Milestone Review Flysheet 2019-2020

Institution	Auburn University

Milestone	PDR

Vehicle Properties

Total Length (in)	132
Diameter (in)	6.2
Gross Lift Off Weigh (lb)	48.75
Airframe Material(s)	Carbon Fiber, Fiberglass
Fin Material and Thickness (in)	Carbon Fiber, .2 in
Coupler Length(s)/Shoulder Length(s) (in)	14 in/ 6 in

Motor Properties

Motor Brand/Designation	Aerotech L2200
Max/Average Thrust (lb)	696/494.58
Total Impulse (lbf-s)	1147.4
Mass Before/After Burn (lb)	10.54/5.55
Liftoff Thrust (lb)	557.5
Motor Retention Method	Aeropac bolted

Stability Analysis

Center of Pressure (in. from nose)	103
Center of Gravity (in. from nose)	75.57
Static Stability Margin (on pad)	4.27
Static Stability Margin (at rail exit)	3.18
Thrust-to-Weight Ratio	10.1:1
Rail Size/Type and Length (in)	15-15 rail/96
Rail Exit Velocity (ft/s)	87.86

Ascent Analysis

Maximum Velocity (ft/s)	679
Maximum Mach Number	0.6
Maximum Acceleration (ft/s^2)	441
Target Apogee (ft)	5000
Predicted Apogee (From Sim.) (ft)	5247

Recovery System Properties - Overall

Total Descent Time (s)	88.9
Total Drift in 20 mph winds (ft)	2,607

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	4
	Backup	4.5
Energetics Mass - Other (grams) - If Applicable	Primary	N/A
	Backup	N/A

Payload Deployment

Location: Air or Ground (if applicable)	Ground
Altitude of Deployment (if applicable)	n/a

Recovery System Properties - Recovery Electronics

Primary Altimeter Make/Model	Stratologger PerfectFlite
Secondary Altimeter Make/Model	Stratologger PerfectFlite
Other Altimeters (if applicable)	
Rocket Locator (Make/Model)	Featherweight GPS Tracker
Additional Locators (if applicable)	RF Tracker
Transmitting Frequencies (all - vehicle and payload)	***Required by CDR*** (Complete on pages 3 and 4)
Pad Stay Time (Launch Configuration)	8hrs
Describe Redundancy Plan (batteries, switches, etc.)	Each altimeter is powered by its own battery and has its own e-match and charge associated with it. The systems are isolated from one another.

Recovery System Properties - Drogue Parachute

Manufacturer/Model	Auburn University / Circular			
Size or Diameter (in or ft)	30 in			
Main Altimeter Deployment Setting	Apogee			
Backup Altimeter Deployment Setting	Apogee+1sec			
Velocity at Deployment (ft/s)	0			
Terminal Velocity (ft/s)	97.1			
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)	5/8 inch Tubular Nylon			
Recovery Harness Length (ft)	2X10			
Harness/Airframe Interfaces	(2x) Quick Link to U-Bolt mounted in bulk plate			
Kinetic Energy (Ft-lbs)	Section 1	Section 2	Section 3	Section 4

Recovery System Properties - Main Parachute

Manufacturer/Model	Auburn University / Hemispherical			
Size or Diameter (in or ft)	10.5 ft			
Main Altimeter Deployment Setting (ft)	550			
Backup Altimeter Deployment Setting (ft)	500			
Velocity at Deployment (ft/s)	97.1			
Terminal Velocity (ft/s)	12.76			
Recovery Harness Material, Size, and Type (examples - 1/2 in. tubular Nylon or 1 in. flat Kevlar strap)	5/8 inch Tubular Nylon			
Recovery Harness Length (ft)	2X15			
Harness/Airframe Interfaces	(2x) Quick Link to U-Bolt mounted in bulk plate			
Kinetic Energy (Ft-lbs)	Section 1	Section 2	Section 3	Section 4
	49.96	17.22	44.1	

Milestone Review Flysheet 2019-2020

Institution	Auburn University	Milestone	PDR

Payload

Payload 1 (official payload)	**Overview** The paylaod will be broken down into three subsystems. The main payload will be a remote controlled aerial vehicle deployed on the ground. The vehicle will be manually flown to a sample site and will extract the sample with a auger-like mechanism. The ejection system will be an active lead-screw driven system that is remotely activated by the team once the launch vehicle lands. The orientation and retention system will be an active system that will be locked during flight. After the flight is complete, the orientation system will actuate, orienting the payload. Once the payload is deployed, the retention system will actuate, releasing the payload from the orientation system.
Payload 2 (non-scored payload)	**Overview** The optional payload will be a variable drag system that will deploy to control the apogee of the vehicle. It will only be deployed after the booster has completed its burn, if the vehicle is above a predetermined altitude, and below a predetermined speed. The system will be completely autonomous, and will not receive any remote commands. The drag mechanism will be a set of four grid fins that are mounted externally on the body. The fins will be driven by one stepper motor, via a drive mechanism which connects the fins to the motor through four shafts. In order to increase safety, a solenoid will be used to lock the drive mechanism in place until powered. Two batteries will be used to power the system, a 3.3v Li-Po for the microcontroller and a 7.4v Li-Po for the stepper motor.

Test Plans, Status, and Results

Ejection Charge Tests	Ejection testing for the subscale rocket was completed on October 19 in Huntsville, AL. The test was successful for both drogue and main separations, proving that the subscale rocket was prepared for a successful launch and recovery. Further, because the full scale rocket will have the same layout as the subscale rocket, this test demonstrated that this recovery layout will be effective for the full-scale rocket as well. Full scale ejection tests will be performed at least a week prior to the first full scale launch, at an Auburn University research facility located just off campus in Auburn, AL.
Sub-scale Test Flights	A 2:3 scale rocket was manufactured with scaled-down but otherwise similar layouts, compartments, and materials as the full scale rocket is expected to have. In the place of payloads, a small electronics package was flown to collect flight data so that accurate payload simulations could be performed after the launch. This simulated the weight and volume of the full scale payloads. Due to weather complications on October 19, the team was not able to complete a subscale launch; it is expected that a subscale launch will be completed on October 26 in Samson, AL.
Vehicle Demon-stration Flights	The earliest full scale demonstration launch is December 7, 2019, in Samson, AL. If the team is unable to launch on this date, the earliest launch in January 2020 will be utilized (exact date TBA).
Payload Demon-stration Flights	If the payload is completed in time for the December 7 full scale launch, the team will use this as the payload demonstration flight as well. If the payload is not ready for a demonstration flight, then the earliest 2020 launch will be utilized (exact date TBA).

Milestone Review Flysheet 2019-2020

Institution	Auburn University	Milestone	PDR

Transmitter #1			
Location of transmitter:	UAVES Bay		
Purpose of transmitter:	Receives commands for the UAVES system and transmits status data		
Brand	Reyax	RF Output Power (mW)	31.62
Model	RYLR896	Specific Frequency used by team (MHz)	915MHz
Handshake or frequency hopping? (explain)	Handshake - The transmitter prefaces its transmission with the address and network of the target receiver		
Distance to closest e-match or altimeter (in)	6 in		
Description of shielding plan:	A carbon fiber bulkhead is placed between the transmitter and the altimeter		

Transmitter #2			
Location of transmitter:	AOS/ARS		
Purpose of transmitter:	Receives commands for the AOS and ARS systems and transmits telemetry and status data		
Brand	Reyax	RF Output Power (mW)	31.62
Model	RYLR896	Specific Frequency used by team (MHz)	915MHz
Handshake or frequency hopping? (explain)	Handshake - The transmitter prefaces its transmission with the address and network of the target receiver		
Distance to closest e-match or altimeter (in)	12 in		
Description of shielding plan:	A carbon fiber bulkhead is placed between the transmitter and the altimeter		

Transmitter #3			
Location of transmitter:	Ground Station		
Purpose of transmitter:	Transmit instructions to the UAV		
Brand	FrSky	RF Output Power (mW)	100mW
Model	QX7	Specific Frequency used by team (MHz)	2400
Handshake or frequency hopping? (explain)	Frequency hopping - Uses the FrSky ACCST protocol to pair with a receiver		
Distance to closest e-match or altimeter (in)	Ground based		
Description of shielding plan:	The carbon fiber body tube shields the altimeters from ground based transmissions		

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:			

Institution	Auburn University

Milestone	PDR

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