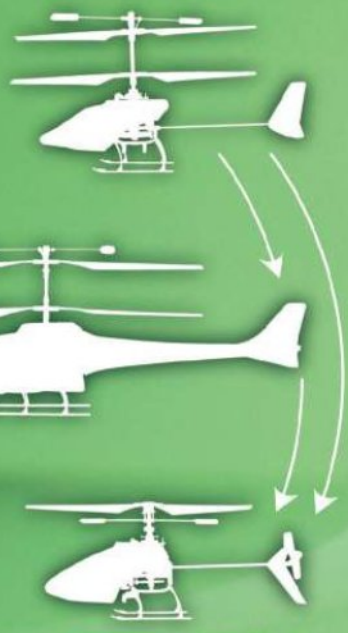

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