James Webb Space Telescope
Independent Review Board

Assessment Report and NASA Response

Presented to Committee on Astronomy and Astrophysics

March 26, 2019

Webb IRB* Charter

Assess the implementation of the IRB recommendations.

* *Independent Review Board (IRB)*

Webb IRB Members

Thomas Young, (Chair)
William F. Ballhaus
Steven Battel
Orlando Figueroa
Fiona Harrison
Michele King
Paul McConnaughey
Dorothy Perkins
Peter Theisinger
Maria Zuber

Dan Woods (Review Manager)
John Karcz (Executive Secretary)

Review Methodology

Structured Reviews

Informal Sessions

Personal Interviews

Formal Cost/Schedule Analysis

IRB Deliberations

Assessment Defined

Appropriate – The response, including future activities, fully addresses or exceeds the IRB recommendation, maximizing the probability for mission success.

Appropriate with additional work needed – The response largely addressed the IRB recommendation, missing a few key elements critical to maximizing mission success.

Inadequate – The IRB recommendation was not adequately addressed.

Summary and Conclusion

- JWST is an observatory with incredible capability, awesome scientific potential and significant complexity, risk and first-time events.
- JWST has a demanding level of work yet to be accomplished requiring continuous focus on mission success.
- The Webb IRB report dated May 31, 2018 contains 32 recommendations intended to maximize the probability of JWST mission success.
- NASA, Northrop Grumman and the Space Telescope Science Institute have developed a response to the Webb IRB recommendations.
- The Webb IRB overarching observation is that the response is high quality and comprehensive.
- The responses to 29 of the 32 recommendations are assessed to be “Appropriate” or “Appropriate with additional work needed”.
- Three responses are judged to be “Inadequate”.
    - Mission Success Dependence on Launch Vehicle (1 recommendation).
    - JWST Reporting (2 recommendations).
- This concludes the Webb IRB activities. Any further review of JWST will be determined by NASA.
- The Webb IRB maintains its belief that JWST should continue based on its extraordinary scientific potential and critical role in maintaining U.S. civil space leadership.

Mission Success Dependence on Launch Vehicle

Recommendation

LSP [Launch Services Program] shall be accountable for JWST launch success at the same level of responsibility they have for U.S. launches, or NASA should contract with Aerospace Corporation for similar accountability.

Assessment

Inadequate.

Observations

Ariane's launch mission success record is comparable to U.S. provided launch vehicles of the same class.

Interactions between NASA and the European Space Agency (ESA) have resulted in LSP participation in additional and key reviews conducted by ESA, and, where ESA has agreed to provide data and information to LSP system engineers as appropriate, better understanding the logic and rationale for decisions.

LSP informed the IRB that they are unwilling to accept accountability for launch mission success. This puts the NASA Administrator in the position of accepting launch mission success risk without the full benefit of NASA's launch expertise.

The IRB recognizes that utilizing an international launch vehicle dictates unique circumstances, however the IRB believes that the importance of JWST requires that LSP do everything possible to be accountable for launch success.

Alternate Opinion

A minority view exists that NASA's response is appropriate since NASA has achieved accountability (in spirit) and significant insight to make risk informed decisions about the launch vehicle.

JWST Reporting

Recommendation

Implement JWST reporting structure as represented by accompanying diagram.
(See diagram in JWST IRB Report, May 31, 2018)

Assessment

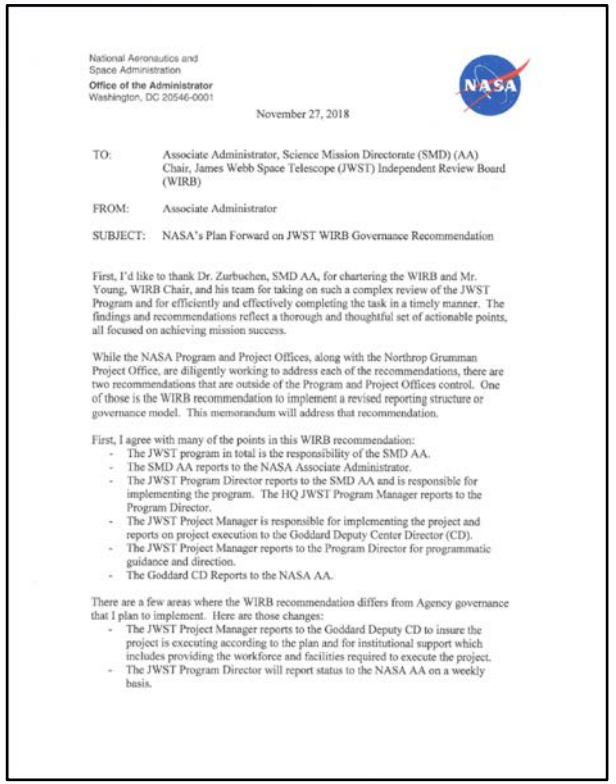
Inadequate.

Observations

The NASA response to the "JWST Reporting" recommendation is documented in the memorandum from the NASA Associate Administrator dated November 27, 2018 with the subject "NASA's Plan Forward on JWST WIRB Governance Recommendation."

Establishing the Science Mission Directorate (SMD) Associate Administrator (AA) as responsible for the JWST Program in total is consistent with the IRB recommendation.

The reporting relationships for the SMD AA, the JWST Program Director and the JWST Program Manager are consistent with the IRB recommendation.



National Aeronautics and Space Administration
Office of the Administrator
Washington, DC 20546-0001

November 27, 2018

TO: Associate Administrator, Science Mission Directorate (SMD) (AA)
Chair, James Webb Space Telescope (JWST) Independent Review Board (WIRB)

FROM: Associate Administrator

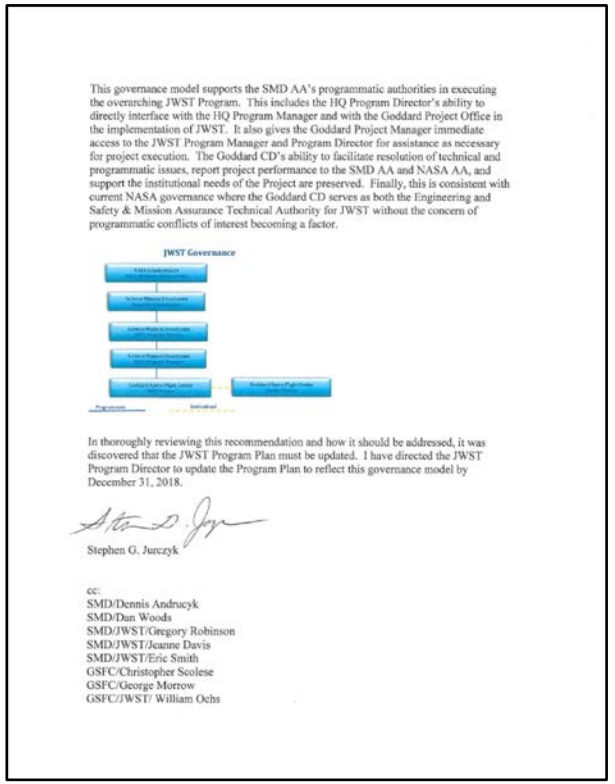
SUBJECT: NASA's Plan Forward on JWST WIRB Governance Recommendation

First, I'd like to thank Dr. Zurbuchen, SMD AA, for chartering the WIRB and Mr. Young, WIRB Chair, and his team for taking on such a complex review of the JWST Program and for efficiently and effectively completing the task in a timely manner. The findings and recommendations reflect a thorough and thoughtful set of actionable points, all focused on achieving mission success.

While the NASA Program and Project Offices, along with the Northrop Grumman Project Office, are diligently working to address each of the recommendations, there are two recommendations that are outside of the Program and Project Offices control. One of those is the WIRB recommendation to implement a revised reporting structure or governance model. This memorandum will address that recommendation.

First, I agree with many of the points in this WIRB recommendation:
- The JWST program in total is the responsibility of the SMD AA.
- The SMD AA reports to the NASA Associate Administrator.
- The JWST Program Director reports to the SMD AA and is responsible for implementing the program. The HQ JWST Program Manager reports to the Program Director.
- The JWST Project Manager is responsible for implementing the project and reports on project execution to the Goddard Deputy Center Director (CD).
- The JWST Project Manager reports to the Program Director for programmatic guidance and direction.
- The Goddard CD Reports to the NASA AA.

There are a few areas where the WIRB recommendation differs from Agency governance that I plan to implement. Here are those changes:
- The JWST Project Manager reports to the Goddard Deputy CD to insure the project is executing according to the plan and for institutional support which includes providing the workforce and facilities required to execute the project.
- The JWST Program Director will report status to the NASA AA on a weekly basis.



This governance model supports the SMD AA's programmatic authorities in executing the overarching JWST Program. This includes the HQ Program Director's ability to directly interface with the HQ Program Manager and with the Goddard Project Office in the implementation of JWST. It also gives the Goddard Project Manager immediate access to the JWST Program Manager and Program Director for assistance as necessary for project execution. The Goddard CD's ability to facilitate resolution of technical and programmatic issues, report project performance to the SMD AA and NASA AA, and support the institutional needs of the Project are preserved. Finally, this is consistent with current NASA governance where the Goddard CD serves as both the Engineering and Safety & Mission Assurance Technical Authority for JWST without the concern of programmatic conflicts of interest becoming a factor.

JWST Governance

In thoroughly reviewing this recommendation and how it should be addressed, it was discovered that the JWST Program Plan must be updated. I have directed the JWST Program Director to update the Program Plan to reflect this governance model by December 31, 2018.

Stephen G. Jurczyk

cc:
SMD/Dennis Andrucyk
SMD/Dan Woods
SMD/JWST/Gregory Robinson
SMD/JWST/Jeanne Davis
SMD/JWST/Eric Smith
GSFC/Christopher Scolese
GSFC/George Morrow
GSFC/JWST/ William Ochs

JWST Reporting

Observations (cont'd)

The IRB interpretation of the memorandum is that the GSFC Center Director is not responsible (including accountability and authority) for all aspects of the JWST project reporting to the SMD AA. Additionally, the JWST Project Manager does not report to the GSFC Center Director. This role for the GSFC Center Director is not consistent with the IRB recommendation.

The judgment of the IRB is that restricting the involvement of the Center Director as specified in the NASA Associate Administrator's memorandum will significantly reduce the probability of JWST success including cost, schedule and in-flight performance. Aside from the JWST Project Manager, the GSFC Center Director is in the best position to assure successful execution of the approved program. The Center Director controls the resources required to formulate and execute such a complex space system development effort. The belief of the IRB is that the Center Director is an extraordinary resource that should be fully utilized in the implementation of JWST.

An observation of the IRB is that the governance model identified in the November 27, 2018 memo is inconsistent with NASA Policy Directive 1000.0B which states that "Center Directors are responsible and accountable for all activities assigned to their Center."

JWST Reporting

Recommendation

Revise NASA policy directive consistent with recommendation.

Assessment

Inadequate.

Observations

The NASA decision contained in the November 27, 2018 memorandum from the NASA Associate Administrator is not consistent with the IRB recommendation.

Launch Date

Recommendation

The Webb IRB recommends the launch date be established as March 2021 (based upon the Project's 5/18 assessment of the impact of the membrane cover assembly acoustic anomaly).

Assessment

Appropriate with additional work needed.

Observations

Since the IRB's May 2018 assessment of JWST's launch date, the project has completed the MCA recovery plan and SCE vibration testing. The preparation and execution of the SCE vibration testing consumed more margin than expected by the IRB. It is the judgement of the IRB that the added time was warranted to ensure the successful completion of the SCE vibration test.

The Project has made a variety of improvements that positively impact schedule management going forward:

- Project has performed engineering audits, risk reduction testing, and established a Commissioning Manager to work risk mitigation in advance of and during I&T.
- OTIS and SCE had an earlier opportunity to coordinate for integration purposes (in parallel with recovery work vs. as part of I&T flow).
- Project has increased the presence of RDEs on the floor, which helps with real-time resolution of issues/potential issues (i.e., "decision makers") and overall work efficiency.
- GSFC has a larger engineering on-site staff at NGAS and has incorporated more people on the floor for oversight.
- Process documents have been updated to incorporate lessons learned and reduce process escapes.

Launch Date

Observations (cont'd)

- I&T training and certification has been implemented (i.e., approximately 1800 hours invested to modernize training and 5600 training hours completed).
- More participation of relevant personnel in table-top reviews.
- NASA and NGAS are promoting the theme of "ensuring mission success" by allowing flexibility for workforce to stop work pending any unclear processes or potential issues. Mitigating risks before they become problems generally results in less impact to the schedule.
- NASA Project Management is getting the help it needs from NASA senior management through more interaction in management communications (e.g., more meeting opportunities for NASA Project Management to interact with levels of senior management all the way up to the NASA AA).

Work Still Needed

The IRB has not repeated the May 2018 in-depth programmatic analysis. Because greater than planned schedule reserve has been utilized, the IRB recommends that the in-depth analysis be updated and the NASA management team and the SRB continue to closely monitor schedule and cost performance and programmatic risk.

NASA Response to Webb IRB Assessment

National Aeronautics and
Space Administration

Headquarters
Washington, DC 20546-0001

Reply to Attn of: Science Mission Directorate February 28, 2019

NASA response to the Webb Independent Review Board recommendations implementation assessment

On February 8, 2019, the Webb Independent Review Board (IRB) provided their final briefing to NASA on their assessment of NASA's implementation of the recommendations from their report dated May 31, 2018. Of the 32 recommendations, the IRB deemed implementation of 21 of the recommendations as appropriate, 8 as appropriate with additional work needed, and 3 as inadequate.

Examples of appropriate implementation include enhancing the existing sunshield testbed/simulator that will allow the project to better assess potential problems in the flight sunshield deployment. Corrective actions have been taken to reduce the likelihood of human mistakes by improving processes and training, ensuring personnel certification is complete for complex or critical tasks, and ensuring individual accountability is stressed in the workplace. Another area deemed appropriate by the IRB included an extensive review of both closed and open risks, ensuring that the project fully understands and communicates risks as they move forward in the development phase. To better improve communication, a structuring of key meetings and participation to be more inclusive of all levels of management has been implemented to ensure that consistent and timely information is provided on technical and programmatic status, risks and issues.

NASA agrees with the additional work still needed for the eight items that were identified by the IRB, as they represented work planned but not completed at the time of review. Some examples include ensuring that the newly appointed JWST Commissioning Manager engages with experienced experts outside the project to incorporate any lessons learned to JWST on orbit commissioning. The JWST Project and Program are improving communication with the public and science community on current status, technical issues and accomplishments. The project and program will ensure that communication processes and protocols for pre-launch, launch and post-launch activities and products are clearly defined in the JWST communication plan. Also, an in-depth schedule risk assessment will be conducted within the next three months and reported to senior NASA management.

For the three areas that were deemed inadequate, the responses are provided below.

Recommendation: LSP [Launch Services Program] shall be accountable for JWST launch success at the same level of responsibility they have for U.S. launches, or NASA should contract with Aerospace Corporation for similar accountability.
Response: NASA does not believe that it is possible or prudent for LSP to be "accountable" for the Ariane 5 launch vehicle. The European Space Agency (ESA) and Centre National D'Etudes Spatiales (CNES) are the design and qualification authorities for the Ariane 5 launch vehicle and are the most appropriate organizations to ensure these activities are performed correctly; their managers, engineers and technicians are the experts for this launch vehicle. The Ariane 5 launch vehicle has a proven record, with 103 successful launches with only 2 catastrophic failures (the last of which occurred over 15 years ago).

The IRB recommendation has helped strengthen the partnership between NASA LSP and ESA's Ariane 5 Program. NASA and ESA have agreed to have LSP experts participate in specific technical activities to enhance NASA's insight into the qualification and monitoring of the Ariane 5 launcher. Senior Systems Engineers from LSP will participate in key ESA reviews to better understand the thoroughness of ESA's and CNES' decision logic related to the production of the launch vehicle for JWST. LSP will also review documents that define ESA and industry practices as well as specific analysis related to the JWST launcher. All of these activities will increase NASA's insight in the production and launch of the Ariane 5 vehicle that will launch JWST.

Recommendation: Implement JWST reporting structure as represented by accompanying diagram. (See diagram in JWST IRB Report, May 31, 2018).
Response: The governance model as described in the Nov 27, 2018, memo from the NASA Associate Administrator (AA), in response to the IRB recommendation, defines the most appropriate programmatic authorities for executing the JWST mission. This is consistent with the Agency governance model with programmatic authority and accountability held by the Science Mission Directorate (SMD) Associate Administrator. The AA has elevated reporting for key positions with the JWST Program Director reporting directly to the SMD AA and the JWST Project Manager reporting directly to the Goddard Space Flight Center (GSFC) Deputy Center Director. The AA is also ensuring that communications at all levels of JWST and NASA management are clear, continuous, consistent, and open, including weekly meetings with SMD and Goddard leadership, and the JWST Program Director and Project Manager.

Recommendation: Revise NASA policy directive consistent with recommendation.
Response: The governance model for JWST complies with the current NASA directive.

We want to thank the Board members for their thorough assessment and thoughtful consideration of all of the hard work by the JWST team to address the recommendations. We truly believe that mission success was enhanced by this activity. We all look forward to the day when the discoveries made by this incredible observatory will enrich our understanding of the universe.

Thomas H. Zurbuchen, Ph.D.
Associate Administer
NASA Science Mission Directorate

Stephen G. Jurczyk
Associate Administrator
National Aeronautics and Space Administration