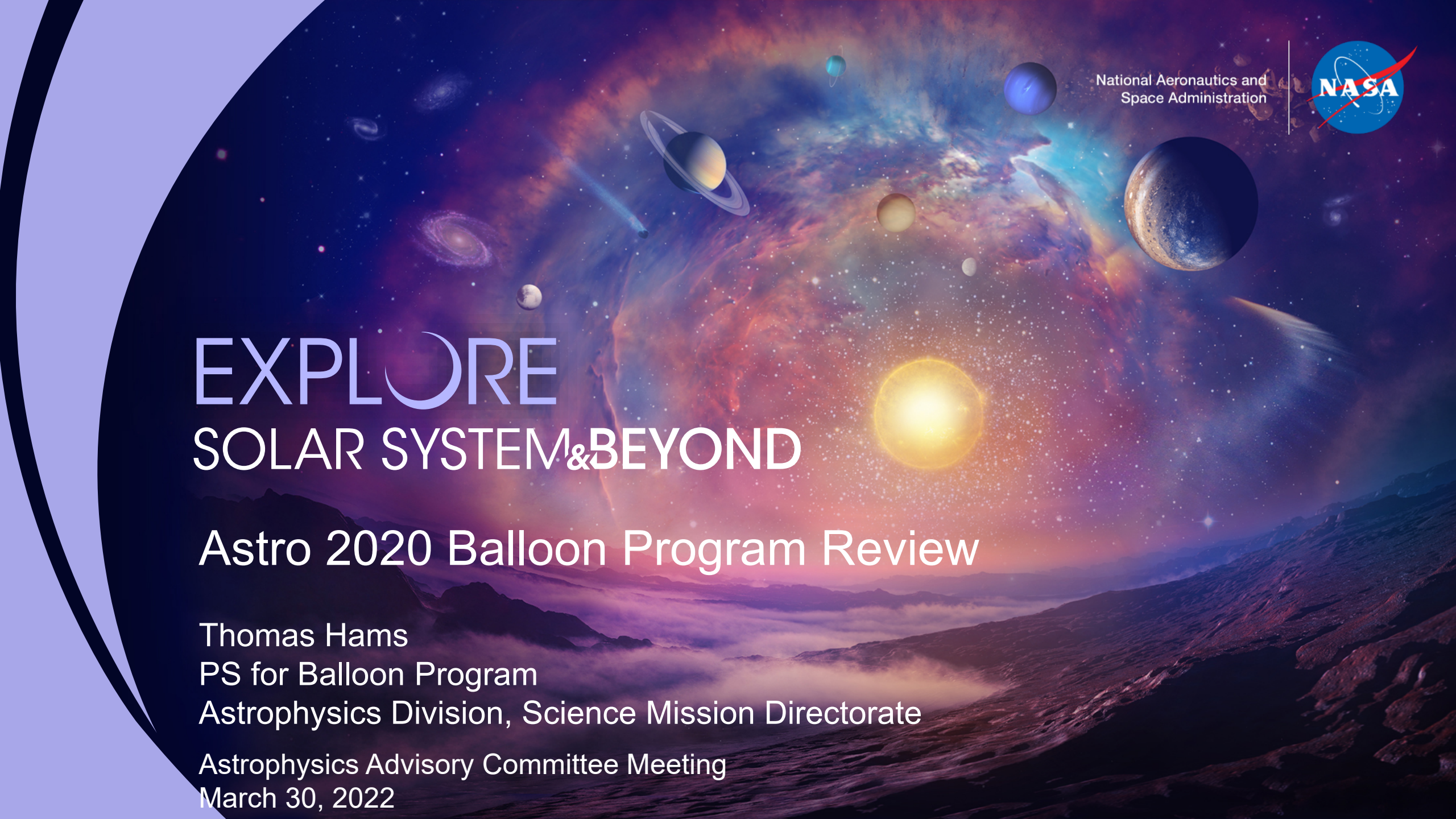

Astro 2020 Balloon Program Review

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PS for Balloon Program
Astrophysics Division, Science Mission Directorate

Astrophysics Advisory Committee Meeting
March 30, 2022

Outline

- Recommendations of the Committee for a Decadal Survey on Astronomy and Astrophysics 2020 (Astro2020) for the NASA Balloon Program.
  “Pathways to Discovery in Astronomy and Astrophysics for the 2020s”

Bottom Line Up Front:
Request input and concurrence of the Astrophysical Advisory Committee (APAC) to establish a Balloon Program Independent Review as a subcommittee of the APAC.

ASTRO 2020

6.2.1.1.1 The Balloon Program, Page 6-7

The balloon program offers access to a near-space environment with a wide variety of options for duration and sky coverage. Its wide array of capabilities include single day “conventional” flights and Long Duration Balloon (LDB) flights lasting up to 60 days in circumpolar flights around the Antarctic.

After years of development, super-pressure balloons for Ultra-Long Duration Balloon (ULDB) flights carrying payloads up to 2000lbs with nearly constant float altitudes for up to 100 days, and are coming to the fore, opening up new possibilities. The balloon program’s impact on innovation and science can be seen in its breadth of payload instrumentation: kilo-pixel IR and mm-wave cameras (Figure 6.1), CMB polarimeters, stabilized platforms with sub-arcsecond pointing accuracy for wide-field UVO imaging, gamma ray detectors, and sub-atomic particle detectors. Multiple proposed satellites with CMB, IR, X- ray, and time-domain capabilities submitted to Astro2020 have roots in the balloon program, just as their predecessors did for existing and completed explorers and flagships.

Pathways to improving the balloon program to take maximum advantage of these promising opportunities include: (1) increasing the number of flights; (2) continuing to strive for higher ULDB float altitudes; (3) increasing the accessibility of the program to more PIs by reducing barriers to entry; and (4) exploring structural adjustments that can support new PIs. Possibilities for accomplishing (4) include “piggy-backing” instruments on existing payloads, providing common hardware, providing access to funded engineering and mentoring support, and combinations of these.

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ASTRO 2020 (continue)

Page 6-8

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Although it is beyond the scope of this survey to perform an in-depth analysis of the program, it is clear from the Enabling Foundations report (H.2.8.1) and the progress addressing NWNH recommendations that important challenges lie ahead for achieving the goals enumerated above, particularly for taking advantage of new ULDB opportunities. The first challenge relates to the available funding levels for balloon payloads, which have not kept up with the increased scope and complexity.

Although NWNH recommended increasing the funding by $5 million a year to the R&A program (pg. 222, along with a $10 million a year increase for infrastructure), the budget has remained roughly constant over the decade at $25 million a year in awards typically supporting approximately 30 payloads in various stages of build, standby, deployment, and analysis. A second challenge relates to the ballooning infrastructure and management, which requires investment and possibly reorganization to find the right balance between increasing the launch rate and balloon technology development, while recognizing the inherent risks. Finally, broadening and diversifying participation will require changes to the way NASA supports teams, particularly those with young investigators at institutions that are still developing strong, independently funded technical and engineering infrastructure.

ASTRO 2020 Recommendation

Recommendation: NASA should undertake an external review of the balloon program to establish a framework for accomplishing the competing needs of achieving flight capabilities and launch rates that meet demands, ensuring adequate investment in payloads, and lowering barriers to entry.

Review Plan

In Response to this Decadal Recommendation:

APD will establish a Balloon Program Independent Review that is a subcommittee of the APAC.

Review team will be comprised of the science users of balloon program, include a member of the 2020 Decadal Survey and the PAG 2020 Balloon Roadmap Team as well as costing and project management subject matter exports.

Review Deliverables

The Subcommittee will prepare a report that includes findings and recommendations to assist the Astrophysics Division implement a more effective Balloon Program:

- Prioritized list of balloon technologies/capabilities needed to enable science investigations and technology maturations for future missions;
- Prioritized list of launch site requirements and what constitutes a healthy campaign cadence and expected number of launches per campaign;
- For the Astrophysics Research and Analysis Program, a healthy number of balloon investigations and notional funding profiles;
- Capabilities of commercial suborbital flight providers and efficiency gains to be leveraged; and
- Ways to reduce barriers to entry, particularly for new PIs and new (to the Balloon Program) organizations, including underrepresented people and organizations.

Tentative Review Schedule

The Review Panel Chair and members will be selected in the spring of 2022.

A detailed review schedule will be established in partnership with the BPO by June 1, 2022.

A tour of the WFF facilities by the Review Team will mark the kick-off of the review process and will be held by the end of July 2022.

It is anticipated that additional meetings at WFF or HQ may take place to present data to the Review Panel. Draft recommendations will be presented to the APAC in February of 2023 with a final report due for the March meeting of the APAC in 2023.

Summary and Next Steps

We ask the APAC to provide input and concur with the Review Plan and Terms of Reference for the Balloon Program Independent Review to respond to the recommendation of the Recommendations of the Committee for a Decadal Survey on Astronomy and Astrophysics 2020 (Astro2020) for the NASA Balloon Program.

Terms Of Reference

Terms of Reference

Balloon Program Independent Review Subcommittee
of the
Astrophysics Advisory Committee

The Balloon Program Independent Review Subcommittee is established as a subordinate group (hereinafter, "Subcommittee") of the Astrophysics Advisory Committee (APAC), a stand-alone advisory group established under the Federal Advisory Committee Act (FACA). The Subcommittee has been established at the discretion of the Director, Astrophysics Division, following the recommendation of the Decadal Survey on Astronomy and Astrophysics 2020 in its report, *Pathways to Discovery in Astronomy and Astrophysics for the 2020s*.

The Subcommittee will conduct an Independent Review of the NASA Balloon Program. The purpose of the review is to assist NASA's Astrophysics Division in maximizing the scientific yield and operating efficiency of the Balloon Program within the available funding. For the purpose of this Review, the Balloon Program incorporates both the Balloon Project Office at Wallops Flight center, which provides flight capability, and the research programs including the Astrophysics Research and Analysis (APRA) program, which provide payloads and science. For the purpose of this Review, the Balloon Program incorporates the needs of all users of NASA's balloon capability, including all Divisions of the Science Mission Directorate as well as reimbursable users.

NASA will use the findings from this Review to assess the funding and mission model of the Balloon Program. NASA will also use the findings from this Review to:

- Define an implementation approach and mission model to achieve SMD science goals and astrophysics strategic objectives;
- Prioritize the activities of the Balloon Program to maximize flight rates and science return;
- Leverage the capabilities of commercial suborbital platform and system providers;
- Issue initial funding guidelines for the Balloon Project and payload development programs including the suborbital investigations elements within the APRA program.

The role of the Subcommittee is to respond to the recommendation of the Decadal Survey on Astronomy and Astrophysics 2020 for "an external review of the balloon program to establish a framework for accomplishing the competing needs of achieving flight capabilities and launch rates that meet demands, ensuring adequate investment in payloads, and lowering barriers to entry." The Subcommittee will compile findings based on the response from the Balloon Project Office to its questionnaire as well as the PAG 2020 Balloon Roadmap Report. The guiding evaluation criterion is to achieve an efficient mission model with high flight rate and a maximum return for a wide range of science investigation, technology maturation, and training of the next generation of NASA leaders.

The Subcommittee will prepare a report that includes findings and recommendations to assist the Astrophysics Division implement a more effective Balloon Program:

- Prioritized list of balloon technologies/capabilities needed to enable science investigations and technology maturations for future missions;
- Prioritized list of launch site requirements and what constitutes a healthy campaign cadence and expected number of launches per campaign;
- For the Astrophysics Research and Analysis Program, a healthy number of balloon investigations and notional funding profiles; and
- Capabilities of commercial suborbital flight providers and efficiency gains to be leveraged; and
- Ways to reduce barriers to entry, particularly for new PIs and new (to the Balloon Program) organizations, including underrepresented people and organizations.

The Director, Astrophysics Division, will appoint the Chair and members of the Subcommittee, for terms of up to 18 months. The Subcommittee will have approximately eight to fifteen members. The membership will consist of individuals with relevant experience and expertise drawn from government, academia, independent researcher centers, and industry. Members of the Subcommittee who are not Regular Government Employees will be designated Special Government Employees. Staff and travel support for the Subcommittee Chair and members will be provided by NASA.

The Director, Astrophysics Division, will appoint a Designated Federal Officer for the panel who will coordinate membership, meeting, and other requirements.

The Subcommittee can hold up to six meetings during the year and is expected to be responsive to the requests of the Director, Astrophysics Division, and the Associate Administrator, Science Mission Directorate. The Director, Astrophysics Division, or the Subcommittee may establish panels as needed. It is expected that all or most meetings will be non-public and attendant FACA administrative procedures will be adhered to.

The Subcommittee will report to the APAC and will not provide advice or work products directly to NASA. The Subcommittee Chair or designated member will submit an Independent Review report containing the Subcommittee's recommendations and findings, as well as its work products, for public deliberation by the APAC. After public deliberation of the Independent Balloon Program Review report delivered to it by the Subcommittee, the APAC will deliver a final report to NASA reflecting its formal recommendations to NASA, as well as append an unedited copy of the Independent Balloon Program Review Subcommittee's report.

These Terms of Reference will be terminated at either the discretion of the Director, Astrophysics Division, following consultation with the Associate Administrator, Science Mission Directorate, or 18 months from its signed effective date, whatever comes first.

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Paul Hertz
Director, Astrophysics Division
NASA Science Mission Directorate

Date

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