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INTERACTION OF UNITED STATES OBJECTIVES IN SPACE WITH THOSE ON EARTH

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PROGRAM OF POLICY STUDIES IN SCIENCE AND TECHNOLOGY
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Table of Contents

	<u>Page</u>
Summary.....	vii
INTRODUCTION.....	1
INTERNATIONAL SYSTEM--PAST.....	2
THE ROLE OF SCIENCE AND TECHNOLOGY.....	4
INTERNATIONAL SYSTEM--FUTURE.....	4
SPACE AND THE FUTURE INTERNATIONAL SYSTEM.....	6
DOMESTIC SYSTEM--PAST.....	7
DOMESTIC SYSTEM--FUTURE.....	9
SPACE AND THE EVOLVING DOMESTIC SYSTEM.....	10
THE NEED FOR MAJOR NEW NATIONAL COMMITMENTS...	11
WHAT SHOULD BE THE OBJECTIVES OF THE UNITED STATES' LONG-RANGE SPACE EFFORT?.....	12

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SUMMARY

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Developments in science and technology have ushered in a new era of history--the space age. In some ways, space exploration seems a natural progression in technological advance, but in other respects it is a revolutionary factor. The United States should continue its research in space exploration, with primary emphasis on peaceful uses, including supervision of arms reduction, made possible by reconnaissance satellites, and the creation of worldwide enterprises in which the nations of the world will have a common interest.

The space program of the United States can make a substantial contribution to domestic economic progress. Besides invigorating the economy as a whole, space research should provide an opportunity for raising the skills and educational standards of a portion of the population. The needs of the whole society must be considered if the exploration of outer space is to be integrated into our national life. The mastery of the environment of the solar system should be our goal in space. On earth we should seek United States leadership of a worldwide program directed to strengthening the bonds of common interest among the nations of the world.

Author

INTRODUCTION

The space program is shaped by the earthly environment in which it is carried out. Political, economic, social, scientific, and technical considerations influence its objectives, its methods, and its level of support. Conversely, the space program is a major factor in modifying man's life on earth. Space activities are important not only because of the new knowledge they generate and the specific practical applications they stimulate but also because of the new capabilities they create and the existing institutions which they may strengthen. Perhaps most significant of all they are bringing alive a new dimension of man's existence which can have untold implications for every other aspect of life.

Indeed, it may not be over bold to assert that the opening of outer space to human exploration may prove to be a momentous revolution in the history of human development comparable to the discovery of the new world in the fifteenth century and surpassing in importance the advent of nuclear weapons. A new vision of what is possible and what is necessary is needed.

The most advanced technological development of our time came to the notice of the world on October 4, 1957, when man sent into space the first artificial satellite of the earth, the Soviet Sputnik. This event was followed by the establishment in our country of the National Aeronautics and Space Administration in October, 1958.

These events and the events of the intervening years have had a profound impact on human affairs throughout the world and especially within our own country. No area of human activity or thought has escaped this impact. The toys of our children, the ambitions of our young men and women, the fortunes of industrialists, the daily tasks of diplomats, the careers of military officers, the pronouncements of high church officials--all have reflected the influence of the beginning steps in space exploration.

Yet the door to space as a dimension of man's experience has just been opened. Great new enterprises lie ahead. While maintaining United States leadership in space, these activities can also serve other international and domestic objectives. If they are to do so, however, a clear understanding of our international and domestic situation is essential.

INTERNATIONAL SYSTEM--PAST

Let us look first at the international environment. The United States objective remains a world community of free nations in which law and order prevail.

In the nineteenth century, order in the international system was largely maintained by balance of power politics. World War I destroyed this political system. The period between the two world wars was characterized by the decline of the League of Nations, by rising nationalism, and by growing anti-colonialism. The decade of the 1930's was marked by the Great Depression and the beginning of war preparations. World War II found the United States and the Soviet Union in alliance. The end of the war saw the creation of the United Nations as a step toward the international institutions required to maintain order in the world community. The Soviet Union and the United States emerged as the two great superpowers, the former with a tight bloc of satellites and the latter with a growing system of alliances. A host of newly independent nations also arose and sought to find their place in the world scene.

In response to the threat of Stalin's Russia and Communist parties in many countries, the United States sought to strengthen the economic base and military capabilities of its allies, first in Europe and later in other parts of the world. Throughout the 1950's the Soviet Union and the United States sought to advance their own versions of a world community.

During this period both the United States and the Soviet Union worked to increase their arsenal of nuclear weapons. By

the early 1960's these efforts had culminated in strategic striking forces, based on aircraft and growing numbers of intercontinental missiles, each capable of destroying the society of the other at will. The superpowers found they had created a world in which the utmost power coincided with the utmost vulnerability. While the United States maintained a superior striking force, its relative value for rational political ends tended to decline.

Nations in Europe and elsewhere gradually came to appreciate the nature of the nuclear stalemate or "precarious balance of terror," as it came to be called. Meanwhile, in western Europe rapid economic recovery and growth occurred. As the fear of the Russian threat declined and national vitality was restored, western Europe as a whole, and individual nations such as France in particular, sought to play a larger role in the world. Eastern European nations, following the "thaw" in the Soviet Union, sought to re-establish their historic ties with western Europe and to disengage themselves in some degree from the Soviet Union.

Elsewhere in the world the forces of nationalism sought to maintain and increase the independence of many new and developing nations. While most new nations sought economic development and accepted assistance from one or both the great powers, all sought to jealously guard their independence.

By the early 1960's the growing centrifugal political and economic forces presented major problems to the two great powers. One of the problems in the western alliance was the independent course taken by de Gaulle's France. On the Soviet side they led to the momentous split with Communist China as well as the increasingly independent course of the European Communist states.

In very recent times the cumulative changes in Khrushchev's Russia, the stark lesson of the Cuban missile crisis, as well as the increasingly multi-centered character of the international system, led to a limited detente between the United States and the Soviet Union.

THE ROLE OF SCIENCE AND TECHNOLOGY

Throughout the past century and particularly in recent decades, science and technology have played an increasing role in the lives of nations. They have provided the means of economic growth and of meeting the basic needs of the population. At first this advance was limited to a number of industrial states of European origin. But now the spread of technology is worldwide and everywhere there is the expectation that its applications will make a nation prosperous and independent.

Science and technology have also provided new weapons designed to enhance the national power of the more advanced states. At the same time the advanced states are finding themselves engaged in scientific and technical efforts which will benefit from, and indeed ultimately compel, worldwide political arrangements if the potential advances are to be fully realized in meeting the needs and desires of mankind. Similarly, there is a growing realization that the large-scale transfers of technology required for the progress of underdeveloped lands will require new forms of international collaboration.

Meanwhile, the dilemma of military security for the nation state in the thermonuclear era persists. It has led to increased attention to arms control and disarmament measures which would reduce the present hazard to civilization. The fundamental difficulty of substantial progress in the field of arms reduction among the major nations has led to a search for means of strengthening their common interests.

INTERNATIONAL SYSTEM--FUTURE

In the light of past developments in the international system, what can be said about the next ten to twenty years which may be relevant to the long-range plans for the nation's space program?

First, conflicts over ends and means will continue in the future as they have in the past. Indeed, in the multi-centered rapidly changing world now emerging the conflicts may possibly be more numerous.

Second, in an era of thermonuclear weapons the need for a growing sense of world community and a structure for settling disputes without resort to force is more urgent and important than in times past.

Third, despite the urgent need for a fully developed world community, the ultimate reliance of nations in the immediate future seems destined to remain with national forces. But since the nuclear components of the major powers represent a threat to the very life of civilization, their control and possible reduction becomes an objective of highest importance.

Fourth, since a community must evolve out of the tested common interests of its members, each of the great powers as well as all others have a growing stake in the creation of worldwide enterprises and endeavors which give meaning and strength to such interests.

Fifth, in the United States' efforts to strengthen a world community of free nations, it is useful to differentiate between Europe and the developing nations. (In regard to economic development and maturity, Japan and the Soviet Union can be considered with Europe.) We wish to maintain and strengthen our historical ties with Europe as a way of augmenting the strength of the West. We wish to enlarge our contacts and working relations with the Soviet Union because each represents the greatest threat to the other's survival. We wish to work with the developing nations to reduce the disparity between their standard of life and ours because the alternative is chaos and conflict. In the longer run, of course, we desire to strengthen a world community because though the peoples of the earth may differ, they are all human.

The space program is but a part, though a major part, of the nation's scientific and technological effort. In turn,

science and technology can be but part of the larger effort of the nation to create an international system in which law and order prevail.

SPACE AND THE FUTURE INTERNATIONAL SYSTEM

What part can the United States space effort play in maintaining law and order in the international system?

First, by concentrating on the peaceful uses of space it can make a substantial contribution to the avoidance of conflict in that new dimension of man's activity. By the manner in which it conducts its programs, by prior consultation, and by taking into account the interests of other nations, it may reduce or avoid conflicts of interest.

Second, in a world where ultimate reliance for some time must be on national force, the effort can, by developing a broad national capability for operations in space, help to make sure that the United States is not unprepared in the event that others should begin to utilize space for military purposes. It can help to insure that the military might of the United States can be reliably and swiftly deployed if necessary.

Third, the space program can make major contributions to the control and reduction of arms. Already the reconnaissance satellites may have played a crucial role in the ability of both sides to ease the arms race. Other developments which would contribute to this end can be an integral part of the space effort.

Fourth, and most important, the space program can serve the positive goal of creating worldwide enterprises in which the nations of the world will have a common interest, not alone in their outcome but in their doing. The creation of common enterprises in space and on earth may be the only way we can bring into being a viable sense of the community of mankind.

In such endeavors the United States must distinguish between the capabilities of the various nations--the Soviet Union, which

even today has the technical capability to be a full partner; western European nations which have the ability to become full partners; and the other nations whose talents and interests may require cultivation over a substantial period of time.

DOMESTIC SYSTEM--PAST

Turning now to the domestic scene, what do the events of the recent past suggest with respect to the future and the relation of the nation's space program to that future?

Throughout the nineteenth and early twentieth centuries, periods of prosperity alternated with slack periods as industrial nations grew. For the most part these cycles in business activity were accepted as an unavoidable consequence of growth. The hardships created by unemployment were widely held to be an individual burden, rather than a public responsibility. A growing public awareness of the need for community action was reflected in the development of various social security systems in Europe. In America the main reliance continued to be on a system of universal education which in theory provided an equal start in the competition for jobs for all who wished to take advantage of it.

As a result of the Great Depression, a shift occurred in the sense of public responsibility for providing employment for the nation's labor force. The major conversion problems faced by the nation at the end of World War II precipitated the enactment of the Employment Act of 1946, which placed squarely on the federal government the responsibility for maintaining high employment and economic growth. In the same period the federal government's role in providing support for education was greatly expanded for the special purpose of education for veterans.

The Employment Act of 1946 envisioned primary reliance on monetary and fiscal policies to maintain growth and employment. A considerable effort was devoted to devising countercyclical measures which would come into play when growth slackened.

Most of these and other economic measures of the immediate postwar period were envisioned as operating within an industrial economy not radically different from that of the preceding decades--one characterized by scarcity of products to meet the growing demands of the population. Despite a number of mild recessions in the postwar period, production and employment continued to rise. A serious depression was avoided. Nevertheless, unemployment over the period also manifested a tendency to increase.

By the late 1950's structural problems in the economy began to be identified, raising new questions concerning public responsibility for growth and employment. In simplest terms science, technology, and large-scale enterprises appeared to be taking the country beyond the industrial age. Continued scarcity in a growing economy was replaced by true abundance of consumer goods. At the same time the requirement for production workers declined.

Automation is a salient characteristic of the postwar period which has been termed the age of cybernetics. In the industrial era human skills were combined with machine power to produce great national wealth and provide a reasonable standard of living for the majority of the population. Today, a new productive system is emerging based on machine skill and machine power, the computer and automated machinery. The nation is moving into the new era with great rapidity. It is characterized by the growing capability of automated industry to meet effective demand with fewer workers. For an increasing proportion of the population the skill of machines seems to be rising more rapidly than the educational capabilities of the individual. While the service industries have in recent years been expanding, they too will find it possible to automate their many routine tasks. The problem will be compounded in the period ahead by the bulge in the labor force resulting from the postwar baby boom just now coming into the labor market.

During the 1950's another major change occurred which has long-range implications for the society. Research and development, largely under the stimulus of support by the federal government, became a major national influence. A fundamental

shift in American defense strategy provided the initial impetus for the growth of research and development. Whereas the United States had previously relied on mobilization after the outbreak of conflict, the new doctrine of deterrence, the new weapons technology, and the United States position of world leadership now made it necessary for military power to be available for immediate use. The possibilities of rapid technological progress in weaponry by the adversary also called for continuous research and development effort. With the opening of the space age, the research and development effort was expanded to seek American preeminence in that new dimension of existence.

As the public and private support of research and development has expanded, the pace of acquisition of new knowledge and the application of new technologies has quickened in many sectors of the economy. Increasingly, we are becoming a research-oriented society. Rapid change places new demands on institutions and individuals. Learning must be looked upon as a life-long process. Not only must the engineer and technician continually learn to cope with new technologies, but teachers must acquire and incorporate the increasing fund of new knowledge into the curriculum. Managers must combine technical competence with the arts of leadership. Political leaders must be provided with new means of directing research and development resources to the goals of society and new ways of adapting the institutions of society so that the full benefit of advancing science and technology may be gained.

DOMESTIC SYSTEM--FUTURE

In view of the changes now occurring in the domestic system, what of the future?

First, the nation has already placed on the federal government the responsibility for leadership in achieving sustained economic growth and a high level of employment. The responsibility of the federal government in this regard will continue to grow.

Second, because of structural changes in the economy and the rapid increase in the labor force in the years immediately ahead, fiscal and monetary measures will need to be complemented by new and probably more direct measures to provide employment opportunities. Certainly cutbacks in defense, if they should occur, would need to be offset by action in other sectors.

Third, research and development now heavily concentrated in defense and space must be fostered in other sectors if we are to achieve balanced national growth.

Fourth, the nation's investment in education will require substantial augmentation. On the one hand, increased opportunities for training throughout the work life are needed for the more highly trained groups. On the other hand, far more specialized training is needed by the less skilled groups. All citizens need more training which not only equips them to earn a living in modern society but also permits them to participate in the evolution of domestic democratic institutions required by advances in science and technology.

Fifth, in seeking to meet the nation's employment and education needs, increasing attention must be given to the opportunities and requirements of the international system.

SPACE AND THE EVOLVING DOMESTIC SYSTEM

What role can the space program play in meeting the needs of the domestic system?

First, space activities provide a rapidly expansible means of creating demand for goods and services and thus of creating employment. It would be useful, of course, to know much more about the "multiplier" effect of this form of action.

Second, to the extent that space activities generate new industries or major new elements in existing industries (e.g., satellite communications), they make a significant contribution to employment opportunities.

Third, since NASA is the major non-military research and development agency of the federal government, it has both an opportunity and an obligation to assist in the growth of research and development in other civilian sectors of the society.

Fourth, NASA is now supporting higher education in ways designed to strengthen its own program. The question of whether NASA's long-run interests in higher education are not substantially broader than its present program warrants serious attention.

Fifth, as unskilled manpower becomes more numerous and less employable, programs will be launched to deal with the problem. NASA, in the interests of its main objectives, should now consider what role it can play in this area.

THE NEED FOR MAJOR NEW NATIONAL COMMITMENTS

At home and abroad the greatest need of the United States today is a national commitment to bold new tasks. At home new tasks are needed to enhance the sense of purpose in our national life and permit a growing number of individuals to find fulfillment in socially useful work. Abroad the commitment is essential if the United States is to play its full part in the creation of a world community in which its security is assured and in which its way of life and values may prosper. Undertakings which appear impossible in the absence of a consensus on great goals will be found achievable once the commitment is made. Today, one hears it said that the United States lacks national purpose. A soundly conceived space program can provide one such major goal in the years ahead. This is not to suggest, of course, that space activity is a panacea which will subdue all conflict and eliminate all poverty here on earth. Yet, it can play a crucial role in raising man's vision to what is possible and necessary in the coming decades.

WHAT SHOULD BE THE OBJECTIVES OF THE UNITED STATES' LONG-RANGE SPACE EFFORT?

Our brief review of the international and domestic situation raises the following major questions with respect to the earth-oriented objectives of the space program.

First, should we in the future as in the past view the space program as a national effort in which foreign participation is accepted but not sought? Or, should we seek to design under United States' leadership a worldwide space program in which the industrial nations and others participate with a growing common interest? In other words, should the emphasis of the space program be shifted from our interests as a nation to our interests as a world leader? The distinction is subtle but important.

Second, what role should the space program play in meeting the employment and education needs of the nation? Should NASA employment and educational activities be limited to meeting short-run operational needs, or should its responsibilities include strengthening the abilities and skills of both the highly trained and those needing basic skills?

A decision that the space program is to serve the broader international and domestic objectives of the United States would have important implications for the formulation of the technical objectives of the program. If the technical space objectives are strengthened by giving increased attention to international and domestic political and economic objectives, then the case for attempting to do so would be persuasive.

If the space program is to serve other than technical objectives, it appears to require a superordinate goal. After an initial period devoted to catching up with the Soviet Union, both in reality and in the public mind, the space program is now focused on a manned lunar landing and return to earth by the end of the decade. At the same time a major capability for operations in space is being created. The time is ripe for a long-range

planning effort designed to shape the programs for the post-Apollo period. It has been suggested that the objectives for this period should include the creation of a national capacity for operations in space, development of new knowledge, creation of opportunity for new applications, and the strengthening of institutions. These are valid objectives but they remain open to the broader question: For what purpose? Is not the capstone still missing? Is it premature to suggest a purposeful super-ordinate mission in space? Or should the space program for the next two decades continue to be oriented solely around particular missions, particular applications, and the creation of more or less generalized capability?

The international and domestic interests of the United States suggest the desirability of a primary goal for the program both in space and on earth. An admittedly cursory examination of the possible missions in space during the next two decades suggests the possibility of now setting forth their primary goal. While some activities in the next two decades will be chiefly concerned with increasing our understanding of the universe, the overwhelming proportion will be concerned with the environment of the solar system.

Would it not be useful to state that in the decades immediately ahead our goal in space is the mastery of the environment of our solar system?

As a preeminent goal the mastery of the environment of our solar system gives larger purpose to the objective of a national capacity in space. Space, as man moves into it, is not a void but a complex and strange environment. Mastery requires vast amounts of new knowledge. It requires the perfection of man's ability to explore and work in the new environment. Finally, it involves his ability to use the new environment to serve his ends on earth and elsewhere in the solar system. These lesser objectives become means of achieving and demonstrating progress toward the larger goal. All are then clearly required and probably on an increasing scale.

Moreover, the scientific and technical objective of mastery of the solar system complements what appears to be a supreme

political goal, namely: United States leadership of a worldwide program directed to strengthening the bonds of common interest among the nations of the world.

Mastery of the environment of the solar system would demand a breadth of effort which is also needed to provide the flexibility to meet a wide range of opportunities here on earth. As has been suggested, these opportunities include large-scale participation by the European nations, major areas of cooperation as well as competition with the Soviet Union, and a growing commitment to the development of the capabilities of other nations in specific areas. Domestically, they include a growing contribution to the employment possibilities and educational capabilities of the nation.

The program would also maintain the nation's ability to deal with unforeseen contingencies which could arise as a result of the development of new weapons systems or the obsolescence of present systems--to win an arms race or to lead the world in arms control and disarmament.

In short, a United States effort in space which is worldwide in scope and which seeks the mastery of the solar system will contribute most to individual fulfillment within the nation and to the security and influence of the nation within the international system.

The identification of the program mix and the program decisions needed for a well balanced and properly timed effort to achieve these two goals is the task now immediately before us.