Discovery PI Forum

Lessons Learned from New Horizons

March 16, 2016

Glen Fountain
Former Project Manager
Johns Hopkins University Applied Physics Laboratory
glen.fountain@jhuapl.edu

New Horizons Pluto Reconnaissance Mission

- APL responsibilities
  - –Mission Management
  - –Spacecraft Development
  - –Develop 2 (of 7) instruments
  - –Mission Operations
  - –EPO
  - –Science
- SwRI responsibilities
  - –Develop 5 (of 7) instruments
  - –Payload Development Management
  - –Science Operations, PDS
  - –EPO Science Liaison
  - –Science

Science Objectives

- •Characterize the global geology and
- • morphology of Pluto and Charon
- •Map the surface composition of Pluto
- •Characterize the neutral atmosphere of Pluto

Period of Performance:

Phase A/D: July 2001 – Mar

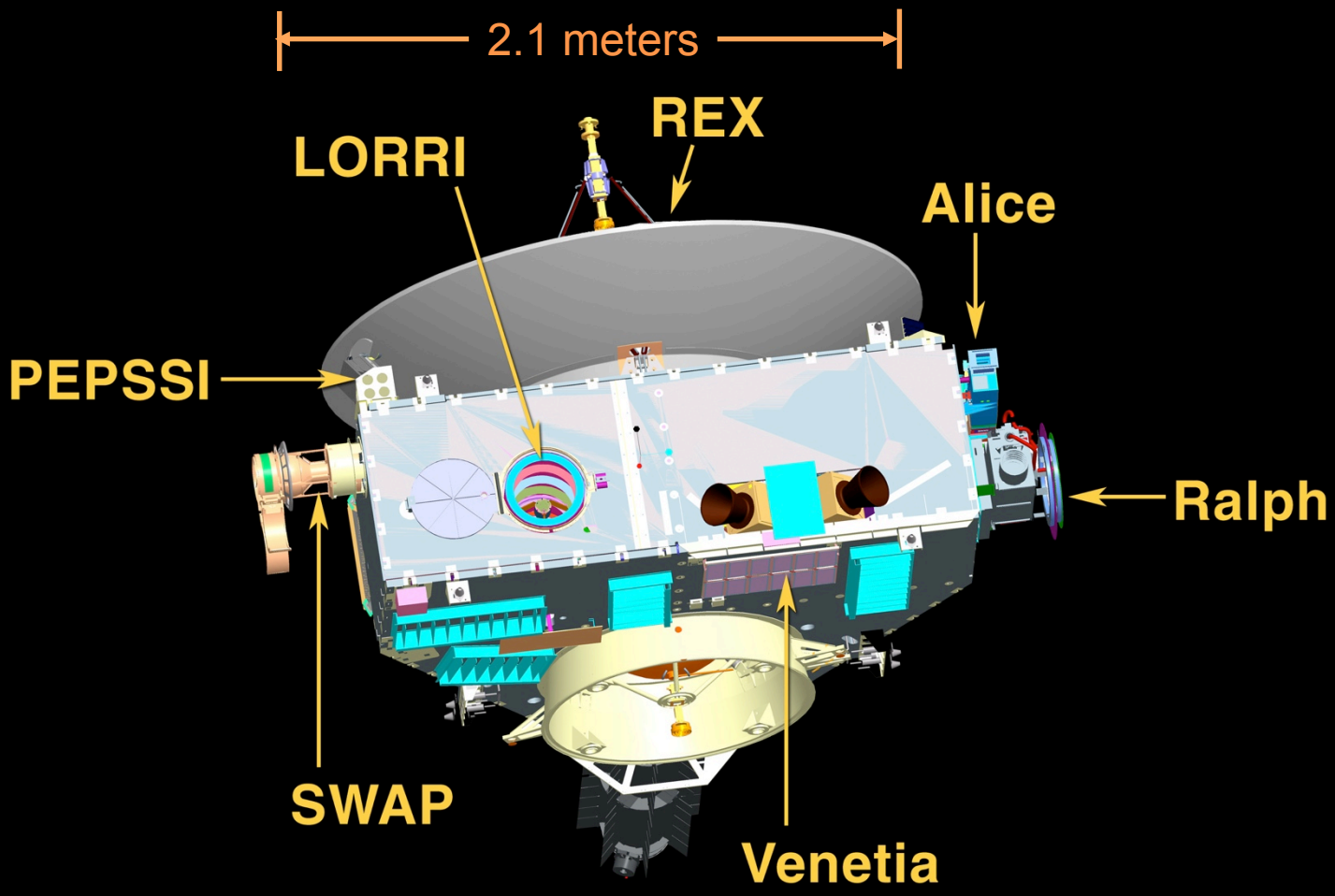
Phase E: March 2006 – Apri

Total Project Cost: $722 M

Phase A/D: $535 M

Phase E: $187 M

Instruments



Major Phase A/B/C Challenges

- Programmatic
  - Changes in proposal assumptions
  - Changes driven by external review boards
  - Launch integration issues
- Technical
  - Surprises from (even small) changes in technology
  - Software (autonomy) complexity
- Schedule
  - Vendor-driven delays
  - Regulatory approval processes (nuclear launch approval)

Issues & Lessons – 1

- Compatibility of PI and development team
  - Hands-on PI is valuable
  - Selection of senior team members with a compatible style was needed
    - Work through the process of forming, storming, norming, and performing quickly!
- Tight coupling of science and engineering
  - Development team is enhanced with in-house science team members
- When faced with a problem, move quickly to problem solving

Issues & Lessons – 2

- Buy – Off of requirements
  - Resist requirements creep!
- The MSFC Program Office – it can help
  - Balancing over-sight and in-sight
  - Provides a source for outside expertise on unique problems
  - Balancing the number and depth of reviews
    - Peer reviews
    - Independent Review Teams (IRTs)
      - Resolve funding issues to support
- Openness is REQUIRED!

Issues & Lessons – 3

- Balance process knowledge and engineering team knowledge base
  - Inheritance reviews are important
  - Don't assume!
- Work tasks efficiently
  - Prioritize tasks and risks
  - Do not work an issue before it's time
- Integrate mission operations and I&T teams whenever possible

Issues & Lessons – 4

- Knowledge retention and team stability for the long term
  - –Goals of Discovery missions are conducive to stability, but
    - Maintaining team communication is essential
    - Need depth and cross training
    - Prepare knowledge archive
  - –Project and line management needs to balance mission requirements and team members' career needs

Issues & Lessons – 5

- Be prepared for contingencies
  - Continue the risk management process during flight
    - Ask what is the proper risk tolerance level for flight
    - Continue asking
    - Be sure “features” are not risks
  - Think through responses to even unlikely risks
    - Document
    - Practice

BACKUP CHARTS

Science Objectives (partial list)

- Group 1 – Highest Priority
  - Characterize the global geology and morphology of Pluto and Charon
  - Map the surface composition of Pluto
  - Characterize the neutral atmosphere of Pluto
- Group 2 – Important
  - Characterize the time variability of Pluto's surface and atmosphere
  - Image Pluto and Charon in stereo
  - Map the terminators of Pluto and Charon
  - Characterize Pluto's ionosphere and solar wind interaction
  - Map the surface temperatures of Pluto and Charon
- Group 3 – Desirable but still lower priority
  - Refine bulk parameters and orbit of Pluto and its satellites

How Did We Arrive at Pluto?

- Why did it take so long to get a Pluto mission funded?
  - What were the barriers?
  - How were they overcome?
- What is the New Horizons mission?
  - How was it implemented?
- What were the Pluto/New Horizons mission team's strategies for managing such a long-duration mission?