Sounding Rocket Working Group

National Aeronautics and Space Administration

Meeting of January 14-15, 2020

Findings

1. Embracing the Increased Sounding Rocket Flight Rate as the "New Normal"

Summary

The SRWG applauds the fact that NASA's Sounding Rocket Program has experienced an increase in new starts with significant numbers of high "mission complexity level" payloads. Further, it appears as if this situation will continue as the "new normal", based on this support from NASA HQ and the strong recommendations from high level advisory panels to NASA HQ to not only support but also expand the Sounding Rocket Program. In view of these solid endorsements, the SRWG urges the Sounding Rocket Program Office at Wallops to put in place arrangements to embrace the increased flight rate/complexity levels, particularly with respect to the NSROC contract and subsequent staffing and space concerns identified in previous findings. For example, if the baseline number of rockets stipulated in the new NSROC contract were to increase, NSROC would have additional support to alleviate its overburdened staff as well as expand facilities, concerns that the SRWG learns about every meeting. Furthermore, from the standpoint of actually launching the rockets, increased operations support is needed, not only for carrying out remote campaigns but also for including Poker Flat as a standard range available to the community every year, in concert with Wallops Island and White Sands.

Background

As discussed in a similar SRWG Finding from one year ago, the most recent Heliophysics Decadal Survey (2013) called for a substantial increase in sounding rocket flight rates for Solar and Geophysics missions via its DRIVE initiative (DRIVE = Diversify, Realize, Integrate, Venture, Educate). Similarly, and in parallel, the Astrophysics Decadal Survey (2010) specifically called for increased funding for suborbital programs (rockets and balloons) in support of science, technology development, and student training. This good news has been reflected with increased overall flight rates in the program in the last three years with high mission complexity levels.

The SRWG is thrilled with the solid endorsement of the program from the community and the positive response from NASA HQ, particularly over the past several years. As this posture appears to be the "new normal", the SRWG urges the Sounding Rocket Program Office (SRPO) to work with NASA HQ so that the program support accommodates this new model in terms of personnel, payload systems, and facilities, rather than simply manage these needs as an "overguide" request each year. In this regard, this finding mirrors Finding #1 from the SRWG meeting of February,

2019, in which concerns were raised regarding the need to increase NSROC support staff and working space in Building F-10 at Wallops, as we also learned at that meeting of the overburdened staff and cramped facilities. We are particularly eager to learn if the new model will be reflected in the next NSROC contract.

As representatives of the sounding rocket community, the SRWG is eager to engage with the program office at Wallops in any way possible to help ensure that the new mission model is accommodated with solid program support from NASA HQ.

2. **Communicating Technology Developments**

Summary

The SRWG applauds the continuing efforts of the Sounding Rocket Program to develop useful new technologies for the sounding rocket program. Whereas the SR Technology Roadmap is impressive, we suggest that such new technologies might be used more effectively and efficiently if communication within the user community concerning their availability were improved, perhaps via a webpage readily accessible to the community. We further recommend including increased opportunity for user input in the early stages of the development, for which the SRWG seeks to work with SRPO.

Background

The SRWG applauds the continuing efforts of the Sounding Rocket Program to develop useful new technologies and capabilities for the sounding rocket program. Although we remain extremely pleased that the SRPO maintains a new technology roadmap, we believe that these new technologies could be more effectively and efficiently put to use if: (1) there were more communication with the user community about their availability, and (2) there were more opportunities for user input in the early stages of the development.

Along these lines, we suggest that the SRPO "New Technology Roadmap" be readily accessible to the community via a webpage which clearly identifies four different categories for the endeavors under development:

1. New capabilities under consideration for development
2. Development projects in progress: current state and expected performance
3. Projects completed and undergoing flight qualification with an estimate of readiness date, conditions for use, etc.
4. New capabilities available for proposed payloads or payload upgrades. These would eventually belong in the Sounding Rocket Handbook, but that can't be updated often enough to substitute for this.

It further appears to the Working Group that soliciting user input early in the process will help optimize the capabilities of the new technology being developed. This approach would be most sensible for technologies with broad impact to the community.

The current SPARCS upgrade serves as a good example. The SPARCS upgrade is already underway, as we learned during the meeting. The SRWG (representing the community at large) seeks to work with the SRPO to help identify which of the specifications and new features are most important. Accordingly, we are collecting input from current SPARCS users concerning which specifications are important for them and what new features or performance improvements would be useful, which will then be passed on to the project.

Indeed, the Technology Roadmap could include a means to solicit user input, including perhaps a "wish list" of subsystems that researchers would like to have. Although the SRPO has always been very responsive to new ideas and suggestions, some in the user community may not be aware of how to suggest new ideas and/or communicate them to Wallops. Including an appropriate means within the Technology Roadmap web site (perhaps providing an email contact within the SRPO for those wishing to discuss new ideas/comments) would provide a vehicle for new ideas to be put "on the table" for subsequent evaluation by the SRPO of their practicality, breadth of use, cost considerations, etc.

3. Engineering Support for Solar and Astrophysical Telescope Payloads is Thin

Summary

The SRWG is concerned that there appear to be inadequate numbers of engineers at the White Sands Missile Range (and elsewhere) who are available to assist with solar and astrophysical telescope sounding rockets that require fine pointing and uplink commands. At present, a very small number of engineers is available with the necessary expertise to enable these key capabilities which are required for successful launches, including those at White Sands, Australia, and possible other locations.

Background

The SRWG is concerned that there appear to be inadequate numbers of engineers who are available to assist with solar and astrophysical telescope sounding rockets that require fine pointing and uplink commands.

For solar launches, the command uplink and SPARCS subsystems are both required. During the proposed solar flare campaign, for example, two rockets will be launched, each requiring command uplink and SPARCS subsystems. It does not appear that there is adequate engineering coverage of these two subsystems to allow for two simultaneous solar launches. Additionally, when there is a campaign that requires command uplink in locations other than White Sands, such as the upcoming Australia campaign, it is difficult to also schedule solar launches at White Sands due to lack of coverage.

Indeed, the success of telescope payloads for both solar and astrophysics relies on what appears to be a very thin crew of knowledgeable, highly capable supporting engineers provided by the program. We believe this is a risk to the program and we urge that new engineers be trained and incorporated into the program in this area of expertise. To this end, the Sounding Rocket Working

Group suggests either cross training of these important subsystems with other engineers or hiring new engineering staff capable of deepening the bench on these two subsystems.

4. Aircraft Support for Geospace Rockets with Vapor Trails

Summary

The SRWG is pleased to learn that aircraft support for geospace rockets with vapor trails can now be provided from the SRPO office, as a general rule. This Finding expresses our strong support for this decision and further suggests that the program allow commercial jet aircraft to be used in cases where suitable NASA planes may be unavailable.

Background

The SRWG is pleased to learn that aircraft support for geospace rockets with vapor trails can now be provided from the SRPO office, as a general rule. We strongly support this decision. We summarize here the main advantages of aircraft support for certain experiments that require photographs of vapor trails as well as suggest that NASA consider commercial aircraft when suitable NASA airplanes are not available.

Providing aircraft support for geospace rockets to enable accurate, high resolution photography of vapor trails provides both scientific and operational advantages. The main operational advantage is that vapor trail observations can be made above cloud or haze layers that would otherwise make ground observations impossible, precluding a launch. Thus, including aircraft support generally allows for increased launch opportunities and hence reduces the time in the field for both the Wallops and experiment teams.

An aircraft also enables significantly improved, and in some cases, additional, scientific research to be carried out. For example, an aircraft platform in some cases may provide trail photography during daytime releases and under moonlight conditions, when ground observations are not of sufficient quality to meet the research goals. Aircraft platforms can also enable closer viewing baselines for triangulation, for example, far over the ocean, when trails cannot be viewed from the coast.

In view of the formidable advantages that airplane support provides, jet aircraft (such as the Gulfstream G3) provide the greatest benefit, since they can fly above cirrus clouds, even at low and mid-latitudes. Other advantages are less crosswind sensitivity for takeoff, longer loiter times during the launch window, and higher speed for more flexibility in choosing the best baseline for triangulation.

Aircraft-based vapor trail observations can be made on many types of aircraft. This is due to universal mounting hardware, the experience gained during past campaigns regarding camera position and preparation of windows, and the reliance on GPS and IMU units in the aircraft that provide (and record as a function of time) accurate position and viewing angles of the aircraft platform. This versatility ensures that NASA need not rely solely on one specific aircraft to carry out these observations.

In light of this, the SRWG encourages the NASA SRPO at Wallops to further study the use of local, commercial jet aircraft, in cases where NASA aircraft may not be available. Indeed, such commercial aircraft may, in some cases, be more cost-effective and flexible compared to the sole reliance on available NASA-owned aircraft.

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