

# Milestone Review Flysheet

**Institution** Northwestern University

**Milestone** CDR

## Vehicle Properties

Total Length (in)	110
Diameter (in)	5.5
Gross Lift Off Weigh (lb)	47.5
Airframe Material	G12 Fiberglass
Fin Material	G12 Fiberglass
Coupler Length	6"

## Motor Properties

Motor Designation	L1420
Max/Average Thrust (lb)	407.8/319.2
Total Impulse (lbf-s)	1035
Mass Before/After Burn	10.1/4.4
Liftoff Thrust (lb)	346
Motor Retention	Retainer ring

## Stability Analysis

Center of Pressure (in from nose)	83.28
Center of Gravity (in from nose)	66.76
Static Stability Margin	3
Static Stability Margin (off launch rail)	1.92
Thrust-to-Weight Ratio	6.75:1
Rail Size and Length (in)	1.5/96
Rail Exit Velocity	57.4 ft/s

## Ascent Analysis

Maximum Velocity (ft/s)	617
Maximum Mach Number	0.55
Maximum Acceleration (ft/s^2)	230
Target Apogee (From Simulations)	5301
Stable Velocity (ft/s)	40
Distance to Stable Velocity (ft)	< 8

## Recovery System Properties

### Dogue Parachute

Manufacturer/Model	Fruity Chutes: Elliptical			
Size	18"			
Altitude at Deployment (ft)	5301			
Velocity at Deployment (ft/s)	0			
Terminal Velocity (ft/s)	94.8			
Recovery Harness Material	Nylon			
Harness Size/Thickness (in)	9/16"			
Recovery Harness Length (ft)	45			
Harness/Airframe Interfaces	Threaded welded eye bolts and 880 lb quick links			
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	5797			

## Recovery System Properties

### Main Parachute

Manufacturer/Model	Fruity Chutes: Iris Ultra P		
Size	168"		
Altitude at Deployment (ft)	70		
Velocity at Deployment (ft/s)	94		
Terminal Velocity (ft/s)	10.		
Recovery Harness Material	Nyl		
Harness Size/Thickness (in)	9/1		
Recovery Harness Length (ft)	2		
Harness/Airframe Interfaces	Threaded welded eye bolts and links		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3
	66.7		

## Recovery Electronics

Altimeter(s)/Timer(s) (Make/Model)	2 Missileworks RRC3
Redundancy Plan	One Missileworks altimeter is the main with one acting as a backup. They both set off charges independently of each other
Pad Stay Time (Launch Configuration)	Assuming freshly charged batteries, once avionics are

## Recovery Electronics

Rocket Locators (Make/Model)	Communications Specia Hunters beacc
Transmitting Frequencies	223.450, 223.210, 222.180
Black Powder Mass Droogie Chute (grams)	2.5
Black Powder Mass Main Chute (grams)	2.5

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### Autonomous Ground Support Equipment (MAV Teams Only)

Capture Mechanism	Overview  
Container Mechanism	Overview  
Launch Rail Mechanism	Overview  ***Include Description of rail locking mechanism***
Igniter Installation Mechanism	Overview  

### Payload

Payload 1	Overview  
Payload 2	Overview  

### Test Plans, Status, and Results

Ejection Charge Tests	Ground test before both subscale flight and fullscale flight
Sub-scale Test Flights	Weather conditions: 12mph wind speeds and 10°F; very stable flight; could not recover avionics bay as it was stuck in a tree 40 feet or higher off
Full-scale Test Flights	1/12/17

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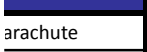
Milestone

Additional Comments









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16"
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and 880 lb quick

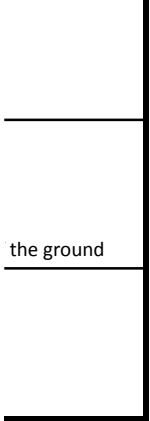
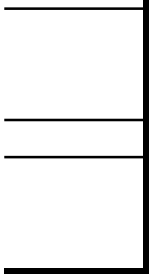
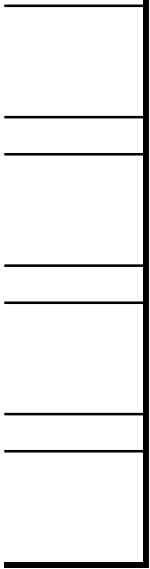
Section 4



alist Rocket  
on

), 223.330



the ground

