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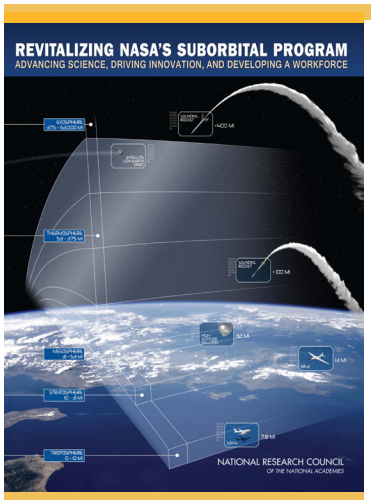
REPORT IN BRIEF

Revitalizing NASA's Suborbital Program:
Advancing Science, Driving Innovation and Developing a Workforce

SPACE STUDIES BOARD



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Suborbital flight activities, including the use of sounding rockets, aircraft, high altitude balloons and suborbital launch vehicles, offer valuable and cost-effective means for advancing science in a wide range of disciplines. These activities also train the next generation of aerospace scientists and engineers, providing opportunities for participants to acquire skills in systems engineering and systems integration that are critical to maintaining the nation's leadership in space programs. Reductions in suborbital programs at the National Aeronautics and Space Administration (NASA) have raised concerns by many space researchers that contributions from suborbital missions fall short of what they could and should be. Produced at the request of NASA and in response to language in the NASA Authorization Act of 2008, *Revitalizing NASA's Suborbital Program* is an assessment of the current state and potential of NASA's program for suborbital research. The findings of this study illustrate that suborbital research activities play vital and necessary strategic roles in NASA's research, innovation, education, employee development, and spaceflight mission success, thus providing the foundation for achievement of agency goals. Given its importance, the study recommends that NASA's suborbital program be prioritized and reintegrated with the organization's larger research agenda.

The NASA Authorization Act of 2008 finds it in the national interest to expand the size of NASA's suborbital

research program and consider it for increased funding. This study reviews the existing programs that make use of suborbital flights; the status, capability, and availability of suborbital platforms; the existing or planned launch facilities for suborbital missions; and opportunities for the integration of scientific research, training, and educational collaboration in suborbital missions by NASA.

The Value of NASA's Suborbital Programs

The Airborne Science Program, Scientific Balloon Program, and Sounding Rocket Program, as well as other activities such as the Stratospheric Observatory for Infrared Astronomy (SOFIA), each represent unique capabilities with far-reaching effects. These programs enable a wide variety of cutting-edge research in areas such as Earth observations, climate, astrophysics, and solar-terrestrial observations, as well as calibration and validation of satellite mission instruments and data. In Earth sciences, in particular, the suborbital program (especially through use of its airborne and balloon capabilities) has enabled studies of chemical and physical processes occurring in the atmosphere, oceans, and land (and at their interfaces) having important socioeconomic and political implications. Suborbital programs not only offer cost-effective means of scientific discovery, they also provide NASA's employees with effective hands-on engineering and management experience that transfers readily to spaceflight missions. These frequent opportunities offer exposure to the full life cycle of a mission, providing training for students, researchers, principal investigators, project managers, and engineers that is vital to the success of future space endeavors.

Need for Improvement

Although suborbital elements and facilities fulfill a critical role in contributing to overall mission success, changes in resource allocation and organizational structure at NASA have led to an erosion of capability. The committee found that NASA's existing suborbital programs are insufficiently funded and lack a well-defined and integrated long-term strategic plan. As a consequence, they are not fully or effectively used.

Stressing the precarious position of NASA's current suborbital program and the modest level of funding required for a robust and healthy program, the study committee issued the following recommendations as a basis for a marked change of course for the suborbital program as a whole:

Reordering of NASA Priorities to Increase Funding of the Suborbital Program

NASA should undertake the restoration of the suborbital program as a foundation for meeting its mission responsibilities, workforce requirements, instrumentation development needs, and anticipated capability requirements. To do so, NASA should reorder its priorities to increase funding for suborbital programs.

Elevating Program Leadership

NASA should assign a program lead to the staff of the associate administrator for the Science Mission Directorate to coordinate the suborbital program. This lead would be responsible for the development of short- and long-term strategic plans for maintaining, renewing and extending suborbital facilities and capabilities. Further, the lead would monitor progress toward strategic objectives and advocate for enhanced suborbital activities, workforce development, and integration of suborbital activities within NASA.

Training and Career Development

To increase the number of space scientists, engineers and system engineers with hands-on training, NASA should use the suborbital program elements as an integral part of on-the job training and career development for engineers, experimental scientists, system engineers, and project managers.

Investing in Advanced Capabilities

NASA should make essential investments in stabilizing and advancing the capabilities in each of the suborbital program elements, including the development of ultralong-duration orbital capability for sounding rockets, and modernization of the core suborbital airborne fleet. (The committee notes that it was not asked to prioritize the different elements of the suborbital program, but such a prioritization should be an integral part of implementing this recommendation.)

Monitoring Commercial Suborbital Space Developments

NASA should continue to monitor commercial suborbital space developments. Given that the commercial developers stated to the committee that they do not need NASA funding to meet their business objectives, this entrepreneurial approach offers the potential for a range of opportunities for low-cost quick access to space that may benefit NASA as well as other federal agencies.

Committee on NASA's Suborbital Research Capabilities: Stephen R. Bohlen, Texas A&M University, Chair; **Kristin A. Blais**, The Boeing Company; **Mark A. Brosmer**, The Aerospace Corporation; **Estelle Condon**, NASA Ames Research Center (Retired); **Christine M. Foreman**, Montana State University; **Adam P.-H. Huang**, University Of Arkansas; **Michael J. Kurylo III**, Goddard Earth Sciences And Technology Center; **Robert P. Lin**, University Of California, Berkeley; **Franklin D. Martin**, Martin Consulting Inc.; **R. Bruce Partridge**, Haverford College; **Rober Pincus**, RP Consultants; **W. Thomas Vestrand**, Lost Alamos National Laboratory; **Erik Wilkinson**, Southwest Research Institute

Staff: Robert L. Riemer, Study Director; **Dwayne A. Day**, Senior Staff Officer; **Catherine A. Gruber**, Editor; **Linda M. Walker**, Senior Project Assistant

The National Academies appointed the above committee of experts to address the specific task requested by NASA. The committee members volunteered their time for this activity; their report is peer-reviewed and signed off by both the committee members and the National Academies. This report brief was prepared by the National Research Council based on the Committee's Report. More information can be obtained by contacting the Space Studies Board (hyperlink).

Copies of the full report can be purchased from the National Academies Press, 500 5th Street NW, Washington DC, 20001; (800) 624-6242; www.nap.edu