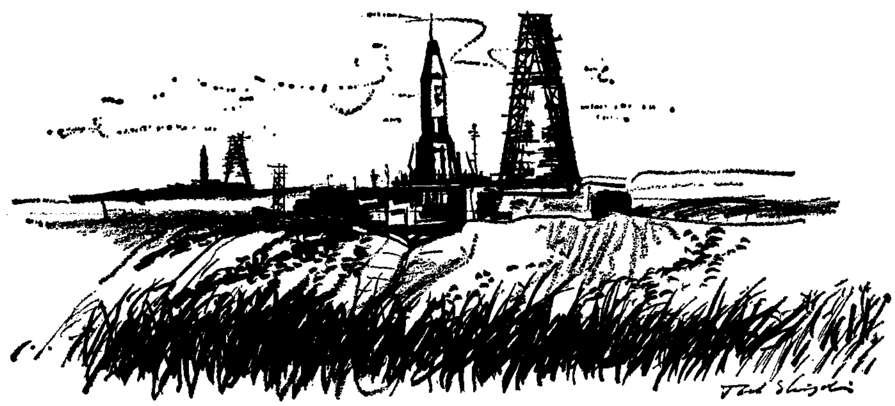
cares for the distorted Ben Bella-Nasser version of nonalignment nor do they appreciate the bullying methods used by these two dictators in Africa and elsewhere. "The fact that we Africans have a third of the votes in the U.N. Assembly doesn't give us the automatic right to throw our weight around," says Ben Hima. "We cannot count in the world, and we should not, until each of us has learned to be master in his own house."

In keeping with this principle, Moroccan foreign policy has been sensible and restrained. Despite an occasional wistful glance at Mauretania, which the Istiqlal insists should be part of a Greater Morocco, Hassan and his foreign minister refrain meticulously from interfering in the affairs of other African states; and in the Organization for African Unity, they strongly oppose interference from other quarters. Their position is moderate in the Arab League, where they recently refused to follow Nasser in breaking with West Germany over Israel. They have also refused to play the Third World neutrality game according to the Ben Bella-Nasser pro-Communist rules. They have sided respectively with East and West in the U.N. according to the point at issue; and while their relations with the Communist states are cordial, the Russian and Red Chinese embassies in Rabat are expected to remain within the bounds of diplomatic protocol, and they do. The example they set may be mocked in Algiers and Cairo, but it is level-headed enough to win growing respect in most other African capitals.

It is also rare enough to merit warm American interest in the future of Hassan and his monarchy. The French are interested too, of course, particularly since they have $3 billion invested here (whereas our own private investments are negligible). But the *colons* are leaving now, and with the future so uncertain when they have gone, Hassan is particularly anxious to avoid overdependence on France. More and more lately, he has been turning to the United States for money, advice, and comprehension. He certainly needs it all, if only because of what might happen to Morocco if he fails.



The Case for Man in Space

S. FRED SINGER

In President Johnson's budget request to Congress for fiscal 1966, there is an item of $150 million for the Defense Department to initiate the development of a manned orbiting laboratory—a program known as MOL. Presumably Congress will appropriate the money, but the decision to spend the funds will be made by Secretary Robert S. McNamara only after a study to show whether the MOL program can produce something of military value. It now appears likely that such value will be adequately demonstrated, although the applications will be defensive rather than offensive. Thus within a few weeks the so-called preprogram definition phase will be entered; hardware, rockets, and reentry capsules will be selected; and the United States will have a second manned space program, this one concentrating on orbiting space stations rather than on exploration of the moon.

Like the civilian program, manned space flight for military purposes may be expected to come under attack from a variety of critics—of whom some have objected to manned space flight on principle as being wasteful and frivolous, and others have simply attempted to counter the exaggerated claims made by the proponents of man in space in the past. Given the amount of money, emotion, and scientific uncertainty involved, the argument over the relative usefulness of men versus instruments in space is necessarily a complicated one. But seven years after the first successful American space shot, it is possible to take stock of what is now known about the military, scientific, and social value of these controversial programs.

The Competing Robot

In 1957, when rockets originally built for ballistic missiles proved adequate to put small unmanned instrumented satellites into orbit, the proponents of manned space flight seemed to have lost out. Instrumented satellites were gradually getting larger and more sophisticated—they could orient themselves in space, remember and follow instructions, record their observations, and release them on command; they became robots with supersensitive instruments far exceeding the capabilities of the human senses; they could explore the whole wavelength range of the electromagnetic spectrum from the ultra-short X rays to the long radio waves, and not just the visible range to which the human eye is sensitive. Above all, they could observe and record day after day without becoming tired, dulled, bored, and inaccurate. To many scientists and technologists, manned space flight seemed superfluous and needlessly expensive.

There was, however, an incongruous grouping that did promote manned space flight. First there were the pioneers of the Wernher Von Braun or "Mount Everest is there" school. Then there were geopoliticians who correctly estimated the impact that manned space flight would have on the imagination of the public and who viewed the space race as a less expensive means of international competition than an arms race or an armed contest. Finally there were those, especially in the military, who claimed that man could perform functions that instruments could not achieve, and who, although not quite sure of just what man could do, kept pressing for man in space as a high-priority goal.

It was a combination of these arguments with a heavy weighting of politics and prestige (and partly to buy insurance on the military side) that prompted President Kennedy to establish the manned lunar landing, Project Apollo, as a national goal in 1961. But since the Apollo Project was first announced, there have been some highly significant changes in arguments, both by its proponents and its opponents.

No High Ground

In the beginning, there were a good many military people who deplored the Apollo Project on the basis that it was taking priority over a space program geared to our defense needs. Over the past few years, however, the thinking on what those needs were has been drastically altered. Only two years ago there were still plenty of people in the Pentagon clamoring for a program of nuclear weapons in orbit to assure what they called the "military domination of space." To be sure, Senator Barry Goldwater was strongly influenced by these views as recently as the 1964 campaign, and General Thomas S. Power, whose *Design for Survival* has just been published, continues to warn of the possibility of nuclear-armed Soviet satellites "floating in stationary orbits over every part of the United States." General Curtis LeMay, who recently retired, still worries in his public addresses about the Soviet Union's capability of delivering strategic weapons from near space. Such arguments, of course, ignore some fairly obvious scientific truths. If a bomb is released from a satellite without giving it any propulsion, it will stay with the satellite and simply blow it up. For a bomb from a satellite to be directed to a point on earth, it must be propelled not only with a lot of rocket power but also with exceedingly fine guidance. In principle, this can be done from a satellite or from the moon or even from the planet Pluto; but the cost and complexity is enormously greater than that of an equally effective ICBM buried deep in the earth itself.

Gradually the notion that the military uses of space are hard to define has been brought home, and generals no longer allude to them so readily. For instance, the outstanding proponent of the military role in space, General Bernard A. Schriever, nowadays is somewhat tentative in his approach to the subject. "United States military capabilities in space must insure that no nation achieves a position in space which threatens the security of the United States," he said recently, concluding only that "it is necessary to investigate the military potential of space systems. . . ." Indeed, even those hardy old generals, no doubt schooled in artillery, who a few years ago were talking about building a fortified position on the moon from which to bombard the earth have finally realized that even though the moon is the "high ground," this does not make it any less vulnerable. For that matter, a bomb in a satellite is more exposed and can be more easily eliminated than the same bomb placed in a Polaris submarine.

A TREMENDOUS JOB of internal education has been done by the Defense Department, especially within the past two years. There has been no outright cutoff of the military space program, but such projects as the Dynasoar manned orbital glider and the infrared missile-warning satellite have been terminated—in some cases after considerable funds had already been spent. More recently, managers in Defense have been able to delay the "projectizing" of new programs by first studying the subject to death. In treading this very thin line, the department has cut off expensive but highly questionable projects and simultaneously staved off an internal revolt—so far.

The usefulness to military operations inherent in satellites for navigation, for communications, and for surveillance has become fairly obvious. At the same time, these operations do not violate the U.N. resolution of December, 1961, outlawing aggressive uses of outer space. What has been much more difficult to establish—what, in fact, is still not proved—is the military value of a man operating in space. The most intensive study effort is at present concentrated on this point.

One factor against the operational use of man on a round-the-clock basis is his extreme vulnerability to radiation. A potential enemy could eliminate the man by exploding a small nuclear device some distance away, probably without harming the satellite itself and the instruments within it. The biological material of man, composed as it is of long-chain molecules, is so fragile and sensitive to radiation that it can be destroyed by radiation doses 10,000 times lower than those needed to destroy the most sensitive piece of electronic material. This fact, coupled with our uncertainty concerning the physiological performance of man in the gravityless space environment, makes the job of assessing man's military value extremely difficult. And the sooner man is put into the space environment, whether on the lunar or the orbital missions now being planned, the sooner we shall have at least a partial answer.

Apollo's 'Spin-offs'

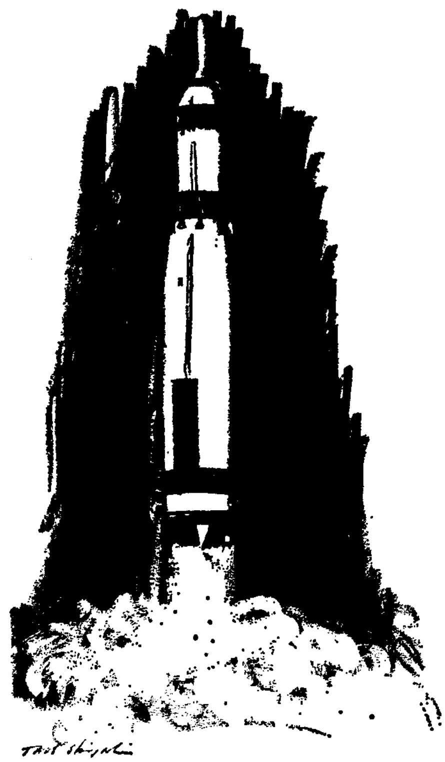
Within the political and scientific communities, it is the civilian space program—particularly manned space flights—that has drawn the heaviest criticism. Former President Eisenhower, for example, has characterized the Apollo Project as a "mad effort to win a stunt race." Senator William Proxmire (D., Wisconsin) has spoken for those who see the space program as a squandering of our scientific talent. Senator William Fulbright (D., Arkansas) has regretted the expenditures as taking funds from more urgent earthly programs; and any number of scientists have argued that manned space flight will add less than instrumented flight to our scientific knowledge.

Can the critics be answered? Administrator James E. Webb of NASA, in defending the civilian space program, has argued that rather than squandering scientists, it has had a tremendous impact on advanced education, particularly in the sciences. NASA's sustaining university program, for instance, is eventually expected to assist in the training of one thousand Ph.D.s a year to provide highly qualified persons who will be needed not only in space science but also for other scientific-technical endeavors.

Nor is there any evidence in support of the Proxmire thesis—namely that the expenditures on space science have actually resulted in any de-emphasis of other scientific fields on an absolute basis. On the contrary, a wide range of scientific disciplines, some only remotely space-related, have benefited. The manned space program has actually spawned new developments in the biological and behavioral sciences.

Again, while the direct applications of space-technology inventions are being questioned as to their benefit to industries that are not space-oriented, one of the most important "spin-offs," although seldom pointed out explicitly, has been in the production of skilled managers. Running a space project is several orders of magnitude more difficult than the usual type of industrial operation and has led to management techniques involving advanced scheduling methods, mathematical simulation techniques, linear programming, operations research, cost/benefit studies—in general, quantitative assessment of the factors that up to now have been handled largely by intuition. All of this has bred a new kind of professional who can carry over this training to make civilian operations more efficient or into such large-scale peaceful projects as nuclear desalinization, transportation systems, or urban planning.

Furthermore, the space program is increasing our technological potential. One should consider it a resource fully as important as raw materials and productive capacity. Perhaps only a small fraction of the investment will benefit the civilian economy immediately, but all evidence points to a valuable long-term investment. A good example is the experience of the ComSat Corporation as it begins to construct the satellite world communications system; it will turn to American industry, where competence has already been developed through government-financed research. Not all of the investment will be paid back to the government in terms of identifiable tax dollars. For example, the benefits to agriculture and transportation alone from the new operational weather-satellite system are difficult to measure but are bound to be reflected in an increased gross national product and tax revenues.



PROBABLY the most telling attacks on the manned space program have come from scientists themselves, some within NASA, who are involved in the unmanned—or instrumented—satellite programs and who question the need for adding a man, plus the expense of providing for him, to our projects. The best answer seems to be that there is a place for instruments and a place for man, since it is nearly impossible to replace the human factor in an exploring situation. Many scientists have adopted as a rule of thumb that you can design an instrument if you know what you're going to measure. Conversely, if you don't know what to expect, then the design of the instrument presents certain difficulties. This dilemma is being brought home in the discussions going on among a select scientific group on how to design an instrument to determine whether life exists on Mars. This instrument would have to descend to the surface of Mars and then perform certain operations; but just which operations or which measurements could ascertain the existence of a form of life have not been resolved.

Then there is the moon. In many respects it is a very unusual satellite when compared with the moons of other planets. How unusual it is will become known only when we examine it at first hand. The analysis of its surface and of its deeper rock layers may hold the key not only to the origin of the moon but also to the whole problem of the origin of the earth and the solar system. The quality of the TV pictures from the Ranger probes keeps on improving, but in spite of these pictures a multiplicity of interpretations of the lunar surface is still with us. The question of whether all the features are due to impacts of meteorites or to volcanism, or to some combination of the two; the question of the existence of permafrost under the surface of the moon, or even of glaciers in regions protected from the sun; the actual nature of the moon's surface, whether there is any bare rock, the thickness of the dust layer, whether it is puffed-up lava or rubble produced by the constant impact of meteor projectiles—none of these has been finally settled.

If one faces up to the problem of designing a single set of instruments to solve all these problems, and perhaps others that are not yet so clearly defined, one comes up against the fact that the sum total of these instruments is going to be very heavy and very expensive to transport. If one adds to this the need for a chemical analysis of lunar rock from various regions and from various depths and specifies that these samples have to be properly selected and brought back for the detailed analysis that can only be performed in the laboratory, then the manned lunar program does not seem too extravagant in comparison. Maybe it proves a recent axiom: "Man is the lowest-cost, 150-pound, non-linear, all-purpose computing system which can be mass-produced by unskilled labor."

The Proper Study of Man

At the present time the Apollo Project seems to be safe, although possibly behind schedule. Guiding it to a successful conclusion, however, involves more than technical skill and good engineering. It involves adroit maneuvering. Any public admission that the project may be allowed to run behind schedule is likely to bring demands for cuts in the rate of spending. Certainly the rate of spending is going to be reduced if the project can be stretched out.

But with the moon-landing project now a national commitment, the question is being asked, Where next? One answer has been given by the Space Science Board of the National Academy of Sciences, which points toward Mars as the next object for intensive investigation by instrumented, unmanned probes. But there are good scientific reasons, as well as economic and perhaps even military arguments, for the construction of manned orbiting space stations instead. The Mercury Program has provided the basic equipment for a manned orbital laboratory: a booster rocket and a re-entry capsule. The Gemini Program has extended this into a two-man capsule. The Apollo hardware provides a three-man re-entry capsule and a very large booster rocket adequate to carry a lunar excursion module; this could be replaced by a quite adequate laboratory section.

With these components in hand, one could therefore think of carrying out programs with manned orbiting platforms. And indeed, planners both in NASA and in the Defense Department are concerned now with finding suitable missions and applications.

The study of man himself, his basic physiological reactions as well as his ability to carry out certain jobs in the space environment, is probably the most important thing that could be done in a manned orbiting laboratory. The effects of long periods of weightlessness are entirely unknown. The whole range of physiological and psychological responses would have to be explored. In this connection it would be essential to have two or more men in orbit so that they could observe and analyze each other.

It is likely that there will be some significant physiological changes, as yet unanticipated. The problem would be to explain why these effects occur and which aspect of the space environment is responsible for these changes. The final step would be to see if these changes can be exploited in some manner. They may turn out to be beneficial, they may even be therapeutic—we simply do not know at this stage.

Missing Links

We are on a firmer basis when we try to predict the usefulness of a manned orbiting platform for astronomical observations, but especially for surveillance of everything below the satellite: the earth's land and ocean surfaces, the atmosphere and everything contained within the atmosphere, such as dust and droplets, clouds, water vapor, ozone, and other gases.

The example of weather satellites may be the most significant one to consider, also because weather observations are likely to bring the greatest economic return. The United States now has an operational weather-satellite system (unmanned), based on a modification of the Tiros research satellite, but the initial capability of the system is crude indeed. It will merely identify the existence of clouds with a precision of one or two miles, and it will be able to do this only during daytime. But in theory technology can do much better: not only determine the types of clouds, their altitudes and properties, the distribution by day and night, the size of water droplets, and the existence of precipitation, but also measure winds and temperatures at various atmospheric levels, the amount and distribution of water vapor in the atmosphere, and even determine the state of the ocean surface, the height of waves, the distribution of snow, its thickness and degree of melting and the distribution of ice, its thickness and condition of breakup, the moisture content of soils, the state of crops.

The list of applications is impressive. But developing the proper instrumentation is a long and tedious job if done with conventional unmanned satellites. The use of a man could shorten the development time, changing it from something like fifteen to twenty years to perhaps only three to five years.

There is little question that a manned platform can play the leading role in the development of appropriate satellite instrumentation, which would then be used in a future weather-satellite system. It would save a considerable amount of time and money and yield a better instrument to have both a man and an instrument in space during the early phases of development. Only a man can efficiently make the proper adjustments, settings, and calibrations, and then focus a number of instruments at the same time on a given phenomenon.

One might argue, of course, that a robot could do as well as a man; it would be controlled from the ground on the basis of readings of the satellite instruments. But there is an important factor that is usually overlooked: complex robots have a limited reliability; and beyond a certain level of complication, adding more links to the loop reduces reliability and shoots up the cost of maintaining an operating system too rapidly to make it worthwhile.

This fact has been demonstrated for weather-satellite systems by an elaborate mathematical analysis, but it holds for any operating system that cannot repair itself. One either has to provide costly redundancy or replace the whole system if a vital part fails. It is at this stage that man is most useful: his versatility represents a possible solution, in terms of cost, to operating a really complicated satellite system, because a man can adjust, calibrate, and even repair.

THESE, then, are some of the tasks that make manned space flight mandatory. There are a few cases where a man merely presents a cheaper and more reliable alternative to a computerized robot. But there are also the situations and missions that use man's capabilities to the fullest: as an explorer, as an experimenter, and as the subject for experimentation. His military value in space remains to be investigated, but his scientific value is assured.

Santo Domingo's Activist Adventurers

MAX CLOS

SANTO DOMINGO

FROM THE OUTSET of the civil war in the Dominican Republic, there have been three entirely different categories of fighters on the rebel side, each waging its own struggle for its own motives. There are the armed groups of the left-wing organizations; there are the civilians who have taken up arms in the name of the deposed president, Juan Bosch; and finally there is a small group of professional soldiers who are entirely different from the others—the unit of frogmen which rallied around Colonel Montes Arache. They wear camouflage-patterned uniforms, have the best weapons (most of them taken from U.S. soldiers), and ride in American jeeps draped with Dominican flags. They are a kind of elite corps, the spearhead of the forces of Colonel Francisco Caamaño Deño. Theirs is a personal war, a fast war of swift blows dealt by a dozen men who strike, then immediately withdraw to strike elsewhere. The group is dangerous because it is well-trained and the men crave danger. The fact is that these activists have not the slightest desire for a peaceful accommodation. It is more likely that, in the face of Caamaño's orders, they have been deliberately provoking the Americans.

Colonel Montes Arache is minister of national defense in Caamaño's government. He is a fighting minister who never sits in his office and is usually to be found where the shooting is going on. The sixty frogmen are with Colonel Montes Arache because they respect him and would follow him to the end of the world.

Chief among Montes Arache's lieutenants is a Frenchman who is rated fourth on the list of the rebel military command drawn up by the rival "government" of General Antonio Imbert Barreras. His name is André Rivière and he is very popular in the Ciudad Nueva, Colonel Caamaño's stronghold in downtown Santo Domingo. He is thirty-eight, of average height, and wiry; he has sharp features and piercing black eyes in a sun-tanned face. Rivière is the very image of the adventurer and soldier of fortune, which is just what he is although he himself seems unaware of it. For the past fifteen years, his life has been a series of wild adventures, which does not prevent him from explaining to me every time I meet him: "I'm not so young any more. It's about time I thought of settling down. I'm tired of doing crazy things. If you only knew how I long to live quietly."

RIVIERE who had no particular reason to get involved in this war rallied behind Montes Arache because he admires him. "He's a swell guy," he explained, emphasizing his words with a gesture of the raised thumb. Three former members of the French Foreign Legion went along with Rivière because they are his friends. One of them, an Italian named Capocci, was killed on May 19, together with Colonel Rafael Fernández Dominguez, Caamaño's minister of the interior, in a raid on the National Palace occupied by Imbert's forces. Capocci, a former major in the Italian army, was fifty-two years old, and his greatest pride was that he could swim longer than