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Common Sense and the Future of Space Exploration

by

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The overall record of the National Aeronautics and Space Administration during the nearly thirty years of its existence has been a brilliantly successful one, in many different ways.

NASA has provided the scientific and technical foundations for a wide array of direct human services, most notably in worldwide communications, in improved understanding of the physical and chemical conditions for all forms of life on Earth, and in the global survey of natural resources. It has sponsored a golden age of advances in our knowledge of the solar system and of the remote astronomical universe and it has achieved the popular cultural objective of flying human crews in space, most notably to and from the moon.

But despite all of these successes and our truly enormous potential for space activities, our national launching capability is now in a state of nearly total paralysis for a period of at least two and a half years. This default is unprecedented in the history of the program. Meanwhile, billions of dollars worth of high priority commercial, scientific, applicational, and military spacecraft are piling up in the launching queue.

What went wrong?

How can we fix it?

These are the questions that I now address.

In a critique of President Reagan's February 1988 state-of-the-union message, Senator Robert C. Byrd remarked that "Ideology is no substitute for common sense." This remark, though made in a different context, summarizes my point of view on our national space policy.

An often repeated ideology of space activities is, in brief, that it is the manifest destiny of mankind to live and work in space and to colonize the solar system. This credo was adopted as an axiom, or perhaps a divine revelation, by President Reagan in his 1984 and 1985 state-of-the-union messages and by the National Commission on Space in its 1986 report.

My own approach to the subject as a long-time practitioner is quite different. I advocate a pragmatic, incremental approach, exploiting the things that work and phasing down the things that do not.

The essence of my position is that we must return to primary reliance on unmanned launch vehicles and unmanned, commandable spacecraft in order to reestablish the health and international stature of our national space program.

Let me explain.

The history of space exploration by the United States, the Soviet Union, the European Space Agency, and all other countries provides overwhelming evidence that space science and the many important practical applications thereof are best served by unmanned, automated, commandable spacecraft -- the obvious and only important exception being the study of human physiology and psychology under prolonged free-fall or low-g conditions.

Yet the civil space program of the United States continues to give dominant emphasis to the flight of human crews as its centerpiece and focus.

The failure of our national policy for exclusive dependence on the manned space shuttle for the launching of all commercial, scientific, applicational, and military spacecraft has been evident to practitioners for many years. The tragic explosion of the Challenger in January 1986 dramatized the wrong headedness and fragility of that policy and, at last, brought these facts to public attention.

That dramatic realization elicited astonishingly different responses by the Department of Defense and by the National Aeronautics and Space Administration.

Soon after the accident, Secretary of the Air Force Edward C. Aldridge, Jr., made the forthright public statement: "We made a great mistake in planning exclusive reliance on the shuttle to deliver military payloads into space. Believe me, we will never make that mistake again." True to his word, he placed the nearly-completed Vandenberg shuttle-launch facility in caretaker status and resumed the procurement of several classes of unmanned, expendable launch vehicles.

In contrast, NASA passed up the opportunity to reexamine the validity of its policy of the 1970's and early 1980's and hunkered down to vindicate it. Toward that end the agency has continued to devote a major fraction of its available resources to manned flight. Specifically it has undertaken to remedy known

weaknesses in the three remaining shuttles and associated boosters; has initiated the procurement of a replacement shuttle; and has planned to continue still another costly project -- namely the development of a large, permanently manned space station. These emphases were embodied in the agency's FY 1987 and FY 1988 budgets, which effectively ignored the nearly unanimous judgment of the user communities -- commercial, scientific, and applicational -- that return to primary dependence on expendable launch vehicles was the matter of greatest national urgency.

Only within recent months has NASA itself "nibbled the bullet" and expressed a relatively timid intention to return to a mixed fleet of manned shuttles and unmanned expendable launch vehicles. Even this intention is now threatened by the unwillingness of NASA to assure the Congress that it regards this matter as one of overriding priority.

Meanwhile, no truly comprehensive recovery of our civil space program has yet been implemented.

It is obvious that a rapidly increasing annual budget for NASA could respond affirmatively to all of the diverse constituencies of the civil space program. But the public mandate for approach to a balanced federal budget appears to negate such an expansive point of view. Either, NASA must be exempted from this mandate, or hard choices must be made. There is no way that a shuttle fleet of three or even four shuttle orbiters can meet the pent-up launching requirements of the next ten years, especially if the construction, deployment, and utilization of a space station go forward. Given due regard for increased safety, the optimistic shuttle launch rate is eight to ten per year. At this launch rate the shuttle system is the world's most expensive and least robust of available techniques and it is quite inadequate for national needs. Despite heroic efforts to improve safety and reliability, it will be difficult if not impossible to achieve better than a 97% success rate under normal operating conditions. Such a success rate corresponds to the loss of one shuttle about every three years.

It is, of course, of central importance to note that only a small fraction of our science and applicational missions require a human crew in space. This fraction can be progressively reduced by good engineering.

Surely there is no element of our civil space program as important as returning to primary reliance on unmanned vehicles and unmanned spacecraft. This can be done within prevailing budgetary limits by simply reducing emphasis on the relatively unfruitful manned program and by deferring development of a large space station, pending critical review of its value.