

Sounding Rocket Working Group

National Aeronautics and Space Administration

Meeting of June 29-30, 2021

Findings

1. Covid Recovery and Manifest Accommodations

Summary

The SRWG recognizes the tremendous effort the SRPO and NSROC have made to recover from the difficult circumstances of the past 16 months imposed by the Covid pandemic. We applaud their achievement of launching 11 missions with 11 complete successes since September, 2020, when flights were allowed to resume. We concur with the program's strategy for handling the daunting mission backlog, which includes four foreign campaigns and 27 launches over the next 12 months: avoid enforcing a science priority triage, at least at this stage, and wait to see if slips might be forced by external circumstances. This will maximize the number of missions flown.

Background

The Covid pandemic required a complete shutdown of operations at Wallops and White Sands. When it was possible to do so, careful plans were made for minimal groups of essential personnel to return to on-site work to prepare for launches at WSMR in September and October, 2020. In 2021 there have been four additional launches at WSMR and five at Wallops, all entirely successful. This is a notable achievement. However, at this time, the program faces 27 missions scheduled over the next twelve months, including four foreign campaigns. If everything went according to plan, the SRPO has informed us that they could handle the campaigns, subject to possible delays and other obstacles, although the total number of missions is more than can be accommodated within a year. Given the uncertainties of Covid developments, range schedules, and payload readiness, rather than asking headquarters to prioritize science priorities, at this point the SRPO plans to wait and see which missions might be forced to slip for other reasons. We applaud this approach, since there are no obvious reasons to instigate delays based on science. We recognize that the workload that the SRPO and NSROC faces is daunting, and we applaud their ability to persevere and keep science at the forefront during these difficult times.

2. Commercial Sub-orbital Platforms

Summary

The SRWG acknowledges the new capabilities afforded by commercial suborbital flights which are being evaluated as options for use within NASA's sounding rocket program including the STMD Flight Opportunity Program. These launch opportunities have the potential to open a new, unique niche of experiments within the existing program. The community awaits further flight details regarding these opportunities and looks forward to embracing these new capabilities. The

SRWG urges that decisions to utilize the new platforms be science-driven based on peer-reviewed proposals, with launch opportunities and vehicle selection based on maximizing the science return, as is currently the case for all mission selections within the sounding rocket program.

Background

The SRWG acknowledges the new capabilities afforded by commercial suborbital flights which are being evaluated as options for use within NASA's sounding rocket program including the NASA HQ Space Technology Mission Directorate (STMD) Flight Opportunity Program. These launch opportunities have the potential to open a new, unique niche of experiments, if the new flight platform meets the performance needs of the investigation and provides a cost-competitive option. The community awaits further flight details regarding these opportunities and looks forward to embracing these new capabilities. Examples of the information needed to evaluate the suitability of the new vehicles for science missions include: resource availability for the experimenter (volume, mass, power), nominal apogee, attitude knowledge and pointing capabilities, vibration profile, radiation exposure, time and quality of microgravity, access to direct space and view ports, mounting position, human-in-the-loop operations, cost (launch and I&T), launch frequency, and the ability to launch into desired geophysical conditions such as the aurora, electrojet, spread-F, lightning, etc. These details would allow scientists to define experiments which take full advantage of these new capabilities as they submit their proposals, enabling science and technical peer review to fully evaluate submissions. This information is also critical for the STMD and/or the SRPO to fully assess the cost and technical benefits of these commercial suborbital opportunities against existing platforms within the program. The SRWG believes that the sub-orbital missions should not become a "stand-alone" opportunity that is carved out of the existing sounding rocket program, as it risks encouraging "contrived science". In other words, the SRWG urges that decisions to utilize the new platforms should be science-driven, resulting from peer-reviewed proposals, with launch opportunities and vehicle selection based on maximizing the science return, as is currently the case for mission selections within the sounding rocket program.

3. Sub-orbital technology development flights

Summary

The SRWG applauds the SRPO's proposal to institute flight opportunities based solely on technology development. Indeed, technology development has been a hallmark of the rocket program since its inception. If a new programmatic line of missions were to be enacted, the SRWG urges NASA HQ instruct review panels to evaluate such proposals based on how suborbital demonstrations contribute to technology maturation, since most proposals are currently evaluated on science merit and closure of a science question. Given the well-established fact that sub-orbital carriers provide a significant opportunity for instrument development as well as lowering the risk for large scale missions, a new line of missions dedicated to new technology will enhance this important feature of the program.

Background

The SRPO has a long history of accommodating instrument technology demonstrations on sounding rockets, although often this is carried out on an ad hoc basis. For example, the "Dallas"

sub-payloads highlighted in the recent SubTec flight, were originally conceived by researchers from Clemson University and the University of Alaska. However, there has been no well-defined process for proposing such demonstrations of PI-driven technology or dedicated opportunities to fly them. The SRPO's proposal a dedicated opportunity for technology demonstration payloads is an important step forward to providing regular flight opportunities for new technologies.

NASA's sounding rocket program has an impressive list of instruments in all disciplines which have been developed on sounding rockets which ultimately have flown on orbital and planetary missions. Indeed, a suborbital rocket flight provides a means to demonstrate new instrument concepts and whether they can operate and gather meaningful data in space. They are also an effective means to determine whether an instrument can survive launch loads and operate effectively in zero gravity and in a vacuum, as well as have the claimed sensitivity, data generation rate, power consumption in a space environment. Although some features of the space environment, such as radiation tolerance during long-term exposure in space, are limited on sounding rockets, experimenters who have deployed instruments first on sounding rockets before advancing them to orbital platforms, have provided strong testimony to a variety of review panels that the sounding rocket experience is the single greatest contributor to advancing space flight instrumentation and creating low-risk instruments for orbital missions.

From the programmatic side, members of the community including many on the SRWG have found resistance in the review process for using sounding rocket flights primarily as a means to mature technology even when it makes abundant sense to do so. If a new programmatic line of missions were to be enacted, the SRWG urges NASA HQ instruct review panels to evaluate such proposals based on how suborbital demonstrations contribute to instrument development and technology maturation, since most proposals are currently evaluated on science merit and closure of a science question.

In summary, dedicated suborbital demonstration flights will provide a well-defined means to augment NASA's instrument development and technology maturation process. Facilitating this with regular flight opportunities will furthermore lower risk for NASA's larger scale science missions and in a very cost-effective manner.

4. Clarifying Safety Requirements at WSMR

Summary

The SRWG applauds SRPO's emphasis on and attention to safety, as evidenced by the timely and suitable reactions to recent incidents highlighted during the meeting. However, we are concerned with frequently shifting cryogenic safety requirements imposed on instruments and teams while deployed in the field. There is an apparent disconnect concerning who is in control in the field and the fact that rules change without informing the experiment teams. We believe that communication must be improved between the experiment teams, Wallops, and the WSMR range.

Background:

The SRWG applauds SRPO's emphasis on and attention to safety, as evidenced by the timely and suitable reactions to recent incidents highlighted during the meeting. However, we are concerned

with frequently shifting cryogenic safety requirements imposed on instruments and teams while deployed in the field. The motivations and engineering justifications for these changes are often unclear to the science teams, the chain of decision making regarding cryogenic safety is likewise opaque, and changes to agreed requirements are often imposed at a late date when changes to the hardware or procedures are not feasible, or problematic. To improve communication of requirements and responsibilities, we request that the SRPO clarify the process by which cryogenic system design is reviewed, define how the development of cryogenic systems and procedures should be incorporated into the standard sounding rocket engineering lifecycle, describe the process for post-design cryogenic system and procedure deviations, and lay out a mechanism by which science teams can assist in collaboratively solving safety concerns. Additionally, we encourage the further development and deployment of online training for cryogenic safety available to science teams, and eagerly await instructions to enroll our personnel.

5. Planning a Sounding Rocket Symposium

Summary

The SRWG aims to broaden the exposure of the sounding rocket program as well promote communications between various experiment teams within the astrophysics, solar, geospace, and planetary communities by showcasing its capabilities, ongoing projects, scientific successes, and hardware development through a community-wide symposium. The meeting would highlight the program and current projects, provide a venue for technical exchanges, and offer a networking opportunity for early career researchers and students. The SRWG seeks support for establishing a hybrid virtual/in-person symposium in approximately one year.

Background

For some time, it has been apparent that the extensive advantages of NASA's rocket program are not well-known outside of the rocket community. Furthermore, a great deal of the development work on rocket instruments and payloads are not well communicated within the rocket community. Convening a sounding rocket symposium that brings the community together and enables sharing of the many features of the program with potential new users, as well as with management at NASA HQ and other agencies, appears to be an idea with enormous potential. Accordingly, the SRWG aims to bring such a symposium to fruition by planning an event in the coming year.

NASA Sounding Rocket Working Group

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