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FW: 56 Cleveland 80" Playboy Senior - Battery and Prop Selection

1 message

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Tue, Jul 24, 2018 at 4:50 AM

From: Tandy Walker [mailto:aerotan1503@outlook.com]
Sent: Saturday, July 01, 2017 1:20 PM
Subject: 56 Cleveland 80" Playboy Senior - Battery and Prop Selection

*Cleveland 80" Playboy Senior**July 1, 2017*

In Report No. 54, a 16" diameter prop was used to size the length of the landing gear/wheel combination. However, the rationale for the selection of a 16" diameter prop was not provided. Therefore, this report is intended to provide that rationale.

The electric motor/gear box selected for the Playboy Senior is for the SAM Electric Texaco event. The motor/gear box unit was manufactured by the Neutronics Enterprises, Inc. located in San Diego, California. As you can see in the picture below, the motor designation is "1107/6D/S" and the 5.2:1 gear box designation is "P29/5.2". The cost of this unit was \$312.



At this point in the project, the individual Playboy parts were weighed (in grams) on an Acculab scale as indicated by the asterisks in the table below. In addition:

- Weight of the fuselage's structure was doubled as more planking and stringers have to be added
- Covering was estimated as 10 ounces
- A contingency of 4 ounces was also included

The Playboy's Ready to Fly weight estimate came out to be 54 ounces.

Weight Summary

Item	Grams	Actual
Wing	221	*
motor	236	*
Rx Battery	62	*
Stab	51	*
Rudder	12	*
Pylon	26	*
Fuselage (44 X 2)	88	
Firewall & LG	57	*
Wheels	100	
2 Sevos	63	*
ESC	74	*
LiPo Battery	113	*
Prop	67	*
Covering (10 oz)	283	
Rubber Bands	35	*
Contingency (4oz)	113	
Total	1527	
Wt = 54 oz		

SAM rules for electric events using LiPo batteries require a minimum weight of:

$$W_{min} = (2 \times \text{LiPo Capacity})/50$$

The minimum weight using a 1300 mAh 2S LiPo battery pack would be:

$$W_{min} = (2 \times 1300)/50 = 52 \text{ ounces}$$

Jay Burkart has always been willing to counsel me on electric powered models. Based on his experience as well as others like Jack Hiner, he advised me that a 54 ounce Playboy Senior was too light to be competitive in the SAM Electric Texaco event. Jay suggested a 1600 mAh 2S LiPo battery pack would be a better choice to increase the Playboy weight to:

$$W_{min} = (2 \times 1600)/50 = 64 \text{ ounces}$$

Jay uses a software program called "ElectriCalc" to evaluate various electric power train combinations of motor/prop/battery for a given model weight. For Texaco, he uses "Thrust" and "Climb Angle" to base his selection on. I was thinking a prop diameter of 15" would be about right for the Playboy's landing gear/wheel length. Jay made two runs with a prop diameter of 15" shown in the table below. The first run with a 15 X 10 prop only produced 12 ounces of thrust and a very shallow climb angle of 4°. The second run with a 15 X 12 prop produced 14 ounces of thrust and only increase the climb angle to 5°.

ElectriCalc Runs

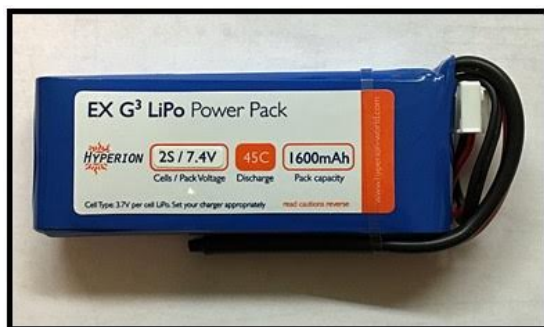
Prop	15 X 10	15 X 12	16 X 10	16 X 12	16 X 12	17 X 12	18 X 10	18 X 10
Battery	1600 20C	1600 20C	1600 20C	1600 20C	1600 45C	1800 65C	1600 20C	1600 65C
Volts/Cell	3.5	3.5	3.5	3.5	3.6	3.7	3.5	3.7
Thrust	12	14	15	16	18	20	19	21
Wt	64	64	64	64	64	64	64	64
Thrust/ Wt	0.19	0.22	0.23	0.25	0.28	0.31	0.30	0.33
Climb Angle	4	5	7	8	9	10	10	12
Run Time	16.6	14.3	13.6	11.8	11.3	10.2	9.6	8.8

Over a week's time period with some phone discussion, Jay made various runs using 16", 17", and 18"

diameter props for comparison as shown in the table above. As you can see, the larger the prop diameter the more thrust is produced which provides for a higher climb angles. However, it was my judgment to limit the prop diameter to 16" to keep the length of the landing gear/wheel combination from becoming excessive.

Now a 20C-rated battery pack provides 3.5 volts/cell, 45C provides 3.6 volts/cell, and 65C provides 3.7 volts/cell so the higher the C-rating the better the performance. In the table above, a 1600 mAh 2S 45C pack driving a 16 X 12 prop (highlighted in red) produced 18 ounces of thrust and increased climb angle to 9°.

Jay nor I either one could find a 1600 mAh 2S LiPo pack with 65C, but he finally found a Hyperion 1600 mAh 2S LiPo battery pack on eBay with a 45C-rating. I have ordered two of the Hyperion LiPo battery packs and already received the first one shown below.



A summary of the power train and performance is shown below.....Tandy

- Motor: NEU 1107/6D/S/P29/5.2
- Prop: APC 16 X 12e
- LiPo Battery Pack: Hyperion 1600 mAh 2S 45C
- Thrust: 18 oz
- Climb Angle: 9°
- Run Time: 11.3 Min