Sounding Rocket Working Group

National Aeronautics and Space Administration

Meeting of January 26/27, 2012

Findings

1. Black Brant Motor Situation

Summary

The Sounding Rocket Working Group (SRWG) remains very concerned about the status of the Black Brant vehicle. The SRWG appreciates the great expenditure of effort of the Sounding Rocket Program Office (SRPO) in carrying out an aggressive test program, particularly with respect to increasing Black Brant motor stability via efforts to eliminate unacceptable angles of the exit cone at burn out (non-symmetric throat erosion), spin up anomalies, and combustion instabilities. The acquisition of three surplus Black Brant motors from the Navy in exchange for launch support services is applauded. We also commend the actions of the SRPO in advancing the "return to flight" of the BBXII/BBXI, as well as pursuing alternate high-altitude launch vehicles (e.g. the Talos-Terrier-Oriole and Terrier-Terrier-Oriole).

Background

Safety concerns resulting from recent issues with the stability of the Black Brant (BB) motors has resulted in a moratorium of the entire Black Brant fleet within the NASA Sounding Rocket Program while the cause of the instability was investigated and mitigated. Although the BBIX configuration has been approved for a return to flight, stability issues still linger. In fact, a limited moratorium remains on the BBX, BBXI, and BBXII rocket configurations due to safety concerns resulting from the increased impact dispersion of the Nihka motor due to Black Brant coning and concerns that the instability might have on payload loss/recovery.

The SRWG commends the SRPO on its aggressive test program to understand and help correct the Black Brant issues. Corrective actions led by the SRPO include: increasing the motor throat diameter, use of unblended ammonium perchlorate (AP), switching to a US vendor production of ammonium perchlorate, construction of a hybrid case design, analysis of the integral exit cone design, and aft enclosure modifications permitting thicker throat region insulation. While increasing the nozzle diameter and the use of unblended ammonium perchlorate have enabled the BB motor stability to be sufficient to obtain acceptable altitudes for the BBIX payloads, the BBX, BBXI, and BBXII payloads are still under moratorium pending the implementation and test of a suite of corrective actions. Upcoming BBXI and BBXII flights will employ new motors fabricated with US unblended AP. BBXII/XI payloads will be required to fly a thrust termination system on the Nihka stage until the motor throat retains sufficient insulation margin.

Although these corrective actions have permitted a much needed and appreciated return to flight, altitude performance has been negatively impacted. The BBIX now has a slight altitude performance loss (resulting in a science loss) due to the motor modifications implemented to resolve/mitigate the instability issue. Upcoming BBXII flights

scheduled for early 2012 will require an FTS on the Nihka stage which will further adversely affect the altitude performance for these vehicles. The reduced performance of the BBXII negatively impacts auroral zone missions that require high altitudes to carry out their research. The SRWG encourages the SRPO to continue its pursuit of options to retain the performance capabilities realized by the BBIX – BBXII launch vehicles.

2. High-velocity Ejection Systems for Small Sub-Payloads

Summary

The SRWG recommends that the Sounding Rocket Program Office take responsibility for the technical development of a reliable, high-velocity ejection system for small sub-payloads. Not only is this role too large for an individual experimenter to assume, the technical capabilities should be available to the entire user community.

Background

There continues to be strong interest in sounding rocket missions that incorporate small, sub-payloads, particularly those that eject at high velocity. Proposals for projects that make use of this technique continue to be submitted to NASA HQ in each annual proposal round, yet review panels have shown a lack confidence in the reliability of the ejection systems and thus, these missions have not gone forward. The SRWG recommends that the Sounding Rocket Program Office (SRPO) take responsibility for the technical development of a reliable, high-velocity ejection system for small sub-payloads.

A specific example of the problem is that associated with the ejectable modules referred to as Ampules. The Ampules system was initially proposed by the University of Alaska and much of the early development was carried out at that institution. The SRPO provided assistance with the further development of the system for the initial test flights, but problems were largely left to the investigator to resolve. The responsibility for the development of a reliable, high velocity deployment system suitable for flight should ultimately rest with the SRPO, as is the case with other vehicle deployment systems such as nose cone and door deployment systems. The science that is being addressed by the ejectable sub-payload proposals is compelling, but the Working Group finds that a commitment by SRPO to develop a reliable system is required to make these compelling science proposals viable in the review process. Furthermore, if the SRPO retained "ownership" of the small payload ejectable system, it would then be available to the entire user community for future investigations.

3. Incorporating Larger Data Rates

Summary

The SRWG is pleased to learn that the new 20 Mbps telemetry system will be routinely available for flights at the end of this year. Despite this advance, the user community remains very interested in systems that could provide orders of magnitude higher telemetry. As an interim solution for recoverable payloads, such high rate telemetry may be available via high speed recorders.

Background

The SRWG is pleased to learn that the new 20 Mbps telemetry system will be routinely available for flights at the end of this year. This represents a factor of two improvement over the currently available 10 Mbps system. The SRWG notes that future scientific experiments will require orders of magnitude improvements in capability. These future experiments include, but are not limited to, imaging and spectroscopy science payloads. In general, technology development of science payloads is now yielding smaller, less power intensive, and much richer data production than years ago. This trend is increasing. It is imperative for sounding rockets to match this pace in order that a large number of its missions might remain relevant in the future.

The SRWG is pleased to learn of the possible availability of high speed recorders in the future, which will provide a new capability to fill this need for recovered payloads, at least in the interim. The SRWG seeks more details on the planned development and field testing of these recorders. Currently, experimenters are building data recorders into their own systems and would immediately benefit from a standardized data recorder module. The SRWG notes, however, that the high speed recorders do not replace the continued need for much higher capacity telemetry systems.

4. White Sands Missile Range -- Notes on the NASA Infrastructure Upgrade

Summary

We commend NASA for the welcome and long overdue improvements to the payload integration and testing facilities at White Sands Missile Range. A list of additional improvements is provided.

Background

We commend NASA for the welcome and long overdue improvements to the payload integration and testing facilities at White Sands Missile Range. The new laboratory space is clearly a major improvement over the existing high and low bays in the NASA Vehicle Assembly Building used for payload testing. The conference and office space on the second floor is particularly well thought out.

A survey of researchers using the facility has recently identified a few concerns that may offer additional improvements and which we list here: (1) The new laboratory space has open access, and clean garb and sticky mats are used intermittently at best, so the space will become dusty over time without regular cleaning. We recommend finding an operating procedure that will keep the new lab space clean. We understand that a regular cleaning service will be used, and regular schedules to service filters and sticky mats will be implemented, procedures which we wholeheartedly support. If that is insufficient, adding a vestibule double door with sticky mats, hanging clean anti-static smocks, and restricting access to the personnel doors may be necessary. (2) The floor of the new lab space is already cracked and coming up from spilled liquid nitrogen. The situation should be monitored and a more durable replacement surface should be considered. (3) Clean room tents have not been installed as of March 2012. A ready means to lift instrument sections while under the clean tent is needed. (4) As more payloads are integrated simultaneously and the N200 space is decommissioned, floor square footage will be at a premium. An accessible place to store unused experiment crates and equipment, such as an adjacent shed, will maximize floor space efficiency

during peak periods and keep crates and miscellaneous packing materials out of the new lab space. (5) Finally, we are concerned about the policy being imposed that science payloads are ITAR restricted, as opposed to the NSROC components already covered by TAAs. This interpretation requires elaborate procedures to be set up with multiple science payloads in the VAB, imposing serious operational impediments. We note that a recent US State Department memo determined that science payloads are not inherently ITAR-controlled. Due to the adverse consequences, we suggest this policy be carefully reviewed to determine if it is justified.

5. Support for Infrastructure for Virtual Meetings

Summary

We urge the SRPO and NSROC to implement inexpensive, but effective, upgrades to their virtual meeting infrastructure.

Background

Government travel restrictions and the general expense of traveling to the Wallops Flight Facility (WFF) make it increasingly difficult to conduct short but critical project meetings at WFF. Unfortunately, the telecon, videocon, and collaborative meeting software (i.e. WebEX, EVO, etc...) at WFF are not sufficient to conduct modern virtual meetings. These deficiencies have recently resulted in less than optimal communications during critical meetings, including both project meetings and design reviews.

We urge the SRPO and NSROC to implement inexpensive, but effective, upgrades to their virtual meeting infrastructure. This should include telecon equipment (with extension microphones!) such that all participants in the room are within range, videocon equipment or software (EVO,http://evo.caltech.edu/evoGate/ that is free and widely used in the science community), and virtual meeting software (i.e. WebEX). These upgrades are inexpensive and will allow critical collaborative work to proceed in an environment where face-to-face meetings are increasingly impractical.

6. Dr. Mary Mellott – Appreciation

The Sounding Rocket Working Group expresses its sincere appreciation and deep gratitude to Dr. Mary Mellott, who guided and helped manage the program at NASA HQ so effectively over the past several years and who retired at the end of last year. Mary worked for a considerable number of years as both the Program Scientist for the Sounding Rocket Operations at NASA HQ and as the Discipline Scientist for Geospace within the Heliophysics Division at NASA HQ. The Sounding Rocket Working Group acknowledges in particular the contributions of Dr. Mellott during some particularly difficult years for the program -- times when program funding was extremely low at NASA HQ and the very future of the program was quite uncertain, and also during the period in which the program transitioned to the NASA Sounding Rocket Operations Contract at Wallops. The sounding rocket program that Mary Mellott helped nurture has enabled unique scientific achievements to be carried out in space, reflecting highly on both NASA and the United States. We acknowledge Mary's unwavering support for, and her untiring dedication to, NASA's Sounding Rocket Program.

NASA Sounding Rocket Working Group

Dr. Robert Pfaff, Jr. (Chair and Project Scientist)
NASA/Goddard Space Flight Center

Dr. Scott Porter (Deputy Project Scientist)
NASA/Goddard Space Flight Center

Committee Members:

Dr. Scott Bailey
Virginia Polytechnic Institute and State University

Dr. James Bock
Jet Propulsion Laboratory

Dr. Keith Gendreau
NASA/Goddard Space Flight Center

Dr. Darrell Judge
University of Southern California

Dr. Mary Elizabeth Kaiser
Johns Hopkins University

Dr. Michael Kowalski
Naval Research Laboratory

Dr. Miguel Larsen
Clemson University

Dr. Kristina Lynch
Dartmouth College

Dr. Scott Robertson
University of Colorado

Dr. Douglas Rowland
NASA/Goddard Space Flight Center