Sounding Rocket Working Group

National Aeronautics and Space Administration

Meeting of July 12-13, 2023

Findings

1. Plan to Hire Civil Servant Mission Managers as "Term Hires" is Very Concerning

Summary

The Sounding Rocket Program Office (SRPO) decided several years ago to require that all mission managers be civil servants to ensure that their expertise would be maintained within the NASA work force as part of the long-term national reservoir of knowledge inherent to the sounding rocket program. The SRWG was consequently alarmed to learn that Wallops is being instructed to bring on new mission managers as "term hires" without the guarantee of a permanent position. Aware that hiring guidelines are imposed on the SRPO by agency policies beyond their control, we urge the SRPO to explore every possible avenue to obtain authority to offer permanent positions to new mission managers, and, at the very least, to be able to convert such term hires to permanent positions after a two-year probation, instead of the nominal six-year term that was announced at the SRWG meeting.

Background

Mission managers are among the most critical and respected positions within the Sounding Rocket program. In preparing for the new NSROC-4 contract, the Sounding Rocket Program Office (SRPO) decided several years ago, with concurrence from Center management, to require that all mission managers be civil servants to ensure that their expertise would be maintained within the NASA work force as part of the long-term national reservoir of expertise inherent to the sounding rocket program. The SRWG was consequently alarmed to learn that Wallops is being instructed to bring on mission managers as "term hires" without the guarantee of a permanent position.

The new operational plan baselined in the NSROC-IV contract involves moving the Mission Manager role to the SRPO office. These positions must be full civil servant positions in order to both maintain existing in-place long-term experienced personnel and attract high-quality new personnel. Recently announced NASA hiring limitations force the Centers to limit the number of new civil-servant FTEs. This limitation conflicts with the intent to transfer current NSROC-mission-manager positions to SRPO permanent civil-servant mission-manager positions.

The SRWG urges the Wallops SRPO to work with NASA upper management to acquire the authority to offer permanent positions for new Mission Manager hires. At the moment, new hires will come with 6-year "terms" after which permanent positions may or may not be offered. A successful LCAS program requires permanent mission managers per the agreed-upon "new paradigm" to switch the SR mission management to civil servants in order to keep the corporate

knowledge at NASA regarding how to carry out its highly successful sounding rocket program. Further, this will enable the program to attract the finest managers as new hires and avoid high turnover rates which would impede the program.

If there is no alternative to the term hires, we urge that these term appointments be converted to permanent positions as early as after Year 2, rather than the default Year 6. Accordingly, there must be a plan in place to convert the term hires easily and in a timely fashion to permanent positions.

2. Shifting Operations Personnel to the Science Operations Center at Poker Flat

Summary

Recently the SRPO has proposed moving many of the launch Ops team from the blockhouse to the Science Operation Center (SOC) on the "upper range" at Poker Flat Research Range. This would bring flight operations at Poker in line with other launch sites in which the core Ops management team and the science PI and their team are co-located. The changes would also reduce the number of personnel from the launch danger zone in the blockhouse. While these changes are generally positive from an operations standpoint, the SRWG is concerned that there may be unintended and unforeseen consequences which might impede the quality of scientific research carried out at the SOC. For example, rocket missions that focus on the aurora and aeronomy require close scrutiny of geophysical conditions during dark skies and would be hampered by light contamination of optical instruments resulting from added vehicle traffic. Furthermore, added personnel in the SOC can cause distractions that could potentially cause missed launch opportunities. As this new plan is still being evaluated, the SRWG requests that a task force of PIs that use the Poker Flat Research Range be included in discussions of changing the Ops configuration at Poker in order to optimize planning from the scientific research perspective. In particular, PIs should be informed of the final personnel configuration planned for the SOC prior to arriving for the field campaigns, and boundaries and rules must be established to optimize the scientific launch decisions as well as the research data gathering methods, which often persist for several hours prior to, and after, a sounding rocket launch.

Background

The infrastructure at Poker Flat has grown organically over its 50+ year history, with most of the original buildings now replaced with those built during the Poker Flat Upgrade in the early 1990s. After that upgrade, the division of personnel on range during launch operations has been as follows: all payload engineering and flight ops personnel in the blockhouse, the telemetry team in the telemetry building, and the science teams typically located in the Science Operations Center (SOC) at the top of the hill. The separation of the flight ops team and PI is different from other ranges, e.g., at Wallops, White Sands, Andøya, and Esrange where the PI and ops team are co-located at least within the same building if not within the same room. The choice for the science team location at SOC was driven by the desire of the PIs to be able to observe the development of auroral and upper atmospheric conditions in a quiet, dark location at the top of the hill. Locating the ops team in the blockhouse was originally driven by a concern to optimize communications between mission manager and the launch officer. Improved reliability in communications has

reduced this concern, and advances in auroral observations infrastructure (most data feeds are available as web pages) has freed up significant room in the SOC.

An expansion in operations positions has resulted in the limited blockhouse space becoming more crowded. Based on this and a desire by NASA safety to move non-essential personnel out of the immediate danger zone, which includes the blockhouse, there has been a proposal to move much of the ops team from the blockhouse to SOC. Such a move would facilitate face-to-face conversation between the PI and Ops team since traversing the distance between the blockhouse and SOC results in a ~30-minute investment of time by either party. The Mission Manager location must be discussed, with advantages of staying with the ops team as well as the blockhouse.

On the other hand, the SOC was designed as an optical observatory with the expectation that it would support science research teams, not a larger contingent that included operations personnel. The water and wastewater infrastructure are limited, sometimes being exhausted even with just the science teams during long launch windows. Scientific instruments, both supporting the launch as well as other research, can be affected by overuse of internal lights as well as headlights (many rental cars require headlights to be on while driving) and flashlights. While science team members are likely not to be moving while there are favorable conditions, Ops team members may have reason to transition to the TM and downhill locations during portions of the count, risking light contamination in all-sky cameras and other instruments that are used to make a launch decision.

Description and assessment of options

The figures below show the portions of the SOC that are being considered and are appropriate for hosting Ops members. One is the conference room (room 118) on the ground floor (Figure 1), which is nominally 25’ x 25’, or 625 square feet of open floor space. The other is the “Science

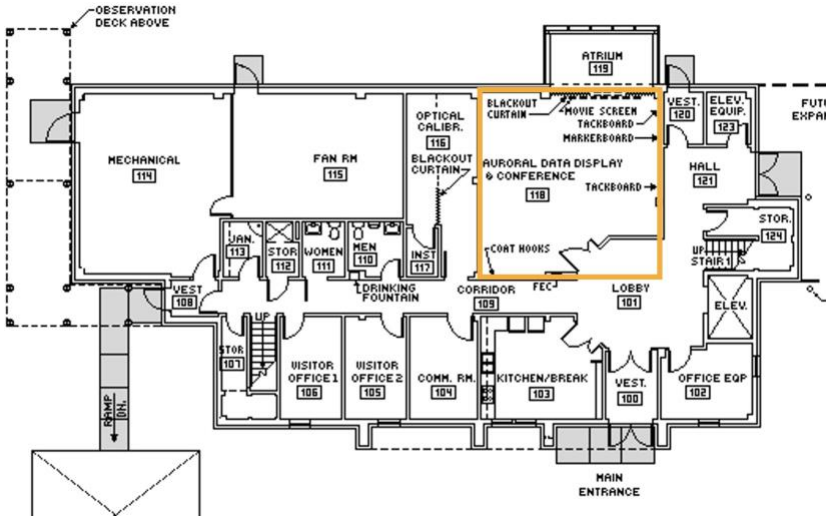

Figure 1 – Ground floor of the Science Operations Center showing the conference room (orange rectangle), which is one alternative for accommodating Ops personnel at SOC.

Operations Manager” space on the 2nd floor (room 201, Figure 2) which is 40’ x 18’, or about 720 square feet of open floor space. The space used by the PI science team(s) is also shown in Figure two in the blue rectangle.

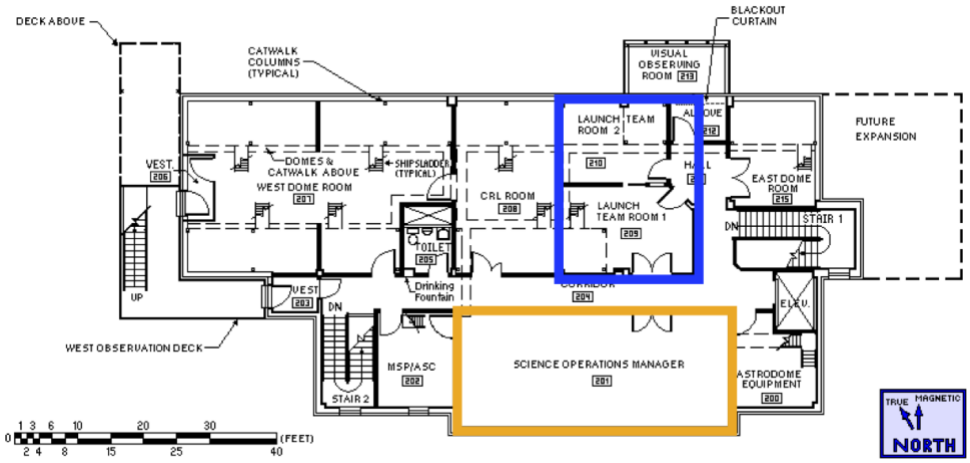

Figure 2 – Second floor of the Science Operations Center showing the PI launch decision rooms (blue rectangle) and the Science Operations Manager room (orange rectangle), which is another alternative for accommodating Ops personnel at SOC.

The table below outlines what are perceived as pros and cons, unranked, and from several stakeholders, for several options for the location of the Ops team at Poker Flat. Besides remaining at the blockhouse or moving to the SOC, another idea would be for the Ops team to use the Data Lynx building which is also on the top of the hill, but separate from the SOC.

Location of Ops Team	Pros	Cons
Remain at blockhouse	^ No impacts on science operations at SOC ^ No costs for any modifications to SOC	^ Continued crowding in blockhouse ^ Time for Ops team and PI to meet for face-to-face conversations (~30 min)
SOC Science Operation Manager (201) or Conference room (118)	^ PI, PM, and MM are located in the same building fostering immediate face-to-face communications ^ Permanent presence by SRPO enables justification for SOC infrastructure funding via NASA contract	^ Increased dust and light pollution from additional vehicles at SOC. ^ Increased light pollution from activities within SOC affecting optical domes ^ Potential for science team distraction ^ Loss of space for other activities at SOC, e.g., science logistics (camera ops) and education (summer schools) ^ Separation of SRPO and NSROC teams
RAC option 1, use Manager and visitor office, or conf. room	^ No significant construction required ^ Less travel time for Ops personnel once on range	^ Reduces range staff resources ^ Time for Ops team and PI to meet for face-to-face conversations (~30 min)
RAC option 2, build add-on outside of break/conference room	^ Dedicated space does not impact existing functions and activities at RAC	^ Significant construction costs required
Addition to SOC	^ Dedicated space for Ops, adjacent to PI team, with less impact on SOC activities	^ Significant construction costs required

3. **Establishing a Scientific Radar at Wallops**

Summary

The SRWG is pleased to learn that plans to bring a scientific radar to Wallops are being considered in earnest. Such a radar would provide an indispensable tool for observing the ionosphere at the Wallops location providing a significant asset which would provide simultaneous measurements which would augment sounding rocket research of a variety of geospace phenomena during both daytime and nighttime conditions. Importantly, the radar measurements would be used for context of the rocket observations and provide input for launch decisions. We urge Wallops management to continue to explore the possibilities and feasibility of establishing a permanent scientific radar at the Wallops Fight Facility, including the possibility of a bi-static radar with Millstone Hill.

Background

The SRWG appreciates the presentation at its most recent meeting pertaining to the feasibility of establishing a scientific research radar at Wallops. Such a radar would provide an indispensable tool for observing the ionosphere at the Wallops mid-latitude location providing a significant asset which would augment sounding rocket research of a variety of geospace phenomena during both daytime and nighttime conditions. Examples of science topics include the daytime dynamo currents, traveling ionospheric disturbances, mid-laitude "spread-F" ionospheric depletions and turbulence, intense neutral winds of unexplained origin, and penetration electric fields associated with geomagnetic storms. Importantly, the radar measurements would be used for context of the rocket observations as well as provide input for launch decisions.

When coupled with sounding rocket launches, such rocket/radar observations would open new opportunities for mid-altitude ionospheric research, while also providing a permanent observatory for other research projects, including support of NASA's GDC mission. Such a radar would also fill a gap in the meridional chain of Millstone Hill and Jicamarca radars, created with the unfortunate recent demise of NSF's Arecibo incoherent scatter radar in Puerto Rico. The recent study suggesting operating the existing SPANDAR radar at Wallops in a bi-static mode with Millstone Hill has considerable merit and we look forward to further progress reports pertaining to possible incoherent and coherent scatter scientific radars to be established at Wallops.

In summary, the SRWG is pleased to learn that plans to bring a scientific radar to Wallops are being considered in earnest. We urge Wallops management to continue to explore the possibilities and feasibility of establishing a permanent scientific radar at the Wallops Fight Facility.

4. Plans to Maintain a Steady Supply of FTS Ordnances

Summary:

The SRWG is concerned about the status of flight termination systems for launch operations at White Sands Missile Range. There is a dwindling supply of "paddle" FTS systems currently in use by the sounding rocket program and these are projected to be exhausted this coming fall. The SRPO and NSROC should be commended for identifying a stop-gap measure, i.e., a commercial FTS ordinance (Pac Sci 832552-03) already in use at WSMR on other programs. However, the Pac Sci system may pose additional risk to payload recovery if the FTS is utilized. A new FTS (called the Versatile Linear Shape Charge) has been in development for many years by the sounding rocket program that would solve the ordinance supply chain issues as well as having a much longer shelf-life. The SRWG strongly encourages the sounding rocket program to pursue a multi-pronged approach to a solution to the current FTS issue. In the short term, the SRPO is encouraged to examine the risk of the Pac Sci system on payload recovery and whether it is practical to implement additional mitigations to protect the payload. In addition, we urge the SRPO to accelerate the development of the replacement FTS system as its highest priority technology development program. In addition, the longer shelf-life of the new FTS system could enable the sounding rocket program to maintain a multi-year inventory that will hopefully preclude another inventory crisis. The sounding rocket program is strongly encouraged to do so.

Background:

Flight Termination Systems (FTS) are required for sounding rockets flown at White Sands Missile Range, as well as some other locations, depending on the vehicle. Furthermore, the FTS systems must undergo a rigorous approval process at WSMR. Keeping the FTS system approved, up-to-date, and in-stock has proven to be a challenge for the sounding rocket program, particularly over the last 15 years. The sounding rocket program has risen to this challenge multiple times and has kept operations at WSMR from grinding to a halt. However, that was not without compromise. In 2011, we had to temporarily switch to an expensive Orbital Systems FTS system that posed additional risk to the payload recovery due to qualification of an updated FTS required by WSMR. In 2016, the SRWG was informed of the development of a new FTS system that would replace the "Paddle" design currently in use and that inventories of the current FTS would be reduced. We are currently experiencing supply chain issues with the ordinance paddles in the operational FTS, and the new FTS is not yet operational. It is projected that the "Paddle" FTS inventory will be exhausted in Fall of 2023.

New ordinance paddles have been on order since at least 2021, with delivery delayed until at least December 2024. A new temporary solution has been identified by Wallops of utilizing a Pac Sci system already in use at WSMR. However, this system may pose additional risk to the payload during recovery. In the short term, the SRPO is encouraged to investigate if any mitigations can be developed to protect payloads from the Pac Sci FTS system. In the longer term, the SRWG strongly encourages the SRPO to substantially accelerate the development of the new FTS system that has been in development since at least 2016. The new system appears to not be subject to the same supply chain issues and has the added benefit of having a 10-year shelf life. The SRWG believes that the new system coupled with a significant multi-year inventory is the only viable long-term solution to supply chain risks and uninterrupted operations at WSMR.

5. Implementation of a Common Launch Site Vacuum System

Summary

Maintaining a payload vacuum environment is a critical requirement of numerous sounding rocket experiments, frequently encountered in Solar and Astrophysics missions, as well as some Geospace instrumentation. Having a common design Launch Site Vacuum System (LSVS) as a standard option would be of great benefit to many of these programs. The SRWG applauds the "new technology" arm of the SR program for recognizing the LSVS's value to the SR community and urges its further development as a high priority.

Background

Operating at wavelengths <180nm, oxidation-sensitive coatings, molecular contamination, high voltage (HV) turn-on timing and arcing avoidance are all common concerns that require an adequate vacuum environment to effectively mitigate. Additionally, launches with large, thin foil filters require vacuum conditions to survive the acoustic environment of launch. Several research programs simply can't afford their own mobile pumping station, while others have custom systems that are not always fully vetted for use on a launch rail. Even for those that can, some of the most cumbersome and uncertain time periods for maintaining a payload vacuum environment are while on the rail and the downtime pre-launch, post-arming. Further, the ability to monitor end-to-end payload health and gather data up to launch and/or at low altitudes (during accent) would be greatly beneficial to many SR research programs.

A highly capable and common design LSVS that is easily adaptable to researchers (user friendly), with the ability to be used on all launchers, would be optimal. Additional features of importance, for the LSVS to consider in its development, identified thus far by SRWG, include:

1) **Payload Coupling Valve and Extraction Method:** standardized design and maximize pre-launch time on vacuum (e.g., breakaway, or automated valve-off de-coupling). This is especially critical as there is a lot of testing that goes into this critical event of the extraction that can only be simulated when actually on the rail; therefore this leads directly to test from personnel at the range.
2) **Cleanliness:** e.g., A high-conductance check valve on LSVS, allowing researcher supplied coupling bellows tube to isolated payload from potential LSVS contamination concerns. Additionally, cleanliness requirements of the system should be verified before/after every mission, e.g. RGA, to ensure cleanliness of the LSVS system
3) **LSVR Power & Conductance:** i.e., Can the LSVR pump down a typical large payload volume to high-vacuum and in an adequate time?
4) **Connectivity:** Established and dedicated GSE lines and other support equipment from the pump, down the launcher, and to the blockhouse.

The SRWG anticipates that some experimenters may have valid circumstances that require use of their own vacuum system on the rail, and thus, LSVR should be an option and <u>not</u> a new requirement. In other words, it is critical to avoid the creation of a new safety requirement that mandates LSVS use in the future.

6. Peru Campaign Planning

Summary

The SRWG is thrilled that significant progress is being made with respect to a future Sounding Rocket Campaign in Punta Lobos, Peru. The Wallops work on this new foreign campaign is exemplary and their proactive stance to bring this long-awaited campaign to fruition reflects well on the program's ability to carry out remote campaigns "where the science is". We look forward to learning results from their upcoming site visit and stand ready to provide any support required from the science community standpoint to ensure mission success.

Background

The SRWG is pleased that great progress is being made with respect to a Sounding Rocket Campaign in Punta Lobos, Peru. The Wallops work is exemplary and their proactive stance to bring this long-awaited campaign to fruition reflects well on the program's ability to carry out remote campaigns "where the science is".

We look forward to learning results from their upcoming site visit and stand ready to provide any support required from the science standpoint to ensure mission success.

The SRWG both acknowledges and thanks Wallops for their work thus far on this upcoming campaign, including their proactive stance in bringing this important research project to fruition. The SRWG fully supports this new campaign and stands ready to provide whatever science support might be needed to help bring it to fruition.

NASA Sounding Rocket Working Group

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