Why I Have the Coolest Job Ever

Joseph Tirona

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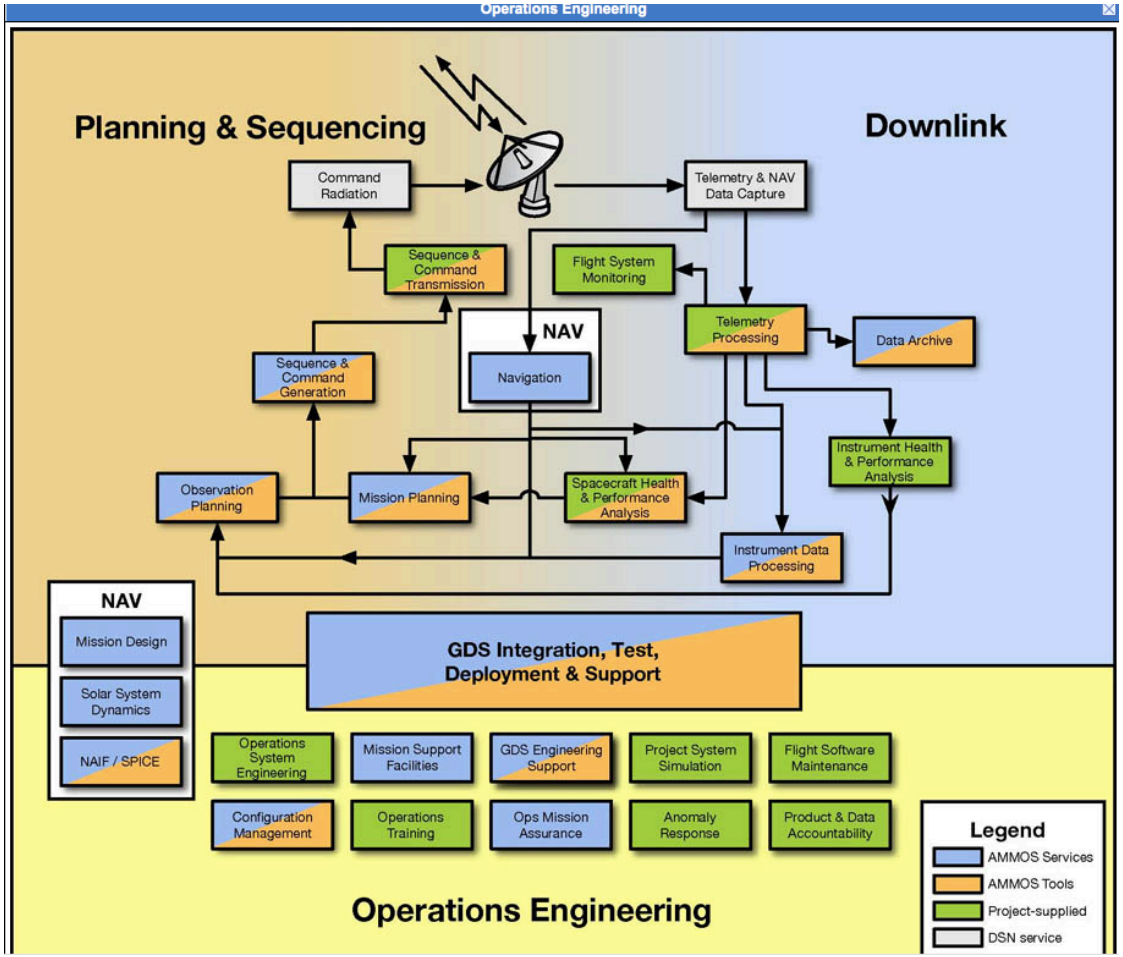
Outline

- Introduction
  - JPL
- Things I've Done or Do
  - Operations Engineering/Ground Data Systems
  - Verification and Validation
    - Model Based
    - Traditional
- 3 of the coolest missions I've worked on
  - Caveat

Jet Propulsion Laboratory (JPL)

- Fall 1936, a group of enterprising young men from Caltech in Pasadena, Calif., decided to risk their reputations and give engineering substance to rocket fantasy.
- Over time, the inventors' explosive and noisy motors proved too dangerous for the campus. In 1940, a new facility -- across the Arroyo from the original test site -- was built in the foothills of Pasadena.

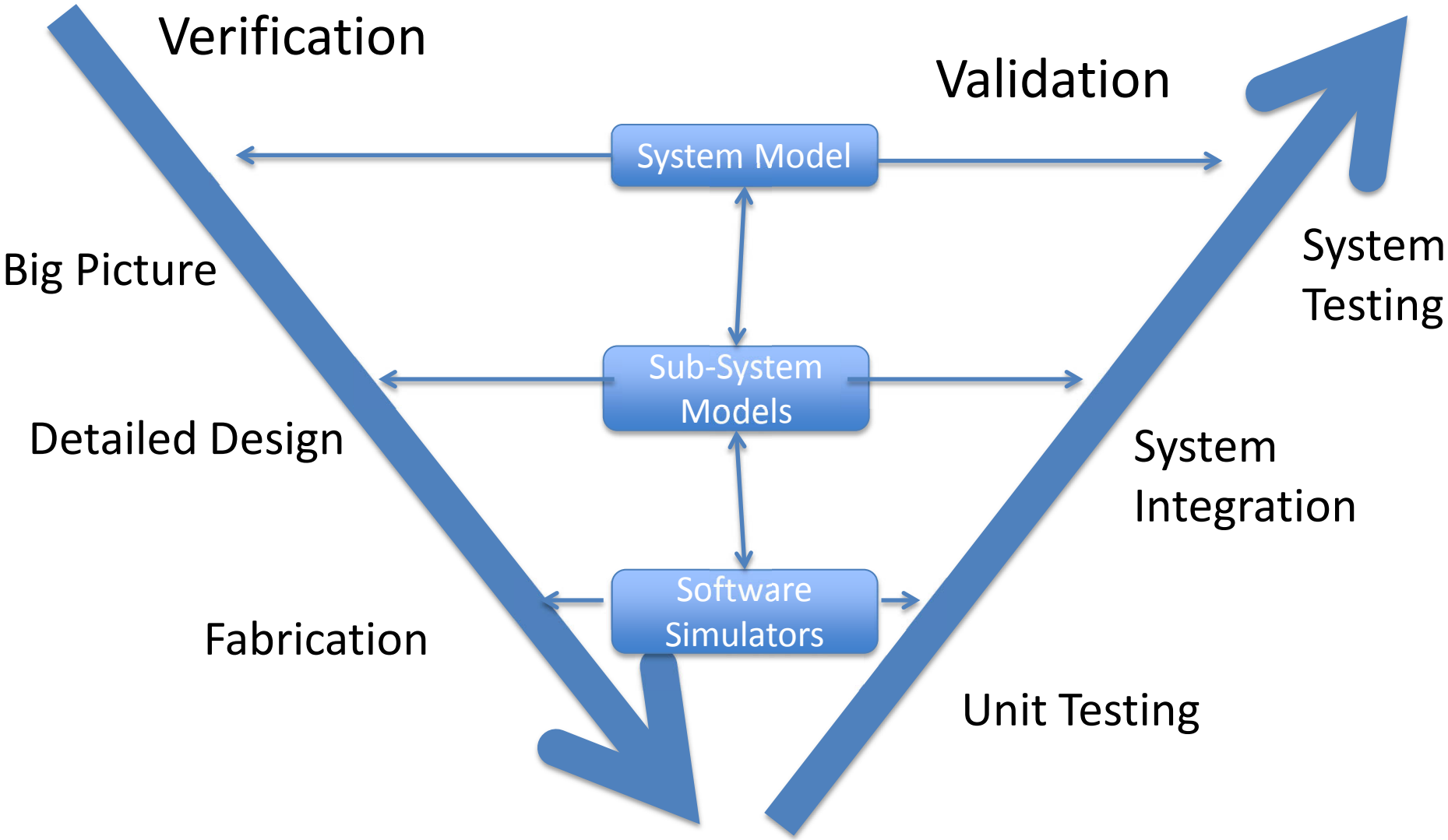
Operations Engineering



Ground Data System Functions

- Planning & Sequencing
- Downlink
- Navigation & Mission Design (NAV)
- <u>Ground Data System (GDS) Integration, Test, Deployment & Support</u>
- Operations Engineering

Verification and Validation (V&V)

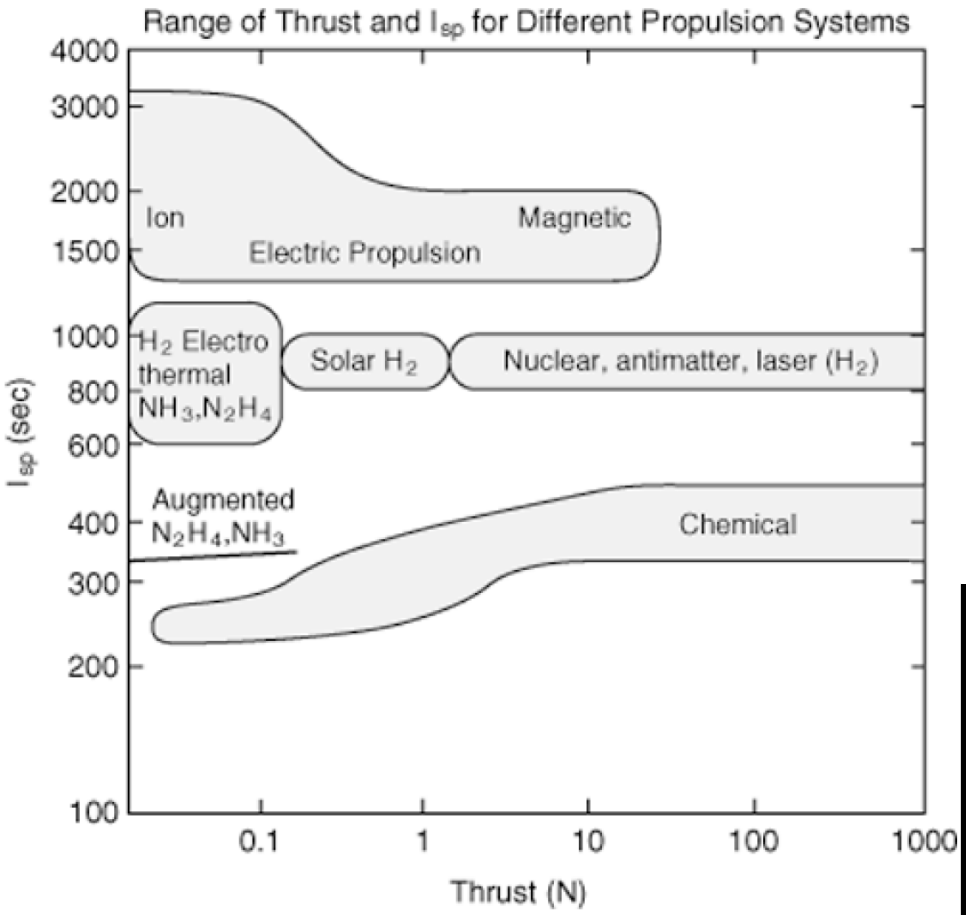


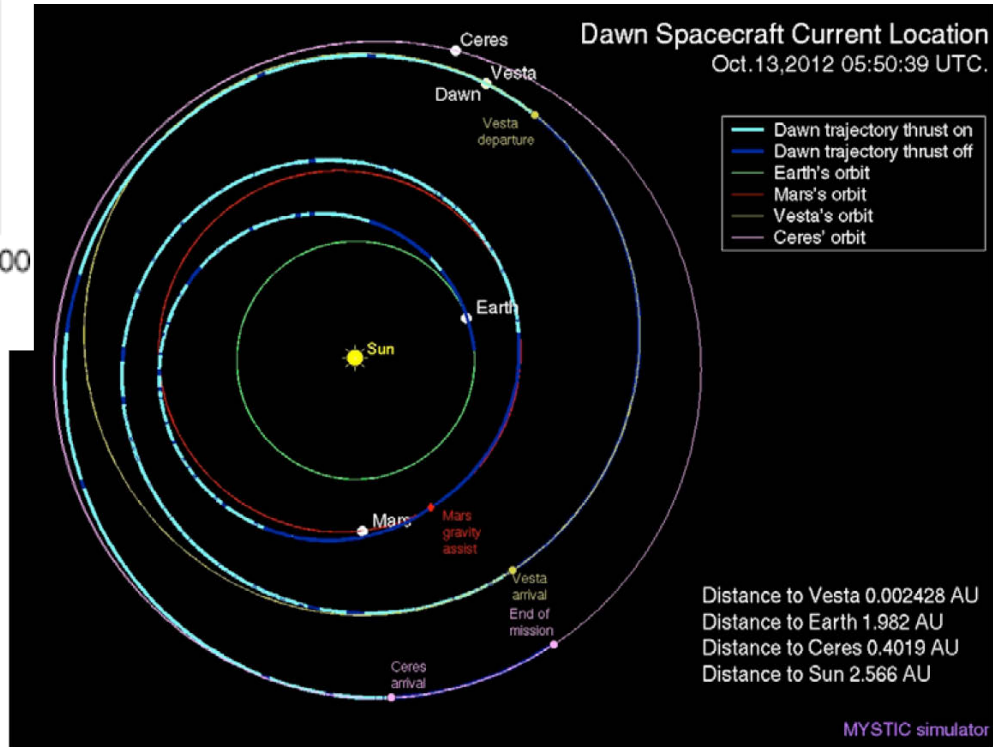
Mars Science Laboratory

- Coolest moment
- 2nd coolest moment: On console during the first SIV
- **Mission name:** Mars Science Laboratory
- **Rover name:** Curiosity rover
- **Size:** About the size of a small SUV -- 10 feet long (not including the arm), 9 feet wide and 7 feet tall
- **Arm Reach:** About 7 feet (2.2 meters)
- **Weight:** 900 kilograms (2,000 pounds)
- **Features:** Geology lab, rocker-bogie suspension, rock-vaporizing laser and lots of cameras
- **Mission:** To search areas of Mars for past or present conditions favorable for life, and conditions capable of preserving a record of life
- **Launched:**
  7:02 a.m. PST, Nov. 26, 2011
  Landed:
  10:32 p.m. PDT, Aug. 5, 2012
  Length of mission on Mars: The prime mission will last one Mars year or about 23 Earth months.

Dawn

- Ion propulsion (Xenon)
- ISP = the force with respect to the amount of propellant used per unit time.
- 2 different proto-planets in the asteroid belt





SMAP

Specifications

Radar

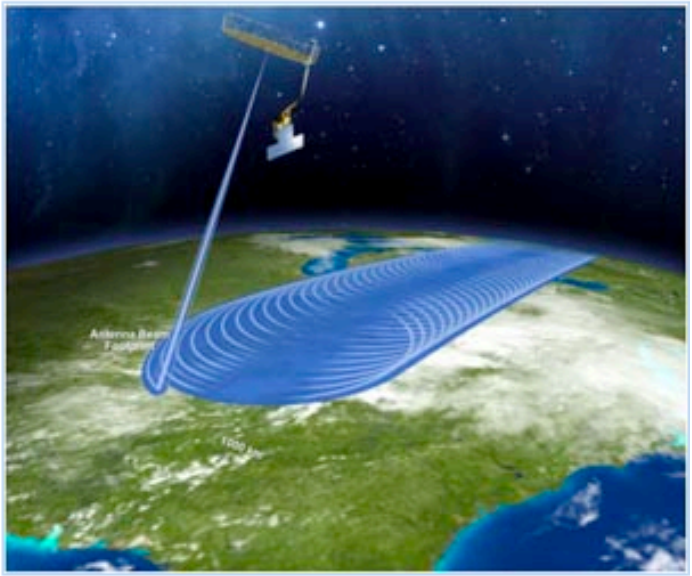
- Frequency: 1.26 GHz
- Polarizations: VV, HH, HV (not fully polarimetric)
- Relative accuracy (3 km grid): 1 dB (HH and VV), 1.5 dB (HV)
- Data acquisition:
  - High-resolution (SAR) data acquired over land
  - Low-resolution data acquired globally

Radiometer

- Frequency: 1.41 GHz
- Polarizations: H, V, 3rd & 4th Stokes
- Relative accuracy (30 km grid): 1.3 K
- Data collection:
  - High-rate (sub-band) data acquired over land
  - Low-rate data acquired globally

Antenna

- Conically-scanning deployable mesh reflector shared by radar and radiometer
- Diameter: 6 meters
- Rotation rate: 14.6 RPM
- Beam efficiency: ~90%
- Spatial Resolution:
  - Radiometer (IFOV): 39 km x 47 km
  - SAR: 1-3 km (over outer 70% of swath)
- Swath width: 1000 km



Specific Weight and Inertia so large that antenna cannot be tested in earth's gravity

References

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