

Sounding Rocket Working Group

National Aeronautics and Space Administration

Meeting of August 16, 2022

Findings

1. Lines of Authority at the Poker Flat Research Range During Launch Activities

Summary

New protocols and responsibilities were implemented at the Poker Flat Research Range in the winter of 2022. To a large degree, these procedural changes involved the roles and responsibilities of the campaign, mission, and range managers. Sorting out these new policies contributed to a fair amount of confusion and concerns. Among them, perhaps the most important issue involved who has the authority to call for a “hold” during the countdown. The new protocol was such that the Principal Investigator only had the authority to declare a “red” status, leaving it up to the campaign manager to call for the “hold”. This situation underscores a general concern resulting in confusion that could result from rushed discussions and possibly even an unintended launch, particularly if the launch were imminent. The SRWG asks that the lines of authority be discussed with the principal investigators and clarified prior to start of the countdown activities.

Background

Rocket launches from the Poker Flat research range require a highly coordinated effort between Wallops personnel, the mission science team, and range personnel. A number of issues arose in the 2022 winter campaign that led to confusion and misunderstandings by various personnel regarding new protocols and, to a significant degree, generated uncertainty regarding lines of authority and responsibility.

Although all personnel were aware of the material presented in the "Pre-Deployment Brief", that material did not include certain specific information regarding the roles of the Campaign Manager, Deputy Campaign Manager, Mission Manager, and/or Range Manager. Whereas this might not have been an issue in past years, it soon became clear within the course of the campaign that protocols had changed, resulting in uncertainty and confusion. This also contributed to confusion about work-hour issues and access to Science Operations Center, described in separate findings, below.

In particular, one especially important issue stood out, regarding who has the authority to call a "hold" during the final countdown. In past years, the Principal Investigator (PI) could call for a hold any time before $T=0$. During this past winter's campaign, however, if there were reasons for concern or to stop the count, the PI could only broadcast a statement akin to "PI is red" to try to stop the launch. The ability to call a “hold” was then up to the Campaign Manager. The concern is that confusion could result in rushed discussions and possibly lead to an unintended launch if the launch were imminent.

The SRWG urges that protocols be clarified and thoroughly discussed with the PI and appropriate members of their science team. Those protocols and procedures should then be thoroughly disseminated. In general, science teams at Poker Flat include researchers with decades of experience as well as students on their first campaign. All personnel need to understand procedures and protocols, especially regarding the launch call.

2. Impact and Extent of NASA Work Hour Policy During Campaigns

Summary

The SRWG recognizes the importance of a well-rested team for mission success, and commends NASA, in general, for implementing the maximum work hour policy presented by Mr. Gordon Marsh at the SWRG meeting. However, the SRWG believes that the scope, rules, and applicability of these policies are not entirely clear, particularly for the science teams, and requests that SRPO staff clarify specifically what the specific rules are, to whom the rules apply, who within SRPO or NSROC staff has authority to enforce them, and the circumstances under which waivers will be granted. In particular, we seek to understand how these work hour policies apply to the experiment teams during field campaigns, particularly non-NASA researchers, who might be completing calibration and other instrument checks.

Background

A sounding rocket mission's field schedule is filled with a wide range of activities including those necessary to successfully integrate the payload to the launch vehicle, calibrate and validate the science instrument(s), test the final flight configuration, and maintain schedule margin. As field teams do not work at a pace or cadence that might cause harm to the mission or personnel, the project field schedule is always constructed with this in mind and field operations usually are completed successfully, with extra time allocated should a problem arise. In particular, PIs and their science teams, who are generally outside of the government, respect and strive to adapt their field activities regarding the payloads to the labor rules set by SRPO and NASA, as well as unions and contractors. Nevertheless, instrument teams do have to carry out calibrations and other instrument checks prior to their installation in the payload, which might take place during the start of a field campaign on the bench, and may, under some circumstances, require some additional time to verify the successful operation of the instrument.

At its recent meeting, the SRWG learned of new interpretations of a standing maximum work hour policy that applies to the SRPO/NSROC teams. We found a significant lack of clarity regarding what specifically these rules are. Particularly unclear were whether the rules apply to experimenter teams, and how they will be adapted in non-emergency but extenuating circumstances (e.g., time-specific calibrations, cryogenic service, or needful access to assets for teaching and mentoring). We request clarification of these rules, and specifically how they are applied, monitored, and under what circumstances waivers may be required for the experiment teams. To this end, a subset of SRWG members can be made available to join an ad hoc sub-committee to discuss the labor needs of science projects, best practices for NSROC and experiment teams, and the waiver process in light of their significant real-world experience of successfully and safely flying these kinds of missions for many decades in all disciplines (Astrophysics, Solar, and Geospace).

3. Access to the Science Operations Center at Poker Flat, AK, During Campaign Periods

Summary

The Science Operations Center (SOC) at Poker Flat, Alaska, is an invaluable research center run by the University of Alaska, Fairbanks (UAF), that serves the science community not only during launch campaigns but also by facilitating auroral and other high latitude research year-round. UAF operates the SOC, permitting researchers to use the facility at all times. During recent launch campaigns at Poker Flat, however, newly imposed NASA range protocols precluded scientists from using the SOC during campaign periods, even when the launch activities were suspended. The SRWG asks that this policy be reviewed, and that scientific research be allowed to continue at all times at the SOC, under the rules of the University of Alaska, including during campaigns when the launch activities are not being supported.

Background

Scientific research at the Poker Flat Research Range (PFRR) has been carried out at the range since its inception in 1969, not just with sounding rockets and balloons, but also with ground-based instruments, such as those operated by the NSF-sponsored incoherent scatter radar (PFISR), the UAF lidar facility, and the Science Operations Center (SOC) which includes an impressive array of all-sky cameras, optical photometers, riometers, and magnetometers. The SOC is also where scientists involved in sounding rocket launches work closely together to study the evolving high latitude ionosphere/upper atmosphere conditions to eventually make the decision to launch the rocket or rockets in a given campaign (as well as planning for future campaigns). As with its counterparts at rocket ranges in Norway and Sweden, the Science Operations Center at Poker Flat Research Range (PFRR) is thus a valuable and critical facility for the entire community of auroral and other high latitude researchers doing field work.

From the standpoint of the aurora, much of what researchers and auroral rocket Principal Investigators (P.I.s) can understand about the auroral system comes from a history of nights of real-time observation, and the SOC makes this viable by providing a safe, accessible, and instrumented site for doing these observations. While in some cases those researchers might be able to study recorded videos after the fact, true understanding regarding how the aurora works comes from repeated, regular, real-time visible observations of the aurora in its natural state, night after night after night, and at all local times, including pre- and post-midnight.

For auroral sounding rocket campaigns in particular, the 2-3 week period leading up to and surrounding a moon-down window, provide opportunities for auroral science teams to converge on these observational periods. The team observations have intense science value, over and above the context they provide for an individual rocket shot. The repeated observations leading up to a launch window provide practice drills for the actual launch call and provide context for the science of the event which is used for the launch. Thus repeated, extended, nightly observations are critical both for (a) the NASA-funded auroral science endeavor, and (b) the smooth functioning of a well-polished launch call procedure. This is increasingly true with the multi-platform system-science auroral missions that are increasingly of use, which can include distributed field sites such as ground based observational arrays and other field data sources with team members at other sites

in real time. Such regular observations are also important for understanding the auroral response to unpredictable increases of solar activity.

The University of Alaska, Fairbanks (UAF), runs the SOC and lidar facility at Poker Flat, permitting researchers to use the facility at all times. The UAF does not impose any restrictions on the time or duration for someone to be present at the SOC or lidar facility, as long as that person is not alone at the Poker Flat research facility and provided the temperature regulations for accessing the range are not violated.

During recent (winter 2022) rocket campaigns at Poker Flat, however, newly imposed NASA range protocols precluded scientists from using the SOC during periods when the launch activities were not supported, for example during some evenings and weekends. The SRWG asks that this policy be reviewed, and that scientific research be allowed to continue at the SOC, under the rules of the University of Alaska, including periods when the launch activities are not supported. To be clear, we are not requesting any access to payloads or rockets or the blockhouse during these times (all of which is protected and not accessible anyway). We simply ask that access to the SOC and lidar facilities be permitted for scientific researchers during all times permitted by the University of Alaska.

4. Safety Requirements and Communication Between the PI and Safety Office

Summary

Complex payloads, especially those that involve cryogenics, often require extensive safety protocols. It is essential that the safety requirements, equipment, and procedures be agreed upon as early as possible in the development of the mission. Late requirements, late documents, late review, and late changes can seriously affect schedule and team preparation, adding significant and unnecessary risk to mission success. The SRWG urges the SRPO to facilitate early communication between the payload team and the safety office resulting in early document preparation and sign-offs, at least by the pre-integration review. Signed safety documents should also have some momentum, i.e., changes should be difficult unless something significant changes in the payload or operations. Finally, cross-training of mission personnel for some hazardous operations (e.g., cryogenics) would substantially alleviate schedule pressure and work rule issues, which could themselves contribute to a less safe environment.

Background

Mission schedules and payload operations require well developed procedures, including those that involve hazardous operations such as cryogenics. Recently, changing requirements, protocols, and late agreements have hampered operations both at WFF and in the field. All parties recognize that sounding rocket missions should be safe for personnel, NASA assets, and experiments. However, more effective communication between the payload team and the safety office could significantly streamline operations and reduce stress on personnel. The process should start early, preferably with *direct discussions* at the MIC and shortly following it between the PI and the responsible safety person(s). Direct conversations would greatly facilitate a clear understanding by both sides of what the hazards are and what the requirements to mitigate them will be. An agreement should be made at this point as to the required safety features, documents, and the scope of the

requirements. Communication with the safety office should continue during mission development culminating with a list of safety requirements around which the payload team can develop the required procedures. This process should be complete by the Requirements Review. The procedures should be signed off expeditiously once prepared with agreement and signed-off documents in place at least by PIR.

Clear communication of requirements between the safety office and the payload team is essential to this process and SRWG urges that this communication happen early and that changes to requirements be kept to the absolute minimum to reduce the burden on payload teams. Finally, some hazardous operations, notably cryogenics, must take place multiple times a day, sometimes at odd hours, in order to service the payload. Restrictions on work rules, may increase schedule pressure on hazardous operations. Cross-training of mission personnel so that more staff are qualified to oversee these operations would significantly decrease the pressure on payload teams and safety personnel. The SRWG urges the SRPO to investigate ways of broadening the number of personnel capable of overseeing particularly cryogenic operations.

NASA Sounding Rocket Working Group

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