The 2013 MAVEN Mission To Mars

Bruce Jakosky (Univ. of CO, MAVEN PI)
and
David Mitchell (GSFC, MAVEN PM)
Summary of MAVEN Status

- We’ve been developing MAVEN since 2003; now 5 months to launch!
- All eight science instruments are on the spacecraft
- Spacecraft assembly is complete and its in final stages of environmental testing
- Launch period is 18 November – 7 December, 2013
- Arrival at Mars in September, 2014
- One-Earth-year primary science mission

*Technical development is on track, we are on schedule and on budget!*
Abundant evidence for ancient water

Volatiles can go into the crust

Volatiles can be lost to space

Carbonate deposits in a Martian meteorite

Escaping ions detected from Mars Express
What Will MAVEN Do?

• Determine the structure and composition of the Martian upper atmosphere today
• Determine rates of loss of gas to space today
• Measure properties and processes that will allow us to determine the integrated loss to space through time

MAVEN will answer questions about the history of Martian volatiles and atmosphere and help us to understand the nature of planetary habitability.
The MAVEN Science Instruments

Mass Spectrometry Instrument
- Neutral Gas and Ion Mass Spectrometer; Paul Mahaffy, GSFC

Particles and Fields Package
- Solar Energetic Particles; Davin Larson, SSL
- SupraThermal and Thermal Ion Composition; Jim McFadden, SSL
- Solar Wind Electron Analyzer; David Mitchell, SSL
- Solar Wind Ion Analyzer; Jasper Halekas, SSL
- Langmuir Probe and Waves; Bob Ergun, LASP
- Magnetometer; Jack Connerney, GSFC

Remote-Sensing Package
- Imaging Ultraviolet Spectrometer; Nick Schneider, LASP

Mass Spectrometry Instrument
- Neutral Gas and Ion Mass Spectrometer; Paul Mahaffy, GSFC
The MAVEN Spacecraft

- 3-axis attitude control (wheel based)
- Mono-propellant propulsion system
- Single-fault tolerant during all critical events
- Launch (Wet) Mass: 2550 kg max
- Spacecraft Dry Mass: 903 kg max
- Power: 1135 W at Mars Aphelion

MAG (2)

LPW (2)

SWEA

Articulated Payload Platform
(IUVS/STATIC/NGIMS)
MAVEN Mission Architecture

20-Day Launch Period: November 18 – December 7, 2013

Ten-Month Ballistic Cruise to Mars

Orbit Insertion: 22 Sept 2014

One Year of Science Operations
MAVEN in Thermal Vacuum Testing
MAVEN is On Track, On Schedule, On Budget

• We’re not done yet, so we can’t get cocky or complacent.
• We’re not done yet, so we can’t get cocky or complacent.
• We’re not done yet, so we can’t get cocky or complacent.
MAVEN is On Track, On Schedule, On Budget

• Experienced team and A players, including all partners around the project.
• Well-defined and limited science scope from the beginning
• No changing requirements (i.e., no science or engineering creep)
• No new technology development.
• Real heritage, in the best sense of the word.
• Project office at GSFC staffed by A players, with nobody being yanked to work other projects.
• No piling on of bodies at GSFC, but deep bench available when we needed additional support
• Team that identifies issues, works them, reaches solutions, makes decisions without later second-guessing.
• Adequate reserves from the beginning, accommodated Phase B growth.
What Took Me By Surprise As PI?

- Cost estimates at each stage are not binding but are, at best, good-faith estimates.
- There was an incredible focus on requirements early on that didn’t make sense to me until now with the run-up to launch.
- Level 1 requirements really are important, not just another document to get approved.
- The annual budget process actually makes sense.
- People really listen to the PI; this has both good and bad sides to it.
Comments To Other Potential PIs

- Being PI will have a major impact on outside life and family; there’s no way around it.
- A decade from inception to launch is a long time (and we got selected on our first time proposing); it’s a marathon, and can’t be treated as a series of 100-yard dashes.
- Be prepared to travel; nothing takes the place of face-to-face interactions.
- There can be only one priority; everything else has to take a back seat.
- I have little control over my schedule – things happen when they need to happen.
- Value the identification of disconnects – they can’t be addressed until they’ve been identified.
- PI is the only person watching out over the entire project, from science concept to implementation to operations to data return to science results.
- It’s a tremendous opportunity (and responsibility) to be able to define a mission in the way that one thinks is important.