

# Mission and Design

Table 1: Mission Demonstration Analysis

Mission Element	Beneficial Abilities	Required Hardware	Tradeoffs
Waypoint Navigation (20%)	<ul style="list-style-type: none"><li>- High Maneuverability</li><li>- Long Range</li><li>- Flight Autonomy</li></ul>	<ul style="list-style-type: none"><li>- Flight Computer</li><li>- Flight Controller</li><li>- Large Battery Capacity</li></ul>	<ul style="list-style-type: none"><li>- Lower Speed</li></ul>
AirDrop (20%)	<ul style="list-style-type: none"><li>- Hovering Capabilities</li><li>- Mobile UGV</li></ul>	<ul style="list-style-type: none"><li>- UGV</li><li>- Descent Retarding Mechanism</li></ul>	<ul style="list-style-type: none"><li>- Reduced Range (Non-Fixed Wing)</li><li>- Increased Weight</li></ul>
ODLC (20%)	<ul style="list-style-type: none"><li>- Actionable Submission</li><li>- Autonomous Submission</li><li>- Accurate Vehicle Localization</li><li>- Accurate Vehicle Attitude Determination</li></ul>	<ul style="list-style-type: none"><li>- Camera System</li><li>- Flight Computer</li><li>- Image downlink</li><li>- Onboard Processing</li><li>- Gimbal</li></ul>	<ul style="list-style-type: none"><li>- Increased Weight</li></ul>
Obstacle Avoidance (20%)	<ul style="list-style-type: none"><li>- High Maneuverability</li></ul>	<ul style="list-style-type: none"><li>- Flight Computer</li><li>- Flight Controller</li></ul>	<ul style="list-style-type: none"><li>- Lower Speed</li></ul>
Timeline (10%)	<ul style="list-style-type: none"><li>- High Speed</li><li>- Fast Setup and Removal</li></ul>	<ul style="list-style-type: none"><li>- N/A</li></ul>	<ul style="list-style-type: none"><li>- Lower Maneuverability</li><li>- Increased Mechanical Complexity</li></ul>

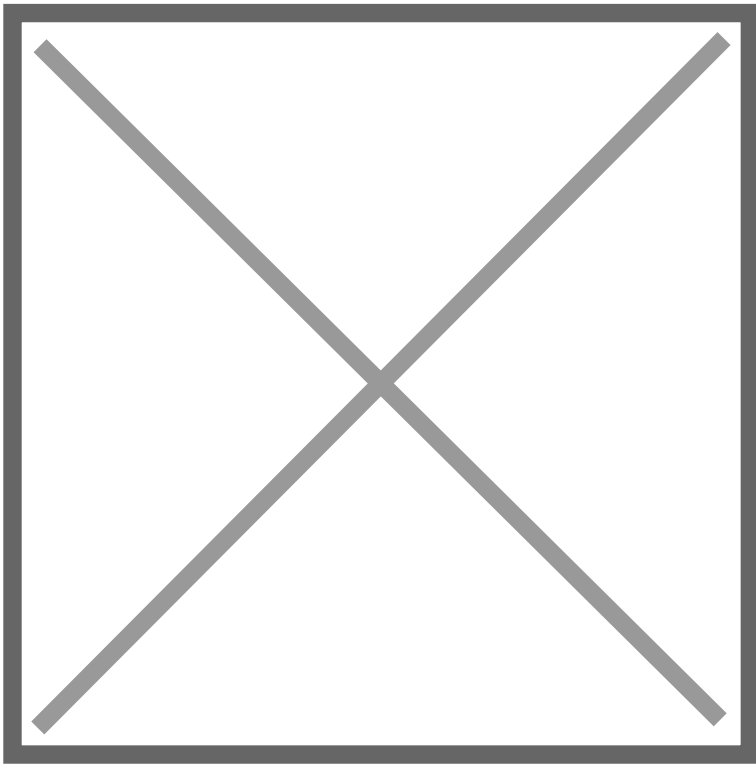
<b>Component Set</b>	<b>Number of Arms</b>		
	<b>4</b>	<b>6</b>	<b>8</b>
	<b>Mass Estimate (kg)</b>		
<b>Base Weight w/o UGV</b>	14.1	14.8	15.4
<b>Base Weight w/ UGV</b>	15.4	16.1	16.7

Motor Propeller	4004	4006	4008	5008	5010	5012	5015	6008	6012	6015	8110	8115	8120
15 x 5.5		NH											
16 x 6		NH	NH	NH									
17 x 6		NH	OP	NH	NH	NH		NH	NH	NH			
18 x 6.5		OP	OP	NM	80%	80%	NM	NM	NM	NH			
18.5 x 6.7		OP		OP	60%	60%	75%	NM	NM	NH			
19 x 6				OP	65%	65%	75%	NM	NM	NM			
19.5 x 7				OP	55%	55%	55%	OP	70%	NM			
20 x 6				OP	60%	60%	60%	OP	75%	NM	NH		
21 x 6				OC	OC	OC	OC	OC	60%	70%	NH		
21 x 12									OC	OC	NH		
Viable Option. (%) Amount of total battery capacity required to fly 4 miles carrying UGV payload				NH: No Hovering			OC: Over Current			OP: Over Power			
				NM: No Maneuverability					Blank Box: Not Feasible				

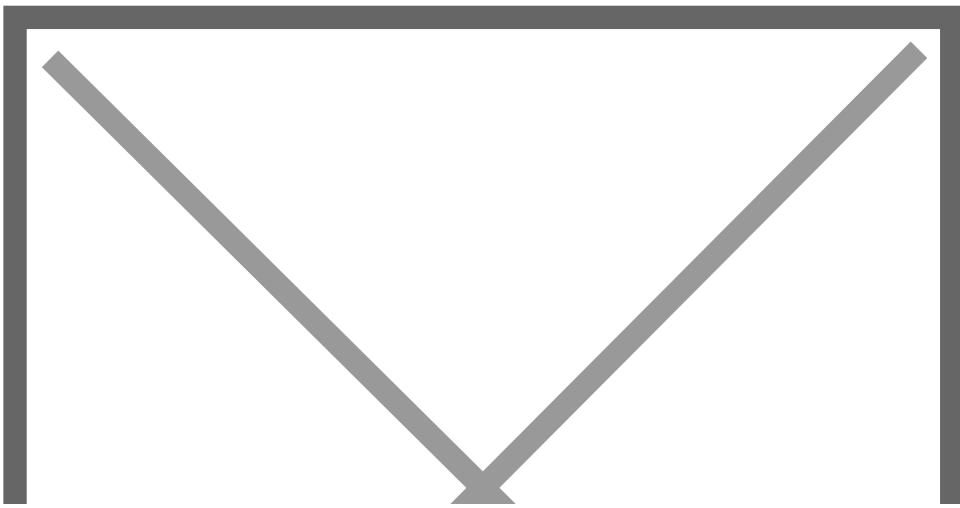
Motor Propeller	4004	4006	4008	5008	5010	5012	5015	6008	6012	6015	8110	8115	8120
16 x 6		OP	NM	NM	NM	NM	NH						
17 x 6		OP	95%	70%	70%	70%	NM	NM	NM				
18 x 6.5		OP	OP	60%	55%	55%	60%	65%	75%	NM	NM	NH	
18.5 x 6.7		OP	OP	OP	55%	55%	55%	60%	60%	80%	NM	NH	
19 x 6				OP	60%	60%	60%	65%	65%	80%	NM	NH	
19.5 x 7				OP	55%	55%	55%	OP	55%	60%	NM	NH	
20 x 6				OP	60%	60%	60%	65%	60%	65%	NM	NH	
21 x 6					OP	OC	65%	OP	60%	65%	NM	NH	
21 x 12					OP	OC	OC	OC	OC	OC	NM	NH	
Viable Option. (%) Amount of total battery capacity required to fly 4 miles carrying UGV payload				NH: No Hovering			OC: Over Current			OP: Over Power			
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<b>Carbon Fiber</b>	1335	66724
<b>Aluminum 6061-T6</b>	89	25536
<b>Titanium 6M-4V</b>	191	25419



in a matter of



minutes.

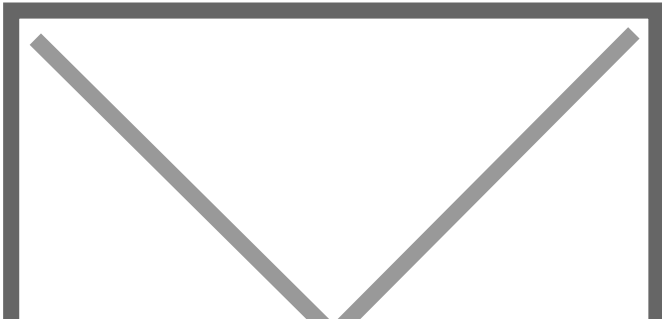


Table aa: Aircraft Properties

Item	Relevant Properties		Item	Relevant Properties
1. Chassis Plates	22" Effective Diameter x 0.172" Thickness		6. Vehicle Maximum Thrust	339 N (76.2 lb)
2. Chassis Structure	22" Effective Diameter x ___" Height		7. Vehicle Cruising Speed	25 km/h (15.5 mph)
3. Arms	0.997" Outer Diameter, 0.880" Inner Diameter, 23.0" Length		8. Vehicle Max Speed	27 km/h (16.8 mph)
4. Propeller	19.5" Diameter x 7 Pitch		8. Climb Rate	10 m/s (32.8 ft/s)
5. Motor	300 Kv, 200g, 36A Max, 62 mOhm		9. Vehicle Design Range	4 miles (6.4 km) carrying UGV + 2 miles (3.2 km) additional without UGV
10. Vehicle All Up Weight	16.4 kg		15. Flight Time	15 Minutes Forward Flight 35 Minutes Hovering Flight
11. UGV Weight	0.68 kg		7. Assembly Time	15 minutes
14. Batteries	6S, 20P, 4050 mAh		6. Disassembly Time	6 minutes

Revision #4

Created 25 August 2023 17:15:06 by Dwight Howard, II

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