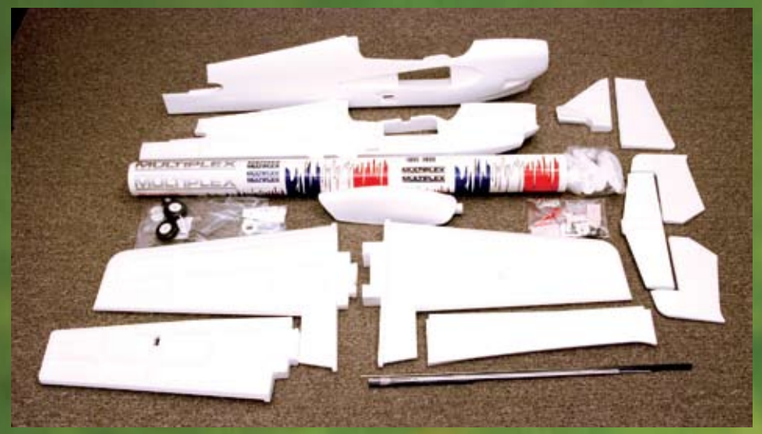
Multiplex AcroMaster

BY: Mike Hoffmeister

Recently I progressed from flying flat foam 3D airplanes to more advanced aerobatic/3D planes of the built-up balsa and plywood construction type. While these fly great, my fear of destroying them while practicing low-altitude high-risk 3D and aerobatic maneuvers was slowing my learning progression. What I really needed was a mid-size aerobatic/3D airplane that flies like a built-up balsa model, yet has the durability of my expanded polypropylene (EPP) foamies. When I heard about the AcroMaster's durable Elapor® foam construction, large-scale size, and great lines, I jumped at the opportunity to get one.



▲ The kit contents provided are very complete, which make the build fast and easy.

One of my first electric-powered airplanes was a Multiplex EasyStar, which held up for a long time and survived many instances of "dumb thumbs" with little or no repair needed. My positive experience with the EasyStar gave me confidence in the AcroMaster's ability to deliver extreme durability and great flight characteristics along with simple and straightforward construction.

Kit Contents

I received the airplane kit, plus the power set kit and the receiver/servo flight pack kit for the build. Note that the power kit and flight pack are both available from Multiplex USA/Hitec USA and their dealers. Upon opening the boxes, you will find the following items all well-packed and organized:

Airplane

Molded Elapor foam parts for fuselage, wings and tail panels
Carbon Fiber reinforced fiberglass spars
Undercarriage mount, undercarriage, wheels, motor mount
Small parts hardware package
Decals
Comprehensive instructions

Power set

Himax 3516-1130 brushless outrunner motor with mounts/collet and hardware
Castle Creations Phoenix 45-amp electronic speed control (ESC)

Flight Pack

2 Hitec HS-81 servos
2 Hitec HS-65 servos
2 Hitec 24 in. servo extensions
1 Hitec Mini 6S receiver

Construction

Airframe

As I laid out and inspected the airframe parts, I was very impressed with the obvious care and precision that went into the design and manufacture of the airplane's parts. The internal pockets and ribbing assure a lightweight airframe without compromising structural strength. The fit and finish are outstanding. It's like a big 3D (no pun intended) puzzle, where all of the parts fit together perfectly.

Before starting the build, I studied the instructions. They are very well structured and clear, with good illustrations. One thing that caught my eye and made me smile was the statements advising to only use cyanoacrylate (CA) and kicker, with no need for epoxy or other types of adhesives.

Due to the good fit and interlocking nature of the parts, I found it quite easy to keep the major parts aligned during the assembly/gluing process. While the instructions state to apply a light dusting of CA accelerator to one side of the joint, I wanted to make sure I had enough time to properly line up the parts before the CA started to set, so I omitted the accelerator on the major assemblies (fuse halves, wing panels).

I deviated from the instructions slightly while hinging the control surfaces. I find it much easier to glue the hinges into the movable part of the control surface first, with the thin (flex-joint) portion of the hinge positioned accurately. Once the glue sets, I fit the hinge-equipped control surface to the mating airframe part. Then you only have to manage lining up half of the hinge, with no chance of the hinge going crooked or getting further into one side than the other. Before the glue sets, I move the control surfaces to their extremes to slightly pull the hinges out of the airframe side of the joint to make sure they will deliver maximum control surface throws while at the same time minimizing the gap at the hinge-line.

There have been reports of folks spending a lot of time sanding the little bumps off the foam surfaces of this type of airplane to make it as smooth as possible. I chose not to do this in order to save time and also to allow the best adhesion of the included decals—a sanded surface will not allow as good a bond with the decals. At the advice of Hitec/Multiplex USA, I did lightly sand the leading edge of the wing, using 400-grit sandpaper, to smooth out the mold lines and assure that the most critical part of the airfoil—the leading edge—had no discontinuities or steps. This is intended to help improve performance in high-alpha or any other maneuver where the wing transitions in and out of a stall.

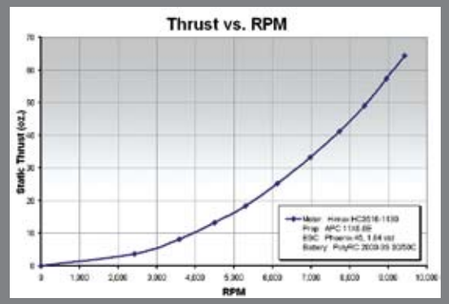
The included decals are brightly colored and of high quality, although it does take a bit of time to cut them out cleanly and apply them to look their best. Relative to the speed and simplicity of the airframe build, applying the graphics does take some patience, but the instructions give good advice on how to achieve a successful outcome. Things started out a bit shaky when one of the decals got a fold and stuck to itself,

I was able to fly the AcroMaster like a kite into a strong headwind while making an approach over the runway.

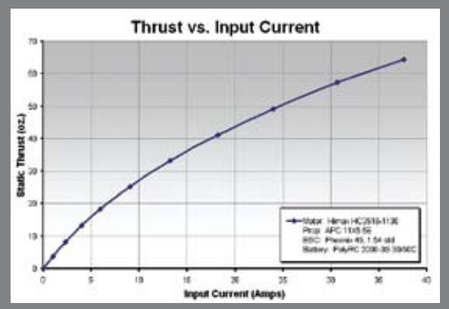
Power Set

Prior to flying the AcroMaster, I tested the power system on my thrust test stand. The stand uses the Medusa Research Power Analyzer Pro system to collect the data. I ran the motor for 5 seconds at each of 10 throttle points (every 10% stick position) to map the rpm, thrust, current, and watts as a function of throttle stick position. The battery pack was the PolyRC XQ3S-2000 30/50C LiPo as the power source. With the model's 36 oz all-up weight, the test data would predict that the model hovers at 64% throttle, with the motor pulling 15 amps. At full-throttle, the power system delivers over 64 oz thrust, for a thrust/weight ratio of 1.8:1.

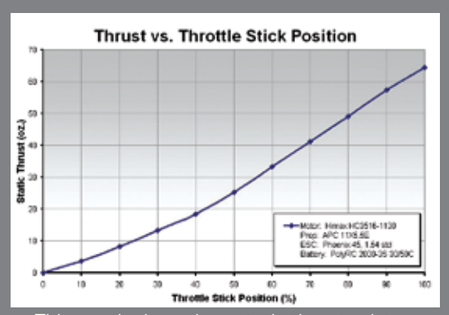
Graphs



This graph shows the static thrust vs. rpm of the motor during bench testing of the power system. In this case the motor was turning the recommended APC 11x5.5-in. electric propeller.



Here you see a graph that represents the relationship between current draw and static thrust.



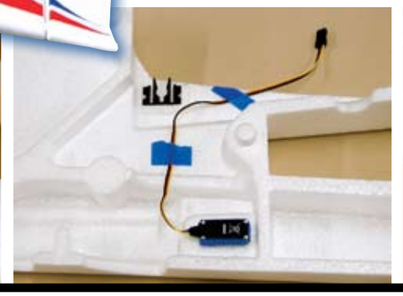
This graph shows how static thrust relates to transmitter throttle stick position. Test data predicts that the model will hover at 64% throttle, which was verified during flight-testing.

▼ My new AcroMaster has strong climb-out performance just after rotation, with 64+ oz of thrust.

▲ The flight pack components include two Hitec HS-81 servos, two Hitec HS-65 servos, two servo extensions, and a Hitec Mini 6S receiver.

▲ The power components include the Himax 3516-1130 Brushless Outrunner motor (with mount parts, fasteners and prop hub), plus Castle Creations Phoenix 45-amp speed control.

▲ Installing a servo in the fuselage is a snap thanks to the perfect fit of the molded-in servo pockets!



▲ Prior to joining the fuselage halves, the servo wires are taped down to prevent them from getting trapped in the glue-joint.

▲ Elevator assembly shows the two elevator halves glued to the plastic joiner and hinged to the fixed portion of the horizontal stabilizer.

The AcroMaster makes a low fly-by over the runway at the HAWKS field in Cincinnati.

which lead to a tedious but successful effort to straighten the piece out and apply it neatly. The message is to take your time and work carefully, as the instructions say.

Power System

Installation of the power system was quite simple using the recommended components. The Himax 3516-1130 brushless outrunner motor fits the mount perfectly. There is ample room in the fuselage for wire routing and ESC/battery placement.

The included Castle Creations Phoenix 45-amp ESC was easy to install as well, requiring only the usual skinning/tinning and attachment of a battery connector to the input end and direct soldering (my preferred method) of the output wires to the motor wires, with some shrink tubing to tidy up and protect the solder joints. The motor comes with bullet connectors attached and the connector parts needed for the ESC, so if you prefer to use connectors between the ESC and motor, they are included.

The only item that was not included in the power system kit was the flight battery. Multiplex recommends a 3-cell 2100- to 3200-mAh LiPo battery. I usually try to keep the setup as light as possible without sacrificing power by using a high quality, high "C" rated pack. Since there are so many battery choices within the recommended range, I decided to contact Pat at RC Lipos for advice. We selected the PolyRC XQ3S-2000 30/50C pack. It weighs just less than 6-oz and can easily keep up with the peak current draw of the motor, which is ~38 amps, when the motor is turning an APC 11x5.5-in. electric propeller. Although slightly lower than the recommended 2100 mAh minimum capacity, I have found this pack to hold higher voltage under load than several other packs that I've tested. The whole radio and battery bay area is easy to access, very large, and has good airflow to keep components cool, even when pushing the power system hard.

Radio Installation

Once again, the precision molding of the airframe parts makes servo mounting a snap! The servo pockets are so accurate that the servos simply

▼ The tail wheel wire and hinge bracket are loosely fitted to the rudder prior to gluing in place.

▼ Here is what the completed rudder installation looks like.

push in with a nice snug fit. With a few drops of CA or some hot-melt glue, they are quite secure.

This is about as easy as it gets! I chose to wrap the servos with one layer of masking tape and then CA them into the pockets. This gives a firm grip and aids removal of the servos if needed.

Mounting of the receiver is easy using the included hook and loop fastener material in the kit. I tucked a bit of the antenna wire inside the fuse and taped the rest to the bottom of the fuse with a short tail dangling under the rudder.

Control Throws and CG

The kit includes servo arm extensions and attaching screws, so the control surfaces can get enough throw for 3D type flying.

The final step prior to flight is to carefully set up the control throws to achieve what is specified in the directions. Information is provided for low and high rates and suggested starting values for expo. I found all of the recommended starting points to be quite good, and only some final tweaking to suit personal preferences is required. On high rates, I like my airplanes to get maximum possible control surface deflections. Then I fine-tune exponential to provide a nice feel for the pilot around center. I started out with a center of gravity (CG) setting of 115 mm, which is right in the middle of the recommended range.

Flying

The first take-off was smooth and easy! I set the rudder/elevator/aileron rates to their "low" setting, smoothly rolled on the power, and in short order the airplane accelerated and lifted off. It needed two or fewer clicks of trim on each channel to achieve straight and level flight.

After getting a general feel for flying it around at partial throttle—around 40-50% throttle—it was time to explore the performance envelope of the AcroMaster and to delve into the realm of 3D.

The airplane is very responsive, but not twitchy, and I found it to be a very smooth flyer on low rates. I then switched to high rates. Thanks to expo settings of 30% on rudder and 70% on elevator and aileron, it was still smooth with small inputs around center. With large stick inputs, the AcroMaster livened up considerably! This model has a very high roll rate, snaps quickly and cleanly, flies inverted with no elevator input required, and is generally more than capable of any 3D maneuver.

By the end of my first flying session, the wind conditions had deteriorated to 15 to 20 mph with gusts to 25+ mph, and the AcroMaster was fully capable of handling it. It was easy to fly it like a kite and even fly it backwards, plus do landings with zero rollout. My initial frustration with the deteriorating conditions quickly turned into smiles as I got to further explore the capabilities of the model in less-than-ideal conditions.

With the recommended thrust angles, the model tracked cleanly while inverted, during vertical uplines, and in large loops. I may do some fine-tuning when I get a chance to fly in calm conditions, but nothing more than some minor adjustments. Knife-edge flight is easy, with very little rudder input required. I assumed the AcroMaster would need around 50% rudder input to hold knife-edge, but was impressed to find that only about 20 to 30% input was required, as the generous side area and rudder size deliver excellent knife-edge capability and authority.

It's quite easy to move the CG around by changing the placement of the battery pack on the angled surface under the canopy. I ended up flying the model with its CG at 117 mm from the leading edge, which gave the best aerobatic and 3D performance, but without too much pitch sensitivity in level flight. With this setting, inverted flight required zero elevator input to maintain level flight.

Power is more than adequate, with a 1.8:1 thrust-to-weight ratio. The model will climb with authority and punch out of a hover easily. Hovering is of moderate difficulty—harder than with a flat foamy, but plenty manageable.

Aside from flight characteristics, another thing worth noting is how shockingly good-looking this model is! The lines are very clean and appealing. The graphics show up extremely well and really complement the shape of the airplane. Many other modelers at the airfield commented that the AcroMaster looked great both in the pit area and in the air.

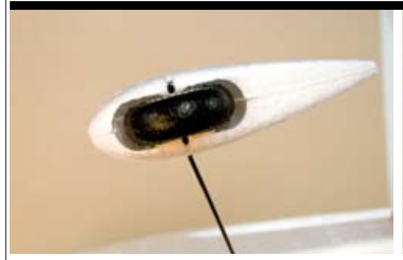
Conclusions

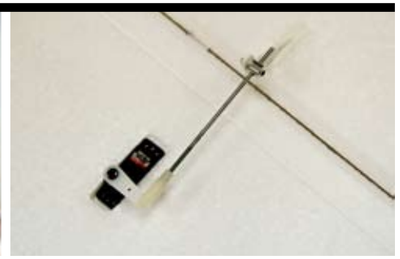
From the moment the box is opened until you're putting it through its paces at your local airfield, the AcroMaster truly impresses! The kit quality, design, instructions and flight performance are all top-notch.

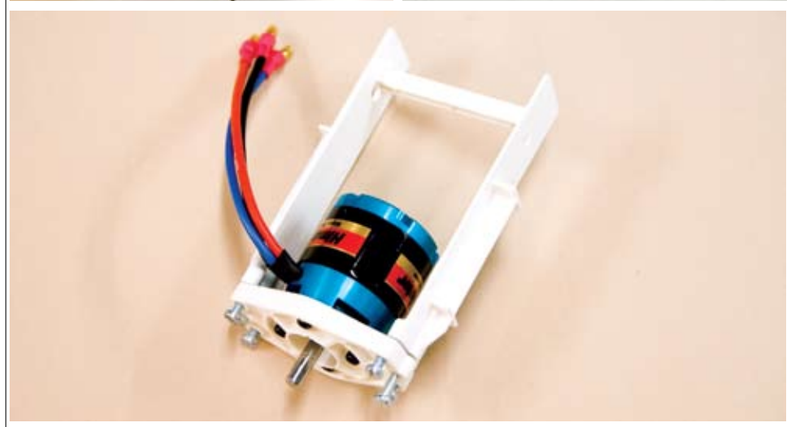
I highly recommend this model to anybody who wants to improve their aerobatic and 3D piloting skills and who wants a nice-looking model that is easy to build and has the durability of Elapor foam. QF

▼ Completed, the wheel pant fits nicely around a main-gear wheel. Make sure to spread the wheel collars before tightening the set screws to assure the wheel spins freely.

▼ As you can see the aileron linkage installation is very clean. Notice the long servo arms used to provide lots of control surface throw.







▲ The motor mount parts were bench-fitted to the motor to demonstrate how the parts fit together.

AcroMaster Vendors

APC Props
Tel.: 530-661-0399
Fax: 530-666-6661
http://www.apcprop.com/

Castle Creations
Phone: (913) 390-6939
Fax: (913) 390-6164
e-mail: info@castlecreations.com
http://www.castlecreations.com/

RC Lipos, Inc
Phone: 800-699-7659
Fax: 714-444-0500
http://rclipos.com/

West Mountain Radio (source of Powerpole connectors)
Phone 203.853.8080
Fax 203.299.0232
http://westmountainradio.com/

AcroMaster Distributor

Multiplex USA
12115 Paine St.
Poway, CA 92064
Phone: 858-748-6948
Web Site: multiplexusa.com

Suggested Retail Price: $119.99

AcroMaster Specifications

Aircraft Type	Sport/3D
Pilot Skill	Intermediate to advanced
Wingspan	43 in.
Length	45.3 in.
Wing Area	567 sq in.
Airfoil	Symmetric
Weight	36 oz (ready to fly)
Wing Loading	9.1 oz/sq ft
Controls	ailerons, elevator, rudder, throttle
Construction	MULTIPLEX Elapor Foam, molded plastic parts
Radio Channels	4
Recommended Battery	3-cell LiPo, 2100- to 3200-mAh capacity
Battery Used	PolyRC XQ3S-2000 30/50C
Motor	Himax 3516-1130 Brushless Outrunner
Speed Controller	Castle Creations Phoenix 45
Connector Used	Anderson Powerpoles
RPM	9,425
Current Draw	37.6 amps
Watts	395
Watts/lb	175
Static Thrust	64.4 oz
Flight Times	8 to 12 minutes
Flight Speed Range	0-50 mph
Radio Equipment Type	Hitec Optic 6 transmitter, with receiver and servos
Instruction Manual	Very good, photo and figure illustrated

▼ A part-speed pass over the runway, up nice and close!

▼ The electronics and battery bay have ample room for the components, so it's super-easy to work on.

▼ Showing off the extreme control surface deflections with high-rates set for maximum throws! Tumbling and snapping maneuvers are very aggressive with high rates.