Statement of Work Requirements Verification Table - Addendum

Vehicle Requirements

Requirement	Success Criteria	Verification
1.1	No specific design requirement exists for the altitude. The altitude is a function of obtaining supersonic flight for the supersonic payloads	Vehicle attains supersonic flight while remaining under maximum allowable altitude of 20,000 ft. AGL
1.1.1.	Obtaining the predicted altitude of 15,800ft.	Record post-flight altimeter to determine max altitude attained.
1.1.2.	The Range Safety Officer approves the altitude by the CDR	Predicted altitude is below the specified maximum.
1.2	The vehicle shall use a COTS barometric altimeter for recording official altitude.	Both altimeters will be PerfectFlite StratoLoggers
1.2.1	Altimeter successfully recovered and presented to NASA official while still beeping	Successful recovery of Prometheus following competition launch.
1.2.2	The vehicle shall have additional altimeters to control vehicle electronics and payload experiments	Two altimeters will be used to successfully trigger the recovery system. The competition altimeter and a redundant device.
1.2.2.1	Present altimeter to be marked as official altimeter.	Designate official altimeter ahead of time.
1.2.2.2	Altimeter successfully recovered and presented to NASA official while still beeping	See requirement 1.2.1
1.2.2.3	Silence all other altimeters in the rocket.	All altimeters will have a dedicated power source
1.2.3	See Sub Requirements	See Sub Requirements
1.2.3.1	The official altimeter is presented to the RSO undamaged while still reporting an altitude	See requirement 1.2.1
1.2.3.2	The team will report to the RSO in a timely manner after recovery of the vehicle	Team will develop and follow specified launch day procedures.
1.2.3.3	Current predictions do not	Simulations in Rocksim

	exceed 16,000 feet AGL	predict max altitude of 15,800 ft. AGL
1.2.3.4	CRW current plans to have a team in Utah for the competition flight of Prometheus	Travel arrangements are being made to transport a launch team, at minimum.
1.3	Rocket will be designed to land slow enough so no hardware is damaged	Simulations and testing of recovery system design for proper function and to minimize impact energy.
1.4	Payloads and recover system will be simple in design and allow the rocket to be assembled in 2 hours from waiver opening.	Ground testing of payload and recovery system designs to ensure quick assembly. Launch procedures detailing all steps in assembly.
1.5	Vehicle shall remain in launch configuration for at least one hour.	Batteries have been selected so that individual systems remain functional for 1.75 hours
1.6	The vehicle shall be able to be launched by a 12V ignition system that will be provided	Motors selected for subscale and full scale flights are commercially available and can be ignited using a 12V system
1.7	Vehicle shall not require any external circuitry to initiate launch	The ignition system provided by NASA will be the only circuitry external to the vehicle
1.8	The vehicle shall use a COTS motor propulsion system using APCP	The selected motor will be a CTI M4770- Vmax
1.9	Prometheus will not have a pressure vessel.	Prometheus will not have a pressure vessel.
1.10	See Sub Requirements	See Sub Requirements
1.10.1	The vehicle and recovery system will be flown and operate correctly during a full-scale flight.	The rocket will be visually inspected and flight data will be used to confirm recover system results.
1.10.2	See Sub Requirements	See Sub Requirements
1.10.2.1	See Sub Requirements	See Sub Requirements
1.10.2.1.1	If all payloads are not prepared mass simulators will be placed in	Mass simulators will be based on latest know

	the approximate location as the unfinished payload.	expected payload mass
1.10.2.2	Prometheus contains no external surface changing payloads or energy management systems	Prometheus contains no external surface changing payloads or energy management systems
1.10.3	A full-scale flight with a full-scale or near full-scale motor will be flown to validate design and test payloads.	The full-scale flight will validate launch calculations, payload design, vehicle design, and recovery system design.
1.10.4	A full-scale flight with complete ballast shall be flown before the FRR.	A full-scale flight with all payloads in flight ready configuration or with simulated weight will be flown and safely recovered.
1.10.5	After competition of a full-scale flight the system will be completely designed and not require a redesign.	Should anything need to be changed, concurrence must be obtained from the Range Safety Officer (RSO) priory to design change.

Recovery System Requirements

Requirement	Success Criteria	Verification
2.1	Use a dual deploy system that can bring the rocket down fast enough to keep drift under 5000ft for a 20 mph wind.	Test recovery system during full-scale to validate parachute calculations. Use actual drift to extrapolate drift at 20 mph.
2.2	A completely custom made parachute designed and manufactured by the UAH Charger Rocket Works team	No parachutes will be purchased for the full-scale or final rocket.
2.3	The highest landing energy will belong to the large body of the rocket and will be maintained near the current prediction of 33 ft.*lb	Verify landing energy calculations from full-scale launch accelerometers at landing.
2.4	The recovery system circuit will be designed to be completely self-contained and isolated from the payload circuits.	The circuits will be tested in ground tests and during full-scale launch to validate independence.
2.5	Two commercial altimeters will provide redundancy to insure recovery system deployment. Both the drogue and main will have redundant altimeters.	Fly two altimeters for the full-scale flight to verify both systems deploy during flight.
2.6	Dual arming switches to insure both altimeters are armed and keep both systems separate from each other.	Full-scale flight will insure that both altimeters can be accessed from outside the rocket from a separate arming switch.
2.7	Each altimeter will have a dedicated power supply to completely isolate each recovery system and prevent a single failure point.	Will be Tested during full-scale flight to insure that each altimeter is powered correctly from their independent batteries.
2.8	Pull pins will be used and the system will be designed to be on once the pins are removed.	Full-scale test will insure the pull pins activate both altimeters and that the altimeters remain on.
2.9	Shear pins will keep the single deploy point (Nosecone) attached. The shear pins will be removable to access the	The shear pins will be checked to insure they can be removed before launch and they will be tested in

	recovery system.	shearing during the full-scale launch and ground tests.
2.10	See Sub Requirements	See Sub Requirements
2.10.1	The rocket will return tethered together. The rocket will have GPS broadcasting in real time during the descent and have a dog tracker as a backup solution.	The GPS will be tested during the full-scale launch and tested during ground test. The dog tracker will be tested during ground test and full-scale.
2.10.2	The tracking system will be functional and integrated with the Landing Hazard Detection System.	The tracking system will be tested during full-scale flight to insure correct integration with landing hazard detection system.
2.11	See Sub Requirements	See Sub Requirements
2.11.1	The recovery system will be located in a different compartment from the LHDS, the only broadcasting system.	Tested during full-scale flight to insure radio does not power on until clear of the rocket.
2.11.2	No onboard devices will be transmitting until the recovery system has already deployed.	Tested during full-scale flight to insure radio does not power on until clear of the rocket.
2.11.3	The recovery system will be separated from energy producing payloads and the energy producing payload will reside in a faraday cage.	Ground tests will insure recovery system is properly isolated from energy producing payloads and tested during full-scale flight.
2.11.4	No devices will interfere with the operation of the recovery system electronics through any means.	Several sub-scale tests, ground tests, and full-scale test will insure the recovery system remains un affected by other payloads.

Payload Requirements

Requirement	Success Criteria	Verification
3.1	See Sub Requirements	See Sub Requirements
3.1.1	Landing Hazard Detection System will include a COTS camera to scan the ground during descent for hazards and use one of three different methods or a combination of them to detect hazards.	Test Landing Hazard Detection System during full-scale flight and testing using google images and “hazards” on a wall.
3.1.2	Use a Beaglebone to provide sufficient processing to analyze the image in real time by the computer on the rocket.	The Beaglebone White has a Sitara AM335x Cortex A8 ARM processor, and will be tested before the competition flight to ensure proper data transmission.
3.1.3	The presence of hazards or lack thereof will be transmitted back to a ground station in real time using a COTS radio solution connected to the Beaglebone.	Tests of full scale flight hardware will be conducted on the ground and on the full scale test flight within acceptable limitations of the hardware and expected flight conditions
3.2	Fly additional payloads 3.2.1.2 and 3.2.2.4	Ensure that each payload meets its separate payload requirements from the CDR
3.3	Design payload to have easily changeable batteries and remain undamaged on landing so the system can be easily re-flown without requiring repairs.	Ensure that payload is recovered from full-scale launch and is completely intact and ready to be re-flown.
3.4	3.4 and sub requirements are not applicable	3.4 and sub requirements are not applicable

General Requirements

Requirement	Success Criteria	Verification
4.1	Launch and safety checklist made and tested for full-scale launch.	Launch checklist will be tested and run through during full-scale launch to insure completeness.
4.2	A successful mission flown and built completely by students at Charger Rocket Works of University of Alabama in Huntsville	Although external sources shall be used for advice, all construction, design work, and writing will be performed by students.
4.3	Project plan will contain details concerning all aspects of the project and lay out a path forward till the project's completion.	A final project binder containing purchases, timeline, organization chart, outreach details, and more shall be made before the flight day.
4.4	Mentor will be identified and be certified at the appropriate level by full-scale launch.	Mentor identified by PDR. Achieved required level.
4.5	All team members, instructors, and mentors will be identified to NASA including Foreign nationals	Completed. List submitted before CDR.
4.6	Foreign Nationals will be identified by PDR and informed of potential separation during launch week activities	Completed. List submitted before PDR.
4.7	Follow all generally accepted safety procedures as well as any additional safety procedures that are imposed by the RSO at any local club launches.	Check with RSO before each launch and insure they approved of the flight.
4.8	Complete an outreach packet that is modular in nature and easily adaptable to different age groups to reach as many students as possible. Lay groundwork for future teams to build upon outreach. Reach at least 200 students at least half of those being middle schools.	Request feedback from outreach students and educators to evaluate worth of outreach program and improve. Put outreach slides and plans on flash drive and give to instructor to present to next class.
4.9	A new custom hand crafted	Use online HTML verifiers

	HTML5 website will be designed for the Charger Rocket Works team. This will be used to spread information concerning the team and its efforts in both outreach and project. Allow easy access to all documentation made by the team. Website should be complete by Launch Day with only flight results left to post.	to insure HTML5 compliance and test document download to insure they work correctly. Check website and insure completeness by launch day.
4.9.1	Post documents to website in an easily accessible manner. Email NASA when documents are posted.	PDR: Completed CDR: Completed FRR: April 18th 8:00am