

PSD Facilities Program Review

April 11, 2016

The four experimental facilities supported by PSD — the Reflectance Laboratory (RELAB), Ames Vertical Gun Range (AVGR), Glenn Extreme Environments Rig (GEER), and Planetary Aeolian Lab (PAL) — were reviewed in early FY2016. Each review was conducted by an expert Review Panel and led by a Group Chief. Also present were the overall Panel Chair (Dr. Stephen Mackwell), the NASA lead for the facilities (Ms. Doris Daou) and representatives of the appropriate NASA disciplinary field. Each panel was provided with review objectives and criteria focused on assessing best practices and lessons learned in the operation of a NASA-supported Facility. In addition, the Review Panels were specifically instructed not to make findings or any comments regarding funding levels.

The structure of each review was essentially the same, with a presentation by the Facility leadership team, followed by a Q&A session between the Review Panel and the Facility team, closed discussion amongst the Review Panel, and then follow-up Q&A with the Facility leadership team. The Review Panel was charged with writing a report that identified each Facility's Strengths and Weaknesses, and conclude with the Findings and Comments to the Facilities leadership and to NASA. All were reviewed by the Facilities Program Officer, Ms. Doris Daou; and signed off by Planetary Research Director Dr. Jonathan Rall and Planetary Science Division Director Dr. James Green.

The summary report is released and published on the SARA and the Facilities' Websites. In addition, each Facility has also received their individual Review Panel's report and has been asked to address the weaknesses as their current budget cycle allows.

Review of currently funded SMD Planetary Facilities

Stephen J. Mackwell, USRA-LPI – Panel Chair

February 18, 2016

Overview

The Planetary Science Division (PSD) within NASA's Science Mission Directorate (SMD) currently provides funding for staffing and infrastructure of four facilities that perform technical and scientific activities for members of the Planetary Science community. These facilities include:

- Reflectance Experiment Laboratory (RELAB) at Brown University in Providence, RI
- Planetary Aeolian Laboratory (PAL) at NASA Ames Research Center in Mountain View, CA
- Ames Vertical Gun Range (AVGR) at NASA Ames Research Center in Mountain View, CA
- Glenn Extreme Environments Rig (GEER) at NASA Glenn Research Center in Cleveland, OH

Reviews of each facility were performed in early FY2016 at the NRESS Facility in Arlington, VA. Each review was conducted by a specialist Review Panel, led by a Group Chief. Also present were the Panel Chair (Dr. Stephen Mackwell), the NASA lead for the facilities review (Ms. Doris Daou) and representatives of the appropriate NASA disciplinary fields. The structure of the reviews was essentially the same, with a presentation by the Facility leadership, followed by questions and answers from the panels, closed discussion among the panel membership, and follow-up questions and answers with the Facility leadership. The Panels were provided with criteria and objectives for this review, which focused on assessing lessons learned and best practices in support of the Facilities. They were charged with writing a report with Strengths and Weaknesses, Findings and Comments to the Facilities leadership and to NASA, all of which are appended at the end of this document. In addition, the Panels were specifically instructed not to make findings or any comments regarding funding.

Panel Reviews

Details of the four Review Panels are provided below, and in more detail in the appended review panel reports:

Planetary Aeolian Facility (PAL)

- Panel Review - October 12, 2015
- Dr. Ralph Lorenz (Johns Hopkins University – Applied Physics Laboratory) – Group Chief
- Dr. Lynn Neakrase (New Mexico State University) - Panelist
- Dr. Laura Kerber (Jet Propulsion Laboratory) - Panelist
- Dr. Stephen Mackwell (Lunar and Planetary Institute) – Panel Chair

Reflectance Experiment Laboratory (RELAB)

- Panel Review – October 14, 2015
- Dr. Vicky Hamilton (Southwest Research Institute) – Group Chief
- Dr. Jeff Johnson (Johns Hopkins University – Applied Physics Laboratory) - Panelist
- Dr. Paul Lucey (University of Hawaii) - Panelist
- Ms. Elizabeth Fisher (University of Hawaii - student) – Executive Secretary
- Dr. Stephen Mackwell (Lunar and Planetary Institute) – Panel Chair

Glenn Extreme Environments Rig (GEER)

- Panel Review – November 16, 2015
- Dr. Natasha Johnson (NASA Goddard Space Flight Center) – Group Chief
- Dr. Sushil Atreya (University of Michigan) – Panelist
- Dr. Allan Treiman (Lunar and Planetary Institute) - Panelist
- Dr. Stephen Mackwell (Lunar and Planetary Institute) – Panel Chair

Ames Vertical Gun Range (AVGR)

- Panel Review – November 16, 2015
- Dr. Kevin Housen (Boeing Corporation) – Group Chief
- Dr. Fred Hörz (Jacobs Engineering) – Panelist
- Dr. Dan Durda (SwRI-Boulder) – Panelist
- Dr. Stephen Mackwell (Lunar and Planetary Institute) – Panel Chair

Summary Findings

While the individual Panel Reports document many strengths and weaknesses that are specific to the facility under review, many of the findings pertain more generally and can be grouped into specific areas for consideration of all Planetary Science Facilities.

1. User Community – all of the reviewed facilities have both in-house and external individuals and groups that make use of the facility. Nonetheless, several of the facilities are dominated by in-house researchers and past students of in-house researchers. The narrow user base is partly a product of the finite size of the appropriate discipline but also results from poor dissemination of information on the nature and availability of the facility.

2. Uniqueness of Facility – the existing facilities all possess capabilities that, at some level, are not replicated elsewhere in the country but provide critical functionality for future scientific and mission activities. In several cases, creation of new facilities, should the existing ones be closed, would present significant financial challenges. This is especially true for existing facilities that leverage other local infrastructure and shared personnel.

3. External Interface – current facilities generally do poorly in communicating facility capability, availability and mechanisms for access. They also do not provide adequate indications of the importance and successes of the facility in support of NASA science and missions. In particular, web sites are generally poorly designed and lack critical information, such as a facilities manual, information on how to apply for access, publications resulting from use of the facility, roles in

mission activities and technology development, and highlights of recent research. The facilities also generally lack a visible presence at appropriate meetings and conferences, and do not run workshops or training events for potential new users.

4. Management – in general, management of the facilities is provided at minimal cost to the facility budget, allowing only modest time commitment from management personnel. Such a model can result in management by staff that has appropriate administration skills but neither the scientific nor technical knowledge/background appropriate to the facility. This deficiency can hamper reach into the broader user community, result in sub-optimal maintenance of web-based outreach tools and reduce effectiveness of review of user proposals.

5. External Advisory Boards – external advisory boards populated by members of the scientific or technical community knowledgeable about the facility, its operation and requirements have not generally been used by the existing facilities. Such groups can provide review of user proposals for access (although there is a real concern about conflicts of interest as the user communities are often quite small), as well as review requirements for infrastructure maintenance and potential upgrades. They are also able to provide support and advice for facility management in outreach activities.

6. Internal Infrastructure – onsite personnel that are highly knowledgeable about the instrumental and experimental capabilities of the facility is critical for support of external users. In a number of cases, existing facilities have staff members with unique knowledge and skills but no mitigation strategy should that person no longer be available. As Planetary Facilities are generally fairly narrowly focused and operate on modest budgets, potential loss of critical technical personnel is a serious concern.

7. Maintenance and Upgrades – several of the facilities under review are imbedded in organizations that use, provide maintenance, and upgrade existing infrastructure at no or minimal cost to the PSD Facility. In these cases, maintenance and operations staff does not necessarily require full support.

8. Financial Considerations – there is no standardized approach to financial operation of the existing facilities. While this partially reflects the diversity of users from both within and outside the planetary sciences, the extent to which planetary science users pay for facility access, infrastructure and personnel costs from their own grants has not been well-defined.

Comments to NASA

Based on these summary findings, we identified a series of lessons learned resulting in a list of best practices to improve the performance of existing facilities and provide a blueprint for future facilities.

1. User Community – existing and new facilities must demonstrate a broad user base that has a clear interest in using the facility beyond in-house scientists and technologists. Each Facility must also endeavor to assess its community's needs and provide a plan on how to support them.

2. Uniqueness of Facility – while a facility does not necessarily need to be unique within the US, facility leadership must provide justification for and demonstrate why facility support is needed

relative to hourly user fees (paid from research grants), as are used for many analytical instruments.

3. External Interface – all facilities should have a strategy to provide potential users and others with information about the facility. In particular, a web presence is necessary that provides potential users with information on facility resources, how to propose for access, and the conditions attached to usage. The web site should also document and archive facility usage and productivity. If appropriate, facilities should also run training workshops at the facility or associated with major meetings to inform potential users of the resource and facilitate access for new users. Presentations during and coordination of facilities related sessions at appropriate major meetings are also an effective way to communicate the existence and capabilities of the facility.

4. Management – management of the facility must be engaged in the scientific and technological aspects of the facility, and preferably be a user of the facility. They must also be prepared and able to commit the time and energy needed to manage the facility and its interface with the external community of current and potential users.

5. Advisory Boards – advisory boards or committees composed of a modest number of senior members of the user community can provide support and advice to facility management on allocation of resources, potential upgrades, and management of the user/community interface. Such a board would meet periodically (quarterly or every 6 months), in person or virtually. The roles for the advisory board membership are likely to vary between facilities.

6. Internal Infrastructure – all facilities should have a succession plan for all key personnel, especially including critical technical support staff.

7. Maintenance and Upgrades – where possible, facilities should leverage non-planetary science usage of the facility and personnel to increase efficiency and minimize dead-time.

8. Financial Considerations – facilities should seek an optimal model for operations that potentially includes user fees for facility access paid from user grants.