2019.Nov.19

To: Dr. Harold Yorke, Director SOFIA Science Mission Operations

Re: SOFIA Science Users Group (SUG) Meeting# 15 – Report

The SOFIA Science Users Group (SUG) held its 15th meeting at the NASA Ames Research Center on 04 November 2019. The primary discussion topics between SUG members and the SOFIA Science Mission Operations (SMO) staff, led by Drs. Harold Yorke, SMO Director and James Jackson, Associate Director for Research, SOFIA Science Center, are captured in the meeting Agenda. Expanded details and charts presented at the SUG meeting are available at: https://www.sofia.usra.edu/science/sofia-overview/advisory-groups/sofia-users-group-sug. Three new members of the SUG rotated on to the committee at this meeting.

The environment of the SMO and SUG15 conversations was marked by the Project’s reactions to recommendations within the FMR and SOMER reports and to directives from NASA SMD as SOFIA enters its extended mission period leading to possible inclusion of SOFIA in a Senior Review portfolio in 3 years.

SUG Executive Summary:

The next 24-month period (encompassing Cycle 8 and 9) of the SOFIA extended mission is critical for the continued success of the Project. The SUG is concerned that the SMO has not appreciated the tremendous urgency of the situation. The SMO must posit a bold scientific plan which establishes the raison d’être for continued operation of this flagship mission and establish actionable goals. Science return and productivity of SOFIA must dramatically increase. The SUG calls on the SMO to advance high-risk, high reward science and/or operation models that will yield immediate impact. Rather than adopt a passive and reactive approach to the challenges, the SMO must realize a high impact science plan and inform NASA and other stakeholders the requirements for delivery.

Below are highlights and recommendations based on the SMO staff presentations and conversations, which are consensus items derived from the SUG’s impressions (not necessarily in rank order, but thematically grouped). We have itemized for clarity and to enable specific reference to recommendations and actions in future discussions.
[SUG15 – 1] LEADERSHIP:

The SUG thanks Harold Yorke for his capable leadership as SMO Director.

The SUG is unsettled by the retirement of the SMO Director and is worried about the effects of a changeover at this critical juncture. Finding a new Director as soon as possible to maximize the overlap between the current and future Directors will ensure a smooth transition.

[SUG15 – 2] FMR/SOMER PERFORMANCE METRICS:

The SUG requests the SMO finalize and provide clear performance metrics in response to recommendations and comments contained in the FMR and SOMER reviews with regard to quantitative measures of SOFIA scientific impact and productivity. These performance metrics will be critical for focusing SOFIA efforts in the coming months and should reflect the continually evolving SOFIA instrument suite.

[SUG 15 – 3] FORCAST:

The SUG does not support either the withdrawal from availability or the decommissioning of the facility instrument FORCAST during the next 24 months as suggested by the SMO. The SUG views FORCAST as an important strategic instrument in the SOFIA portfolio. FORCAST provides the only means to conduct many science experiments which cannot be duplicated in any NASA missions or ground-based facilities. The decommissioning or withdrawal of FORCAST would disproportionately affect the Stellar and Solar System Science communities. Furthermore, FORCAST is one of the most productive instruments on SOFIA, with FORCAST observations consistently resulting in scientific publications at a rate higher than several other instruments.

[SUG15 – 4] GREAT:

The SUG encourages the SMO to work collaboratively with the GREAT team to maximize the number of flight opportunities in Cycle 8. In view of the high proposal pressure on the GREAT instrument, the SMO should discuss creative options with the GREAT team to use their limited resources as efficiently as possible. Since the time requested by priority 1 proposals in Cycle 8 exceeds the number of flights available with GREAT, the SMO will also have to find a way to distribute the allocable time equitably.

The SUG strongly urges that, beyond the immediate planning for Cycle 8, addressing whether the GREAT team can be positioned to support a larger number of flights per cycle must be fully explored. Since GREAT – as a PI instrument – is largely funded from sources outside of NASA/DLR, this demand will require a longer-term perspective to the instrument's usage on SOFIA. It is clear that, if at all possible, the SMO should explore ways of providing resources to the GREAT team.
[SUG15 – 5] HIRMES:

The SUG is extremely concerned with the development of HIRMES. If the progress on the instrument continues on its current pace and schedule as described by the SMO, this new capability is unlikely to have significant impact on SOFIA science productivity within the next 24-month period. The SUG also is disappointed that details regarding HIRMES’ cost and schedule were not presented in a forthcoming manner. As is, the SUG is unable to comment on whether the resources being devoted to HIRMES are appropriate or provide any suggestions regarding how to proceed.

[SUG15 – 6] CYCLE 8 SOLICITATION OUTCOMES:

The SUG notes that the GO oversubscription rate in Cycle 8 had increased significantly (factor of 6.6). The SUG observes that the oversubscription rate combined with a large number of new, first-time investigators indicates development of a growing community of SOFIA users.

[SUG15 – 7] DUAL-ANONYMOUS REVIEW AND THE TAC:

The SUG is delighted that the SMO is reviewing the SOFIA proposal infrastructure and TAC processes with the eventual intent of implementing dual-anonymous review in future cycles. The SUG strongly advises the SMO to begin adopting established best-practices and procedures developed by other NASA guest investigator (GI) opportunities, tailored to the needs and requirements of SOFIA.

It is reassuring that the SOFIA TAC review process generally does not produce biased recommendations with respect to gender, although there is considerable evidence that name recognition plays an unacceptable role in the process. Thus, the SUG fully support measures that increase and safeguard fairness in the TAC review process and recommends that a double-blind process be adopted by SOFIA sooner rather than later.

[SUG15 – 8] LEGACY SCIENCE OPPORTUNITIES – CAPS:

The SUG recommends to the SMO that SOFIA Legacy programs not exceed a cap of 30% of the available flight hours in a given proposal cycle. The 30% value is roughly equivalent to the proposal pressure for the Legacy program in Cycle 8. Having 70% of the cycle flight hours available for smaller programs will provide more opportunities for new observers, especially graduate students and early career scientists, to obtain high quality infrared data that would otherwise be unattainable. A strong program of small and medium projects enables a larger variety of science topics, involves a larger fraction of the astronomical community, encourages proposals from small institutions (where the astronomers may not be well connected to the large consortia that typically dominate Legacy programs) and other astronomical specialties (i.e., non-infrared), and allows for high-risk, high reward observations. Furthermore, a 70%/30% distribution is likely to support SOFIA’s goal of increasing publications since smaller programs are likely to be completed and hence published more quickly than Legacy programs.
LEGACY SCIENCE OPPORTUNITIES – THEMATIC CALLS:

The SUG suggests the SMO consider whether establishing orchestrated thematic science for a given legacy proposal solicitation would have higher impact than the current legacy call guidelines. Such orchestration would allow a variety of smaller investigating teams to participate in legacy science activities, putting focus on particularly unique SOFIA instrument capabilities, and result in a rich archive of datasets for different astrophysical classes. A model to consider is the ULLYSES program undertaken by The Space Telescope Science Institute for the Hubble Space Telescope.

PUBLICATION ENHANCEMENT:

The SUG encourages the SMO to reach out to all its investigators and urge these groups to rapidly publish SOFIA data, including those that may have resulted in null results. The latter is especially important because it will help better focus future investigations on objects and features that were detected, avoiding unnecessary observational duplications. If refereed journals are unwilling to publish null results, the SMO could encourage observers to submit to venues such as the Research Notes of the AAS, which provide a Facilities keyword and DOI for easier tracking of SOFIA-based articles.

ARCHIVE DATA DELIVERY AND IMPACT:

The SUG challenges the SMO to expedite delivery of level 3 and 4 data products from all SOFIA instruments to investigators regardless of instrument configuration changes or modifications to promote timely analysis and enhance the likeliness of scientific publication.

The SUG also recommends that any changes in the existing pipelines that result in data being reprocessed be clearly documented so that observers can easily understand how and why their data have changed.

The SUG suggests that SMO scientists reach out to investigators to encourage them to promptly examine their data and make them aware that the investigators can consult the SMO scientists. To the extent possible, SMO scientists should schedule meetings (using virtual meeting platforms for example) to go over preliminary analysis and ascertain potential bottlenecks to producing publications from the data.

SOFIA UTILIZATION STATISTICS AND PUBLICATION METRICS:

The SUG requests the SMO provide utilization statistics of current large data sets in the archive. The SUG advises the SMO to carefully track any usage of SOFIA archival data products in publications no matter the magnitude of the SOFIA contribution to the science being explored by the investigators.

The SUG also recommends including instrumentation papers, since one of the often-quoted strengths of SOFIA within NASA’s portfolio of projects and missions is the early development of technologies and expertise with potential for long-range impacts on future space missions.
[SUG15 – 13] FLIGHT SURGES:

The SUG recognizes extended southern deployments of SOFIA may be constrained to be no greater than five weeks in duration and advises the SMO to carefully examine the surge strategies employed to maximize the total number of flights within this period.

The SUG recommends the SMO investigate surge flight strategies from Palmdale when the atmospheric water vapor and tropospheric levels are more conducive to returning high quality science products or at times when there is a high concentration of high priority targets.

[SUG15 – 14] FLIGHT OPTIMIZATION AND SCIENCE IMPACT:

The SUG appreciates the detailed explanations provided by the SMO about ongoing studies and proposals for optimizing productivity by varying flight durations and cadences. We were impressed by the staff’s understanding of the many factors that can affect the quality and quantity of data that can be acquired within the constraints of an airborne science program and that the factors may have different weights for different instruments, science objectives, and environmental conditions. Whatever initial plans are adopted, the SUG recommends that both the rationale and results be carefully and clearly documented and that the approach (or approaches) be modified if necessary, to achieve the best possible scientific returns.

The SUG looks forward to a detailed report on the SMO test of a 5 x 8 hr flight schedule, its ability to produce high-quality science data, its impact on personnel, and its costs. The SMO should consider if the 5 x 8 hr schedule can be used at certain times of the year or with certain instrument series to maximize science return at an acceptable cost.

[SUG15 – 15] FLEXIBLE FLIGHT PLANS:

The SUG encourages the SMO to continue to be flexible regarding flight plans to maximize the science return and program completion statistics in a given instrument campaign. The SMO should assess if additional flight planning tools or resources are likely to be cost-efficient in terms of flight hours preserved.

[SUG15 – 16] PROPOSAL PLANNING TOOLS:

The SUG recommends the SMO enhance proposal planning tools to reflect conditions that actually are encountered during typical flight profiles to enable investigators to better determine signal-to-noise estimates enabling optimization of science hour requests.

[SUG15 – 17] PYTHON CODE TRANSITION:

The SUG cautions the SMO that the transition of SOFIA pipeline processing codes from various instruments to Python with the intent of public release may have impacts that are not well understood. Although this may be a laudable goal in the long run, and though the conversion may well make the in-house software more reliable and maintainable, the SUG is concerned that the effort of preparing and documenting the software for public release could have a negative
impact on the time and attention of staff members who are crucial to the more immediate goal of accelerating and enhancing the analysis and publication of data. The SMO should have clear goals in mind regarding the conversion and release of pipelines beyond simply providing the user community with the pipelines.

In the near term, it may make more sense to poll the community to see how many external groups would be actively interested in using and contributing to specific portions of the pipeline. If the demand is limited and the responding groups are capable of working with the software without significant support from DCS programmers, the software could be released on a “shared risk” basis. The benefits could be two-fold. The external groups could provide additional insights into the operation of the pipeline (additional quality control information), and useful new software modules could be developed at no cost to SOFIA. To be effective, this approach would need to be initiated as early as possible, and the impact of interactions with the external groups would need to be carefully monitored to make sure it doesn’t compromise the primary responsibilities of the DCS staff.

The SUG also recommends an intermediate step in this process is necessary wherein select users or teams are identified to receive, install, and test the software to ascertain whether value is delivered. The beta-test groups and the SMO should critically review and evaluate the effort and user impact within one year as a step-gate prior to wider, more general implementation.

The SUG suggests the SMO ask current SOFIA GOs and their teams whether not having pipelines in Python is a significant pacing step in their analysis of SOFIA data.

[SUG15 – 18] MENTORING:

The SUG encourages the SMO to creatively and proactively develop new programmatic engagement formalisms and mentoring opportunities between SMO scientific staff with students, especially those SOFIA projects led by graduate and/or undergraduate students.

The SUG thanks the SOFIA staff and Director for their efforts at preparing presentations. However, the SUG requests that for future meeting these presentations be made available to the SUG ten (10) business days prior to the meeting – on a best effort basis – to sharpen meeting focus and to enable SUG members to more effectively engage the Project on topical issues.

Respectfully,

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