



Sustain American Excellence in the Aerospace Sciences with Increased NASA Funding for Hands-On Training of Tomorrow's Space Scientists

There is a real need to increase funding for workforce development via hands-on research and experiments for undergraduate, masters and doctoral students at American colleges and universities. A failure to invest in today's students and young professionals will ultimately lead to a crisis when that generation is expected to assume the mantle of leadership within the U.S. aerospace community.

NASA must address this problem by increasing its investment in proven programs such as sounding rocket launches, aircraft-based research, and high-altitude balloon campaigns, which provide opportunities for hands-on flight experience at a relatively low cost of failure. NASA's involvement in providing development and flight opportunities for university experiments will pay future dividends not only by encouraging larger numbers of talented students to enter the field, but also by improving the abilities of incoming employees.

NASA's Workforce Crisis Is Resulting in Fewer Scientists and Engineers with Aerospace Expertise

- The U.S. aerospace and defense industry is losing an estimated 27,000 employees per year, and the average age of NASA's workforce of engineers and scientists is now 46.
- 12% of NASA's engineers and 21% of its scientists are now eligible to retire.
- Estimates show there will be a need for more than 1,000 new doctoral and masters graduates each year to replace key positions in the retiring NASA aerospace workforce.
- Without a supply of younger workers to assume future leadership roles as older workers retire, NASA is facing a looming workforce crisis.

Decreases in the Suborbital Experimental Launches Limit the Hands-on Training Opportunities Available to Train the Next Generation of Space Scientists

- In the last 40 years, U.S. suborbital experimental launches have decreased 80% - from 270 per year to just 50 planned launches in 2007.
- Decreases in suborbital launches have resulted in a corresponding drop in the hands-on training opportunities our universities provide to undergraduate, masters and doctoral students in hard sciences.
- The current instability in NASA funding for suborbital experimental launches often leads students and faculty to choose other scientific career paths that appear better funded and more stable.
- The June 2007 National Research Council (NRC) report on science and technology workforce needs reported an increasing gap in supply and demand for aerospace science and engineering graduates.
- Scientists who participate in suborbital experimental launches gain invaluable experience in research related to critical fields like Earth Science, Climate Change, Astrophysics, Heliophysics, Manned Space Flight Instrument Testing, and Pre-Flight Satellite Calibration.
- While U.S. investments in suborbital experimental launches are declining, China and other countries are increasing their investments in research and development of similar projects to provide future generations of scientists the critical training skills that will serve as a foundation for future research.
- Faculty research is fundamental for student training and leads to the development of new technology and tools for future applications in space. Hands-on experience for students is provided by suborbital programs, Explorer, and other small spacecraft missions, and design competitions, all of which rely on continuing NASA support.
- Undergraduate and graduate co-op student programs are particularly effective in giving students early hands-on experience and in exposing students and NASA to each other to help enable sound career choices and hiring decisions.



Critical Training Opportunities for Tomorrow's Scientists Can Be Provided At A Relatively Low Cost

- The average research payload for sounding rocket projects range from \$200,000 to \$2.5 million.
- The average cost of recent sounding rocket payloads was just over \$1 million, while balloon launch payloads range in cost from just \$50,000 to \$1 million. Launch, labor and infrastructure costs involved with each payload launch adds additional costs that average \$2 million.
- The 2007 NASA budget includes a total of \$64 million in funding for Sounding Rockets (\$32M), balloons (\$22M) and aircraft (\$10M) - **those numbers should be at least doubled in FY09 and beyond.**
- NASA currently spends more than \$150 million a year on education efforts but much of that funding is aimed at outreach education in primary and secondary schools.

THE BEST SOLUTION: Increase FY2009 Funding for NASA's Suborbital Experimental Launches to Support Hands-on Training Opportunities for Students

- Expanding NASA's funding for suborbital experimental launches would allow several hundred new scientists to have experimental hands-on training in spaceflight projects before they graduate.
- Increased funding should provide for at least 150 suborbital experimental launches per year.
- Funding will triple the number of scientists and college students engaged in this research.
- The average experimental launch is a training opportunity for 3 to 5 doctoral and masters students.
- NASA should support involvement in suborbital programs and nontraditional approaches to developing skills.
- Investment in programs such as Centennial Challenge prizes and other innovative methods has the potential to pay benefits many times greater than their cost, by simultaneously increasing NASA's public visibility, training a new generation of workers, and pushing the technology envelope.

Representatives from 101 Major Research Universities Unanimously Voted to Urge Government Action on this at USRA's Annual Conference This Year.

Proposed Report Language for the FY2008 Commerce/Justice/Science Appropriations Bill:

For the FY08 appropriations cycle, USRA seeks report language asking NASA to study the need to invest more in suborbital research programs that provides hands-on experience and determine the additional funding needed to reach those goals:

The Committee is aware that the National Research Council (NRC) completed a report on science and technology workforce needs. Based on recommendations included in this report, the Committee believes increased hands-on experimental opportunities at the university level are essential for recruiting and maintaining the highly trained technical workforce necessary to implement NASA's future programs. The Committee therefore directs NASA to provide a report within 90 days of enactment of this bill that outlines the Agency's plan to increase its investment in suborbital programs, such as sounding rocket launches, manned and unmanned aircraft-based research, high-altitude balloon campaigns, and emerging private sector suborbital flights that provide opportunities for hands-on flight experiment experience, and to detail the funding level necessary to fully implement this plan.

About USRA: USRA is a private, nonprofit corporation founded under the auspices of the National Academy of Sciences (NAS). USRA's 101 member institutions with graduate programs in space sciences or technology are involved in a broad array of space- and aeronautics-related fields, including astronomy and astrophysics, Earth sciences, microgravity, life sciences, space technology, computer science, and advanced concepts.