For "Aerospace 86", Annual Meeting of American Institute of Aeronautics and Astronautics, Arlington, Virginia, 29-30 April, 1 May 1986

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Introductory remarks by James A. Van Allen, University of Iowa, at Space Station session on 30 April

Mr. Chairman, Ladies, and Gentlemen:

It is no news that our national space program is now in a state of massive disarray.

All of us in the program have the professional obligation to help "get our act back together".

My position is that undertaking development of a space station at this time will impede rather than advance this effort.

Let me explain!

In 1946, now forty years ago, we began high altitude research using scientific equipment carried by rocket-propelled vehicles through and above the atmosphere of the earth. This early work laid the foundations, both technical and scientific, for the effective utilization of satellites of the earth and spacecraft on deep space missions. The birth of the space age, following a gestation period of some eleven years, is usually said to have occurred on 4 October 1957 with the launch of Sputnik I. We have now passed through a very difficult, and expensive, adolescence and have reached a level of substantial maturity in understanding the great potential of space techniques. But, as a nation, we are continuing to behave like an adolescent in the sense that we are not really using our experience thoughtfully and effectively.

I listened very carefully to President Reagan's state-of-the-union address on the 25th of January 1984 and later got a transcript of it. It was very pleasant to hear his endorsement of our national space program but I was distressed by its emphasis as represented by the following verbatim quotation:

> "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 "man's permanent presence in space" and the bright prospects for manufacturing large quantities of medicinals for curing disease and extraordinary crystals for revolutionizing electronics -- all in the proposed space station.

As a basis for national policy, all of this was so hyperbolic and so poorly grounded in experience as to leave an informed person gasping for breath. Indeed, such statements do our entire space effort a substantial disservice by creating quite unrealistic expectations. I am devoted to forward thinking and have, in fact, made my professional career in that spirit but I have tried to remain attached to available experience and to move forward in a measured way.

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Some of the basic elements of our forty years of experience in space are as follows:

1. 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. In addition, private companies have, of course, the central role in selling space equipment and services to the federal government. But these functions do not qualify for the usual understanding of the term commercialization, which means developing products and/or services that pay their own way in the non-governmental market place.

2. 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.

3. Nearly all of the above mentioned applications of space technology and nearly all of the spectacular advances in the space sciences, including 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 grossly optimistic predictions to the contrary in the early 1970's.

4. 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 for that purpose.

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In September 1983, the Space Science Board of the National Academy of Sciences concluded a preliminary assessment of the prospective usefulness of a manned space station for scientific purposes. The following is quoted from their report (full text in Appendix I):

"... The Board has also examined the set of specific missions proposed for implementation from the Space Station system during the years 1991-2000. It has found that few of these missions would acquire significant scientific or technical enhancement by virtue of being implemented from this space station. In view of this and the adequacy of the present space transportation system for the purposes of space science, the Board sees no scientific need for this space station during the next twenty years. ..."

A much more massive two-year study of "Major Directions for Space Sciences, 1995-2015", under the same auspices, is now approaching completion. 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, 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 pre-flight developmental and test work. 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.

In an attempt to stimulate support by the scientific community for the proposed space station program, NASA has appointed groups of scientists with the assignment of trying to think of something for which a space station would be useful -- if one were in existence. Such an assignment is one of the world's outstanding examples of a loaded question.

The unmentioned assumption is that a space station can be created and maintained by some form of budgetary magic without any diminution of the resources available for space science and applications. I believe this assumption to be unjustified.

Following the peak of our national space effort in the mid-1960's, the budget of NASA has fallen to about one-third of its peak value, in terms of normalized dollars, and has been essentially flat for the past twelve years [Figure 1]. This latter fact must be interpreted as representing a sociological/ political equilibrium between advocates of increased space activities and skeptics of their worthiness. Recognizing this fact together with our present federal budgetary distress, I submit that it is optimistic to even assume a zero-sum game for NASA's near term budgetary future.

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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.

SPACE SCIENCE BOARD ASSESSMENT OF THE SCIENTIFIC VALUE OF A SPACE STATION

During the past year, the Space Science Board has examined the question of what space systems are required to launch and support adequately the space science missions designed to attain the high priority science objectives identified by the Board and its committees. These missions are very numerous, challenging, and exciting. However, the rate at which they are launched would have to increase significantly above the current rate if all of the missions needed to fulfill this program are to be flown during the next two decades. The means of launching and tending them is now available or being developed in the form of expendable launch vehicles and the space shuttle, augmented as required by adequate high energy upper stages. One reason for the present slow pace is the delay in bringing the shuttle and its upper stages to full operational status. Another is that we have not yet learned how to use the shuttle efficiently and effectively as a manned orbiting laboratory. The Space Science Board urges that the present launch systems be fully and flexibly exploited and adequate resources be brought to bear so that the stated objectives of space science can be reached in a timely fashion. The results of following this course should be a rich harvest of discoveries and insights in all disciplines of space science.

The Space Science Board has carefully examined the proposal by NASA for a manned space station in low Earth orbit designed to engage in a number of major activities. A significant portion of these activities involves support of space science missions. The Board has also examined the set of specific missions proposed for implementation from the space station system during the years 1991-2000. It has found that few of these missions would acquire significant scientific or technical enhancement by virtue of being implemented from this space station. In view of this and the adequacy of the present space transportation system for the purposes of space science, the Board sees no scientific need for this space station during the next twenty years.

In the longer term, the Space Science Board sees the possibility that a suitably designed space station could serve as a very useful facility in support of future space science activities. Such a space station could provide means for erecting and fabricating large and novel structures in space, and for servicing, fueling, and retrieval of payloads in orbit. If NASA wishes to develop plans for such an ambitious and technically demanding space station for the next century, the Space Science Board would be pleased to work with NASA in defining the properties of such a space station.

APPENDIX I

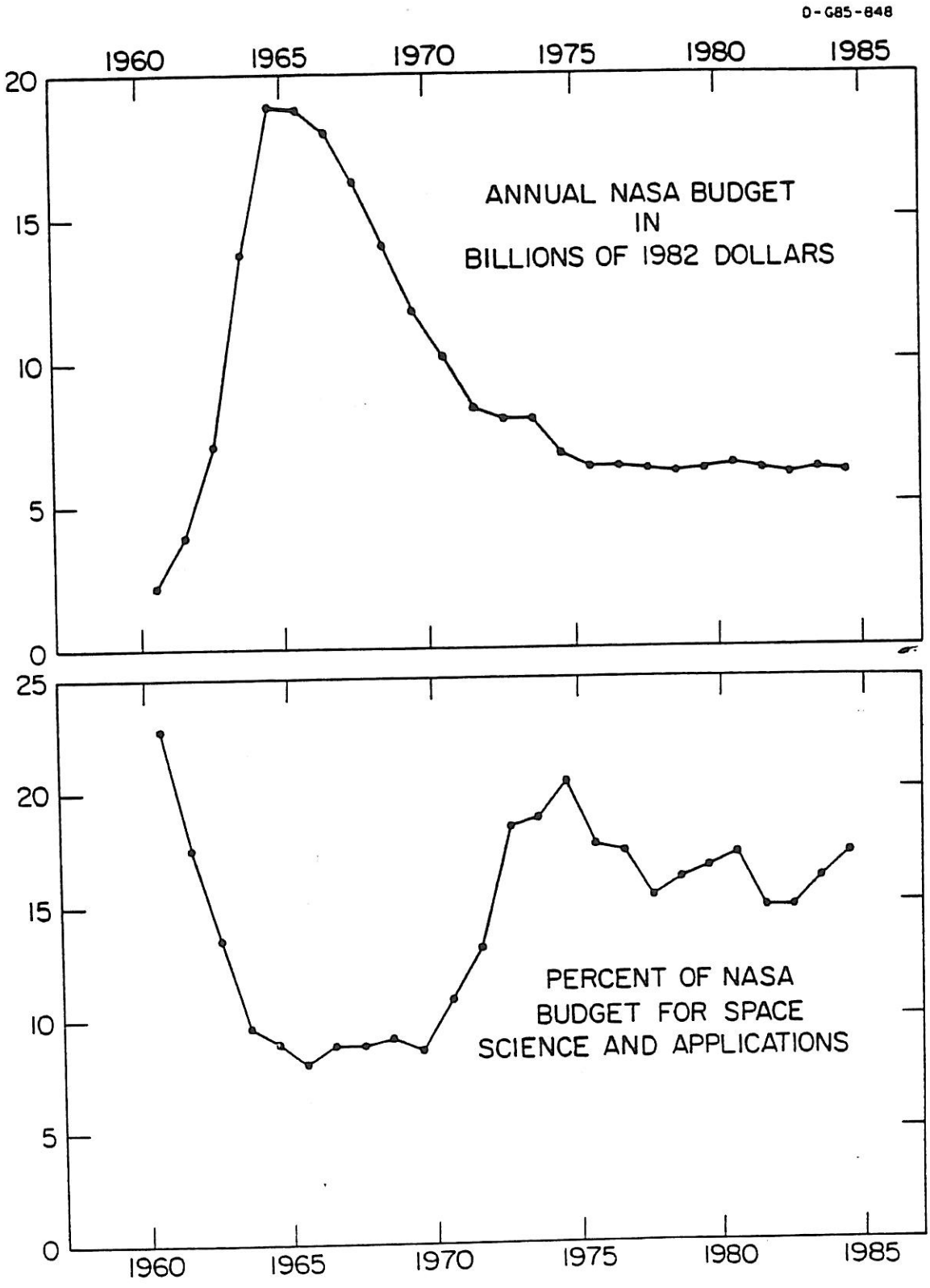
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Figure 1