Milestone Review Flysheet 2018-2019

Institution	North Carolina State University

Milestone	CDR

Vehicle Properties	
Total Length (in)	99
Diameter (in)	5.5
Gross Lift Off Weigh (lb)	41.9
Airframe Material(s)	Fiberglass
Fin Material and Thickness (in)	Aircraft Grade Birch Ply/0.25
Coupler Length(s)/Shoulder Length(s) (in)	11 in, 10.25 in/2.75 in

Motor Properties	
Motor Brand/Designation	AeroTech L1150R
Max/Average Thrust (lb)	302/258
Total Impulse (lbf-s)	790.7
Mass Before/After Burn (lb)	8.1/3.54
Liftoff Thrust (lb)	290.9
Motor Retention Method	Retainer, Engine Mount, Centering rings

Stability Analysis	
Center of Pressure (in. from nose)	72.89
Center of Gravity (in. from nose)	61.82
Static Stability Margin (on pad)	2.01
Static Stability Margin (at rail exit)	2.73
Thrust-to-Weight Ratio	6.94
Rail Size/Type and Length (in)	1515/144
Rail Exit Velocity (ft/s)	66.7

Ascent Analysis	
Maximum Velocity (ft/s)	521
Maximum Mach Number	0.47
Maximum Acceleration (ft/s^2)	1345
Target Apogee (ft)	4090
Predicted Apogee (From Sim.) (ft)	4089

Recovery System Properties - Overall	
Total Descent Time (s)	76
Total Drift in 20 mph winds (ft)	2236

Recovery System Properties - Energetics		
Ejection System Energetics (ex. Black Powder)		Black Powder
Energetics Mass - Drogue Chute (grams)	Primary	2
	Backup	2.5
Energetics Mass - Main Chute (grams)	Primary	2.8
	Backup	3.5
Energetics Mass - Other (grams) - If Applicable	Primary	-
	Backup	-

Recovery System Properties - Recovery Electronics	
Primary Altimeter Make/Model	PerfectFlite StratoLoggerCF
Secondary Altimeter Make/Model	PerfectFlite StratoLoggerCF
Other Altimeters (if applicable)	-
Rocket Locator (Make/Model)	BigRedbee 900
Additional Locators (if applicable)	-
Transmitting Frequencies (all - vehicle and payload)	Fully independent, dual redundant altimeters, with sepearate batteries, switches,
Describe Redundancy Plan (batteries, switches, etc.)	Fully independent, dual redundant altimeters, with sepearate batteries, switches, ematches, and black powder charges.
Pad Stay Time (Launch Configuration)	2.86 hours

Recovery System Properties - Drogue Parachute				
Manufacturer/Model		Fruity Chutes 24-inch Compact Elliptical		
Size or Diameter (in or ft)		24 in		
Main Altimeter Deployment Setting		Apogee		
Backup Altimeter Deployment Setting		Apogee + 1 second		
Velocity at Deployment (ft/s)		95		
Terminal Velocity (ft/s)		79		
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)		5/8 in tubular Kevlar		
Recovery Harness Length (ft)		30		
Harness/Airframe Interfaces		U-bolt with quick link		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	1171	839	1135	-

Recovery System Properties - Main Parachute				
Manufacturer/Model		Fruity Chutes 84 in Iris UltraCompact		
Size or Diameter (in or ft)		84 in		
Main Altimeter Deployment Setting (ft)		600		
Backup Altimeter Deployment Setting (ft)		550		
Velocity at Deployment (ft/s)		79		
Terminal Velocity (ft/s)		18.7		
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)		5/8 in tubular Kevlar		
Recovery Harness Length (ft)		30		
Harness/Airframe Interfaces		U-bolt with quick link		
Kinetic Energy of Each Section (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	66	47	75	-

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Payload	
Payload 1 (official payload)	Overview The team aims for the payload to successfully eject from the rocket, arm the motors, and safely fly to and deliver the simulated navigational beacon. To accomplish the mission, the team will utilize a payload pod, designated the "Egg," which will house the UAV, the "Eagle," while the rocket is in flight. The purpose of the Egg is to protect the UAV, to provide the UAV a means to self-right, and to act as a place to take off from once the rocket has landed. A receiver will be placed forward of the payload bay on a removable bulkhead that will receive a signal from the hand-held radio transmitter. This receiver will activate a preprogramed controller that will control all the electronics involved in deploying the payload
Payload 2 (non-scored payload)	Overview N/A

Test Plans, Status, and Results	
Ejection Charge Tests	In order to ensure that the altimeters used for ejection charges onboard the rocket execute correctly, altimeters will be placed in a vacuum chamber and will be hooked up to an LED. If the LED illuminates at the correct pressure, then it will be deemed worthy for flight. Black powder ejection charge testing will take place to confirm calculations performed in the PDR. These calculations rely on a constant to find the ideal pressure for a certain separation force. Testing will start with the calculated amount of black powder loaded into a mock-up of each section that is weighted and connected appropriately. Further tests will be performed until the sections separate by the appropriate amount.
Sub-scale Test Flights	The subscale flight is scheduled for November 17, 2018. During this flight, the primary mission system designs will be validated and any failures will be accounted for in future documentation. The subscale payload will simply be a simulated weight in the payload bay. Upon landing of the subscale, a full-scale mock-up of the payload will simulate deployment in the location that the subscale lands. The launch vehicle will also test recovery systems and altimeter accuracy will be validated.
Vehicle Demon-stration Flights	The full-scale test flight will take place on February 23, 2019. This test flight will validate all launch vehicle systems and provide confidence in mission success prior to FRR. Launch vehicle recovery system timing and sizing will be confirmed, target apogee and altimeter accuracy will be tested, and necessary weight adjustments will be made in the weeks preceeding FRR.
Payload Demon-stration Flights	The payload demonstration flight will take place with the full-scale vehicle demonstration flight on February 23, 2019. The payload will be deployed upon landing of the full-scale vehicle and the UAV mission will be tested and completed.

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Transmitter #1			
Location of transmitter:	Midsection AV Bay		
Purpose of transmitter:	Locating the vehicle after recovery		
Brand	BigRedBee	RF Output Power (mW)	250
Model	BRB900	Specific Frequency used by team (MHz)	900
Handshake or frequency hopping? (explain)	Broadcasts on 900 MHz spread spectrum		
Distance to closest e-match or altimeter (in)	4		
Description of shielding plan:	Birch plywood AV sled between transmitter and altimeter will be lined with aluminum foil		

Transmitter #2			
Location of transmitter:	Payload electronics stack		
Purpose of transmitter:	Transmit video to the screen/receiver combo the team will use.		
Brand	AKK	RF Output Power (mW)	600
Model	KK-831	Specific Frequency used by team (MHz)	8
Handshake or frequency hopping? (explain)	Handshake - must only broadcast to team system		
Distance to closest e-match or altimeter (in)	23		
Description of shielding plan:	Will be powered off until end of flight, and will not operate nearby other electronics in flight. Furthermore, as it must broadcast to the team, sheilding cannot be applied to the transmitter.		

Transmitter #3			
Location of transmitter:			
Purpose of transmitter:			
Brand		RF Output Power (mW)	
Model		Specific Frequency used by team (MHz)	
Handshake or frequency hopping? (explain)			
Distance to closest e-match or altimeter (in)			
Description of shielding plan:			

Transmitter #4			
Location of transmitter:			
Purpose of transmitter:			
Brand		RF Output Power (mW)	
Model		Specific Frequency used by team (MHz)	
Handshake or frequency hopping? (explain)			
Distance to closest e-match or altimeter (in)			
Description of shielding plan:			

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Transmitter #5			
Location of transmitter:			
Purpose of transmitter:			
Brand		RF Output Power (mW)	
Model		Specific Frequency used by team (MHz)	
Handshake or frequency hopping? (explain)			
Distance to closest e-match or altimeter (in)			
Description of shielding plan:			

Transmitter #6			
Location of transmitter:			
Purpose of transmitter:			
Brand		RF Output Power (mW)	
Model		Specific Frequency used by team (MHz)	
Handshake or frequency hopping? (explain)			
Distance to closest e-match or altimeter (in)			
Description of shielding plan:			

Additional Comments