Project Management Workshop
15th Annual First Nations Launch

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Material Credit
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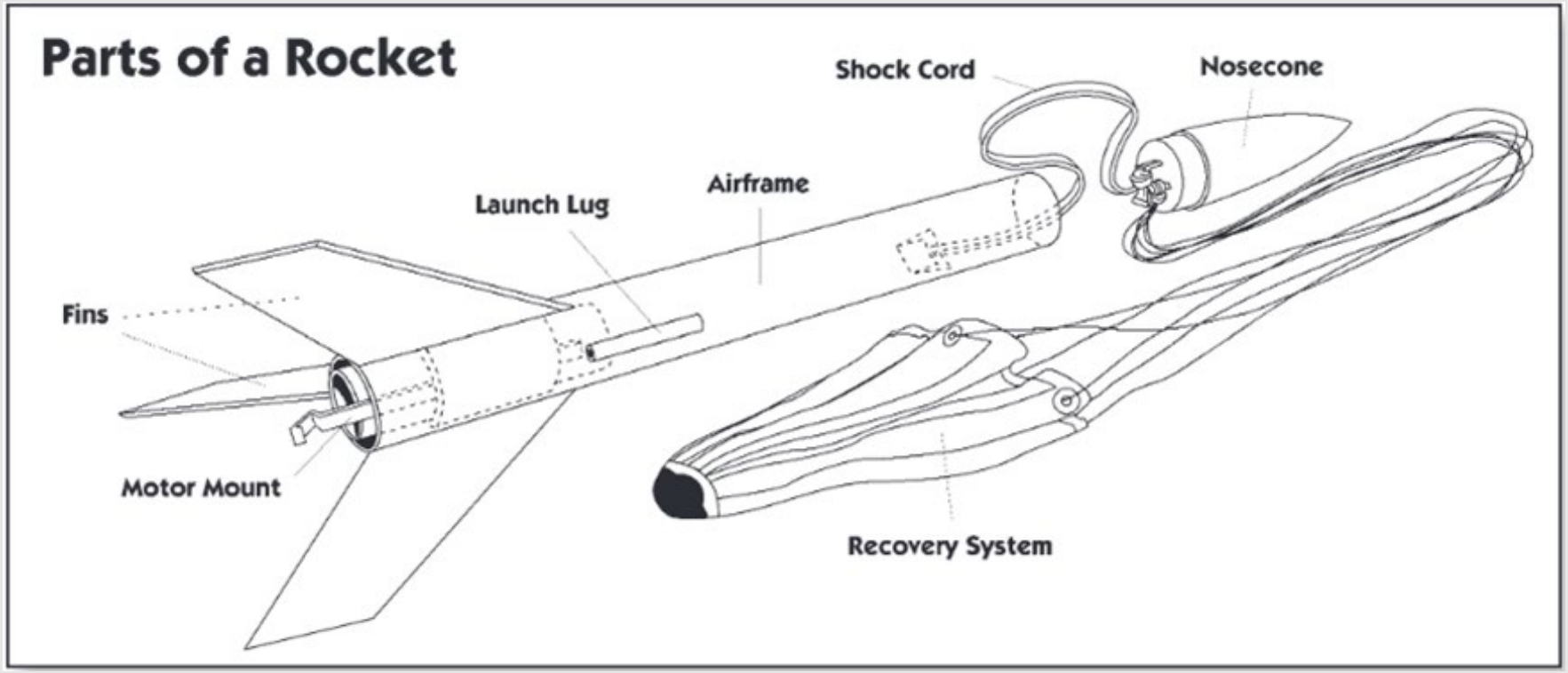
Goddard does work in teams and through projects



Teams

- Common Goal(s)
- Interdependent
- Complementary skills

Projects

- Time-defined
- Cost-controlled
- Limited scope

Projects have to be planned, organized, implemented and controlled

Project Management

- Project has a start date, end date and produces a tangible product
- Project Management is both an art and a science
  - As a science, it is the foundation for the art of leadership
- Good Project Manager (PM) demonstrate vision, motivate, and coordinate people to achieve objectives.

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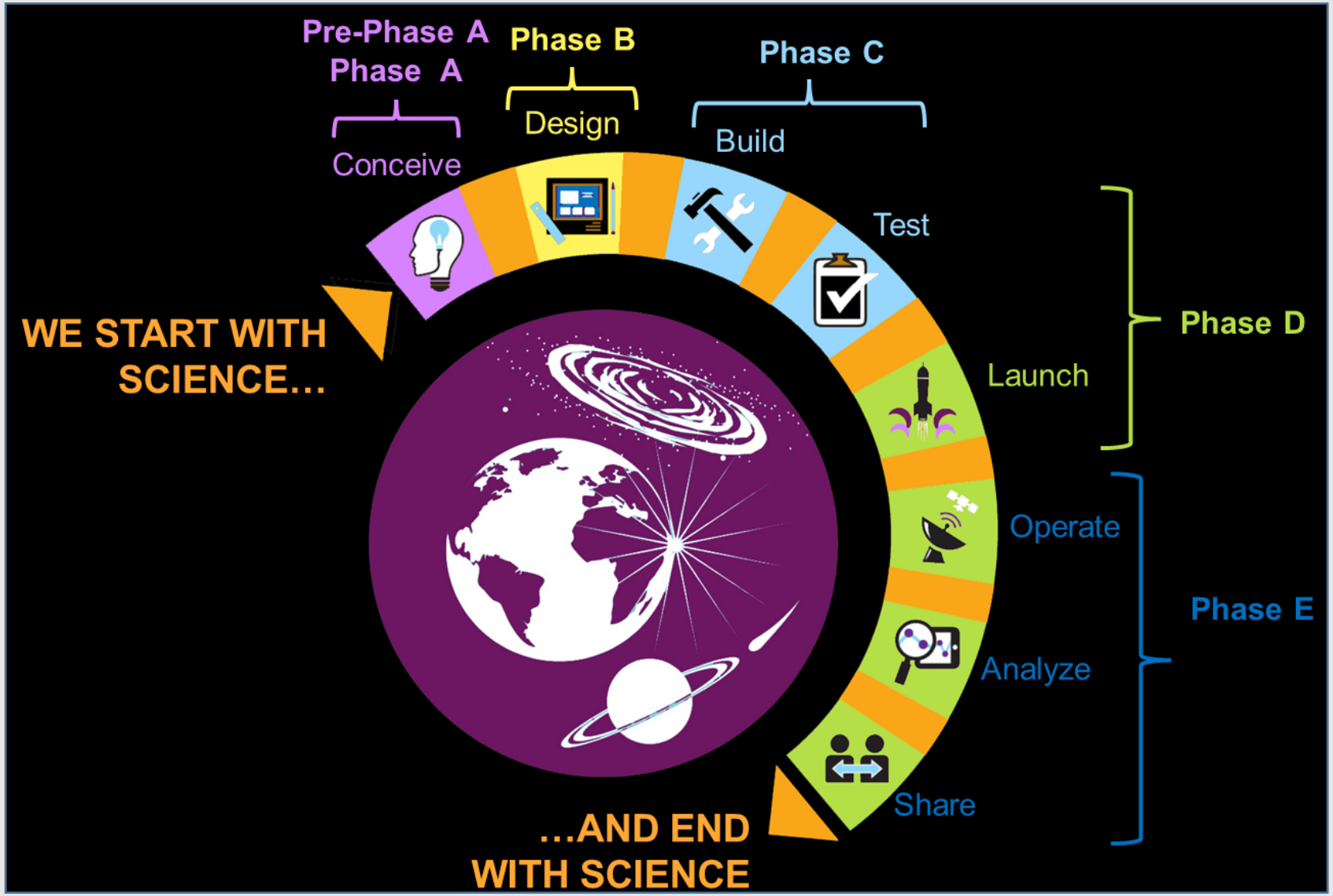
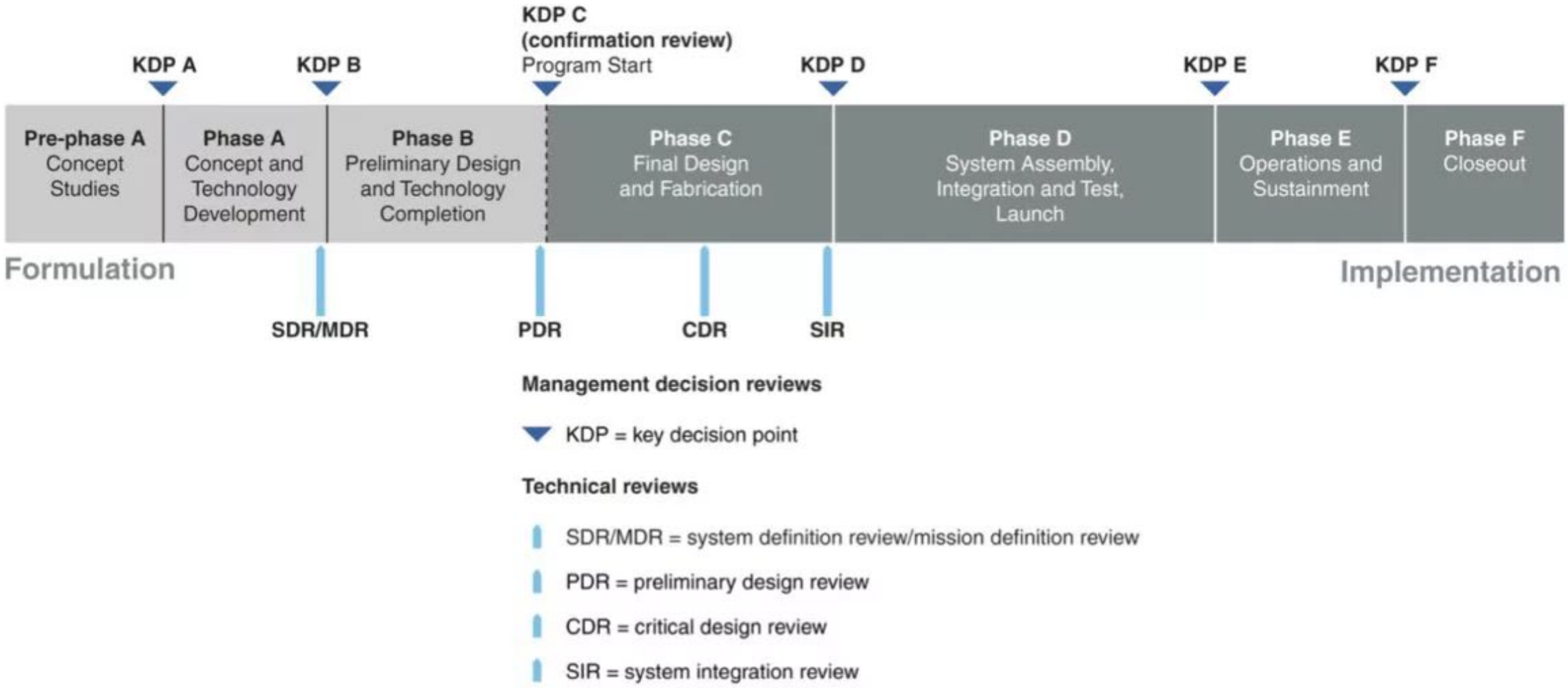
- FNL
  - Team Lead should implement the tools of Project Management
  - Team Lead will need to define the vision, motivation, and coordinate people to achieve objectives of FNL
    - Gateway, Moon, and Mars Engineering Challenges

NASA Project Life Cycle

At NASA, it all begins and ends with science. We derive and share information, solutions, and technology for the benefit of all—NASA, the Nation, and the World.

Engineers and many others are involved in all parts of the Project Life Cycle.

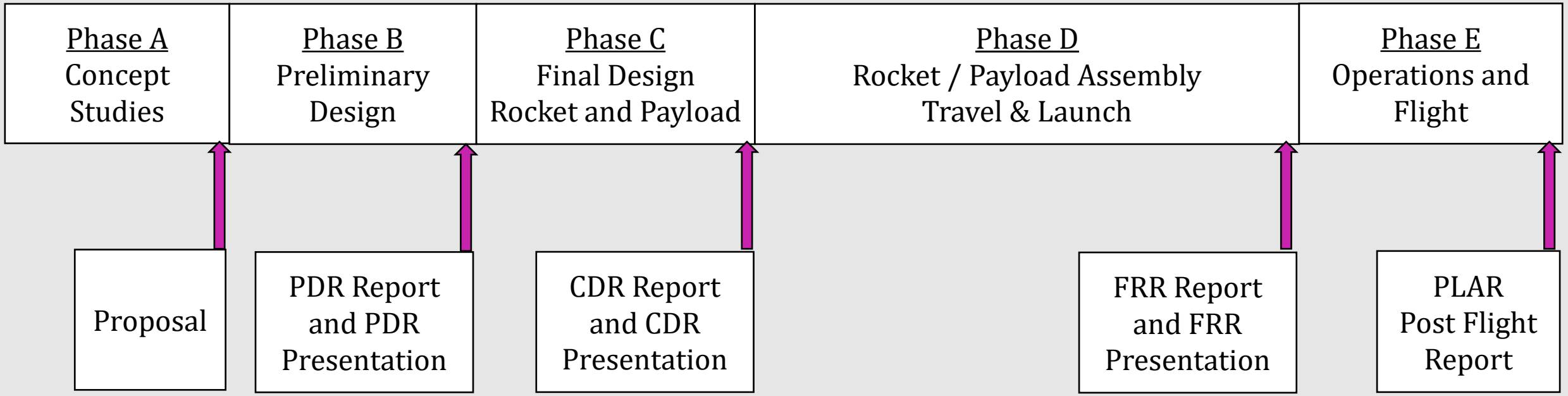




- Develop and visualize the FNL Timeline
- Organize the execution of the project in such a way that they can be well-tracked and well-managed.

FNL Life Cycle

- Develop and visualize the FNL Timeline
- Outlining objectives and major reviews
  - Understanding objectives for each Phase (Student Handbook)



Elements of a Schedule: Key Terminology

For the purpose of this workshop, we define a schedule as containing the following elements:

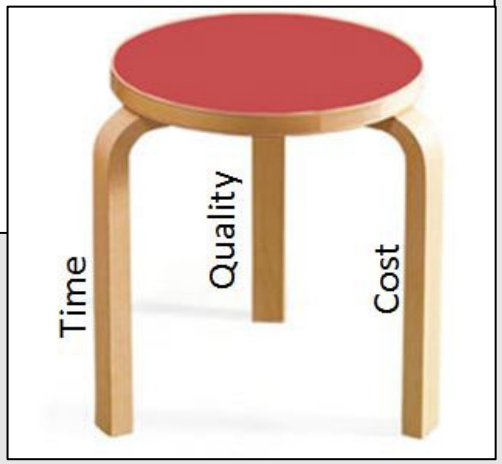
- Task: A higher level subdivision of work scope that will be further broken down into supporting activities.
- Activity: A detailed step that needs to be performed to complete a task.
- Sequence (Logic): The order in which activities and milestones need to take place.
- Milestone: An important event with no duration signifying measureable progress toward, or achievement of, an activity, task or objective.
- Duration: Length of time estimated to complete an activity.
- Critical Path: Longest sequence of activities in the schedule from beginning to end.
- Slack: The amount of duration an activity or milestone can be delayed without causing a delay to subsequent activities or the project/subsystem completion date.

Schedule Purpose and Functions

A schedule is… a tool for identifying what the Project Manager (PM) and her/his team intends to do and when they intend to do it.

Functions:

- Integrates subsystem's tasks/activities into a logical flow.
- Establishes the intended timetable for achieving objectives.
- Helpful for setting work priorities
- Supports the development of a time-phased cost estimate and resource plan
- Provides a means to measure work accomplishment
- Helpful in identifying potential problems early



Developing a credible schedule is critical to the project's success

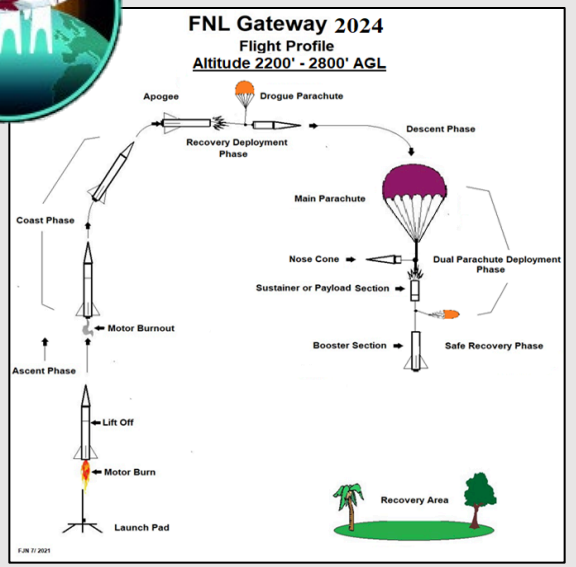
Schedule Purpose and Functions

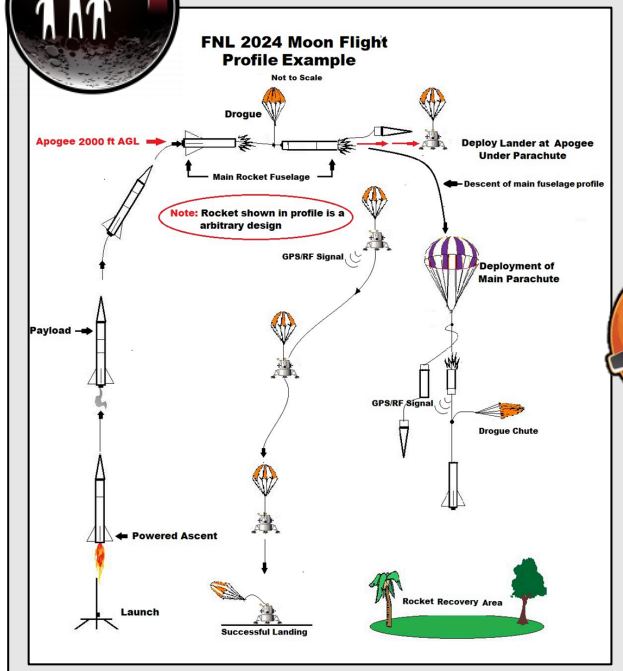
What is the FNL objective?

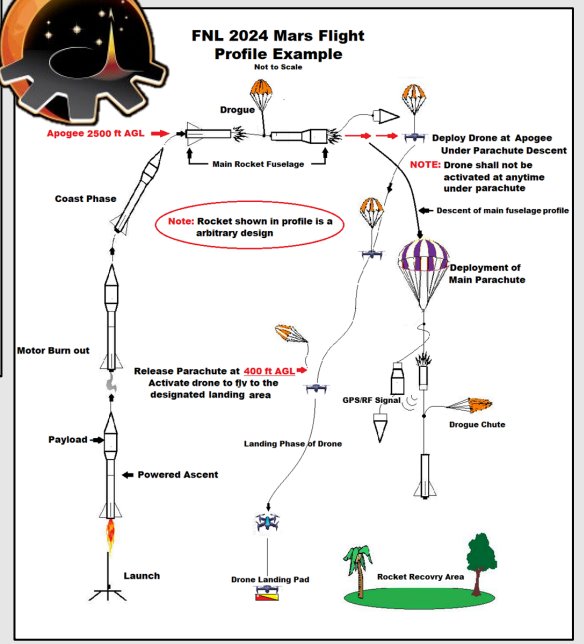
- Gateway, Moon, and Mars Engineering Challenges

Functions: Identify major functions to meet the objective and translate to a timeline

- Identify Requirements (teams, faculty, cost)
- Identify subsystem's tasks/activities
- Establishes timetable for achieving objectives.
  - Milestone reviews, Activities by weeks or months
  - Schedule meetings in advance
- Helpful for setting work priorities
  - Class & Works schedules (Establish Availability for FNL)
- Develop budget for cost estimates and resource plan
- Provides a means to measure work accomplishment
- Identify potential problems early
  - Schedule conflicts, ordering items, resources, labs







Planning a Project and Creating the Schedule

Steps in Gathering Project Information

- Set goals & objectives
- List the tasks
- Estimate duration
- Determine sequence
- Assign resources

Entering General Information

- Set up calendars
  - Project
  - Resource

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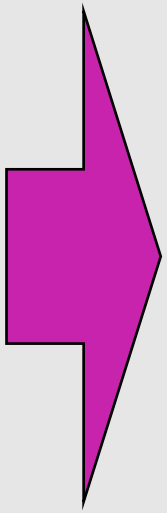

FNL

- Competition requirements and Deliverables (Student Handbook)
- Set goals & objectives
  - Find what is needed for Proposal, PDR, CDR, FRR (each milestone)
- Set up calendars
- List the tasks
  - Presentations and Reports
  - Vehicle Requirements
  - Payload Requirements
  - Budget
- Estimate duration
- Outline steps needed to accomplish each task
- Assign resources
  - Team member tasks and communication

Defining the FNL Project/Challenge

What are Milestones?

- An important event signifying measureable progress toward, or achievement of, an activity, task or objective. By definition milestones have no duration.

Milestones - Characteristics

- Demonstrate accomplishment of work scope
- Indicate to external stakeholders that progress is being made
- Signify the achievement of major objectives such as the completion of a design review, finish of a test, or delivery of a component
- Represent the retirement of risk such as the completion of a life test, receipt of a long lead component

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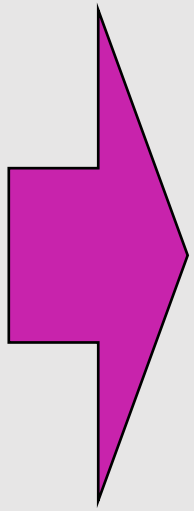


- FNL Milestones
- Proposal, PDR, CDR, FRR, PLAR
  - Student Handbook
  - Identify Criteria and Expectations
  - Know WSGC deadlines.
  - Document progress along the way to each deadline
  - Progress
    - How are you meeting objectives and requirements
    - Maintain accountability for each task
    - Risks: challenges or problems (know who to contact)

Defining the FNL Project/Challenge

- Break Project into Tasks and Milestones
  - Scope project first
  - Create list of tasks
  - Use experienced staff to plan the project
- Tasks
  - Activities that must be finished to achieve end result of the project
  - Take project from event to event
  - May include reviews & walk through
- Tasks - Characteristics
  - Precise and detailed
  - Significant
  - Appropriate level of detail
  - Task scope and assumptions
- Defining Tasks
  - Top down
    - start with major project phase
    - add details
  - Bottom up
    - list all tasks group into phases

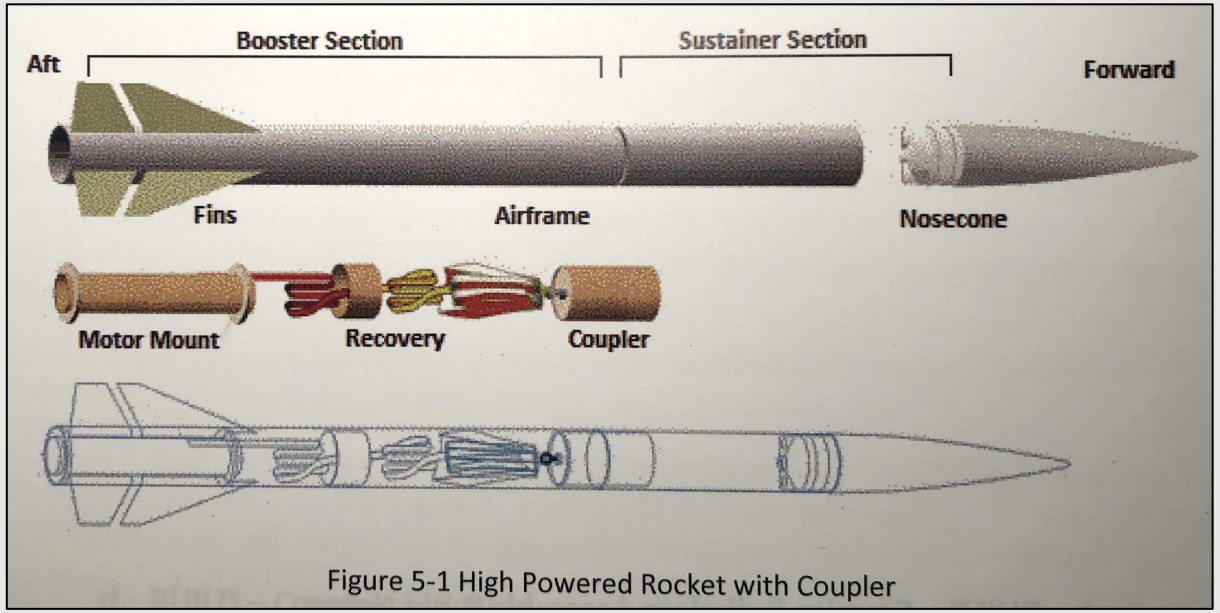
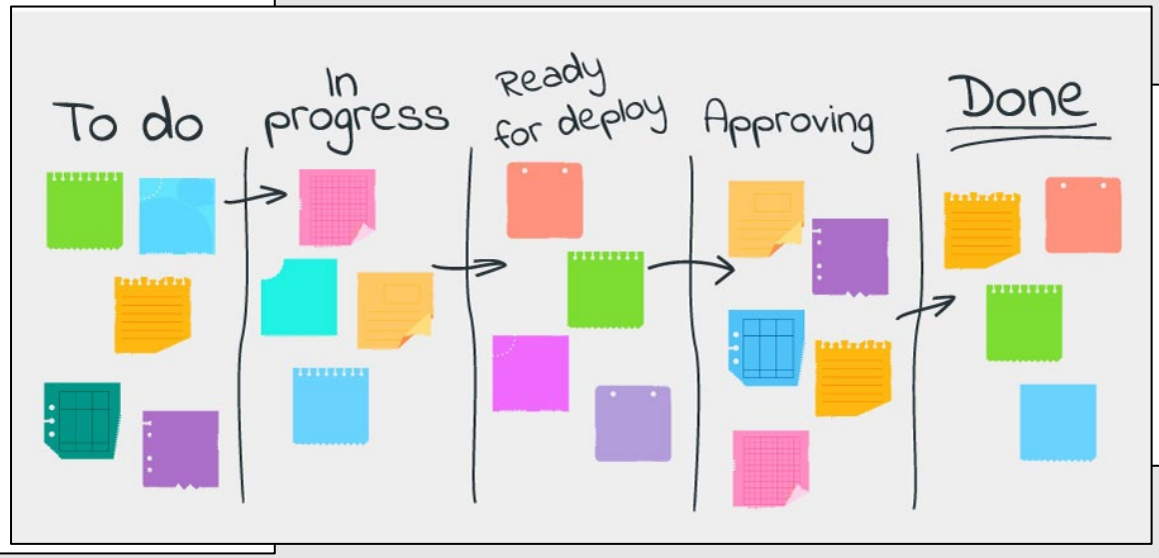


Figure 5-1 High Powered Rocket with Coupler

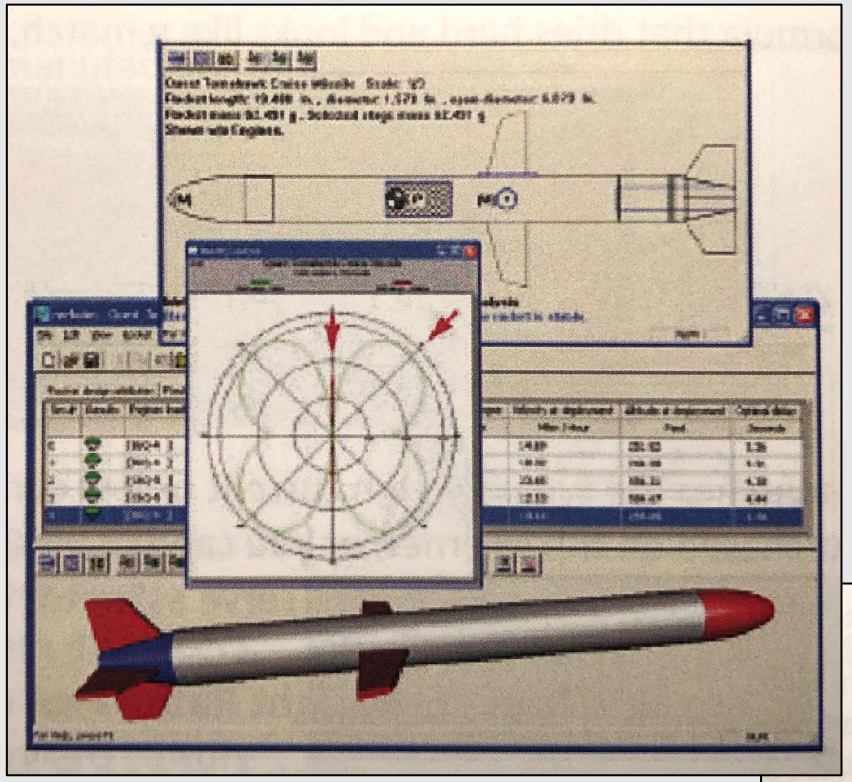


Consider using notecards or Post-It to visualize your activities on the wall when discussing them within your team

Estimating Tasks

Determining Task Duration*: period between start and end of task*

- Do's
  - Apply realistic estimates
  - Consider each task independently
  - Consider experience of the assigned resource
  - Estimate in units [e.g., hours, days]
  - Assume normal working conditions
  - Match resource with type of task
  - Consider task complexity



Structures
Systems
Materials:

- Parts & Subassemblies
- Nose Cones
- Airframes & Couplers
- Motor Tubes
- Motor Retainers
- Centering Rings & Bulk Plates
- Fins
- Rail Buttons
- Construction Techniques
- Design Considerations
- Stability
- Center of Gravity
- Center of Pressure

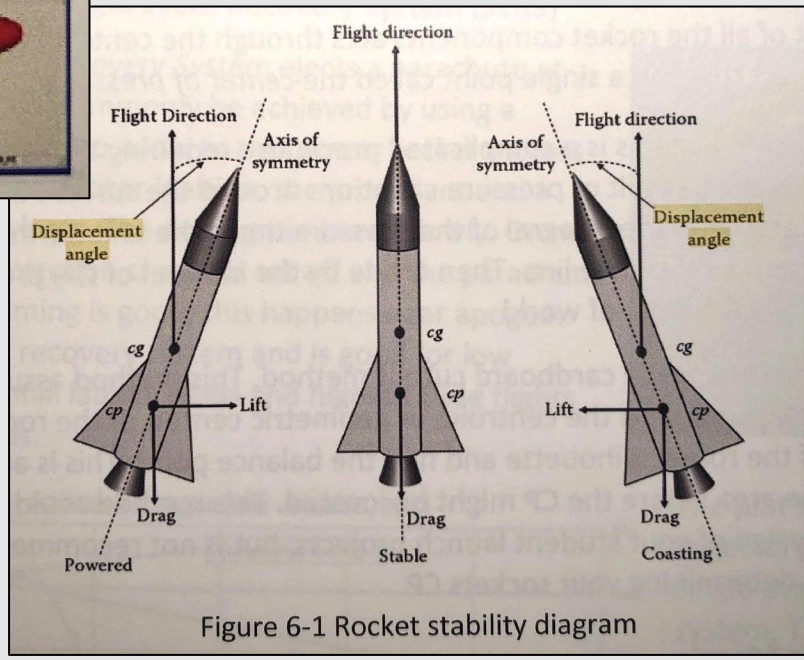
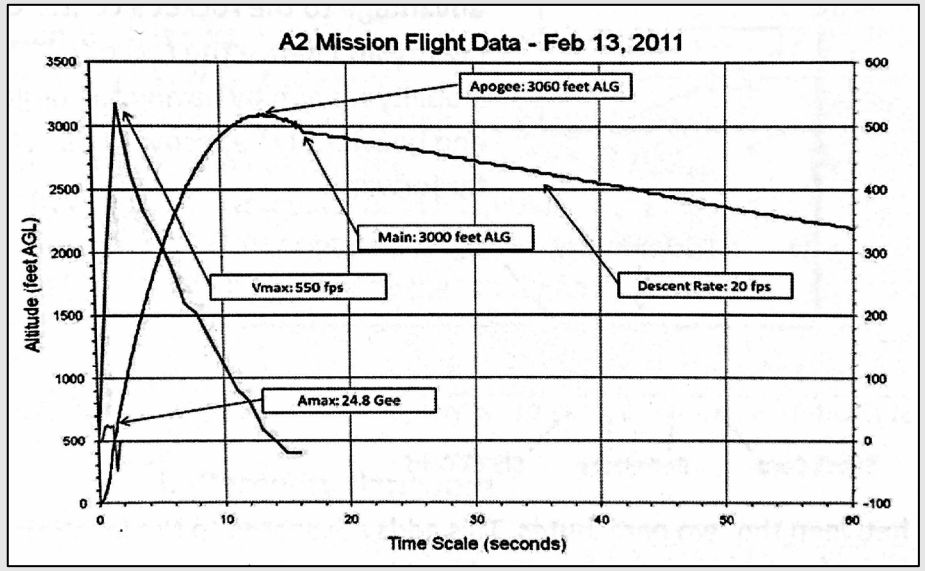
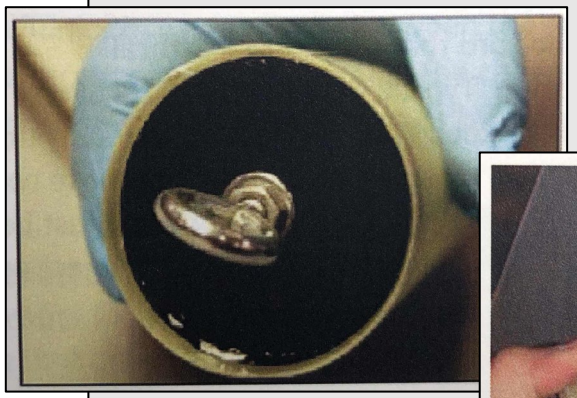


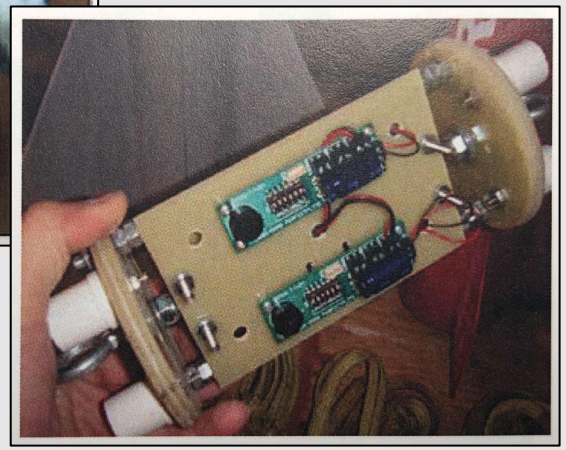
Figure 6-1 Rocket stability diagram

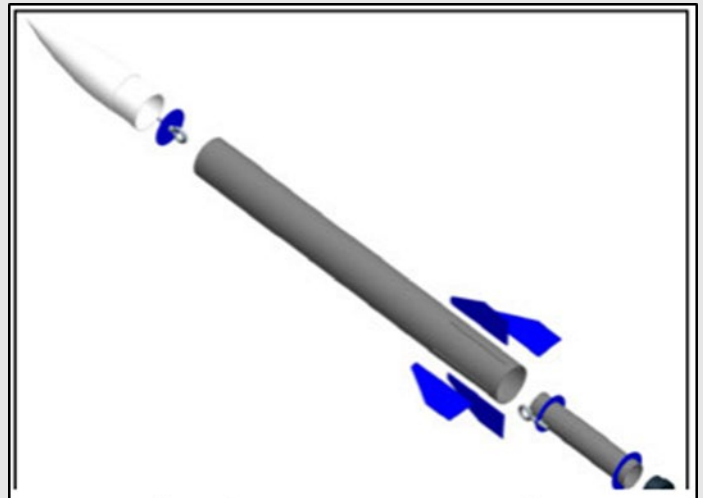
Sequencing Tasks

- Task Dependencies
  - Task sequence
  - Task relationship
  - Lead or Lag time
  - Constraint
- Task Sequence
  - What tasks must be finished before another?
  - Predecessor - successor
- Task Relationships
  - What are the related tasks?







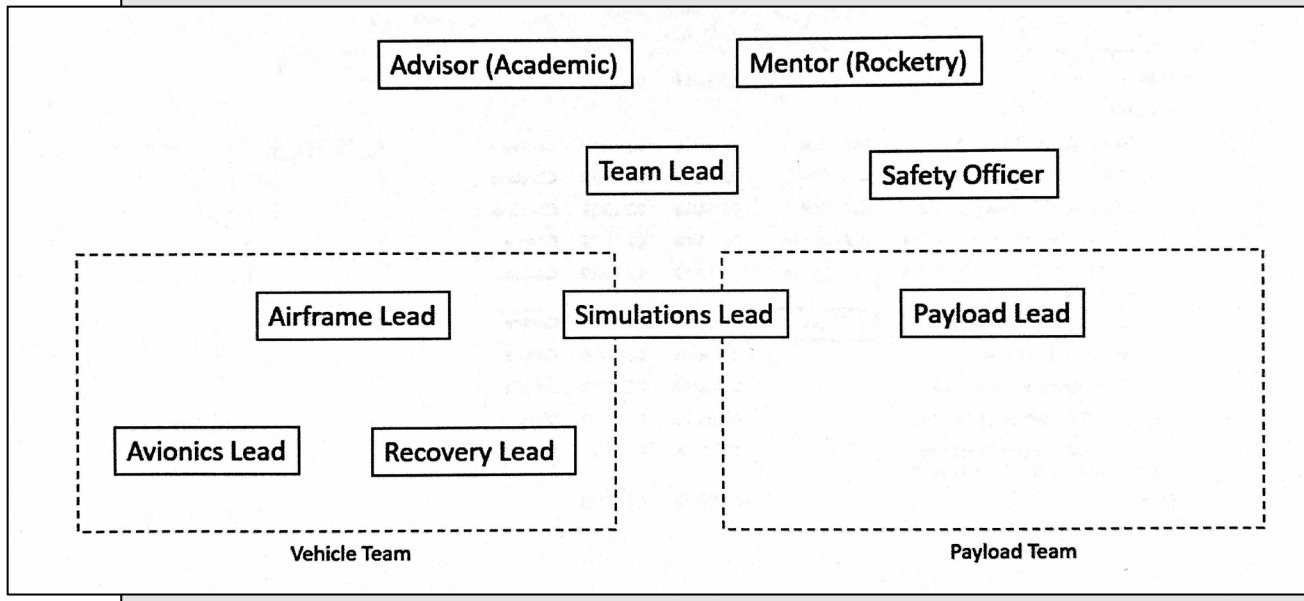


Part Number	REV	COMPONENT	Status
MAE4931001	A	Booster Airframe	Released
MAE4931002	D	Forward Centering Ring	Released
MAE4931003	C	Tailcone	Released
MAE4931004	E	Fin Bracket	In Work
MAE4931005	D	Fin	In Work
MAE4932001	A	Forward Airframe	Released
MAE4932002	A	Forward Airframe Coupler	Released
MAE4932003	A	Recovery Avionics End Closures	In Work
MAE4932004	F	Recovery Avionics Rack	Released
MAE4932100	D	Non-Pyro Ejection Device	In Work
MAE4933001	A	Payload Airframe	Released
MAE4933002	A	Payload Airframe Coupler	Released
MAE4933003	B	Gemini Capsule	In Work
MAE4933004	C	Gemini Service Structure	In Work
MAE4933005	E	Space Science Module	In Work
MAE4933006	C	Payload Rack	In Work

https://www.nasa.gov/sites/default/files/atoms/files/sl_video_instruction_book.pdf

Assigning Resources

- Assigning People, Equipment and Costs to Tasks
  - Point of Contact
  - Who will do the task?
  - When are they needed?
- Resource Requirements - Considerations
  - Facility – Labs
  - Skills required - specialist/consultants
    - Mentors or Advisors
  - Team Schedules
  - Number of resources required
  - Types of other resources required - (e.g. equipment)
- Estimating Costs - Considerations - Why Plan Costs? → Budget
  - Equipment costs
  - Other costs
  - Are costs fixed or variable?



Google image

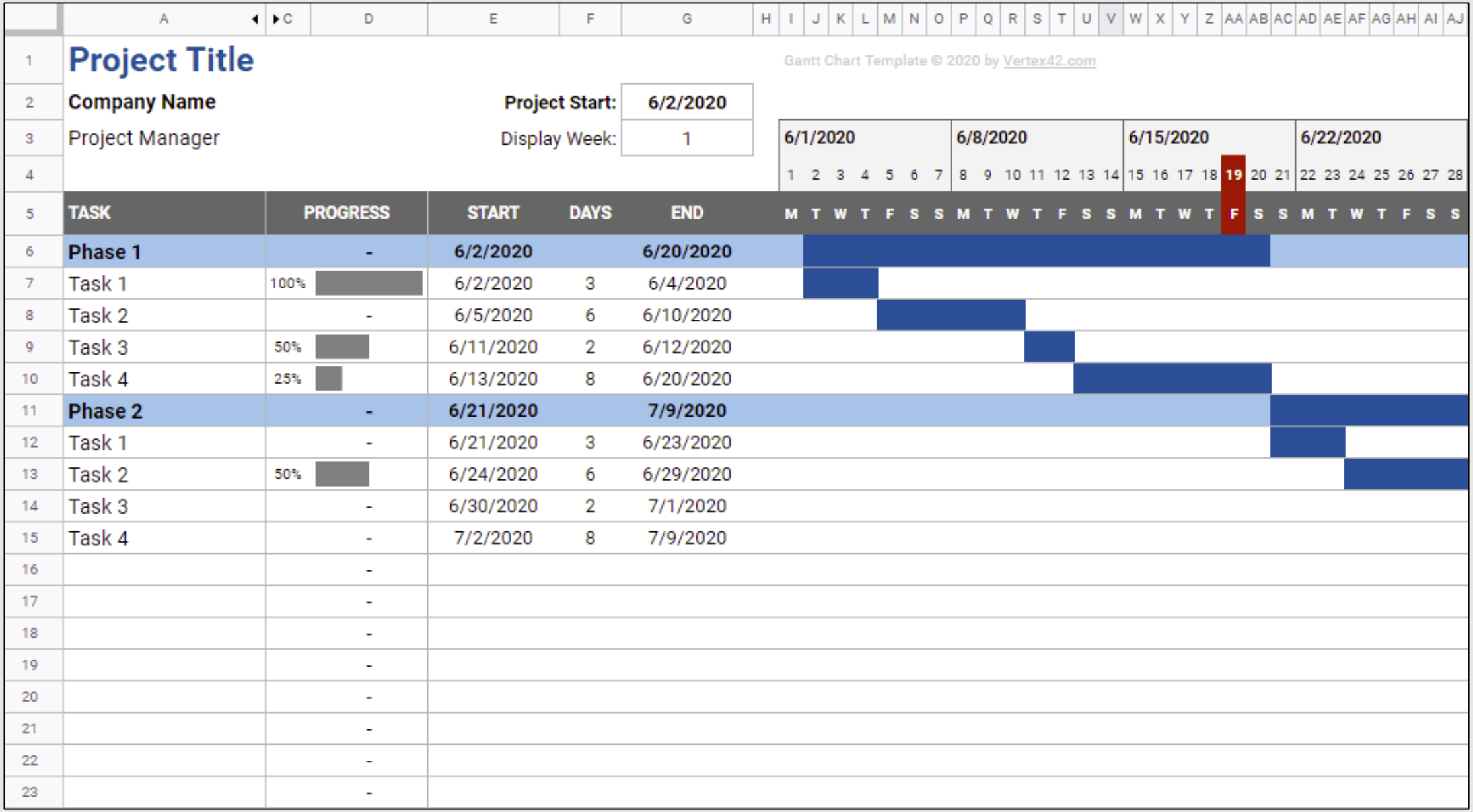
Schedule Management - 1

- Why Plan? - Time-consuming, but critical
- Schedule management is a critical component of project planning and control
  - FNL: know your target deadlines and work to develop a task schedule
- Schedules are part of project baselines, and critical milestone completions often are important project events that are reported to stakeholders
  - FNL: know in advance what is needed (ie Handbook)
- Schedule development and control starts with the objectives, assumptions, activity definition, task order, & duration estimation
  - FNL: have a complete overview of all activities
  - Understand the basics of Rocketry → know handbook and other rocketry resources. Tool and Tips. Workshops.

Schedule Management - 2

- Plan ahead and identify steps early to determine reasonable schedules and to limit future schedule risk
- Team progress
  - Keep schedule updated
  - Check in with each member of your team
  - Faculty member check ins
  - Include all internal and external critical milestones
- Ensure objectives are accomplished within project commitments
  - Follow handbook milestone guidelines as those are the requirements
  - Utilize the tools you are being taught in your studies

Example of Top Level Schedule



Project Title

Gantt Chart Template © 2020 by Vertex42.com

Company Name

Project Manager

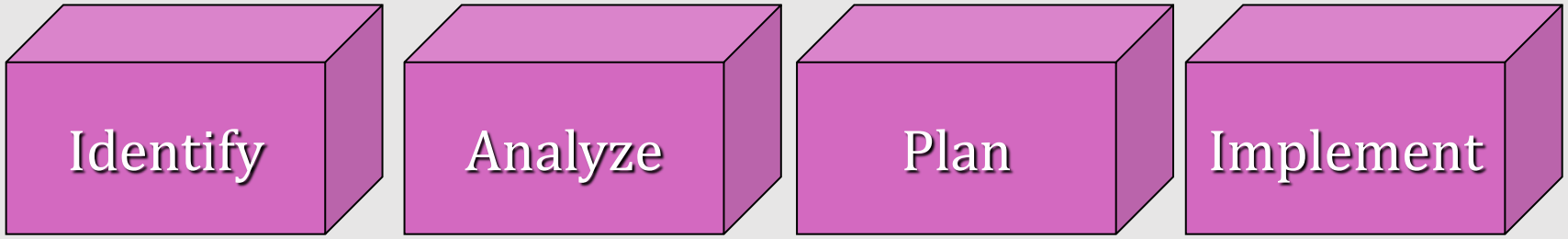
Project Start: 6/2/2020

Display Week: 1

TASK	PROGRESS	START	DAYS	END
Phase 1	-	**6/2/2020**		**6/20/2020**
Task 1	100%	6/2/2020	3	6/4/2020
Task 2	-	6/5/2020	6	6/10/2020
Task 3	50%	6/11/2020	2	6/12/2020
Task 4	25%	6/13/2020	8	6/20/2020
Phase 2	-	**6/21/2020**		**7/9/2020**
Task 1	-	6/21/2020	3	6/23/2020
Task 2	50%	6/24/2020	6	6/29/2020
Task 3	-	6/30/2020	2	7/1/2020
Task 4	-	7/2/2020	8	7/9/2020

Risks, Issues, and Opportunities

- Risk Management: Planning for the "bad things" that may occur during the project's life cycle
- Issue Management: Addressing events that have occurred during the project's life cycle
- Opportunity Management: Seeking "good things" that may benefit the project



Helpful Collaboration Tools

- **Drive**
- **Calendar**
- **Photos**
- **Docs**
- **Sheets**
- **Slides**

The 12 Best Free Project Management Apps*

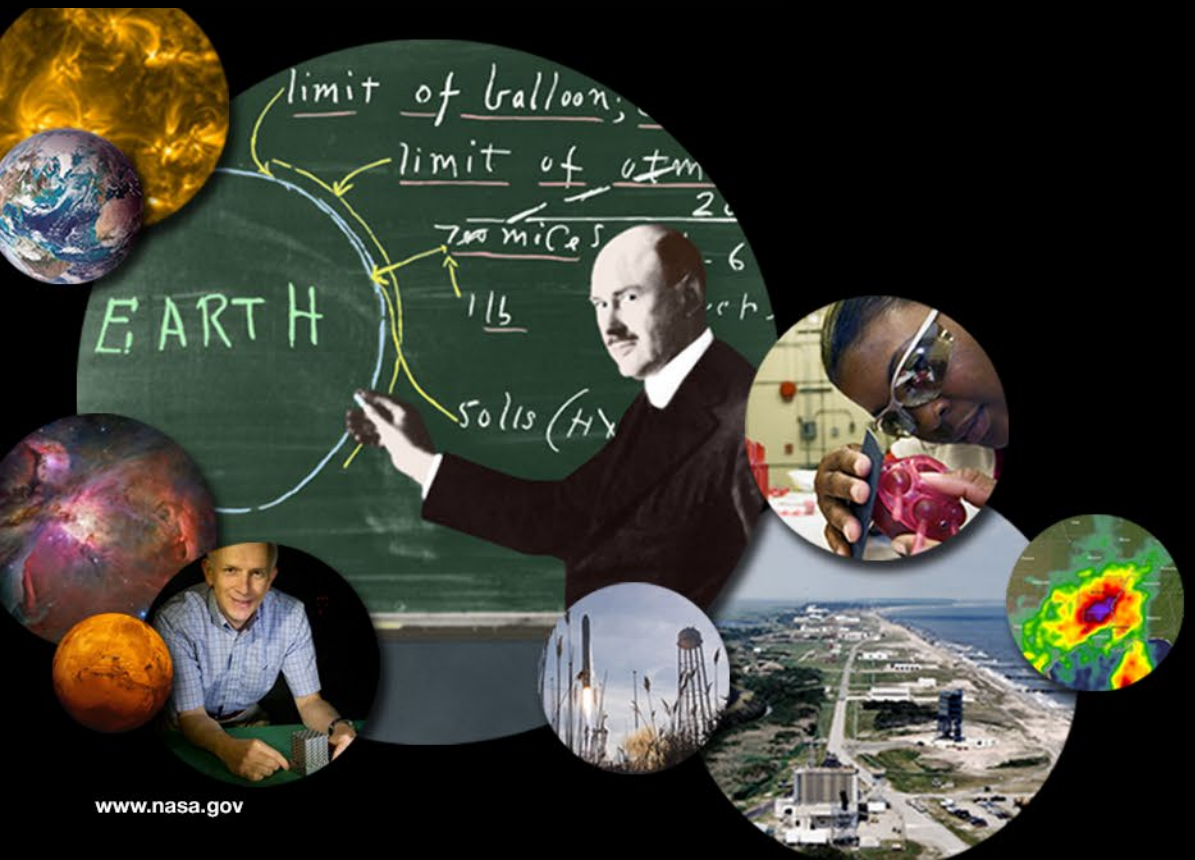
- Trello (Web, macOS, Windows, iOS, Android) for individuals and teams who need a work pipeline
- MeisterTask (Web, Windows, macOS, iOS, Android) for combining project ideation, planning, and execution
- KanbanFlow (Web) for combining kanban, time tracking, and Pomodoro
- Freedcamp (Web, iOS, Android) for managing all projects and communications in a single tool
- Asana (Web, iOS, Android) for creating a to-do list powerful enough to manage projects
- Paymo (Web, Windows, macOS, Linux, iOS, Android) for freelancers who charge by the hour
- Bitrix24 (Web, Windows, macOS, iOS, Android) for classic project management with Gantt charts
- Wrike (Web, Windows, Mac, iOS, Android) for spreadsheet-like features in a project management app
- Podio (Web, iOS, Android) for customizing your project management tool
- Yodiz (Web, iOS, Android) for Agile and Scrum teams
- Agantty (Web) for creating Gantt charts quickly and easily
- AND CO (Web, macOS, iOS, Android) for projects that require invoicing

- https://zapier.com/blog/free-project-management-software/

National Aeronautics and Space Administration

Set goals, challenge yourself, and achieve them. Live a healthy life... and make every moment count. Rise above the obstacles, and focus on the positive.

– Robert H. Goddard



Questions?

"Building what we've never built before, to discover what we've never known before."

Goddard

Goddard SPACE FLIGHT CENTER

Additional Resources

Definitions

- **Project Phase** - A collection of logically related project activities, usually culminating in the completion of a major deliverable

- **Key Decision Points (KDPs)** - The event at which the Decision Authority determines the readiness of a program/project to progress to the next phase of the life cycle

- **Formulation –** The identification of how the program or project supports the Agency's strategic needs, goals, and objectives; the assessment of feasibility, technology and concepts; risk assessment, team building, development of operations concepts and acquisition strategies; and establishment of high-level requirements and success criteria

- **Implementation –** Execution of the Program Plan [the Formulated Project] in a cost effective manner

Project Phases

- **Pre-Phase A** – Concept Studies - Evaluation of a broad spectrum of ideas and alternatives for new missions including mission concepts, requirements, and technology
- **Phase A** – Concept & Technology Development - Formation of project team, development of baseline mission concept, define/begin development of needed technologies
- **Phase B** – Preliminary Design and Technology Completion - Completion of preliminary design and technology development
- **Phase C** – Final Design and Fabrication - Completion of final design, begin fabrication of test and flight article components, assemblies, and subsystems
- **Phase D** – System Assembly, Integration and Test, Launch - Completion of system assembly, integration and test
- **Phase E and F** – Operations and Closeout – Transition from Phase D to Phase E occurs when on-orbit checkout has been completed—typically 30 to 90 days after launch.
  - At the end of the nominal operational lifetime of the mission, HQ may decide (on the basis of science and programmatic data provided by the Center) to go into "Extended Operations". A formal decision is made – KDP-F - to continue operations or to initiate decommissioning.
  - At the end of the useful lifetime of the mission, a Decommissioning Review is held to confirm readiness to proceed with the safe decommissioning and disposal of mission assets in accordance with NASA policy on limiting orbital debris.