

TESTIMONY TO THE  
COMMITTEE ON SCIENCE AND TECHNOLOGY  
SUBCOMMITTEE ON SPACE AND AERONAUTICS

NOVEMBER 13, 2019

A. THOMAS YOUNG

Chairwoman Horn, Ranking Member Babin, and Committee Members, I am pleased to have the opportunity to present my views as to the critical actions necessary to maximize the probability of success of the Mars-Moon human exploration program.

Mars human exploration, with humans to the Moon as preparation, is one of and perhaps the most challenging, exciting, and potentially rewarding exploration endeavors ever undertaken. The challenges and risks cannot be overstated, nor can the excitement and anticipated extraordinary rewards. It is a bold and achievable endeavor that the United States should pursue. “Business as usual” will not be adequate to successfully implement the Mars-Moon program. The “best of the best” will be required. Extraordinary actions will be necessary, requiring that the program have high national priority.

NASA has exceptional Moon and Mars experience with sophisticated robots at the Moon and Mars, and humans on the surface of the Moon. No one else, domestic or international, has this breadth and depth of exploration experience and capabilities. The challenges of the Moon-Mars program are such that the leadership capabilities of NASA must be augmented. Additional senior, experienced leadership from other government organizations, industry, and academia will be needed as was the case was for Apollo.

Strengthening the NASA workforce will also be necessary. Half a century has passed since Apollo making that experience

less relevant. A workforce experienced in the development and execution of large, complex space projects will be required. The International Space Station (ISS), Orion, SLS, and the Mars robotic program have contributed significantly to workforce development. I believe the most important role for the lunar phase is additional workforce experience. Mercury, Gemini, and Saturn V clearly were important contributors to workforce development for Apollo.

The United States aerospace industry has implementation capabilities that are second to none. Utilizing the implementation capabilities of industry in partnership with the breadth of NASA experience will be critical to achieving program success. More specifically, the full capability of NASA and industry will be required.

Management and contracting experiments must be excluded from the Mars-Moon program. Implementation will be at the limitation of our capability without the additional complications of management and contracting experiments.

A clear, unambiguous goal is required. Is the lunar part of the program to support success at Mars or is it to achieve sustained lunar presence? Does the Mars part of the program have specific objectives such as a Mars orbital mission followed by “boots on the ground,” or is it a long-range objective? Answers to these questions will have a profound impact on schedule, cost and a reasonable timeline for humans to Mars.

A clear, unambiguous goal must be followed by a detailed plan that is consistent with the goal and developed by the Mars-Moon program leadership. A detailed plan is the “glue” that integrates the vast array of Mars-Moon participants into the incredible team necessary to implement the Mars-Moon program. Additionally, a detailed plan is necessary to rally support, develop a credible budget, and obtain program and budget approval.

Obviously, a budget is required. To be credible, the budget must fund the most probable cost of the program. My understanding of NASA policy is that the most probable cost is defined as a 70/30 cost estimate.

The budget should be phased by fiscal year consistent with the work plan associated with the detailed plan discussed earlier. This will result in a budget profile that is “bell” shaped with higher fiscal year funding required in years with development, manufacturing, integration, and testing. “Flat” budgets with a relatively equal funding level each fiscal year is the least efficient program management approach. A “flat” budget approach can result in years of scheduling delay and potentially the doubling of projected costs. Obviously, a “flat” budget should be avoided.

Today, NASA’s human space flight “plate” is full. ISS, commercial cargo, commercial crew, Low Earth Orbit commercialization, the new commercial space paradigm, etc. are all demanding activities. SLS, Orion, and Gateway are

challenging elements of the human space flight endeavor. In my opinion, the inclusion of the Mars-Moon program makes the portfolio of human space flight activities unachievable with an acceptable probability of success. Priorities and most likely the termination of some activities will clearly be necessary.

The Mars-Moon program is clearly the most challenging and difficult civil space program ever undertaken. Success will depend upon the recognition of the challenges, difficulty and risk. Success will depend upon the implementation of extraordinary actions necessary to have a sufficiently high probability of success. In summary, the actions include:

- NASA Leadership augmentation
- Strengthening NASA workforce
- Full utilization of NASA and industry capabilities
- Avoiding management and contracting experiments
- A clear and unambiguous goal
- A detailed plan
- A budget consistent with the most probable cost estimate
- Prioritization of human space flight activities

- Elimination of current human space flight activities necessary to assure the required resources are available for implementation of the Mars-Moon program.

The Mars-Moon program, while bold, is achievable. Extraordinary actions will be required to assure success. A “business as usual” approach will most likely end in failure. The absolute best of NASA, industry, academia and our international partners is required.

Thank you.

## **A. Thomas Young**

A. Thomas Young is the former Director of NASA's Goddard Space Flight Center, President and COO of Martin Marietta and Chairman of SAIC. He retired from Lockheed Martin in July, 1995 and the SAIC Board in 2013. Mr. Young is involved in various advisory and review activities associated with the U.S. Space Program.

Mr. Young began his career with NASA at the Langley Research Center in 1961. He was a member of the Lunar Orbiter Project Team and was Mission Director for Project Viking, which resulted in the successful landing of two spacecraft on the surface of Mars. He became Director of the Planetary Program at NASA Headquarters in 1976 and was appointed Deputy Director of the Ames Research Center in 1978. Mr. Young was Director of the Goddard Space Flight Center from 1979 to 1982. He joined the Martin Marietta Corporation in 1982 and was subsequently President of Baltimore Aerospace and the Electronics and Missiles Group. Mr. Young was President and COO of Martin Marietta from 1990 to 1995.

Mr. Young is a Honorary Fellow of the American Institute of Aeronautics and Astronautics, a Fellow of the American Astronautical Society, a Fellow of the Royal Astronautical Society and a Fellow of the International Academy of Astronautics. He is a member of the National Academy of Engineering and the University of Virginia Raven Society. Mr. Young is a former member of the NASA Advisory Council.

Mr. Young earned a bachelor of aeronautical engineering degree and a bachelor of mechanical engineering degree in 1961 from the University of Virginia. In 1972 he received a masters of management degree from MIT which he attended as a Sloan Fellow. He also holds a honorary doctor of science degree from Salisbury University.