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## Life Cycle of a Mission

Presentation to
Girl Scout Master Trainers

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## Agenda

- Introduce myself
- Discuss the "Six Phases of a Mission"
  - Planning
  - Designing
  - Building
  - Testing
  - Flying
  - Analyzing
- Answer questions (if there's time)

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## Who I Am

Mary Brownell (now Bothwell) greeting Dr. Werner von Braun as part of the Girl Scout Space Exploration Conference in Huntsville, Alabama, July, 1968.

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## What Does Planning Involve?

- Reason for the mission
  - What science questions do you want to answer?
- Mission enablers
  - What technology is ready to help answer your science questions?
- Objectives and requirements
  - What capability do the spacecraft and ground system need to answer the science questions?
- Timing
  - When are the available launch dates?
  - How long will it take to design, build, and test the spacecraft?
- Cost
  - How much money is available?

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## Designing the Flight System

- Flight system = spacecraft + instruments
  - They have to work together, because they fly together.
- Team X concepts become the basis of the detailed flight system design
- Engineers create the detailed designs
  - Production drawings and instructions
  - Models



## Building the Flight System

- Now the fun (and frustrations) start
- Subsystems are built by multiple organizations and delivered to the spacecraft integrator who puts it together

## Testing the Flight System

- Test in the relevant environment
  - Thermal
  - Vibration/acoustic
  - Vacuum
  - Other, as needed
- Field tests, as needed
- End-to-end mission simulations



## Flying the Mission

- Mission operations is staffed by
  - Expert mission controllers
  - Engineers from each spacecraft subsystem
- Involves coordination of the Deep Space Network
  - Stations in Goldstone, CA; Canberra, Australia; Madrid, Spain
- Long hours of fairly "routine" work (if all goes well), punctuated by short periods of extremely critical events
  - Landing on a planet
  - Entering orbit around a planet

## Analyzing the Data

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- Science data goes to science teams' data centers
  - MIPL at JPL handles photo and photo-like data for earth and planetary missions
  - Teams analyze and report through scientific meetings and publications, and the popular press
  - Data is archived for use by "anybody"
    - Planetary Data System
    - Distributed archive centers
- Spacecraft data is also analyzed throughout the mission
  - Health and safety
  - Resource planning

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## Summary (very conceptual)

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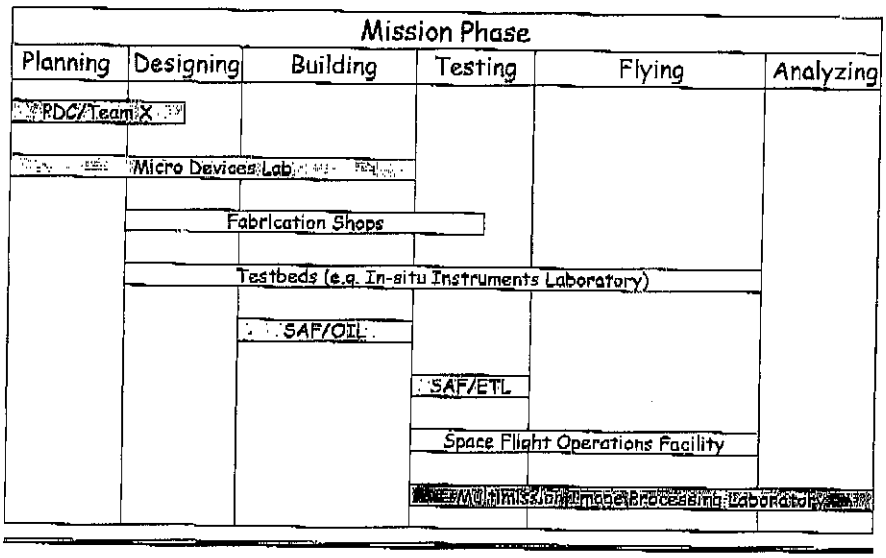


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