Project Schedule				
				
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	Signatures			
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	Revision History			
	Version 1	08/30/2018	Initial Release	

Goals & Phases

	Systems	**Structures**	**Avionics**	**Recovery**	**Software**
End of Semester 1:	**Phoenix II Launch**	**Redesign rocket for separation via charge**	**RF Beacon & Listener**	**Develop pneumatic deployer**	**Build in some sort of fault tolerance**
Secondary Objectives:	Develop medium scale cold gas thruster	Eliminate external fin holders (weird drag currents)	Design GDS architecture (hardware)	Design medium-scale parachute	Design GDS architecture (software)
		Begin designing large-diameter structures	Design real-time state estimation (Kalman filter?)		
		Figure out how to reliably measure altitude in real-time!			
End of Semester 2:	**Grasshopper Launch**	**Manufacture medium-scale structure**	**Live telemetry & active thruster control**	**Test prototype recovery system**	**Develop (new) FSW & GDS software**
Precursory Objectives:	Develop medium scale cold gas thruster	Develop & manufacture skeleton	Reliable real-time state (and altitude) estimates	Demonstrate pneumatic deployment	Support new avionics hardware
	Write procedures & V&V all subsystems	Develop & manufacture skin	Active thruster valve control from estimates	Develop medium-scale parachute	Support GDS receivers
	Oversee ATLO & lab testing	Integrate nose cone & fins			Support GDS users/ front-end
	Project Phases (NASA Definitions)				
Pre-Phase A	Concept Studies	Brainstorm, Trade Studies, Feasibility Studies			
Phase A	Concept Development				
Phase B	Preliminary Design Completion	Detailed trade studies, Develop system designs and plans		System requirements review, System design review, Non-advocate review	
Phase C	Final Design & Fabrication	Finish design, build hardware & software, test subsystems		PDR, CDR, Test readiness review	
Phase D	System Integration, Test, & Launch	Bring everything together, test everything at each stage of assembly		Flight readiness review	
Phase E	Operations	Fly the spacecraft, do the mission		Primary + Extended mission	
	Project Phases (Braden's Definitions for Olin)				
Pre-Phase A	Mission Formulation	PM & SE develop mission concept, define L1 & L2 reqs, establish CM & mission management plans and perform initial setup for semester			
Phase A	Preliminary Design	Subsystems define L3 reqs, establish work agreements and technology development plans, and produce an initial design and cost estimate. No technology development or prototyping may take place during this phase, but hardware acquisition may take place at the discretion of the PM. System design reviews take place. **Phase A ends with a PDR**.			
Phase B	Detailed Design & Prototyping	Subsystems develop V&V plans, process plans, acquire hardware, and execute on the technology development plans. Prototyping. Laboratory and/or relevant field testing (by V&V plan!) is expected with results documented accordingly. **Phase B must include a CDR and/or EDR and ends with a fully completed vehicle design.**			
Phase C	Fabrication, Integration, & Testing	Subsystems produce reliability assurance plans, document final designs, and construct flight hardware. SE oversees the integration of subsystem deliverables and performs systems-level V&V at each stage of HW/SW integration. Laboratory and/or relevant field testing (by V&V plan!) is expected with results documented accordingly. As-built design documented in real time. **Phase C ends with a fully completed flight vehicle.**			
Phase D	Launch Operations	Live-fire operation(s) of flight vehicle. **Phase D ends with completed flights.**			
Phase E	Mission Debrief	Subsystem performance analyses, mission-level reports, lessons learned, and as-built designs compiled and archived. **Phase E ends with archive completion.**			

Calendar

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
	August	26	27	*Move-In Day*	29	*First Day of Classes*	31	**1**	
	September	2	*Labor Day*	4	5	6	**Kickoff**	8	
Phase A		9	10	11	12	13	*Olin Monday*	15	
		16	17	**Gate Review**	19	**Revisions Due, Order HW**	**PDR**	*Alumni Weekend*	Intention is to have a preliminary design complete
Phase B		*23*	24	25	26	27	28	29	Intention is to complete prototyping and development during these two weeks
	October	30	**1**	2	*Career Fair*	4	5	6	
		7	*Columbus Day*	**Gate Review**	10	**Revisions Due**	**CDR**	*Family Weekend*	Intention is to present results of development
		14	15	**Design Freeze**	**EDR@SLAC**	18	**Begin Fabrication**	20	
Phase C		21	22	23	24	25	**Complete Fabrication**	27	Intention is to fabricate subsystem components
	November	28	29	**Begin ATLO**	31	**1**	**Complete ATLO**	3	Intention is to assemble subsystem components
Phase D		4	5	**Launch Rehearsal**	**Launch Opportunity**	8	9	10	
		11	12	13	**Launch Opportunity**	15	16	17	
Phase E		18	*Thanksgiving Break*					24	
		25	26	27	28	29	**Subsystem Gate Review**	**1**	
	December	2	3	4	5	6	**Project Gate Review**	8	
		9	*Study Day*	*Finals*				15	
		16	*Expo*	*Winter Break*					

Gate Products

	Project Manager	Systems Engineer	Structures/Recovery	Avionics/GDS
Pre-Phase A	Mission Concept	Project Schedule		
	Project Plan	Configuration Management Plan		
	L1 Project System Requirements	Project Review Plan		
	Communication/Education Plan	L2 Project System Requirements		
	Problem Reporting Plan			
	Fundraising Plan			
	2 weeks:			
Phase A	Flight Operations Plan		L3 Project System Requirements	L3 Project System Requirements
	Launch Approval Plan	Work Agreement	Work Agreement	Work Agreement
		Technology Development Plan	Technology Development Plan	Technology Development Plan
	Risk Assessment		Materials & Processes Plan	Software Management Plan
		Cost Estimate & Acquisition Plan	Cost Estimate & Acquisition Plan	Cost Estimate & Acquisition Plan
		Master Equipment List	Detailed Equipment List	Detailed Equipment List
		Receivables – Deliverables List	Receivables – Deliverables List	Receivables – Deliverables List
		Preliminary Design	Preliminary Design	Preliminary Design
				GDS HW/SW V&V Plan
		System V&V Plan	Flight HW V&V Plan	Flight HW/SW V&V Plan
	4 weeks:			
Phase B	Mishap Preparedness & Contingency Plan			Telecommunication Design Control Document
	Decommissioning Plan			Telecom Link Frequency Assignment
	Fundraising Report	Reliability Reqs & Assurance Plan	Fabrication Quality Assurance Plan	Sensor Calibration Reqs
	Risk Assessment (Updated)		Reliability Reqs & Assurance Plan	Reliability Reqs & Assurance Plan
		Technology Readiness Assessment	Technology Readiness Assessment	Technology Readiness Assessment
		Detailed Design	Detailed Design	Detailed Design
		Master Equipment List (Updated)	Detailed Equipment List (Updated)	Detailed Equipment List (Updated)
	2 weeks:			
	Risk Assessment (Updated)			
Phase C		As-Built Design	As-Built Design	As-Built Design
		Technology Development Assessment	Technology Development Assessment	Technology Development Assessment
Phase D				
Phase E		Performance Report	Performance Report	Performance Report
	Lessons Learned	Lessons Learned	Lessons Learned	Lessons Learned
	Mission Report			

Gate Product Descriptions

Gate Product	Required From	Phase	Description	Additional Signoffs
	Unless otherwise noted, gate products are to be delivered to the configuration manager (CM), with all additional signoffs, prior to gate reviews. The project manager (PM) and systems engineer (SE) shall review all relevant documents prior to the conclusion of a project phase.			
Mission Concept	PM	Pre-Phase A	Establishes technology goals and a mission concept for the semester. This document shall also establish a longer-term vision for the team and justify how semester goals are instrumental for achieving that vision. The PM shall present this mission concept to the team at the start of every semester (essentially as a "state of the union" address).	
Project Plan	PM	Pre-Phase A	Outlines an implementation approach, cost budget, and schedule for meeting semester goals, negotiating mission concept with sponsors as necessary. This document shall establish deliverables and technology demonstrations expected from project subsystems as well as lay out a schedule and preliminary budget that includes both income and allocations.	
L1 Project System Requirements	PM	Pre-Phase A	Establishes formal technology goals and definition of mission success criteria. High-level definition of mission objectives, technology demonstration goals, and project constraints.	
Communication/ Education Plan	PM	Pre-Phase A	Establishes goals and plan for interfacing with external entities (e.g. students, sponsors, conferences, other rocket teams) and establishes objectives for collaborating, sharing information with, and/or demonstrating technology for those venues. Plans for an Educational Design Review (EDR), if desired, should be included in this plan.	
Problem Reporting Plan	PM	Pre-Phase A	Defines formal communication channels for reporting unexplained events, anomalous behavior, and out of spec performance as well as bad teaming situations, and poor/ dangerous engineering practices. Also establishes expectations for corrective actions and verification of correction activities (both for teaming and engineering issues).	
Project Schedule	SE	Pre-Phase A	Calendar of project meetings and actions, developed in parallel to the PM's Project Plan gate product. At a minimum, the project schedule establishes dates of team meetings, gate reviews, design reviews (tentatively), launch dates, key deadlines, and includes margins.	PM
Configuration Management Plan	SE	Pre-Phase A	Establishes a procedure for storing and updating (controlling) project artifacts. Artifacts include documentation such as gate products, requirements, designs, atmospheric models etc. as well as deliverables including software products, flight hardware, testbeds/test equipment, etc. This plan shall be implemented and maintained at all stages of the project.	PM
Project Review Plan	SE	Pre-Phase A	Establishes schedule and lists tentative review board members for project design reviews, both internal (gate reviews, etc.) and external (CDR, PDR, etc.). EDR, if planned, should be listed in this gate product but should be detailed in the Comm/Edu Plan gate product.	PM
L2 Project System Requirements	SE	Pre-Phase A	Breaks L1 requirements and objectives into technology goals and success criteria at the subsystem level. L2 reqs establish subsystem-level design constraints, objectives, and technology demonstrations necessary to meet L1 requirements and mission success criteria.	PM
Fundraising Plan	PM	Pre-Phase A	Establishes a series of goals for advancing team funding as well as actionable steps to achieve those goals during the semester. The PM will present the state of this plan's execution to the team at the conclusion of Phase B (see gate product: Fundraising Report).	
Flight Operations Plan	PM	Phase A	Establishes clear procedures, safety planning, checklists, and timeline for launch operations. This document should include safety checklists and procedures for nominal flight operations with an accompanying timeline of events/concept of operations for a nominal launch.	
Risk Assessment	PM	Phase A, Phase B, Phase C	Assessment of known risks and risk status that shall be reported by the PM at each major review. These risks may include but are not limited to: issues reported via the Problem Reporting Plan; recommendations and requests for action from design reviews; technology dedicated to be test-as-you-fly; risks and potential red flags raised by any team member; significant non-flight-technology risks; risks to the project timeline or mission success criteria. It is recommended that risks be characterized via a standard 5x5 risk matrix (plotting likelihood against consequence). The assessment should be co-authored by the PM and SE, but the PM is the document owner and is responsible for ensuring a sound risk analysis process is followed.	
Launch Approval Plan	PM	Phase A	Compilation of safety plans, procedures, and other documentation requested by the launch venue as necessary to secure a launch site.	
L3 Project System Requirements	All subsystems	Phase A	Breaks L2 requirements and objectives into design constraints and success criteria for implementation. L3 reqs establish low-level enough constraints, conditions, and criteria that technology development can begin.	
Work Agreement	SE, All subsystems	Phase A	Establishes commitments for work to be completed and requests resource allocation (for both prototypes and flight versions) from the PM. At a minimum, this agreement should include a list of deliverables and a proposed timeline for their delivery. This document must be signed off by the PM and subsystem leads before it can be submitted as a gate product.	PM
Cost Estimate & Acquisition Plan	SE, All subsystems	Phase A	Spreadsheet that includes two items: Phase B hardware purchase orders; and an estimate of the cost of a flight unit. The first tab of the spreadsheet should consist of purchase requests and list all hardware to be ordered for Phase B (prototyping material, etc.) including price, quantity, and purchasing links/acquisition plan. The second tab of the spreadsheet should list only the hardware expected for a final flight unit and notes the expected price.	PM
Detailed Equipment List	All subsystems	Phase A	Spreadsheet that lists technical information of expected flight hardware (no pricing info). This spreadsheet should list the hardware and quantities expected to be used for a final flight unit and include relevant mass, volume, density, operating voltages, peak power draw, etc. specifications as well as a link to a relevant data sheet or source of technical information.	

Gate Product	Required From	Phase	Description	Additional Signoffs
Receivables – Deliverables List	SE, All subsystems	Phase A	Spreadsheet that includes two items: deliverables to be produced by a subsystem; and necessary deliverables from other subsystems. The first tab of the spreadsheet should list deliverables and tentative delivery dates. The second tab should list receivables this subsystem will require from other subsystems and requested dates of delivery.	Any subsystems with requested receivable
Preliminary Design	SE, All subsystems	Phase A	Compiled documentation of the proposed subsystem design. At a minimum this should include: a standalone explanation of proposed designs (including all relevant drawings and calculations); a clear (textual) explanation of design decisions and rationales; a summary of L3 requirements and justification for how they meet L2 requirements; and a .zip file of all relevant CADs, drawings, simulations, and other digital files.	CM
Technology Development Plan	SE, All subsystems	Phase A	Proposes a series of goals and a timeline for developing, testing, and verifying new technologies (any design that has not been flown before by this team). This document should include explanations for why it is valuable to develop a new technology (as opposed to heritage technology) and should request a waiver for any test-as-you-fly designs.	PM, (SE if any TAYF requests)
Materials & Processes Plan	Structures	Phase A	Technical explanation of materials to be used, plans for testing the material (to verify it behaves according to *our* expectations), an outline of the manufacturing process, a list of necessary manufacturing facilities/equipment, and an time estimate for hardware fabrication.	
Software Management Plan	Avionics	Phase A	Establishes a set of deliverables (builds and releases), timetable, workflow, and control plan for flight software development. Control plan must establish plans for software checkout/ build management, version control, and interfacing with project configuration management. It is highly recommended that software workflow be organized by sandbox > build > release.	CM
Master Equipment List	SE	Phase A, Phase B	Spreadsheet that includes two items: a catalogue of technical information for expected flight hardware (no pricing info); and a . This spreadsheet should list the hardware and quantities expected to be used for a final flight unit and include relevant mass, volume, density, operating voltages, peak power draw, etc. specifications as well as a link to a relevant data sheet or source of technical information.	PM
Mishap Preparedness & Contingency Plan	PM	Phase B		SE
Decommissioning Plan	PM	Phase B		
Fundraising Report	PM	Phase B	Inventory of team resources and update on the state of the fundraising plan's execution. The PM will present this status report to the team at the conclusion of Phase B.	
GDS HW/SW V&V Plan	Avionics	Phase B		
Telecommunication Design Control Document	Avionics	Phase B		PM
Telecom Link Frequency Assignment	Avionics	Phase B		PM
Sensor Calibration Reqs	Avionics	Phase B		
Fabrication Quality Assurance Plan	Structures	Phase B		SE
Reliability Reqs & Assurance Plan	SE, All subsystems	Phase B		
Technology Readiness Assessment	SE, All subsystems	Phase B		PM, (SE if any TAYF requests)
Flight HW V&V Plan	Structures	Phase B	Including timetable and control plan for supporting software tools	PM, SE
Flight HW/SW V&V Plan	Avionics	Phase B	Including timetable and control plan for supporting software tools	PM, SE
System V&V Plan	SE	Phase B	Including timetable and control plan for supporting software tools	PM
Detailed Design	SE, All subsystems	Phase B		CM
As-Built Design	SE, All subsystems	Phase C		CM, SE
Technology Development Assessment	SE, All subsystems	Phase C		PM, (SE if any TAYF requests)
Performance Report	SE, All subsystems	Phase D		
Lessons Learned	SE, All subsystems	Phase D		
Mission Report	PM	Phase D		