the Ampeer

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The Next Meeting: Thursday, August 3, at the South Lyon field on Rushton Rd Start and flying time: ASAP

The Hobby Lobby Strontium 150
by Doug Ingraham of Lofty Pursuits
via "Charge Ahead"
Editor: Ben Almojuela, 1941 - 6th Ave. W., Seattle, WA 98119

I purchased a Strontium 150 at the Toledo show in April of 1994. I purchased it because:

1) It looks very well built
2) The price is very attractive ($69 in the catalog HLPM05).
3) No brush holder protrusions.
4) Claims to have performance similar to the Astro Flight FAI-05 motor. (I make the assumption that the comparison is to the older 6 turn armature version of the Astro flight motor and not the new 5 turn.)

I discovered that the motor is lacking two items that are included with the Astro Flight motor. The first is a power connector. This is not that important since you might want to use a kind other than that provided and I agree that this is a very small amount of money in any case. The other part that did not come with the motor was the prop adaptor. Any prop adaptor for use with a 5 mm shaft can be used. Options from the catalog with page numbers and prices are:

GPE06061 6x6 prop $20.20 Page 39 Includes a prop and spinner.
GPE08046 8x4.5 prop $20.20 Page 39 Includes a prop and spinner.
GPE08061 8x6 prop $20.20 Page 39 Includes a prop and spinner.
GPE09050 9x5 prop $20.60 Page 39 Includes a prop and spinner.
GPE09070 9x7 prop $20.60 Page 39 includes a prop and spinner.
HLAN2409 Adaptor $5.70 Page 39 This is what I used.
GR1171 Adaptor $10.70 Page 51 spinner shaped prop nut.
GR1304/5 Spinner $19.90 Page 51 High speed spinner 1 & 1/2" diameter
GR1313/5 Spinner $16.30 Page 51 High speed spinner 1 & 3/4" diameter

All of the above are more elaborate than the Astro supplied adaptor except for the HLAN2409 which is equivalent. Even after shelling out the extra dollars for the necessary add on parts this motor is a bargain.

In Hobby lobby catalog #25 there is a

What's in this issue? **Hobby Lobby Strontium - FX-35D review - Howell Meet - Video Review KRC '94 - Good Cheap Motor - Sig Wonder Electric - Steve Neu on Speed Controllers**

comparison chart between the FAI-05 and the strontium 150 that just doesn't jibe with my own experience with these motors over the past summer. This is the chart from the HL catalog.

	Strontium 150 with 8x4.5 prop		Astro 05FAI with 8x4.5 prop	
Cells:	Amps:	RPM:	Amps:	RPM:
6	20	9200	24	9200
7	22	9900	28	9000
8	26	10800	32	10900
10	32	12000	40	12200

The numbers for the Strontium 150 did not seem quite good enough from the experiences I have had with the motor. Then, when looking at the numbers and some of my notes, the numbers for the Astro Flight motor are very low. I decided to do this same comparison as best I could. The only thing I didn't have was the 8x4.5 (probably the Graupner) prop. I do have an Aeronaut 8x5 prop (HLAN3415) which should be close and give slightly lower RPM figures than from the Hobby Lobby supplied chart. The equipment to perform the test was the LPSC-1 digital speed control used only as an On/Off switch and an Astro Digital Volt/Amp meter placed in line to measure the voltage and current at the motor. The tach was an old Royal optical unit attached to a frequency counter. Accuracy of plus or minus 60 RPM. Elevation approximately 3500 ft. All tests were repeated 3 times with different battery packs and the results didn't even have to be averaged since the numbers were identical in all cases except for one. When this test was repeated it was found that a number had been copied down incorrectly during the very first test run.

Strontium 150

Cells	Volts	Amps	RPM	Watts in
6	6.0	20	9900	120.0
7	7.2	25	11100	180.0
8	7.8	28	1970	218.4
10	9.4	35	13290	329.0

Astro FAI-05 (6 turn)

Cells	Volts	Amps	RPM	Watts in
6	5.6	28	10800	156.8
7	6.3	33	11970	207.9
8	7.1	40	12900	284.0
10	8.1	51	14610	413.1

On the 6, 7, and 8 cell tests the batteries were 1400SCR cells. On the 10 cell test the batteries were 1000SCR cells which explains the greater voltage drop under load. Notice that all my measured numbers for the Strontium 150 are better than the figures given in the Hobby Lobby chart even though a higher pitch prop was used. Again notice that my numbers for the Astro FAI-05 are a LOT higher than the numbers given in the Hobby Lobby chart.

I wanted to know why these numbers are the way they are so I resorted to measuring the motor constants for both motors as detailed in Bob Boucher's new book Electric Motor Handbook. Here are the tables I prepared for each motor after measuring the constants. These tables are based on equations that predict what the RPM should be at a given voltage and current. The voltages and currents are those I measured during my tests and given in the above charts.

The measured motor constants for this particular S-150 are:
Io = 3.1 amps Rm = 0.070 ohms Kv = 2144

	Predicted	Measured
RPM for the S-150		
at 6.0 volts and 20 amps =	9862 RPM	9900 RPM
at 7.2 volts and 25 amps =	11684 RPM	11100 RPM
at 7.8 volts and 28 amps =	12520 RPM	11970 RPM
at 9.4 volts and 35 amps =	14901 RPM	13290 RPM

The measured motor constants for this particular FAI-05 are:
Io = 3.5 amps Rm = 0.038 ohms Kv = 2376

	Predicted	Measured
The RPM for the Astro		
at 5.6 volts and 28 amps =	10778 RPM	10800 RPM
at 6.3 volts and 33 amps =	11989 RPM	11970 RPM
at 7.1 volts and 40 amps =	13258 RPM	12900 RPM
at 8.1 volts and 51 amps =	14641 RPM	14610 RPM

Notice that the predicted numbers for the Astro are right on target but the S-150 become progressively worse. Part of this is probably timing. I set the timing advance on the Astro for 40 amps while the S-150 was set to the maximum advance which was only correct for about 20 amps. To improve this situation one would have to drill new screw holes in the endbell, but this is a problem became the noise suppression stuff is in the way.

The Kv and Io of these motors is similar. The real difference in these motors is in the motor resistance (Rm). The difference in Io would only matter at very low currents. The Rm being so different is what makes the S-150 motor 3-6 percent less efficient. The following tables were again prepared from the test data

given above using the equations from Bob Boucher's book.

Strontium 150

Cells	Amp	Volts	Watts in	Watts out	Eff
6	20	6.0	120.0	77.7	64.8%
7	25	7.2	180.0	119.4	66.3%
8	28	7.8	218.4	145.4	66.6%
10	35	9.4	329.0	221.7	67.4%

Astro FAI-05 (6 turn)

Cells	Amp	Volts	Watts in	Watts out	Eff
6	28	5.6	156.8	111.1	70.9%
7	33	6.3	207.9	148.9	71.6%
8	40	7.1	284.0	203.7	71.7%
10	51	8.1	413.1	292.7	70.9%

Conclusions:

The Hobby Lobby published test results are quite different from those I obtained. I can think of two possible reasons for this.

1) The S-150 motor takes a long time to break in. I ran mine for 5 hours and the brushes were still not completely seated. The brushes are seated better now after the motor has been flown a few dozen times. I expect that this would have an effect on the Rm constant.

2) The resistance of the batteries and harness used to drive the Hobby Lobby test was much greater than in my test. This would account for the lower than expected figures for both motors but would make the Astro appear much worse than it is because of it's much lower Rm and the higher amp draw. You can see the effect of this in my charts because the voltages on the Astro side of the chart are so much lower than those on the S-150 side for the same number of cells.

I like my S-150 and expect to use it for many years to come. But if I were to replace an Astro FAI-05 with one I would be disappointed because it runs hotter and doesn't turn the RPM. This motor is much closer to the non-FAI Astro Flight 05 (model 605) motor if the Astro Flight motor constants published are correct. The published constants are Io=2.5 which is better than the S-150 but only matters at low current draws. The Rm is 0.045 which is better than the S- 150, and the Kv is 2125 which is worse than that of the S-150 but not by much. At higher Amp draws the Astro 05 probably will turn faster than the S-150. At lower currents it should be the other way but the efficiency should always be in favor of the Astro 05 by a small margin. Some day, when I have the necessary few hours of time and a desire to do the comparison, I will run these same tests on the standard Astro 05.

I am currently using the S-150 in my Blue Curry with the Aeronaut 9.5x5 folder on 8 cells (33 amps). This combination pulls the plane around nicely. I may try the 9x6.5 or 9x7 or 10x6 or 10x7 folder on 7 cells as this draws too much current on 8 cells.

I hope this was useful to you. I know I learned a lot and would love to receive any components both positive or negative.

Thanks to Jim Martin of Hobby Lobby for permission to reprint the chart and to publish the part numbers and prices from the catalog. I also want to thank Bob Boucher for producing such a fine book.

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AI/Robotics FX-35D Electronic Speed Control

by Bernard Cawley, Jr.

from "Charge Ahead"

Editor: Ben Almojuela, 1941 - 6th Ave. W., Seattle, WA 98119

By now I imagine all of you have seen, somewhere, ads for the FX-35D speed control. The ads make a rather large number of claims for the unit, including several safety features, two braking modes, two soft-start modes, the ability to charge a Rx pack in flight as an alternative to pure BEC, and "smart" overcurrent and overtemperature protection. It also has a unique three position switch (called the "sequential arming system") which allows powering up of the radio before arming the motor, eliminating the need for a separate radio system switch. It is rated for 6 to 20 cell motor battery operation, at continuous currents up to 30 amps. AI/Robotics has been kind enough to supply me with one of these units to try out. The news is good.

Physical Description

The FX-35D, as supplied, is a flat package 1 3/4 x 1 3/8 x 1/2 with 4 inch long 14 gauge silicone rubber insulated wire leads for the battery on one end of the unit and the motor leads on the other end. Also emerging from the unit on the motor lead side are three jumpers which allow selection of the BEC motor shutdown mode, throttle response setting and brake on/off. Emerging from the battery side of the controller is a 5 1/2 inch lead which ends in the "sequential arming switch" and a 3 inch lead for the receiver input. No power or receiver connectors are supplied. This package weighs 1.8 ounces. Addition of Sermos connectors and an 8 inch receiver lead (which must be