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EDWARD J. GURNEY
FLORIDA

COMMITTEES
GOVERNMENT OPERATIONS
PUBLIC WORKS
SPECIAL COMMITTEE ON AGING

United States Senate

WASHINGTON, D.C. 20510

Space Program

May 4, 1971

Honorable Robert Dole
United States Senate
Washington, D.C.

Dear Colleague:

Enclosed is a pamphlet concerning the future of this nation's Space program. It was prepared by the Florida Department of Commerce and we are transmitting it to you at the request of Governor Reubin O'D. Askew.

We are most pleased to recommend this pamphlet to you as an instrument for relating highly technical space exploration activities to the man on the street.

Sincerely,

Ed Gurney

Ed Gurney

Lawton Chiles

Lawton Chiles

SENATOR BOB DOLE
RECEIVED
MAY 7 1971
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WASHINGTON, D. C. 20510

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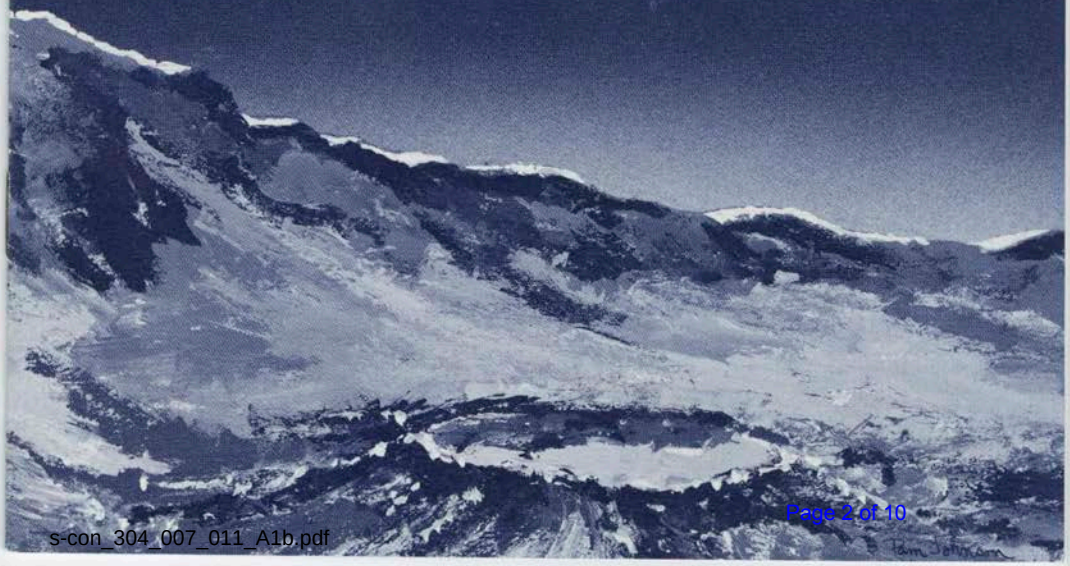
we *can* afford to lead in space...

...*can* we afford not to?



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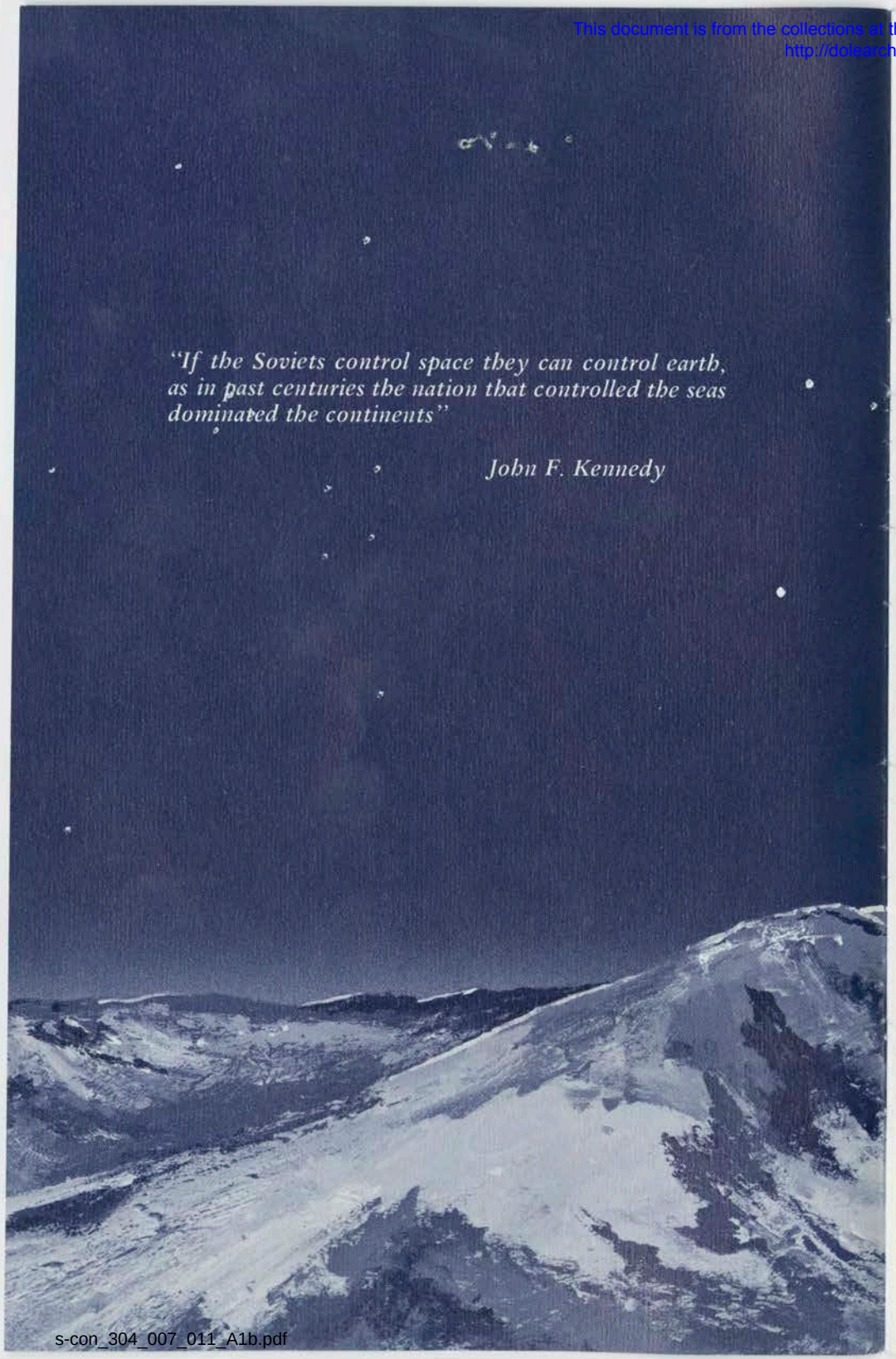

Prepared by:

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Major General, USAF (Ret.)
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FOREWORD

This booklet has been prepared to present to the reader a brief and objective picture of America's space program today. The story is well-known to NASA and to the many aerospace contractors, but they are often unable to speak out, either because of governmental controls or because their remarks could appear to be self-serving.

Despite our apparent world leadership in space exploration, our future in space research and development has reached a critical point. Planning and funding for our march to the moon began nearly a decade ago, and with its completion ends our major efforts in manned space flight. Only by providing continuity to our space program can we assure that our nation will at least remain in contention during the years ahead.

We must do it for the material benefits that are beginning to result from our past efforts, we must do it for national pride, and above all we must do it for national survival.

The entire history of the American space program spans little more than a decade, dating back to the fall of 1957 when we were jolted into action by the first stunning launch of a Russian sputnik. We responded with a small token satellite of our own in January, 1958 **but it was years before we were able to overtake them with our manned space vehicles, finally placing the first man on the moon.**

Our efforts were marked by the concentration of our nation's scientific talent and technical know-how during this feverish period. Our first man in space venture came in 1961 when Alan Shepard was launched on a 15-minute suborbital flight, landing in the Atlantic Ocean. This was followed by Gus Grissom's flight of the same duration. Then came the Mercury-Atlas flights in which John Glenn became the first American to orbit the earth. The Mercury flights were followed by the two-man Gemini-Titan series. Lastly came the Apollo series resulting first in man orbiting the moon and then Neil Armstrong landing upon it.

All in all, by the spring of 1971, some 24 launches involving 50 astronauts took place from Cape Kennedy and the Kennedy Space Center.

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In addition to the manned program, 223 earth satellites were placed in orbit, checking weather, enlarging our communication network or carrying out space experiments. Another 73 payloads were launched into deep space to gather information on Mars, Venus and our sun. Besides these space efforts by NASA, there have been about 1500 other launches of small to very large missiles and rockets in test and operational launches for the Department of Defense.

These have been truly amazing accomplishments when considering the short time span during which they took place. And yet, as a nation, we seem suddenly disenchanted with our missile and space programs.

Now that our earlier missile and space objectives have been achieved, now that we have placed a man on the moon, now that we have reduced satellite launches to near routine and proved the capability of our military missiles, we seem to have lost our will to move ahead with the same imagination and enthusiasm that earned our supremacy in space.

As of today, our firm goals for the future cover a very short period of time, no more than four or five years. Only a few more Apollo launches remain before our moon program is shut down and packed away. After Apollo comes the Sky Lab program.

The Sky Lab is a space station/laboratory/workshop which will be placed in low earth orbit by the same boosters which lift the Apollo. It will contain life support systems and other facilities to accommodate three astronauts at a time. The first crew will be launched shortly after the lab is placed in orbit. They will rendezvous and dock with the lab, then transfer to it from their space capsule, remaining there for some 28 days. They will then return to earth in their space capsule. A second crew will be launched to remain in the lab for 56 days and later a third crew will occupy it for a longer period.

The objective of this program is to determine the effects on man of prolonged living in space, and to determine, as an example, whether it will be necessary to create artificial gravity to sustain life.

This is an exciting move forward in our space research, but it is of short duration. It will begin and end in a single year.

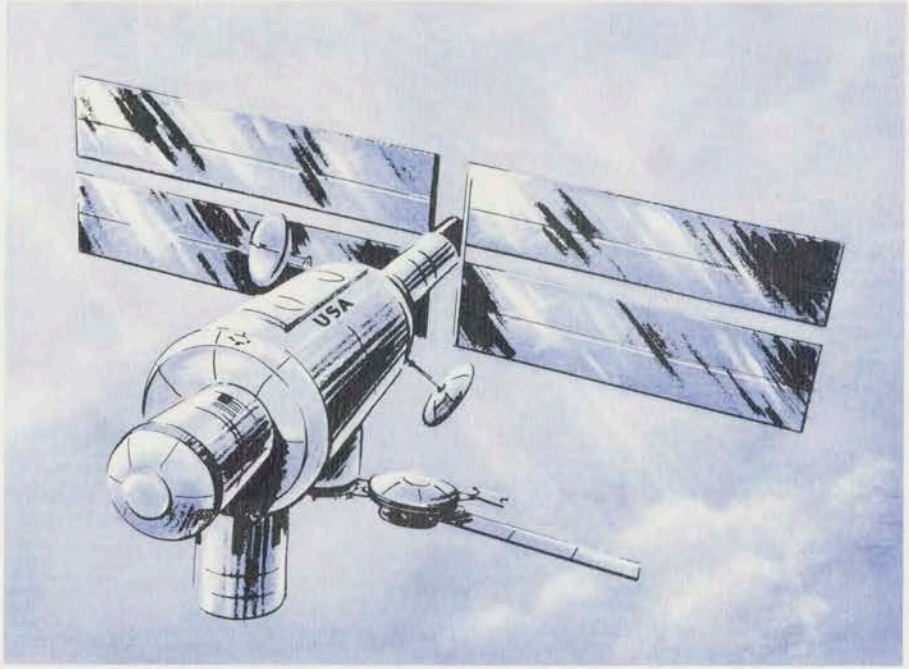
Hopefully, the Space Shuttle will follow the Sky Lab as a logical and necessary next step, and it is this program which merits our deepest concern. On this one program alone hangs our future role in space, yet it has received so little national attention that few people today are even familiar with its name.

The Space Shuttle is exactly what the name implies, a system for shuttling people and things in and out of space using the same vehicle again and again in a manner similar to the handling of aircraft. **It is a common sense approach which can permit us to continue our space research while remaining within acceptable cost boundaries.**

The system is comprised of two winged vehicles, one called the booster and the other the orbiter. The two vehicles, each with a crew of two, are launched as a unit, separating at an altitude of perhaps sixty miles. Upon separation the booster, its mission completed, returns to land near the launch site. The orbiter accelerates to orbital velocity and continues on its mission. When its mission is completed – hours, days or weeks later – it also returns to earth, landing as would a conventional aircraft. On return, both vehicles can be readied for another mission in about two weeks.

The booster, as presently conceived, will be about 257 feet long, slightly larger than the Boeing 747 Jumbo Jet. However, it will be 36 feet in diameter. In essence, it is a flying fuel tank.

The orbiter will be about 190 feet long, or roughly the size of the Boeing 707 or Douglas DC-10. It will be able to carry up to 12 passengers and their equipment, or a total payload of approximately 65,000 pounds, depending upon the launch direction, the orbital altitude and the configuration of the booster.



The Skylab is an exciting step forward – but the program covers but a single year.

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One of the attractive features of the space shuttle is economy of operations, since both the booster and orbiter are fully reusable. Based on the X-15 experiments, the vehicles can be reasonably expected to have a reusable life of no less than 100 missions covering a ten-year period.

At the present time, all of our launch vehicles are expendable as are the spacecraft. Nothing is brought back that can be used again. One can imagine how slowly our airlines and aircraft industries would have developed had it been necessary to discard an airplane after every flight. Reusable spacecraft will permit the same kind of development and growth.

While the space shuttle is not an end in itself, it does represent an extension of our current state-of-the-art and will permit us to improve our operational techniques, especially in the area of unmanned programs such as weather, communications and reconnaissance satellites. And it should reduce the cost of placing a payload in orbit from some $1,000 per pound down to about $100 per pound.

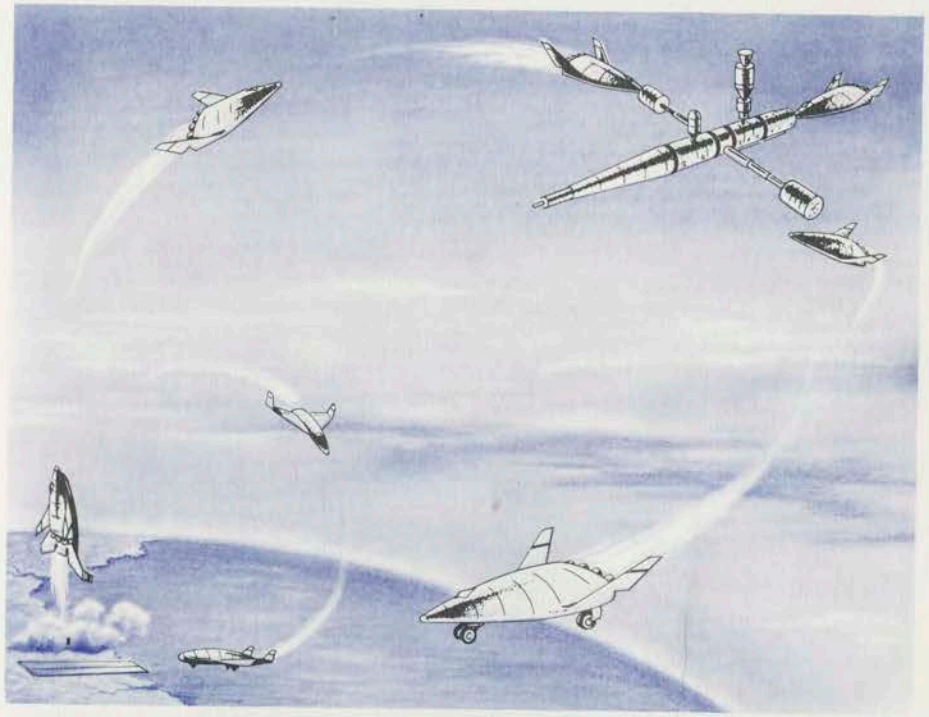
The shuttle, carrying a satellite into space, can position it in the desired location. If the satellite does not operate properly, it can either be corrected on the spot or returned to earth for repair. Today, our satellites – like the boosters that place them into orbit – are expendable.

Once they are launched, they are gone forever. A recent flying observatory satellite failed to function after launch. This single satellite represented 90 million dollars – almost as much as the present allocation for the shuttle program. Had it been placed on location by the orbiter, it would be sending back information today.

Another advantage in the use of the shuttle to place satellites in orbit is the protected environment provided. They will be spared some of the shock, vibration and exposure which takes place in present launches. This alone will permit simpler construction, eliminate the need for redundant systems, and do away with the heavy protective shell now required. **This simplification of construction will decrease the cost of satellites from 25 to 75 percent.** In addition, a duplicate back-up satellite need not be built.

The orbiter can, of itself, serve as a space station carrying out experiments, remaining aloft several weeks before returning to earth. Again, because of the protected environment and because the satellite or equipment need not be fully automated, electronic and photographic devices can be similar to or the same as used on the ground. This in itself will affect large savings. The scientist in the orbiter conducting his space experiments can carry with him his own laboratory equipment.

The orbiter will be able to carry twelve passengers into space in a shirtsleeves environment, and they need not be astronauts. The maximum gravitational pull will be but three g's. This will open space travel to those now unable to meet the physical perfection demanded of our astronauts.



How the Shuttle Works.

The orbiter can also play a key role in our national defense, providing intelligence or carrying out operational assignments requiring human on-the-spot judgment not possible with an unmanned vehicle. **This single capability is in itself sufficient to justify the shuttle.** From the beginning of time, man has looked to the high ground for his protection. In ancient times, castles were built on hills. In modern times, air power has been the key to victory. **In the future, we can expect the nation that controls space to control the area below. While we may have no desire to control the area below, our national survival demands that this control not be handed to another world power.**

The ground support needed to handle the shuttle system is similar to that required for our present space program, and fortunately much of it is already in being at the Kennedy Space Center and the Air Force Eastern Test Range. The system requires a launch complex, a communications and instrumentation network, an area for assembly, maintenance and repair, and a landing strip to accommodate both the booster and the orbiter on their separate returns to earth.

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Despite the unlimited potential of the Space Shuttle program and the future promise it holds for us all, the program is in jeopardy.

One of the reasons is public apathy. Now that the moon has been landed upon, explored and televised, its soil returned to earth and analyzed, much of its mystery has been laid bare. The glamour has faded and our attentions are turned elsewhere.

Another reason is money. The Space Program has been costly, although not unreasonably so. But our major investment has already been made, and common sense tells us that we must capitalize on that investment. **Now is the time to move ahead boldly, taking advantage of the knowledge, talent and resources we have accumulated at so great a cost and effort.**

Viewed objectively and in relation to other national programs, our expenditures for space research are modest. This year's proposed budget for space exploration is $3.2 billion, or only 1.4% of our total national budget.

This is less than we spend for foreign aid, 2/3 of what we pay to farmers not to grow things, and less than is budgeted for rivers, harbors and parks. Space research has now been relegated to one of the smallest major items on the national budget.

By comparison, **Russia is allocating 3% of its gross national product to space research while we set aside a pittance, less than a 1/3 of 1%.** Today, Russia has a vehicle crawling about on the moon, radioing back information. They have soft-landed instruments on Venus. They have developed the ability to place satellites in orbit carrying nuclear weapons, and to explode them on our country with pin-point accuracy. **We have not even begun to develop any defense against them.**

We know that Russia is developing a Space Laboratory that will probably be placed in orbit about the earth before our own Sky Lab is launched. There are also good indications that Russia will shortly attempt to place a man on the moon. It is worth noting that no American has viewed a Russian launch, nor has Russia ever proclaimed any peaceful motives in her space program, despite the fact that America has freely provided her with every detail of our own efforts. It is time we recognized that our competition with Russia is not a friendly rivalry between two old and close friends. Space is as much a part of Russia's military might as her expanding submarine fleet. **Our reluctance to continue the competition will not diminish the threat, nor will wishful thinking make it go away.**

Too often the value of our space program is assessed by the number and weight of rocks brought back from the moon. It is seldom recognized that the value of our space exploration is not in the riches we find in space but in the wealth of knowledge we accumulate in getting there. This knowledge is put to practical use in every field of endeavor from manufacturing to farming to national defense.

America's unquestioned superiority in computerization resulted from the need for instant information and instant answers to problems. Weather satellites report on weather conditions throughout the world, permitting accurate forecasts and warnings of storms. Satellites show patterns of plant and crop diseases better than can be observed on the ground; these patterns could be used by farmers to take prompt actions. Satellites can locate ore deposits on the ground and find schools of fish in the sea. Satellites have expanded our communications network and now permit live television coverage of events throughout the world. The medical field has been a major beneficiary and there are people alive today only because of the discoveries made in space-medicine research. New materials have been developed that are almost impervious to heat, cold and corrosion and are stronger than anything before known.

The list of benefits is so long, and is increasing at such a rate that no compilation has ever been possible. It is unfortunate that these facts are not better and more widely known, for we are about to starve our golden goose through inadequate funding just as the golden eggs are beginning to be produced.

Through the medium of television, we have allowed the world to participate with us in man's dramatic conquest of space. Unfortunately, enlightenment seems not to have inspired us nor challenged us to greater efforts. The staggering implications of man's ability to travel freely in space seem to have made little more impact on our intellect than the commercials that interrupt the viewing.

Unless we pursue our space program with greater vigor, we stand to lose not only the material advantages but our role as world leadership as well. Just as England's position of world power diminished with the disintegration of her sea power, so will America's position diminish if we fail to maintain our superiority in the air and in space.

America no longer dominates the markets of the world. Other nations, with lower labor costs, have adopted our mass production techniques and now out-produce and undersell us with comparable quality goods. **Today, our sole advantage lies in brainpower and research.** An industry must allocate a share of its resources to research, if it is to maintain its competitive position, and a nation must do the same. America should certainly invest no less than it gives away.

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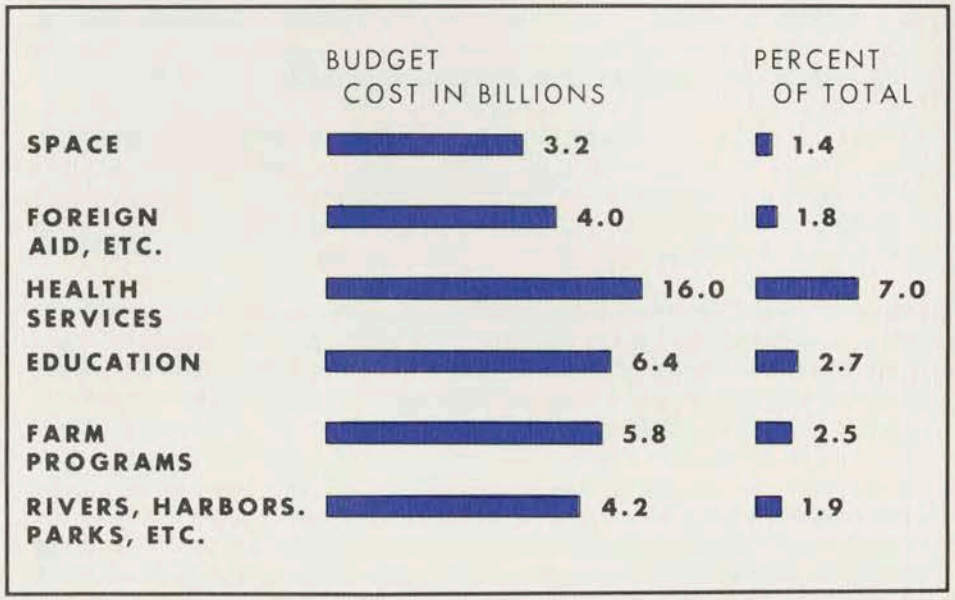
Through decreasing investments in our space programs, we are in imminent danger of breaking up the greatest assembly of technical competence the world has ever known. When Russia's next space spectacular again jars us into awareness, we will be able to respond within reasonable time at reasonable cost **only** if we do not abandon our present position for the sake of saving a few dollars in an already impoverished space budget. Otherwise, we may well expect future crash programs involving multibillion dollar expenditures, agonizing reappraisals, the fingerpointing of hindsight and the waste of catch-up exercises.



Proposed 1971 Budget Allocations.

The proposed expenditures allocated to the Space Shuttle this year is but 100 million dollars, or less than the cost of a single Apollo flight, little more than the cost of a highly sophisticated satellite, less than 1/30 of the proposed NASA budget. This, despite the fact that the Space Shuttle is the key to all future space research and development.

Because of the years which intervene between the design of a space vehicle and its actual operation, we must begin adequate funding immediately or face the extremely expensive loss of continuity in our space program. Unlike ordinary programs, our space effort cannot be curtailed or postponed except at great cost. The reason is not hardware alone, which can be duplicated or rebuilt in three or four year's time. The reason is the people.

Our space scientists, engineers and technicians, in both government and industry, obtained their highly specialized knowledge and skill through years of actual experience. These people are naturally limited in supply, and their numbers diminish steadily as the space program shrinks. Once released, these people find new careers in new fields, that they are not apt to abandon when space jobs do become available again. Training replacements to the same level of competence requires much money and many years.

Keeping these space teams intact during cycles of low national interest, which we seem to be facing today, poses a difficult and sometimes insoluble problem to our aerospace industries whose finances will not permit keeping people on the payroll when there is no work for them to do.

In recent months it has become fashionable to criticize the cost of our space programs while downgrading the magnitude of its successes. The expenditures for space research have been blown out of proportion by proponents of broader social programs, by poverty marches and demonstrations. While these antics are dramatic and make good copy, they do a disservice to our entire nation. **If the dollars proposed for the Space Shuttle this year were returned to the public, each citizen would get less than fifty cents, not enough to buy two loaves of bread.** It is doubtful that the funds proposed for the Space Shuttle would even cover the overhead of administering a single major welfare program.

Unfortunately, there are those who liken the space program to a tremendous fireworks display where, after the flame and thunder fade away, nothing remains but an exciting memory. This is far from the case. While our equipment may be sent into space, the dollars stay on earth, moving from hand to hand. Money invested in space research creates jobs throughout the nation, not only in aerospace industries but in every trade and service available to aerospace employees. Every dollar turns over many times, increasing employment even in fields unrelated to space. Moreover, money thus spent produces something in return. New materials, equipment, methods and knowledge which result from space research have a potential benefit beyond measure for all mankind.

Just as the ripples of our space cutbacks have been felt by even the most remote segments of our national economy, so would the benefits be felt if we but allocate the money needed to pursue a sensible course in future space research.

It is impossible to view objectively the attitudes and circumstances which are today shaping America's space program without feeling deeply troubled for the future.

If we truly care, we must make the situation known to others. We must insist that our elected leaders devote to the space program the urgent support it now demands.

We have reached the point in time when important decisions of direction must be made, and they must be the right decisions because they will not only chart our destiny as a world power but determine our survival as a nation.

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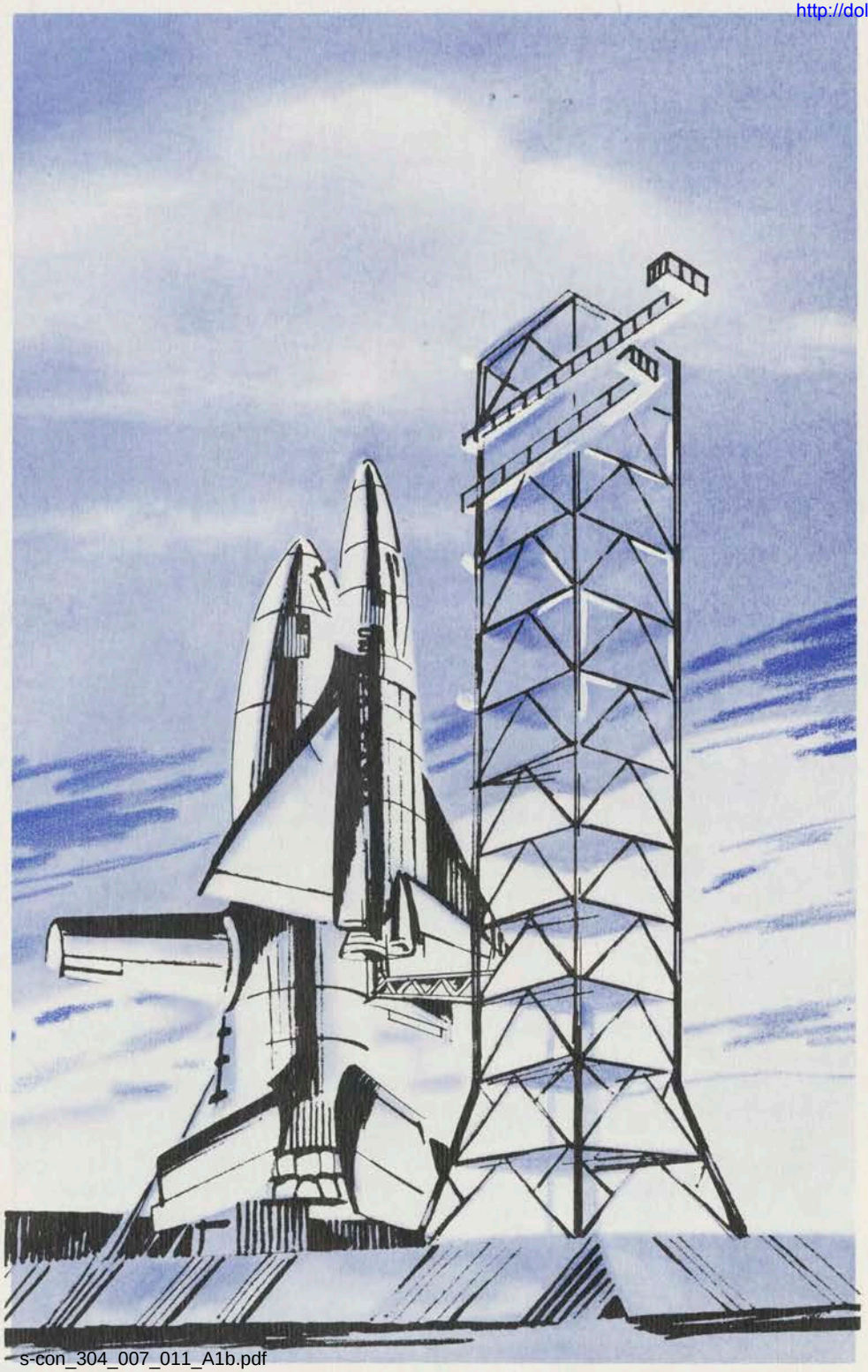

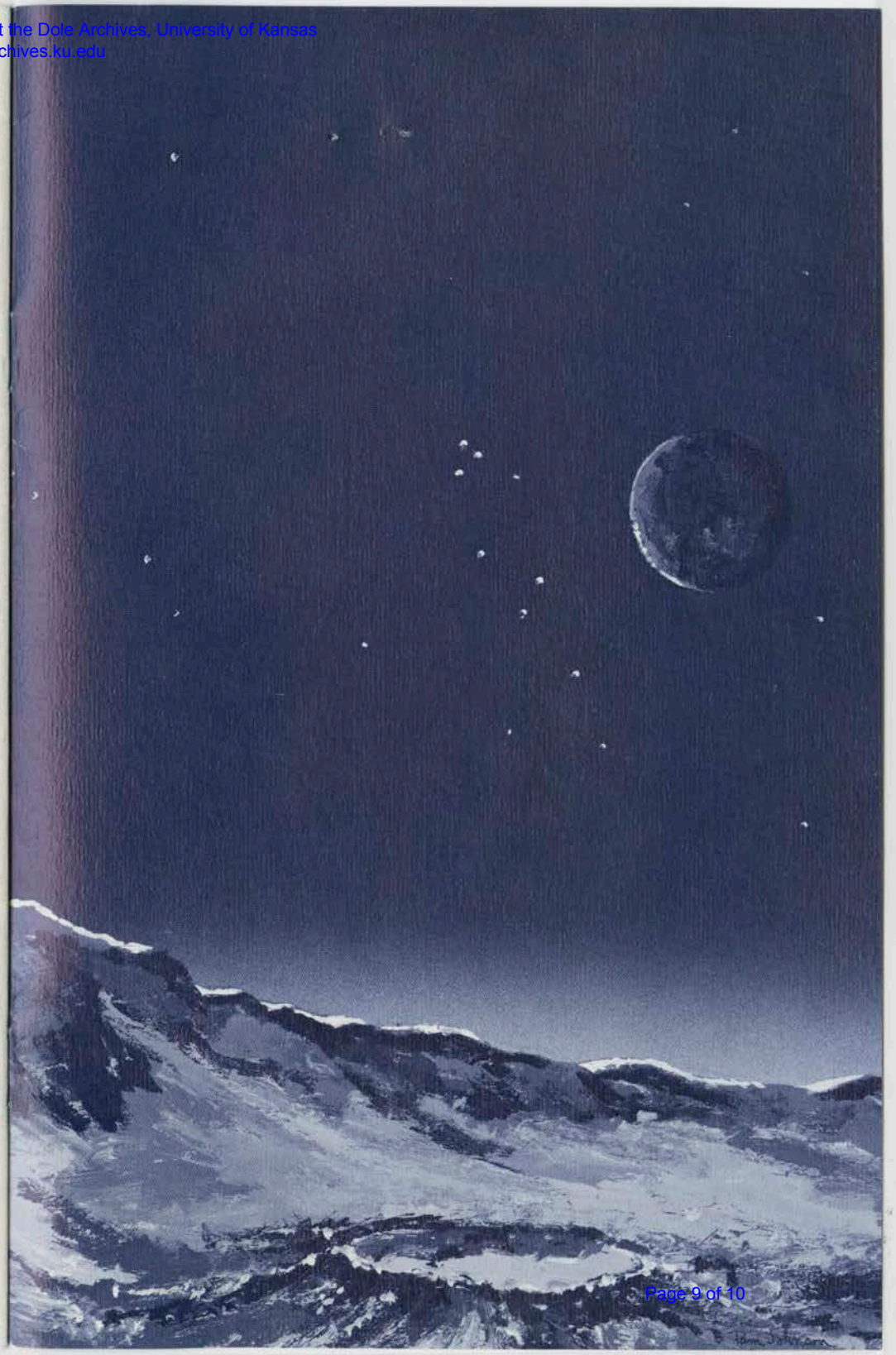

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