

FEELING LOOPY? Learn Outside and Tumbling Loops pg102

RC Heli

THE WORLD'S BEST-SELLING RC HELICOPTER MAGAZINE

POWER SURGE

We Test Our
MOST POWERFUL
Electric Yet!

**Mikado Logo
600 V-Bar**

TESTED:

» **WALKERA**
HM-83#

» **HITEC**
AURORA 9
2.4GHz

» **PHOENIX** SIM 2.5
SPEKTRUM COMBO

» **ICHARGER** 101B+



MARCH 2010 / ISSUE 44



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**WHO'S THE WORLD'S MOST
POPULAR RC HELI PILOT?**

Our Exclusive **Bruce Jenner** Interview Inside



JUST ADD

Try a different approach to Radio Control Helicopters

FUEL

Raptor 50 2.4GHz Ready-To-Fly

Specifications:
 Full Length of Fuselage: 48.03"
 Full Width of Fuselage: 5.51"
 Total Height: 15.74"
 Main Rotor Dia.: 52.95"
 Tail Rotor Dia.: 9.29"
 Gear Ratio: 8.5:1:4.56
 Full Equipped Weight: 6.60 lbs.
 Ask for TTR4853-F08M2A1



Items Included:

RedLine Pipe
High performance tuned pipe



Sky Tech TS6i
ACE8608 2.4GHz 6 CH Digital Radio



(4x) S1807MG
Control surface servos
ACE8120



TG-7000
Heading lock gyro
ACE8070



DS0606
Digital rudder servo
ACE8130



TRS6010D
2.4GHz 6CH Receiver
ACEA92257



RL-53HX
Powerful Redline Engine

FEATURES:

- Radio pre-programmed for a truly Ready-to-Fly helicopter
- 2.4GHz programmable radio system with pitch control, idle up, and throttle hold
- Redline 53HX exclusive power system
- CNC rotor head and hardened main shaft
- Fiberglass canopy
- Includes fiberglass main rotor blades
- Longer tail boom to fit 620mm blades
- Stainless steel flybar & linkage rods
- Heavy-duty clutch bell
- Push-pull control on cyclic and collective



Elevator push-pull control system



600mm fiberglass main blades



Metal rotor head and 10mm main shaft



Pitch push-pull control system



High performance Redline tuned-pipe



Rear mounted DS0606 rudder servo



Pre-painted Fiberglass Canopy



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BL 9088

BL 9080

7.4 VOLT RATED
(2 CELL LIPOS)

BL 9088 TAIL Servo 760/560Hz

Speed / Torque

6.0 v : 0.05 / 63.48 oz

7.4 v : 0.04 / 78.53 oz

8.4 v : 0.03 / 91.64 oz

BL 9080 CYCLIC Servo

Speed / Torque

6.0 v : 0.07 / 88.32 oz

7.4 v : 0.06 / 112.35 oz

8.4 v : 0.05 / 132.86 oz



JK
Designed by:
Jason Krause

ALIGN

TREX 700 Nitro Pro

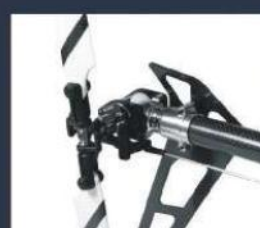


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- ★ Battery tray designed for easy and clean radio gear installation.
- ★ Fuel Tank Capacity 630cc.
- ★ Heavy duty tail with thrust bearings.
- ★ Torque Tube driven tail for incredible 90 sized performance.
- ★ Rigid frame design that can also handle hard crashes without damage.
- ★ Super engine cooling system very efficient airflow to provide unequalled cooling and horsepower.
- ★ New main gear with one-way bearing design for high torque.
- ★ Ready to fly weight (no fuel) is an incredible 4.2Kg.

Specifications:

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



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CONGRATULATIONS
TO OUR CHAMPIONS



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&
THE T-REX 700N

ALIGN

Picture Courtesy of Rotorworld UK

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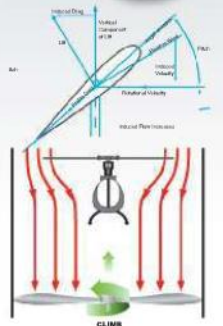
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LOOPS AND MORE LOOPS
Throw them with ease.

» **70 FLIGHT CHECK: MIKADO
LOGO 600 V-BAR**
The most powerful 600 we've ever tested.



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Better eat your Wheaties!

TESTED

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or up.



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Fail to adapt at your own peril.

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Because everyone wants to be a star.

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The most important thing you
probably never do.



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AMA EXPO

Ontario Convention Center, Ontario CA

WORDS: Ryan Kephart | PHOTOS: Jason Boulanger

IT'S THAT TIME OF YEAR AGAIN, WHERE ALMOST EVERY VENDOR YOU CAN IMAGINE GATHERS UNDER ONE ROOF TO DEMONSTRATE THEIR PRODUCTS AND ANSWER ANY CUSTOMER QUESTIONS. This event is hosted at the Ontario Convention Center in Ontario, CA, which is conveniently located next to an international airport (not to mention the RC Heli offices). The AMA Expo is more than just vendors and manufactures showing off their products. The show offers guest speakers, including Burt Rutan who designed a private sub-orbital spacecraft and several energy efficient planes. The AMA Expo also allows the manufactures to fly their product in an indoor flying section.

INNOV8TIVE DESIGNS

When it comes to brushless motors, Lucien Miller does not disappoint. He brought several new motors for the helicopter crowd. Scorpion motors are known to put out some serious power and the new "limited edition" HK-4225-610 for 50-sized helicopters can put out a maximum continuous power of 3000 watts, or roughly 6.5 peak horse power. Each motor is hand wound with some of the thickest wire I have ever seen. They can make roughly one per day, so if you're looking for maximum power for your 50-size electric don't wait; their initial stock will run out quickly. Along with the 50-size motor a new 90-size motor will be available, rated at nine-horse power. Scorpion has also released a conversion kit for the Hirobo Eagle 3 to make it completely electric.

WWW.INNOV8TIVEDESIGNS.COM



2010 is going to be a big year for RC helicopters.

THUNDER POWER

Thunder Power set up a big booth displaying the latest and greatest in LiPo technology. Their new line of 45C batteries really pack a punch and can be charged faster than ever with their chargers. Thunder Power carries many different sizes of batteries for any application. This month we used one of the biggest batteries available in our Logo 600 review. These packs put out the power.

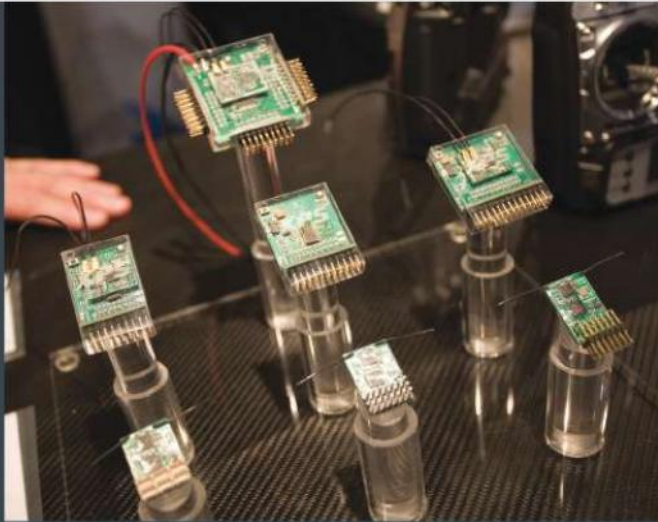
WWW.THUNDERPOWERRC.COM



XPS

XPS has been working on some new and more affordable 2.4ghz receivers that are ready to hit the market. These receivers offer a better connection between the transmitter and model and can be bought for a fraction of the price of the originals. Expect to see 6-channel receivers starting at \$29.00.

WWW.XTREMEPOWERSYSTEMS.NET



STATIC DISPLAYS

Every year, the AMA Expo invites hard working modelers to put their results on display. The displays are judged and awarded with ribbons prior to the start of the show. These models are displayed throughout a row spanning about 50 yards. On top of the gorgeous models on display, a double booth is filled with old radios dating back to the "reed radio" years. This year a special display was provided for the children. A giant 1/3 scale F117 Nighthawk was set up so the children could climb in and have their photo taken.



See the guy in the plaid shirt? Remember him.

CASTLE CREATIONS

Castle Creations displayed their entire line of well-known speed controllers and brushless motors. You may have heard about their speed controls or you might own a few yourselves, but what you might not know lies quietly on the web. Castle has developed a software update for all of their speed controls, allowing your motors to perform better and allowing new data to be seen about batteries, amp draw, head speed, and much more. Castle also added a new autorotation function that allows you to spool up your helicopter faster to bail out of an auto. Download your update today on their website.

WWW.CASTLECREATIONS.COM



PURETECH

With today's helicopter looking cleaner and cleaner, it is no wonder why this company has been a hit. PureTech makes battery strap downs look good. Their battery and ESC straps take sticky back Velcro and add a colorful strap. Not only do they stick well to your helicopter, they stick well to your battery or ESC. Along with battery straps, PureTech makes other great little products to make your life easier. PureTech makes one of the most comfortable neck straps I have ever used. It's made from wide, high quality webbing and includes a neoprene neck pad. This pad makes holding any transmitter comfortable. PureTech also offers a receiver wrap that is made from shockproof neoprene and utilizes their same colorful straps.

WWW.PURETECHPRODUCTS.COM



See anyone familiar on this page?

HITEC

The Hitec booth advertised their new line of 7.4v servos with the new Aurora 9 (which we review this month). There was also a new Optic 6 Sport 2.4ghz radio for entry-level pilots.

WWW.HITECRCD.COM



HACKER

Although Hacker did not have any new products the booth was setup and had a knowledgeable staff that was happy to answer any questions about their motors. The booth displayed all their current motors including the electric turbine helicopter motors.

WWW.HACKERBRUSHLESS.COM



GENERAL VENDORS

If you were looking for some replacement receiver batteries or some connectors for your newest helicopters, then the AMA expo had it. Vendors from around America came to sell their gadgets, everything from tools to glues, magnets, servo extensions, shrink tubing, Y-harnesses, and much more. Some of the vendors represented were Batteries America, E-Power, Power Edge, MTA, Micro Fastners, Grex, Ram, Super Battery Packs, Utopia Tools, Hobby People, Cermark, Pegasus Hobbies, and Pacific Coast Hobbies.



MICRO-HELICOPTER T-REX 250 SE

- [KX019004] T-REX 250SE Kit w/250SP Motor and ESC
 [KX019005] T-REX 250SE Super Combo w/250SP Motor, ESC,
 3-DS410 Servos, 1-750/420 Gyro Combo

ALIGN

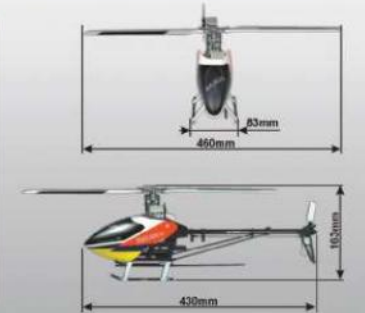
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Fabulous 3D Flying



Design Features:

- Refined all metal rotor head with improved bearings for increased stability and overall agility.
- New design metal control levers and CCPM Swashplate add to the improvements.
- New swashplate anti-rotation guide prevents flexing while adding to overall frame structural strength.
- New Servo mounting system making installation and removal easier.
- New stronger landing gear for those unexpected hard landings. Skid pipes now attached to landing gear braces with set screws.
- New tail case with improved counter weighted tail blade grips for smoother, more accurate tail control and performance.
- Includes new highly visible painted canopy with improved fitment and clearances.
- Includes new 3400kv 250SP brushless motor.

Specifications:

- Length: 430mm
- Height: 163mm
- Main Blade Length: 205mm
- Main Rotor Diameter: 460mm
- Tail Rotor Diameter: 108mm
- Motor Pinion Gear: 15T
- Tail Drive Gear: 120T
- Drive Gear Ratio: 1:8:4.28
- Weight (w/o power system): 148g
- Flying Weight: Approx 340g

Kit Includes:

- T-REX 250 Kit Set X1 set
- H205 blades X1 set
- 205D Carbon Blades X1 set
- RCE-BL5X 15A Brushless ESC X1 (Built-in 5-6V stepless adjustable BEC)
- 250SP Brushless motor X1

Super Combo Also Includes:

- DS410 Servo X3
- DS420 Servo X1
- DS750 Head Lock Gyro X1

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AIRTRONICS

Airtronics displayed their newest lineup of radios and servos, including the new SD-10G. Recently, Airtronics revamped their servo lineup to provide more dependable torque and speed. Also on the shelf was a new adapter that allows older Stylus users to convert their radio to 2.4 GHz operation. The adapter utilizes a radio wave reflector that bounces the signal off the plate and to the model.

WWW.AIRTRONICS.NET



CENTURY HELICOPTERS

Every year there is one booth that stands out from the rest - Century Helicopters. Their booth is filled with helicopters from end to end. Every helicopter is well polished and a couple of their employees are there to answer any question. This year, Century was displaying some of their newest helicopters, which included the new Radikal. Along with the Radikal, Century was also displaying a behemoth of a helicopter designed as a video and photography ship.

WWW.CENTURYHELI.COM



HORIZON HOBBY

Horizon Hobby set up a large display with the entire E-Flite and JR line of helicopters. E-Flite has a new helicopter under development. The new Blade SR is a micro collective pitch helicopter somewhere between the mSR and the Blade 400. Horizon claims that this is a great helicopter to step up to from their counter rotators. Keep an eye out for the full review in the pages of RC Heli.

WWW.HORIZONHOBBY.COM



GREAT PLANES / HOBBICO

On display at the Great Planes booth was the new O.S. 55HZ along with a new matching pipe. The new pipe is designed around the 55 and will help provide maximum power for the new engine. Great Planes also displayed their newest models from Heli-Max, which included the new Novus AH-1J Sea Cobra and the Comanche counter rotator.

WWW.GREATPLANES.COM

WWW.HOBBICO.COM

WWW.HELIMAX-RC.COM



Ryan finally ditched the guy in the plaid shirt.

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LETTERS & PICTURES

CLEAN FLEET

I've been reading your magazine for the past year. I finally decided to send you pictures of my fleet which I just completed over the new year. The 90SG has an OS HZ, a Futaba 611 gyro and GV-1 governor. The Vibe 50 has an OS 50, a Futaba 611 gyro and GV-1 also. The newest is the 500E which has a Scorpion motor, Spartan gyro and Hyperion batteries. I hope you like them and keep up the good work.

John D'Arcangelo
 Florham Park , N.J.

MACHINE OF THE MONTH!

GRATEFUL

First I want to thank you for the great job that you do. Your help via the magazine for newcomers like me is gold! This is my heli, it's an e-Flite Blade 400, with Heliartist BO-105 fuselage, Gaui GU-365 gyro, Hitec HS-65mg servos, Align night-blades, and navigation lights from RC Lights. Under the heli is a camera wrap with foam just incase! My next step is a four blade rotorhead. keep on the great job!!!

Costas Porichis
 Greece by way of Toronto Canada



Fire at will!

RUNNING RIGHT!

This Is My Align Trex 600 Nitro Pro, It has Spektrum DS821 Digital Servos, Futaba S9254 Tail Servo, Futaba GY401 Gyro, Spektrum DX7 Radio, Spektrum AR7000 Receiver, OS .55 HZ Engine, Curtis MP5 Muffler, and a JR 4500 Battery. Your how-to articles have helped me out a lot, especially the Engine Break-In article. Thanks for the awesome magazine!

Jesse Alcazar



Servos You Want From The Name You Trust



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

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

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

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



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— David Messina, LaGrangeville, NY



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ROTOR HEAD

THE UNKNOWN PILOT

Hi Guys, I know you like putting the scale birds in the magazine so I thought I'd send you pictures of one of my favorites. It's an MA Xcell 60 with a custom OS .70 SZ-H, Electro-dynamics navigation and strobe lights and a cable driven tail. I used automotive speedometer cable for that setup. Hope you like the shots. Love the magazine.

Anonymous



WANT TO SEE YOUR HELI IN THE MAGAZINE?

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

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feedback@rchelimag.com

Please put "Feedback" in the subject line.

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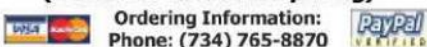
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Since 2003 more pilots and drivers have chosen the #1 in Performance and Reliability for long-lasting power and performance over any other brand. And now Thunder Power RC is proud to announce **exclusive Generation 4 (G4) chemistry** that offers a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



G4 Pro Lite V2 20C Series Batteries

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



G4 Pro Power 30C Series Batteries

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



G4 Pro Power 45C Series Batteries

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



G4 Sport Race 25C Series Batteries

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



G4 Pro Race 40C and 50C Series Batteries

The world's fastest and longest-lasting batteries for surface vehicles! G4 Pro Race 40 series batteries are the best choice for powering sport and race vehicles using 10.5T, 13.5T, 17.5T and other 'stock' motors, while G4 Pro Race 50C series batteries are the most powerful batteries ever made available for pro- and competition-level racing in the hottest 'mod' motor classes. Capable of being charged at rates up to 6C* and available in capacities from 3200 to 5200mAh and configurations from 1S 3.7V to 4S 14.8V.



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

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FREQUENTLY ASKED QUESTIONS

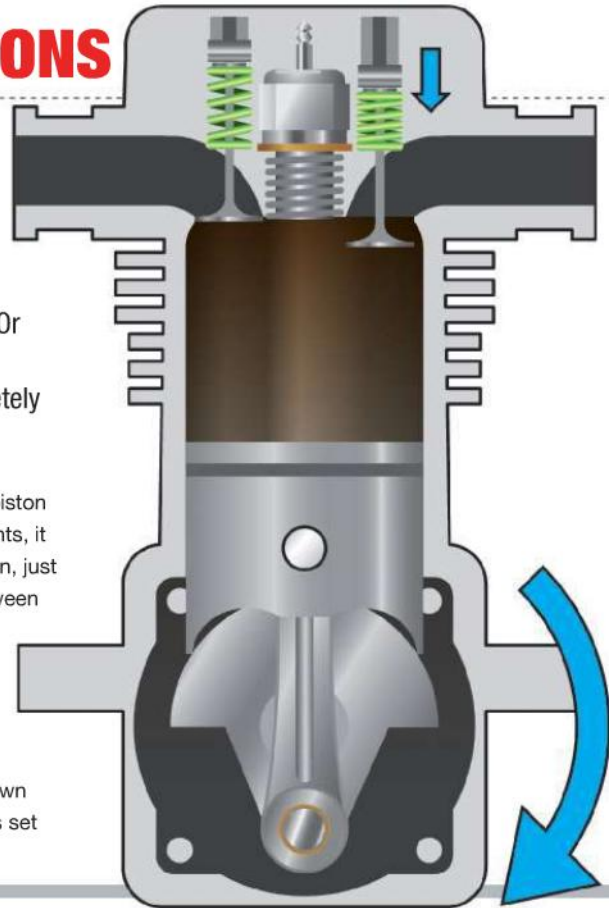
Q: I am familiar with the nitro engine break in procedures as its been discussed in various forums. Then there's this month's article in our beloved magazine.

MY QUESTION IS THIS: During the cool down period in between tanks, should I have the piston resting at the bottom of the cylinder? Or does it matter?

I know that it's important to allow the engine to cool down completely before starting the next cycle.- **redlegtu**

A: I read somewhere a while ago that during break-in you should have the piston down so the ring is not compressed. As far as letting it cool between flights, it depends on how fast you want to get back in the air. Once you have it broken in, just refuel and fly. However, if you are really hammering it then let it cool down between flights. That is why you need at least two nitros. If I have two with me I switch off. Fly one, then the other, then back to the first. **-kcgraves**

The process is referred to as heat cycling. During the cool down it's best to leave the piston at BDC (Bottom Dead Center). This is especially important on non-ringed engines. During break-in you should allow the engine to cool down between runs, however once it's broken in you can run continually if the carb is set correctly. **-MikeV**



Yes, that's a four-stroke engine in the illustration. We think it looks cool and serves our purpose.

Q: First I hope that everyone had a merry Christmas. I am a beginner to RC and my first machine was an E-flight Blade CX. Now I have an E-flight CP+. I upgraded my CP+ by replacing the tail boom, skids, and landing gear with super skids. When I lift the CP by the flybar to test the balance, it is heavier to the rear. I tried to move the battery forward and that didn't help much. I would like suggestions on how to fix that problem. I placed some lead fishing weights around the rubber band that holds the battery in place and that seemed to help. This was

probably not a good idea as it is not really secured. Thank you.-**Art475021**

A: I use stick on tire weights. I needed to do the same thing on a 450 because the batteries were from different manufacturers and did not weigh the same. **-vermonster**



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QUICK TIPS

SPRING CLEANING IS ALMOST HERE!

When cleaning your helicopters, it's sometimes necessary to remove some parts and give them a good cleaning. One of the dirtiest parts of your helicopter is the engine. Removing the engine can give you access to many parts of the helicopter that are sometimes unreachable. Cleaning the engine can also make your helicopter look as good as it did the day you bought it. You'll want to make sure to keep any debris from falling into the engine, so before you start cleaning place a piece of masking tape over the exhaust port and carburetor to make sure nothing can get into the internals.



When is winter over with? We want to fly!

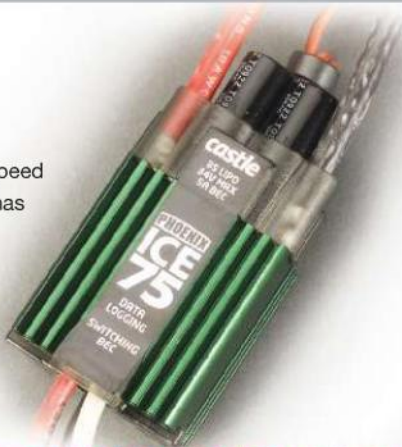
GET A GRIP ON YOUR PINION GEAR

➔ If you are running an electric helicopter, then you may have already noticed that the pinion gear is what supplies the power to the main and tail rotor. If this gear slips, no power can reach these vital components. In some cases, the motor you purchase will have a flat spot already ground on the motor shaft. If your motor does not have this flat spot, you should make one by using a Dremel or file. First, install the pinion and motor on the helicopter and align the pinion to the main gear. Then, remove the engine and measure from the base of the motor to the setscrew that holds the pinion to the motor shaft. Remove the pinion and place a mark on the motor shaft at the measurement you took. Take a file or Dremel and create a flat spot. If you don't care about looks you could just grind off a flat spot along the entire length of the output shaft. Either way this will give the setscrew something to grip and prevent the pinion from slipping.



CASTLE UPGRADE

Are you currently running a Castle Creation speed control in your helicopter? If you are, Castle has released a firmware update that will make your speed control run much better. A new autorotation feature is available that allows you to perform an auto and in an emergency the speed control can spool up faster than during the initial spool up. This can be a real heli saver!



THE BEST PART OF WAKING UP!

Often times we find ourselves wanting to get to the flying field as early as possible and we end up forgetting things at home. Every full size pilot has a pre-flight checklist, so why shouldn't we? Create a checklist that you can run through so you will not forget anything. The checklist does not have to be elaborate, just add the items that you need to take to the field every time you go flying. When everything is in your vehicle, place the checklist back on your workbench to use for the next time you go flying.





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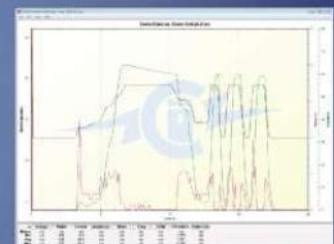


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GLOW PLUGS

Where the heat originates!

WORDS: Jim Innes | PHOTOS: Jason Boulanger



A NITRO HELI ENGINES A VERY SIMPLE AND STRONG PIECE OF MACHINERY. It's able to produce relatively large amounts of power with just a single piston. The whole combustion process in these little wonders depends greatly on the lowly glow plug. Let's look and see exactly what a glow plug is and how it works.

» WHAT IS A GLOW PLUG?

A glow plug looks similar to, and performs much like a spark plug found in an automobile. It's a threaded piece of metal with a hole containing a coil inside. This coil, or filament, is the heart of the plug. In modern glow plugs, the filament is usually coated with or made purely of platinum. The top of the plug has an adapter for a glow starter to attach to. A washer on the threaded end is meant to seal the plug, while the motor head rounds out the unit. The glow plug is truly a simple device.

RECEPTACLE: The top of the plug is set so that a glow adapter can be connected with one polarity going to the center and the other connecting to the outside of the plug.

PLUG BODY: The shell of the plug threads to the engine head and contains the coil and the receptacle, which is insulated from the body. The threaded portion often has a washer to seal leaks from the combustion chamber.

COIL OR FILAMENT:

The working part of a glow plug. The coil heats up and glows when given power. The coil then stays glowing due to the combustion process and ignites the fuel mixture each cycle.



HOW DO THEY WORK?

Glow plugs keep the fire going in a nitro motor. Their primary function is to ignite the fuel as it is compressed in the combustion chamber by the piston. The resulting explosion forces the piston down and produces motion for another cycle. Like a spark plug in your car, the glow plug needs electricity to heat up when starting the motor. This is usually applied via a one-cell Ni-Cd or Ni-MH battery. The coil in the plug will glow red from the current passing through it and will ignite the fuel/air mixture in the motor as it is started. Once the motor is running, the power can be removed from the glow plug and the motor will keep going. How does it do this? The answer to this is simple: platinum. The platinum used in our glow plug coils reacts catalytically with the methanol in the fuel so that the coil is heated with each combustion cycle, negating the need for outside power to the plug. The plug will stay hot as long as the motor is running and fuel is present.

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TIPS FOR BUILDING YOUR FIRST HELICOPTER

There's a first time for everything.

WORDS: Brandon Updike

EVERYONE'S BEEN THERE, GETTING THEIR FIRST KIT IN EXCITEMENT, ready to begin tearing open the bags and to start building. New pilots quickly realize how hard it is to build these things and may end up doing some things the wrong way. Some of us have learned the hard way over a simple mistake.

Our helicopters are complicated machines. There are a lot of simple rules when building one that may not be that clear to the beginner. There are a lot of things to look for and perform properly to make sure that the first flight will be as trouble free as possible.

THE HEAD

Perhaps one of the most complicated parts of a build is the rotor head. There are many different designs, but the most prominent design is the tried- and- true rubber o-ring design with thrust bearings. Making sure that your dampers are installed properly is very important. Some people like to apply lube to dampers to give them a smoother movement along the spindle shaft. This isn't necessary, but it can help prolonging the life of your dampers.

Make sure that all of your bearings and spacers are in the right areas. When assembling thrust bearings, lube all parts of the bearing with grease. Make sure to always put the bearing race with the larger inner diameter onto the spindle first, then the smaller diameter race after the roller bearings. Make sure that the bearing in the middle has the flange side facing towards the head block. This allows the centripetal force to push the balls outward, keeping them in the sleeve.

Depending on the model of heli, your rotor head may have different input/output options. Generally, the further away from center your settings are the more stable your helicopter will be. This may vary from heli to heli, so reference your manual to be sure.

When tightening your spindle bolts, be sure to apply a couple drops of thread lock to the bolt.

Too much grease will clog your arteries!



Greasing your thrust bearing is pivotal to prevent future failure.



TAIL DRIVE ASSEMBLY

Many beginners start with a belt helicopter for its simplicity and practicality. There are a few simple rules to remember with a belt helicopter. One is to make sure that you have the tail rotor spinning in the correct direction. Most tail rotors spin counter-clockwise, meaning that you'll have to twist the belt once in a certain direction to get your tail blades to spin properly.

Another thing to check is belt tightness. You definitely don't want your belt to be too loose, because that would cause issues like a jumpy tail during hard climb outs. Running the belt too tightly can cause it to fray, or even fail in extreme cases. The best way to check is by holding the head and attempting to spin the tail blades to see if they skip.

The other method of tail rotor drive is the "torque tube". The down side to these is that setting gear mesh can be tough. The best way for a beginner to set their gear mesh is to use the "paper technique" - run a piece of paper between each set of gears and then tighten. Be sure to use some sort of lubrication when sliding the torque tube into the boom to prevent any damage to the tube. Aluminum tubes can bend easy, causing future tail failure. Be sure to glue the center bearing at the proper length and make sure it doesn't pop out when sliding the tube into the boom.

TAIL ROTOR

The tail rotor shares many of the same characteristics as the rotor head. Assemble your thrust bearings the same way (if your kit uses any) and make sure that you place the bearings in the proper locations. Don't forget to lube the tail output shaft for smooth pitch slider movement.

Some tail rotor designs use pins for the pitch arms; make sure these are tight. I've seen many instances where pilots almost had tail failures due to pins slowly backing out.

BASIC SETUP

Everyone has their own preferences in setup, but for a CCPM helicopter you'll want to make sure that all your servo arms are centered on the servos. You'll want to have all your bellcranks and control arms on your head "90 and square" to their linkages. Make sure that your swash is level and that you're running a symmetrical pitch range (such as +10/0/-10 degrees). Your pitch curves will most likely be linear in a 3D setup, but these can be adjusted around center stick to suit your needs.

If you're not running a governor, your throttle curves will resemble a "V" and will take a little time to set up. If you're running a governor/limiter, be sure to follow the manufacturer instructions for a proper setup. Make sure that all your control surfaces are going the correct direction and that there is no binding in the head. Watch out for your gyro reverse option.



ENGINE

The engine assembly is usually straightforward, but some cooling fans may require that you dial indicate them (check out the dial indicating How To this month). Some helicopters also require that you set the proper mesh from the clutch to clutch bell. This can be tough; the best way to go about it is to make sure that you're not touching the top of the clutch bell and to try to center it as best as possible. Also, when tightening the engine nut to the fan hub, don't forget to

use a crank locking tool or you'll risk damaging the piston.



CONCLUSION

Building a helicopter for the first time can be overwhelming, but it will be a memorable experience. The best advice I can give is to find a local club and seek help from the friendly field veterans. Don't be afraid to ask questions and you'll be an expert in no time. Don't forget that post-flight inspections and properly cleaning your helicopter are also important. Have fun and be safe. **REEL**

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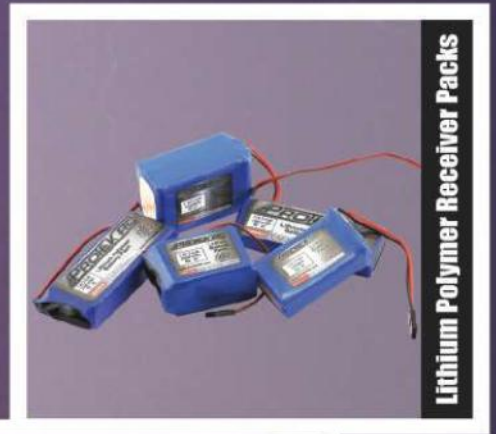
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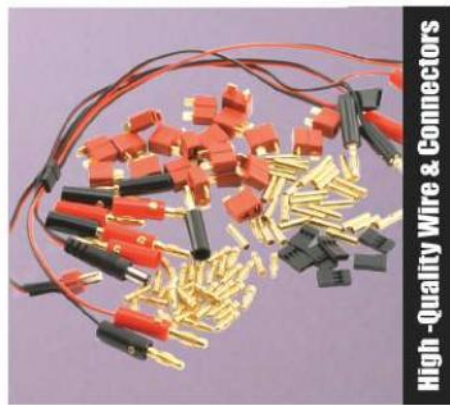
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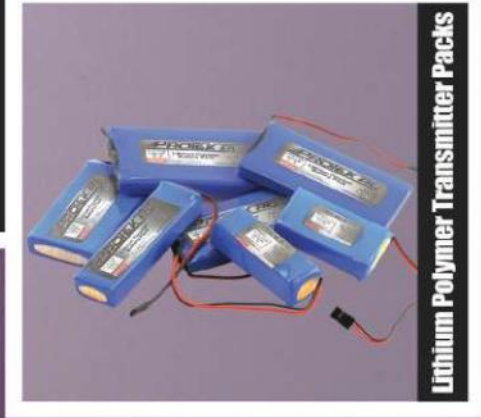
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FLIGHT LOGS

Log it, record it, write it down.

WORDS: Brandon Updike

I'm sure many pilots have had an eventful weekend of flying, only to forget most of the details a week later. Some of these details could be important, such as a specific adjustment to your helicopter that worked especially well. Sadly, some of us don't have the greatest of memories. For those whose memories can be questionable, you can always keep a flight log to help you keep track of your flights. Anybody who's ever had any experience with full-scale aviation will likely know what a flight log is. A flight log will allow you to keep track of your flights for better consistency.

WHAT IS A FLIGHT LOG?

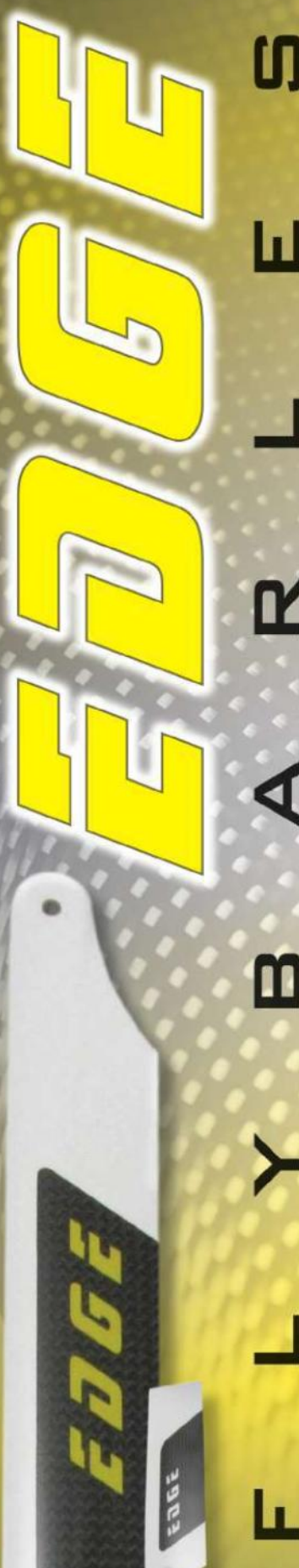
A flight log is fairly simple. It's a means of keeping a record of each flight with details. There are many different ways to log your flights, and different pilots have different ideas of what they'd like to keep track of.

In general terms, a flight log will contain a date, the model type, flight times, fuel consumption, battery performance, weather conditions, notes of what may have happened during the flights, and other critical data. Doing this lets you understand the behavioral changes your helicopter might have from flight to flight. If you make any changes to the helicopter, you can note how it affected the flight performance and use that for reference.

Perhaps the biggest reason to log your flights is - much like a full size aircraft - to see how much time you're spending in the air. It also allows you to pinpoint exactly how fast you're progressing. The nice thing about keeping a log is that a pilot can record whatever they want, as there is a never ending amount of data that can be recorded.. A popular means of flight logging is with electronic components such as an Eagle Tree data logger. This will allow you to see the different stresses your helicopter endures during flight. It is a very powerful tool that can help with the setup process.

DATE/TIME	MODEL	LOCATION	WEATHER	LENGTH	NOTES
1/18/10 11:31am	Align T-rex 450	Central park, NY	56° F Partly Cloudy	3 min 21 sec	Cold weather was hard on fingers... wear mittens
1/18/10 12:05pm	Align T-rex 450	Central Park, NY	62° F sunny	8 min 15 sec	Mittens helped especially with warmer noon-time temperature.
1/18/10 1:12pm	Align T-Rex 450	Central Park, NY	65° F sunny	7 min 32 sec	hot dog cart was delish, must eat there again! Guy was oddly friendly though.
2/15/10 3:29pm	TT Raptor 50	Sandy Beach, OR	72° F sunny + breezy	5 min 48 sec	Flight cut short due to crash. I need to learn how to fly better.

Here's an example of what your log might look like.



HOW TO LOG YOUR FLIGHTS

There are many different ways to log your flight depending on your data preference. The easiest way is to use Microsoft Excel. Excel is a very powerful tool and can be highly customized. There are also many flight log software online. Just search around and find one that suits you best. You can even blog your flights with your own website. I've known pilots who would chronicle each day they flew and established quite a following.

Logging isn't limited to just the computer. If you're old fashioned and don't get along with technology you can always use a notebook and pen. If you don't like using your computer, you can even log your flights on your cell phone. If you have a phone that supports applications (such as the iPhone) the folks at www.clevertangerine.com have developed an app that has all of the parameters needed for effective flight logging.

TYPES OF LOGS

- Microsoft Excel
- Microsoft Access Online logging applications (many to choose from)
- Internet blog site
- Phone applications
- Notebook and pen



CONCLUSION

Whatever method you choose to log your flights, establishing a good flight log will help you in the long run. It is also a nice way to see how well your flight skills are progressing. A log isn't an absolute necessity, but it never hurts to add another tool in the arsenal. **EDG**

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Hitec AURORA 9 2.4 GHz

Telemetry Equipped

WORDS: Chuck Bassani

I'M REASONABLY SURE I CAN SPEAK FOR MOST OF US WHEN I SAY "HITEC OFFERS SOME OUTSTANDING SERVOS TO COVER A WIDE RANGE OF HELICOPTER APPLICATIONS." On the other hand, I think their radio systems have never been truly considered 'mainstream' in the heli world. Could this radio change this?



Bling already installed.

At a casual glance, Hitec appears to have finally taken us helicopter users seriously. The Aurora 9 is extremely customizable, includes just about all of the 'must have' features we've been asking for, accommodates a wide array of power options, and supports telemetry (2-way communications). Most of all, the programming suite is quite impressive, and extremely intuitive. Best of all, it comes at a very attractive price.

But what about performance, does it cut the mustard? As usual, RC Heli Magazine is going to walk you through the Aurora 9 and subject it to our usual battery of tests. We'll give you the results of our performance measurements, our

overall impression of the system, and hopefully enough information for you to make a well educated call.

THE TRANSMITTER

"Does it hang level from a neck strap?" This question was asked by just about every one of the 'guys' when I told them I was going to be reviewing the Aurora 9. Personally, I would have asked about a dozen other questions before that one, but I guess many of you consider it pretty important. So, let me address that right away – the answer is, unfortunately, "no". I can't say this surprised me, considering the system is a module based design,

and as such it must also accommodate a 72 MHz RF module and the associated antenna length that comes along with it.

As long as I'm on that topic, let me diverge to a side note here. Using the optional Spectra Pro 72 MHz RF module, the Aurora 9 can transmit FM PPM (with selectable shift) and FM QPCM modulation schemes on any of that band's 50 available channels; with frequency scan and select capability.

Back to the 2.4 GHz review. The system ships with a 6-cell, 1300 mAh NiMH transmitter battery pack. Alternately, you can use NiCad and LiPo chemistry packs. A low voltage cut off is adjustable from 6.0 – 6.6V. This range

provides sufficient coverage for all battery types and insures the battery will not be damaged if TX power is accidentally left on.

The gimbals are completely ball bearing supported. I found them to be extremely smooth and precise. All four joystick control trims are digital. Six stick modes (1 - 4, and two 'custom') may be configured. Mode switching is easily performed by the user; and without opening the case! The 'ratcheting' for BOTH vertical sticks is adjustable from silky smooth through strong detents with just the turn of a screw. Centering spring tensions are also adjustable from the outside. Even the sticks themselves arrive 'pre-binged', with a nice red anodized finish.

Apart from the four 'stick' controls and their respective trims, the transmitter also sports six 2-position switches (one with a spring loaded return), two 3-position switches, two variable position side levers, and three additional digital trim type controls. I did find the spacing between the top switches to be rather close. Other than that, the transmitter had a very nice and high-quality feel to it.

Control assignment is extremely flexible, as each one of them (including the sticks and trims) can be freely assigned to any function. The functions to channel mappings are entirely customizable as well.

PROGRAMMING

The Aurora 9 is a 9-channel, 1024-step resolution system. Programming and viewing its operational status transpires through a very nice, backlit, 5.1" / 320 x 80 pixel, touch-screen LCD display. The firmware features programming for helicopters, airplanes, and gliders. Internally, it is capable of storing settings for up to 30 models; with the ability to tag each one with an up to 20 character name. Coming up with creative acronyms and abbreviations won't be necessary. A transfer feature gives you the ability to copy model settings across systems (through a trainer cable) and to/from a PC (through the HPP-22 PC interface).

The programming has a rather unique paradigm. When you select a model type, the system proceeds to prompt you with a series of questions. For example, when you select 'Heli', you're asked about the model's swashplate geometry, whether or not you'll be using a governor, mixture control, etc. The system then hides access to functions pertaining to questions for which you answered "no"; thus reducing menu clutter. Control/function/channel mapping get automatically configured to default settings. Plus, there'll be no need to disable unneeded flight conditions (modes); because by default you'll only get one (Normal). Additional flight conditions

INDEPENDENT SPECIFICATION VERIFICATION

HITEC SUPPLIED RECEIVER SPECIFICATIONS

OPTIMA 7

WEIGHT: 17.0 g / 0.60 oz
SIZE: 57.0 mm x 21.0 mm x 11.4 mm / 2.24" x 0.82" x 0.44"
CURRENT DRAIN: 190 mA (max)

MEASURED RECEIVER SPECIFICATIONS

OPTIMA 7 (SUPPLIED RECEIVER)

WEIGHT: 15.3 g (w/SPC jumper) / 0.54 oz
SIZE: 57.0 mm x 20.8 mm x 11.4 mm / 2.24" x 0.82" x 0.45"
CURRENT DRAIN: 85.0 mA (w/signal)

HITEC SUPPLIED TRANSMITTER SPECIFICATIONS

CURRENT DRAIN: 300 mA

MEASURED TRANSMITTER SPECIFICATIONS

CURRENT DRAIN: 146.5 mA (w/back-light off).
The supplied 1300 mAH battery pack will provide over 8 hours of operation (non-setup use w/back-light off).

Reminds me of an old watch I use to own.



may then be added as needed; up to eight total. Separate delays can be applied to each flight condition, which can be used to 'dampen' the transition from one condition to another. You may even re-name the conditions. While you're at it, you have the option of adding your 'most used' functions to a custom folder; further improving the efficiency of menu navigation.

Moving along to programming, you'll find the features common to all model types are end-point adjustments, dual rates & exponential, sub-trim, servo reversing, servo speed adjustments, and eight general purpose programmable mixes. Helicopter specific features include aileron-to-throttle, elevator-to-throttle, rudder-to-throttle, and revo compensation mixes, throttle cut, fuel mixture, needle control, gyro gain, and governor. In addition to those, I feel the following helicopter specific features deserve special mention:

SIX SWASH TYPES • 1-servo mCCPM and five eCCPM geometries; 3-servo 90°, 4-servo 90°, 3-servo 120°, 3-servo 140°, and 2-servo 180°

SWASH MIXING • Not only does it contain the usual Pitch/Aileron/Elevator travel adjustments, it also features an extremely flexible swash calibration function. Six separate 7-point correction curves are available for pitch, aileron, and elevator swash movement. Additionally, there's an acceleration adjustment to further fine-tune any swash tracking anomalies.

7-POINT PITCH/THROTTLE CURVES • Each curve has the ability to activate EXP to smooth out the inflection points on the curve as well as an option to factor in an adjustable acceleration.

During programming, you'll notice many of the features contain an option to configure it in a combined (C) or separate (S) manner. Combined, it allows the feature to have one setting that is tied to a flight condition. However, changing the setting to 'S' on a particular feature allows you to add additional 'switch selectable' settings. As an example, setting the dual rate feature to 'S' and assigning it to a 3-position switch can yield up to twenty four rates when all

eight flight conditions are enabled. This may sound confusing, but it opens up a vast array of programming flexibility.

You'll also find some nice feature tidbits in this system. Touch and hold the 'Model Type' icon on the home screen for two seconds while the radio is transmitting – it activates a 'Throttle Lock' feature. This will hold the throttle servo where it is until the feature is once again turned off by holding down the icon.

RECEIVERS

As of this writing, the receivers compatible with the 2.4 GHz Spectra RF module are the Optima 6, Optima 7, and Optima 9; which are 6, 7, and 9-channel receivers respectively.

A great feature of these receivers is their dual power capability. Not only can you power the receiver in the traditional manner (through the servo output bus), but you can optionally choose to power it using a separate SPC (Supplementary Power Connection) port. Doing so isolates the receiver power from the servo bus power. This is an extremely effective way to prevent receiver brown-outs from occurring. When powering through the servo output bus alone, you can use supply voltages ranging from 4.8v – 7.4v. When using the SPC port however, you can power the receiver using voltages ranging from 4.8v to 35.0v; although the servo port bus must still be powered from a separate 4.8v – 7.4v source.

NOTE: the voltage specifications for powering the servo port bus are nominal values. The receivers will support powering the bus with a fully charged 2S LiPo pack.

Receiver voltage telemetry comes standard in all three receivers. Essentially, the receiver's supply voltage is monitored and displayed on the transmitter's home screen. Furthermore, the transmitter's RF module features an audio alert that warns when the receiver's voltage falls below a set threshold. That threshold defaults to either 4.5v or 5.6v, depending on the voltage present when the receiver is turned on. This works well for 4 and 5-cell NiMH and NiCad packs. Using the HPP-22 PC interface, the module's low voltage threshold can be reprogrammed – which I

LATENCY AND PERFORMANCE

Measurements performed by John Kos

Latency and performance measurements were performed using the Aurora 9 TX with the included Spectra 2.4 GHz AFHSS transmitter module and the Optima 7 receiver.

LATENCY WAS IDENTICAL WITH BOTH 'NORMAL' AND 'ECCPM' SWASH MODES

■ CHANNEL 1

MINIMUM LATENCY: 41.4 mSec
MAXIMUM LATENCY: 62.6 mSec
AVERAGE LATENCY: 52.0 mSec

■ CHANNEL 2

MINIMUM LATENCY: 42.4 mSec
MAXIMUM LATENCY: 64.6 mSec
AVERAGE LATENCY: 53.5 mSec

■ CHANNEL 3

MINIMUM LATENCY: 43.4 mSec
MAXIMUM LATENCY: 66.6 mSec
AVERAGE LATENCY: 55.0 mSec

■ CHANNEL 6

MINIMUM LATENCY: 46.4 mSec
MAXIMUM LATENCY: 72.6 mSec
AVERAGE LATENCY: 59.5 mSec

Aileron and elevator input latencies also fall within these ranges, as per their respective channels. Enabling the swash calibration mixes did not affect the latency, nor did having any other mixes active or inhibited. Latency did, however, increase when displaying screens that contained graphics that update based on control inputs. For example, having the swash-to-throttle mix screen displayed resulted in a latency increase of almost 20 mSec.

The receiver's output pulse frame period is nominally 21.0 mSec, but is not stable; as it wanders between about 20.7 and 21.3 mSec. The channel outputs are sequential; therefore I recommend assigning the three swash functions to three adjacent channels (i.e. channels 1, 2, & 3). When doing this, eCCPM performance appears

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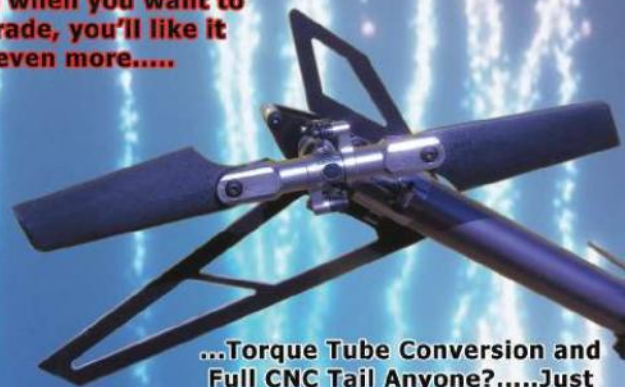
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to be good. Channel output positions were observed to transition completely within one frame.

Examining the data going between the transmitter and the RF module, we focused in on two of the signal lines; labeled 'PLL' and 'SIG'. With the Spectra 2.4 GHz module installed, the system does operate in a pure digital manner. The 'PLL' line was observed to pass digital data from the Aurora 9 to the module and the 'SIG' line passed digital telemetry data from the module to the Aurora 9. With the module removed, the Aurora 9 outputs a PPM signal on the 'SIG' line. As we didn't have the Spectra Pro FM module to test, we suspect it uses the digital data from the 'PLL' line when transmitting the QPCM modulation scheme and analog data from the 'SIG' line when transmitting in normal FM mode.

recommend doing if you choose to power the receiver with a LiPo pack. The built-in voltage telemetry is capable of reporting voltages up to 35.0v when using the SPC port. Another advantage to powering the receiver via the SPC in an electric model using the main flight battery is that the

voltage from this pack will be displayed on the screen, not the BEC voltage, thus enabling you to have the radio tell you when the pack gets to a critical level and it's time to land. The voltage reading on the transmitter screen was accurate to its 0.1v resolution when compared to a DVM.

The Optima 7 and Optima 9 receivers feature a Telemetry Sensor / System Port. Through this port you can update the receiver's firmware using the HPP-22 programmer or connect an optional external sensor station. The Optima 9 receiver also features an External Switch Port. In the event your receiver isn't easily accessible (as may be the case when installed in a scale fuselage); a remote Setup Switch can be connected.

The Hitec 2.4 GHz system utilizes an Adaptive Frequency Hopping Spread Spectrum (AFHSS) scheme. A unique feature of these receivers is their ability to be configured in 'Normal' and 'Scan' modes of operation. Upon initial setup of the system, the TX/RX will scan all 79 available 2.4 GHz channels in order to find the 20 'cleanest' frequencies. In 'Normal' mode (which, by the way, is the default), this sub-set of 20 channels are used during all subsequent sessions. The advantage of this mode is a quicker link-up between the TX/RX should the RX experience some sort of power interruption event. Also in this mode, the system is capable of re-linking should TX experience any interruption in power. 'Scan' mode on



Optima 7 (top) & Optima 9 (middle) receivers feature integrated RX voltage telemetry and support additional external on-board telemetry sensors. Even the Optima 6 (bottom) receiver features RX voltage telemetry.

the other hand performs the 79 channel scan every time the system is powered up, assuring it's always operating on the 20 cleanest channels. This mode is recommended during use in crowded 2.4 GHz environments; such as a large fun-fly. The downside however is that if the RX does experience a power interruption, the re-link process takes longer. And should the TX experience a power interruption

Chuck really did the testing on this radio.



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AURORA 9 2.4GHZ RADIO

when operating in 'Scan' mode, the system is incapable of re-linking without recycling power on both the TX and RX.

A robust 'Fail Safe' feature lets you program output positions on every channel. Should you decide not to use 'Fail Safe' – servo positions will be held for one second upon loss of signal. After that, all servo outputs will go limp. For this reason I highly recommend using Fail Safe. It's also important to note that should you happen to disable the Fail Safe feature after having programmed it; the stored failsafe positions are deleted and must be re-programmed.

TELEMETRY

As mentioned above, when using the Optima 7 and Optima 9 receivers, the system supports a suite of external telemetry sensors. In order to use any external sensors, you must purchase the optional telemetry Sensor Station. This is an interface device that plugs into the receiver and provides input ports for a variety of additional sensors. As of this writing, Hitec has announced sensors for RPM, temperature, fuel level, and GPS.

CUSTOMIZE

A much desired feature of new systems is firmware upgradability. I'm happy to report that the Aurora 9, the Spectra 2.4 GHz RF Module, and all the Optima receivers are

all firmware upgrade enabled.

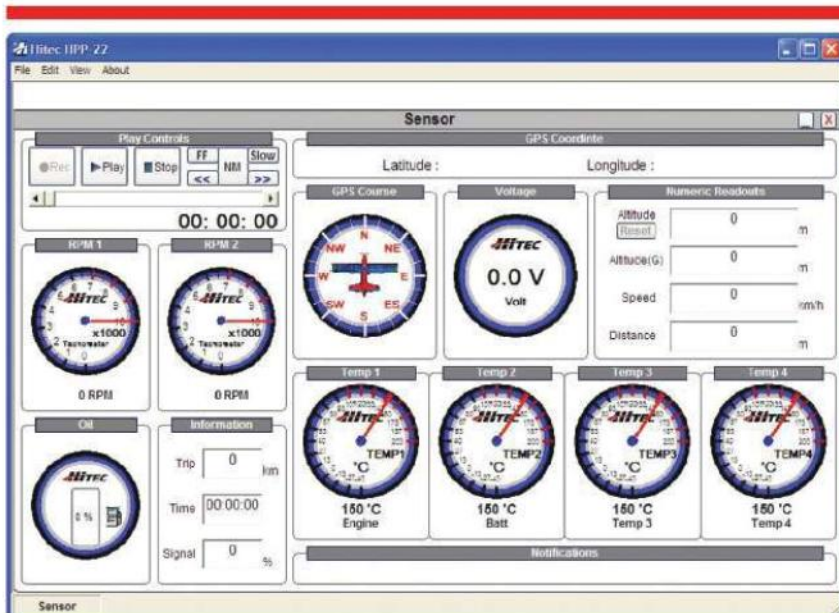
Firmware updates will be available directly from Hitec via their web-site. The HPP-22 PC Interface is required in order to install the updates. It connects any of the devices to be upgraded to your PC and provides the functionality necessary to write firmware images into the device's flash memory.

The HPP-22 is also used for customizing the units of measure (i.e. mph, km/h, knots) for the telemetry data, selecting which data is displayed, and editing alert thresholds such as the receiver's low voltage warning. In fact, the telemetry can be recorded and played back on a PC through the HPP-22. And if you happen to record with the GPS sensor on board, the software can overlay your model's flight path over a 3D Google Map display.

INSTALLATION AND TEST FLIGHTS

Although not really a big deal, you should be cognizant of the fact that the Optima 7 receiver has servo outputs on two sides. I needed to re-route some servo leads in order to accommodate that configuration.

For testing, I thought it would be interesting to put the Aurora 9 up against one of today's high performance sets. So I called up a good friend of mine, who just happens to be one of the top 3D



A screen shot of the HPP-22's PC software's sensor display.

pilots in the US.

I decided to re-fit my TRex 600N with a set of JR DS8717 servos on swash in order to identically configure (sans receiver of course) his heli and mine. For a frame of reference he currently flies his TRex 600N with a Spektrum DX7se; one of the lowest latency sets available today. The plan is to have him setup my heli with the Aurora 9 and then fly the two machines back-to-back. This will give us a 'real feel' for whether or not the relatively high latency of the Aurora 9 has any impact on performance.

On the day of the flight tests, I handed over my heli and the Aurora 9 over and told him to "do his thing". My poor TRex was never so abused. After the flight, I asked for his comments. Keep in mind, that he was not privy to our latency measurements before the test.

He said "the radio felt great in my hands, but the switch spacing on top was a concern." "The control linearity was excellent." "Hovering and aerobatics were very smooth, but there was a somewhat noticeable lag during very fast control movements" "Over time though, I think one would probably be able to mentally compensate for the delay." With my more average piloting skills I personally was unable to detect any sort of lag in response during my admittedly more sedate routine.

CONCLUSION

Overall, the Aurora 9 has had a very positive impact on me. Hitec didn't simply choose to follow the leaders, but has, in fact taken a novel approach to radio system design and has released a very impressive product. When it comes to features and price this thing is a TEN. However, considering this is a new system, expectation leans towards better latency and higher resolution. Perhaps one or both of these can be addressed in future firmware updates? Prior to publishing this article, I did contact Hitec to discuss our latency findings with them. Admirably, they accepted our findings as 'constructive criticism' and were told our data would be conveyed to their engineers. Well done Hitec. The new Aurora 9 is by far the best radio offering

from Hitec to date and rivals the features and quality of any radio I've tested. The ability to receive telemetric information is also a huge plus for those interested in this sort of data. Again, very solid radio from Hitec! **TRU**



+ THE GOOD

- Tremendous value
- Innovative and extremely robust programming capability
- Highly customizable
- Telemetry
- Transmitter, RF module, and receivers are all firmware upgradeable
- Two Year Warranty

- THE BAD

- Unimpressive latency
- 1024-step resolution

CONNECT

MANUFACTURER:	Hitec
WEBSITE:	www.hitecrd.com
PART NUMBER:	191244
STREET PRICES:	\$429.99 Aurora 9 TX w/Optima 7 Receiver

OPTIONAL COMPONENTS

- **AURORA 9 TX W/OPTIMA 9 RECEIVER & (4) HS-5485HB SERVOS** - #191240, \$529.99
- **AURORA 9 TX W/OPTIMA 9 RECEIVER** - #191242, \$459.99
- **OPTIMA 6 RECEIVER** - # 28410, \$49.99
- **OPTIMA 7 RECEIVER** - # 28414, \$69.99
- **OPTIMA 9 RECEIVER** - # 28425, \$99.99
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Runtime Games PHOENIX SIMULATOR 2.5

V2.5

WORDS: Brandon Uptike



RUNTIME GAMES PHOENIX FLIGHT SIMULATOR HAS ARGUABLY BECOME THE MOST POPULAR CHOICE FOR FLIGHT SIMULATORS since its release a few years back. With an affordable price tag mixed with free updates directly from Runtime, Phoenix proved to be a real winner. Now Phoenix is back with its most current update, version 2.5. Phoenix is now also distributed by Horizon Hobby, boosting already great support. Thanks to a partnership with Horizon, Phoenix is now available with a fully functional Spektrum DX5Se transmitter.

FEATURES

Having never used the Phoenix Simulator before, I was excited to see what all the hype was about. Version 2.5 comes in a large box since it now houses the 2.4 GHz DX5e transmitter. The DX5e can also be used with compatible Bind-N-Fly helicopters or many airplanes. The simulator itself comes on a single DVD and the USB interface wire is included. We were supplied with the wire obviously suited for JR/Spektrum radios with the DSC connector. There is also a manual for the transmitter. Phoenix boasts physics that had input from several great former champions, so I was eager to put it to the test.

SPECIFICATIONS

Phoenix has always been known for low computer hardware requirements, and this time around it is no different. Phoenix has an easily attainable list of minimum requirements:

- Microsoft Windows 2000/XP/Vista/Windows 7 (all editions)
- 1.0 Ghz Pentium 3/4 or AMD Athlon/64 compatible processor

- 256MB system memory (RAM)
- 1.5 GB free, uncompressed hard-disk space*
- ATI Radeon 9800/NVidia Geforce Ti4200 with at least 128MB memory
- Microsoft DirectX 9.0c or higher*
- DVD-ROM Drive for installation
- 1 free USB 1.1/2.0 port
- 100% DirectX 9 compatible sound card (optional)

This list allows Phoenix to be ran on a wide variety of computers. Another thing about Phoenix is that it can also be run on an Intel-based Mac with the use of a program like Bootcamp. Version 2.5 is also Windows 7 compatible for anyone who just made the jump to the new operating system.

INSTALLATION/ TESTING

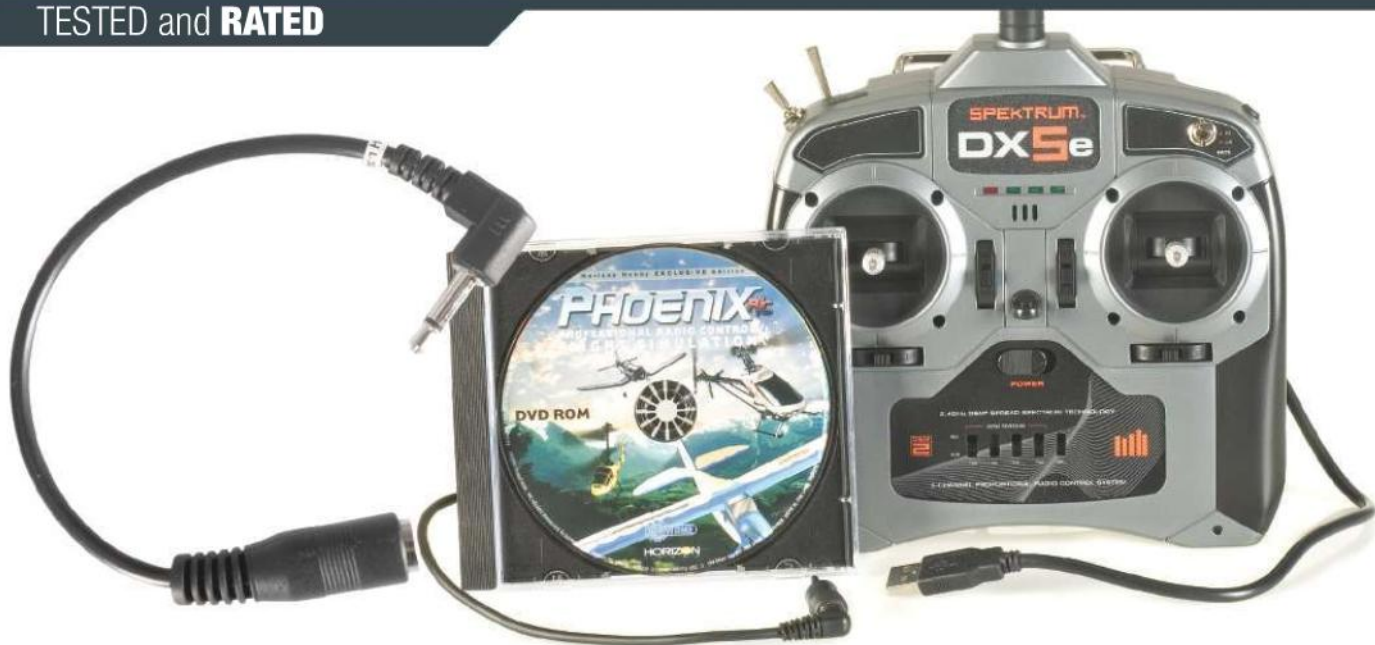
After removing all the contents from the box, I proceeded to pop the DVD into the disc drive. The system I used for testing is the same one I used for my last simulator scope, a 3.0Ghz AMD 6000+ dual core CPU, 2GB of ram, and an ATI Radeon HD4850 video card. I also tested it on a lower level laptop with an integrated graphics chip to see how well the simulator

responded to a lower level system. The installation went flawless and quickly.

After the basic installation, I was then directed to the radio calibration menus. For the DX5e, you have to use an adapter to plug it into the DSC port. I quickly realized how uncomfortable this was because the adapter was on the side of the radio rather than the back. As such, the adapter and wire are in the way of your hand, making holding the radio a bit uncomfortable. Horizon is now offering an improved adapter to anyone who purchased the simulator and will start including it in the new products. The new adapter allows the transmitter to be held much easier and is less noticeable than the original version.

After calibrating the transmitter, I did a quick test with an airplane. Right when the airplane loaded, an update prompt came onto the screen so I updated to the latest version. The thing I liked about this process was that it updated on its own without closing the program, so I was able to continue flying. This was a very nice touch that I really appreciated.

After this, it was time to load the helicopter. I choose the TREX 700 to fly first. I immediately noticed that it flew quite well in stock form but was a little off from



The adapter works much better!

what I wanted. Anyone who knows me knows that I don't like how any simulator helicopter flies in stock form and that I do quite a bit of tweaking. I tested out the editing features to see how extensive they were. It had all the basic features that I expect to see and some other features that I really haven't seen before. The main thing I look for when tweaking a helicopter is to see if it is a solid platform to improve on. Many of the performance helicopters in Phoenix 2.5 are great platforms to work with and perfect.

After some quick tweaking, I got the TREX where I wanted and played with some of the other helicopters. There is a great list of helicopters to choose from; most of the major manufacturers are represented and helis range from micro to all out 3D and scale helicopters. This simulator gave me the impression that it is truly geared towards the helicopter side of things. I also liked the fact that you can beef up the toughness of the landing gear in the editing features. I found myself constantly breaking the gear even on the softest hits so I toughened it up a bit and the problem was solved. Big moves were fun to pull off as the helicopters tracked well and the collective intensive maneuvers had a lot of pop. The tail held very well on all the helicopters and there wasn't any blowing out and pirouette performance was consistent.

Phoenix 2.5 comes with a lot of neat training features that can help anyone progress through the beginning stages. There are virtual flight instructors and

other tools to help you hover and work on basic flying concepts. There are also fun mini games such as balloon bursting and streamer combat. Eventually, I switched to my main radio - a JR X9303 - for a more comfortable feel and additional tweaking abilities through the transmitter. I played with the airplanes a little bit and didn't really like the way they felt. The sound wasn't that impressive because it sounds similar throughout all areas of the field giving you a false sense of perception. I've spoken with people that were unhappy about the blade discs in past versions, and the rotor disks are still quite visible but this is now adjustable. Everything ran well on my setup, as I was able to get around 200fps with everything completely maxed out. I'm not a big online flyer, but I played with it a little bit and it was a smooth process. You also have the ability to scuff the blades on the ground, I like this addition.

CONCLUSION

After playing with Phoenix, I can finally see why everyone likes it so much. The physics are great and it looks really good. There are over 100 aircraft to fly and a ton of fields to choose from. The price is right and now that it is bundled with a full functioning radio it will be even more beginner friendly. It is priced well at \$179 with the transmitter and \$129 without. Anyone who has bought Phoenix in the past most likely has upgraded to the new 2.5 free of charge. Overall, this is one of the best all- around

simulators on the market. I've flown most simulators and each of them has their own feel; picking the right one really comes down to preference. Good luck and have fun practicing. **[THL]**



THE GOOD

- Great physics
- Nice looking visuals
- Extensive editing features
- Available with functioning DX5e transmitter.

THE BAD

- Uncomfortable feel on stock DX5e because of the connection placement.
- The sound is misleading

CONNECT

MANUFACTURER:	Runtime Games
WEBSITE:	www.phoenix-sim.com
PART NUMBER:	RTM2500
STREET PRICE:	\$174 with Transmitter \$129 without Transmitter

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WORDS: Ryan Kephart

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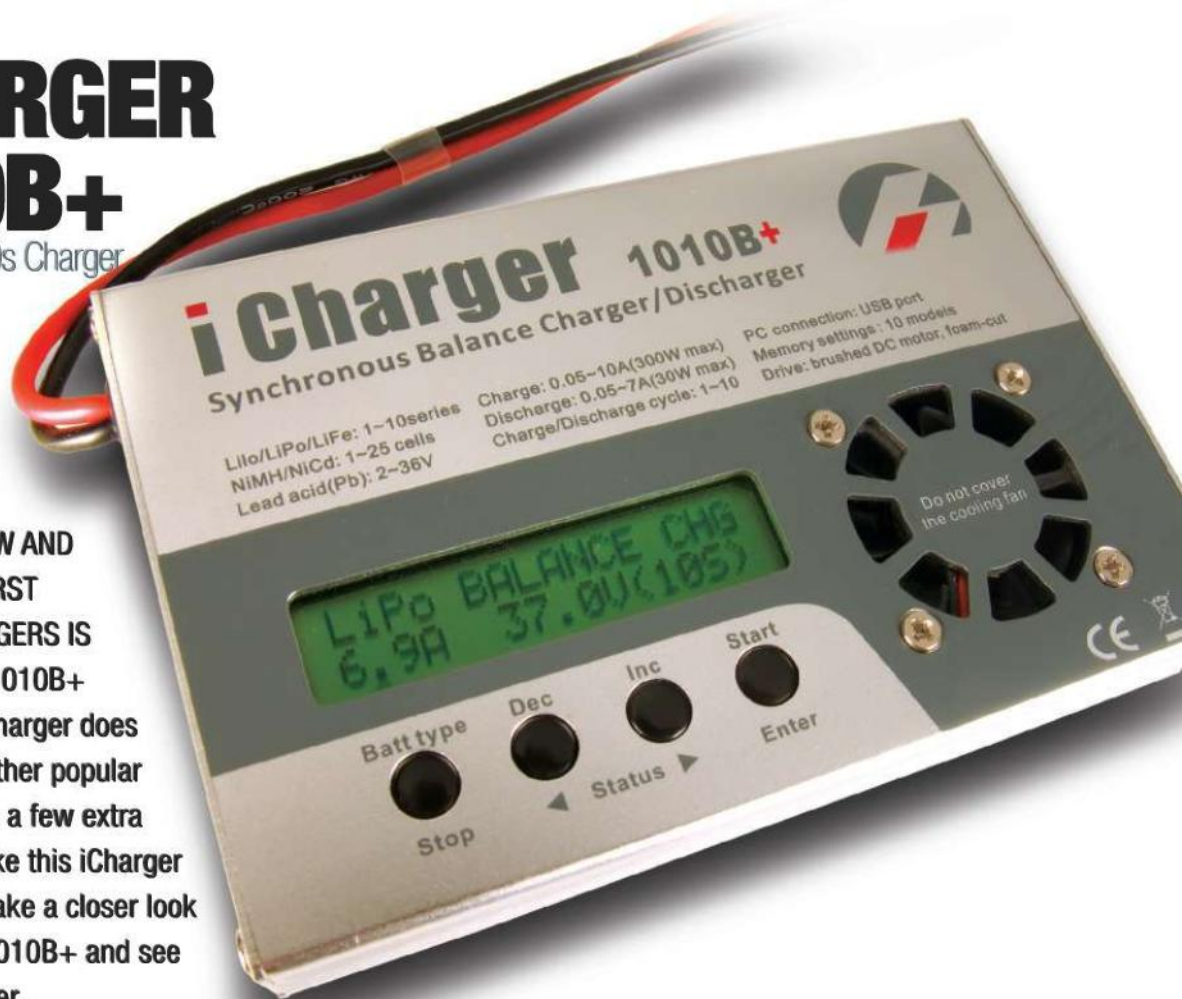
chargers do, plus a few extra

features that make this iCharger

stand out. Let's take a closer look

at the iCharger 1010B+ and see

what it has to offer.



FEATURES

The iCharger 1010 is packed with tons of features to make your modeling experience a positive one. If you are into electric helicopters, planes, and cars you will find that the 1010 will provide you with all the functions necessary to fulfill your needs.

The iCharger 1010B+ features dual power input points, allowing you to plug your charger directly into a power supply or use the included spring clamps to connect to your car battery. A basic output charge lead is included with alligator clips. The iCharger can charge multiple battery types and configurations, allowing you to charge up to a 10-cell lithium pack, or up to a 25-cell NiCd or NiMH pack. In addition to charging LiPo, Lilo, LiFe, NiCd, and NiMH chemistries, the iCharger can also charge lead acid

style batteries which are commonly used in flight boxes.

The iCharger has a fully integrated balancer that can balance alone or be used in conjunction with the charging function. Multiple battery configurations can be used with the included battery adapter, which allows you to perfectly balance - for example - two 5S packs at the same time. Protek has also included a temperature probe to monitor battery temperature and shut down if the temperature exceeds normal charging limits. Along with the external temperature sensor, the iCharger has a built in internal temperature probe. This allows the charger to use a built-in fan that turns on when the temperature rises too high.

With today's RC pilots owning more and more models, the iCharger includes a multi battery memory to keep track of

battery packs for different models. This allows you to quickly select the charge rate and battery type for each model. The iCharger even includes an electric motor testing mode for brushed motors. This mode allows you to break in electric motors, check performance, and check tolerances.

Have you ever wanted to make your own foam plane? The iCharger includes a convenient power supply for a wire foam cutter. The iCharger even has the ability to be connected to your computer and display the charge and discharge data. All of these features are packaged in a nice aluminum case with a backlit display that can show two lines of 16 characters.

TESTING

We tested the iCharger on several power sources including a car battery, and a



Additional types of balance adapters are available including: TP, standard, and Polyquest.

23-amp Protek P350 power supply from Progressive RC. The charger has a wide range of input voltages, allowing us to connect the charger to a car battery even with the car running. (This is important, as charging multiple packs on the car can drain the battery enough to prevent your car from starting.) The iCharger 1010B+ worked flawlessly while charging all cell types and number of cells.

I also tested the safety features to make sure that all was in working order. I grabbed a LiPo pack that was way out of balance and the charger didn't skip a beat detecting the cell and immediately shutting off the charger due to an over voltage in a single cell. I also tested the external temperature probe by heating the probe with a lighter. As soon as the probe recognized the high temperature,

the charger shut off and sounded an alarm indicating that the battery temperature was over the normal range. I also was able to test out the foam cutting function and the brushed motor driver. These functions proved to work well and provided extra value to an already great charger.

CONCLUSION

The Protek iCharger is a great little charger. The charger is durable as a result of its aluminum case and the display is very easily read, even in dark conditions. The ability to charge and balance two separate batteries simultaneously and have them perfectly balance makes owning a larger helicopter easier. **THL**

SPECS

- **INPUT VOLTAGE RANGE:** 10.0 – 18.0VDC
- **CHARGE CURRENT RANGE:** 0.05 – 10.0A
- **DISCHARGE CURRENT RANGE:** 0.05– 7.0A
- **MAXIMUM CHARGE POWER CAPACITY:** 300W @ Input voltage > 13.5V
- **MAXIMUM DISCHARGE POWER CAPACITY:** 30W Maximum internal
- **DISCHARGE POWER CAPACITY:** 280W @ 40V/7A
- **CURRENT DRAIN FOR BALANCING:** <300mA
- **BALANCE ACCURACY:** <10mV
- **LITHIUM (LIPO/LIIO/LIFE) BATTERY CELL COUNT:** 1 – 10 Series (In non-balance mode, expand LiFe to 12s)
- **NICD/NIMH BATTERY CELL COUNT:** 1 – 25 series
- **PB BATTERY CELL COUNT:** 1 – 18 series (2 –36V)
- **BATTERY SETUP MEMORIES:** 10
- **INTELLIGENT TEMPERATURE CONTROL:** Yes
- **PC CONNECT:** USB port
- **WEIGHT:** 410g
- **DIMENSIONS (L X W X D):** 143X97X26mm 5.63"X3.82"X1.02"



+ THE GOOD

- Backlit display
- Can charge several batteries in series
- Extra functions not commonly seen on a charger

- THE BAD

- Only includes up to a 6S adapter
- No LiPo save function

CONNECT

DISTRIBUTOR:	AMainHobbies
WEBSITE:	www.ainhobbies.com
PART NUMBER:	PTK-1010B+
STREET PRICE:	\$179.99

Pilots want features, and this charger is fully loaded.



Peter Brady knows all about change.

SETUP TIPS FOR CHANGING CONDITIONS

When it's time to change, you've got to rearrange.

WORDS: Jim Innes | PHOTOS: Jason Boulanger

THOSE OF US ADDICTED TO FLYING MODEL HELIS UNDERSTAND THAT THERE ARE FEW THINGS THAT CAN STOP US FROM GETTING OUR FIX. We fly in all types of weather, we take our helicopters with us on vacation, we even sometimes plan a vacation around a certain event or funfly. Due to this obsession, we often find ourselves flying in a broad range of temperatures and altitudes. Certain adjustments can help our models fly to their fullest regardless of the venue or time of year.

» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

1.0 **RC-Heli**

» TIME TO COMPLETE

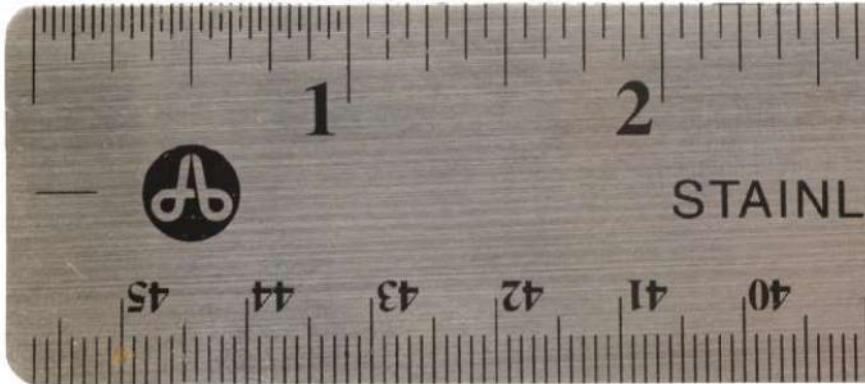
15 Minutes

» TOOLS NEEDED

- BASIC WRENCHES
- TRI-FLOW OIL
- BALL LINK SIZER

LITTLE VARIABLES

Each of the condition changes caused by varying weather and altitude are fairly small. In and of themselves, they don't affect a great change on how the model flies. It is the accumulation of all the small changes that can have a noticeable effect on the model.



Just like the individual ticks on a ruler, the minute changes caused by temperature changes are fairly insignificant until they are combined together.

TEMPERATURE CHANGES

The most common natural change most helicopter pilots encounter is the weather. While some "magic" places maintain a pretty regular temperature throughout the year, most of us encounter seasons and pretty drastic changes in the weather. As you encounter temperature changes, some minor adjustments are needed to make a helicopter fly as expected.

Most of our models are set up in the warm weather of summer, as well as the warmth of the workshop. So most commonly, we need to make an adjustment when things get cold. The following are things to watch for when winter sets in:

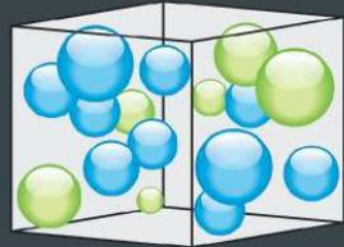
BOLT TIGHTNESS • Cold weather can cause parts of a helicopter to contract or shrink slightly. It is important that all bolts are checked and re-tightened when you get into the cold.



Though you should be checking bolts as part of a regular pre-flight, it is especially important that they be checked whenever the heli is moved from a warm place to a cold environment.

AIR DENSITY

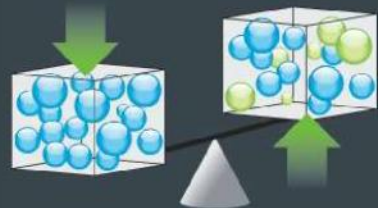
Air is composed of several molecules; nitrogen, oxygen, carbon dioxide, argon, hydrogen, helium, neon, krypton, and water vapor. The ratio of mass of those molecules per a given volume is air density. As air temperature, humidity and altitude change the density of air also changes.



Air density is the ratio of combined masses of the Molecules for a given volume

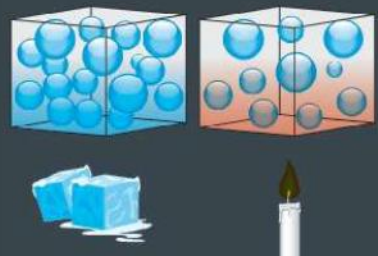
HUMIDITY

Humidity is water vapor entrained in air. The molecular weight of water vapor is less than air and when the water vapor displaces heavier molecules such as oxygen it causes the air density to decrease.



TEMPERATURE

With increased temperature you get a corresponding increase in molecular motion. More heat = more agitated particles that need more space. With each molecule needing more space the density decreases.



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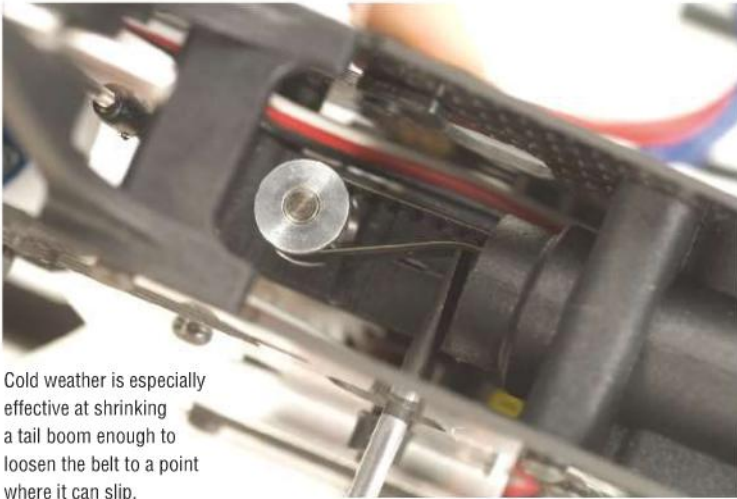
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BELTS • any model that runs a belt driven tail needs that belt checked in the cold. The contraction of a cold boom can loosen a belt significantly.



Cold weather is especially effective at shrinking a tail boom enough to loosen the belt to a point where it can slip.

ENGINE • if you run an internal combustion engine you will need to re-tune it in the cold months. This is mostly due to the colder air being more dense than hot summer air. Despite what common logic tells you, you usually need to richen the needle mixture in the winter instead of leaning it out, the denser air requires more fuel to burn at the proper mixture. Always remember that the mixture needle is NOT a temperature control. Too many people make the mistake of tuning to a certain temperature. You should never tune to temperature.

BATTERY CARE • All batteries will run less effectively in the cold, but LiPos are by far the most susceptible. If you use a LiPo in your helicopter, it's important that the battery pack be kept "warm", at least at room temperature, until right before it is time to fly. Flight times may also need to be reduced a little to make up for less efficient cold battery packs. Keep in mind that receiver battery packs will also need more frequent checking and you can expect less flights out of a charge in the cold.



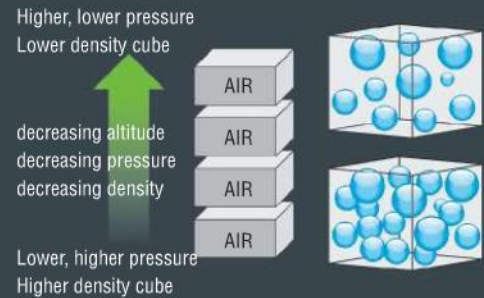
Lithium-polymer batteries are especially sensitive to cold temperatures. For best performance, keep them at room temperature right up until they are used.

BALL LINKS • This one is often overlooked, though it can have a huge effect on winter flying. If the ball links on your model are somewhat tight in the summer, they will tighten up more in the winter. I have seen ball links tighten up so much that the helicopter in question had a hard time returning to center and required constant, little inputs to correct attitude. Resize the links so that they are not tight.

The above list covers the most common adjustments needed when moving from warm to cool temperatures. Of course, as you transition from winter to summer you should recheck fasteners, ball links, belt tension, and engine tuning and adjust back as needed.

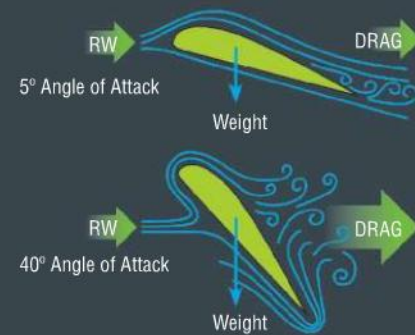
ALTITUDE

Imagine a vertical column of air as cubes stacked one on top of the other from the surface of the earth to space. Because of gravity the cubes at the bottom feel greater pressure from the cubes stacked on top. Just like the cubes the pressure felt by the column of air at lower altitudes allows more and more air molecules to be squeezed in a given volume increasing air density and conversely the higher the altitude the lower the pressure and corresponding air density.



DENSITY AND PERFORMANCE

To generate rotor thrust air mass must be accelerated. The heavier the air volume accelerated the greater the force achieved. If air is less dense then more air volume needs to be pumped to achieve the same amount of thrust. More air volume requires higher pitch settings causing more drag and decreased performance. Also with lower air density less oxygen is available for burning fuel at a given mixture setting, resulting in less power available from gas motors. The combination of lower power available and reduced thrust from the rotor is a compounding effect that greatly reduces performance.



Higher Pitch Angles are Required to Produce the same amount of thrust at low air density Causing higher drag forces and the blades will stall sooner

BEST CONDITIONS

The ideal atmosphere for flying is one that has the highest air density. Cool temperatures, low altitudes, and dry climates contribute to higher air density resulting in better flight performance and high altitudes, high temperature, and high humidity reduces performance.

Quick temperature changes can effect the gyro.

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ALTITUDE CHANGES

Unless you fly from a moving full size aircraft (not recommended) you probably don't change relative altitude that often during a flight. You would most commonly find yourself flying in different altitudes if you travel to funflys or take your helicopter with you on trips. There are some things to note when you find yourself flying in a new location that is drastically higher or lower in elevation than you are accustomed to.

The general rule of thumb is that lower altitude is better for helicopter performance. The reason for this is simply air density. At or near sea level the air is dense, allowing more air and fuel to be burned in a nitro engine as well as thicker air for rotor blades to bite into during flight. Those of you who fly at sea level are able to get the most from your models and may even find that you can fly just fine using low-nitro fuels as well.

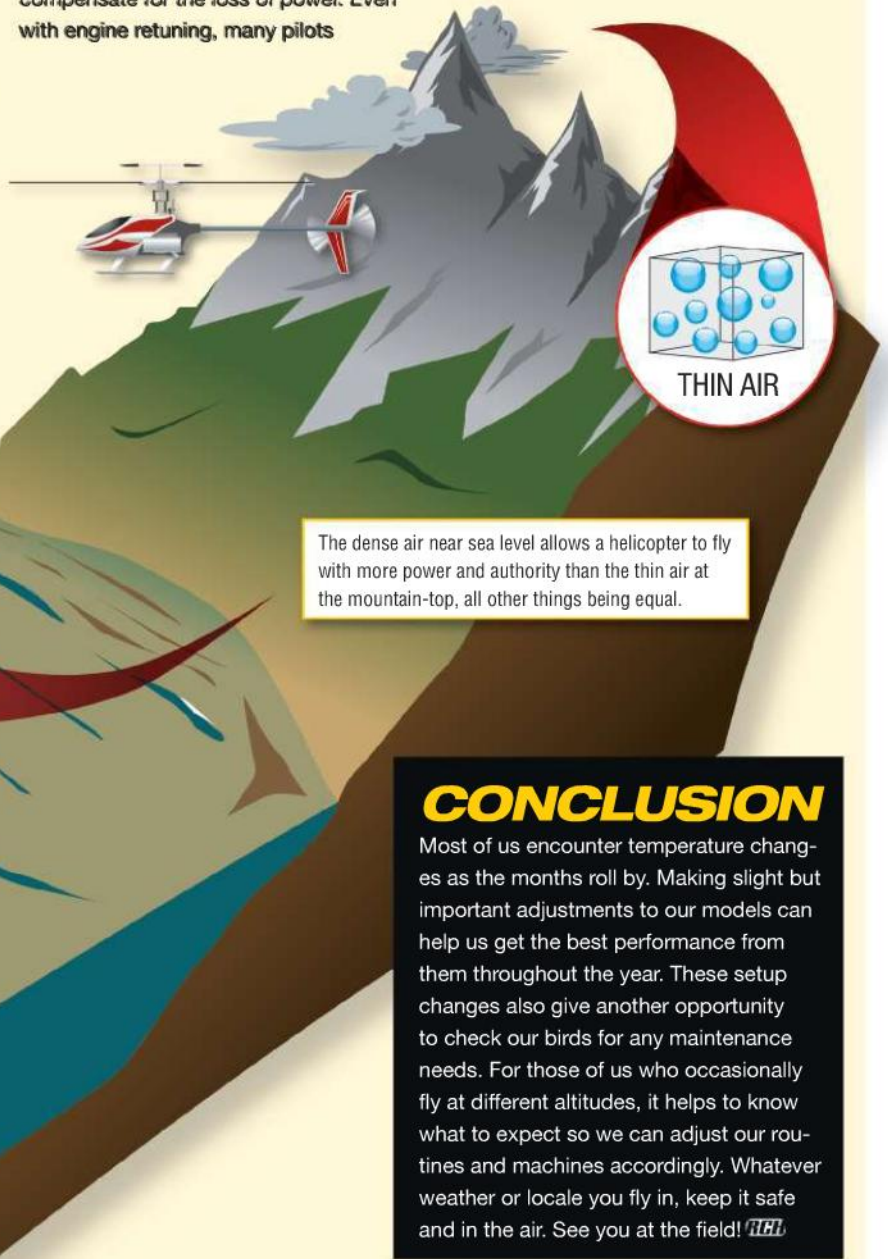
Those of us in higher altitudes have to deal with thinner air (especially noticeable in the warm months). This

means that we must run leaner fuel input to match the air density, resulting in less power output. Added to that, the thinner air equals less lift from the rotor blades. Running higher head speeds, increasing pitch, high nitro fuel, and of course learning stick management compensates for the thinner air.

Pilots that reside near sea level often gain altitude during funflys and trips. They usually just retune the engine and fly, though sometimes they may temporarily run a higher nitro fuel to compensate for the loss of power. Even with engine retuning, many pilots

notice the thinner air, I have heard many pilots comment on the "lack of power" when flying at higher altitudes. The best thing a pilot can do at higher elevations is manage control inputs accordingly.

Those of us accustomed to higher altitudes have the advantage when we get to fly at a lower elevation. After retuning the engine for the denser air, our helis gain more power and our rotors find more bite. However, learning to handle the added power can be considered an adjustment as well



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SHOOTING RC HELICOPTER VIDEOS

Lights, Camera... ACTION!

WORDS: Derek Threatt | PHOTOS: Carl Hyndman

FOR THOSE OF YOU WHO HAVE ACCESS TO THE INTERNET AND YOUTUBE, I'm sure that you have seen my RC helicopter videos (www.rcheliresource.com). I won't say that I am one of the best in the industry, but I would say that some of my videos are the most popular around. In this article I'm going to share some of my experience so that you too can make great RC helicopter videos and post them on your website, Facebook, or YouTube and share your experience in



Who doesn't have access to the internet and Youtube?

» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

5.0

RC-Heli



EQUIPMENT STANDARDS

There are a lot of cameras out there nowadays. You could use anything from a basic camera phone to an high-end television camera. The options are endless. Most people doing this could do very well with a camera in the under \$1,000 range. SD resolution is pretty much fading away, making HD the standard. In order to do great videos, I would at least recommend a camera that can shoot in 720 HD mode (1280x720).

There are a variety of devices that you can use to take video ranging from digital cameras, iPods, and cell phones to low budget consumer and high-end prosumer camcorders. The only limit is your wallet.





THE THREE MOST IMPORTANT FEATURES YOU'LL WANT WHEN LOOKING FOR A VIDEO CAMERA TO SHOOT RC HELICOPTER VIDEOS ARE AS FOLLOWS:

1. MANUAL EXPOSURE/IRIS: This function determines how much light gets in to the camera when shooting. When moving from below to above the horizon, the camera AUTO exposure will go from light to dark, causing too dark a picture when pointed at the sky and too light a picture when below the horizon. A sunny day will help with this when using AUTO mode, but on an overcast or cloudy day the helicopter will just be a shadow. I usually set my camera around f/4 in manual mode.

2. MANUAL SHUTTER: This function determines how long the shutter will be open to take a single frame of video. The

shorter the time, the less light is let in to the camera lens. This is almost the same as the manual exposure or iris, except it's just for one frame of video.

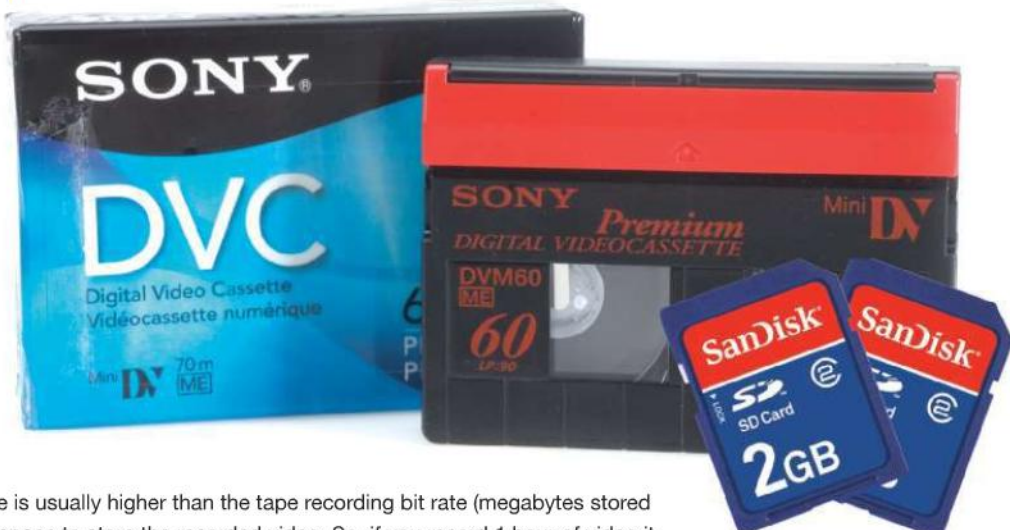
If the shutter time is too fast (over 1/100) the blades will be stopped for each frame, giving you the pinwheel type of video you see on cell phone camera videos (because they do not have an iris they use the electronic shutter to determine exposure). In order for the video to show a disk instead of stuttering blades, the shutter should be set to 1/60th or less. If you set it too slow, however, the video will be not as sharp. I usually aim for 1/60th.

3. MANUAL FOCUS: This is one of the most important factors in choosing a camera. If you want to have the ability to zoom in during flight, a camera with auto focus only will never be able to keep up with all the movement. Infinity manual focus is the only way to shoot fast action sports. Auto focus could only be used if you never zoom in or you are shooting just hovering or scale type helicopters.

Other features to consider are 30p and 60p frame rates are much better than 24p. 24p is very choppy for fast 3D flying. A microphone with an electronic wind screen is a good feature to keep out the blowing wind sound.

TAPE VS. FLASH

There are two standards in the industry. Flash (fully digital) format and Tape (still digital but on a analog style tape). Both mediums support HD and SD format. Tape, in my opinion, offers a better archival format and is cheaper. Tape cost about \$10 per hour to shoot. Flash cards have come down in price, especially the SD card format - the costs are about the same as tape. While the flash cards can be reused over and over, tape usually is used just once; however, it can be erased and reused with little or no loss in quality. When using tape, it helps to use the full tapes as an archive. My main problem with the flash format is that the recording bit rate is usually higher than the tape recording bit rate (megabytes stored per minute), so you need lots of hard drive space to store the recorded video. So, if you record 1 hour of video it will take 1 hour to export it. With flash, you can use a card reader and export the recording. It takes much less time - usually 5-15 minutes per hour of video - and is usually immediately editable.



TRIPODS VS. HANDHELD

I usually shoot with a tripod. The reason is that sometimes I shoot for 6-8 hours per day and it's impossible for me to hold a camera for this length of time comfortably. Another reason is that on a tripod, the panning and tilting are much smoother, but because of the tripod damping it's sometimes hard to keep up with the helicopters. I only use handheld for 450 size helicopters or smaller but it's really a user preference. The tripod video will look a lot more professional than handheld, but may not be as agile when shooting close-in hardcore 3D.



Larger cameras are better used on tripods because of their weight alone. But if you do decide to go handheld, be sure to use both hands, tuck in your elbows and use your body to track the helicopter. This will give you a smooth and steady shot.

Among other talents, Dave is our in-house video guy.

CAMERA POSITION

The best camera and pilot position is with your back to the sun and pilot in front of you and the helicopter in front of the pilot. This is the position that gives you the best light, the least interference to the pilot, and the safest location in case of accidental crash. Helicopters move quick, be aware of your surroundings should you need to flee an out of control helicopter coming your way.



TRACKING THE HELICOPTER

When tracking the models, wider shots are easier to follow because you have a greater margin of error when the helicopter suddenly changes direction; you have more time to react and change the camera position. Wide shots, however, will also get very small when the model is doing big sky and high autos. Tight shot zooms get difficult when shooting from a distance because small movements appear very large at full telephoto, causing over controlling of the camera and loss of the model. To recompose, you must go wide and then find the heli in the sky. Sometimes it's easier to follow nitro helicopters because you can just follow the smoke trails.

COMPOSITION

When I am composing my video shot, I like to vary the field of view, getting both tight shots and wide shots. When shooting handheld or with a tripod it's important that you keep the camera level...not tipping the camera side to side (called dutching). Shooting too many tight shots will not give a user a sense on the speed and altitude of the helicopter because it will be the only object in the frame. Shooting too many wide shots will not allow the viewer to see the detail of the model. A good mix between the two is about 60 percent wide and 40 percent tight.



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



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3. Eric Weber



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1. Dominik Hägele 2. Duncan Osbourn
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EDITING

There are lots of ways to edit the videos and we can't go into great detail about it all in this article, but most people just shoot entire flights with a simple title at the beginning. Most people on PC/Windows use Windows Movie Maker which does a great job of doing basic editing. If you want something more advanced on the PC you might want to try something like Sony Vegas or Adobe Premier. On a Mac the basic level editor would be iMovie and the advanced editor would be Adobe Premier or Final Cut Pro. With all of these editors, you import your video and put it on what's called a timeline. Once the movie is on the timeline you can then cut out the parts you don't want and keep what you do want. Then you would add your titles, maybe some music, fade-in and fade-out and then you are done with the basic edit.



COMPRESSING

Compressing is one of the most important parts of the whole process, because this is where a great video can be destroyed. The most important aspects of compressing are resolution, bit rate, and codec.

Compressing is done after the edit. From the editing program I always export at full resolution and then do my compression outside of the editing program. The reason is because I usually use two computers; a slower computer for editing and a faster computer to do the compression. The reason I do that is so I can continue to edit while compression is being processed.

On the PC/Windows side, most people use Windows Media format (wmv) for compressing videos. Its a free compression codec and can be downloaded for free from the Microsoft website. Most of the video editing programs have this compression codec built in and there is no need to download it. When exporting the video you'll want to set your RESOLUTION/SIZE export settings for 1280x720 resolution for HD and 768x576 for SD (DVD quality). On Windows Movie Maker you will choose the

«more settings» option and then «Windows Media HD 720p.» You can choose the 1080p setting as well, but 720 will play back smoother on older computers. Adobe Premier and Sony Vegas should have similar presets to export as well.

On a Mac using iMovie, Final Cut, or Quicktime Player, you can export using the H.264 CODEC which is one of the highest quality compression formats right now. In iMovie it allows you to compress and upload directly to your YouTube account in SD (DVD Quality) and HD formats. This is the easiest process on the Mac. If you want to export a full resolution file from Final Cut or Adobe Premier and compress in QuickTime, you can use the File->Export To Web function and choose the «Desktop» format for a quick low-resolution export. This, however, will only be at 1.5 Mbps bit rate. I recommend staying above 2.5Mbps. Optimal is 5Mbps. To compress at a higher bit rate use the File->Export menu and choose «Movie to QuickTime Movie», then export. This should give you the optimal setting automatically.

UPLOADING AND PUBLISHING

The most popular place to upload your videos today is YouTube. However, there are many other video sharing sites that you can utilize. If you have your own website you can upload using an FTP program the same way you upload pictures and webpages. However, hosting video on your own website can place a tremendous load on the website servers and may end up costing your extra money if the video is downloaded frequently. Using a video sharing site is usually the best practice.

I hope this small tutorial on making RC helicopter videos will help you produce great videos that you will want to share with the rest of the hobby. **TFL**



Here you can compare a sample of the same frame of video. The properly compressed video is on the left, notice how sharp and clear the frame is with very little banding and artifacts. The frame on the right was improperly compressed with large amounts of banding in the sky and video artifacts around the helicopter.

Those programs cost big bucks. You could spend that money on a whole new helicopter.

A HEAD OF OUR TIME



Hirobo's new SDX .50 kit with cutting-edge head design

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DIAL INDICATING

Making sure the “straight and narrow” is actually straight.

WORDS: Shawn Kitchen | PHOTOS: Jason Boulanger

SPEND ENOUGH TIME IN THIS HOBBY, AND YOU’LL GET TO SEE A LOT OF PEOPLE FLY A LOT OF HELICOPTERS. Develop a discerning eye and ear, and you’ll quickly be able to spot the helicopters that were “built”, versus the ones that were merely “assembled”. The ones that are “built” have a certain sound to them. There’s a kind of evenness to the tone, appearance, and presence of the helicopter that’s similar to hitting the “sweet spot” on a baseball bat – hard to explain in words, but you sure know it when you hear it.

The difference between building a helicopter and assembling a helicopter comes down to attention to detail. The people who sweat the details have the best flying helicopters. One of the single most influential details during assembly is dial indicating. Far from being some kind of new iPhone app, dial indicating is the process of using a specialized tool called – you guessed it – a dial indicator to determine how “straight and true” a rotating part really is.

You may have an uber-fancy helicopter with carbon fiber this-and-that and anodized aluminum such-and-such, but if you don’t take the time to dial indicate the rotating parts, you’ll have little more than a carbon fiber and aluminum paperweight.



Miss aligned parts can equal disaster.

WHY BOTHER?

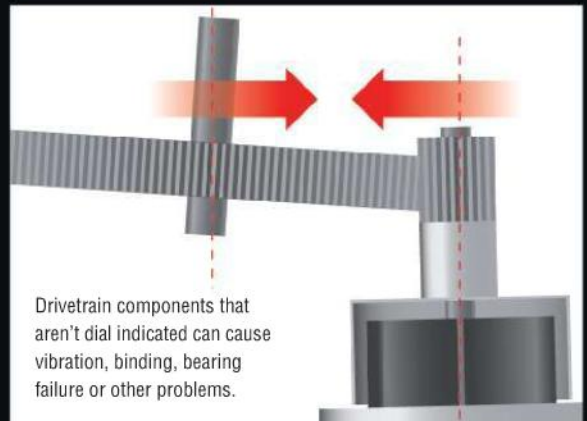
It’s easy to tell yourself “My helicopter flies just fine without me having dial indicated anything”, but in reality there are a number of good reasons why you should take the time to dial indicate your heli’s rotating parts. Consider for a moment the powertrain on a nitro helicopter. The average helicopter nitro engine is spinning upwards of 15,000 rpm or more depending on your engine size and headspeed. It’s bad enough that a single-cylinder nitro engine has an inherent secondary balance problem, but if you don’t take the time to dial indicate the fan hub, you now have an engine that’s spinning at a staggeringly high rate of speed with a wobbly cooling fan. If you happen to have a heli where the start shaft is physically coupled to the clutch/hub assembly without a one-way bearing, that wobbly hub will cause the vibration

problem to be even worse at the end of a long start shaft.

Electric helis tend to not have some of the potential issues of a nitro engine (due to not having a clutch or fan hub), but there are still areas common to both nitro and electric helicopters that should be checked. Main shafts, tail shafts, and head axles are all potential areas for an out-of-round condition.

Vibrations caused by out-of-round parts do more than affect the appearance of smoothness while flying. Non-concentric parts create vibrations that affect a gyro’s ability to hold the tail still, they can cause fuel foaming in nitro

helicopters that leads to erratic engine tuning, they can cause radio interference in crystal-based radios, and in broad terms can create intermittent problems with any piece of electrical equipment. Without taking the time to ensure that your rotating parts are perfectly straight, your helicopter will never fly at its best.



» HOW DOES IT WORK?

A dial indicator is fundamentally a simple device. In the simplest terms, it's a telescoping shaft with a readout on the top. On the end of the shaft is a rolling ball tip (think ball-point pen), which helps the tool glide smoothly over the surface being measured. As this shaft is pushed in and out, the gauge face shows how much distance the shaft has moved. Dial indicators can be purchased in both digital and analog versions. What makes the dial indicator special is that it's calibrated to read very small movements, down to the thousandth of an inch or smaller. It's this fine level of accuracy that makes all the difference when building a helicopter. The target you're looking for is .002" or less of total runout. We'll get to that shortly.

In order to ensure the precision that you need from a dial indicator, you'll need to have a secure way to mount it. The easiest way is with a bench vise (no modeler should be without one), in conjunction with a magnetic base for your dial indicator. A typical magnetic base will attach to the upper flat on the bench vise and will have a set of movable arms that will allow you to position the dial indicator as needed.



» SKILL LEVEL

SCALE RATING: 1=EASY 5=ADVANCED

4.0



» TIME TO COMPLETE



15-60

 Minutes

» TOOLS NEEDED



- DIAL INDICATOR
- SECURE BASE FOR DIAL INDICATOR
- PLASTIC HAMMER (OR OTHER NON-METALLIC IMPACTING TOOL)
- HIGH-POINT BALANCER
- BENCH VISE
- PATIENCE
- FREE TIME

Use the engines mounts to securely hold it in the vise.

A BASIC TUTORIAL

Dial indicating a part is actually quite easy. The key during setup is to position the indicator at 90 degrees to the direction of rotation of the part being measured. This way, the indicator will be able to see a "wobble" in the part and you'll be able to get the most accurate runout reading. To illustrate, we'll use nitro engine and fan hub assembly.

- 1.** Secure the engine (with fan hub attached) in the bench vise so that it can't move.

An easy way to do this is by using the bench vise jaws to clamp on to one of the crankcase mounting tabs. Remove the glow plug so that the engine can be rotated easily (leaving the glow plug in will cause a false reading on the dial indicator). For ease of positioning and measurement, make sure that the crankshaft is pointed straight up.



- 2.** Attach the base for your dial indicator to the bench vise (this is why I prefer magnetic bases), and position the dial indicator so that the shaft is pointed at a 90-degree angle to the outside diameter of the fan hub. The further away from the engine you can measure, the better.





3. With the tip of the dial indicator resting against the end of the fan hub, zero out your gauge. Then, slowly rotate the engine by hand and watch the display on the dial indicator. You'll find that the display will give you numbers on both sides of your zero reading; this is because as you rotate the part, the wobble will cause the part to move away from the indicator and then back towards it.

4. Take the highest measurements on each side of zero, and then add them together. For example, if you get a maximum reading of $+0.004''$ and $-0.003''$, then add those together for a total of $.007''$ runout.

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5. Rotate the fan to the point with the highest positive reading on the dial indicator. Move the tip of the indicator away from the hub. With your non-metallic impact tool (like a plastic hammer), tap the top of the hub on the opposite side from the dial indicator to shift the hub closer to zero.

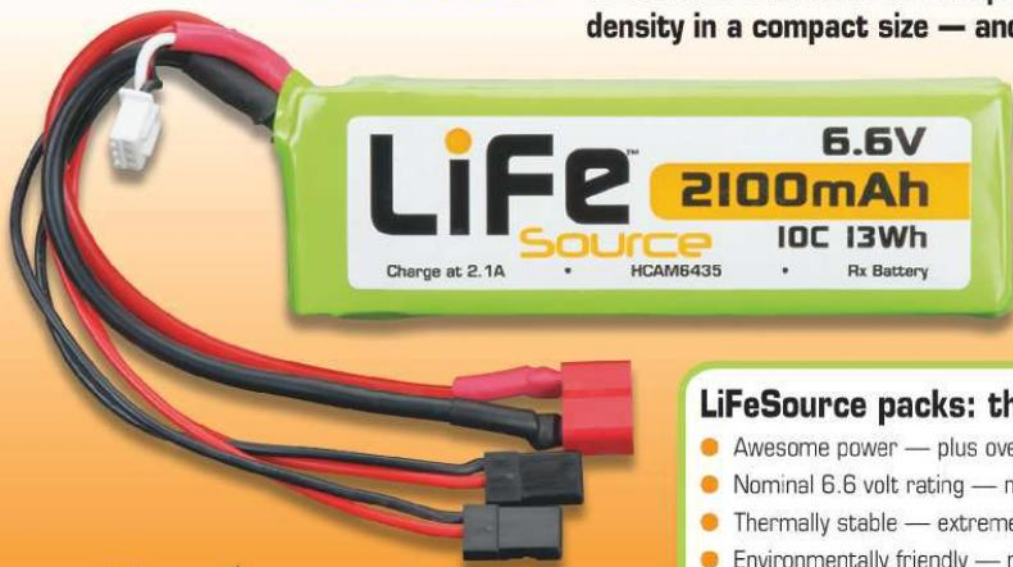
6. Repeat as many times as necessary until your total runout is .002" or less.



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Not All Hubs Are Created EQUAL



Depending on the design of the fan hub and how it mates with the crankshaft, the procedure for adjusting the runout will vary. Some hubs are threaded and screw on to the crankshaft, and as such don't allow for truly precise centering. You might be able to coax a very slight adjustment out of them (usually no more than .001" or so), but by the time you've sufficiently tightened the hub to the engine to keep it from coming off during flight, you've taken up all the wiggle room in the threads anyway. Threaded hubs make for quick and easy assembly, but they're not ideal.

The most adjustable method of hub securement is with tapered collets. Many high-end models use this design. It uses cone-shaped sleeves (collets) that slide over the crankshaft, with the hub having a matching taper in the bore. The hub is sandwiched between the collets, and the tapers allow for the hub to be moved very slightly during the tightening process. In general terms, you tighten the fan hub down a little bit, check and adjust the runout, tighten it down some more, adjust the runout again, and repeat the process until the hub is sufficiently tightened.

With care and patience, it's entirely possible to get readings below .002" of runout. On my personal machines, .002" was the highest runout I'd allow if I was feeling lazy. In many cases, I'd shoot for .0015" or less. When you get the runout down to .001" or less, then you're really sweating the details!

If your heli kit has an optional colleted fan hub, buy it and learn how to dial indicate it well. You'll enjoy the results.

Fan hubs aren't the only thing that should be checked for runout (sorry, electric guys... no one gets away scott-free). The other major areas to check are the main shaft and tail shaft. For each of these, you obviously won't be able to clamp the shaft in a vise and check it. You can use two methods: High-Point balancer or in situ measurement.

A Robart High-Point balancer is the quick and dirty way of checking runout on a main or tail shaft. Just lay it on top of the balancer, set your dial indicator at 90 degrees to the shaft, and slowly rotate the shaft. The trick will be to make sure that the base of the balancer is secured to the table, and that you use a very light touch to spin the shaft (you could even lay a piece of string over the shaft and use a pull-pull motion to rotate the shaft). Light pressure only – too much can distort the reading.

The other method is an in situ measurement (Latin for "in the place"). In other words, checking the runout with the part installed in the helicopter. The trick to this method is that you have to find some way to attach the dial indicator so that it stays motionless relative to the helicopter. As such, you'll have to use some ingenuity to figure that one out, as the size of your heli, the materials it's made of, and other factors will come into play. For that reason, it's often easier to just take the shaft out and check it on the High-Point.

Since there's nothing practical that you can do to straighten a bent shaft (and since replacing them is so relatively cheap anyway), the point of dial indicating the main shaft and tail shaft is to let you know if you have one that's too bent for smooth flight. Check the shaft at both ends and somewhere in the middle. If the runout is too high, replace the shaft.



CONCLUSION

It's not within the scope of this article to give step-by-step instructions for dial indicating every part on every helicopter, but this will hopefully give you a basic understanding of what the dial indicator looks like and the benefits that you can achieve by using it. Taking the time to sweat the details is what separates the heli builders from the heli assemblers. The builders' machines fly better.

For a more detailed explanation on the specifics of dial indicating your particular helicopter, you can either log in and ask your questions at www.rchelimag.com/ forum or you can find someone in your area with the same model helicopter who can help you with more specifics.

Enjoy! **TRH**

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Can you tell who distributes the Logo 600?





Mikado LOGO 600

High Voltage = Extreme Power

WORDS: Ryan Kephart | PHOTOS: Carl Hyndman

THE MIKADO FAMILY OF HELICOPTERS HAVE BEEN KNOWN TO FLY FAST, BUILD QUICKLY, AND FLY WELL. This month we review Mikado's flagship helicopter, the Logo 600 3D flybarless. With the growing trend of manufacturers switching to flybarless heads and electronic stabilization, it's not hard to say that flybarless helicopters are leading the way into the future of RC helicopter flight. Mikado is one of the first to mass produce electronic stability control and is one of the best. Mikado has recently introduced their newest software update that makes adjusting the V Bar a breeze and added some new features that really make this product stand out from the rest. Let's take a closer look at the Logo 600 powered by a 10S Thunder Power 30C LiPo battery.

If you couldn't guess it's Ready/Heli!

» AT A GLANCE

SIZE:	600
POWER:	Electric
TYPE:	Pod and Boom
BUILD TYPE:	Kit
TAIL DRIVE:	Belt

FEATURES

The Logo 600 3D flybarless edition we're reviewing this month comes with Mikado's own V Bar electronic stabilizer and version 4.0 software. The Logo 600 is a unique design that features a two-piece molded frame. The Logo 600 is like all the other helicopters in the Logo class with the exception of the Logo 400 (which is just a scaled down version). The V Bar software includes several new functions such as an Auto Trim feature and a control loop that can equalize the rotation rate of both the elevator axis and aileron. The new V Bar is designed using two pieces, a central unit, which is basically where you plug your servos into, the remote receivers and a three-axis gyro. The central unit of the V Bar uses Spektrum remote receivers to provide a solid connection to JR/Spektrum 2.4ghz transmitters without the use of stand-alone receiver.

» MAIN FRAME

SWASH CONTROL: The 120° CCPM swashplate has a direct connection to the three servos. This provides the best slop-free connection possible.

COMPONENT LAYOUT: The cyclic servos are located around the main shaft in molded pockets that hold standard sized servos. The motor sits in front of the main shaft towards the top of the frames with the pinion facing down. In front of the motor the speed control is located on a little platform and is secured with Velcro or a zip tie. The battery rests below the main gear in a large, open channel that allows you to use a variety of sizes from 6S to 10S. The V Bar central unit is placed on a tray beside the elevator servo. Below this tray the 3-axis gyro is mounted on a separate plate close to the rear skid mount. The tail servo sits above the gyro and offers a straight connection to the pitch actuator.

DESIGN: The frames are designed to be simple, rigid, and keep the components nice and neat. The frames are constructed from plastic and use a mix of plastic bearing blocks and metal spacers.

CANOPY: The canopy on this version of the Logo 600 is made from durable fiberglass and is pre-painted in several different color schemes. The canopy is molded to provide maximum aerodynamic performance and has a hole molded in the top to provide cooling air to the motor, battery, and speed controller. The canopy also wraps around the back of the main frame, protects the receiver, and gives the heli a unique look. The canopy mounts to the frames using a tabbed bottom that interlocks with the frames and landing gear. The rear of the canopy is held in place with two rubber grommets that slide over plastic canopy standoffs. Two second standoffs on each side of the frame keep the fiberglass canopy aligned.

LANDING GEAR: The landing gear is a four-piece design that mounts to the frame with four machined screws with lock nuts that slide into a slotted area in the frame. The skids are powdercoated white and secured to the struts with four setscrews.

Ryan spent a lot of time adding that FMP servo wire wrap.



» DRIVE TRAIN

MOTOR MOUNT: The motor mounts to an aluminum plate that can be replaced by a larger mount if your motor uses a different bolt pattern.

PINION: The pinion on the Logo 600 is a unique herringbone style gear; although expensive, it offers unparalleled quietness in the drive system. The pinion is not included in the kit and must be purchased separately. A wide range of sizes are available.

MAIN GEAR: The main gear is made from strong composite black plastic and is molded with a herringbone gear pattern. The gear has molded-in lightening holes to aid cooling and to keep the overall weight down.

AUTOROTATION DRIVE: The autorotation drive is comprised of a one-way bearing and an aluminum hub. The bearing is press fit into the hub and is secured to the main gear using machine screws.

TAIL DRIVE: A plastic pulley that sits above the main gear drives the tail belt. The tail belt then passes through two guide pulleys before it heads down the boom. At the tail end, the belt passes through another guide pulley just before the tail pulley to give it more grip.



“Flying the Logo 600 with V Bar was one of best testing experiences I’ve ever had”

Mikado LOGO 600

MODEL SPECIFICATIONS

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

FRAME

MATERIAL:	Plastic
TYPE:	One-piece

SERVO TO

SWASH LINKAGE:	Direct
SERVO SIZE:	Standard

ROTOR HEAD

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

TAIL

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

GEARING

MAIN ROTOR TO PINION RATIO:	1:8.5
MAIN ROTOR TO TAIL RATIO:	1:4.75

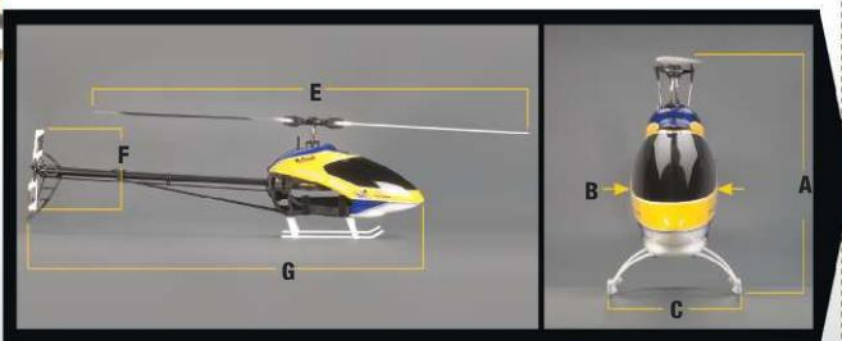
WEIGHT

EMPTY:	4 lbs., 3 oz. (1898g)
FULLY LOADED: (includes battery)	8 lbs., 6 oz. (3,798g)

DIMENSIONS

HEIGHT (A):	14.75in (375mm)
CANOPY WIDTH (B):	5.25 in. (133mm)
LANDING GEAR (C):	8 in. (203mm)
PADDLE TO PADDLE DIA. (D):	13.5 in (343mm)
MAIN ROTOR (E):	54 in. (1,371mm)
TAIL ROTOR (F):	10 in. (254mm)
LENGTH (G):	47.75 in(1,213mm)

I think yellow and blue are going to be my colors now.



FEATURES CONTINUED

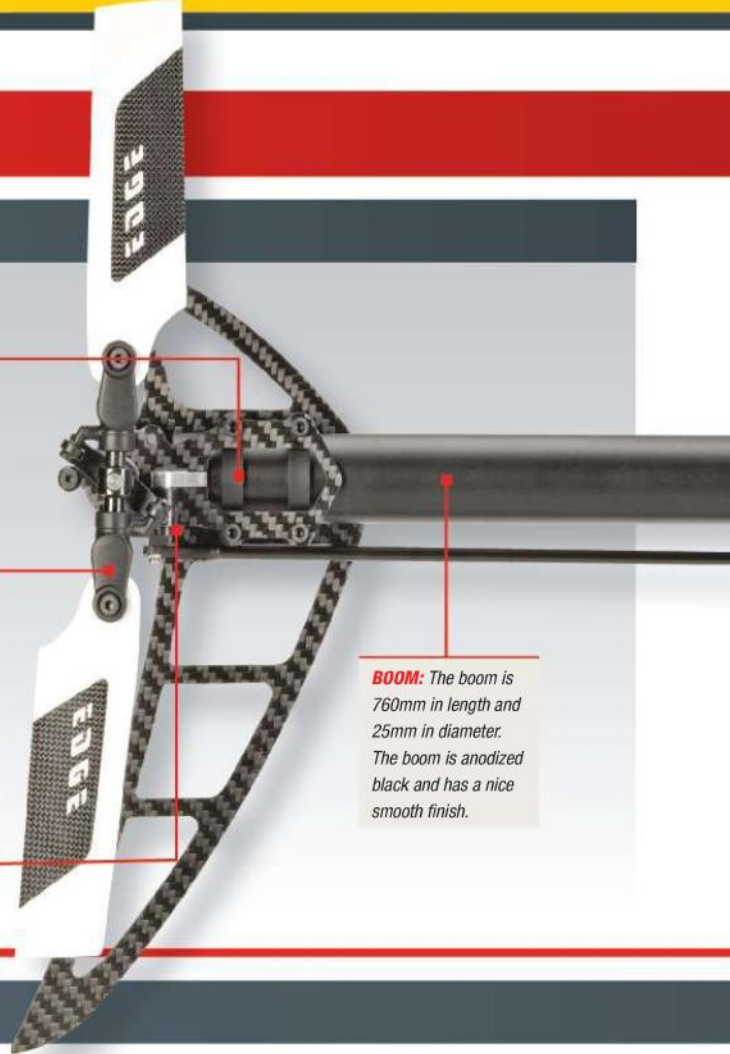
» TAIL & BOOM



TAIL CASE: The tail case is comprised of two carbon fiber plates which include the vertical tail fin. Two plastic boom clamps are secured using the through bolts for the fin. A guide pulley is located above the tail pulley and keeps positive engagement for the belt even if the belt is a little loose.

TAIL BLADE GRIPS: The tail grips are made from high quality plastic and are molded in one piece (this includes the ball links, which are usually metallic). This is a little uncommon on more expensive machines, but overall the tail has no slop. The grips are dual ball bearing support along with a thrust bearing.

PITCH ACTUATOR SYSTEM: The pushrod is connected to a bellcrank mounted to an aluminum standoff. The bellcrank is connected to a single-point tail pitch slider. The slider is linked to the plastic tail pitch fork using a brass sleeve. The links that connect to the tail grips are made from plastic and are pinned to the fork.



BOOM: The boom is 760mm in length and 25mm in diameter. The boom is anodized black and has a nice smooth finish.

» ROTOR HEAD

HEADBLOCK: The headblock is a two-piece design. The upper half is anodized black and attaches to the lower half with four machine screws. The unit is held in place by a clamp which has two machine screws to keep equal pressure to the mainshaft on each side. Above the clamp and close to the upper half of the headblock is a Jesus bolt. Damping is performed by a single damper on each side. The grips are held in place by machine screws that thread into the spindle.

MAIN BLADE GRIPS: The main blade grips are molded from high quality plastic. The grips have reinforcement channels to increase the rigidity. Each grip is dual ball bearing and thrust bearing supported. No input options are available.

SWASH FOLLOWER: The swash follower is clamped to the main shaft by a single machine screw that threads into the aluminum base. The plastic arms are dual ball bearing supported and offer a slop-free connection to the swashplate.

SWASHPLATE: The swashplate is made entirely from aluminum and has a screw that allows the bearing to be tightened to remove slop as the swashplate wears.



So simple..... So clean.

» INSTRUCTIONS & BUILDING TIPS

WHEN YOU OPEN THE BOX

Opening the box for all the Logo style helicopters, you'll find an oversized manual and everything packaged in nicely organized bags. The canopy is wrapped separately and is well protected from scratches and damage during shipping. The main box also contains a retail package for the Mikado V Bar, which has everything you need to get your electronic stabilization system set up.

MANUAL AND BUILD

Building the Logo 600 is fast and easy. The minimal parts count allows the helicopter to be assembled quickly and perfectly as most of the parts interlock to form a solid seam. The manual does a great job showing you how the parts are put together, although it's a little difficult in some sections to see exactly where a screw is going through the frames.

Another thing to look out for is the gear mesh on the herringbone gears. There should be no backlash at all or your main gear will strip. Set the pinion against the main gear, give it a little press, and then tighten down the screw that hold the motor in place.

The V Bar manual is a great, too, as it explains what every function does and how to plug in your servos and receiver. We decided to use the built-in receiver function and two Spektrum remote receivers to accomplish the radio link.

Another great function of the V Bar software is the ability to find out what each section does by simply hovering over the text until a window pops up, telling you what the values do. Mikado also offers a video help guide on their website when you install the software on your computer.

Mikado LOGO 600

RTF & TEST GEAR

» SUPPLIED GEAR



- **V-BAR:** Mikado, V Bar, MIK4010, 2oz. (56g)

» TEST GEAR



- **RADIO:** JR, X9503, JRP2935, \$549.99



- **REMOTE RECEIVERS:** Spektrum, Remote Receiver, SPM9545 .35oz. (10g), \$34



- **CYCLIC SERVOS (3):** Outrage RC, Torq Brushless BL9080, BL9080, 2.15oz. (61g), \$140 ea.



- **TAIL SERVO:** Outrage RC, Torq Brushless Tail Servo, BL9088, 2.15oz. (61g), \$145



- **SPEED CONTROL:** Kontronik, Jive 80+ HV, JVE, 2.96oz. (84g), \$400



- **MOTOR:** Kontronik, Pyro 700-52, PYRO700-52, 13.22 oz. (375g), \$350



- **BATTERY:** Thunder Power, 10s 5000mah 30C, TP500010SP30L, 47oz. (1337g), \$420



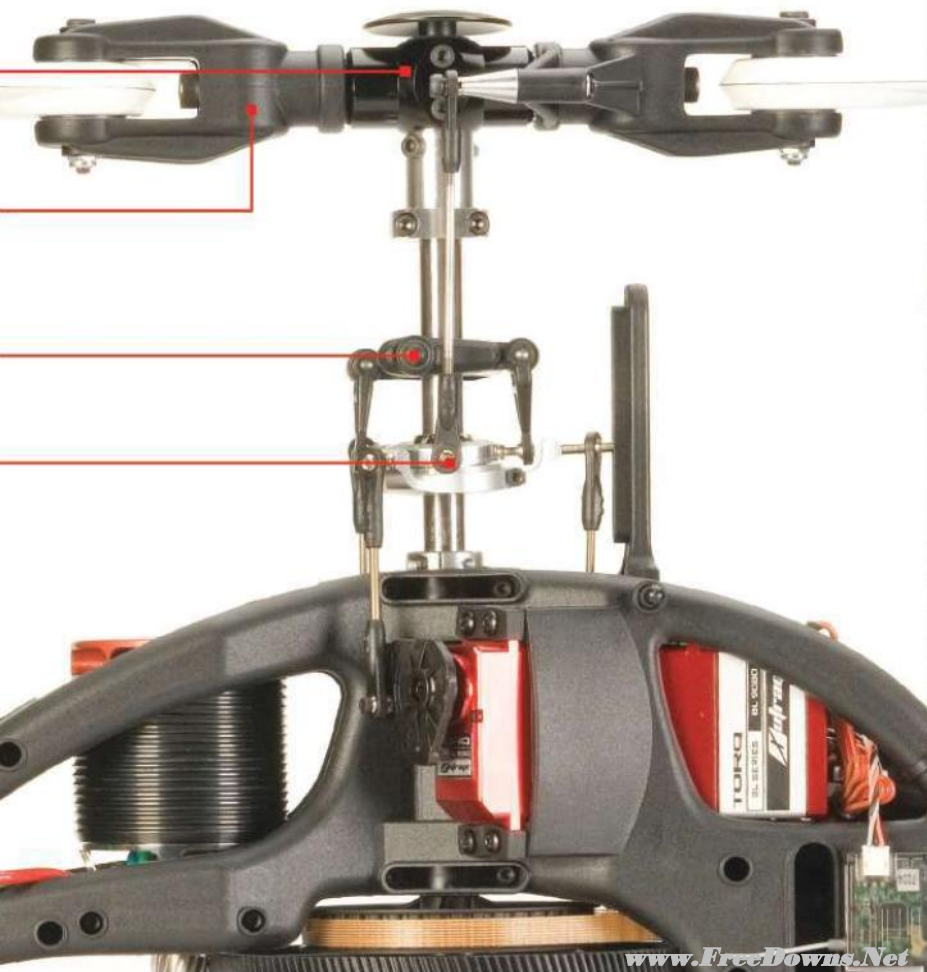
- **CHARGER:** Protek, 1010B+, PTK-1010B+, \$180



- **BLADES:** Edge, 603mm Flybarless Edition, LE-603FBL, 4.76oz. (135g), \$90



- **TAIL BLADES:** Edge, 95mm, LE-95, .35oz. (10g), \$28



High end kit requires high end components.

TESTING

Flying the Logo 600 with V Bar was one of the best testing experiences I've ever had. The electronic stabilization system and auto trim features really allow the model to lock in. On top of the flying aspects of the model, the build itself is straightforward and without any quirks. With the powerful Thunder Power 10-cell Li-Po pack and the quality Kontronik motor and speed control, the Logo has every aspect that a 3D pilot is looking for.

HOVERING • During the initial flight of the Logo 600 I noticed that it started drifting a bit. As tempted as I was to trim the helicopter out with the digital trim on the JR 9503, I remembered the auto trim feature in the V Bar software. I went in, checked "trim flight," then took it back out for a flight. I let the helicopter drift a bit and then moved it back to its original position. I did this three or four times and then landed, unchecked trim flight, and then took it back up. The Logo sat hands-off and would have continued until I landed. Hands down one of the best hovering helicopters out there.

Rating: 5

FORWARD FLIGHT • The Mikado Logo 600 is arguably one of the fastest most graceful helicopters in forward flight. Kyle Dahl recently just won a speed contest with his Logo 600, clocking in at over 90 mph. After testing the helicopter for myself, I can see how this number was feasible. The Logo 600 is fast and flies as straight as they come. The V Bar did a great job keeping the nose of the helicopter down. The Logo flies just as smoothly in a hover. Overall, it's one of the best at forward flight.

Rating: 5

CYCLIC PITCH • Response With the ability to go into the software and change any aspect of the flight characteristics, the cyclic response can be set up to your flying needs. On the aggressive setting, the Logo 600 was fast enough to do any 3D maneuver in the book, but switching it over to Very Aggressive changed this helicopter entirely. The cyclics are matched very well from the left to the right and offer a really nimble feel if you desire it. I also had a chance to see what it was like on the soft settings and it made the helicopter feel like a trainer helicopter with weights on the end of the flybar. Overall, the Logo 600 can roll, flip, and fly like a trainer or a

professional 3D helicopter.

Rating: 5

COLLECTIVE PITCH • Response When setting up the Logo 600 for the first time, you should make the travel equal on each side of the collective. In other words, if you have 10 degrees of positive pitch you'll want -10 degrees of negative pitch. After the first setup you can increase these numbers; I ended up setting the Logo 600 with 12 degrees in both directions. The Logo 600 was a powerhouse and can climb faster than any nitro heli. Quick collective pops were crisp and did not phase the helicopter at all. The collective felt as good, if not better, than any other 3D helicopter I have ever flown.

Rating: 5

TAIL ROTOR RESPONSE • Being a bit skeptical about how the tail would perform with a 3-axis gyro and plastic balls on the tail grips, I went into tail testing with a bit of fear. After a few backwards flights, the Logo 600 relieved my fear and soon I was flying just as fast backwards as it would go forward. The tail is rock solid and provides a nice consistent piro rate throughout the flight. The turn speed can be adjusted through the software to allow for a faster

or slower turn rate (yaw control). Overall, the response was smooth and the tail would stop exactly where I wanted it to every time.

Rating: 5

AUTOROTATION CAPABILITIES • Without the drag of the flybar, the Logo 600 3D does a great job at performing an autorotation. The energy is kept in the blades and allows the helicopter to float even longer than normal. Going into the auto, the helicopter is steady throughout the descent and as soon as you start to flare the head speed rockets up. The auto drive works great and allows the main blades to rotate smoothly.

Rating: 5

POST FLIGHT INSPECTION • After flying the helicopter for over a month I have noticed no wear. The simple design of the Logo allows me to quickly check for loose screws or worn teeth without having to disassemble anything. I must have checked the plastic balls on the tail at least a dozen times to make sure they were not



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TESTING SPECS

Mikado LOGO 600

Part #: MK2298FBLV
Distributor: ReadyHeli
Web: www.readyheli.com

Street Price: \$1,003
Price as Tested: \$3,475
Build/Setup Time: 16 hours

PERFORMANCE

MODE FLOWN: Normal, idle up 1, idle up 2
RPM OF EACH MODE: Normal: 1700
 Idle Up 1: 1850
 Idle Up 2: 1950
MOTOR TEMP (after flight): 110° F
FLIGHT TIME: 8 minutes
CRASH COST: \$45.00

TEST CONDITIONS

WEATHER: Sunny
TEMP / HUMIDITY: 72° F/ 15%
BAROMETRIC PRESSURE: 29.98 in.
WIND SPEED: 4 mph
VISIBILITY: 10 miles
ALTITUDE: 650 feet

PITCH CURVES

NORMAL: -12, 0, 12
IDLE-UP 1: -12, 0, 12
IDLE-UP 2: -12, 0, 12

REQUIRED TO FLY

Radio, remote receivers, battery, charger, main blades, motor, ESC, 3 matching cyclic servos, tail servo

WHO'S IT FOR?

Although this helicopter can be set for a beginner, it is not recommended because it is more complicated to set up. Intermediate and advanced fliers will find this helicopter a blast and will love every minute of it.

SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

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

THE GOOD

- Simple to build and maintain
- Very Powerful
- Stable
- Exceptional flight characteristics

THE BAD

- High-end performance comes at a high-end price

Holy cow!!!! A perfect 5 in overall performance.

wearing, and to my surprise they have not worn out. Overall, the high quality parts and components paid off, as this helicopter looks as good as the day I first built it.

Rating: 5

CONCLUSION

Wow..... Really..... All 5's. That's right, the Mikado Logo 600 3D with V Bar is a well- rounded helicopter that emulates nearly any heli on the market with the included Version 4.0 software. The V Bar holds the tail like any high- end gyro and it also includes a locked- in feel on the cyclics due to the 3-axis gyro. The flight characteristics are locked- in and highly responsive. How can I not give this helicopter a 5? With the setup we used, we were able to get eight minutes of 3D flight and roughly 10 minutes just hovering. **RH**



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Carbon Pro Blades

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coaxial helicopter

www.walkera.com

- » Main Rotor Dia. (upper) : 620mm
- » Main Rotor Dia. (lower) : 520mm
- » Overall Length: 696mm
- » Weight: 833g (Battery included)
- » Receiver: RX 2429
- » Transmitter: WK-2602
- » BSC: WK-WST-40A-1
- » Brushless Motor: WK-WS-28-007W
- » Battery: 11.1V 2200mAh Li-Po 25C
- » Gyro: Built-in
- » One-motor-driving CCPS (Coaxial Collective Pitch System)
- » LM3, used a brushed motor as main power, features longer longevity than the conventional coaxial helicopter
- » For the use of flat-convex airfoil which can offer more lift force, LM3 provides a strong resistance against 3- to 4-level wind outdoors
- » Easy to be a beginner. Any no experience people can easily be a pilot



What inning do we get to fly helicopters?



A close-up, low-angle shot of the Walkera HM-83# helicopter against a clear blue sky. The helicopter's body is white with orange and black accents. The rotor blades are blurred, indicating motion. The text 'HM-83#' is visible on the side of the fuselage.

Walkera HM-83#

Walkera's first nitro helicopter

WORDS: Ryan Kephart | PHOTOS: Jason Boulanger

WALKERA IS WELL KNOWN FOR AFFORDABLE ELECTRIC HELICOPTERS. After the release of some of their popular palm sized helicopters, Walkera has entered the nitro market. Along with being Walkera's first nitro powered helicopter, the HM-83# is also their largest, weighing in at close to 1100 grams without fuel.

Did Walkera strike out with this helicopter?

» AT A GLANCE

SIZE:	.15
POWER:	Nitro
TYPE:	Pod and Boom
BUILD TYPE:	RTF
TAIL DRIVE:	Belt

FEATURES

The HM-83# is sold as a pre-built package that includes everything you need to get the helicopter in the air except for starting equipment. The helicopter is constructed from a mix of carbon fiber and aluminum. The HM-83# is powered by a small .15 engine that is designed to run on 15-30% nitro fuel. Walkera included their WK-2801 2.4ghz radio with this package. The HM-83# also offers a heading lock gyro.

» MAIN FRAME



SWASH CONTROL: The swash is controlled by three mini servos which are directly connected to the swashplate using a ball link. The elevator servo linkage also acts as an anti-rotation pin.

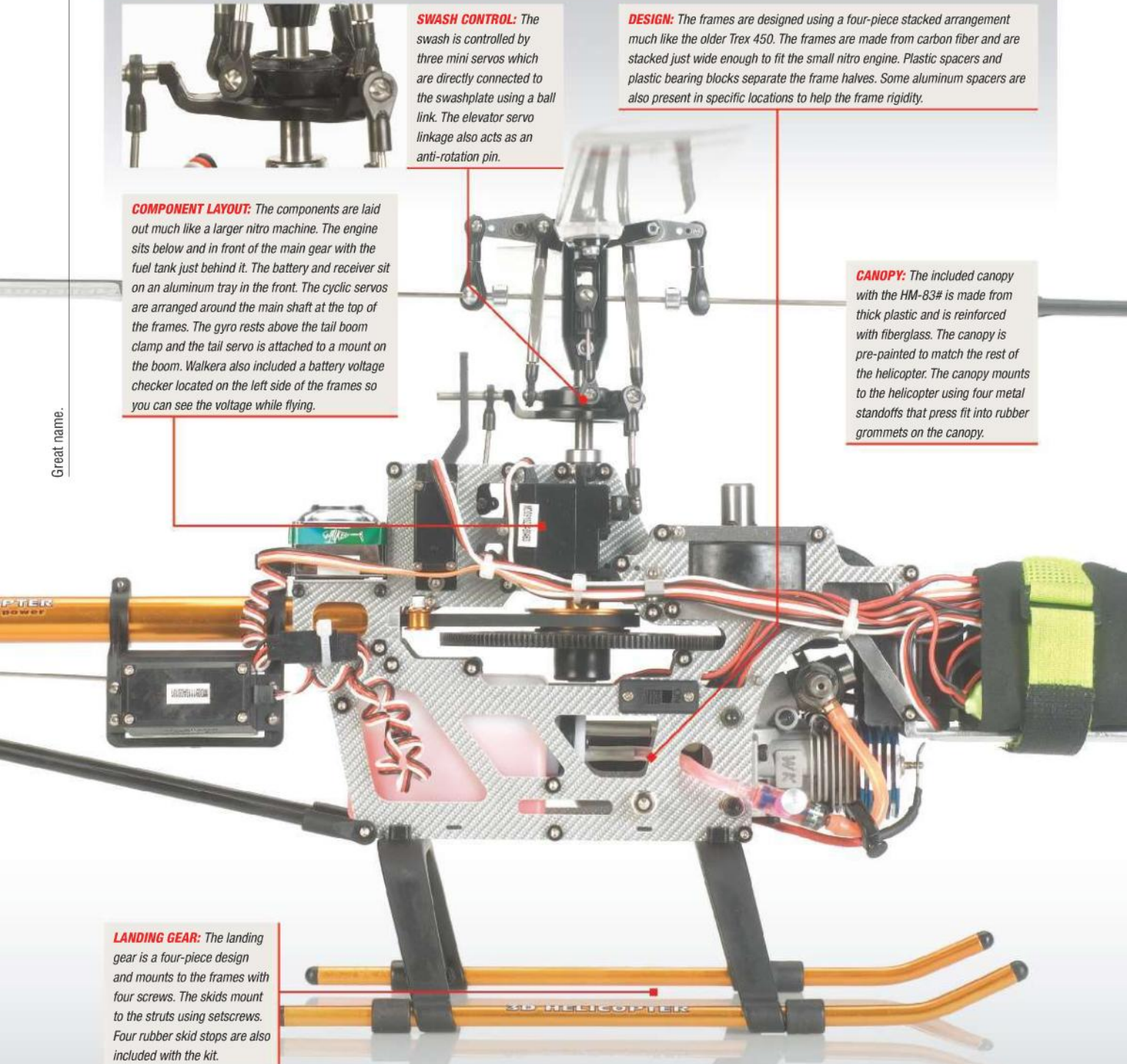
DESIGN: The frames are designed using a four-piece stacked arrangement much like the older Trex 450. The frames are made from carbon fiber and are stacked just wide enough to fit the small nitro engine. Plastic spacers and plastic bearing blocks separate the frame halves. Some aluminum spacers are also present in specific locations to help the frame rigidity.

COMPONENT LAYOUT: The components are laid out much like a larger nitro machine. The engine sits below and in front of the main gear with the fuel tank just behind it. The battery and receiver sit on an aluminum tray in the front. The cyclic servos are arranged around the main shaft at the top of the frames. The gyro rests above the tail boom clamp and the tail servo is attached to a mount on the boom. Walkera also included a battery voltage checker located on the left side of the frames so you can see the voltage while flying.

CANOPY: The included canopy with the HM-83# is made from thick plastic and is reinforced with fiberglass. The canopy is pre-painted to match the rest of the helicopter. The canopy mounts to the helicopter using four metal standoffs that press fit into rubber grommets on the canopy.

Great name.

LANDING GEAR: The landing gear is a four-piece design and mounts to the frames with four screws. The skids mount to the struts using setscrews. Four rubber skid stops are also included with the kit.



» DRIVE TRAIN

ENGINE/MOTOR MOUNT: The motor mounts to two aluminum brackets that are installed to the frames using four machine screws. The engine is then mounted to these blocks with four screws. A remote glow plug is installed on the carbon frames. A copper plate is used to connect the ground to the remote glow plug and a single wire runs to the positive.

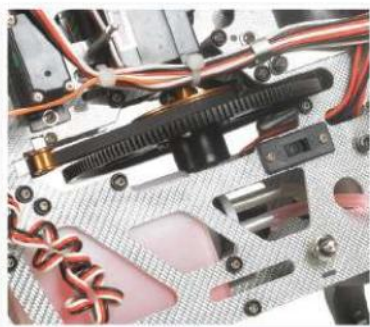
CLUTCH/PINION: The clutch bell and pinion are mounted to the engine. The clutch and cooling fan are then attached and secured to the engine with a nut. The cooling fan is attached to the clutch using two machine screws.

COOLING FAN AND SHROUD: A one-way bearing is press fit onto the cooling fan, which allows the starter to disengage from the engine with ease. An adapter is needed to start this little engine and once the motor has started this adapter is removed. The fan shroud is made from plastic and routes the air over the cylinder head. The shroud does not cover the whole head of the engine.

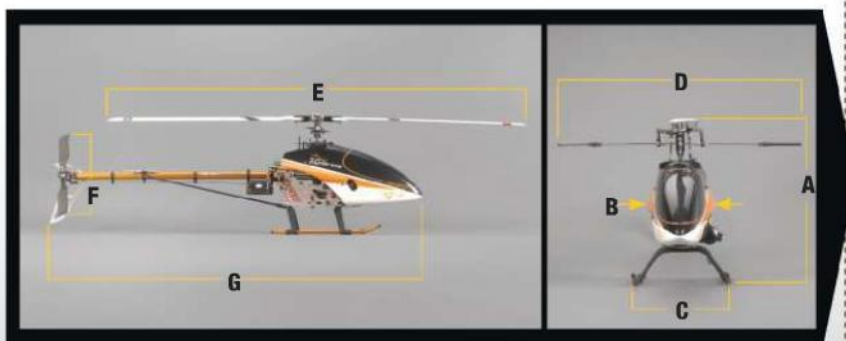
MAIN GEAR: The main gear is made of black plastic. It is only supported by the main shaft bearings and does not have a bearing below the gear. The gear has lightening holes molded into the gear.

AUTOROTATION DRIVE: The main gear hub has a one-way bearing installed and allows the HM-83# to auto rotate while driving the tail rotor.

TAIL DRIVE: An aluminum tail pulley drives the tail rotor. The pulley is mounted to the main gear hub, allowing the tail to be driven at all times. The belt is routed through two guide pulleys before it travels through the boom.



“ALTHOUGH THIS HELICOPTER IS NOT ON THE HIGH END OF THE SPECTRUM, IT DOES A GREAT JOB FOR ITS PRICE.”



Walkera

HM-83#

MODEL SPECIFICATIONS

CLASS:	.15 Nitro
BUILD:	RTF
BLADE SIZE:	403 mm
LEVEL:	Novice-Advanced

FRAME

MATERIAL:	Carbon fiber
TYPE:	Stacked
SWASH LINKAGE:	Direct
SERVO SIZE:	Mini

ROTOR HEAD

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

TAIL

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

GEARING

MAIN ROTOR TO PINION RATIO:	1:7.6
MAIN ROTOR TO TAIL RATIO:	1:4.4

WEIGHT

EMPTY:	2 lbs., 1 oz. (935g)
WITHOUT FUEL:	3 lbs. (1,360g)
FULLY LOADED: (includes fuel)	3 lbs. 3 oz. (1,426g)

DIMENSIONS

HEIGHT (A):	10 in (254mm)
CANOPY WIDTH (B):	4.375 in. (111mm)
LANDING GEAR (C):	6 in. (152mm)
PADDLE TO PADDLE DIA. (D):	15.5 in (394mm)
MAIN ROTOR (E):	35.5 in. (902mm)
TAIL ROTOR (F):	6.75 in. (171mm)
LENGTH (G):	31 in. (787mm)

FEATURES CONTINUED

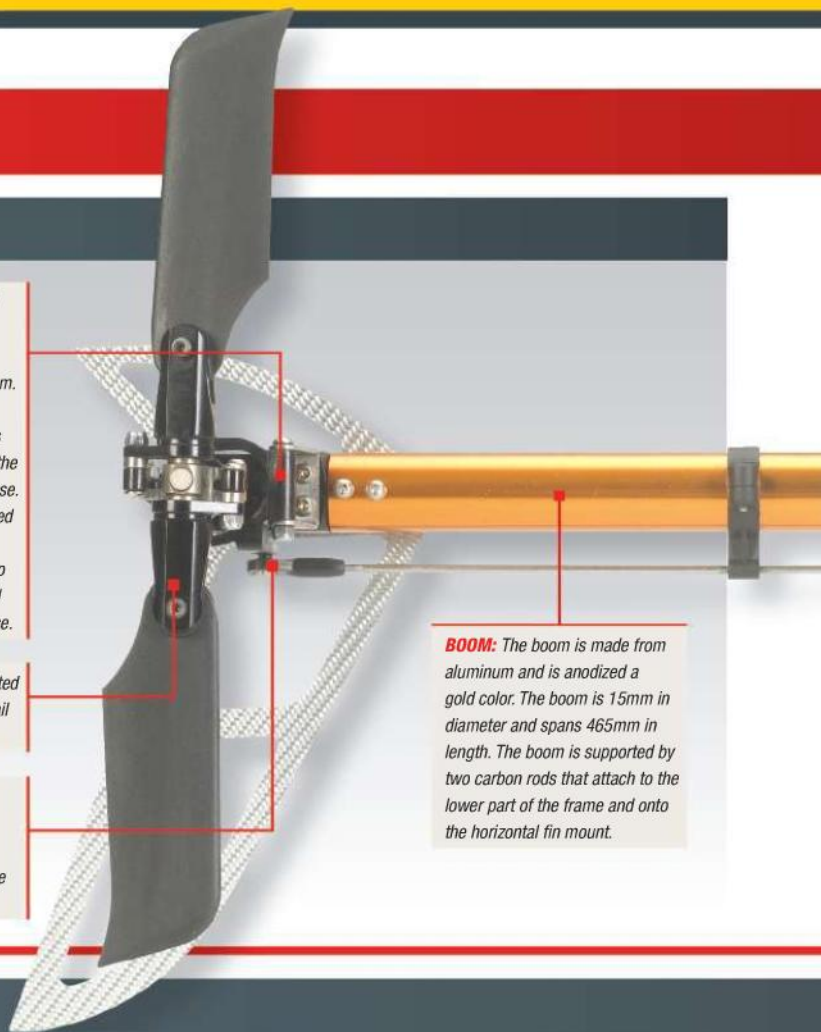
» TAIL & BOOM



TAIL CASE: The tail case is made from aluminum and is pressed into the boom. It is secured to the boom by two screws that thread through the boom into the tail case. The case is comprised of three pieces - a boom mount and two side pieces that hold the tail pulley in place.

TAIL BLADE GRIPS: The tail grips are made from aluminum and are supported by a single radial bearing and thrust bearing. The grips are installed on the tail hub with a machine screw.

PITCH ACTUATOR SYSTEM: The tail is controlled by a pushrod from the boom-mounted servo. Three plastic guides support the pushrod. It's then connected to a bellcrank that is supported by a bracket and a bushing. The bellcrank connects to the dual-pin pitch slider. The slider then connects to the blade grips with a metal link and is attached with machine screws.



BOOM: The boom is made from aluminum and is anodized a gold color. The boom is 15mm in diameter and spans 465mm in length. The boom is supported by two carbon rods that attach to the lower part of the frame and onto the horizontal fin mount.

» ROTOR HEAD

HEADBLOCK: The headblock is made from black anodized aluminum and is secured to the main shaft by a single Jesus bolt. The headblock is machined with a slot to help clamp the headblock to the main shaft. Several other grooves are cut out to allow the flybar to travel up and down. This seems to have a little slop but still allows the flybar to move smoothly.



PHASING: The phasing is accomplished on the HM-83# by two aluminum links that pass through the flybar from the swash to the Bell/Hiller arms and the two links that connect the swashplate to the flybar control arms. Some slop is seen here but should not affect the performance once the head is spooled up.

BELL/HILLER ARMS: The Bell/Hiller arms are mounted to the blade grips and are dual ball bearing supported. The arms are constructed from black anodized aluminum and mount to the main blade grips using a machine screw and lock nut. Three input options are available from the swash and three from the flybar. The links on the swashplate can also be moved.



WASHOUT ARMS: The Walkera HM-83# does not use washout arms. A moving flybar is used instead.

Go ahead, run it lean.

» INSTRUCTIONS & BUILDING TIPS

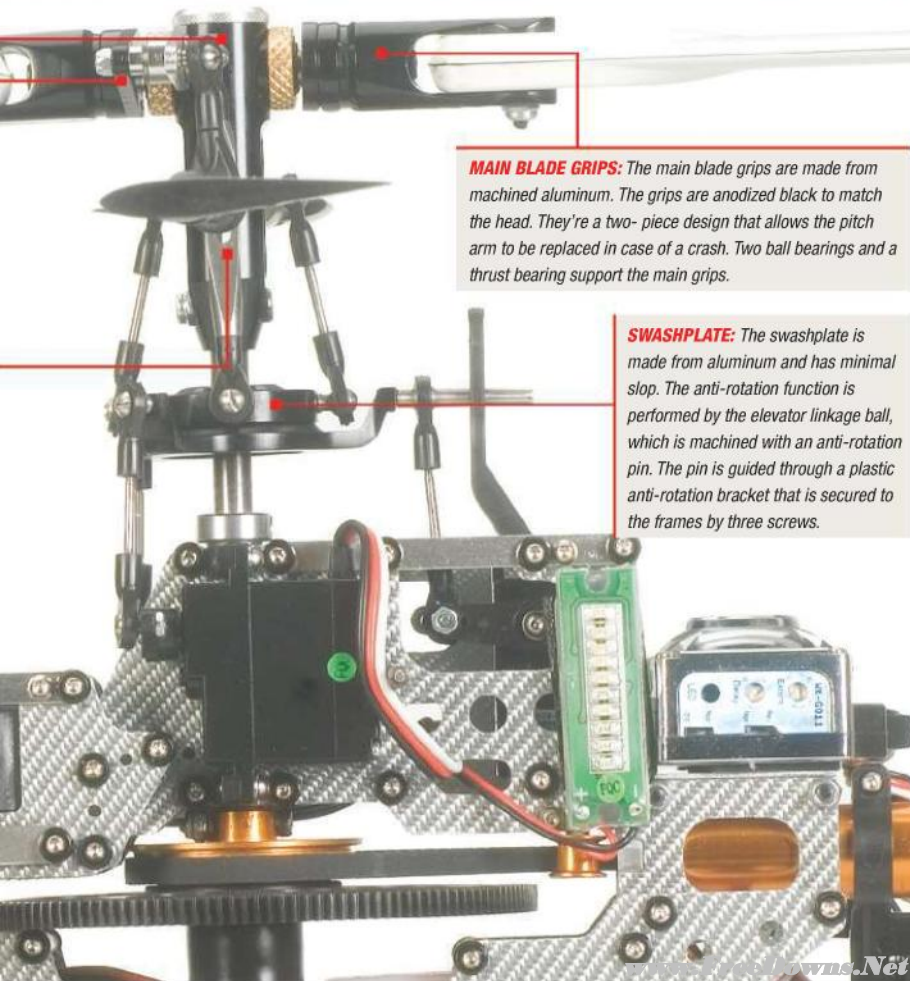
WHEN YOU OPEN THE BOX

Opening the box you will find a plastic holder that cradles the HM-83# tightly. The helicopter is pre-built from the head to the tail with the blades and everything installed. A radio is included and is packaged using the same plastic cradle.

MANUAL AND BUILD

Everything is built on the HM-83# and does not require any additional assembly. I noticed that the main blades were a bit loose so I tightened them up and installed some batteries into the transmitter. The kit includes a charger for the

four-cell NiMH battery so I gave it a charge and started testing right away. I noticed that the first few cycles of the battery pack went by quite fast, but after a few charge cycles the life of the battery drastically increased. Walkera included a manual for each of the major components including the radio, engine, and helicopter. The manuals do a great job telling you how to operate and break in the engine.



MAIN BLADE GRIPS: The main blade grips are made from machined aluminum. The grips are anodized black to match the head. They're a two-piece design that allows the pitch arm to be replaced in case of a crash. Two ball bearings and a thrust bearing support the main grips.

SWASHPLATE: The swashplate is made from aluminum and has minimal slop. The anti-rotation function is performed by the elevator linkage ball, which is machined with an anti-rotation pin. The pin is guided through a plastic anti-rotation bracket that is secured to the frames by three screws.

Walkera HM-83#

RTF & TEST GEAR

» TEST GEAR



■ **FUEL:** Byron, Rotor Rage 30%, \$34

» SUPPLIED GEAR



■ **RADIO:** Walkera, WK-2801PRO, WK2801PRO



■ **RECEIVER:** Walkera, RX-2801, RX2801, .35oz. (10g)



■ **CYCLIC SERVOS:** Walkera, WK-020-2, WK-020-2, .65oz. (18.7g)



■ **THROTTLE SERVO:** Walkera, WK-020-2, WK-020-2, .65oz. (18.7g)



■ **TAIL SERVO:** Walkera, WK-4004, WK4004, 1.8oz. (49g)



■ **GYRO:** Walkera, WK-G011, WKG011, .70oz. (19.8g)



■ **ENGINE:** Walkera, WK-15A, WK15A, 6.4oz. (182g)



■ **BATTERY:** Walkera, 4.8v 1300mah, WKNiMH 021, 3.2oz. (89g)

Not really. But a new engine only costs \$55.

RC-83#

TESTING

We tested the Walkera HM-83# with Byron Rotor Rage 30% nitro fuel to make sure we could get all the power possible from the little motor. The rest of the setup was stock, including the carbon fiber blades that came with this model.

HOVERING • After several break in flights, the little motor started working quite well and it was time for some testing. The HM-83# is a smaller helicopter that is a bit twitchy when hovering. The stock settings give the helicopter a good mid range feel that is not too responsive and not too aggressive, yet agile enough to feel in control. Overall, the cyclic felt locked in but the collective felt a bit touchy and would jump around if you were not smooth on the sticks.

Rating: 3.5

FORWARD FLIGHT • Pushing the nose forward and accelerating was very easy and the heli seemed to transition naturally from a hover. The HM-83# is a fast helicopter that tracks very well. A little forward momentum smoothed out the collective response and it felt very comfortable while flying forward. Banked turns were easily done and it seemed like the engine was just asking for more.

Rating: 4

CYCLIC PITCH RESPONSE • The cyclic had a happy medium feel to it. It was responsive enough to do 3D but still slow enough to cruise around. With the other mixing options, the HM-83# can be set up even more aggressively for someone looking for a more agile feel. The initial response of the cyclic is a bit slow from the soft damping, so quick inputs did not seem to respond quickly enough for aggressive 3D flight.

Rating: 3

COLLECTIVE PITCH RESPONSE • The collective, as mentioned before, seemed to be sensitive around the stick center during hovering. Precise controls are hard to maintain, as the helicopter seems to jump when applying a very small amount of collective. As you move negative on the collective the response seems to improve. This could be caused by a little slop in the head or servos. Overall, the collective range is sufficient for 3D flight. The little .15 motor

seemed to have plenty of power to perform Tic-tocks, loops, rolls, and other demanding 3D moves with some authority. Although this helicopter is not a powerhouse, it is able to perform these maneuvers with a little collective management.

Rating: 4

TAIL ROTOR RESPONSE • The tail holds with some authority but is not the best in performance. The included Walkera gyro performs well for mild 3D but can not handle some of the faster backwards flight. Overall the gyro performs like a Futaba 401 but has a little tendency to drift during hovering. Slight trim adjustments are needed to keep from drifting during every flight.

Rating: 3

AUTOROTATION CAPABILITIES • The HM-83# can perform autos and with the driven tail it really makes it easy to point the nose into the wind and keep the head speed up. The radio is not pre-programmed for hold so you will have to go into the setup and adjust it. Overall expect the HM-83# to

auto rotate like a T-REX 500.

Rating: 4

POST FLIGHT INSPECTION • Going over the helicopter after a month of testing the HM-83# seems to be holding up quite well. The linkages and servos seem to be holding up just fine. I did notice that the damping seemed to be wearing out a bit, but that is a wear item and should be replaced after a certain amount of flights, this one just seemed to wear out a bit faster. Overall the helicopter was built well from the factory and every screw that threaded into metal had thread lock applied.

Rating: 4

CONCLUSION

The Walkera HM-83# is a great little helicopter to fly that is different from the norm. It has a small electric feel and that great nitro smell. Hey who doesn't like the smell of nitro in the morning? Although this helicopter is not on the high end of the spectrum, it does a great job for its price. *TREX*



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TESTING SPECS

Walkera HM-83#

Part #: 2801

Distributor: Heli Direct

Web: www.helidirect.com

Street Price: \$539

Price as Tested: \$573

Build/Setup Time: 1 hour

PERFORMANCE

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

RPM OF EACH MODE: Normal: 2000
Idle Up 1: 2400
Idle Up 2: 2700

ENGINE TEMP
(after flight): 180° F

FLIGHT TIME: 5 Min, 30 Sec.

CRASH COST: \$17

TEST CONDITIONS

WEATHER: Sunny
TEMP / HUMIDITY: 59° F / 35%
BAROMETRIC PRESSURE: 30.01 in.
WIND SPEED: 5 mph
VISIBILITY: 10 miles
ALTITUDE: 720 feet

PITCH CURVES

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

REQUIRED TO FLY

Fuel 15-30%, starter

WHO'S IT FOR?

The Walkera HM-83# is a great little helicopter for the new comer. It offers a complete package and is built well out of the box. Even a seasoned pilot would find this little nitro intriguing for its small helicopter feel but with a big nitro smell.

» SCORECARD

SCALE RATING: 1=POOR 5=EXCELLENT

3.5 Instructions

3 Parts Quality/Fit

3 Durability

4 Tunability

3.5 Overall Performance

4 Value

+ THE GOOD

- Includes a remote glow
- Performs well for this sized nitro
- Low cost

- THE BAD

- Starter adapter does not stay on the heli or starter
- Stronger dampening would be a plus

Good smoke means the engine is getting lube.





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Visalia

HELIMASH

WORDS and PHOTOS: Sean Williams

THE VISALIA CREW KICKED OFF THE FUN FLY SEASON EARLY THIS YEAR with the second annual First of the Year Heli Bash. Located just south of Visalia, California in Tulare on a flattened section of land, the setting was perfect for flying. All forty registered pilots racked up dozens of flights throughout the day and night, with appearances by some California favorites- Tim Jones, Kyle Dahl, Jesse Kavros, Darrin Reed, and Carson Clowes. And though the weather was a chilly 50 degrees, flying was nonstop.

This is Sean Williams' debut!





The Visalia Heli Bash could best be described as a true "open flying" event. There were no contests or formal noontime demos that would close the flight line (a fact appreciated by everyone). The two flight stations were always occupied. Everyone seemed to enjoy themselves, with skills ranging from novice to some of the best 3D piloting in the world.

At noon, pilots gathered at center field for a group picture, motivated only by the fact that no one would be allowed eat the free lunch until every person cooperated. The lunch was nothing short of amazing, with enough tacos, beans, rice and salsa to feed everyone and then some. While people were enjoying their lunch, Jesse Kavros and Kyle Dahl put on some spectacular center stage flights on their Mikado Logos. Their flying was smooth, precise, and low. It seems each year these young pilots continue to progress tenfold.

Tim Jones from Team Castle was putting nonstop flights on his flybarless TREX 700 converted. He seems to have one of the most dialed in flybarless birds this author has ever seen, with crisp rolls and plenty of pop. Tim's flying has always been very smooth and technical, which is complemented perfectly by his setup. He also brought along a home brewed project, dubbed "The Beast" by many Southern California pilots. When you see it in the air, you'll know why. With nearly 10 horsepower on tap, demanding maneuvers become effortless.



Sean is a great photographer as well as pilot.

Visalia HELI BASH

WHERE'S YOUR FLYBAR?

With each event I attend, flybarless setups seem to be more and more prevalent. In this small crowd, there were 15 or more helicopters running some sort of electronic stabilization. This further suggests that the future of this hobby will include flybarless setups.



As night fell, dinner was served and pilots began readying their night machines. Night flying proved to be more popular at this event than others I have attended, with birds going up well into the night with temperatures below 30 degrees. Tim brought out his Beast and put on some stunning flights, and a few of the younger pilots participated in some "ghetto" night flying, where the helicopter was only illuminated by a spot light.

THAT'S A WRAP!

The Visalia fun fly is one of those events you just have to revisit. With the smaller crowd, the atmosphere felt laid back and relaxed. It's the type of event I'd recommend to everyone. Food, fun, and flying... what could be more perfect? *TJH*

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PILOT INTERVIEW with BRUCE JENNER

They Call Him Bruce

INTERVIEW BY: Mike Velez | PHOTOS: Carl Hyndman

I won't hide that fact that I'm a reality TV addict, last TV season my TiVo was set for Survivor, Monster Garage, and even Jersey Shore. One show that I happened to miss was Keeping Up with the Kardashians. I'd caught the show a couple times but my TV viewing time was pretty limited, that was until my wife informed me that Bruce Jenner, the father on the show was an RC pilot. A recent plot twist on the show thrust Bruce Jenner (winner of the '76 Decathlon) into the world of RC helicopters thanks to small clip of the show with a clear shot of a TREX 600 circulating the internet. Turns out Bruce is one of us! I got in touch with Mr. Jenner and was invited over to his place one weekend to check out his workshop and his flying.

Bruce is a reader of RC Heli and a frequent customer at eHobby House (www.helihobby.com) in Reseda California. Bruce has a pretty nice fleet of helis including two TREX 600N's, a TREX 700, and a Logo 500 with a V-Bar. Although he doesn't build or do much wrenching on his own stuff (that's where Jason VanOrden comes in) Bruce has become a solid 3D pilot and does do some minor repairs and adjustments on his own stuff.

Carl and I met up with Bruce and Jason at Bruce's home in Southern California. A friend of Bruce's has some vacant property not far from Bruce's house where he flies daily. This was the perfect opportunity to spend some time with Bruce and get some insight from him on his new found hobby. To check out video of Bruce flying visit our website.

MIKE: HOW DID YOU GET INTO RC HELICOPTERS?

BJ: Not this Christmas, but last Christmas, my son... Brandon; because I'm a pilot. I fly airplanes, helicopters, and all that stuff. I have an aviation company, Bruce Jenner Aviation. He bought me one of those little Blades, little red things, you know. So I got this thing... and I go "this kind of looks cool."

MIKE: DO YOU REMEMBER WHICH BLADE IT WAS?

BJ: The little one, two bladed thing (Blade CX) so he got me that and I went, "oh man.... this is kind of ok." Figure it out and after a while, you know I started getting good with it. Flying it around the house and land it on people's heads, of course at this point I feel like I'm getting pretty good. I bang it into a chair and go to the heli store to get parts and I go "damn there are bigger ones?" (laughs) So, that kind of started it. My next Step was a Blade 400. Man that was like a step up. Whoa, this is pretty big! I thought to myself. I could take it off and fly it tail towards me just out in back and stuff like that. But with the little blade I could do a circle and stuff. So I'm out in my front lawn. I'm flying it around and hey; I'm getting it pretty good. Well, maybe I'll do a just little 360. Start the thing...Wham!

MIKE: SMACKED INTO SOMETHING?

BJ: It just took off toward the trees...whooom! So I go "okay, better get the simulator." I got the flight simulator and said I better start working on this thing.

MIKE: SO LOTS OF LATE NIGHTS ON THE SIM AFTER THAT I ASSUME?

BJ: I got the simulator; figured I'd better start there. I put it on the show and they had to clear it for the show aired. It was the Real Flight sim. After the show aired someone at Hobbico called us and I did a little promo thing for them. So, they (HeliHobby.com) made me two TREX 600s. Actually Jason did, I didn't even know Jason at the time. The production company called me and said, "Hey we've got some helicopters here for you." When I saw them there I figured I hit the jackpot! Of course they didn't have any of the up grades, so, I had to up grade everything. So, that's when I started with the 600's and that was about a year ago.

MIKE: ELECTRIC OR NITRO?

BJ: Two nitros. I've been through kind of a tough process with that. You know crashing a bunch of times and just learning stuff.

MIKE: DID ANYBODY BUDDY BOX WITH YOU?

BJ: No, no one really did. I did it all pretty much on my own.

MIKE: BECAUSE I'M EXPECTING SOME INSANE 3D WHEN YOU FIRE THIS BAD BOY UP (POINTING TO TREX 700).

BJ: Oh major, yeah.... everything... (smiling) I'm working on it; I have come a long way in the last year. Had a lot of fun doing it and I'm just taking it slow. I'm on the computer a lot; trying to figure it out. You save a lot of helicopters that way.

MIKE: YOU CAN CRASH A LOT OF HELICOPTERS IN A NIGHT ON THE SIM.



BJ: I did take one lesson actually. Don't know if you know Todd Bennett?

He said, "Well I spend 23 of 24 hours a day on the computer."

MIKE: YEAH, TODD'S A GREAT PILOT. HE DEVELOPED THE SYNERGY N9 WITH JASON KRAUSE.

BJ: Todd's wife emailed me and said my husband just loves this stuff too; you should get together. He actually came over here. He's a "fly high" guy. Try all your moves real high. This advice actually really helped out quite a bit. I was probably too low when flying a lot of new maneuvers.

MIKE: THEY CALL THAT FLYING 3 OR 4 MISTAKES HIGH.

BJ: So Todd came over and I spent some time with him. He was great. His advice was just to get it up; get used to getting high and get up there and learn your stuff and slowly work your way down. I was only with him once and I just haven't gotten back with him again. I've learned some from my friend Jason here; he's a good pilot. I go over to balboa (local field), meet other pilots, talk and just learn more. For me, honestly, the reason I enjoy it is, I like learning new skills. For me it's always fun. I play golf. Work on my golf game hard. I played in the Bob Hope this weekend and did real well. I like learning skills. It's a plus from being an aviation buff. People don't realize how difficult it is to fly. Do you fly?

MIKE: I'M A PERPETUAL NOVICE, BUT LOVE IT.

BJ: People don't realize really how difficult it is. I tell them it's as hard as learning how to play the piano. It takes time. You've got to fly a lot. You need to spend a lot of time on the sim. I went to the LA Classic Fun-Fly; I didn't know who it was; some kid, looked like he was 17 or 18 years old. He was an Align guy. This little son of a gun just threw that thing all over the place. I'm watching this and just amazed. So I go over, "what's your deal kid? That's real nice...how long you been flying?" He tells me three and a half years. I tell him that it's great and ask how do you learn so quickly?

MIKE: I BELIEVE IT

BJ: Dedication, that's what it takes in anything.

MIKE: SO HOW LONG HAVE YOU BEEN A PILOT?

BJ: A real pilot, 33 years. I have almost 6,000 hrs of flying time. I sold my plane a couple years back. My last one I had I haven't replaced. I just do fun flying with my kids now. A little Decathlon, go out and do aerobatics and all that kind of stuff.

MIKE: SOUNDS FUN.

BJ: I had a Pitts for years, flew aerobatics, did all that.

MIKE: HOW ABOUT HELICOPTERS?

BJ: I never actually gotten my ticket, but I have had a lot of stick time. I have a friend with three helicopters. He is a certified instructor so we'd go out all the time and fly all over the place, but I just never got my actual ticket.

MIKE: SO WHAT'S MORE DIFFICULT, RC OR THE REAL THING?

BJ: Radio control, they are a hundred times more difficult. A full-size is so much easier. You only have one thing to work with. I tell people it's kind of like if you're in a helicopter and you have a swivel seat and you have a mirror in the back and you have to fly looking into the mirror and the seats spinning around. (laughs) That's the best way I could explain it.

MIKE: HOW OFTEN DO YOU AND JASON FLY TOGETHER?

BJ: Off and on probably once a week I would say. He comes here or I go over there (Apollo Field). There are a lot of guys there, which is fun. I've been talking to the producer to get some ACTUAL flying on the show. It's been on the show and we've used it as a story line. We did that whole thing on the wife and the...

That's Jason and his Avant.

FLY LIKE A PRO

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SPECIAL FEATURE

BRUCE JENNER

MIKE: THE CREDIT CARD?

BJ: Yeah the credit card thing and wanted to get parts and I wanted to get a new helicopter and this and that. I guess it created a stir in the heli world.

I went to a website and people were talking about me and the show "oh man he can really fly." So it's kind of been fun, it's a good group of people and fun stuff. So, I've enjoyed that aspect of it. It's fun to give the sport a little bit of good press.

MIKE: YEAH, WE DON'T MIND IT...AS LONG AS YOU DON'T CRASH AND KILL SOMEBODY THEN WE'LL BE OKAY.

BJ: Well I had that the other day, the LA Times was here and they were doing an article for the Calendar section. They said, "Oh we heard about these helicopters, you want to fly?" So I brought them over here, I was going to fly off that little point... (pointing over) and the photographer, he doesn't know. He's trying to get his shot "you're going to get right here with the helicopter." I was going to bring it in inverted, relatively close. I didn't bring it too close, but relatively close. He wanted it inverted. This was with my 700 and this guy kept saying: "you gotta get it in closer." No way, there is no way I'm getting this thing inverted any closer. So I said "no we're not going to do it upside down." I flipped it over and I felt a little more comfortable when it was right side up.

MIKE: HOW WAS IT THE FIRST TIME YOU WENT INVERTED?

BJ: I practiced it a lot on the sim before actually trying it. Right now I'm working on tail first 360's. I work on the computer a lot until I feel good. Then I'll take it up high and practice as high up as I can. You've got to

practice, practice, and practice. Yesterday I did two flights on the Logo, then two on the flybarless 600, and then three on the 700. Unfortunately I have to work once and a while so can't fly that much all the time. The more you fly the more confident you'll be and the better you'll get. It's that simple. I've worked really hard lately on doing sideways stuff instead of straight out and back. It's getting there.

MIKE: SO THE CHALLENGE OF 3D IS MORE APPEALING THAN A SCALE SHIP?

BJ: To each to their own, scale looks great when it flies. It looks like the real thing. But I like 3D.

MIKE: SO DO YOU HAVE ANY BRAND PREFERENCES?

BJ: Well it doesn't make any difference, I pay for these things. Besides the two 600's that were given to me by HeliHobby, so I have no loyalties anywhere. But, put it this way, I proved it 30 years ago I can be bought. (smiling) There is a price on my head. But, ah, they gave me the two TREX 600's, which was very nice. I certainly appreciate that.

MIKE: GOING TO FLY AT ANY FUN FLY'S THIS YEAR?

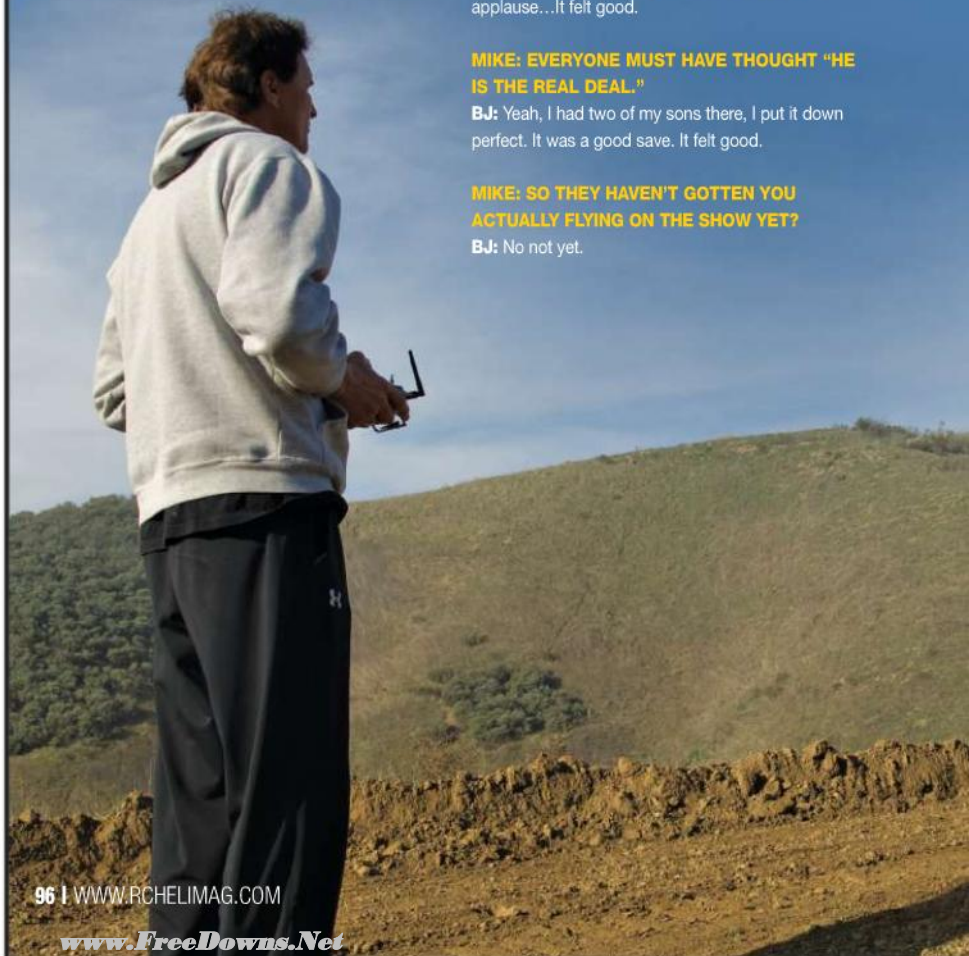
BJ: I went to the LA Classic last year. I was scared; I didn't want to go out there... everyone watching me... I said to myself "damn it Bruce, man up! Go out there and fly the damn thing with all these good guys." Actually, it was pretty funny, I was flying and of course people start coming around. The one I was flying, if you take a turn to the left and the fuel is low, the fuel pick up doesn't work very well. So I knew the fuel was getting low and yeah, I'm going to turn and "vwoom" the engine dies. Perfectly auto rotated it in. I got applause... It felt good.

MIKE: EVERYONE MUST HAVE THOUGHT "HE IS THE REAL DEAL."

BJ: Yeah, I had two of my sons there, I put it down perfect. It was a good save. It felt good.

MIKE: SO THEY HAVEN'T GOTTEN YOU ACTUALLY FLYING ON THE SHOW YET?

BJ: No not yet.



MIKE: YOU GOT TO WORK THAT IN.

BJ: Probably next summer they'll shoot again. That way I can get better.

MIKE: OH, THERE YOU GO

BJ: I got more time to improve. I was thinking about actually taking it, with pictures of me behind the sticks and let Jason fly. You know like do side tic-tocks right in front you know stuff like that? Then turn, take off, and then cut back to me. Everyone would think damn Bruce has gotten good! But that's cheating.

MIKE: I IMAGINE WITH SOME GOOD CAMERA WORK NOBODY NEEDS TO KNOW. (SMILING)

BJ: Yeah, but I'd never do that. I haven't gotten to the sideways tic-tocks. I can do them both ways; up and down, but I haven't gotten to the sideways. I've been playing on the sim with those now.

MIKE: WHAT OTHER HOBBIES DO YOU HAVE? YOU SAID GOLF?

BJ: Really right now, just the helicopters. My golf game I work on everyday. I have to work for a living. I got a lot of kids; I got 10 children.

MIKE: SO WHAT IS THE DAY JOB?

BJ: I work at a lot of things. Obviously, we got the show. I work with different companies; represent companies. Do a lot of speaking across the United States. I did one in Jackson, MS two days ago. I'll be here at home for a few days then I go to New York. I have this thing I'm doing with COPD. Chronic Obstructive Pulmonary Disease. I'm doing awareness work for them. So, I got to go back to NY to do some media stuff with them. Then next week or the week after that, I'm going to drive a RV across the country. The Drive4COPD. With Danica Patrick and a bunch of people, we're all piling into this thing and doing a media tour across the country.

MIKE: IS THE MOTIVATIONAL SPEAKING FOR CORPORATE CLIENTS?

BJ: No, pretty much anybody who's willing to pay. (smiling) I would say 80% are corporate groups.

MIKE: WHAT ARE THE CLIFF NOTES OF YOUR PRESENTATION?

BJ: It's called "finding the champion within." I talk about personal development. I use the '76 games as a kind of a metaphor for life. All the things I went through, leading up into that and it's very motivating. It's about personal development. All the trials and tribulations I went through leading up to the games and relate it to what they are trying to do in their lives.

MIKE: DOING SOME RESEARCH FOR THE INTERVIEW I FOUND AN INTERESTING QUOTE ABOUT JOE NAMATH, DO YOU REMEMBER THAT ONE?

BJ: (laughs) Actually, I was doing a roast many, many years ago. I was doing a roast of Joe Namath. It was back in the old days, when they had the old roasts, you know? The old Dean Martin roasts and they asked me to come in. I said it's amazing the similarities I have with Joe, I said I trained for twelve years of my life for really a career that lasted two days in the Olympic games. Joe trained two days for a career that lasted twelve years. That was one of the lines I used at a Joe Namath roast.


MIKE: THAT'S FUNNY, THAT'S ONE I FOUND THAT AND THOUGHT, WOW, THAT'S PRETTY BRUTAL TO USE IN YOUR MOTIVATIONAL SPEECH.

BJ: No, that was a Joe Namath roast...a million years ago.

MIKE: SO WHAT WAS IT LIKE TRAINING FOR THE GAMES? YOU RETIRED THE DAY THAT YOU WON THE DECATHLON, WHAT WAS THE MINDSET?

BJ: I had to give up too much to be there. Had to give up my entire life just to compete at that level takes so much out of you. You live it breathes it twenty-four hours a day. You dream about it at night. I made the decision in '72 when I competed. I said I'm going to go four more years. Give it absolutely everything I can, give up everything else in my life to see how good I could become at something. And see how far can I go. So I knew there was an end. As I call it, there was finality to this thing. So I can give up a job, living in a little dinky one-bedroom apartment, just getting by because I know there was an end and I'll move on to more important things in life in '76 when the games are over. Win lose or draw, I was moving on. That was also a great motivating factor too. So it was a conscious decision. I couldn't do that forever.


MIKE: WELL I KNOW GROWING UP THAT YOU WERE DEFINITELY AN INSPIRATION FOR MILLIONS OF MY GENERATION. I'M SURE THAT THE SHOW IS GETTING THE YOUNGER CROWD INTERESTED IN YOU AND YOUR STORY. SURELY YOU'LL CONTINUE TO INSPIRE MANY MORE. THANKS FOR THE TIME BRUCE IT WAS A REAL PLEASURE. GOOD LUCK FLYING AND FOR EVERYTHING.

BJ: Thanks a lot, my pleasure. 

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METHODS FOR DESCRIBING VERTICAL FLIGHT

Vertical flight is GO!

WORDS: Art Koral | ILLUSTRATIONS: Dave Palacios

DESCRIBING AND MODELING HOW A HELICOPTER HOVERS, CLIMBS OR DESCENDS is a very challenging academic subject. It takes powerful Computational Fluid Dynamics (CFD) programs to even get close to modeling what happens at the rotor blade. Fortunately, there are tried and true theories and methods that can be taught which simplify understanding helicopter flight tremendously. In this Heli IQ, we will explain two primary methods of describing Vertical Flight: The Momentum Theory and the Blade Element Method.



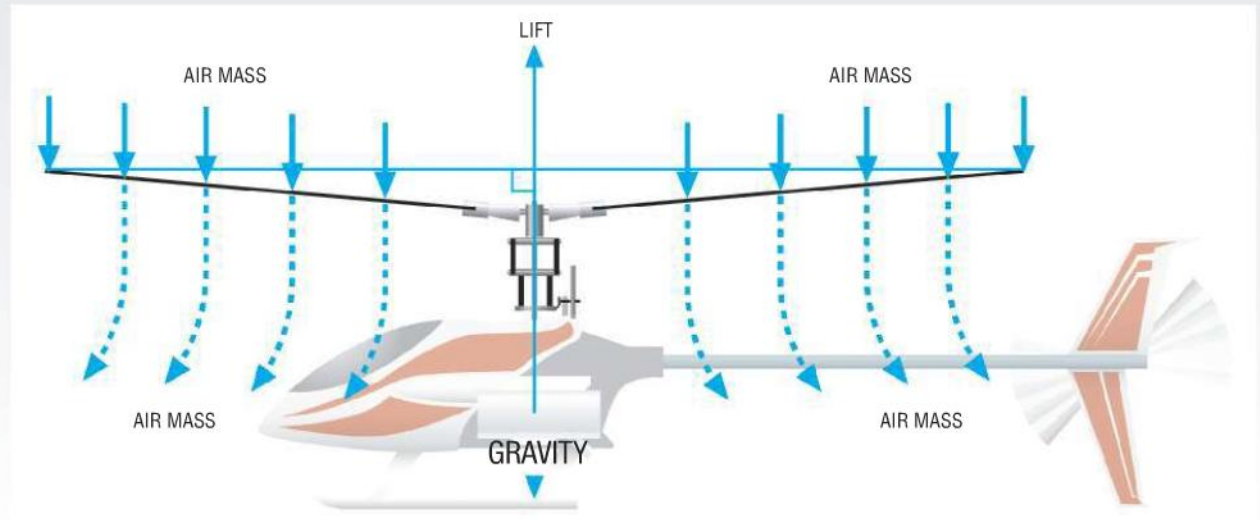
Newton was famous for that apple thing... remember?

» MOMENTUM THEORY

■ **NEWTON'S SECOND LAW OF PHYSICS** states that a force is equal to acceleration times mass or $F = ma$. For a helicopter in a steady-state no-wind hover, force equals rotor thrust, acceleration is the change in velocity of the air well above the rotor disk to the speed of the air below the rotor disk, and mass equals the amount of air flowing through the rotor disk.

■ **NEWTON STATED IN HIS THIRD LAW OF PHYSICS** that for every action force there is an equal and opposite reaction force. In the case of helicopter blades, the force imparted to the air causing the air's acceleration is the same force - only opposite in direction - and causes lift.

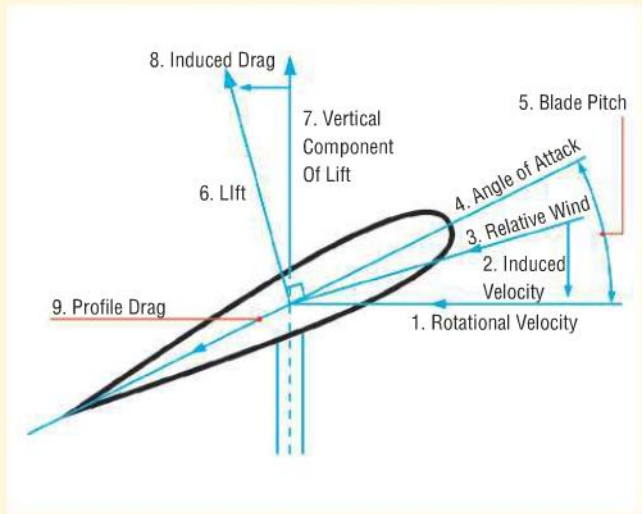
■ **BY THE MOMENTUM THEORY**, hovering is attained by the rotor thrust providing sufficient lift to just overcome the force of gravity. For a climb, thrust is greater than the force of gravity, and for decent the rotor thrust is less.



BLADE ELEMENT METHOD

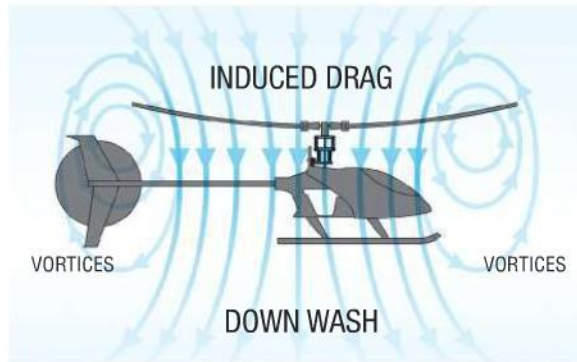
In the Blade Element Method, a blade is viewed from its cross-section. Vectors are used to describe the magnitude and direction of forces. The length of a vector is proportional to the strength of the force and the direction of the vector is the direction in which the force is applied. Vectors are added together geometrically to get a net resultant force. It's the resultant force that causes each blade of a helicopter to generate lift

The blade sees a combination of **rotational flow (1)** and **downward induced flow (2)** called **relative wind (3)**. The **angle of attack (4)** is the angle formed between the relative wind and the chord line, and the **pitch angle (5)** is formed between the rotor plane and the chord line. **Lift (6)** is the total aerodynamic force perpendicular to the relative wind.



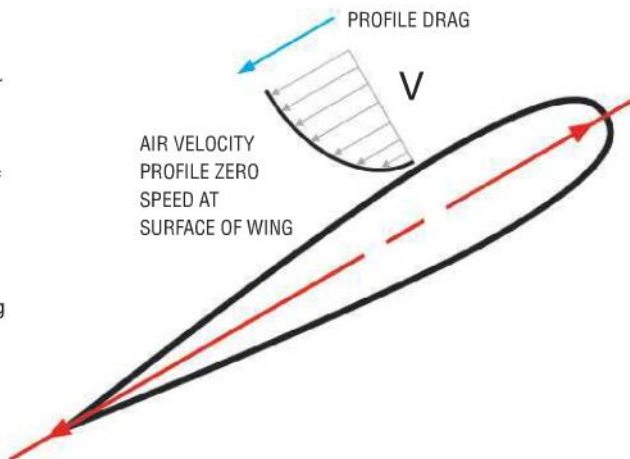
INDUCED DRAG

For a helicopter in hovering flight, the lift is tilted aft. The lift vector can be broken into two components: a **vertical component (7)** - the total force that generates vertical lift, and the rearward component called the **induced drag (8)** formed from the acceleration of air mass (downwash) and the energy spent in the creation of trailing vortices. Induced drag must be overcome to develop lift and power is required to the rotor system to overcome this drag.



PROFILE DRAG

The remaining vector on the blade element diagram is profile drag (9) a result of air friction acting on the blade element. Air traveling over the wings is at zero velocity at the immediate skin of the blade. Within fractions of a millimeter the air velocity increases and quickly goes to the free air stream velocity. The friction in this boundary layer is a result of the air's viscosity causing shear forces. (Kind of like the force it takes to slide two Oreos apart). The faster the velocity over the wing element, the greater the profile drag and more power is required to drive the rotor system.

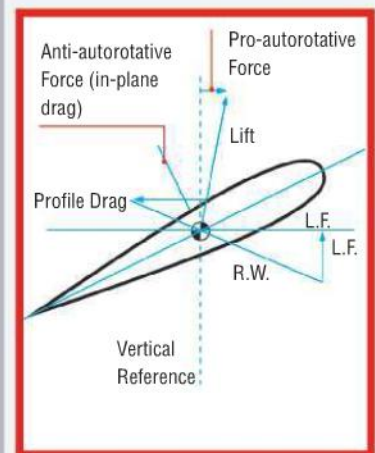


Using the Blade Element Method to describe vertical flight.

TECH INFO

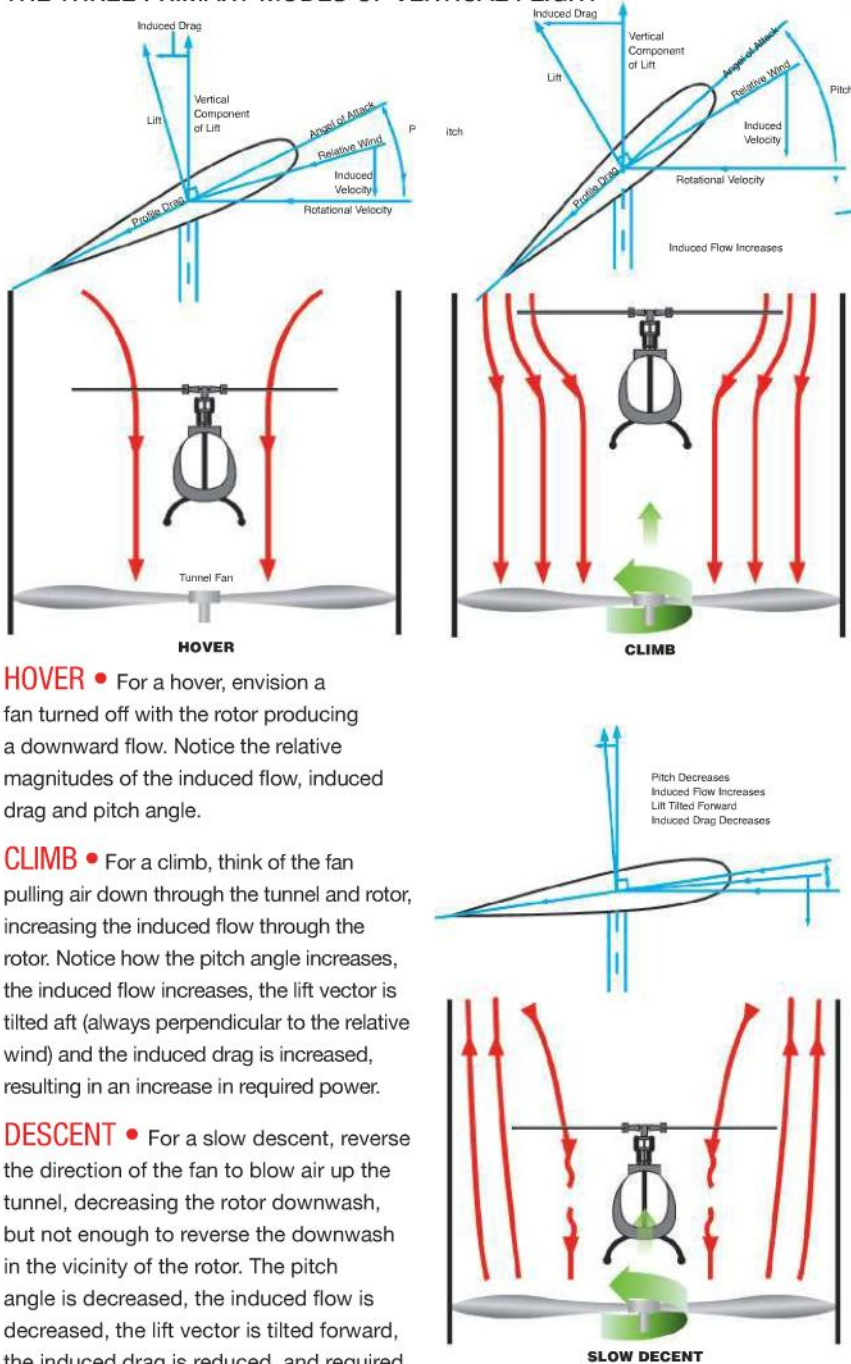
AUTOROTATION

Guess what happens if the pitch angle decreases to the point where the helicopter descends and the air now moves upward through the rotor head? If you guessed "autorotation" you are correct. Notice in the Blade Element Diagram how the induced flow changed direction causing the relative wind to move underneath the rotor plane. As a result, the lift vector gets tipped forward, it's horizontal component (Induced Drag) changes direction and becomes a Pro-Autorotative force. The Pro-Autorotative force turns the rotor head and relieves the motor from generating torque.



Drag...

THE THREE PRIMARY MODES OF VERTICAL FLIGHT



HOVER • For a hover, envision a fan turned off with the rotor producing a downward flow. Notice the relative magnitudes of the induced flow, induced drag and pitch angle.

CLIMB • For a climb, think of the fan pulling air down through the tunnel and rotor, increasing the induced flow through the rotor. Notice how the pitch angle increases, the induced flow increases, the lift vector is tilted aft (always perpendicular to the relative wind) and the induced drag is increased, resulting in an increase in required power.

DESCENT • For a slow descent, reverse the direction of the fan to blow air up the tunnel, decreasing the rotor downwash, but not enough to reverse the downwash in the vicinity of the rotor. The pitch angle is decreased, the induced flow is decreased, the lift vector is tilted forward, the induced drag is reduced, and required power is now reduced.

TECH INFO

VORTEX RING STATE DEFINED

Vortex Ring State or Power Settling is an uncontrolled rate of descent caused by the helicopter rotor encountering disturbed air as it settles into its own downwash at high power settings.

VORTEX RING STATE EXPLAINED

Imagine a helicopter flying over a tunnel with a high power fan at the bottom and the helicopter trying to maintain its position. The fan off would simulate the helicopter in hover. The fan blowing down would simulate a climb. During a climb the helicopter must produce more downwash to remain stationary. To simulate a slow decent the fan is reversed, blowing air up decreasing the rotor downwash required to maintain a hover.

During vortex ring state, the fan is set to blow up at a magnitude equal to the velocity of the rotor down wash. Rotor tip vortices (created by the span wise airflow over the rotor departing over the tip of the blade) are not allowed to move from the vicinity of the rotor, enveloping the rotor in a bubble of air. In essence the helicopter is now riding on a treadmill of air. Instead of the helicopter displacing the air to move or hover, the air is re-circulated back into itself. No significant thrust is created out of the bubble regardless of the power applied and the bubble (along with the helicopter) begin to fall.

Helicopters susceptible to vortex ring usually have power available that barely exceeds power required; they are at their weight limit or at their power limit. Heavy scale birds and fixed pitch trainers tend to be more susceptible to power settling. Most 3D capable helis just power through it without it ever being noticed.

Vortex ring is predominately encountered during steep descents at a speed equal to the rotor down wash velocity. The best way to avoid a vortex ring is to fly shallow approaches into the wind when landing. If suddenly you find yourself adding lots of power and the helicopter is rapidly descending at same time, you're in a vortex ring state! Simply lower the nose, drop the collective, and fly out. If you're low to the ground, level the rotor, freeze the collective, and prepare for impact.

Look out for vortex rings.

CONCLUSION

In summary, the Momentum Theory describes lift as the reaction of thrust created by the acceleration of airflow from the top of the rotor disk to the bottom. The magnitude of the thrust determines if a hover, climb or decent is achieved. The Blade Element Method looks at a cross section of a single blade. It uses vectors to describe specific forces such as profile drag, induced flow, induced drag, relative wind, and lift. The next time you fly your RC heli, consider the Momentum Theory and the Blade Element Method to describe what happens during the various portions of your flight. *RHH*

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OUTSIDE LOOP

Loop the loop.

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

A BASIC LOOP IS USUALLY ONE OF THE FIRST MANEUVERS ATTEMPTED WHEN LEARNING AEROBATICS. IT'S FAMED FOR ITS SIMPLICITY AND HIGH THRILL FACTOR WHEN FIRST ATTEMPTING IT. However, things can get tricky when changing the orientation of the loop. During an outside loop, your skids will face inwards and all your controls will be backwards. This is when your mind plays tricks on you and suddenly the outside loop isn't quite as easy as a regular loop. The overall concept, however, does remain the same, so as long as you're able to get past that first mental lapse it becomes easy. In this installment of Pilot Skills we'll break down the proper way to perform an outside loop and tips to get you over that mental block.

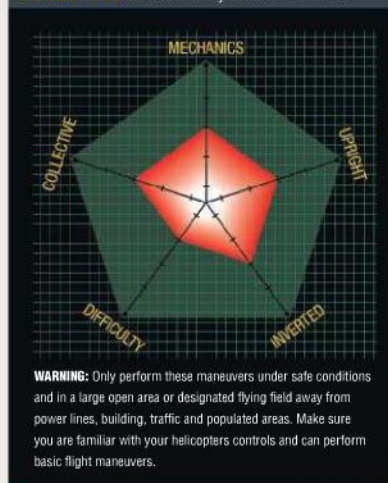


A Loop with the skids towards the center.

Flight School Training

» SKILLS NEEDED

SCALE RATING: GREEN = Easy / RED = Advanced



PROPER SETUP:

- **PRECISION IS KEY** during this maneuver so a "fast" setup isn't necessary; as a matter of fact it will be easier to perform with a more conservative setup.
- **A HEAVIER SET** of blades will slow cyclic response, allowing it to track better throughout the maneuver.

- **A SLOWER SETUP** will help, but it can also be performed with a faster set up as well (you'll just need to be easier on your inputs).
- **A SOLID GYRO** will help out when looping at higher speeds. Keeping the tail straight will determine whether or not the loop is on axis.
- **YOU'LL WANT A DECENT AMOUNT** of power to help your helicopter climb through the loop.

HOW TO PRACTICE IT:


- **BEFORE TRYING** an inverted loop, be sure that you are able to perform a regular loop with ease. This will allow you to understand the characteristics the helicopter exhibits during a looping maneuver.
- **THE BEST WAY** to get ready for it is by rolling your helicopter inverted and while inverted give a forward cyclic input with a negative collective input until your helicopter is vertical. This will help prepare you for your transition into the outside loop.
- **YOU CAN ALSO PRACTICE** your nosedives, I know that sounds crazy,

but you'll need to be comfortable with descents when coming over the top. Work on nose first descents and gradually increase the angle until your comfortable doing dives straight towards the ground.

- **WORKING ON FORWARD FLIPS** will also help your orientation because when flipping from the side your orientation is very similar.

WATCH OUT FOR:

- **WATCH YOUR SPEED ON YOUR DESCENT;** you'll be flying at high speeds so be comfortable at an inverted orientation.
- **YOU'LL HAVE YOUR CYCLIC STICK POINTED FORWARD** throughout the entire maneuver, how much input is needed is dependent on many different factors and will need to be adjusted throughout the loop. With enough practice you'll be able to determine the right amounts of input to add.



6 You'll want to keep the collective stick centered on your descent so it transitions smoothly.

5 Once in the upright position, drop the collective stick back towards center and begin descending back towards the ground.

4 Continue this heading while adding slight corrections to your collective and keeping your cyclic stick forward as it begins to transition to an upright position.

7 Keep your cyclic stick forward until you begin transitioning back into an inverted state, once inverted begin adding negative collective seamlessly until you're completely inverted.

3 Once inverted, add a negative input and slowly move your cyclic stick forward so your helicopter will begin to climb in the inverted position.


START

1 Fly fast forward flight (in this case left to right)

8 Roll the heli over to an upright state.

2 When at center field, add a right cyclic input with a quick positive collective input to begin to roll your helicopter.

CONCLUSION

Even though the concept isn't hard, the outside loop is still one of the hardest maneuvers to do because of the unusual orientations. It's hard enough to fly in an inverted state but even harder to do so while looping. But like all other moves, it really comes down to the basics and once you got that down the rest will fall in place. Just practice it at a high altitude, because the helicopter will come back towards the ground at high speeds during the descent. 

TUMBLING LOOP

Tumbling down, down, down.

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

WE'RE GOING TO KEEP THINGS ROLLING WITH ANOTHER LOOPING STYLE OF MANEUVER, IN THIS CASE A TUMBLING LOOP. A tumbling loop is a fun maneuver and will test your thumb dexterity. The concept is simple but what gets most pilots is the timing. Your collective inputs are the key to success on properly performing a tumbling loop. This one won't be too hard if you're able to do back flips and have some sort of collective management skill. As always, in this edition of Pilot Skills we'll give you a complete breakdown on how to properly perform a tumbling loop in style.



Brandon is worried about what to type here.

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, buildings, traffic and populated areas. Make sure you are familiar with your helicopter's controls and can perform basic flight maneuvers.

SETUP YOUR CHOPPER:

- **AS YOU CAN IMAGINE**, any move that consists of both tumbling and looping will require a capable setup, but like most maneuvers it can be performed with an average setup

instead of solely an "advanced" setup. The faster your cyclic response, the easier your helicopter will tumble throughout the loop. If you have a flybarless setup, you're golden and it will make this move easier. However, you can still go with a tamer cyclic setup for a more graceful rendition of the maneuver.

- **TUNE THAT MOTOR!** You won't need a lot of power if this move is performed properly, but you'll want your motor to be in a healthy state of tune. You're going to need collective authority at random points so it's nice to have it. It's also easy to bog your motor during this move, so the more power the better.
- **THREE WORDS:** carbon fiber blades. You could do with woodies, but I highly recommend carbon fiber.
- **SWAP OUT THAT OLD** mechanical gyro and get with the times and invest in a nice heading hold gyro. The nicer the better.

TRAINING:

- **THE MOST IMPORTANT THING** to learn is to perfect your back flips from a sideways orientation. You're going to have to be able to do this in a stationary position without ever losing your ground. Keep it locked in one spot without having it drift outwards or inwards.
- **ONCE YOU HAVE YOUR FLIPS DOWN**, begin practicing climbing while flipping and descending while flipping. This is very simple, while climbing just add the proper collective input that allows your helicopter to climb when horizontal. When descending add the collective input that pushes your helicopter towards the ground, but don't jam the sticks or you'll find yourself in the ground in a heartbeat.

5 Now that you're upright, flip your helicopter over by adding positive collective and backwards cyclic until the nose is facing back towards the ground.

4 Apply negative pitch and back cyclic to flip your helicopter back to an upright position. Time it so that when you're flipping back over, your helicopter will do a climbout towards the center of the field almost like doing a backwards-inverted loop.

3 Continue pulling back on your cyclic and applying negative pitch until your helicopter is in a complete negative orientation. Make sure to keep your helicopter parallel to the runway.

START

1 Start by putting your helicopter in a backwards-inverted position by applying back cyclic with a positive collective input. Begin transitioning into backwards inverted flight by adding negative collective.

6 On mid descent you're going to have to flip back inverted. The key to this is to add very little collective and to add opposite collective inputs. In other words, instead of doing a typical flip, you're going to add the opposite collective input so your helicopter will continue to descend. However, these inputs are very small and must be timed perfectly.

2 Use that momentum to continue into an inverted orientation by keeping your collective negative and your cyclic stick back.

7 Continue to flip back into an upright position, transitioning back to forward flight.

CONCLUSION

The main thing to remember is to add the proper collective inputs throughout the loop. You'll need to add large amounts of collective to actually make the helicopter loop, otherwise you'll be performing a basic flip. Just watch your descents, because if you add the wrong input you can bury it straight into the ground. **THH**



SPECS

CREW: 2
CAPACITY: 2
LENGTH: 28ft
WINGSPAN: 26 ft 0 in (7.92 m)
MAIN ROTOR DIAMETER: 41 ft 0 in (12.50 m)
MAIN ROTOR AREA: 1,320 ft² (122.7 m²)
EMPTY WEIGHT: 1,647 lb (748 kg)
GROSS WEIGHT: 2,400 lb (1,090 kg)
POWERPLANT: 1 × Kinner C-5, 210 hp (160 kW)

PERFORMANCE

MAXIMUM SPEED: 110 mph (70 km/h)
RANGE: 250 miles (160 km)
SERVICE CEILING: 10,000 ft (3,000 m)

KELLETT KD-1

Another Confused Heli

WORDS: Brandon Uptdike

The autogyro has always been a unique aircraft, as it integrates both helicopter and airplane features into one package. The helicopter aspect comes in the form of a main rotor, while it is mounted on an airplane styled fuselage with control surfaces. The Kellett Autogyro Corporation was a pioneer in the development of autogyro aircraft throughout the 30's and 40's. They initially manufactured the Cierva autogyro and used the knowledge that they gained to begin designing and building their own. After making numerous models, Kellett was able to refine their designs into their flagship the KD-1.

FEATURES

As you can imagine, the KD-1 was a very unique design for its time. The D stood for "direct control", meaning that it did not rely on airspeed for control. This made controlling the aircraft a lot easier and more conventional. There was a two-seat cockpit that was open to the air. Each seat had its own cockpit area. The rotor blades were made of three different kinds of woods: birch, spruce and ash. Each blade had a steel spar with the wood finish built around it. A 255hp, 7-cylinder radial engine provided power to the blades.

Perhaps the feature that really stands out the most was the motor mount. The mount was made from a steel tube that housed all the components and was covered with an aluminum faring. The fuselage was made of steel sheet and tubing covered in fabric. All of the

stabilizers were made of wood with steel spars. It also used an intricate clutch design for the engine, allowing for smooth engagement of the engine during takeoff. The blade design had a damper system that allowed for the blades to align themselves properly for lead and lag. Like all autogyros, the rotor blades were free spinning so there was never any counter torque applied to the fuselage.

SERVICE HISTORY

Like many designs throughout history, the military looked into the KD-1 for possible experimental purposes. The government bought one and designating it the YG-1 and used it for numerous tests. They ended up purchasing a few different KD-1's and fitting each one with different types of components. With the greater success of helicopter

development during WWII, the Army decided to scrap the project. However, it was the first rotary winged aircraft used by the Army to perform air mail service.

CONCLUSION

Following the war, Kellett decided to scrap his autogyro designs and the KD-1 found itself relegated to a museum. There were talks through the years about restoring the original prototype KD-1's, the plans never materialized. The KD-1 - along with other Kellett aircraft - found itself in a barn on a private estate but was destroyed by fire. Very little remains of the original aircraft, but there have been remakes over the years and the Imperial Japanese Army had great success with the design during WWII with their KA.1 helicopter. **TIBL**



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

INVENTION PATENT:

When airplane crashes into ground, while the propeller suffered attacking, the propeller protector will make propeller come off automatically, which avoid destroy of propeller, motor shaft and body. When you put the propeller back into airplane, the airplane can fly normally.



SPECIFICATION

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

SOLO PRO III

2.4GHz--4CH



SOLO PRO

INDOOR AND OUTDOOR FLYING

27g [0.95oz]

ULTRA-MICRO SIZE



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



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

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

PCT patent of "SINGLE ROTOR MODEL HELICOPTER WITH IMPROVED STABILITY BEHAVIOR".
PCT No is: WO/2009/062407

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