

B. Russell de la Torre  
Mechanisms Final Project Proposal  
April 8, 2010

For my final mechanisms project I would like to build a twin tilt-rotor remote controlled helicopter. I am calling it "Scout". I found that most types of remote control helicopters are very hard to fly for beginners. Current R/C helicopter design come in two style [coaxial rotors](#) and [single rotor](#) with a tail rotor. The coaxial rotors offer very stable flight but are not agile. The single main rotor design offers great maneuverability but are hard to fly for novice users. I want to create a hovering aircraft that is easy to fly and very nimble. I also want the helicopter able to carry loads such as cameras and small payloads.

I will be building Scout out of LEGO Technic building blocks. I choose to build Scout out of LEGO bricks for several reasons. First, LEGO bricks are a great prototyping platform. I can build and rebuild my ideas very easily. The cost of materials is cut because I can reuse LEGO bricks. If I were to use a material such as aluminum once I cut a piece that's it I cannot go back. Second, LEGO bricks are accessible to everyone. I want people able to build Scout on their own with minimal amount of tools. Third, going back to my first point, LEGO bricks offer modularity. If I decide later that I want to add another battery bay or a camera arm to the helicopter, I can easily snap those parts into the main design.

I will be using two electric ducted fans (EDF) for the propulsion. The frame will be made out of LEGO Technic. I am using several kits to build the helicopter. I need to use several kits because one kit doesn't include all the parts I need to build this helicopter. Here are the LEGO Technic kits that I will be using:

- LEGO 8297 Off Roader
- Qty. 2 - LEGO 8265 Front Loader
- LEGO 8258 Crane Truck

I also acquired various parts such as gears and shocks off of eBay. The helicopter is essentially two helicopters in one, hence I will need two of everything. Each EDF will need an electronic speed controller (ESC), and battery. I will also need a decent radio system. I choose the Futaba 7C 7-Channel 2.4GHz Heli with 4 S3152 servos. I choose the 7C because I need to do servo mixing. Servo mixing is when two or more servo move together with only one joystick movement. Cheaper radio cannot do this function. The motors I will be using are 3600kv Outrunner Brushless Motors. I will be using two

45A Brushless ESC. The batteries to power Scout are lithium-ion polymer (LiPo) batteries. I chose two 11.1 volt 2800mAh 30C batteries.

Scout isn't cheap but compared to current helicopter in it's class it is a bargain. I sourcing the EDF and batteries directly from Hong Kong, China. I saving over \$300 ordering directly from China. All the electronics parts are made in China. The US stores order their parts from China. I am cutting out the middle man by ordering directly from China. The downsides of ordering from China instead of order from the US is the shipping duration is weeks instead of days. The other issue is the build quality of parts can be can be hit or miss. You may order two batteries, one battery may operate perfectly while the other is DOA. Chinese seller will replace your defective battery but you will have to send them the defective battery and they will not reimburse you for the return shipping cost. Even with the risk of a DOA parts, it is still cheaper to order directly from China. Price list of Scout are below.

Price list:

- LEGO 8297 Off Roader....\$130
- LEGO 8265 Front Loader....\$80 x2
- LEGO 8258 Crane Truck....\$250
- EDF with Motor and ESC....\$48 x2
- Futaba 7C heli with servos Radio System....\$350
- 11.1v 2800mAh 30C LiPo Battery....\$25 x2

Grand Total \$1036

Schedule:

March 15 - April 10....Order supplies

March 20 - April 16....Begin Construction

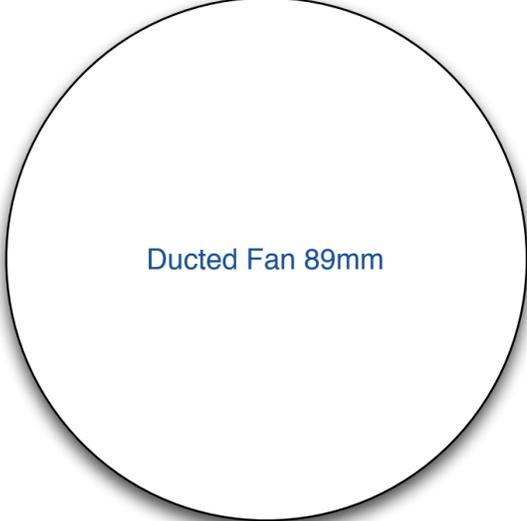
April 17 - 20.....Begin testing and setting up the radio

April 21 - 27.....Test flight and revise

April 29.....Present

<b>Part</b>	<b>Weight (g)</b>	<b>Price</b>	<b>Qty.</b>	<b>Total Weight (g)</b>	<b>Thrust (g)</b>	<b>Total Thrust(g)</b>	<b>Total .oz</b>
Ducted Fan 89mm 3600Kv	123	\$50.00	2	246	900	1800	8.68
Battery 2800mAh 11.1v 30C	203	\$30.00	2	406			14.32
Receiver	7	\$350.00	1	7			0.25
Futaba S3152 Servo Digital	42		2	84			2.96
ESC	65		2	130			4.59
Chassis	500	\$540.00	1	500			17.64
			1	0			0.00
			1	0			0.00
			1	0			0.00
			1	0			0.00
			1	0			0.00
			1	0			0.00
			1	0			0.00
Grand Totals		\$970.00		1373	Power to Weight Ratio=	1.31	3.03 lbs.

Top View



Front View



Extra Parts

