Scaling of the U13A Remote Controlled Helicopter

Concept Generation and Selection

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Overview

- Problem Description
- Concept Generation
  - Blades
  - Battery
  - Lift
  - Landing Gear
  - Camera
- Gantt Chart
- Summary

Problem Description

- Client is Dr. Kosaraju
- Task of scaling U13A remote controlled helicopter
- Capability to have mission specific attachments
- Testing has revealed room for many different improvements.

Blades

- Problem: Blade Contact

Blades continued

- Solution 1: Raised upper rotor
- Solution 2: More durable blade material
- Solution 3: Rigid upper blades

Blade Contact:	Column1	Colum	Col	Column4	Col
Category	Ease of Design	Safety	Cost	Estimated Life	Total
Raised Upper Rotor	3	5	8	7	5.8
Durable Blade Material	7	5	4	6	5.5
Rigid Blade Design	8	5	8	8	7.1
Weight (%)	20	30	20	30	

Blade Solution

- Rigid upper blades

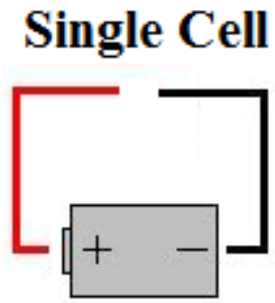
Battery

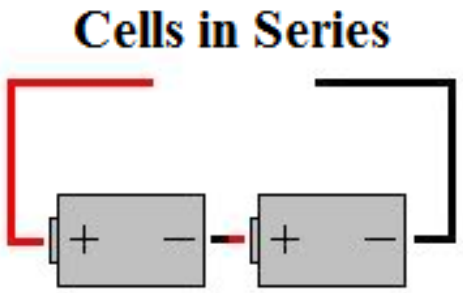
- Problem: Short Battery Life

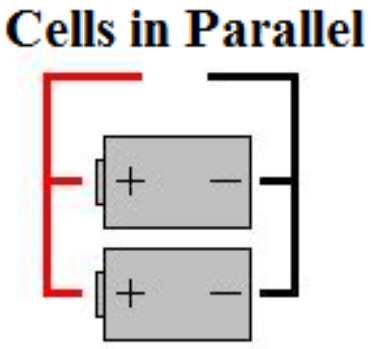
- How can lithium polymer cells be configured increase battery effectiveness?

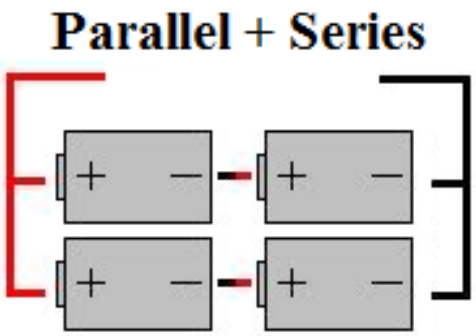
Battery Continued

- Possible LiPo Configurations







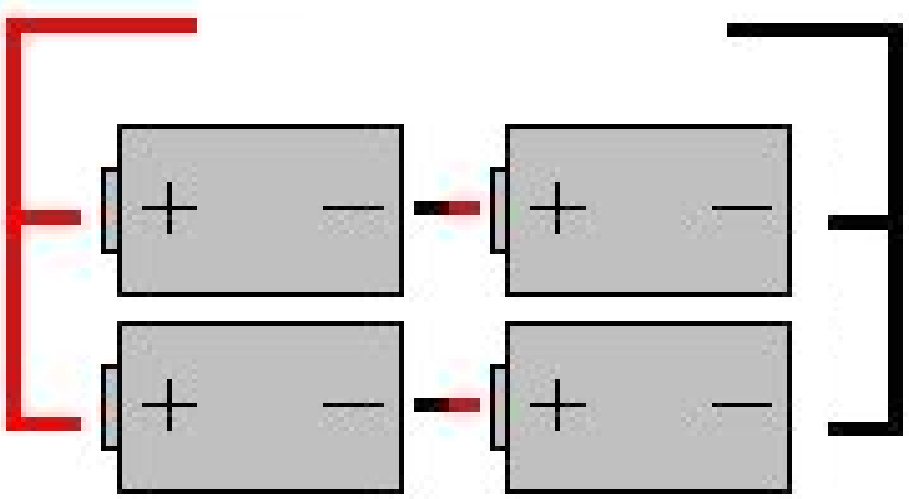


Battery Continued

	Voltage	Capacity	Weight	Durability	Cost	Total
Single LiPo	5	5	10	4	9	6.15
LiPos in Parallel	5	10	7	8	6	7.1
LiPos in Series	10	5	8	8	6	7.45
Parallel+Series	**10**	**10**	**6**	**8**	**3**	**7.9**
Weight (%)	25	30	25	5	15	

Battery Solution

- Solution: Parallel and series



Lift

- Problem: Lift to Weight Ratio

- Solution 1: Extend blade length
- Solution 2: Increase motor size
- Solution 3: Increase gear ratio

Lift Continued

Lift	Column1	Column	Colu	Colum	Columr	Column6
Category	Ease of Design	Minimize Cost	Safety	Weight	Minimize Power	Total
Larger Motors	6	4	7	3	3	4.55
Gear Ratio	7	6	7	7	7	6.85
Longer Blades	8	9	3	8	8	7.15
Weight (%)	20	15	20	25	20	

Lift Solution

- Solution: Increase blade length

Landing Gear

- Problem: Helicopter lands on its side

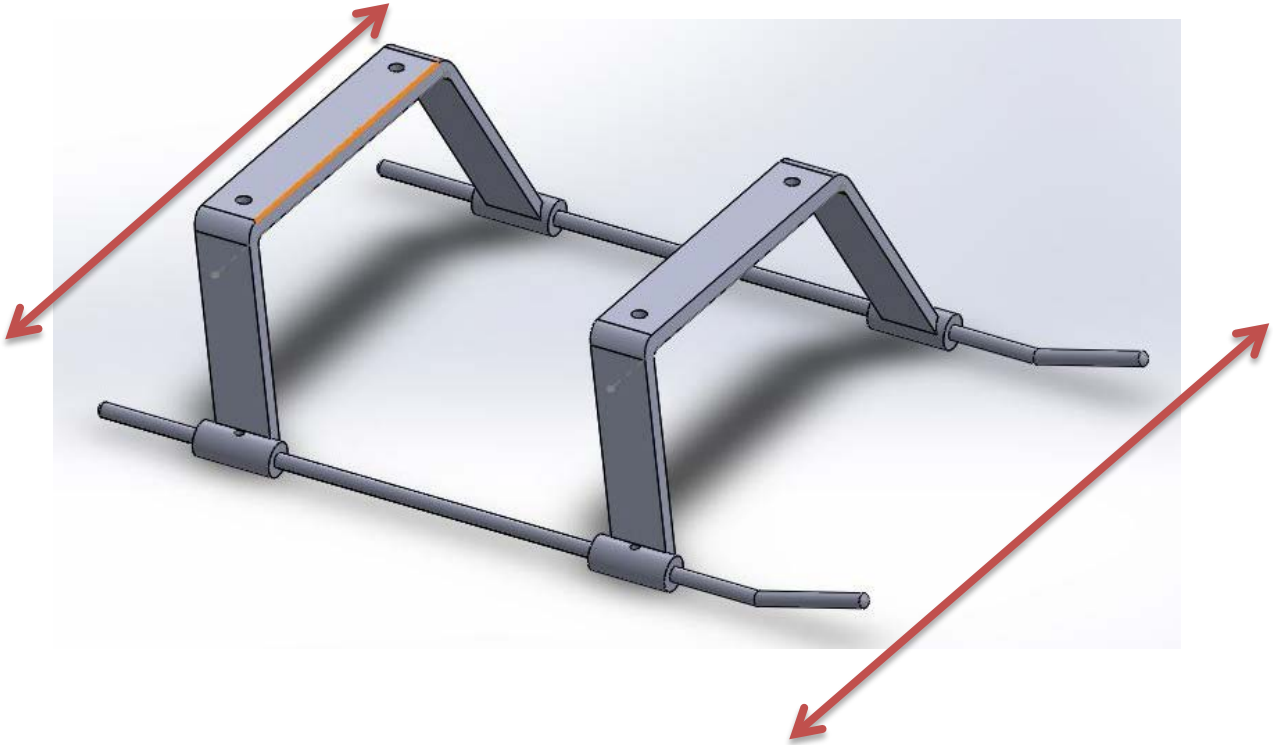
- Solution 1: Small flat landing gear
- Solution 2: Small round landing gear
- Solution 3: Large flat landing gear
- Solution 4: Large round landing gear

Landing Gear Continued

Landing Gear:	Column1	Column2	Column3	Column4	Colu	Colum
Category	Helicopter Weight	Take-off/Landing	Stability on ground	Landing Impact	Cost	Total
Larger Landing Gear (Flat)	7	5	7	7	5	6.4
Smaller Landing Gear (Flat)	1	1	4	6	7	3.2
Smaller Landing Gear (Rounded)	1	2	4	8	7	3.8
Larger Landing Gear (Rounded)	7	8	7	9	5	7.4
Weight %	30	20	20	20	10	

Landing Gear Solution

- Solution: Larger Rounded Landing Gear



Camera

- Requirement: Live Feed Camera

- Solution 1: GoPros HERO3 white edition
- Solution 2: wireless hidden camera
- Solution 3: live feed camera off of another helicopter

Camera Continued

Improved Car	Colum	Column2	Column3	Column4	Colu	Colum
	Weight	Minimize Helicopter Power Usage	Minimize Cost	Durability	Ease of Use	Total
GoPro	4	10	2	10	8	7
Spycam	7	10	9	3	8	7.55
Wi-spi camera	9	3	4	9	8	6.8
Weight (%)	30	25	10	15	20	

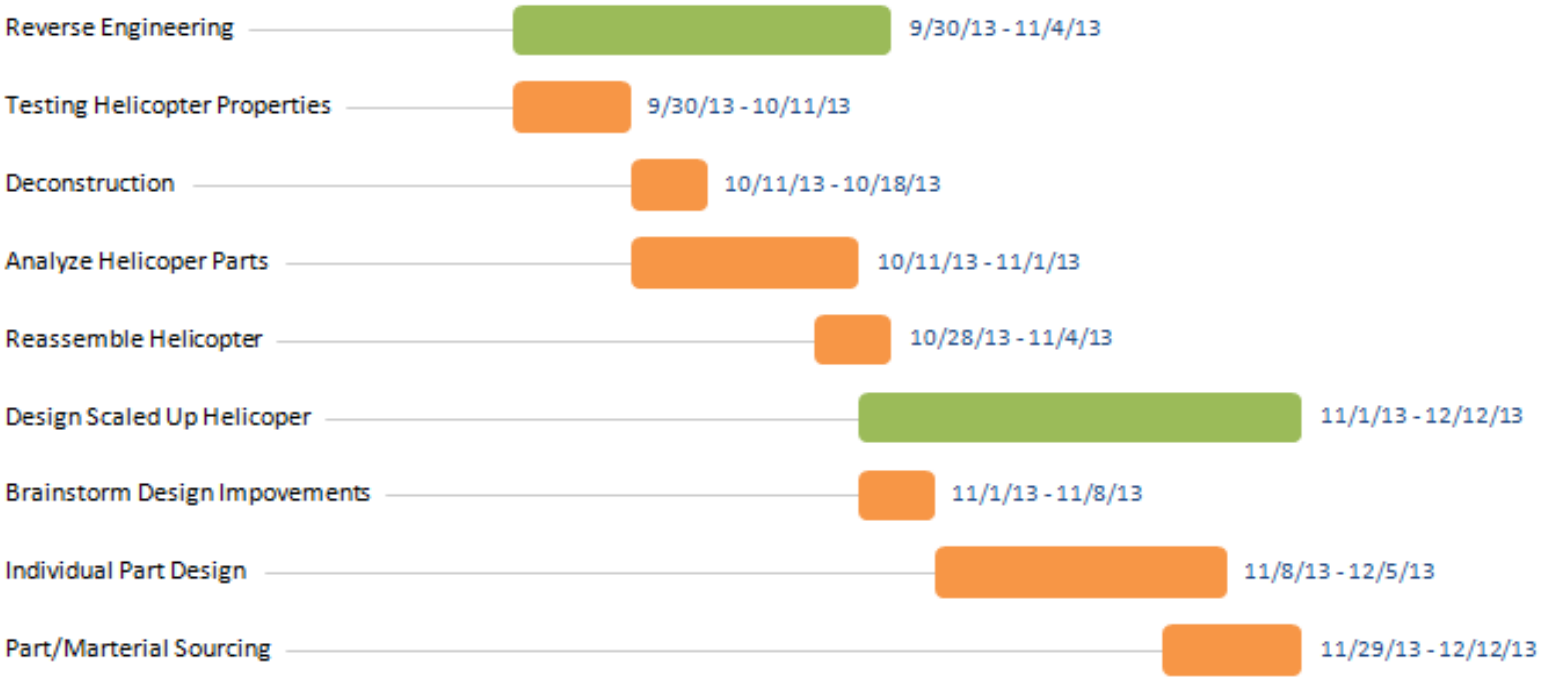
Camera Solution

- Solution: Wireless hidden camera

Source: Security and Self Defense Store

Gantt Chart


Helicoper Test Flight
10/4
Reassembly Test Flight
11/4
Final Design Due
12/5
2013
Sep
Oct
Nov
Dec
2013


Reverse Engineering
9/30/13 - 11/4/13
Testing Helicopter Properties
9/30/13 - 10/11/13
Deconstruction
10/11/13 - 10/18/13
Analyze Helicoper Parts
10/11/13 - 11/1/13
Reassemble Helicopter
10/28/13 - 11/4/13
Design Scaled Up Helicoper
11/1/13 - 12/12/13
Brainstorm Design Impovements
11/1/13 - 11/8/13
Individual Part Design
11/8/13 - 12/5/13
Part/Marterial Sourcing
11/29/13 - 12/12/13

Summary

- Discussed how we are scaling the U13A helicopter by 1.5.
- Chose a rigid blade system to eliminate blade contact.
- Decided most power will be gained by a LiPo battery in series and parallel.
- Figured the best solution to increase lift would be to increase the blade length.

Summary Continued

- Decided on a large rounded base for the landing gear to help stabilize landing.
- Chose the Spycam for the live feed video camera.
- Lastly, we gave an update on our Gantt chart and where we are in our schedule.

References

- [1] *Audio / Video Spy Camera Transmitter*. Security and Self Defense Store, n.d. Web. 27 Oct. 2013.

Questions?