

Milestone Review Flysheet

PDR, CDR, FRR

Institution Name	The Pennsylvania State University
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Milestone	FRR
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Vehicle Properties	
Diameter (in)	4.25 / 3.25
Length (in)	116
Gross Liftoff Weight (lb)	20.625
Launch Lug/button Size	1.5"
Motor Retention	Aero Pack 54mm

Motor Properties	
Motor Manufacturer	AeroTech
Motor Designation	K828FJ
Max/Average Thrust (N/lb)	Max: 1303.8/293 Ave: 862.9/194
Total Impulse (N-sec/lb-sec)	2,157.2/484.96
Mass pre/post Burn (lb)	4.9/1.87

Stability Analysis	
Center of Pressure (in from nose)	83.82
Center of Gravity (in from nose)	76.69
Static Stability Margin	1.68
Thrust-to-Weight Ratio	14.2 (max), 9.4 (ave)
Rail Size (in) / Length (in)	1.0 / 72

Ascent Analysis	
Rail Exit Velocity (ft/s)	63.7
Max Velocity (ft/s)	655
Max Mach Number	0.59
Max Acceleration (ft/s ²)	397
Peak Altitude (ft)	5,324

Recovery System Properties				
Drogue Parachute				
Manufacturer/Model		Giant Leap TAC-9		
Size		24"		
Altitude at Deployment (ft)		Apogee		
Velocity at Deployment (ft/s)		~0		
Terminal Velocity (ft/s)		66		
Recovery Harness Material		Kevlar		
Harness Size/Thickness (in)		0.5		
Recovery Harness Length (ft)		50		
Harness/Airframe Interfaces		Metal quick-links to steel U-bolts to double fiberglass bulkplates		
Kinetic Energy During Descent (ft-lb)	Section 1	Section 2	Section 3	Section 4
	497	568		

Recovery System Properties				
Main Parachute				
Manufacturer/Model		Giant Leap TAC-1		
Size		72"		
Altitude at Deployment (ft)		700		
Velocity at Deployment (ft/s)		60.5		
Landing Velocity (ft/s)		18.9		
Recovery Harness Material		Kevlar		
Harness Size/Thickness (in)		0.5		
Recovery Harness Length (ft)		25		
Harness/Airframe Interfaces		Metal quick-links to steel U-bolts to double fiberglass bulkplates		
Kinetic Energy Upon Landing (ft-lb)	Section 1	Section 2	Section 3	Section 4
	48.5	30.1	25.41	

Recovery System Properties	
Electronics/Ejection	
Altimeter(s) Make/Model	2x PerfectFlite Stratologger SL100
Redundancy Plan	Dual Altimeters, Dual black power charges for each ejection event, Dual e-matches for each black powder charge
Pad Stay Time (Launch Configuration)	>2 hr

Recovery System Properties	
Electronics/Ejection	
Rocket Locators (Make, Model)	Garmin Astro DC20
Transmitting Frequencies	~2.4 GHz
Black Power Mass Drogue Parachute (gram)	3
Black Power Mass Main Parachute (gram)	3

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Payload/Science	
Succinct Overview of Payload/Science Experiment	1) Gravity Gradiometer - Determination of space-time Riemann Curvature Tensor components using rotational arms in torsional resonance. 2) Stand-Alone Science Mission Directorate - Single board automated device that collects atmospheric boundary layer data and vehicle tracking information.
Identify Major Components	1) Gravity Gradiometer - Gradiometer 1, 2 and 3. Spherical housing, electronics (to be determined), and gimbal system. 2) Stand-Alone Science Mission Directorate - Main circuit board, Camera, GPS/Antenna, and Battery
Mass of Payload/Science	1) Gravity Gradiometer - Mass of gradiometers, electronics, housing (acrylic) and gimbal (ABS plastic) estimation: 0.7 lbs. 2) Stand-Alone Science Mission Directorate - 0.25 lbs.

Test Plan Schedule/Status	
Ejection Charge Test(s)	Tested before full scale launches
Sub-scale Test Flights	Completed November 24 th , 2012
Full-scale Test Flights	Two completed, both successful

Additional Comments