

Testimony before Senate Subcommittee
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by

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A Critique of National Space Policy

Mr. Chairman and members of the committee:

It is no news that the space programs of the United States, both civil and military, have been acutely disabled since the Challenger accident in January 1986. Billions of dollars' worth of high priority commercial, scientific, and military spacecraft are backing up in the launching queue but, within the civil sector, no effective effort is being made to remedy this disgraceful situation. In fact, the present inflexible policy runs in the opposite direction -- that is, to worsen the situation.

The likelihood of such a national disability was foreseen in testimony before this committee on the 29th of June 1971 by Senator Walter Mondale, Thomas Gold, Brian O'Leary, and myself. The committee was then chaired by Senator John Pastore.

At that time, advocates of the development of a fleet of manned space shuttles promised the Congress that each of the proposed shuttles would deliver 50,000 pounds of payload into low earth orbit at a launching cost of \$100 per pound; that each shuttle would have a useful lifetime of 100 missions; that by the early 1980's the U.S. would be conducting 50 shuttle flights per year (i.e., about one per week) for civil purposes alone; and that all expendable launch vehicles would thereby be rendered obsolete.

The outrageous optimism of those promises was described in the above-cited testimony; it is now evident to everyone.

In contrast, the unmanned elements of our space program have consistently delivered on their promises and have usually gone far beyond them.

The burden of my testimony today is an assault on prevailing national policy for the conduct of our civil space program -- a policy that ignores the lessons of experience, emphasizes things that do not work, and neglects the things that do work. I make this criticism as one who has devoted over forty years of intensive professional activity to space exploration. There is no one who wishes its continued success more than I do.

I recognize that this committee is concerned with appropriations. But I am not here to suggest that everything can be fixed by another one or two billion dollars per year. On the contrary, I consider that the federal budget for civilian space activities is already at a reasonable level and that the primary fault is one of policy and not one of appropriations.

On the 25th of January 1984, I listened very carefully to President Reagan's state-of-the-union address and later got a transcript of it from the Congressional Record. He singled out space exploration as the second of his four great goals for America. That was very pleasant to hear, but I was appalled by his emphasis as represented by the following verbatim excerpt from his address:

"We can follow our dreams to distant stars, living and working in space for peaceful, economic and scientific gain. Tonight, I am directing NASA to develop a permanently manned space station and to do it within a decade.

"A space station will permit quantum leaps in our research in science, communications, and in metals and life-saving medicines which can be manufactured only in space."

He continued with remarks on the enormous potential for commerce in space.

A year later the President reiterated his enthusiasm for space as the "next frontier" and emphasized the bright prospects for manufacturing exotic medicinals for curing disease and extraordinary crystals for revolutionizing electronics -- all in a permanently manned space station.

These statements were so hyperbolic and so ill-founded as to leave an informed person gasping for breath. Indeed they resembled science fiction much more closely than they did sound national policy.

In refutation of the President's statements, I submit that the principal elements of our forty years of experience in space are as follows:

First, despite much speculation, only one truly commercial application of space technology has emerged thus far. That is represented by our great global network of communication satellites and the associated industry, including the manufacture of launch vehicles. In addition, private companies have, of course, the central role in selling space equipment and services to the federal government. But these latter functions do not qualify for the usual understanding of the term commercialization, which means providing products and/or services that pay their own way in the non-governmental market place.

Second, there are many other important utilitarian applications of space technology -- weather observation and forecasting; remote sensing of the earth's surface resources; marine and aircraft navigation; the applied sciences of the sun and of the earth's ionosphere, magnetosphere, atmosphere, and oceans; and military reconnaissance, surveillance, and other applications that are technically similar to those for civil purposes. But all of these applications remain wholly or principally in the area of governmental services.

Third, nearly all of the above mentioned applications of space technology and nearly all of the spectacular advances in the space sciences including planetary exploration and space astronomy have been, are being, and will continue to be accomplished by unmanned, automated, commandable spacecraft. Moreover, most such spacecraft have been and can be launched by expendable launch vehicles and at considerably less cost than by the shuttle -- despite the grossly optimistic predictions to the contrary in the early 1970's -- and with minimal risk to human life.

Fourth, materials processing in space is still an embryonic science. It has significant research interest but, as of the present date, its demonstrated commercial potential is wildly incommensurate with the cost of a space station that has materials processing as one of its principal declared purposes.

A massive two-year study entitled "Space Science in the Twenty-First Century: Imperatives for Two Decades, 1995-2015," under the auspices of the National Academy of Sciences has been completed recently. Apart from biomedical research on human subjects, this study has again found few first-order scientific objectives that require human crews in space, much less a permanently manned space station, during the adopted time frame.

The cost/benefit ratio of secondary purposes such as repair, refurbishment, refueling, and replacement of equipment in earth orbit is, I think, greatly underestimated by advocates of the space station. Indeed, it is much more cost-effective to improve the reliability and versatility of space equipment by preflight developmental and test work and, if necessary, to service it by remotely controlled, unmanned spacecraft. The true "heavy-hitters" in space science and applications have been long-lived satellites and spacecraft based on intrinsically good design, good engineering, and rigorous testing.

There has been a truly astonishing difference in the responses to the present national emergency in space by the Department of Defense and by the National Aeronautics and Space Administration.

Soon after the Challenger accident, Secretary of the Air Force Edward Aldridge made the forthright public statement: "We made a great mistake in planning exclusive reliance on the shuttle for the delivery of military satellites into space. Believe me, we will not make that mistake again." True to his word, he placed the Vandenburg shuttle-launch facility in caretaker status and immediately initiated the procurement of a family of expendable launch vehicles for defense purposes. The same position has been taken by the National Oceanic and Atmospheric Administration.

But the administration of NASA has steadfastly refused to recognize the full import of the existing problem and chooses to devote the principal part of its resources to the pursuit of vaguely defined objectives of a futuristic nature. Its 1987 and 1988 budgets emphasize repair of the shuttle system, the procurement of a replacement shuttle, a continuing primary dependence on manned spacecraft for all purposes and the rapid development of a huge space station.

I grant the political face-saving importance, perhaps even the political necessity, of resuming shuttle flights with improved safety. But there is no urgency to building a replacement shuttle and far less urgency to developing a space station. The true national urgency, in my view, is to return to primary dependence on expendable launch vehicles for both civil and military purposes. Yet NASA's 1988 budget, now before this committee, makes provision for the purchase of only one ELV.

Three years ago NASA promised the Congress that it could build a large space station for \$8 billion over a ten year period. This estimate, as with the shuttle program estimates in 1971, was so optimistic and so incomplete as to be deceitful -- at least to the uninformed. In a paper that I wrote for the Scientific American magazine in the autumn of 1985, I estimated the true cost as more like \$30 billion. I am happy to read that Congressman Nelson's recent estimates of cost now resemble mine. Both are probably still on the low side.

I have no intrinsic opposition to manned flight or to a manned space station if their purposes are described honestly. But I submit that the development of a large space station during the next ten years is grossly inappropriate to our national predicament in space and to the public mandate for financial responsibility by the federal government.

My overall conclusion is that a space station program, if actually pursued as now projected, will greatly diminish our future advances in space applications of direct human importance and in scientific work of broad appeal to an intelligent citizenry. As a result, our international leadership in space will continue to shrink.