NASA
PROGRAM MANAGEMENT COUNCIL
Meeting Summary, Decisions and Actions

VITAL MEETING DATA

Date: 22 May 2018
Time: 9:30 a.m. – 2:30 p.m.
Location: NASA Headquarters (HQ), 8Q40 and ViTS
Agenda: Attached
Attendance: Attached

Opening Comments:

There were no significant opening comments made by the Chair.

First Item of Business: Mars 2020 KDP-D (Decisional)

Opening Remarks, Purpose, and Introductions

George Tahu, Mars 2020 Program Executive, summarized that the Phase C activities were completed and stated the team is seeking formal approval from the APMC for entry into Phase D. The Science Mission Directorate (SMD) recommends no changes from the Agency Baseline Commitment (ABC).

Science Overview

Katie Stack-Morgan, Deputy Project Scientist, presented the main objectives of mission as well as an overview of payload instruments and international contributions. The project has identified three potential landing sites. Mr. Jurczyk asked if the risk assessment for each site has been completed. Ms. Stack-Morgan confirmed that the atmospheric risk assessment has been completed, that the terrain risk assessment is scheduled for August 2018, and that the safety assessment and hazard review will be completed prior to the science workshop. Mr. Jurczyk also inquired on the sample return caching approach; the project will select a location from orbit in advance and pursue a walkabout strategy to assess/collect samples. The basic environments of the sites are known now, but at the scale of the rover, Mars 2020 will be getting new observations and adapting during the mission.

Project Overview/Implementation

John McNamee, Project Manager, gave a brief overview of the mission noting that the surface mission remains the same as Mars Science Laboratory (MSL) but has been qualified to 1.5 Martian years.

Mr. Wallace, Deputy Project Manager, gave an update on the assembly progress of the rover. The heatshield, manufactured for MSL in 2007-2008, experienced a circumferential crack during testing at Lockheed Martin (LM). There was no evidence of the problem in MSL and no indications on the heatshield during static testing. A Failure Review Board was convened and is focused on design transitions in the failure region. A transition from low density to high density core is believed to have that led to the vulnerability. Mr. Jurczyk asked if LM knows the mechanism that led to the change in the core density. Mr. Wallace answered that toward the shoulder of the core is a denser honeycomb shape with a flex core near the cone. Splicing the two together was challenging. It is possible that a more fitted airbag, redesigned as a lesson

learned from MSL, preferentially loaded the area and triggered the failure. The plan is to repair the heatshield and re-test it, with a plan in place to ensure the replacement heatshield meets the schedule and a senior mechanical manager assigned. There is available schedule to rebuild the shield, but not to rebuild and break again. The rework is not expected to enter the critical path.

The supersonic planetary parachute testing was successful. One more test is scheduled for the end of July 2018 which will be a higher load version of strength of canopy test.

SMD has approved a secondary helicopter payload as an acceptable, incremental risk to the mission, subject to specific conditions being met. The helicopter is acknowledged as a high risk, high reward technology demonstration which will be hosted on the rover with a "do no harm" implementation. Mr. Jurczyk commented that the helicopter is exciting and JPL did a nice job collaborating with centers, industry, and universities. Mr. Jurczyk asked about the conditions specified in the SMD decision memo approving the helicopter, specifically whether failure to meet any one condition or a combination of conditions would trigger termination. Dr. Thomas Zurbuchen, Associate Administrator for the Science Mission Directorate, responded that if any conditions are not met or if the addition harms the primary science it goes back to him for a decision.

Members discussed challenges with the nuclear launch approval process with the Department of Energy (DOE), including breakdowns in communications, with the approval process having the potential to move up the critical path. Mr. Jurczyk asked for detail on the process and whether it is the same as for MSL. James Watzin, Mars Program Director, explained DOE modified their approach to providing products. There are two Technical Interchange Meetings (TIM) this summer regarding clad testing to include gap assessment categorization and model testing. If those are passed successfully in June they will be back on track. Mr. Zurbuchen noted an action from the Directorate Program Management Council (DPMC) to make sure the launch approval process stays elevated at the highest level including to the APMC. Mr. Jurczyk acknowledged they have a good plan.

The project schedule now includes a four-month buffer as a lesson learned from MSL, which missed its first launch window in 2008. The team will be releasing some of that margin over the next eight to nine months. Mr. Jurczyk asked if there are any significant challenges with getting components from vendors for Mars 2020. Mr. Wallace responded that in aggregate, a lot of hardware matured early so they are able to deal with contractor type issues. Subsequent parts, such as the sampling system mechanical parts, are more complex. Advanced machine shops across the industrial base are saturated causing a two-month delay, which the project can absorb. Mr. Jurczyk asked if there is a dedicated person monitoring this day-to-day and week-to-week to ensure progress is being made and Mr. Wallace stated the team has identified a set of dedicated mechanical engineers to go to the machine shops weekly and meet with managers. Mr. Jurczyk asked about any challenges with foreign partners. While Norway and Spain are on track, France is building the mass spectrometer unit for the SuperCam and senior management had issues with the Centre National d'études Spatiales (CNES) which are being

resolved. Members inquired about other potential schedule risks including the status of the single isolation propellant waiver. The waiver issue was worked in 2012, but the Chief Engineer cautioned that the range had agreed only for MSL.

The project's budget has now been forward funded by SMD by moving Phase E funds forward with no change in lifecycle costs, to ensure timely work on the PIXEL and SHERLOC payloads. Andrew Hunter, Deputy Chief Financial Officer asked whether Phase E operations have been shortened as a result of the change. Mr. Zurbuchen responded that for this mission, the launch window is a greater driver than cost or technical factors, with the forward funding needed to meet the 2020 window. The reserves of Phase E had been funded higher than any mission he has ever seen, and thus he does not foresee any negative impact on Phase E. The project is finalizing the Phase E budget with a 15% project reserve.

The project stated that a current challenge is monitoring workforce: delivering quality products and then getting people off the project as products are delivered.

SRB Assessment/Project Responses

Mike Ryschkewitsch, Standing Review Board Chair, described the System Integration Review (SIR) in late February and noted the team is well positioned for the opening of the calendar 2020 launch window. He stated the schedule analysis is tricky because there are no tools that allow for a Monte Carlo analysis and they looked at the highest risk and alternate critical paths. They do have schedule flexibility. The budget rephasing allows the team to attack things based on the technical schedule. Mr. Ryschkewitsch agreed they have operated within the commitments of KDP-C. The SRB looked at the workforce not being able to roll off as quickly and identified a $25M threat and all rephasing actions are addressing that threat. Mr. McNamee stated the next gate review is in about two years at KPD-E but will work with the SRB in the interim. Mike Ryschkewitsch stated they have a very solid posture for moving forward and noted they are green across the board.

JPL and SMD Recommendations

JPL recommends moving to Phase D. JPL agrees that schedule is the highest priority, and that moving funding up from Phase E will help meet schedule.

SMD recommends moving to Phase D.

Decision

The Chair requested changes to the Decision Memo to document cost growth in payloads contributed by the Human Exploration and Operations Mission Directorate (HEOMD) and Space Technology Mission Directorate (STMD), as funded by those Directorates. With those changes, the Chair approved Mars 2020 entry into Phase D.

Second Item of Business: Wide Field Infrared Survey Telescope (WFIRST) KDP-B (Decisional)

Introduction

John Gagosian, WFIRST Program Executive, welcomed everyone and stated they are here to seek approval for moving to KDP-B. Mitigations developed after the recent Directorate PMC have reduced the cost risk going into Phase B: the team has developed descope options, specifically a decision point and alternatives for the coronagraph if it is not advanced on this mission, and an optimal funding profile to be formalized in PPBE20, and elimination of the Wide Field Instrument (WFI) Integrated Field Channel (IFC). The project believes it now has a sound technical baseline that is achievable within allocated resources.

PROJECT AND SCIENCE OVERVIEW

Paul Hertz, Director of Astrophysics, noted WFIRST is the top ranked mission from the 2010 Decadal Survey, will have a field of view 100x larger than Hubble to conduct astrophysics surveys, will likely provide humanity's best possible answers on the question of dark energy, and will expand exoplanet surveys to planets in the outer orbits around their stars, which are not observable by KEPLER and TESS.

Kevin Grady, WFIRST Project Manager, provided an overview of the observatory and each instrument as well as an expanded view of the observatory. Mr. Jurczyk asked about the approach for spacecraft servicing. The project approach is to design some capacity for future access, but not to include servicing within the project scope. Some, but not all, future operations could be done robotically with a dexterous robot.

For the two instruments on WFIRST, reserves in Phase B are a little below the requirement, but recently SMD agreed to move some funding earlier and increase reserve in Phase B. Mr. Jurczyk asked about the Basis of Estimate (BOE) for the coronagraph instrument, the wide field instrument, the instrument carrier and the spacecraft. Mr. Grady responded each subsystem lead developed bottoms up estimates for each subsystem. Some estimates were from industry and off the shelf components. They are developing estimates for labor. The project used the experience from previous missions and looked at analogs, such as the Solar Dynamics Observatory (SDO) to validate costs. On the wide field there was a similar process. For the instrument carrier, construction is very similar to the Integrated Science Instrument Module (ISIM) on the James Webb Space Telescope (JWST) which operates in much more demanding temperature. For the coronagraph, they used parametric and grass roots estimates.

Krista Paquin, Deputy Associate Administrator asked if there are any areas of higher risk compared to JWST. Mr. Grady noted WFIRST has a larger focal plane that needs to be worked early, but they have no system related issues. Mr. Jurczyk asked when the first flight detectors will arrive and Mr. Grady responded in November 2018. The wide field instrument is the critical path with the focal plane being the driver, and the project is working appropriate long lead items hard. Mr. Jurczyk indicated he is concerned about the integration readiness level and Technology Readiness Level (TRL), putting 18 detectors together. Mr. Grady responded they are working hard in that area and this summer there will be a series of tests—a cold detector,

electronic exercising at temperature and two Engineering Development Units (EDU) focal planes. Mr. Jurczyk asked if they can get data on the detectors before the Preliminary Design Review (PDR) to look at focal point issues. Mr. Grady responded they should have enough detectors to check the focal plane.

The second risk is the project requires a heavy lift launch vehicle. There are potentially four launch vehicle options in varying stages of maturity, and it is difficult to envelope the launch environments without having a vehicle selected and with some options having unknown performance. An analogy was drawn to the Terra mission in the 1990s; which did not down select until after CDR, with two of the candidate vehicles never flown. The project will likely end up significantly overdesigning structurally to compensate, however, too much overdesign will compromise on-orbit pointing responsiveness and compromise the science.

Andrew Hunter, Deputy Chief Financial Officer, asked whether the coronagraph technology demonstration and starshade-capable activity funding sources are within the cost cap and how they are allocated. The coronagraph, if confirmed, will not be maximized for performance and is within the cost cap, book-kept between SMD and STMD. Maintaining a capability for a starshade, per legislative direction, is within the cost cap and keeps the option open through a 2020 Decadal Survey recommendation.

Jeff DeWit, Chief Financial Officer, asked about risk and the performance of the contractors for WFIRST. He mentioned lessons learned from past projects and programs. Chris Scolese, Director, Goddard Space Flight Center (GSFC), stated that they don't have a prime contractor and are integrating the spacecraft at Goddard using subcontractors. This approach is cheaper than industry and the center is in control of the costs. WFIRST doesn't have a prime contractor.

Mr. Jurczyk asked about telescope heritage issues. Mr. Grady reported that they are still performing an exhaustive review of the issues. One risk is ion figuring of the mirror that is being done by Harris Corporation where the mirror was developed. Steve Jurczyk asked if the ion figuring that needs to be done is within Harris' experience base and Mr. Grady confirms it is their expertise and is routine.

Mr. Grady summarized that NASA has an amazing team in place and procurements are moving along. The team is ready to move on to Phase B.

Standing Review Board (SRB) Report and Project Response

Eleanor Silverman, SRB Chair, gave the executive summary of the SRB. The SRB found WFIRST personnel to be rigorous, well-managed and experienced. Science requirements were very well-developed with significant input from the community. The team has a combination of long standing leadership and infusion of new leadership that was fresh and showed a lot of enthusiasm without the fatigue which is a good combination of project history and new ideas.

The SRB identified no issues but did have four concerns including phasing of funding to match the cost-capped direction; complexity of the coronagraph; accommodation plans for starshade capability; and on-orbit serviceability.

Ms. Silverman noted that the risks are higher than other projects since WFIRST is cost-capped. Members discussed the necessity of maintaining a cost cap and bounding requirements during formulation. Members discussed the challenge and approach of accelerating funding within the profile while other flagship missions such as JWST are still in development. Mr. Jurczyk noted this is not the only project where NASA has proposed a plan and received different direction from Congress; the SMD will need to go year by year and monitor how things unfold both at the project and SMD portfolio level.

The project concurred that the coronagraph is at risk due to cost. The project will design to cost and do a six-month study and look for opportunities to save an additional $50M. The coronagraph will not drive the mission and has descope options available. Neither the servicing or starshade options are defined requirements, and there is agreement on what servicing and starshade assumptions are in the cost-capped baseline.

Ms. Silverman discussed the SRB cost assessment, which at this point was a quick parametric based on analogues and other model work. When excluding content not within the baseline, the estimate came in just below the cost cap. The project reviewed three independent cost estimates which support an ability to meet the cost cap at a 50% confidence level.

Mr. Jurczyk asked if there are any action items or advisories. Ms. Silverman stated the SRB gave verbal feedback to the project. Mr. Jurczyk stated he would like the project to re-run the model with SRB risks included for KDP C. Ms. Silverman stated she reviewed the green and green/yellow criteria and confirmed that the SRB finds WFIRST to be a fabulous project.

Mr. Jurczyk asked if the plan laid out for Phase B will be successful to get to launch. The team reported there are areas that can be descoped such as removing the coronagraph which is a descope option most projects don't have available. WFIRST can stay within the cost capped budget.

Mr. Jurczyk thanked Ms. Silverman and acknowledged the strong SRB team.

GSFC and SMD Recommendations.
GSFC recommends that the project is ready to enter Phase B.

SMD recommends that the project is ready to enter Phase B. Dr. Zurbuchen noted the team has the knowledge to make sure the cost and schedule work.

Mr. Jurczyk asked Mr. Cook for the JPL institutional view on the coronagraph. Mr. Cook noted they have a good plan for the coronagraph and the action is to look at what they can do to reduce the cost. There are some things that can be done, however going from a Class C to a

Class D probably won't save $50M. They are planning to come up with list of scope changes and talk with the team at GSFC.

Mr. Jurczyk gave an informal action to create a chart that compares the technical challenges of JWST and WFIRST and includes capturing programmatic differences between the two.

Decision Memo Review
Mr. Jurczyk polled the members for concurrence and all polled concur. The Chair approved WFIRST entry into Phase B.

Actions
Mr. Jurczyk assigned one action

- 05.22.2018 Action 1: Informal - Create an updated chart on the programmatic differences between WFIRST and JWST.
  - Due date: June 12, 2018
  - Assigned to: SMD

Prepared by:

(b) (6)

Robert J. Hanley
APMC Executive

Agenda
Agency Program Management Council Meeting
May 22, 2018
NASA Headquarters, Room 8Q40 & ViTS

9:30	Roll Call and General Admin	PMC Exec/Robert Hanley
9:35	Opening Remarks	NASA AA/Steve Jurczyk
Mars 2020 KDP-D (Decisional)		
9:40	Introduction/Purpose	SMD/George Tahu
9:45	Science Overview	JPL/Ken Farley
10:00	Project Overview/Implementation	JPL/John McNamee JPL/Matthew Wallace
11:00	SRB Assessment/Project Responses	SRB/Michael Ryschkewitsch SMD/John McNamee
11:20	JPL Recommendation	JPL/Michael Watkins
11:30	SMD Recommendation	SMD/Thomas Zurbuchen
11:40	Decision Memo Review & Signatures	SMD/George Tahu
12:00	Break	
WFIRST KDP-B (Decisional)		
12:10	Introduction	SMD/John Gagosian
12:25	Project and Science Overview	SMD/Kevin Grady/Jeffrey Kruk
1:10	SRB Report	NRO/Eleanor Silverman
1:25	Project Response to SRB Report	SMD/Kevin Grady
1:35	GSFC Readiness Assessment	GSFC/Chris Scolese
1:45	SMD Assessment	SMD/Thomas Zurbuchen
1:55	Decision Memo Review & Signatures	SMD/John Gagosian
2:25	Review Actions	PMC Exec/Robert Hanley
2:30	Adjourn	

AGENCY PROGRAM MANAGEMENT COUNCIL (APMC)
NASA Headquarters - 8Q40
22-May-18
MEMBERS

Position	Name	Signature
Associate Administrator	Steve Jurczyk, Acting	(b) (6)
Deputy Associate Administrator	Krista Paquin	
Chief Information Officer	Renee Wynn	
Chief Engineer	Ralph Roe	
Deputy Chief Engineer	Joe Pellicciotti	
Chief Financial Officer	Andrew Hunter (for)	
- Director, OCFO/SID	Craig McArthur, Acting	
Chief Health & Medical Officer	Gwyn Smith (for)	
Chief Safety & Mission Assurance	Terry Wilcutt	
Deputy Chief Safety & Mission Assurance	Hal Bell	
Chief Scientist	Helen Grant (for)	
Chief Technologist	Douglas Terrier, Acting	
General Counsel	Sumara Thompson-King	
Associate Administrator, ARMD	Bill Harrison (for)	
Associate Administrator, HEOMD	William Gerstenmaier	
Associate Administrator, SMD	Thomas Zurbuchen	
Associate Administrator, STMD	Prasun Desai (for)	
Associate Administrator, Mission Support	Dan Tenney	
ARC Center Director	Carol Carroll (for)	
AFRC Center Director	David McBride	
AFRC Deputy Center Director	Patrick Stoliker	
GRC Center Director	Janet Kavandi	
GSFC Center Director	Chris Scolese	
JPL Center Director	Richard Cook (for)	
JPL Deputy Center Director	Larry James	
JSC Center Director	Melanie Saunders (for)	
KSC Center Director	Amanda Mitskevich (for)	
LaRC Center Director	Clayton Turner (for)	
MSFC Center Director	Paul McConnaughey (for)	
SSC Center Director	Randy Galloway (for)	
APMC Executive	Robert Hanley	

AGENCY PROGRAM MANAGEMENT COUNCIL (APMC)
NASA Headquarters - 8Q40
22-May-18
Other Attendees and Presenters

Position	Name	(b) (6)
Administrator	Jim Bridenstine	
Deputy Administrator	VACANT	
Chief of Staff	Tom Cremins, Acting	
Associate Administrator, Strategy and Plans	Tom Cremins	
Associate Administrator, Communications	Bob Jacobs, Acting	
Associate Administrator, OLIA	Rebecca Lee, Acting	
Associate Administrator, Small Business	Glenn Delgado	
Assistant Administrator, Human Capital	Gretchen Davidian (for)	
Assistant Administrator, Procurement	Monica Manning	
Assistant Administrator, Strategic Infrastructure	Calvin Williams	
Director, NASA Management Office	Kaiser Adeni (for)	
WFIRST SMD Astrophysics Division Deputy Director	Andrea Razzaghi	
SMD Associate Deputy AA for Programs	Camille Alleyne	
WFIRST Deputy Project Manager	Catherine Peddie	
WFIRST Deputy Project Manager, Resources	Christine Steeley	
Mars 2020 HEOMD Program Executive	Christopher Moore	
WFIRST SMD Cost and Schedule Analyst	Craig Tupper	
Mars 2020 Deputy Program Executive	Dave Lavery	
WFIRST SMD Director of Flight Projects, GSFC	David Mitchell	
Mars 2020 Planetary Science Div Deputy Director	David Schurr	
STMD Program Executive	Dayna Ise	
ARC Chief Engineer	Dean Kontinos	
OSMA	Deirdre Healey	
OACS Director	Dennis Boccippio	
SMD Deputy AA	Dennis Andrucyk	
WFIRST SMD HQ Program Scientist	Dominic Benford	
SRB for WFIRST	Eleanor Ketchum	

AGENCY PROGRAM MANAGEMENT COUNCIL (APMC)
NASA Headquarters - 8Q40
22-May-18
Other Attendees and Presenters

Position	Name	(b) (6)
WFIRST Standing Review Board Chair (National Reconnaissance Office)	Eleanor Silverman	[redacted]
Enterprise Risk Team Lead	Frank Petersen	
Mars Program Manager	Fuk Li	
OCFO/SID	Garth Henning	
SMD Cost and Schedule Analyst	Gary Rawitscher	
WFIRST Deputy Director, GSFC	George Morrow	
Mars 2020 HEOMD Program Executive	George Tahu	
OSMA	Gerry Schumann	
WFIRST SMD Deputy AA for Programs	Gregory Robinson	
Senior Advisor to the Assoc Administrator	James Ortiz	
Mars Program Director	James Watzin	
HEOMD AES Division Director	Jason Crusan	
OACS Senior Analyst	Jeff Beyer	
WFIRST Project Scientist	Jeffrey Kruk	
Mars Planetary Science Division Director	Jim Green	
WFIRST Program Executive	John Gagosian	
Mars 2020 Project Manager	John McNamee	
SMD Deputy Chief Engineer	Joseph Gasbarre	
WFIRST SMD Chief Engineer	Joseph Pellicciotti	
Mars 2020 Deputy Project Scientist	Kathryn Stack Morgan	
SMD WFIRST Review Manager	Keith Chamberlin	
Mars 2020 Project Scientist	Ken Farley	
WFIRST Deputy Project Manager	Kenneth Anderson	
WFIRST Project Manager	Kevin Grady	
Office of the Administrator, Senior Advisor, Technical	Lisa Guerra	
WFIRST OCFO Representative	Mark Hill	
WFIRST Mission Systems Engineer	Mark Melton	
Deputy Center Director GRC	Marla Perez-Davis	
Mars 2020 Deputy Project Manager	Matthew Wallace	

AGENCY PROGRAM MANAGEMENT COUNCIL (APMC)
NASA Headquarters - 8Q40
22-May-18
Other Attendees and Presenters

Position	Name	(b) (6)
Mars 2020 Lead Mars Scientist	Michael Meyer	
Mars 2020 SRB Chair	Michael Ryschkewitsch	
Mars 2020 Program Scientist	Mitch Schulte	
Exec Assist to the Deputy Assoc Admin	Natalie Simms	
WFIRST HQ Program Analyst	Omana Cawthon	
SMD Astrophysics Division Director	Paul Hertz	
WFIRST SMD Chief S&MA Officer	Peter Panetta	
SSC	Randy Galloway	
Principal Advisor for Enterprise Risk Protection	Raynor Taylor	
Deputy Mars Program Manager	Roger Gibbs	
WFIRST SMD Deputy AA for Programs	Sandra Connelly	
WFIRST SMD OCFO Representative	Tracy Osborne	
Mars 2020 HEOMD Program Executive	Victoria Friedensen	
Lead Science Analyst, Budget Division, OCFO	Sean Mccarville	
OCFO/DCFO/Approp	M.D. Kerwin	
Planetary Scienc	David Schum	
Planetary Science, Dir	Lori Glaze	
~~Lisa Pratt~~ Planetary Protection Officer	Lisa Pratt	
Principal Advisor Ent Protect	RAY TAYLOR	
ASST Associate Hqo	Norm Knight	
OACS Support, Total Solutions	Fatima Senghore	
OACS Support, Total Solutions	Diane Clayton	
OACS Support, Total Solutions	Sophia Bogat	
OACS Support, Total Solutions	Lisa Connell	