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Address

by

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THE US SPACE PROGRAM AND ITS INTERNATIONAL SIGNIFICANCE

It should go without saying that we require a fair understanding of a domestic phenomenon before we seek to derive its international significance. In the case of our national space program, however, I think this cautious logic is particularly important. For one thing, the space effort is not well understood. For another, one-dimensional assumptions regarding its nature have led and will continue to lead to only one-dimensional conclusions regarding its international meaning.

Let us for a moment put aside questions of prestige, high adventure, intellectual challenge, military implications and the rest. Let us instead look at the vital statistics and quintessential nature of the national space program.

Character of the domestic space program.

The first and fundamental fact is that we are spending upwards of five billion dollars a year in our civilian space effort. There are widespread impressions that these vast sums are somehow blasted off into space and that space science and technology themselves are highly esoteric pursuits, remote from the mainstream of our national life. These impressions, which are quite wide of the mark, contribute directly to the conclusion that a nebulous prestige is the major, if not the only, reward of our exertions.

In fact, over 90 percent of our space dollars are spent in American industry and find their way into wages, salaries and other compensation. The materials actually launched into space represent about 2 percent of the direct space expenditure. Only 1 percent of our gross national product is used, but, given the normal economic multiplier, the civil space program creates spending in the economy of the order of 20 billion dollars a year. Thus, the preponderant impact is upon industry, here and now. Over 20,000 firms participate directly in contracts and subcontracts under the program. These firms employ more than 400,000 people. The engineers and scientists involved represent only about 5 percent of the nation's total.

While these facts help to develop some appreciation of the very real economic and industrial impact of the space effort, its magnitude is not as significant as its quality. It is first necessary to know that we are not dealing here with new and abstruse disciplines. Space science is the practice of the established disciplines--physics, astronomy, geology, meteorology, geodesy, and others--at their newest frontiers and with the benefit of new tools, the rocket and the satellite. Correspondingly, space technology is the practice of the established technical disciplines--materials, structures, fuels, propulsion, communications, data handling, power sources, and so forth--at their newest frontiers. It is dangerously misleading to suggest that the program diverts scientific and technical personnel from their normal preoccupations. In fact, scientists and technologists are impelled toward new standards and new knowledge, as well as a new, closer interrelationship, in fields which lie at the heart of progress in a technological world. In fact, we may with increasing confidence say that the peculiar quality of space science and technology is its forcing function, its acceleration of joint progress in a wide range of disciplines.

Its direct stimulus to the "economy" of science

and technology defines the fundamental character of the space program perhaps more closely than anything else. Something should also be said of the indirect stimulus. The question of spin-off, the application of specific items of space-borne technology to nonspace uses, has been debated a good deal without benefit of relevant data. Now, useful data are becoming available through a NASA program for identifying and disseminating information of potential and confirmed spin-off cases. Thousands of potential items are identified each month, evaluated and distributed by means of a joint government-industry-university machinery. Almost a thousand nonspace applications of space technology per year are being confirmed. These applications range from frying pans to major industrial products and processes. Examples are a new paint already licensed to fifteen companies and a magnetic hammer applied to the shaping of large structures in shipyards. Industrial firms are contributing almost a million dollars per year to the support of the dissemination centers and, perhaps more significant, renewing their memberships. Yet, the program is only in an early experimental stage.

The advanced managerial capacity developed in large and complex space programs is another major by-product

of the space effort. This capacity is beginning to be called upon for contributions in non-space problem areas in our society such as the design of state-wide transportation systems for the next fifty years, the total re-thinking of large hospital design and organization, and the revitalization of depressed areas.

These energizing effects are not confined to industry. Almost two hundred universities are participating in activities in support of the national space effort, many entering into new and useful relationships with industry in so doing, and programs are under way to create nearly a thousand new PhD's per year in space-related fields.

In sum, our national space effort is to be thought of as a significant economic activity, an unparalleled peacetime stimulus, a force for accelerating scientific and technological progress along a very broad front, and a producer of valuable side effects in industry, government, and university. Having said this much, it is now possible to suggest with somewhat greater assurance the observed and likely international significance of this program.

Implications for the Free World.

If major space expenditures contribute significantly

to the fundamental strength and viability of the United States in a world where economic and military security increasingly rest upon technology, this fact is important not only to the United States but to all those countries of the Free World which look to us as a shield against aggression and subversion. This is the first and perhaps the foremost significance of our national space effort in the world today.

A second element of international significance in the US space program is its relevance as an example, even as a moral, for the developed nations, nearly all of which are aligned with us. What has stimulated, energized, and advanced us may well stimulate, energize, and advance them. Their progress is a contribution to the strength of the Free World. An increasing technology gap between us can lead only to political and economic strains and to weakness. Indeed, the dedication of the Soviet Union itself to space research and exploration is a further lesson to the same point. For the Soviet Union is matching and outmatching us in space activity, obviously spending entirely comparable sums, although its gross national product is half the size of ours and it is faced with far more immediate consumer requirements. That the Soviet Union may be making a space

effort two and three times our own is a sobering fact and is not to be explained in terms of trivial objectives. Yet our friends in the west are spending absolutely or relatively only one-thirtieth as much as we are on space technology. This gap and its implications require the most careful study by our friends in the light of the substantive nature and character of our program and its value to us as a nation.

Direct International Benefits.

In a more immediate and narrow sense, the US space program is, of course, already producing tangible benefits for the peoples of the world through practical applications such as space communications and weather systems. Nearly fifty countries have joined with the US in an international consortium organizing and controlling the daily use of communications satellites, ultimately on a global scale. The success of early television demonstrations on a real-time intercontinental basis hints at the potential value of such programs in bringing peoples closer together. Meanwhile, weather satellites are bringing hurricane advisories and other weather information to areas all over the world which have never before had the advantage of early warning systems or effective prediction services. Simple and inexpensive equipment allows any interested country to receive,

directly from US satellites, weather information in the form of cloud cover pictures for its immediate region twice a day.

In addition to weather and communications services, other wide-ranging and important practical applications of space technology can be foreseen, including many of potential value to developing areas. It is only fair to say that the United States is the only space power in the world which has spent its treasure and energies in this way for space systems of benefit to peoples everywhere.

International Space Cooperation.

It is further significant internationally that the United States has welcomed direct foreign participation in space research and exploration. The US has contributed its boosters to launch six satellites which were conceived, engineered, instrumented and funded by cooperating foreign countries. Eight more such satellites are to be launched by us under existing agreements and, at this date, other agreements are in early prospect. We have opened our own satellites to foreign experimenters. Some twenty experiments proposed by scientists abroad have been selected on their merits for flight on our satellites. These foreign experiments are contributed to the program; we contribute space in

the satellite and its support systems and retrieve the data for the experimenter. Even wider cooperation--with twenty different countries--is achieved through programs which utilize small, nonorbiting rockets to obtain data for which satellites do not commend themselves. In all of these projects, we have shared the tasks and costs in literal cooperation without exporting a dollar.

Apart from these joint flight projects, we have opened our programs to extensive foreign participation in ground-based observation of satellites. Many of our tracking and data acquisition stations abroad are operated wholly or in part by nationals of the host country. Other scientists use their own equipments to observe our satellites for geodetic or ionospheric studies. Where training is required for these cooperative activities, appropriate programs are available in the United States. All in all, scientists of over sixty countries are participating in one or another of these cooperative enterprises, and the more significant joint projects have been brought under agreement with over thirty of these countries.

To appreciate the international impact of these cooperative programs, it is instructive to listen to the national reports of member countries in the major

international space forums, the United Nations' Outer Space Committee and the International Committee for Space Research (COSPAR). Almost without exception, substantial portions of these reports testify to cooperative associations with the United States. Since the Soviet Union has so far given little more than lip service to such programs, virtually no references to cooperation with the Soviet Union are included. The contrast is eloquent and is clearly pushing the Soviet Union toward some more or less imitative effort, a development which will be welcomed by all.

A further example illustrates the international significance of these cooperative arrangements. US experimenters interested in studying the equatorial electrojet with small rockets proposed a joint project with India. The Indian authorities took responsibility for developing a launching site at the tip of India, on the geomagnetic equator. This in turn led to a proposal that the United Nations lend its sponsorship to the range as an international launch site available to any country which agrees to meet the requirements for openness. The proposal was ratified by the General Assembly and, by its very nature, prompted contributions by France and the Soviet Union to the range. Thus, there

has come into being a unique site, where technicians of the east and west may meet together in the context of space flight operations.

In short, the US space program has been deliberately oriented toward cooperation of mutual interest with other countries, providing significant opportunities for foreign scientists to contribute and develop their talents and, at the same time, giving other nations a chance to share not only in the published results of space research but in the doing and the achieving. Here, too, are means by which other countries may enhance the skills and know-how they require for national programs of their own. Not only are advanced countries stimulated and assisted, but developing countries are consciously using this cooperative activity to attract young people into technical fields.

The American space image abroad.

The responsibilities of global leadership and defense have required US positions and actions which are not always understood, appreciated, or admired abroad. In contrast, the civil space program of the United States is among the more positive elements of our international posture. In many respects, it affords perhaps the most effective global projection of the American personality and the American achievement today.

The elements of this favorable projection are the openness with which the program is conducted, the direct benefits to others through space communications and weather systems, the willingness to share both research and results in projects of mutual interest, the energetic forward thrust toward technological and managerial preeminence, and perhaps most important of all, the evidence of high national purpose.

Certain of these factors may be evident principally to elite segments of foreign populations. Others are evident to almost everyone. The space effort, in public affairs terms, has unparalleled visibility, the astronauts have unquestionably been courageous and attractive, and their exploits have all the elements of drama and high adventure in the eyes and ears of the world. Accordingly, the projection of the national image is an intensely favorable one--with the added virtue that it is real rather than contrived. It represents Americans as the world has long thought of Americans and as the world wishes to think of Americans.

The element of prestige.

In discussing the international significance of the US space effort, I have left prestige to the last. I would like to suggest that prestige in and of itself can mean very little in the affairs of nations. Prestige is,

however, meaningful to the extent that it represents a perception of more substantive underlying factors. Were a successful space project in reality seen only as a prestigious stunt, it could have no more significance than the crossing of Niagara on a tight rope. It is precisely because space achievements are consciously or unconsciously recognized as infinitely more important than stunts that they have meaning in the world today. The man in the street, the lay legislator, the government official abroad, recognize clearly or intuitively that solid technical, industrial, and scientific capability lie behind successful space projects. Intuitively also, they sense the national purpose, the energy, the forward thrust which produce and are produced by these programs. I believe it is these perceptions which underlie the highly generalized element of prestige and which alone give it meaning and significance.

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