Sounding Rocket Working Group

National Aeronautics and Space Administration

Meeting of January 21, 2014

Findings

1. Sounding Rocket Data Policy

Summary

The SRWG is in agreement with NASA's stated goal of making all sounding rocket data available to the public. We caution, however, that the resources necessary to make that data available can be significant and that any new requirements on the science team must factor in the need for those resources. Requiring that only high level data products be made available greatly reduces the burden on the PI.

Background

It is appropriate that all observations obtained through NASA-funded projects be made available to the general public. While the main observations are normally published in the literature, digital copies of the data made available by internet to other researchers and interested parties can increase the scientific impact of those observations. The SRWG is, in general, supportive of this activity.

It is often the case that observations from instruments flown on sounding rockets, as with many other sensors, require very mission-specific algorithms and tools to interpret the observations. While the ultimate published data products generally represent a scientific quantities in common units, the low level data products may not. In addition, procedures to apply calibration data, account for different environmental conditions between flight and ground, account for background signals, or address numerous other possible effects on the observations require instrument-specific knowledge that is not easily documented such that the general public or other researchers can apply those procedures. Therefore, any requirement for the PI to provide low level data, must be accompanied by resources to produce that documentation and make the data available.

A more straightforward approach and less costly would be to require the PI to provide only high level data products. This approach greatly reduces the burden on the PI and yet should allow other researchers to reproduce any published analysis. There is still some cost, as time and labor are required to format the data, provide documentation, make it available, and to answer any questions, but the costs are significantly lower than for providing all levels of data products.

2. Towards a science-driven range development roadmap

Summary

The SRWG finds that a "range development roadmap" would be valuable in optimizing the science return of the rocket program. Showing how the rocket program would develop and extend range capability in response to science requirements over the next decade, such a roadmap could be developed by the SRPO in conjunction with input from the SRWG and the larger sounding rocket user community. With the development of new range opportunities, the SRWG finds it essential that the rocket community be informed of which ranges are available when calls for proposals are issued.

Background

One of the defining traits of the sounding rocket program is its ability to utilize multiple launch ranges around the world, adapting to evolving science targets by utilizing new launch ranges, and existing ranges in new ways. Such range utilization over the past decade has had some strong successes (development of Kwajalein as a sustainable option, initiation of the Woomera planning, telescope payloads from Poker and Wallops, tailored trajectories (e.g. HEX), 5 simultaneous launches (e.g., ATREX)). Continued progress in this area will keep the program engaged with the cutting-edge needs of the science community.

A list of potential science investigations that would drive a range development roadmap is put forth here as examples. This list is based on conversations at recent SRWG meetings, but should not be construed as a complete list of inputs from the science community.

a) Continue Woomera (Australia) development as a “sustainable” range with launches every 5-10 years instead of once every 20-30 years. [See Finding #3, below.]
b) Develop southward launch capability from Kwaj. Target is BB XI or larger vehicles. First southern Kwaj launch capability desired by 2017.
c) Develop "high and short" trajectory capability in auroral zone to enable rockets with high apogees (> 500 km) closer to the rocket range. Some combination of guidance, ACS-assisted dispersion reduction, flying FTS, etc., is expected to be required.
d) Develop high latitude, "non-standard" range with eastward or westward trajectories to enable auroral zone “skimming” capability – e.g., from Ft. Churchill, Canada.
e) Develop routine launch capability for medium scale payloads (single stage and two-stage Brants) from Peru, Brazil, and Puerto Rico, as well as for small payloads (150 km apogees of less) from these locations with a minimum of infrastructure needed to support these launches.

As part of the range roadmap, SRWG and the community would like to be involved in the discussion of which ranges are available in any given year, including planning across

multiple years. Often, the community learns about the availability of a range only when the ROSES call for proposals is issued by NASA HQ. This is not optimal for the purposes of planning new experiments. Part of the range roadmap should be a nominal plan in which the availability of ranges in a given year is outlined.

3. Establishing Woomera as a "Routine" Rocket Range

Summary

The SRWG reiterates its strong support for establishing Woomera (Australia) as a rocket range where NASA sounding rocket missions may be carried out on a routine basis. Scientific experiments enabled by access to the southern hemisphere are very compelling for the astrophysics and geospace disciplines.

Background

The SRWG has expressed its support on numerous occasions for a permanent range in the Southern Hemisphere with land recovery, such as that provided by the Woomera rocket range in Australia. Access to such a rocket range would facilitate, in particular, astrophysics sounding rocket launches to provide coverage of the southern hemisphere sky -- for example, to provide viewing access of the Magellanic Clouds. We appreciate the continued efforts of the SRPO to re-establish its capabilities to launch and recover sounding rocket payloads from Woomera. Despite the new constraints communicated to us at the last meeting, such as those involving local mining operations and issues with high altitude vehicles, such as the Black Brant IX needed for most solar and astrophysics payloads, we urge the SRPO to maintain their dedication to working out these challenges, with the ultimate goal of facilitating routine sounding rocket launches at the Woomera range.

With respect to the fact that the area has significant mining in place, we acknowledge that a short launch season would be acceptable if Woomera launches were routine. In other words, there wouldn't be a great need to launch a large number of rockets in a short, two week window, as smaller groups would be able to go more often. In this manner, the rocket launch activities could develop a compatible schedule with that of the mining activities.

Finally, we note that the Southern Hemisphere is also a favorable location for geospace missions. Of particular interest are missions addressing science in the mesosphere/lower thermosphere and ionosphere. The unique geometry of the Earth's magnetic field in the Southern Hemisphere as well as features of orographic content and meteorological phenomena that are found only in this part of the world, provide for investigations that can only be performed by going to a Southern Hemisphere, mid-latitude site such as Woomera.

4. Revisiting the Technology Roadmap

Summary

The SRWG applauds the development of new technology in many areas that has been presented to the committee in recent meetings. At this juncture, we suggest that the technology roadmap be reviewed and updated, in light of both the recent technology developments but also the current science-driven new technology requests. The SRWG looks forward to providing input regarding user priorities on small, medium, and large technology efforts.

Background

At the SRWG meeting, the committee heard presentations on a number of technology development items. For example:

Sub-payload technology. Significant development effort is being directed to the specific sub-payload deployments for two upcoming missions, with this development likely to benefit future sub-payload deployments as well. In addition, higher telemetry bandwidths and the transmission of GPS information between sub-payloads are actively being developed. Indeed, much of this sub-payload technology will soon be verified by the series of upcoming Sub-TEC flights.

On board memory. Large digital memory is being developed, which, if verified as robust and chosen as a "standard" payload item, quite a bit of (often duplicated) effort could be removed from the experimenters' side. Reliance upon the storage of large amounts of flight data on these onboard units will increase the desires for successful location and recovery of the payloads.

Star tracker developments. The split skin and the side-deployed star tracker also seemed like useful capabilities to have in the array of available features.

We applaud the above developments and hope that they will be successfully deployed in the field. Several of these correspond to items identified in the previously distributed technology development roadmap. Other elements of that roadmap have yet to be addressed. The SRWG would welcome an opportunity to revisit and update the technology roadmap. Fully aware that some of the community's development requests require significant resources, we would nevertheless especially like to know where things stand regarding higher altitude flights and technology development for high altitude water recovery. We look forward to an opportunity to provide user-based priorities for small, medium, and large technology development efforts.

NASA Sounding Rocket Working Group

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