Remarks by Dr. Wernher von Braun, Director
George C. Marshall Space Flight Center
National Aeronautics and Space Administration
Huntsville, Alabama

Alabama Legislature
Montgomery, Alabama
June 20, 1961, 11:00 a.m.

Your Excellency Governor Patterson, Lieutenant Governor Boutwell, Speaker Ashworth and gentlemen of this joint session of the Legislature of Alabama:

I want you to know that it is a very real honor for me, a citizen of Alabama, to address you today in the Capital City of our Great State. I deeply appreciate your thoughtfulness in inviting me to be with you in this historic Capitol Building.

It is my privilege to know a number of you personally, and I wish I knew more of you. I'm sure that if the appropriations for the George C. Marshall Space Flight Center came directly from the Legislature of Alabama instead of the Congress I would know many more of you.

I have been privileged for some time, of course, to know Governor John Patterson. In fact, I enjoyed a very pleasant luncheon and conversation in Washington with the Governor not so long ago.

Also, I frequently see and talk with our own representatives from Madison County: Senator Dave Archer, Representative Roscoe Roberts and Representative Luke Reynolds. I should like to give a little public credit to Dave and Roscoe and Luke for the tremendous help they have been to the Marshall Space Flight Center and the U. S. Army at Huntsville. They have frequently helped pull us over the rough spots as the rocket and space exploration business in Alabama began to have more and more impact on the State and South.

I am glad to say, too, that you gentlemen of the Legislature have responded more than once to our expanding needs. And thanks to the persuasiveness of our Madison County delegation -- and your own good judgement and conscience -- I am glad to add that you responded as we wanted you to. We are delighted, of course, that you did, and we are grateful.

As you may recall, some of my former German colleagues and I came to Alabama from Ft. Bliss, Texas, some ten or eleven years ago, and six years ago this past spring we were awarded our American citizenship.

I want to take advantage of this occasion to express my sincere appreciation to the many fine citizens of this State for the warm, truly Southern hospitality which they have extended to us. We like -- and we are proud of -- our Alabama friends and neighbors.

As you will remember, during the past few years all of us in Alabama have shared some exciting, history-making moments together. First there were the pioneering Redstone and Jupiter missile programs; then our launching of the Free World's first satellite around the earth, built right here in Alabama; then our launching of the Free World's first satellite around the sun, again built right here in Alabama; then only a few weeks ago came our launching of the Free World's first man into space. And, I hasten to add, with the Saturn deep space rocket and other programs now underway at the Marshall Center, we expect to ring up a few more firsts before too long.

Even now a lot of people still ask me, "Why do you want to go to the moon?" I like to remind them about one of this country's most famous scientists.

When wise old Ben Franklin sent up his kite that day in the thunderstorm, he got his knuckles singed by electricity. What did Franklin learn by this experiment? Not much. Only that electricity from the clouds would shock him. But because Ben was curious about the world around him, his simple research -- plus a few other experiments conducted elsewhere -- stirred up a lot of interest. A burst of attention was then focussed on electrical research, and as a result, old Ben Franklin's kite sparks flew around the world. Today, we can't drive a tractor, fly an airplane, light a house, or send a satellite into space without electricity.

My point here is that as wise as Ben Franklin was, he didn't have the faintest idea of the great benefits that were in store for mankind as a result of the first faltering experiments that he and others about that time carried out. But Franklin did have scientific curiosity. It was curiosity that made him go fly a kite that day, not some mysterious, prophetic knowledge that he was about to help pave the way for vast new benefits for all mankind.

So when somebody tells you to go fly a kite, don't punch him in the nose. Who knows? You too might discover electricity.

Incidentally, as you know, Benjamin Franklin was not only a scientist and inventor, but he was also a great statesman and politician. In fact, he would be equally as much at home -- were he alive today -- with the employees of the Marshall Space Flight Center as he would with the members of our Legislature. And after reading something of some of the remarkably skillful operations conducted around Goat Hill here lately, I wouldn't be surprised if we couldn't learn more from Franklin about our business than you could learn from him about yours.

It is curiosity that sets man apart.

It is curiosity that makes him learn.

This has been true throughout history. . . . first curiosity; then learning; then advancement.

But the guy who is curious -- the restless searcher for new knowledge -- never knows where his curiosity will lead him. All he knows is that some time, in some way, the knowledge he digs up will better the lot of his fellow man.

For instance, the great bacteriologist, Sir Alexander Fleming, found one day that certain bacteria were killed by a mold. This accidental discovery -- which happened because Fleming was curious about mold -- gave us penicillin.

He didn't have the faintest idea that what he saw under his microscope that day would end up by saving many, many thousands of human lives. It's always that way.

We just never know what the next bit of information will bring forth.

That's why we want to -- and why we must -- explore space. It's our next frontier, our newest challenge, and the greatest unknown today.

I am convinced that the exploration of outer space will produce undreamed of benefits for all of us. And the very fact that nobody knows for sure what all of these benefits will be opens new prospects and excites our imagination to further progress. It has been said (Henry Ward Beecher) that "the soul without imagination is what an observatory would be without a telescope."

Now how are we going to space?

I'd like now to show you a few slides of actual space hardware and discuss with you some promising methods we plan to use to get out there.

The other day The President said we should go to the moon.

Well, he's not alone.

Let us just hope that somebody named Ivan Ivanovich or Yuri Gagarin doesn't get there first.

How are we going to get there? And when?

First, let me say here and now that this country has nothing to be ashamed of in comparison with the Soviets in space exploration to date. This comparison may have been valid three years ago, but today we have orbited many more scientific satellites than they; and from them we have gleaned a great deal more new scientific information from the universe than anyone else.

The area where we are obviously behind is in the field of big boosters. . . . the big push. That is the bottleneck. That's why I should like to talk with you today about our efforts in big space booster development. I shall discuss two in particular: The Saturn and Nova.

But, before I go into that let me say that we're all highly gratified, of course, at Alan Shepard's successful and historic voyage aboard the Mercury-Redstone rocket.

LIGHTS OFF

SLIDE 1

But to achieve this we had to fall back on that old reliable Alabama-made Redstone rocket. The Redstone, taking off on the left, was first developed as a weapon. It has never yet been fired in anger. But when we got into trouble (and maybe angry) because the Russians beat us up there with the Sputniks, we had to call on the Redstone to put the first American earth satellites into orbit. In the middle is the Jupiter C which lofted Explorer satellites I, III, and IV. Then after Yuri Gagarin's orbit. . . . in an effort to stay in the man-in-space race. . . . we again relied on that old reliable Redstone to boost our first American into space. You see it on the right with the space capsule on top.

Following the Mercury-Redstone will be the Mercury-Atlas which will place an American in orbit later this year.

Well, as to How and When. . . . to put it simply the United States now has a whole stable-full of other good rockets to do the job with; and from all indications we're going to accelerate our most vital space exploration programs and timetables rapidly and forcefully.

I should like now to talk with you about two big space exploration vehicles.

SLIDE 2

First the Saturn. Thanks to a little clever faking. . . . and with the cooperation of the Governor's press secretary. . . . we see the Saturn deep space rocket right on the lawn of our Capitol building.

This particular version of Saturn stands about 18 stories high. The Saturn rocket not only compares in size with the Capitol, but I suspect a comparison in internal complexity and perhaps an ability to shift courses might be made.

With the help of private industry and universities around the country, the Saturn space carrier vehicle is under development here in Alabama for the National Aeronautics and Space Administration.

Several versions of the Saturn are being considered. Even the smallest -- so called -- is the world's largest known rocket.

SLIDE 3

Here is a cutaway of the Saturn booster showing the fuel and oxygen tanks. There are eight tanks six feet in diameter surrounding one tank in the middle of the cluster that is nine feet in diameter. Four of the outer tanks -- and the middle tank -- hold liquid oxygen. The remaining carry the kerosene.

You can't see them all here, but the booster has eight kerosene-oxygen engines, each of which can develop 188, 000 pounds of thrust. By "thrust" we mean lifting force.

The Saturn represents a four-fold jump in thrust power.... from the 360,000 pound thrust Atlas to the 1.5 million pound thrust Saturn. This is equal to the energy developed by almost all the 100,000 or more automobiles in Montgomery, Alabama.

This particular first stage will be used to boost the first two versions of the Saturn rocket now under consideration into space.

For our purposes, we call the three versions of the Saturn the C-1, C-2, and C-3.

SLIDE 4

Here is the second stage of the first -- or C-1 -- version of Saturn. This stage will be powered by six hydrogen-oxygen engines, each developing 15,000 pounds thrust.

These new hydrogen engines represent the first step forward in advanced liquid propellants. Our earlier space vehicles generally used some type of kerosene as fuel.

This stage is some 17 feet in diameter and about 40 feet tall.

SLIDE 5

A new development in liquid rocket engines is underway to power this, the number two stage, of the second -- or C-2 -- Saturn vehicle. Four new hydrogen engines, each developing 200,000 pounds thrust, will be combined to give this stage a total of 800,000 pounds thrust. This new engine will be a really big step in the development of hydrogen engines.... from 15,000 pounds to 200,000 pounds thrust.

SLIDE 6

Here at a glance you can get a good look at the three Saturns. The first version, on the left, can put 20,000 pounds of payload into low earth orbit. It is also designed to put three men into orbit around the earth. The first launching of the Saturn C-1, without a payload, is scheduled for the last quarter of this year. With payload, it stands about 180 feet tall. It weighs about 1,000,000 pounds at liftoff.

The second Saturn, in the middle, will be about 210 feet high. It will have three stages and will be capable of orbiting manned or unmanned payloads of more than 44,000 pounds around the earth, soft-land a 3,000 pound payload on the moon and back to earth, or put instruments on Mars or Venus.

The third Saturn shown here is a rather radical departure over the other versions in that the booster will be powered by two huge new kerosene engines, each of which develops 1.5 million pounds of thrust. This Saturn booster, then, will be twice as powerful -- with three million pounds thrust -- as the earlier version. The second stage will have the same four 200,000 pound hydrogen engines, and the third will have six hydrogen engines with 15,000 pounds thrust each.

It can put ~~1,000,000~~ 100,000 pounds into earth orbit, or fly a multiple crew around the moon or send 24,000 pounds on a one-way trip to Mars.

Ten launchings of research and development vehicles are scheduled in the current Saturn program.

We expect the Saturn deep space rocket to be the major rocket for U. S. space exploration for a number of years. It is the first large rocket to be developed in the U. S. for scientific peaceful research.

SLIDE 7

When the Saturn puts men into space it will carry a spacecraft known as Apollo. Here you see the Saturn booster out in space separating from the remaining stage and the Apollo. The Apollo is not only an extension of the Mercury-man-in-space program, it has other capabilities. For instance, men can use it to observe the surface and environment of the moon before a manned landing takes place. The Apollo is also sufficiently flexible to serve as a manned orbiting laboratory. . . . a laboratory where man can perform useful space research in a low earth orbit. This orbiting laboratory is a necessary step leading toward a permanent manned space station.

This will be the main application of the Saturn rocket. . . . man into space.

SLIDE 8

Here is a promising plan to recover Saturn boosters and thus save a lot on money. Rockets are usually considered expendable, but by using this unique Rogallo kite -- called a paraglider -- we think we can return boosters and some upper stages to land and fly them again.

The paraglider would actually be guided down from the ground -- as you see here -- through a radio remote control system. Lines attaching the kite to the booster can be pulled in or let out to control the kite as it descends and finally approaches the landing strip.

SLIDE 9

The special barge was built because it's about the only way -- at present, anyway -- that we can get the Saturn booster from the Marshall Center to Cape Canaveral. However, due to an accident at the Wheeler lock on the Tennessee River not long ago, it looks as if we're going to have to use two water-going vessels temporarily. We'll use the Palaemon -- the name of this barge -- to get it to the lock, move it by a wheeled transporter around the lock, then re-load on a former Navy barge and proceed to the Cape. It's a 2,200 mile trip by river, the intercoastal waterway that runs across the southern tip of Alabama, the Gulf of Mexico and the Atlantic Ocean.

The skipper of this unusual craft describes the barge as a cross between a mine sweeper, a garbage scow and a blimp hanger.

SLIDE 10

Moving the upper stages of Saturn by air is a possibility. A rather startling proposal by Douglas Aircraft has been made to carry the Saturn second stage on top of an aircraft in piggy-back fashion. We're seriously looking into this scheme. The idea is to save time and money.

When I first studied this proposal I couldn't help thinking about the caterpillar who, like too many of us, never can accept a new idea. Two caterpillars were strolling along in the dust one day when a butterfly went by overhead. One caterpillar said to the other: "They'll never get me up in that thing."

SLIDE 11

Here is Saturn with a nuclear upper stage. In this concept of a nuclear rocket, hydrogen is heated by passing it through a nuclear reactor and then exhausted through a nozzle yielding about twice the propellant economy you get with a hydrogen oxygen engine. With this more efficient engine, smaller quantities of propellants will be needed, thus making our payloads a lot bigger. NASA and the Marshall Space Flight Center are making a number of studies in this area. Also, NASA and the Atomic Energy Commission jointly are pushing forward the pace of the Rover development, as the nuclear rocket reactor program is called. We should fly our first prototype nuclear rocket by 1966. This first nuclear rocket will be called RIFT. . . . for "Reactor In Flight Test". It's easy to see that we can dream up weird alphabetical abbreviations with the best of them.

The RIFT nuclear vehicle will be flight-tested as a second stage of the Saturn C-3.

SLIDE 12

As we approach manned space travel involving several men. . . . and women, eventually, of course. . . . we must put up much bigger payloads.

Incidentally, Bob Gilruth, the man in charge of the U. S. Mercury program, was asked the other day if he plans to use women astronauts in the man-in-space program. With a straight face, Bob replied: "Well, we are reserving 110 pounds of payload for recreational equipment."

To put these bigger payloads up it takes thrust. Here is a dramatic example.

The small liquid engine you see creates 188,000 pounds thrust. Eight of these make up the Saturn first stage which produces, as you now know, 1.5 million pounds. Then, at one stroke, comes a single engine that produces the same amount of thrust -- 1.5 million pounds -- that the whole Saturn engine cluster produces. Both are kerosene engines.

To express myself in more familiar terms, this big rocket engine produces 33,000,000 horsepower, compared with these two diesel locomotive units at the left which together produce only about 4,000 horsepower. Now by clustering a batch of these big engines you can see that we can really achieve power.

SLIDE 13

And here is where we will need it. This slide depicts one of the possible Nova space vehicle concepts. Nova is the next big step beyond Saturn.

By clustering the Saturn C-3 boosters -- those first stages with the two 1.5 million pound single chamber engines -- on the left we come up with this clustered Nova vehicle in the center. For very high speed it would be advantageous to increase the propellant capacity of the top stage. Thus Nova would offer us an escape payload of up to 140,000 pounds. By "escape" we mean escape from the earth's gravity.

With Nova, we could land a locomotive on the moon if anyone wanted one there. What is more important, this Nova space rocket can put a spacecraft -- like the one on the right -- with three men on the moon and return them to earth, and at the same time leave 40,000 pounds of supplies and equipment to support a manned lunar station. With a nuclear third stage, it could go into orbit around Mars and return to earth later on. Nova vehicles of this class give us the most direct approach to manned lunar and planetary exploration.

LIGHTS ON

Before Nova, though, comes Saturn. I might mention here that the Saturn space rocket will be shown to the public for the first time on July 1. In fact you can see two fully assembled Saturn rockets which we will display at an open house we are having to celebrate the first anniversary of the Marshall Center.

We will also erect a Mercury-Redstone rocket, complete with a space capsule like the one Al Shepard rode in. We would be most happy to have any of you who can to visit us that day. We hope it will provide you and the public with a pretty good -- and rather interesting -- look at Alabama's major role in the national space program. We will conduct four live, that is hot, static tests of a Saturn engine for you. Also, for the first time each of the 10 space research laboratories of the Marshall Center will be opened to the general public. Our open house will be from 8:30 to 3:30. I'd like to remind you that Huntsville -- for the first time in several years -- is on Central Standard Time this summer. As a reward for our cooperation in staying on standard time, however, they give us the privilege of going to work at seven o'clock in the morning. July 1 is on Saturday, so I suggest you come up to Huntsville for a visit to the space center and leave your politics back here.

Now. . . . what will it take for this country to regain lost prestige and once more assume its place as the scientific and technological leader among nations? More particularly, what can the people of Alabama do? What can the people in this room do?

These slides you have just seen show how much the national space program depends upon the work going on here in the State of Alabama. Just as important for the country's well-being, of course, is the enormous national defense effort being carried out at Huntsville by the Army Ordnance Missile Command and the Army Ordnance Guided Missile School.

The 25,000 persons employed at Huntsville who carry on this work receive an annual payroll of about $200,000,000. The total money spent by these agencies each year is nearly 2.2 billion dollars, and about 16 per cent of this (or 350 million dollars) is spent in Alabama with companies and educational institutions throughout the state.

I haven't mentioned this to Dave Archer yet, but when the figure of 25,000 arsenal and Marshall Center employees was mentioned in a meeting in Huntsville the other day, somebody suggested:

"With all these voters around here, why don't we elect a Senator from Redstone Arsenal?"

The Marshall Center is now in the process of hiring more than 1600 new employees. Most of the people we need so urgently are graduate engineers and scientists. In other words, highly skilled and educated men and women.

Although a substantial number of our present technical people are products of Alabama's educational system, most of them, frankly, have come from elsewhere....from all 50 states and several other countries, as a matter of fact.

You've heard and seen something now about the kind of people we need and what we need them for. We need the best, and we need them for one of the most vital jobs in the history of free men.

This, I submit, is substantial evidence to show that opportunity is indeed knocking on Alabama's door, and knocking hard, just as opportunity knocked on California's door a few decades ago when the aircraft industry was beginning to blossom.

The question today is, "Will Alabama open the door?"

As a proud citizen of this state and of this country, I feel a responsibility to raise this question with you and to discuss it openly and frankly.

Shakespeare said, "There is a tide in the affairs of men, which, taken at the flood, leads on to fortune". For Alabama, the tide is at flood now -- but is passing fast. My appeal to you is to recognize this and to take action today while the opportunity is still available. I am sure there are very few problems in Alabama which could not be solved with more money -- the proper capital investment at this time can produce that money for the State of Alabama.

Now what investment am I speaking of? I am speaking of an investment in people -- strong, capable, educated people! Opportunity goes where the best people go, and the best people go where good education goes.

Unless we get -- and keep -- many more bright young men and women very soon to help us carry the present load, our programs -- and Alabama -- will suffer.

This danger was sensed last winter by a keen Washington official during his visit with us. We were asking for more funds for construction of facilities, and he raised the question as to whether it was really smart for the Federal Government to continue to build up its facilities in a place which has much difficulty in obtaining the right kind of senior personnel to operate these facilities. You see, a government agency functions much like a business: Success is not guaranteed by past successes; no one in Washington is assuring our future; if we begin to falter -- as we most certainly will without the right kind of personnel -- serious consequences will surely result.

To make Huntsville more attractive to technical and scientific people across the country -- and to further develop the people we have now -- the academic and research environment of Huntsville and Alabama must be improved and improved immediately. As many of you know, the University of Alabama has a University Center in Huntsville, which is definitely a step in the right direction. In addition they have just opened a small Research Institute closely affiliated with this Center.

As this Institute grows, large corporations will be encouraged to establish research organizations nearby to form an industrial research park as a part of the University complex, which in turn will give birth to major new industries throughout the State.

Unless, however, large sums of money can be found immediately to improve and enlarge this University complex, its real value may come too late to help us attract and develop the kind of people we must have.

The citizens of Alabama should recognize even more fully that the United States, as well as the other leading countries of the world, now lives in a technological age. The efforts along this line that have been taken in the past -- in developing our technological manpower and other industrial resources -- will not, I repeat, will not suffice to keep pace with the other states and nations today.

It's the university climate that brings the business.

What do you think attracted the aircraft industry to the Los Angeles area? The desert and smog? No, it was U. C. L. A. and Cal Tech and the Art Institute and St. Mary's and The University of Southern California.

Was it beans that brought great electronic and other industries to Boston? It was the Educational Triangle of Boston University, Harvard and M. I. T. A friend of mine said last week that if M. I. T. was as close to Huntsville as are the University of Alabama and Auburn University that M. I. T. would own Redstone Arsenal.

Let's be honest with ourselves about it: it's not water, or real estate, or labor, or power, or cheap taxes that brings industry to a state or city. It's brainpower. Nowadays, brainpower dumped in a desert will make it rich. Right now you could run a profitable electronics firm on the moon, if the company liked the climate. Educational climate, that is.

Without question, such a climate is the most important single resource in attracting new people and new ideas. It's a self-generating process. Once you get it started, it snowballs.

The top people in industry and government today like to improve themselves. They like flourishing research institutions. They thrive on them. If they have a bachelor's degree, they want a master's. If they have a master's, they want a Ph. D. And if they have a Ph. D. they want to teach and do research. So our young engineers with bachelor's degrees are not satisfied. If they could get advanced degrees and remain near an academic environment, they would stay with us. Lacking such opportunities they want to move on to California and Massachusetts.

While we are trying to bootleg young engineers from other states.... because we don't produce them here....the same states are stealing our senior scientists.

The State of Alabama. . . . in this case, you. . . . has a very real responsibility to promote the advancement of science and higher education. In short, it's up to you to create the right climate.

In Huntsville we are trying to create a vigorous and varied educational and research climate. The seed is sown with the University Center and the infant Research Institute. But the seed is starving. It needs something green. . . . Money.

To be specific, the Research Institute needs. . . . at this very moment. . . . three million dollars for buildings and equipment. Following this first investment the Institute will not only be self-sustaining, but will enrich the State both financially and culturally.

Let me remind you of something: the rocket and missile business at Huntsville pours 350 million dollars annually into the State of Alabama. That's more than a hundred dollars a year per man, woman and child.

The only reason that Alabama has this bonanza at all is because the Army had a big chunk of spare real estate that served the immediate purpose of providing a home. We've lived in that home for more than ten years now, and it's about time we got a schoolhouse. And everything that goes with it.

For a three million dollar investment now, I promise you that you'll reap billions. Easily billions. 350 million dollars, don't forget, is more than a third of a billion.

The President has asked the Congress for from seven to nine billion dollars for space for the next five years alone. A big hunk of that dough will end up in Alabama. End up in Alabama, that is, if Alabama can attract the kind of people we have to have, provide them with a decent educational, scientific and cultural climate, and make them want to stay.

If Alabama does this, then the prosperity and culture of the entire state will grow and flourish.

If Alabama doesn't. . . . Well, I'd hate to see those Saturn and Nova rockets begin that long and lucrative trip to the moon from the State of California.

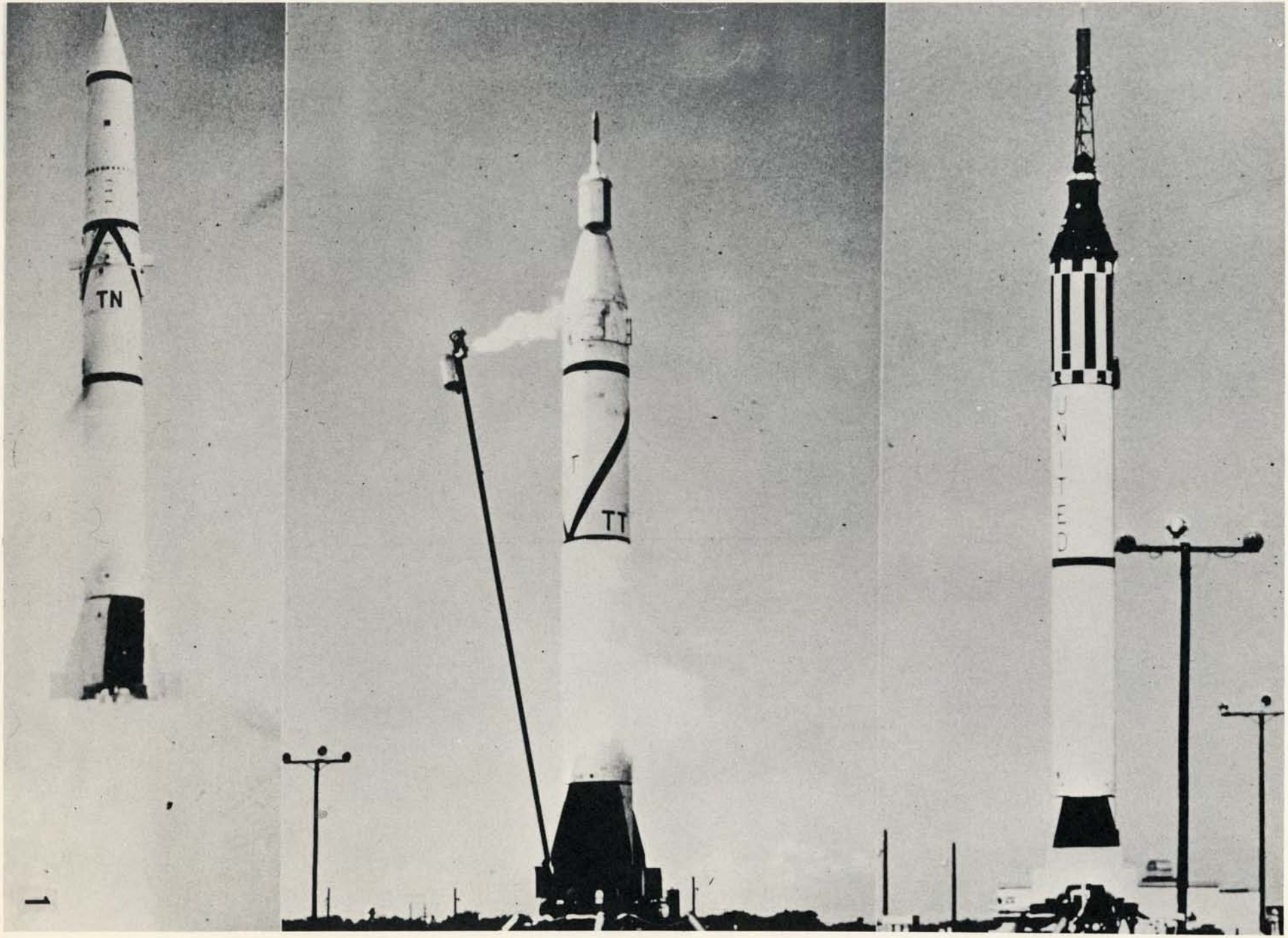
Now, it is not my place to tell you what to change or how to change it, but I trust you may take this warning seriously.

I'm not asking for something next year, or next month, or next week, or tomorrow. I'm asking that you -- each of you, individually and collectively -- do something now.

On one hand, you have the greatest opportunity for wealth, prosperity and culture ever offered to this state and seldom to any other state. While on the other, you face the greatest of dangers. . . . not only the danger of aggression and loss of prestige, but also the danger of economic competition from other cities, states and nations all over the world.

When a prospective employee looks at us he does not try to decide whether to live in Huntsville or Montgomery, he is choosing between Alabama and Los Angeles, New York or Boston. It is your decision whether you want to make Alabama attractive enough to stay in this race.

I do not believe you will back away from this competition. I believe I know the citizens of my state well enough to say with full confidence that they will accept this challenge with the gusto of Macbeth as he said: "Lay on, Macduff, and damn'd be him that first cries, 'Hold, enough!'"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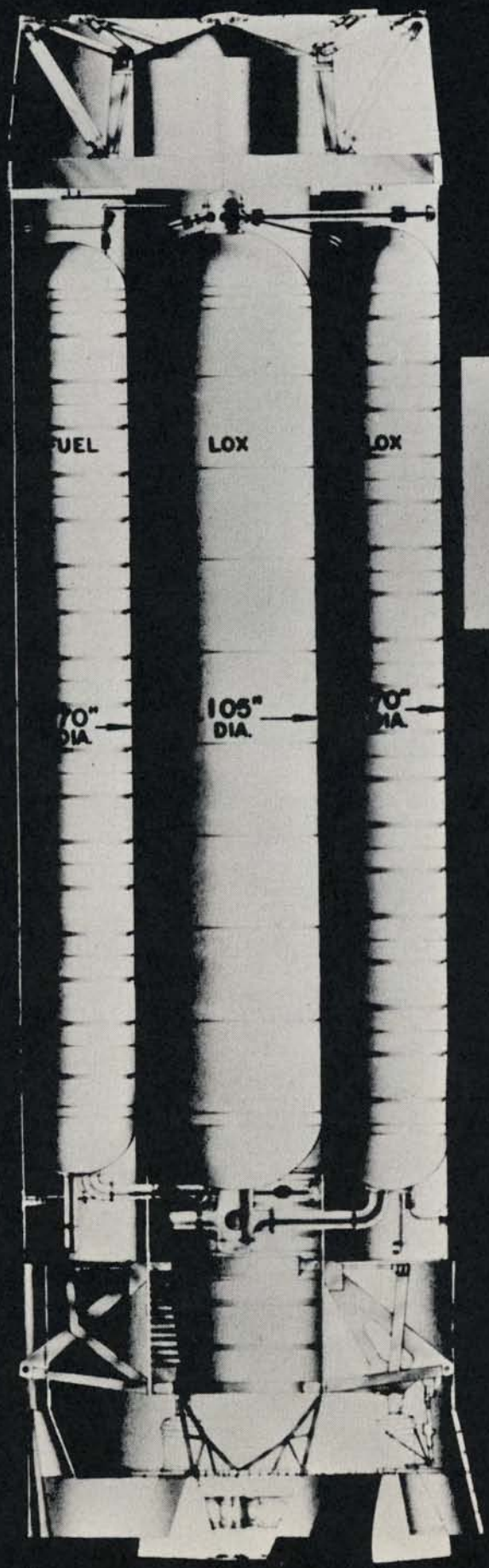
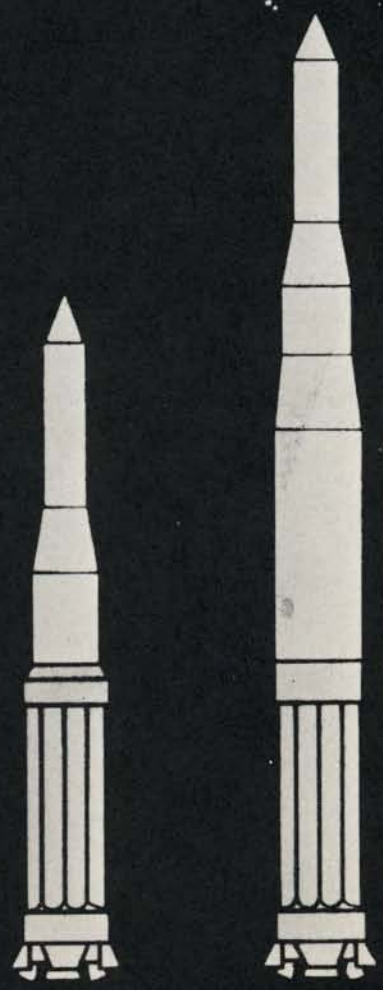
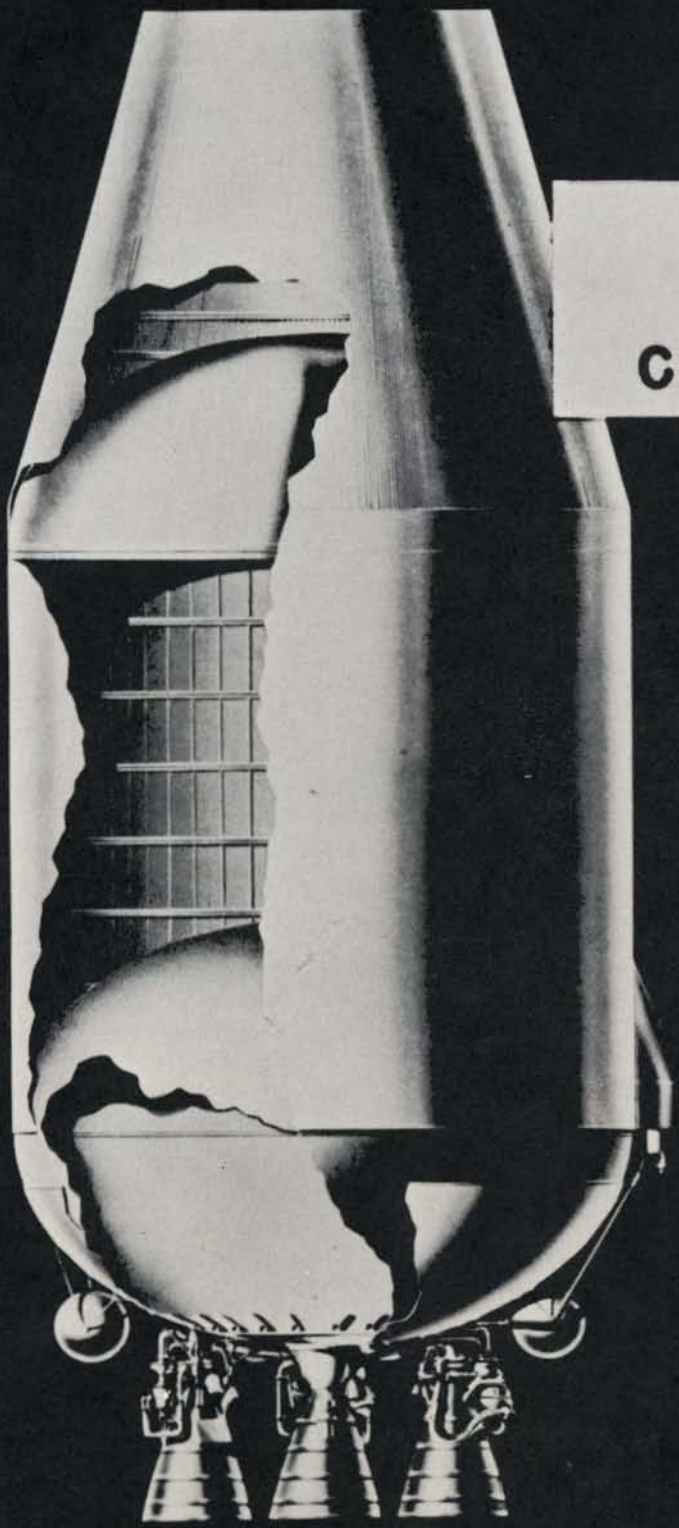


SATURN

C-1 FIRST STAGE
C-2 FIRST STAGE

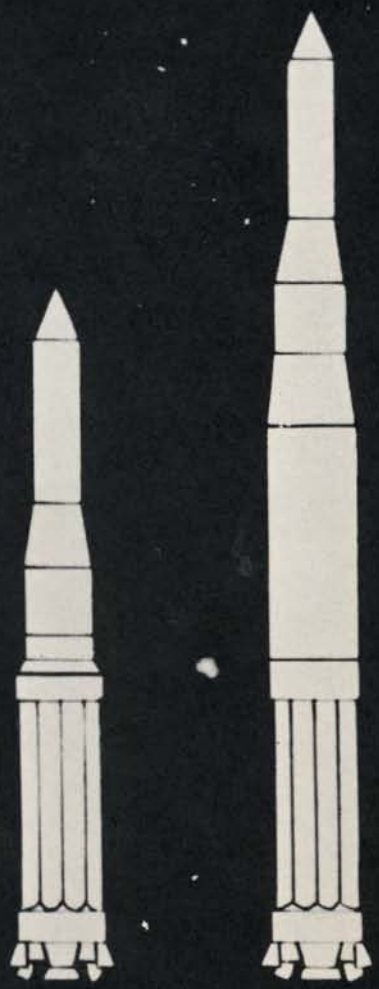


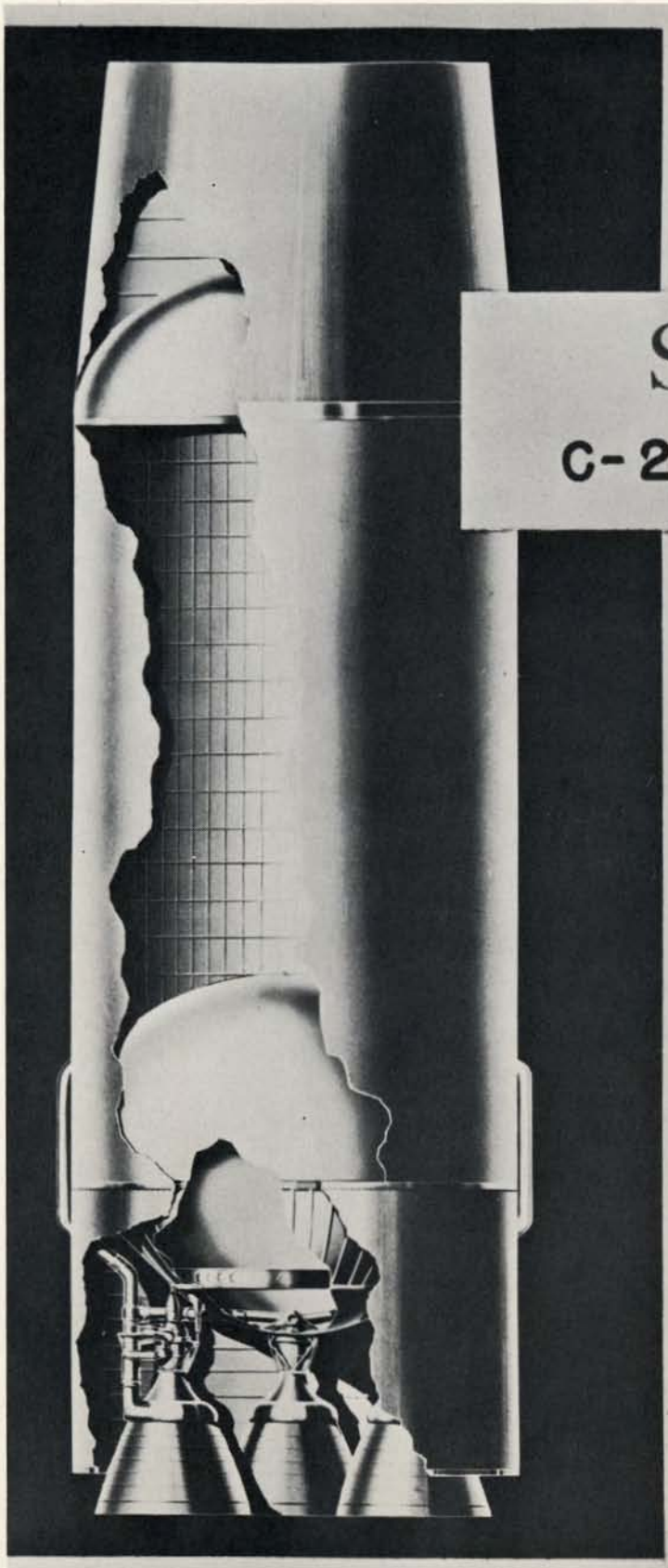


SATURN

C-I SECOND STAGE

ARTIST CONCEPT





SATURN

C-2 SECOND STAGE

ARTIST CONCEPT

GE-72-6-60 18 JUL 60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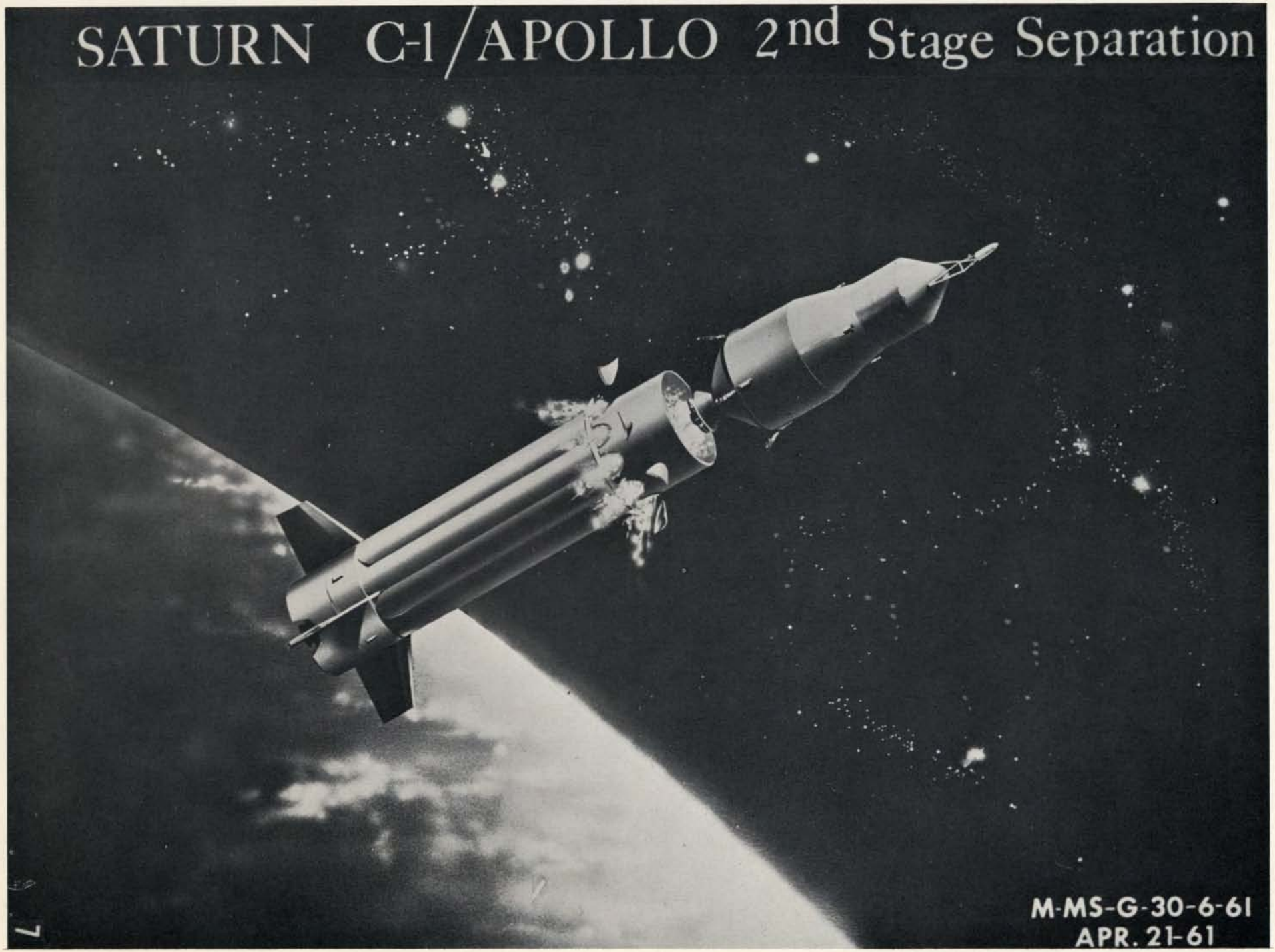
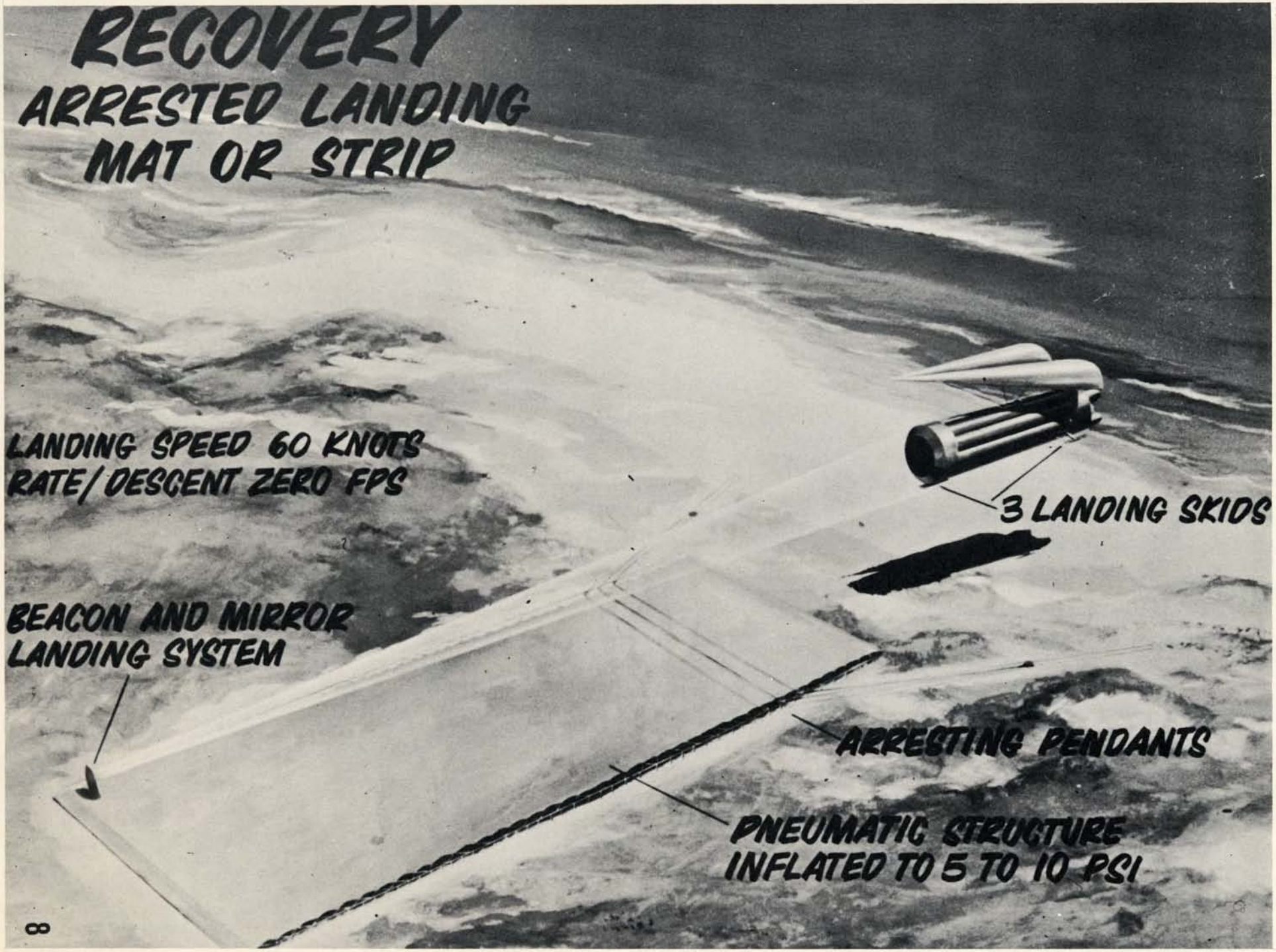
20 Story Bldg
C-1
2 Stage
C-2
3 Stage
C-3
3 Stage
M-MS-G 34-3-61 MAY 17-61

SATURN C-1/APOLLO 2nd Stage Separation

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ARRESTED LANDING
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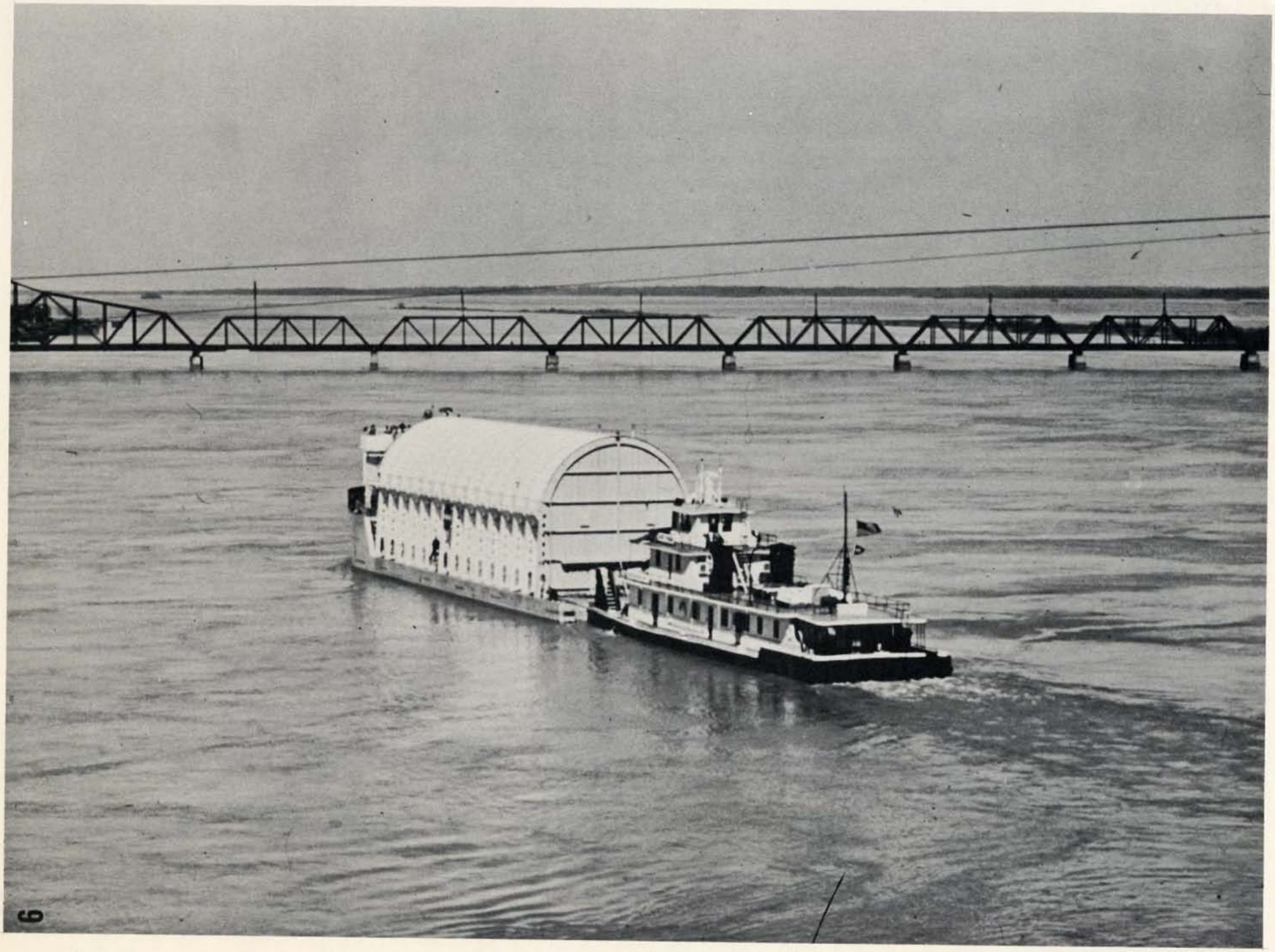
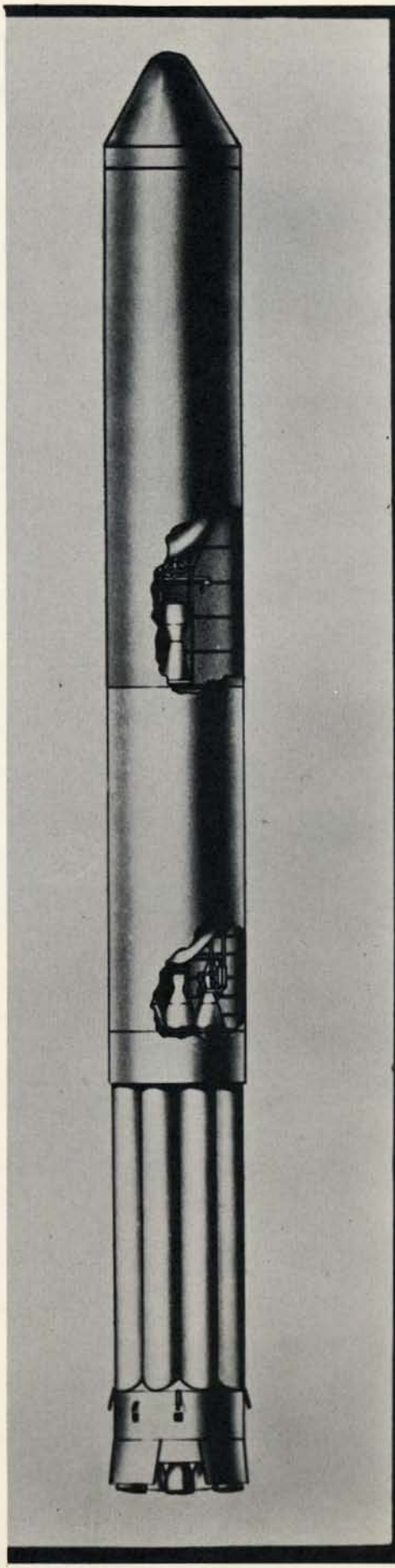


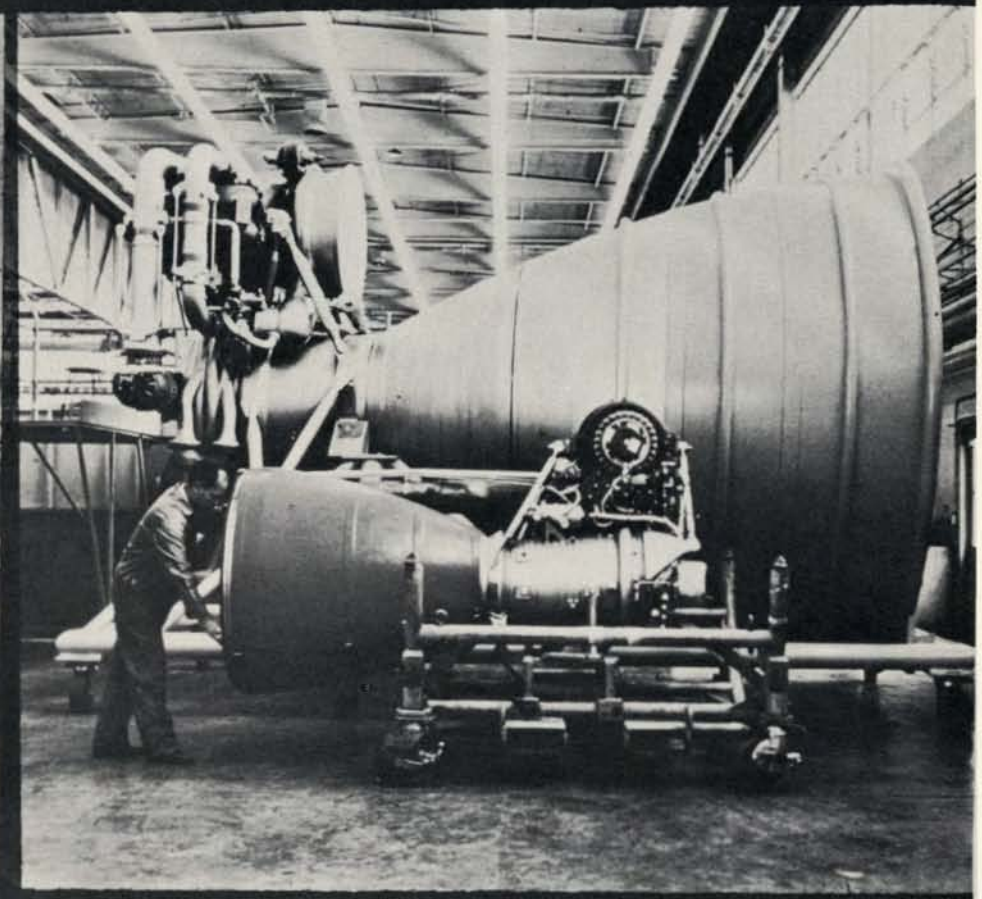

MILITARY AIR TRANSPORT SERVICE
U.S. AIR FORCE



SATURN-NUCLEAR SPACE CARRIER VEHICLE

GE-72-17-60 REV. A 15 MAY 61


UNION
PACIFIC



MODULAR NOVA CONCEPT