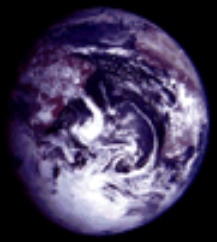
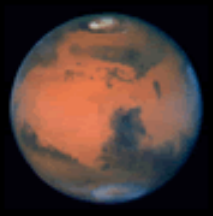




Presentation for the GSAW 2007 Conference

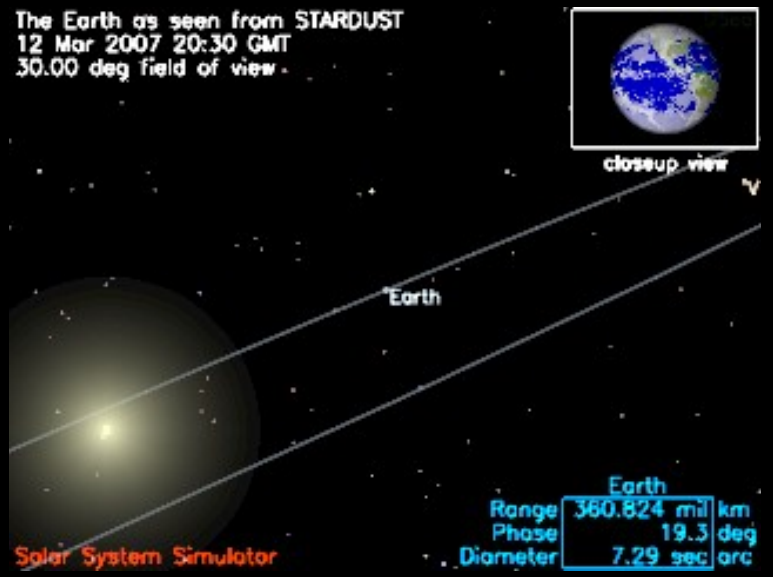
Chris Scolese

NASA Chief Engineer

March 29, 2007

The Critical Link Between Space and Earth

- A properly designed ground system is critical to mission success.
  - Provides mission controllers and data users with necessary access to spacecraft
  - Smart design leverages existing standards, capabilities, and infrastructure and keeps costs down.



- Cardinal rule: keep it simple.

> *Things should be made as simple as possible, but not any simpler*.
> - Albert Einstein

Mission Development Time vs. Operations Time

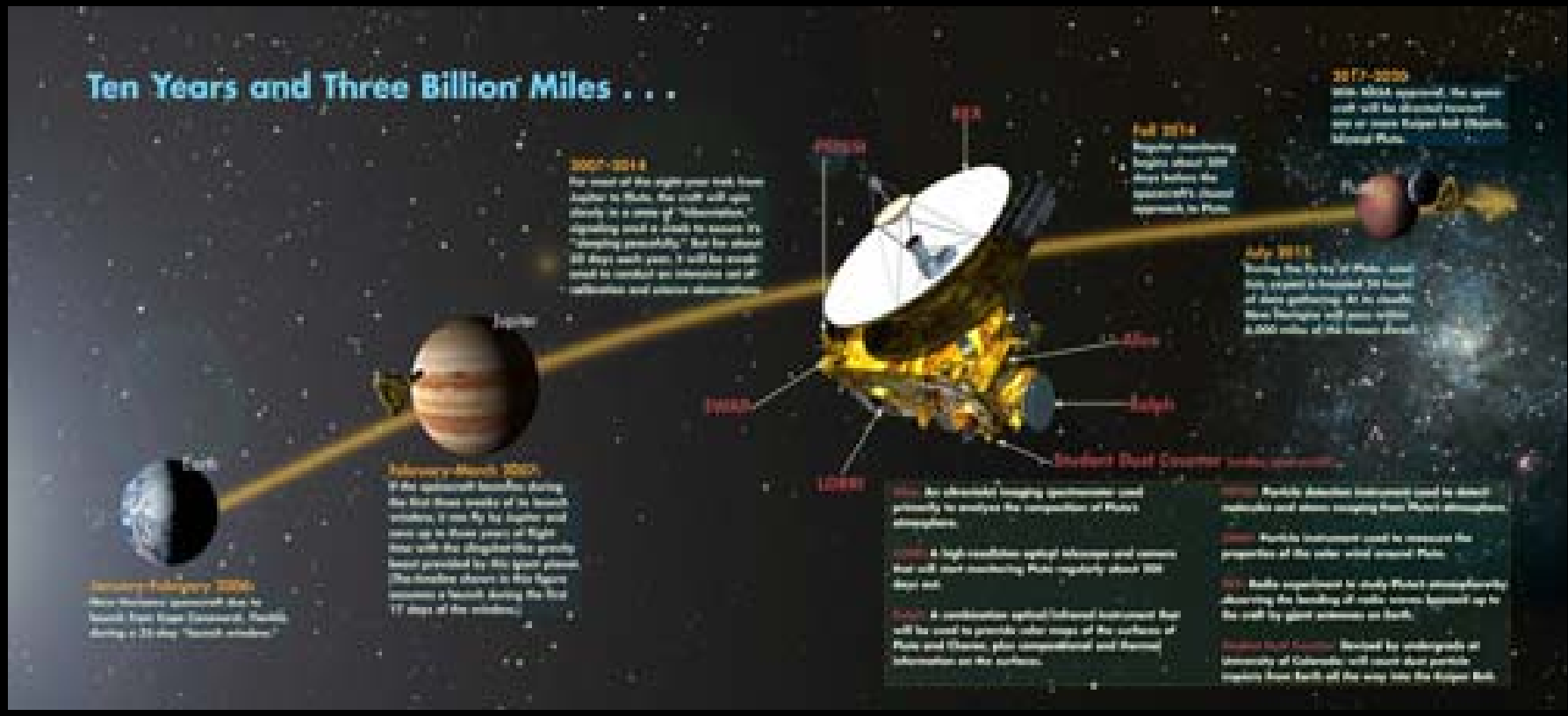
Mission	Development Time (years)	Operations Time (years)
Terra	6	7 (ongoing)
MER	3	3 (ongoing)
MGS	3	10
Mars Odyssey	4	6 (ongoing)
TOMS-EP	5	10 (ongoing)
Landsat 4	3	18.5
Landsat 5	3	27 (ongoing)
POES**	3	15
UARS	4*	14
TIMED	4	5 (ongoing)
Swift	4	2 (ongoing)
GRO	4*	9 years
HESSI	4	5 (ongoing)
AVERAGE	**~3.8**	**~10.1**

- Ops time exceeds development time on average
- Begin using ground systems capability around time of I&T

* Development time does not include Challenger-related delays

** Average development and operations times

Built to Last



Technical Challenges

- **Interoperability**
  - Multiple vehicles and systems demand common protocols and standards that leverage commercial approaches
  - Standardized interfaces
- **Software** – key driver as hardware becomes more common and COTS-oriented
- **Scalability** – Suitable for both large- and small-scale use
- **Flexibility** – Easy to service and upgrade technology
- **Cost Effectiveness** – Components, equipment, standards, development time

Agency Requirements for Ground Systems

NPR 7120.5D applies to all current and future NASA **space flight programs and projects** (including spacecraft, launch vehicles, instruments developed for space flight programs and projects, research and technology developments funded by and to be incorporated into space flight programs and projects, **critical technical facilities** specifically developed or significantly modified for space flight systems, and **ground systems** that are in direct support of space flight operations).

Applicable program/project reviews include:

- Critical Design Review (CDR)
- Production Readiness Review (PRR)
- Operations Readiness Review (ORR)
- Flight Readiness Review (FRR)

Other product lines will be addressed by:

- **NPR 7120.7** – NASA Institutional Infrastructure and Information Technology Program and Project Management Requirements

- **NPR 7120.8** – NASA Research and Technology Program and Project Management Requirements

Ground Systems: The Center of the Architecture

from integration…

…to operations

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