Sounding Rocket Working Group

National Aeronautics and Space Administration

Meeting of February 11-12, 2025

Findings

1. Concerns Regarding Program Funding and Recognition of Strong Support for the Rocket Program in the Recent Heliophysics Decadal Survey

Summary

The Sounding Rocket Working Group (SRWG) continues to have profound concerns regarding the financial health of the sounding rocket program as conveyed to us by NASA HQ at the last two meetings. We are particularly concerned about impending budget cuts to the program and the fact that the approved FY27 manifest requires additional funding at Wallops in order to be carried out as planned.

In view of these concerns, we underscore the strong support for NASA's Sounding Rocket Program in the recently released Heliophysics Decadal Survey by the National Academy of Sciences. Indeed, the report emphasized the importance of the program for producing new instruments and leaders for PI-led orbiter missions, as well as the importance of exploring the mesosphere and lower ionosphere/thermosphere, for which direct or *in situ* sampling can only be carried out with sounding rocket platforms.

Due to the enormous interest in the research and technology development options provided by this program, as reflected in the significantly increased number of proposals in response to the last solicitation, we urge both NASA HQ and the Program Office at Wallops to: (1) secure the necessary overguide funding to complete the currently approved manifest, (2) bring to fruition the long-sought remote sounding rocket campaign in Peru, and (3) accommodate as many new start investigations that funding will allow.

Background

The Sounding Rocket Working Group (SRWG) remains very concerned about impending budget cuts to the rocket program as discussed during the last two meetings. Despite this, we are buoyed by the words of support for the program from NASA HQ that were conveyed during the recent SRWG meeting, as well as the strong support cited in the Heliophysics Decadal Survey issued by the National Academy of Sciences in December 2024. The report highlighted the fact that suborbital projects

> "…have provided significant achievements both independently focusing on targeted research questions and as complementary elements in support of larger missions. In addition, the program has advanced instrument concepts for future explorer and strategic missions and expertise in the solar and space physics community."

The report not only noted that the highly successful Sounding Rocket and Balloon programs are important for science, instrument development, and training but also stated:

> "The support and expansion of these programs is vital to producing a future set of instrument-providers and leaders for NASA PI-led missions."

Further, the Heliophysics Decadal report emphasized the importance of exploring and understanding the mesosphere and lower thermosphere/ionosphere for which the only means for direct sampling of these regions is that achieved with sounding rockets. These, and many other strengths of the rocket program are essential to advancing research within the Science Mission Directorate at NASA.

Although NASA HQ informs us that we are currently "not in an optimistic budgetary landscape", we note that NASA's sounding rocket program remains over-subscribed with the scientific research communities across the country in Astrophysics, Solar Physics, and Geospace and continues to earn unparalleled commendation for its singular achievements in scientific research, technological innovation, and education/training. Indeed, this is reflected in the fact that the number of proposals for new Heliophysics missions increased by 50% compared to last year, as reported to our working group at the meeting. These missions represent high return on investment for the agency, with cutting edge science and technology demonstrations achieved for a fraction of other mission class costs. Accordingly, despite the budgetary realities, we strongly recommend that NASA find ways to invest in as many possible new starts that can be accommodated by available funding and the Sounding Rocket Program Office at Wallops. In particular, we urge that the necessary overguide funds to complete the currently approved FY27 manifest be secured and that the long-sought, critically important remote sounding rocket campaign in Peru be carried out as planned.

2. **FTS Ordnance Supply**

Summary:

The SRWG continues to be concerned about the status of flight termination systems for launch operations at the White Sands Missile Range (WSMR). The supply of "paddle" Flight Termination Systems (FTS) has been exhausted, with upcoming missions instead using ordnance with the potential for damage to the science payload. This could lead to significant costs in equipment and personnel resources for payload teams that the paddle charges have effectively avoided in the past. Although we commend the SRPO and NSROC for identifying this commercial stop-gap measure which has enabled science flights to continue from WSMR, this solution will be exhausted in the near future. Since there are no identified alternatives, the lack of available FTS units effectively halts operations at WSMR and much of the Astrophysics and Solar research programs.

The new Versatile Linear Shape Charge FTS has been in development for many years by the sounding rocket program and could solve the ordnance supply chain issues. However, the completion of this system has been hindered by the fact that the personnel leading this effort are also burdened with the current FTS supply chain issues and stopgap measures. We urge the SRPO to accelerate 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.

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. The sounding rocket program has risen to this challenge multiple times and has kept the program at WSMR operational. However, that was not without compromise. Multiple stop-gap measures have been needed to account for parts obsolescence and changes in qualification requirements. The ultimate solution is the new "Variable Linear Shape Charge" (VLSC) system that has been in development for several years. However, SRPO is currently experiencing supply chain issues with the ordnance paddles in the operational FTS, and the new VLSC is not yet operational. Accordingly, the paddle inventory has now been exhausted.

New ordnance paddles have been on order since at least 2021, with the delivery timeframe delayed due to vendor priority for DOD orders. 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. Although the SRPO has investigated potential mitigations to protect payloads from the Pac Sci FTS system, these are untested. Furthermore, the Pac Sci systems are no longer available to the program and there is no viable alternative. Without delivery of ordnance for the original paddle design, operations at WSMR will cease in the near term causing major disruptions to the Astrophysics and Solar research programs. The SRWG strongly encourages the SRPO to substantially accelerate the development of the new VLSC FTS system that has been in development for several years. 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.

3. Effect of Proposed New "Work Rules" on Field Operations

Summary:

The SRWG is greatly concerned that potential new "work rules" may substantially disrupt field operations. The proposed new rules that were shared with us during the February 2025 Sounding Rocket Working Group Meeting purport to apply the current work rules as "door-to-door" hours rather than "on-site" hours. This has the potential to substantially reduce the efficiency of field operations, with arguably the opposite of the intended effect, i.e. increasing rather than decreasing the stress on field personnel.

Background:

It is our understanding that the current work rules that apply to all personnel involved in Sounding Rocket Program field operations, restrict the number of hours/day, the number of contiguous work days, and the number of allowed overtime hours. However, this has been applied to time-on-site, i.e. the time spent at the job site, just like any other employment. The SRPO reported at the SRWG meeting that the new rules being promulgated by the NASA chief medical officer, are to apply these to "door-to-door" hours instead of onsite hours so that the effective on-site work time will be significantly curtailed. For sites that do not have local housing, WSMR and PFRR for example, the work-day could decrease by several hours or additional "down days" will be required. We have

seen no evidence that this will significantly improve safety, but it will absolutely increase the days-in-the-field for all personnel. Days-in-the-field place additional stress on personnel, families, and the other payloads that are waiting in-line for field operations. This has the additional effect that there will have to be a new metric for choosing housing for all field personnel. To minimize disruption to field operations, all personnel will have to choose housing based solely on commute time. For WSMR, this means staying on-base, which can be quite limiting.

The SRWG is greatly concerned about the additional stress and burden to personnel and the significant decrease in operational efficiency caused by these work rule changes and strongly urges the SRPO to work with the chief medical officer to maintain the current rules regarding on site work. We are confident that a proper evaluation of the effect of work site rules, comparison to other job sites, and a full consideration of all of the unintended consequences will merit a return to on-site hours as the appropriate metric for work rules for sounding rocket operations. Accordingly, the SRWG believes that this will provide the best overall advantages for healthy, efficient, and robust field operations which are a vital part of the sounding rocket program.

4. Optimizing Wind Weighting Measurements at Poker Flat

Summary

Acquiring accurate, real-time wind weighting measurements at the required above ground altitudes at Poker Flat are essential for making the necessary corrections to the rocket launcher settings prior to lift-off and thus ensuring safe launches. Gathering such wind data at Poker Flat continues to pose challenges, although solutions appear to be feasible. Although aware that the SRPO is working on solutions to this problem, given its criticality for successful science launch decisions, the SRWG again stresses the importance of pursuing all available solutions in order to solve this ongoing challenge.

Background

Acquiring accurate, real-time wind weighting measurements at the required above-ground altitudes in the atmosphere at Poker Flat are essential for making the necessary corrections to the rocket launcher settings prior to lift-off and thus ensuring safe launches. This is an absolutely critical requirement that must be carried out on a reasonably fast cadence to enable launch decisions to be made particularly when scientific conditions are changing rapidly. Aware that this is a problem that SRPO is working, the SRWG nevertheless wishes to stress the importance of considering a variety of solutions addressing those problems for which remedies appear to be straightforward.

Our suggestions regarding several outstanding problems/challenges associated with the wind weighting measurements at Poker Flat include:

1) Either restore or replace the existing high altitude (300 foot) tower deemed currently inoperable. This will preclude the need for repeated balloon probes at low altitudes, particularly when the winds are variable and a launch appears to be imminent.

2) Ensure that the performance of the anemometers on the existing low altitude (150 foot) tower wind measurements be made more reliable. We understand that accurate measurements must be made at a fast cadence (every 5-minutes) to be ingested real-time into the wind weighting

software. During the most recent auroral campaign at Poker Flat (Jan-Feb 2025), some of the anemometers on the wind tower were deemed inoperable due to ice buildup and thus could not provide reliable wind measurements. Unfortunately, they could not be repaired in a timely manner necessitating that the launch operations stand down for an entire night. This happened to be the night with the best aurora of the whole campaign, and ultimately was responsible for having one rocket left on the rail at the end of the window.

3) Explore obtaining a commercial lidar system for gathering the necessary wind weighting measurements. For example, the Lidar Research group at the University of Alaska has provided information regarding a possible commercial lidar system provided in this link: https://www.vaisala.com/sites/default/files/documents/WEA-UWE-ProductSpotlight-Windcube-for-EPAs-B212421EN-A.pdf. This solution should be seriously considered with respect to the altitudes that the lidar can cover, its accuracy and performance during low cloud ceiling conditions, and its cost to the program.

4) Solve the problem of GPS-sondes interfering with the Poker Flat Incoherent Scatter Radar (PFISR) or return to the radar-tracked balloon sondes. It is now well documented that the use of GPS-sonde balloons has the potential to require that PFISR be turned off during critical pre-flight operations. However, many geospace missions require continuous PFISR measurements of the ionospheric plasma environment, before, during and after the launch. Surely a sonde for balloons can be designed that works without interference with PFISR. Alternatively, we note that the previously-used radar-tracked passive balloons did not have this issue. Could the radar used for the balloon tracking (or a new replacement radar) be returned to Poker Flat to facilitate the balloon tracking? This would solve this problem.

Although we recognize that SRPO is aware of these issues with respect to wind weighting at Poker Flat, AK, the SRWG urges that the general problem of wind-weighting data input be given renewed priority. This is especially true for the Geospace rockets that launch from Poker Flat, where it is challenging enough to get the acceptable geophysical conditions and who can't afford to miss launch opportunities when they appear.

5. Status of the Heliostat at WSMR

Summary

The heliostat at White Sands, on which many solar payloads rely, is currently not functional. As outlined below, this extended light source is an essential tool for many reasons, including verification of alignment and focus. We request an update of the heliostat status at White Sands as well as input regarding what resources would be needed to complete any repairs to ensure that this resource is available for upcoming missions.

Background

The heliostat at White Sands is currently not functional, on which many solar payloads rely. This extended light source provides a single tool to verify alignment and focus, which is done prior to environmental tests to verify the experiment made it to WSMR without any of the optics shifting, and post environmental test, to quantify any optical shifts in their experiment due to these tests. The Heliostat also verifies LISS alignment to the experiment reference, again both pre- and post-environmental testing. Heliostats enable solar missions to perform their alignments in their home labs, so a consistent source at WSMR would be ideal.

During the SRWG meeting, questions were asked regarding the status and recovery plan for the existing heliostat. Unfortunately, the responsible personnel working this issue from WSMR were not available to provide an update. Accordingly, we request a status update, including a feasibility plan and schedule regarding when a functional heliostat might be made available, anticipating that the funding/resources/personnel will be available to perform this work.

There are at least two upcoming solar missions that would use the Heliostat during pre-flight integration and testing: SNIFS (Chamberlin) on July 17, 2025 and EVE (Woods) on July 24. The heliostat will be used for focus, alignment, and LISS/experiment alignment. Although both payloads are assessing alternate solutions to verify the experiment alignment/focus, a working WSMR heliostat that has been used in the past is by far the preferred option.

6. Exploring Alternate Launch Sites

Summary

During the Feb 2025 sounding rocket working group meeting, two presentations were outlined possible new launch sites that are not part of the current stable of SRPO launch facilities. First, the Geophysical Institute, Univ. of Alaska Fairbanks, and the Alaska Aerospace Corporation (AEC) presented the capabilities of the Kodiak Launch facility, operated by AEC, as well as a possible launching platform on the north shore of Alaska. Second, The Spaceport Company gave a presentation on their mobile ocean-based launch platforms already in use including some future planned platforms. The SRWG appreciates the update on expanding launch opportunities and encourages the SRPO to continue discussions with these and other launch facilities that would enable new science opportunities.

Background

The history of scientific sounding rocket launches includes a wide variety of launch sites, including early launches (1950s and 1960s) from ocean vessels. These enabled rocket launches at a great variety of geographic and geomagnetic locations with a wide range of local times, and significantly expanded our understanding of the upper atmosphere and near-Earth space. Such a diverse set of launch locations is highly desirable. Although remote launches are a hallmark of the sounding rocket program, given limited budgets, SRPO must limit the number and locations of remote campaigns that can be supported each year in addition to its limited stable of "standard" launch locations.

We salute the SRPO for being responsive to desires for expanded launch sites, including the recent campaign in Australia to access southern hemisphere astrophysical targets, and plans for a return to the Punta Lobos, Peru to address pressing equatorial aeronomy research. The two presentations at the winter 2025 SRWG meeting show that the recent expansion in commercial space endeavors may bring renewed opportunities for launch sites that could be used by SRPO missions. Recent interest in sub-auroral phenomena, including STEVE, SAPS, SAIDs make the Kodiak launch facility very attractive. Having a mobile marine launcher could potentially enable simultaneous, but separated in longitude, launches from mid-latitudes (Wallops) or at the equator (in conjunction with Punta Lobos), to uncover important new physics inherent to the ionosphere and upper atmosphere, such as equatorial ionospheric depletions and turbulence and mid-latitude structures.

Going forward, we envision two possible next steps. First, where feasible, the SRPO might assess the capabilities of these facilities and determine if they present viable platforms for SRPO to conduct launch activities. Where feasible, a positive assessment could be communicated to the SRWG who might then work with the broader research community to discuss possible new launch sites. Second, the SRWG would be happy to work within their respective communities to determine what new science might be explored with an expanded set of launch sites. These activities would inform SRPO and NASA HQ regarding recommendations for expending resources to develop new launch site capabilities.

NASA Sounding Rocket Working Group

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