National Aeronautics and Space Administration

Goddard Space Flight Center

Transforming Concepts Into Reality: Project Management Insights from NASA's Goddard Space Flight Center

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Director of Flight Projects Directorate

Presentation to the National Science Foundation and Smithsonian Institution at the 2016 Large Facilities Office Workshop

May 24, 2016

Humanity’s Big Questions

NASA GSFC Installations

- GSFC Greenbelt, MD
- GSFC Wallops Flight Facility, VA
- IV&V Facility, WV
- Goddard Institute for Space Studies, NY
- Ground Stations at White Sands Complex, NM

Greenbelt Campus

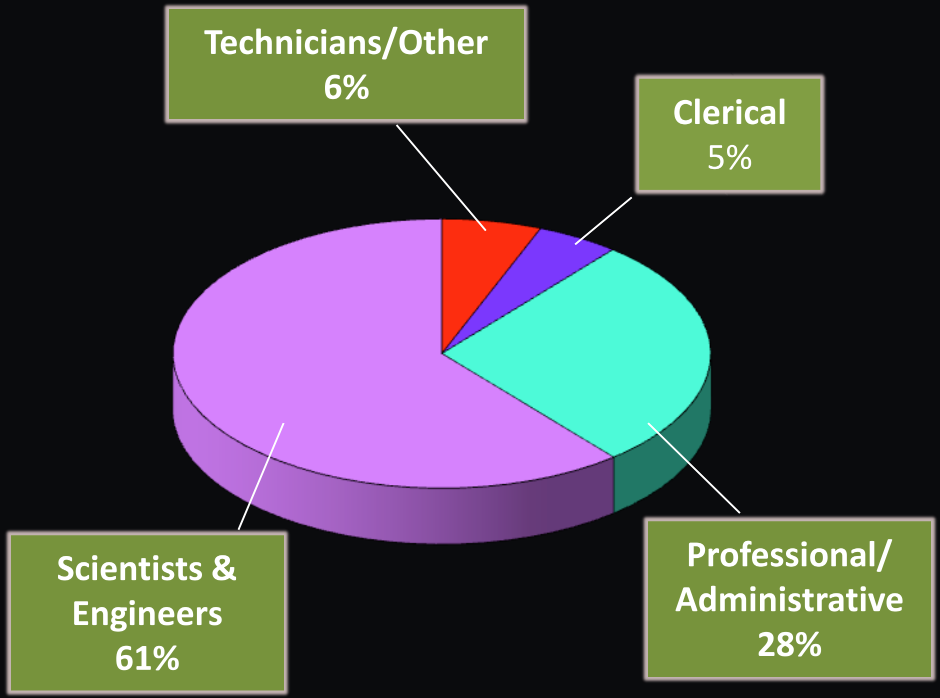
White Sands Complex

Wallops Flight Facility

Goddard Institute for Space Studies

Independent Verification and Validation Facility

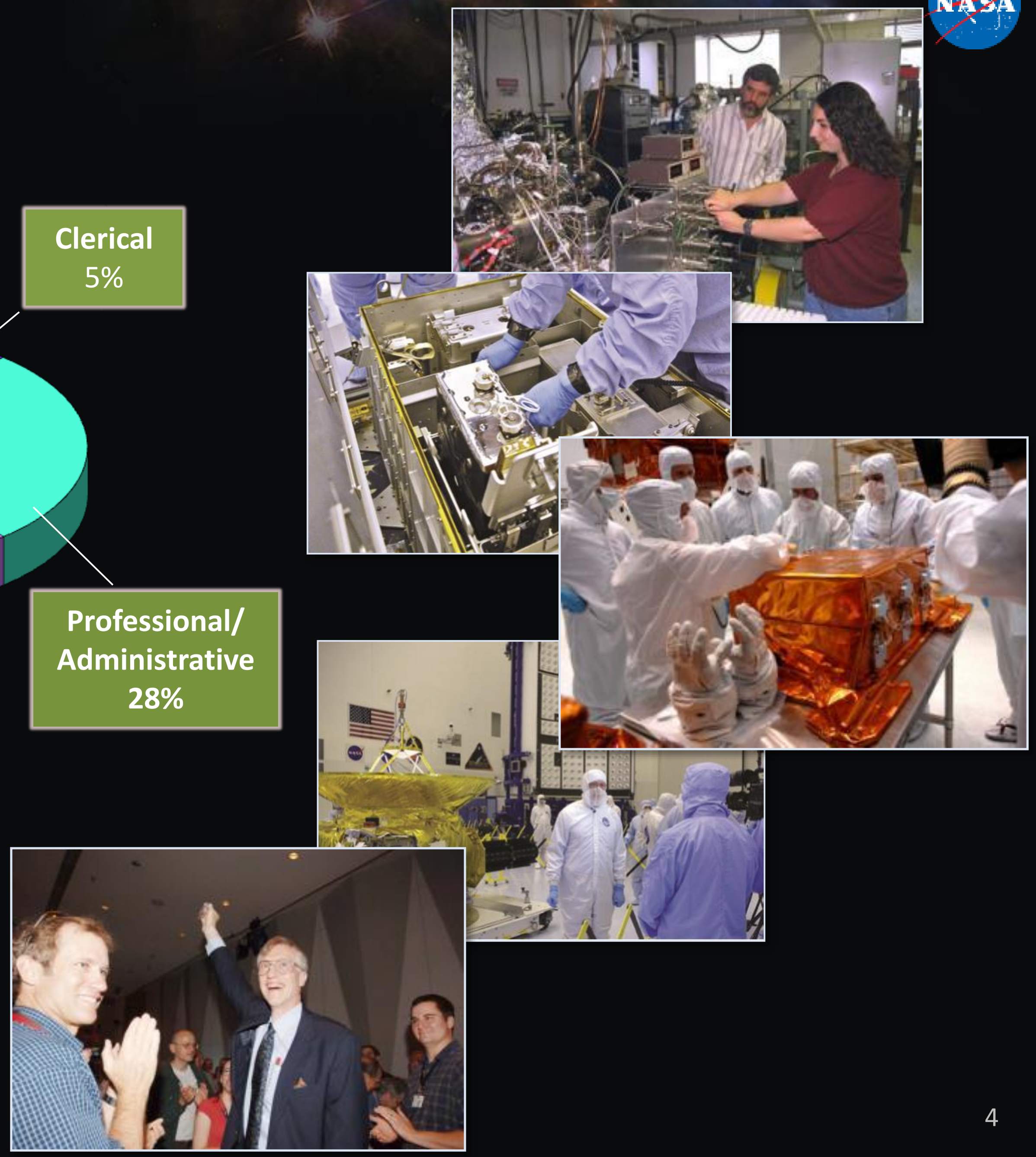
Our People



GSFC Workforce

Total Civil Servants: 3,400
Total Contractors : 6,400

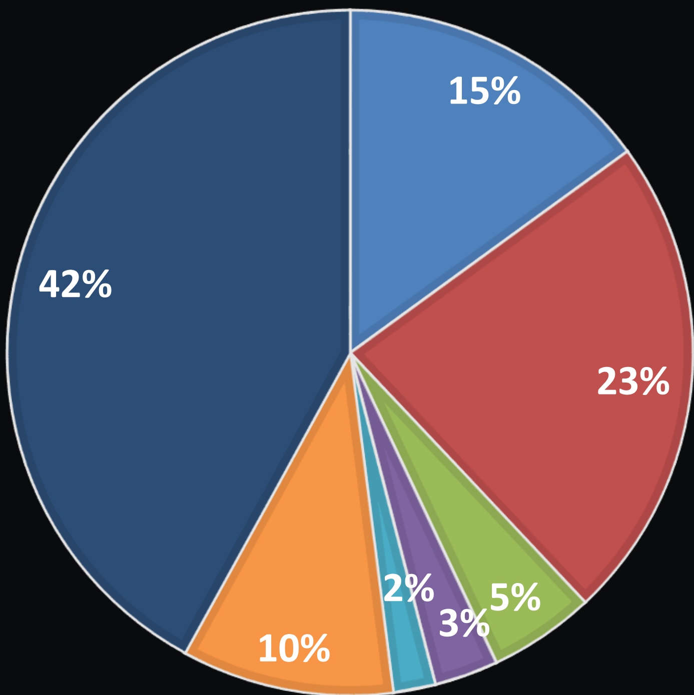
Total Workforce: 9,800



Flight Projects’ FY 2015 Annual Portfolio

As of March 2016

FY 2016 Funding



FPD Workforce (FY 2016)

- 399 Civil Service Employees
- 2,224 contractors

- 2,623 Total Employees

Earth Science Reimbursable – 42%
FY16 NOA: $1,376.3M
Missions in Development: 7
Total in Operations: 1

Astrophysics – 23%
FY16 NOA: $750.0M
Missions in Development: 5
Total in Operations: 5

Heliophysics – 5%
FY16 NOA: $148.9M
Missions in Development: 5
Total in Operations: 15

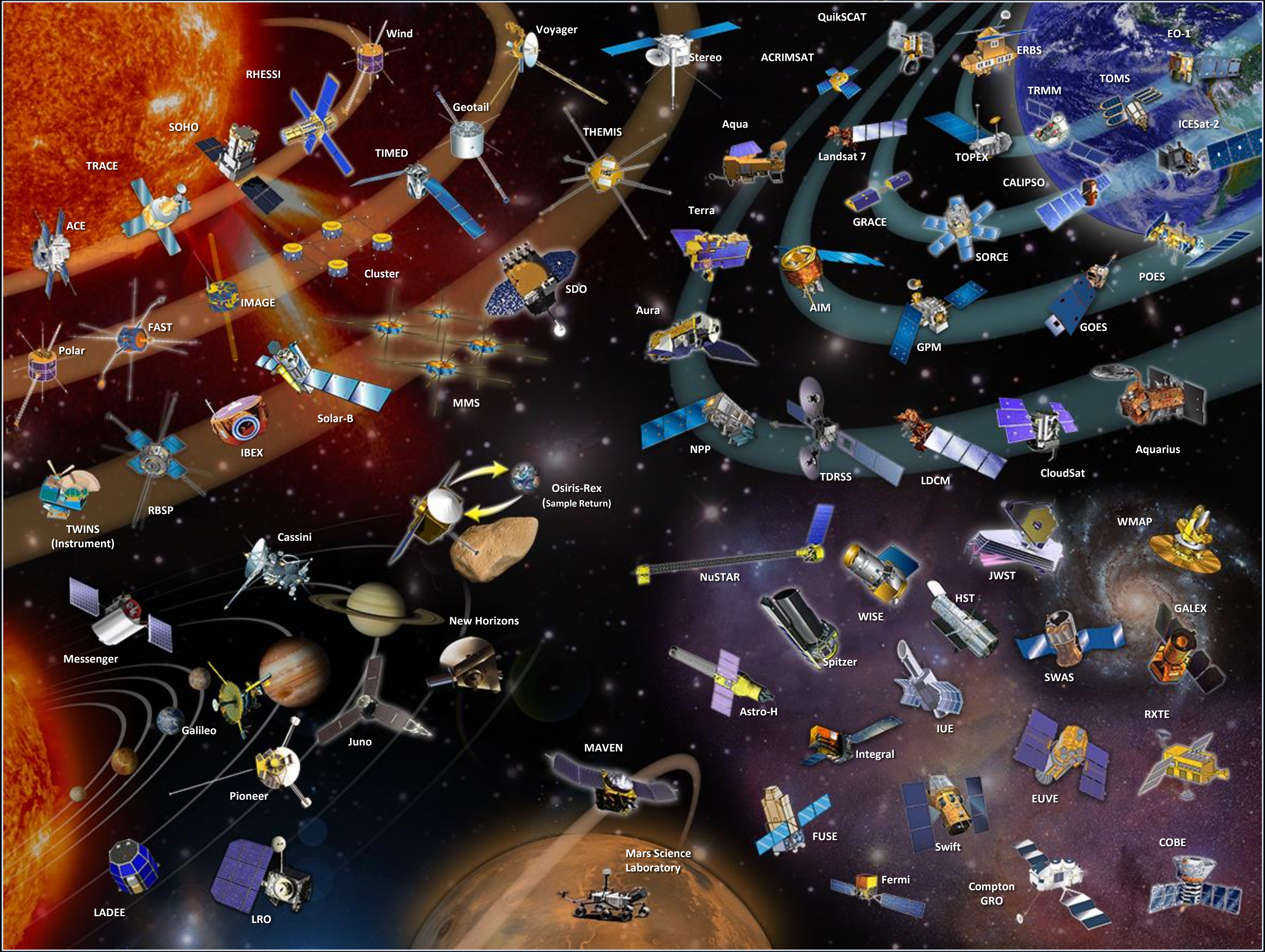
Cross-cutting Technologies – 2%
FY16 NOA: $69.1
Missions in Development: 4
Total in Operations: 1

Earth Science – 15%
FY16 NOA $479.9M
Missions in Development: 5
Total in Operations: 13

Communications & Navigation –10%
FY16 NOA: $316.0M
Missions in Development: 1
Total in Operations: 10

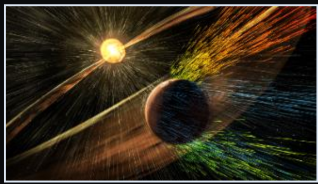
Planetary – 3%
FY16 NOA: $155.9M
Missions in Development: 2
Total in Operations: 2

GSFC: A Diverse Mission Portfolio

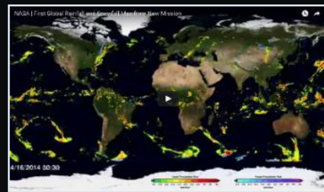


Looking to the Future

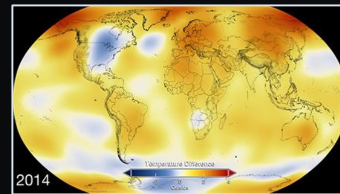
2015 Accomplishments



MAVEN Mission Reveals Speed of Solar Wind Stripping Martian Atmosphere

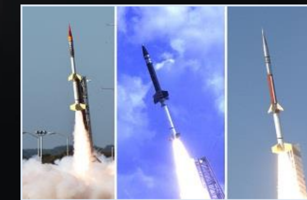


First Global Precipitation Maps from GPM



NASA, NOAA Find 2014 Warmest Year in Modern Record

DSCOVR Discovers Moon Photo-bombing Earth



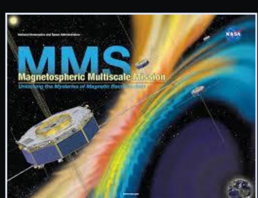
Sounding Rocket Launches

Goddard Open House Attracts Record Crowd of 20,000

Wallops Flight Facility Marks 70 Years

President Park Geun-hye Visits NASA Goddard

Celebrating 25 Years of Hubble

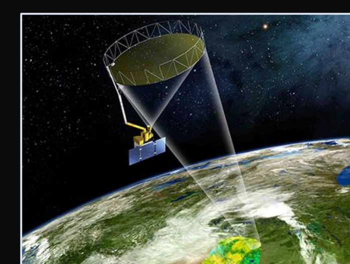


Liftoff for MMS Mission's Quadruplet Satellites

Mars' Moon Phobos is Slowly Falling Apart

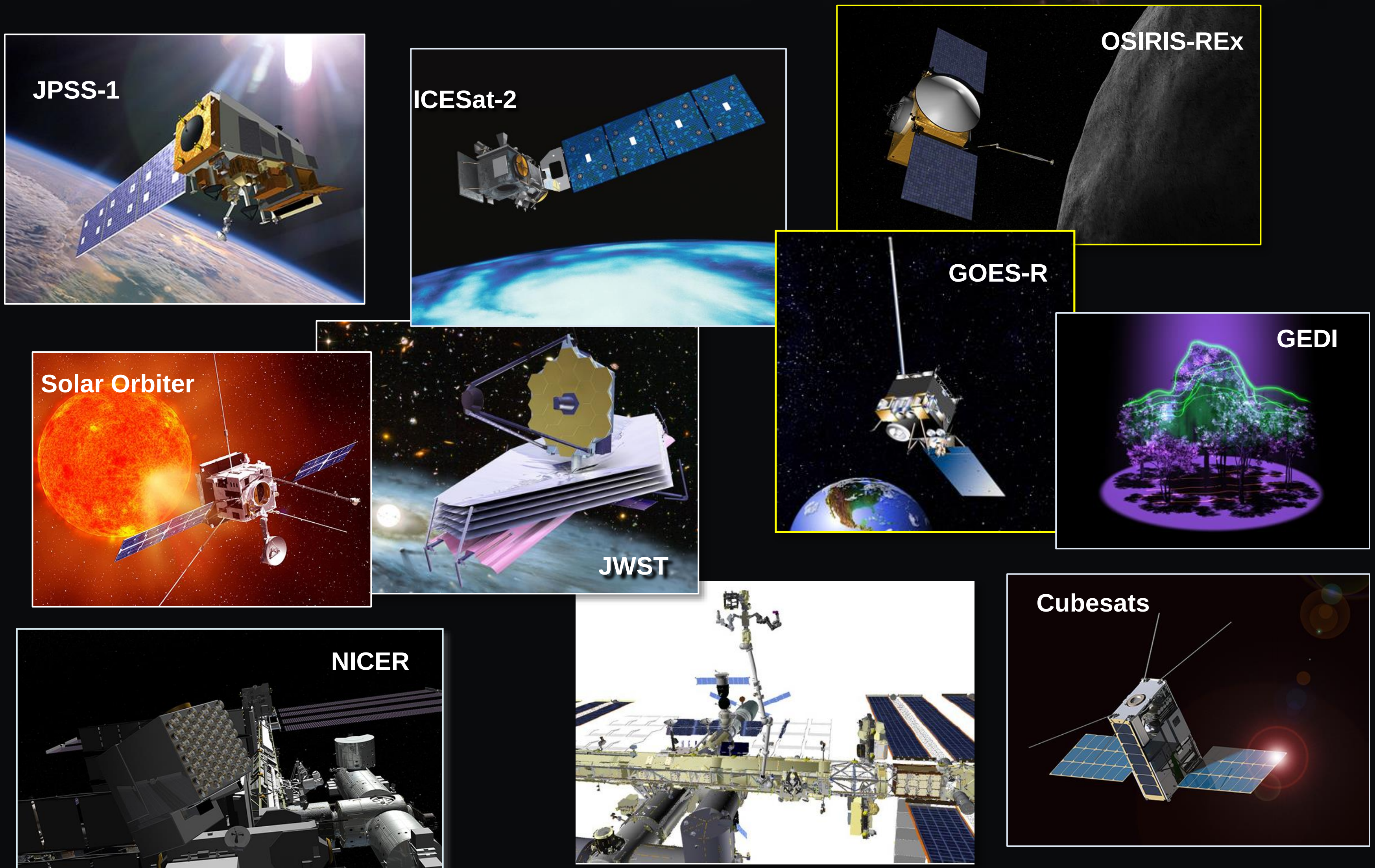
Fermi Satellite Detects First Gamma-ray Pulsar in Another Galaxy

Webb Telescope Mirror Assembly Begins at Goddard



SMAP Launches January 2015

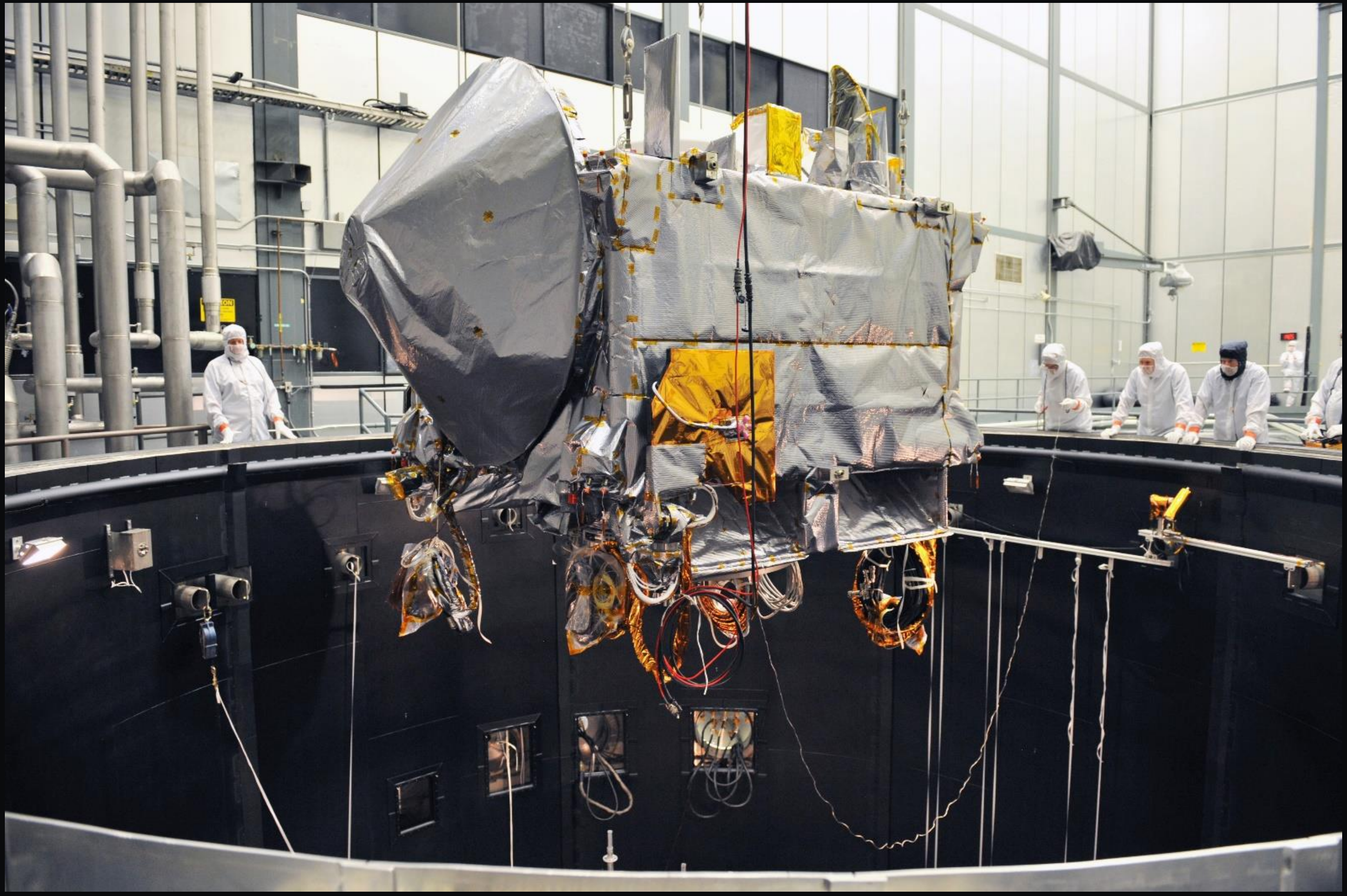
Upcoming Launches and Future Missions



Ammonia Leak Locator
Tool on ISS

Accomplishments - OSIRIS REx

- Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS REx) asteroid sample return mission completing environmental testing
  - Launch in September 2016



Accomplishments - GOES-R Satellite

- Geostationary Operational Environmental Satellite "R" Series (GOES-R) is a collaborative program between NOAA and NASA to develop the next generation GOES environmental satellites (follow-on to GOES-N/O/P)
- GOES-R completed mass properties, sine vibe, shock, dynamic interaction test, and launch vehicle adapter match mate
- November 2016 Launch

GOES-R in Sine Vibe at LMSSC in Littleton, CO

Accomplishments - JWST

- James Webb Space Telescope (JWST) is a deployable infrared telescope, passively cooled, with 6.5 meter diameter segmented adjustable primary mirror designed to study the origin and evolution of galaxies, stars, and planetary systems
- Primary mirror installation is complete
- Integrated Science Instrument Module underwent third and final cryogenic test.
- Side portions of the backplane structure successfully deployed

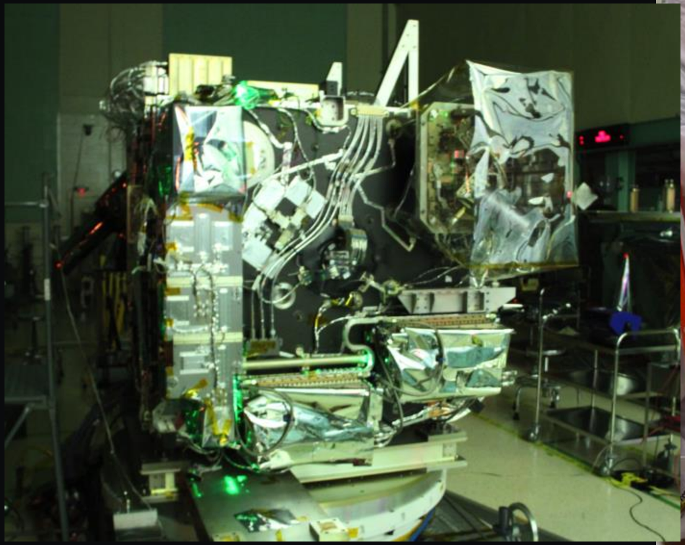
Launch: October 2018

Accomplishments – JPSS

- Joint Polar Satellite System 1 (JPSS 1) spacecraft will sustain continuity of and enhance NOAA's Earth observation analysis and forecasting capabilities from global polar-orbiting observations
- Pre-Environmental Review successfully completed on March 30, 2016
  - On track for January 2017 launch

Accomplishments – ICESat-2

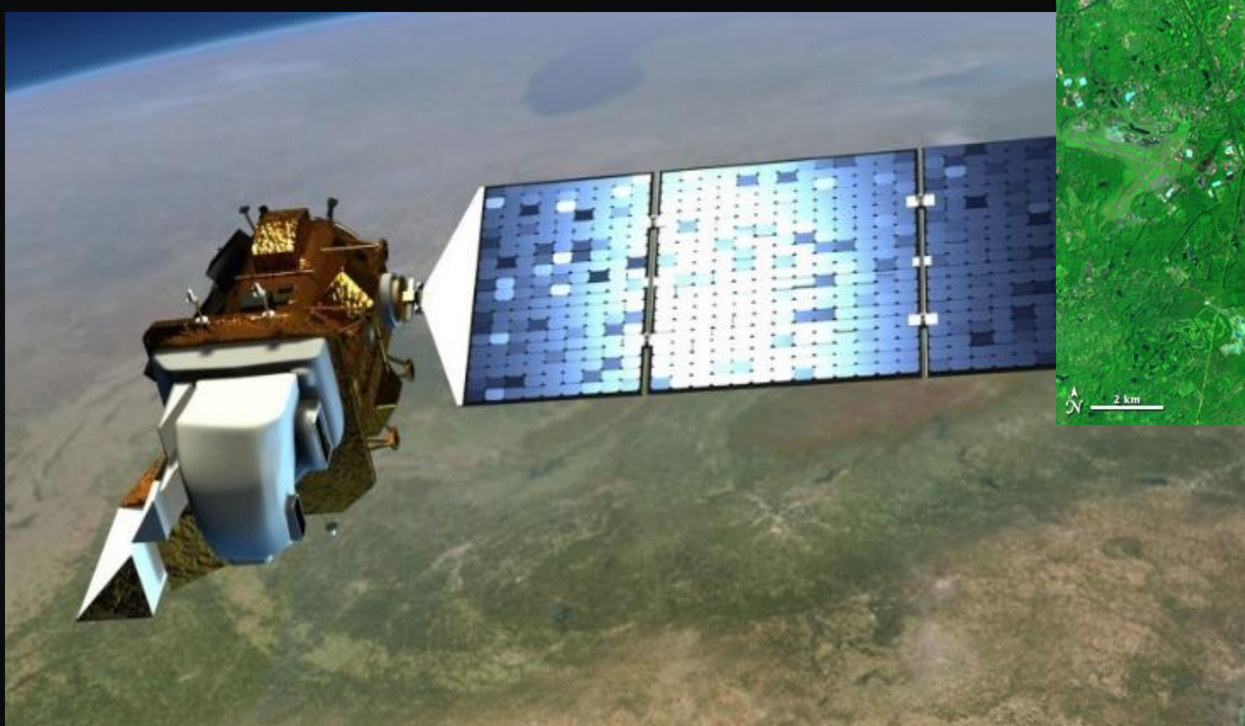
- Ice, Cloud, and Land Elevation Satellite (ICESat-2) is designed to collect altimetric measurements of the Earth's surface, optimized to measure the heights and freeboard of polar ice and global vegetation canopy.
- Project undergoing integration and test
- Launch: October 2017

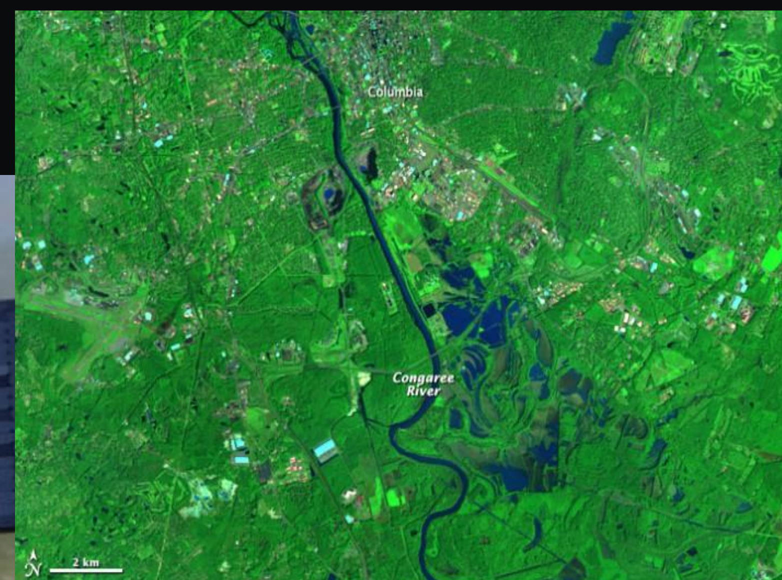


ATLAS Instrument

New Missions for GSFC – LANDSAT 9

- LANDSAT 9 is in Phase A
- Designed to provide continuity in the multi-decadal land surface observations to study, predict, and understand the consequences of land surface dynamics
  - Mission Definition Review scheduled for May 2016

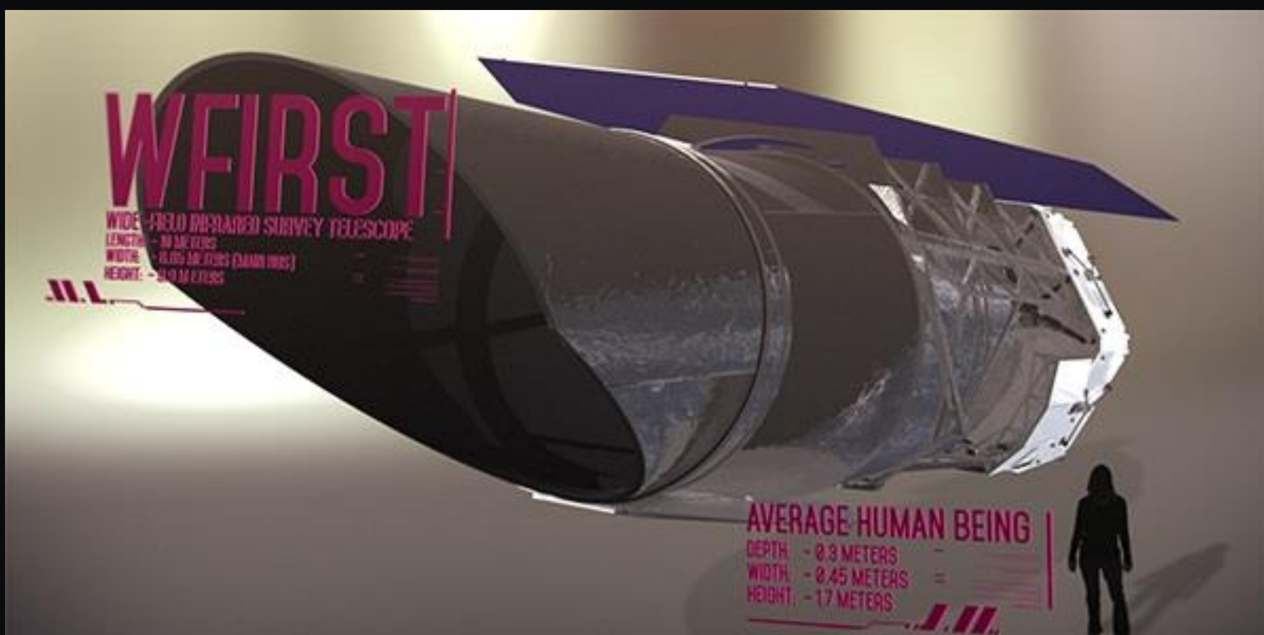




Flooding Near Columbia, South Carolina

New Missions for GSFC - WFIRST

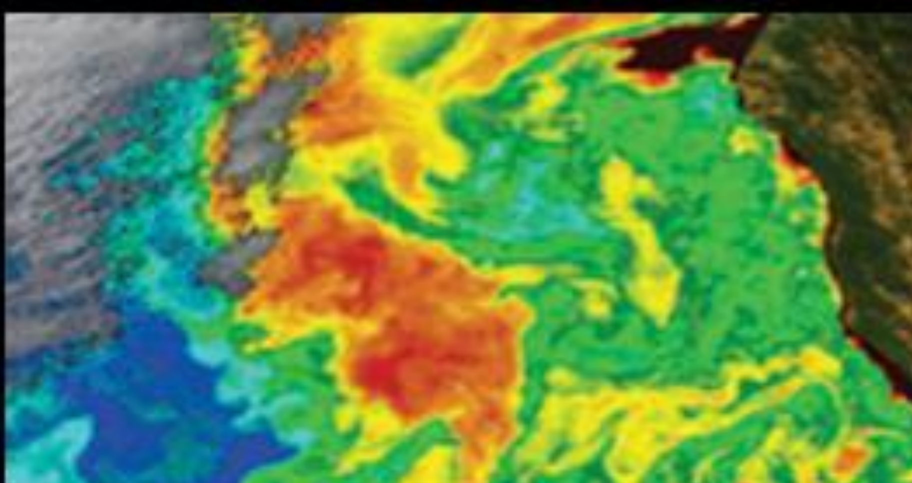
- Wide Field Infrared Survey Telescope (WFIRST) is a NASA observatory designed to settle essential questions in the areas of dark energy, exoplanets, and infrared astrophysics
- WFIRST Mission Concept Review successfully completed in December 2015
- Key Decision Point A was held in January 2016



Baseline WFIRST Image

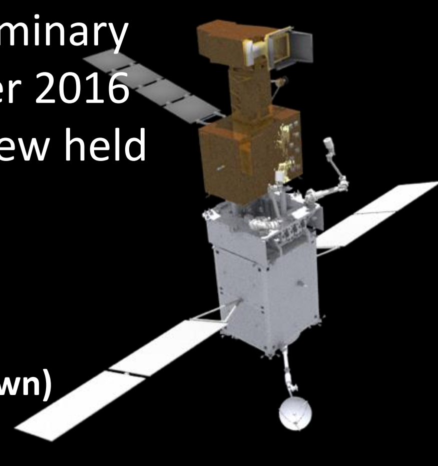
New Missions for GSFC - PACE

- Pre-Aerosol, Clouds, and Ocean Ecosystem (PACE) mission will make global ocean color measurements to provide extended data records on ocean ecology and global biogeochemistry (e.g., carbon cycle) along with polarimetry measurements to provide extended data records on clouds and aerosols
- PACE completed Mission Concept Review in March 2016



New Missions for GSFC – Restore-L

- Restore-L will robotically refuel a Government–owned satellite in low Earth orbit (LEO)
- Restore-L Satellite Mission Preliminary Design Review held in December 2016
- Restore-L Mission Concept Review held April 7-8, 2016

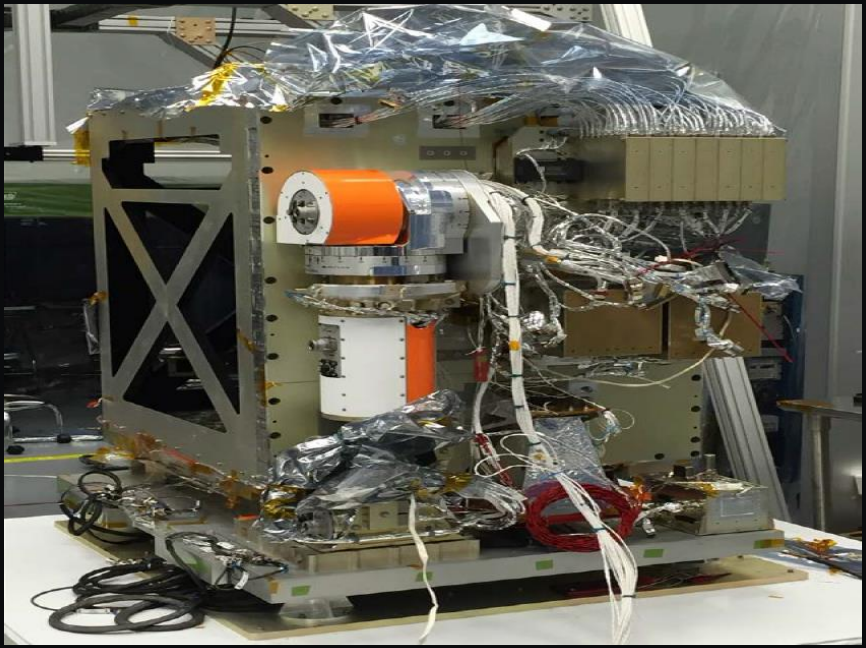


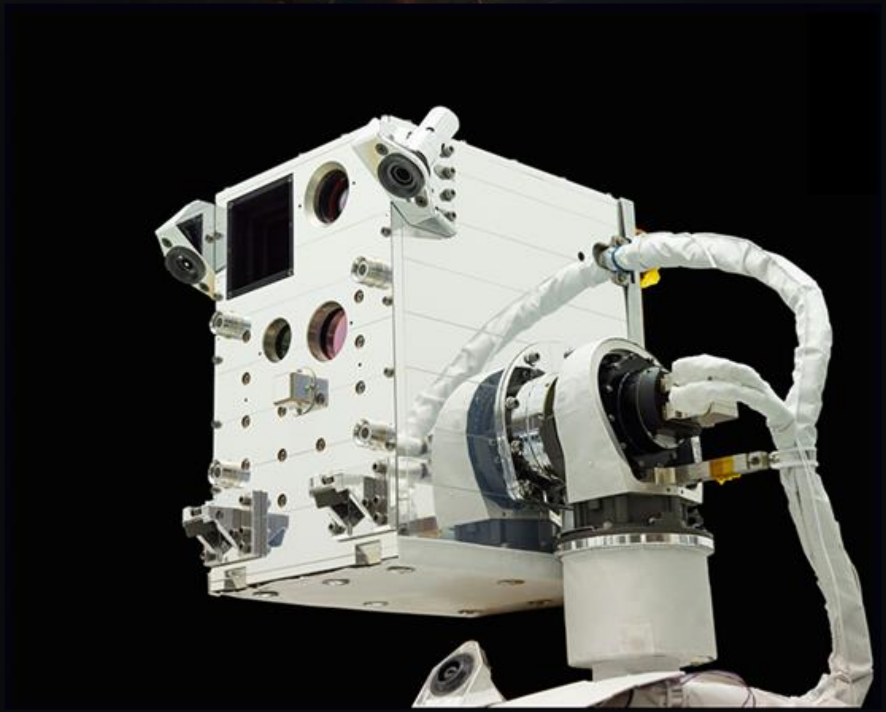
Restore Servicing Vehicle (RSV) (bottom, with conceptual Bus shown) mated to notional client (top)

Development work at GSFC with Landsat 7 as case study

Sen. Barbara Mikulski Officially Opens New Robotic Operations Center

International Space Station Utilization

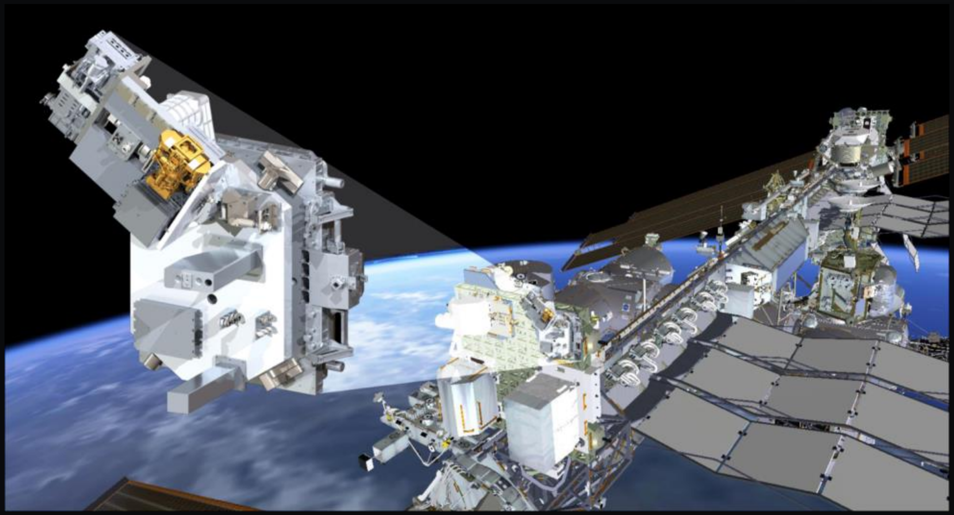




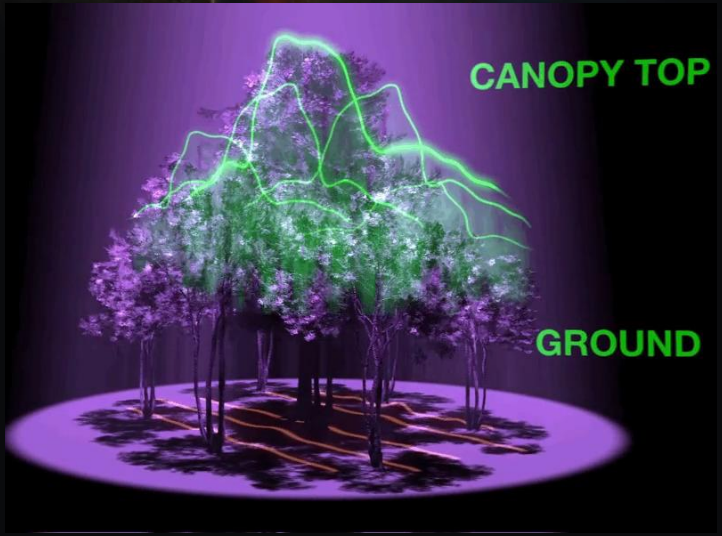
- **Neutron star Interior Composition ExploreR (NICER)** study of neutron stars through soft X-ray timing
- Completed Pre-Environmental Review and is in integration and test
- Launch in January 2017

- **Raven** (relative navigation tech demo) launches to the International Space Station in November 2016

International Space Station Utilization



- The Total and Spectral Solar Irradiance Sensor (TSIS-1) mission will provide absolute measurements of the total solar irradiance (TSI) and spectral solar irradiance (SSI), important for accurate scientific models of climate change and solar variability



- The scientific goal of the **Global Ecosystem Dynamics Investigation Lidar (GEDI)** is to characterize the effects of changing climate and land use on ecosystem structure and dynamics to enable radically improved quantification and understanding of the Earth's carbon cycle and biodiversity
- **Global Ecosystems Dynamics Investigation (GEDI)** is in Phase B Preliminary Design Review held in March 2016

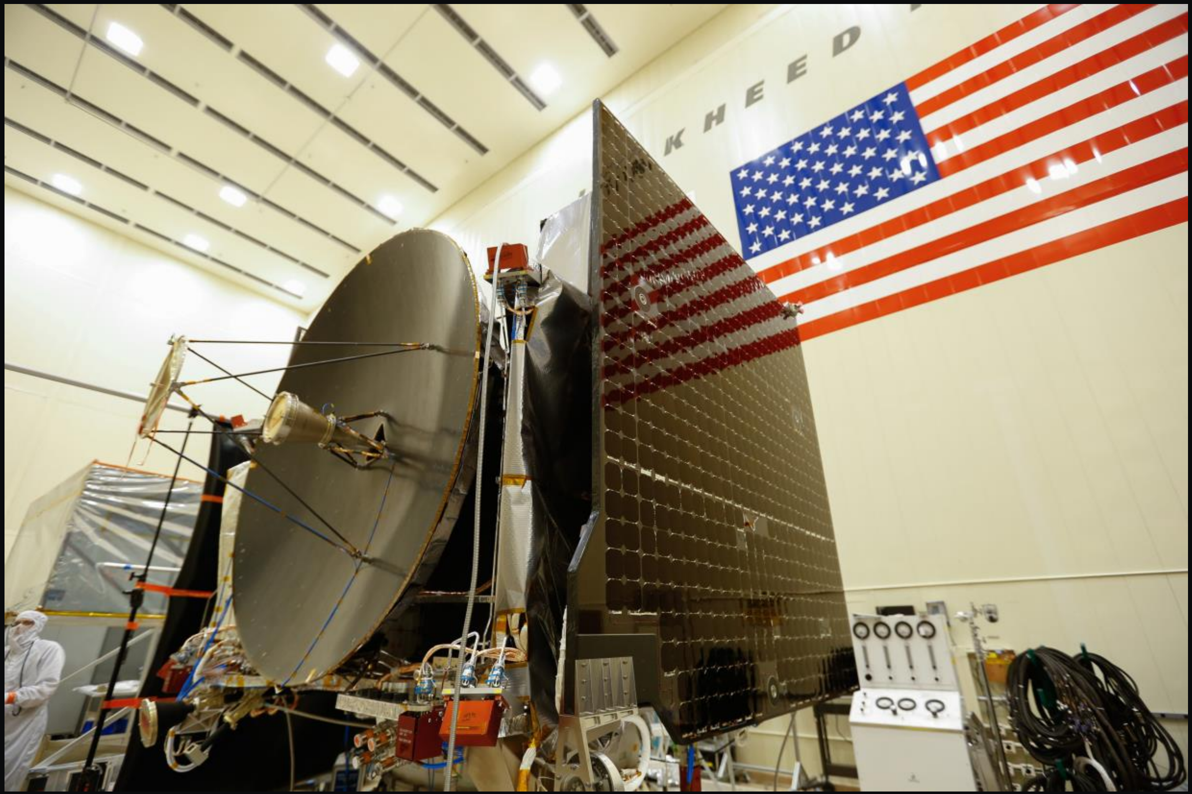
PROJECT UNIQUE CHALLENGES

Unique Flight Project Challenges

- Problems and challenges arise even on the most well planned projects
- Need both schedule and budget reserve to address unknown unknowns
  - Need reserves to actively manage issues and concerns to minimize cost and schedule impacts
  - Need reserves to mitigate risks
- Need to manage technical reserves and design margins
  - Exceeding technical reserves and design margins may force re-designs, affect mission performance requirements, and/or deplete cost and schedule reserves

Challenges - Schedule

- Meeting planetary windows bring hard deadlines
  - May need to wait months or years for next launch opportunity



Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS Rex) completing environmental testing – Shipped to Cape Canaveral on May 20, 2016 – Launch window September 3 – October 12, 2016

Challenge – Complex Design (1 of 2)

- Satellites with complex designs and/or large scale pose unique challenges
  - Drives schedule and cost

James Webb Space Telescope (JWST)

Challenge – Complex Design (2 of 2)

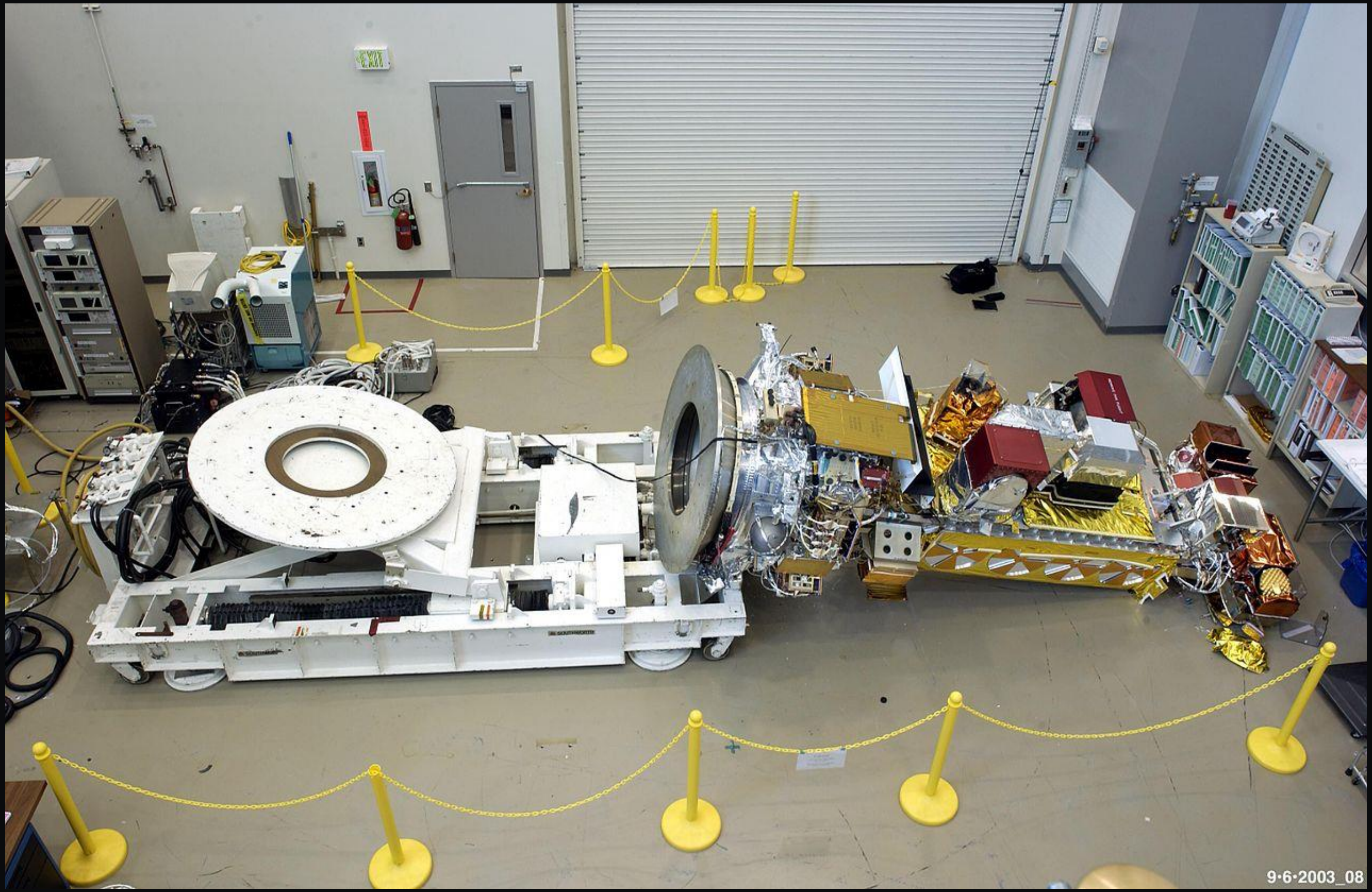
- Satellites with complex designs may need unique or one-of-a-kind facilities and support equipment
- Ground systems can also have complex designs and/or unique challenges

New vibration facility for James Webb Space Telescope (JWST)

JWST thermal vacuum testing to occur at JSC

Challenges – Mishaps

- Major unplanned events often requiring a project "stand-down" and re-plan

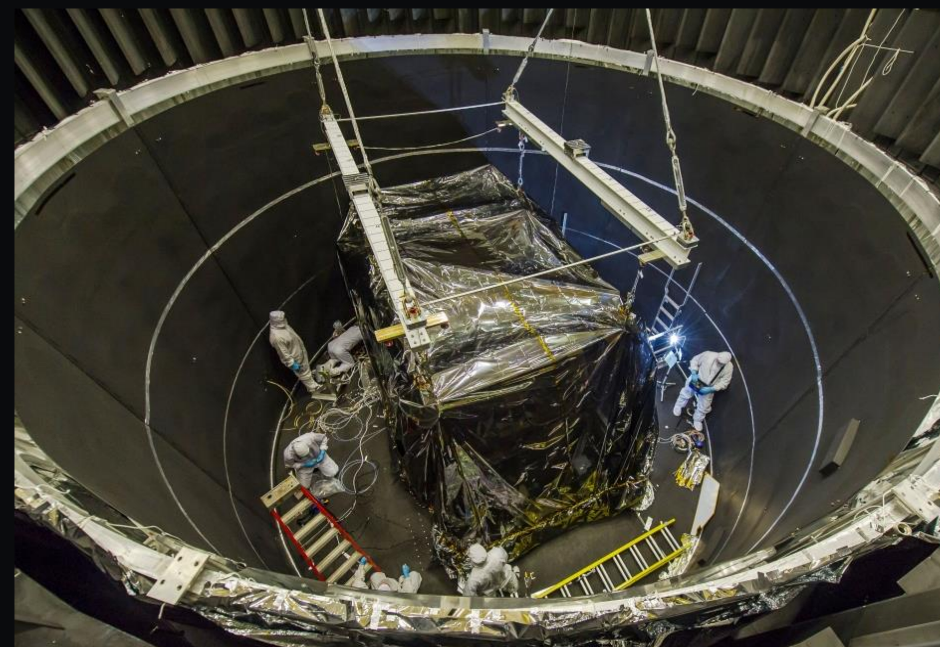


Spacecraft mishap during integration

Challenges – Facility Conflicts

- Schedule conflicts between projects using integration and test facilities
  - May require building new facilities
  - May require taking hardware to outside facilities

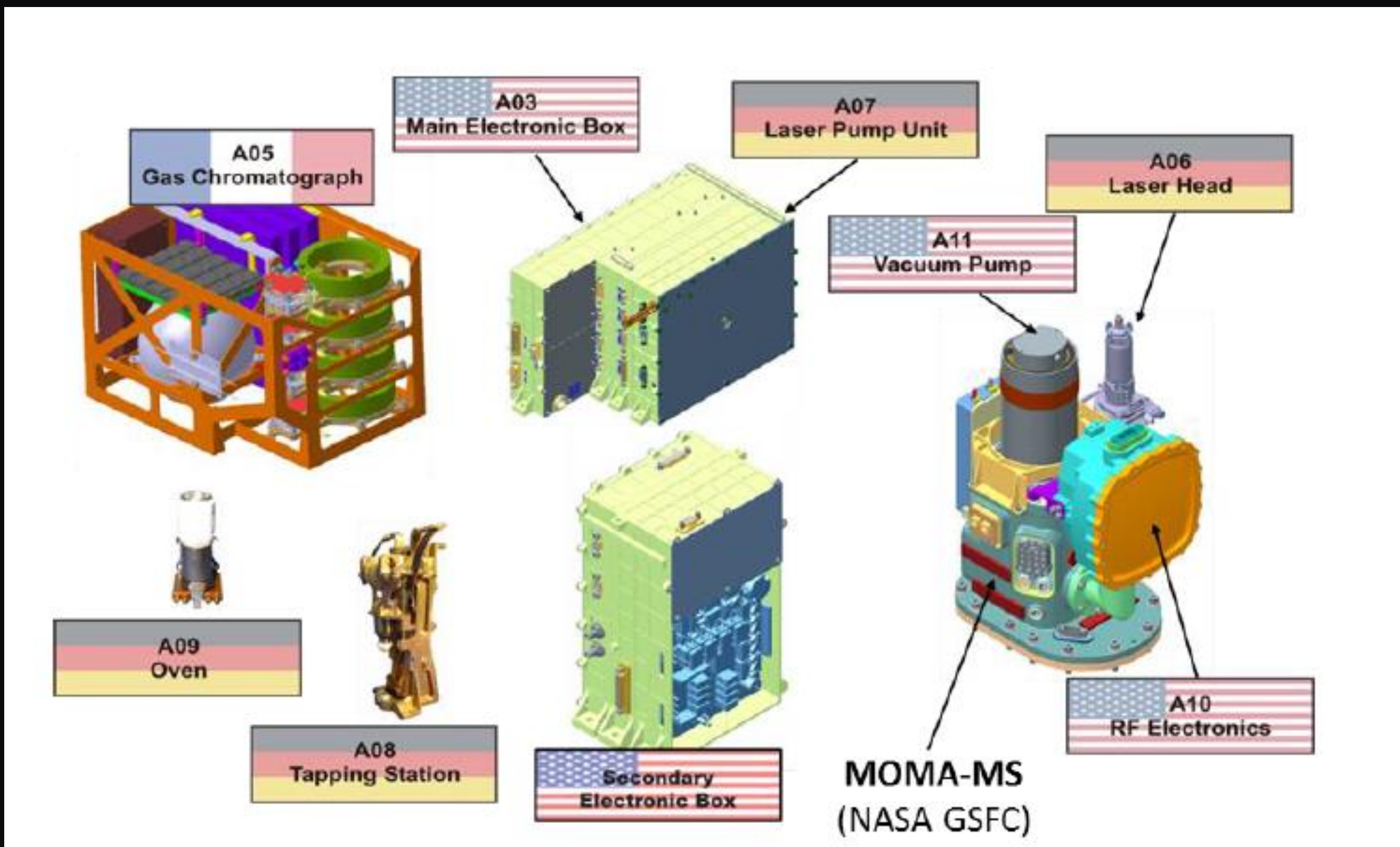
- MMS conflict with JWST required MMS to go to Naval Research Laboratory for Thermal Vacuum testing
- Facility conflicts also drove MMS to build their own cleanroom facility



- JWST Integrated Science Instrument Module being lowered into the GSFC Space Environment Simulator Thermal Vacuum chamber

Challenges – Outside Partnerships

- Partnerships with outside organizations can drive funding and schedule beyond the control of the GSFC project manager
- Partners can also back-out of agreements

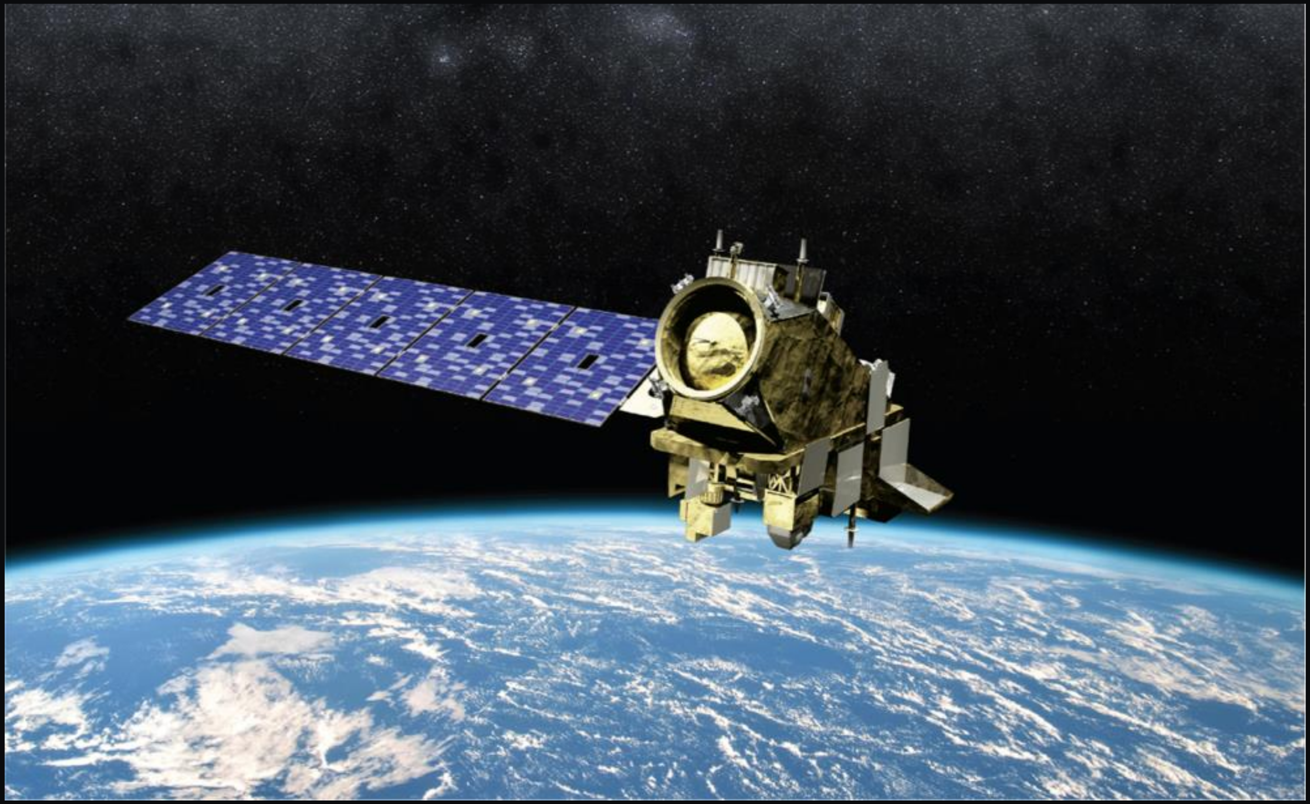


GSFC contribution to European ExoMars mission: Mars Organic Molecule Analyzer Mass Spectrometer (MOMA-MS)

ExoMars mission recently slipped launch 2 years from 2018 to 2020

Challenges – Procurement Delays

- Delays in awarding procurements can increase cost, as well as decrease schedule margins



JPSS 2, 3, and 4 spacecraft experienced a delayed start as a result of a procurement protest

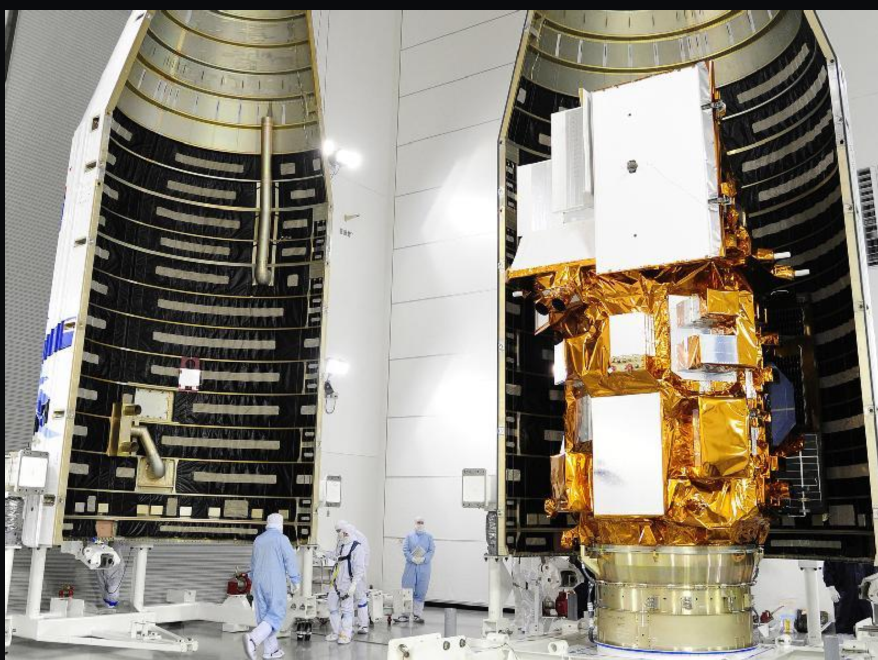
Challenges – Hardware Issues

- Hardware issues can cause cost increases, schedule delays, re-designs, and re-plans
  - Parts issues
    - Parts not available
    - Long lead items don't meet mission schedule
    - Parts may require test program
  - Hardware issues
    - Poor workmanship
    - Failure during testing
    - Behind schedule
    - Exceeded budget
    - Unexplained test results
    - Late deliveries


Late hardware deliveries from suppliers

Challenges – Changing Requirements

- There will be reasons to change requirements after they are baselined — budget cuts, changes in funding profiles, system upgrades, unplanned changes in an interface, or changes in a regulation or a standard, etc.
- Requirements creep, both in the science and engineering areas must be minimized to stay on schedule and within budget



Landsat Data Continuity Mission (LDCM) - The Thermal Infrared Sensor (TIRS) instrument drove schedule

Challenges – Launch Vehicle Schedule

- Delays in launch vehicle schedules use up funding and schedule reserves
- Project manager needs to incorporate schedule and cost margin in budget for normal launch delays of a few weeks or months
  - May need to re-plan and request more funding from Headquarters for longer delays
- Launch vehicle failures tend to cause long launch delays, as well as, backlogs in the manifest

MAVEN Launch on ATLAS V on November 18, 2013

DSCOVR launch on Falcon 9 rocket from Kennedy Space Center on February 11, 2015

Challenges – On Orbit Events

- Orbital events can cause a loss of mission
- STEREO mission experienced problems in October 2014
  - Lost communications with one of the two spacecraft while in extended operations
- Defense Meteorological Satellite Program (DMSP 19) broke up in orbit in February 2015
  - Exploded while in a sun-synchronous polar orbit leaving a large debris field
- Micrometeoroid impact to the MMS 4 spacecraft but all instruments and the spacecraft are still functioning
- NASA monitors space debris and performs collision risk conjunction assessments (CARA)
  - Routinely needs to move satellites to avoid collisions

STEREO Satellites during Spin Test

Challenges – Stakeholders

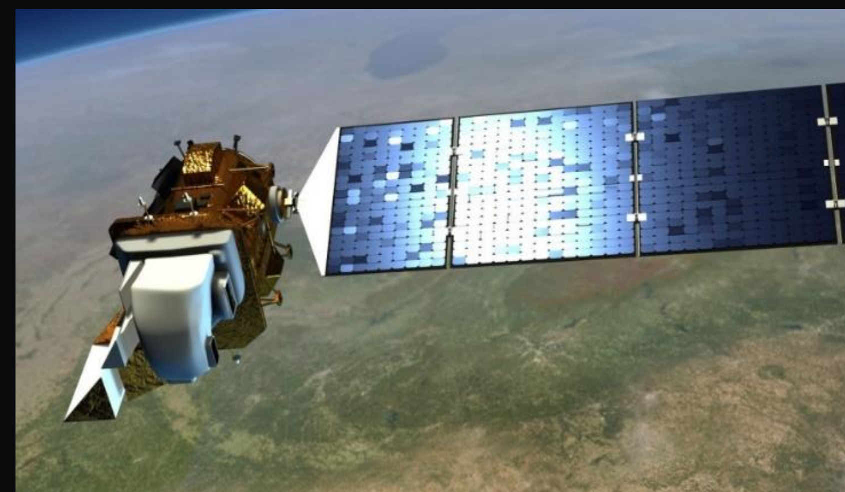
- Key stakeholders often drive launch dates and funding, as well as ownership of mission between agencies
- Stakeholders include Congress, Office of Management and Budget, science communities, and other agencies
- Outcomes are often out of the control of the center and project manager

Deep Space Climate Observatory

Triana mission originally scheduled to launch in 2003 (NASA mission) → Storage from 2001 to 2013

Several attempts to revive mission → DSCOVR mission (formerly Triana) confirmation in 2013 with launch in 2015 (joint NASA/NOAA mission)

Same instruments/measurements – different prime mission focus (earth science to solar storm warning)



Landsat 9: Stakeholders driving launch readiness date

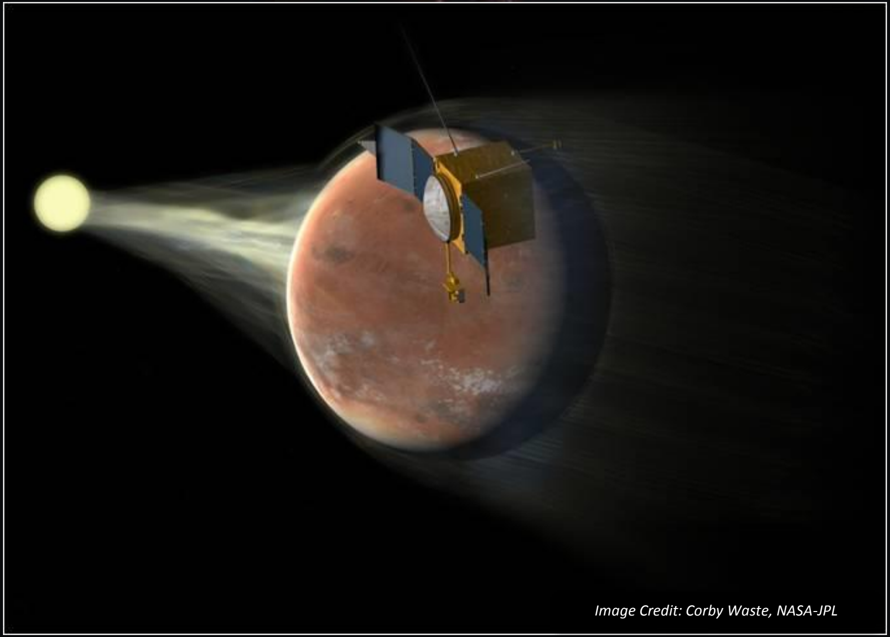
MAVEN

Mars Atmosphere and Volatile EvolutioN (MAVEN) Mission

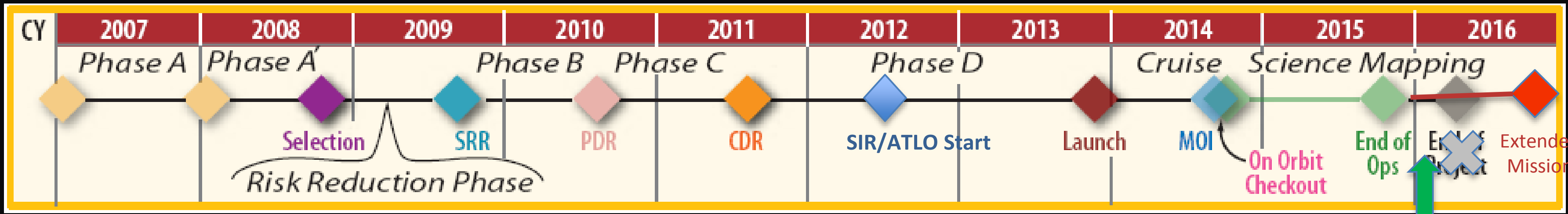
MAVEN's Lessons Learned

The MAVEN Project's Journey

From proposal days…



… to Science at Mars

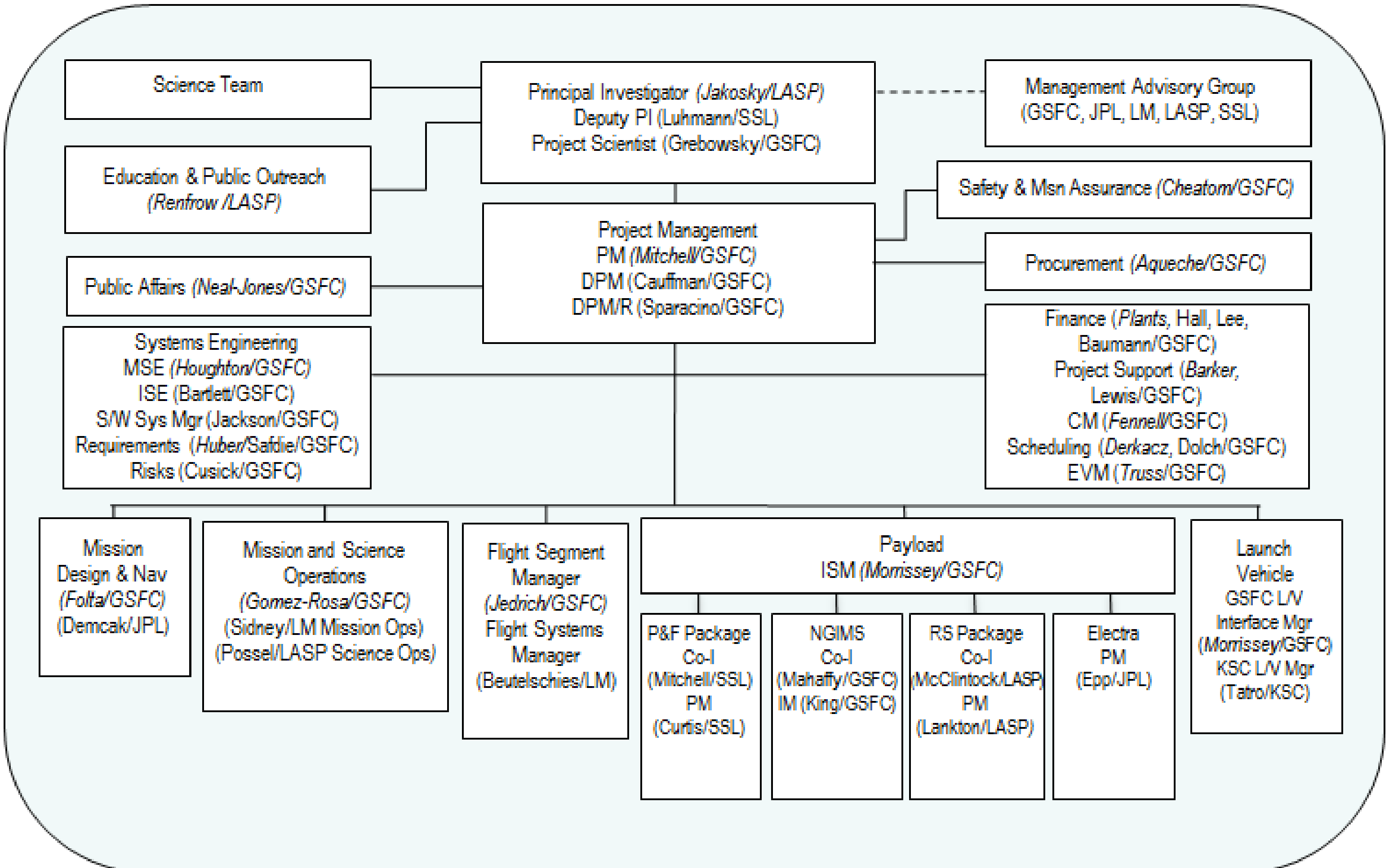


All major milestones, including launch, achieved on the schedule originally proposed in 2008 – and under budget!

Historical Perspective

- The concept which became MAVEN was hatched in 2003 by one scientist from the University of Colorado/Boulder (eventual Principal Investigator [PI]) and two scientists from the University of California/Berkeley
- The MAVEN PI asked Goddard to join the team in 2005. The MAVEN proposal was submitted in response to NASA Headquarters' Scout II Announcement of Opportunity in 2006
- MAVEN was one of 20 Step-1 proposals. Two were selected for a more-detailed feasibility or Phase A study
- Following the competitive Phase A study, MAVEN was selected to move forward to flight in 2008
- After a 1-year "risk reduction phase," MAVEN transitioned to a 4-year development phase for launch. MAVEN was confirmed in 2010
- MAVEN was included in the government shutdown in October 2013, less than 7 weeks from launch. Launch-preparation activities were restarted after 2 days
- MAVEN launched on November 18, 2013. This was the first day of its 3-week launch period, and it launched at the first opportunity at the start of its 2-hour firing window that day. MAVEN entered Mars orbit on September 21, 2014
- MAVEN launched on schedule, under budget, and with the full technical capability that was intended

Project Organization at Launch



As of 6/25/13
Leads are shown in Italics

- Project resides within GSFC's Flight Projects Directorate, Planetary Science Projects Division
- Support from GSFC internal organizations, as well as NASA Headquarters, Jet Propulsion Laboratory, Kennedy Space Center, and industry partners is key
- Note that MAVEN is a University of Colorado at Boulder-Laboratory for Atmospheric and Space Physics PI-led mission, with project management coming from GSFC

Major Partner Institutions

Project Management: Principles to Success

1. Establish a clear and compelling vision
   – Create a clearly defined vision of the future that serves to inspire and motivate the project team which in turn provides an important first step in paving the road toward project success

2. Secure sustained support "from the top"
   – Develop effective working relationships with key stakeholders at all levels

3. Exercise strong leadership and management
   – Identify and develop other leaders and technical staff within the organization, define clear lines of authority and demand accountability

4. Facilitate wide open communication
   – Listen and share the good, the bad and the ugly

5. Develop a strong organization
   – Design and align culture, rewards, and structure

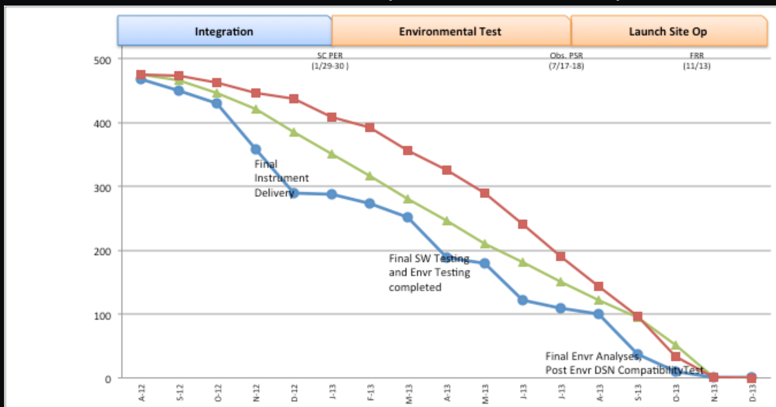
6. Manage risk/seek opportunities
   – Employ a continuous and evolving risk-management process
   – Look forward then exploit opportunities to reduce cost or schedule requirements through agile principles

7. Establish, maintain, and implement an executable baseline
   – Develop clear, stable objectives/requirements from the outset; establish clean interfaces; track changes, implement corrective actions when necessary; and maintain effective configuration control

Lessons Learned from the MAVEN Journey

- Rigorous tracking of metrics (cost, schedule, technical) is critical to keeping leadership aware of negative trends in order to react early

Verification Status (L1 & 2 Burndown)



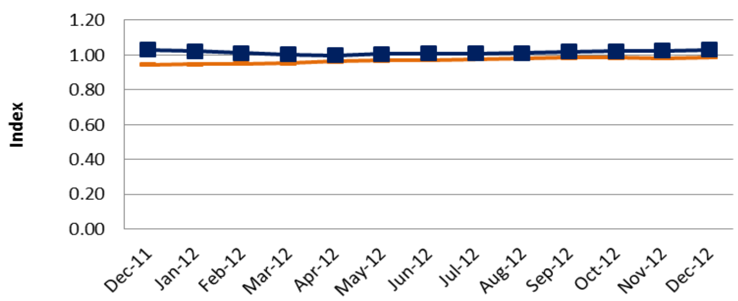
	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13
Verification Availability	469	450	431	359	290	287	274	252	189	180	122	110	100	37	10	1	1
Verif. Burndown Plan	475	466	446	421	386	351	316	281	246	211	181	151	121	95	51	1	0
Actuals	475	474	463	446	438	409	393	357	326	290	241	191	143	96	34	1	0

Chart presents the value at the end of the month

Verification Availability — Verif. Burndown Plan — Actuals

12/9/13

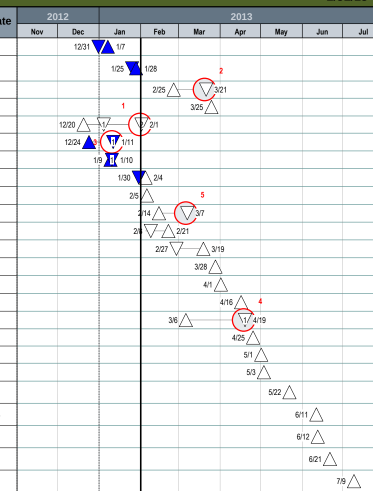
Earned Value Indices Cumulative



	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12
Cum SPI	0.94	0.95	0.95	0.95	0.96	0.97	0.97	0.98	0.98	0.98	0.98	0.98	0.98
Cum CPI	1.03	1.02	1.01	1.00	1.00	1.00	1.01	1.01	1.01	1.02	1.02	1.02	1.03

1/31/13

	MAVEN Critical Milestones	Need Date
1	NGIMS FM ready for Environmental Testing (GSFC)	1/7/13
2	NGIMS Vibration Test Complete (GSFC)	2/7/13
3	Delivery of SWEA Paylaod to LM (SSL)	3/21/13
4	Deliver NGIMS Payload to LM (GSFC)	3/25/13
5	Flight TAME Controller Available to ATLO	2/1/13
6	C&DH #1 DTCI-U Flight Spare available to ATLO (LM)	2/3/13
7	Magnetics Swing Test (ATLO)	1/10/13
8	Begin S/C Modal Survey Test (ATLO)	2/4/13
9	Re-Install TAME (ATLO)	2/5/13
10	FSW Build 5.0 Available (LM)	3/18/13
11	Begin S/C Acoustics Test (ATLO)	2/8/13
12	Begin S/C Sine Vibe Test (ATLO)	2/27/13
13	Install SWEA to Spacecraft (ATLO)	3/28/13
14	Install NGIMS to Spacecraft (ATLO)	4/1/13
15	Begin ORT 1 Test (GDS)	4/17/13
16	Begin S/C EMI/EMC Test (ATLO)	4/19/13
17	S/C Self Test #7	4/25/13
18	Begin SVT/MOI (Off-Nominal) Tests (ATLO)	5/1/13
19	Lost in Time Test (LM)	5/3/13
20	Begin Thermal Vac Test (ATLO)	5/22/13
21	Power Performance Test (ATLO)	6/11/13
22	Begin ORT 2 Launch Nominal Test (GDS)	6/12/13
23	Payload Final Performance Test (ATLO)	6/21/13
24	Dry Spin Balance Test Complete (ATLO)	7/9/13



1 - Reviewing TAME PWB coupons to determine useability
2 - SWEA is diagnosing issues with high voltage discharges.SWEA was decoupled from the PFP package and to be shipped separately.
3 - DTCI Fabrication delayed
4 - EMI/EMC Test moved to accommodate NGIMS delivery
5 - FSW 5.0 delayed to accommodate additional changes

Review	Review Held / Scheduled	Actions	Submitted	% Submitted	Closed	% Closed
RSS PER	4/10/12	5	5	100%	5	100%
PFP PER	5/22/12	7	7	100%	7	100%
NGIMS PER	10/15/12	2	2	100%	2	100%
Spacecraft PER	1/29/13	5	3	60%	3	60%
SIR	6/25/12	4	4	100%	4	100%
Electra HRCR (JPL Internal)	6/21/12	0	n/a	n/a	n/a	n/a
RSS PSR	10/24/12	1	1	100%	1	100%
PFP PSR	10/30/12	1	1	100%	1	100%
NGIMS PSR	TBD	TBD	-	-	-	-
Observatory PSR	7/16/13	TBD	-	-	-	-
MOS/GDS Peer Review	6/5/12	0	n/a	n/a	n/a	n/a
MOR	11/13/12	14	8	57%	6	43%
ORR/FOR	8/13/13	TBD	-	-	-	-
Totals		**39**	**31**	**79%**	**29**	**74%**

Lessons Learned: Planning and Scheduling

- From Phase A, top-level schedules established key milestones (Preliminary Design review, Critical Design Review, System Integration Review, Launch Readiness Date, etc.) that all organizations could use for lower level planning and pricing purposes

- It is critically important to get out of the starting blocks quickly with proper project staffing. Brought the schedule lead, financial manager, and Earned Value Management (EVM) lead onboard at the beginning of the project to design a Work Breakdown Structure (WBS)-based schedule and EVM system – costs and schedule were monitored together

- Held early face-to-face meetings with organizations supplying schedule and EVM data to set expectations and assess institutional capabilities. This created a collaborative environment

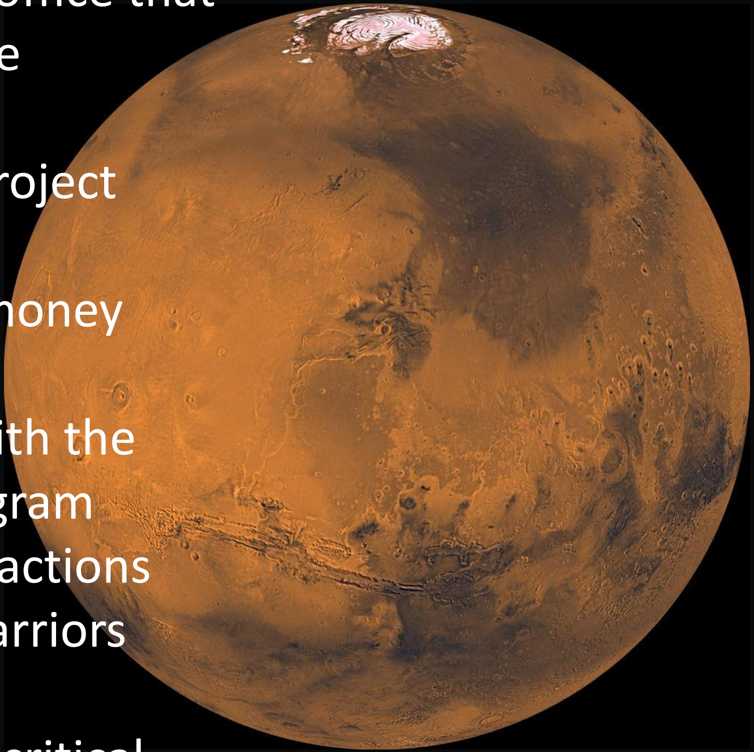
Lessons Learned: Schedule Execution

- All schedules were reviewed 30, 60, and 90 days ahead
- During each shift of key integration and test events, the product lead met with the team, quality control representatives, and the scheduler to review planned and completed activities and status
- During mission integration and test
  - At the beginning and end of every shift, team reviewed the daily and hourly schedule to prepare and execute assignments
  - Daily schedule briefings were held. The team focused on tasks scheduled for the coming days and weeks. Problems were addressed, identifying workarounds to save schedule
- The project team acted with the mindset of "schedule is king" during every phase of the mission. The team had to, given the constrained planetary launch period

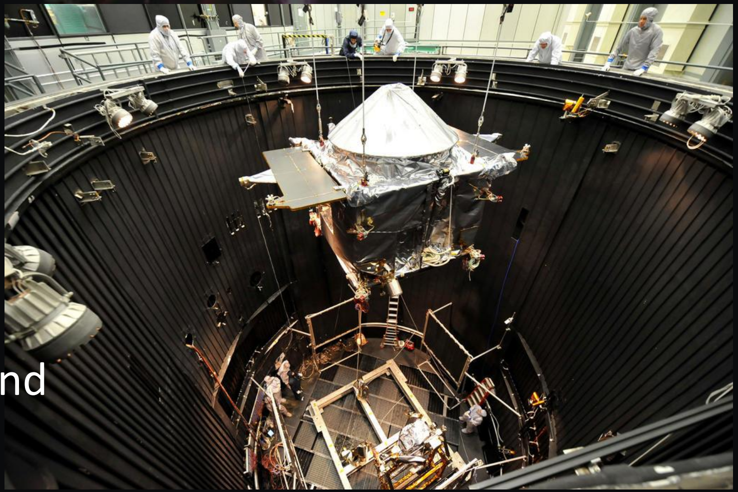
November 18, 2013

Lessons Learned from the MAVEN Journey

- Stability of leadership through the project lifecycle is critical
- Push to get front line managers in the project office that have strong hardware development experience
- Maintain a sense of urgency throughout the project lifecycle even if your mission does not have a constrained planetary launch period. Time is money
- Communicate, communicate, communicate with the project office, the PI, partner institutions, program office and NASA HQ; regular face-to-face interactions are critical. You/your team have to be road warriors
- Transparency and openness with your team is critical. You want to hear about concerns early, not days before or after launch



Lessons Learned from the MAVEN Journey



- Fight for sufficient cost reserves at the outset of the mission (and sufficient up-front funding and carryout). These cost reserves will be needed to address many of the unknowns during development
  – Pressure to cut bid price during the competitive phase was rebuffed by the Principal Investigator and the Project Manager
  – Descoped two instruments shortly before final proposal submission to ensure proper reserves
  – Execution is much more efficient when the project remains green throughout development rather than going yellow or red

- Resist requirements creep, both in the science and engineering areas
  – A solid mission was proposed and we stuck to it even under pressure from various corners (e.g., add a camera, add a student instrument, add a "free" foreign instrument)

Lessons Learned from the MAVEN Journey

- Transition into integration, test, and on-orbit operations (Phase CDE) on a project is a large effort. For a planetary project, any loss of schedule is critical. In an effort to expedite the CDE proposal process, the spacecraft contractor opened the lower level internal subsystem reviews to the Project prior to submittal of the Phase CDE proposal. The result was a delivered proposal that contained no surprises

- Negotiate partner institution Phase C-E contracts before the Confirmation Review - MAVEN retired a significant cost growth risk and bounded the overall scope of effort

- The spacecraft contractor and Project Office personnel traveled extensively together to kickoff meetings at vendor facilities. These meetings set expectations on how we wanted the vendors to operate

- Heritage systems help but just as importantly you need the matching "heritage people" building the hardware (this isn't always possible)
  - In one case, a technician who built circuit boards for previous instruments retired and the replacement tech did not implement the correct high-voltage workmanship techniques because they hadn't been documented

Lessons Learned from the MAVEN Journey

- Spending money early to retire risk significantly reduced late surprises and overruns

- There was a large amount of interest from external parties that impacted "normal" work. Be prepared for significant data requests, questions, audits. Staff accordingly

- Brought the Joint Cost/Schedule Confidence Level (JCL) independent review team into the mix with the project 6 months before the Preliminary Design Review (PDR). This was significant in relieving any disconnects in the run up to Mission PDR and Confirmation Review

Lessons Learned from the MAVEN Journey

- The first lesson in planning is that you can’t plan for everything.
  We encountered plenty of issues on MAVEN that required us to assess the impacts and move forward with Plan B. Surprises along the way:
  - Two instruments were delivered months late, during the year of launch
  - Application of a new material in a heritage system (MetGlas) and impacts in I&T. Must fully evaluate new materials and their application prior to use
  - Sequestration, with imposition of a travel cap in FY 2012 that threatened MAVEN’s approach to conducting business
  - FY 2014 furlough beginning 7 weeks before scheduled launch and how we preserved MAVEN’s full launch period
  - Removal of an instrument at the launch site for rework back at Goddard (the “Cannot Duplicate Problem” that surfaced again during launch preparations at KSC, and forced a late, tough decision)
  - Comet Siding Spring – truly an “unknown unknown” when we bid the mission in 2008. This comet was discovered in January 2013 and drove a significant amount of analysis and mitigation planning and implementation for the October 2014 encounter
- Find opportunities to team build at frequent intervals and schedule in lessons learned opportunities during every phase of development

It is difficult to say what is impossible…
for the *dream of yesterday*
is the *hope of today*
And the *reality of Tomorrow*.

- Robert H. Goddard (1882 - 1945)

Questions?