NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PRESS CONFERENCE ON

APOLLO SOYUZ TEST PROJECT

USA - USSR

PARTICIPANTS:

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for Manned Space Flight

Chester M. Lee, ASTP Program Director

Vance Brand, Command Module Pilot

Washington, D. C.

1:30 p.m.
Friday, 11 April 1975

P R O C E E D I N G S

O'DONNELL: Good afternoon.

We have with us today the Program Director of the ASTP Program and the command module pilot.

We are making a transcript of the entire briefing, and if you want to receive one of these in a week or two, if you will fill out the envelope at the back with your own address.

The format today will begin with Chet Lee, have a short movie on Soyuz 16, and go to Vance Brand, another short movie, and then questions and answers.

At this time I would like to present to you Captain Chester M. Lee, the ASTP Program Director.

LEE: Thank you, Bill.

Ladies and gentlemen, Bill has given you a quick overview of what we want to cover. We have a great deal of information. It may go fairly long, and I am going to try to skip through some of the details that will be on your handouts, just to point out what I think are the significant items.

Of course, it may trigger some questions, and you will have the handouts. And naturally we will be available to answer questions later on. Not necessarily today. If the handouts create some questions that we haven't fully covered for you in this briefing, we will be glad to do it.

There is a wealth of information. What we are trying to do is give you everything as we have it as of today.

(Slide.)

These are our patches. The one on the left is the crew patch. Fairly new. We are just getting decals. And, of course, that is the program patch.

Let's move on into the next viewgraph, please.

(Slide.)

This is a painting by Mr. McCall and on your

right are the objectives. I won't spend a lot of time on them. You are quite familiar with them, I am sure.

I do want to emphasize that there are many facets to the mission and that these objectives as listed are very important, and we have obtained a wealth of information.

It is just not simply a docking. There is a rendezvous technique, and certainly the intervehicular crew transfer, as you will see, is complicated to a degree. And certainly the interaction between the control centers is very complicated. And we are conducting a number of sims to get operational in that aspect.

Next viewgraph, please.

3B

(Slide.)

Very quickly, this is the basic organization. It is the Apollo organization in essence with the responsibilities of the three centers.

I do want to bring out -- I will talk more about Houston which has the Apollo working group responsibilities.

The launch vehicle group you know at Marshall. And they do have the responsibility for several experiments which we feel are quite important.

And, of course, Kennedy has its usual responsibility of test and checkout of the vehicle which they are in the midst of now.

Without going into past history, early in the program we started out with three specific working groups between the United States and the Soviets. This has increased to five, and actually we have a zero working group which is the two technical directors, Glynn Lunney from Houston and Professor Busheyev of the Soviet Union.

These are the responsibilities of each working group and when we have a full-scale meeting we have approximately 100 Soviets and approximately 100 U.S. technicians and specialists involved.

3C

Next viewgraph, please.

OBJECTIVE

TO DEVELOP AND TEST SYSTEMS FOR RENDEZVOUS AND DOCKING OF FUTURE MANNED SPACECRAFT AND STATIONS THAT WOULD BE SUITABLE FOR USE AS A STANDARD INTERNATIONAL SYSTEM. THIS WILL INCLUDE THE RENDEZVOUS AND DOCKING OF APOLLO AND SOYUZ SPACECRAFT AND CREW TRANSFER.

PRIMARY OBJECTIVE DEFINITION: THOSE TASKS NECESSARY TO ACHIEVE THE MAIN MISSION

PRIMARY OBJECTIVES OF THE MISSION ARE:

(1) SPACECRAFT RENDEZVOUS

(2) SPACECRAFT DOCKING AND UNDOCKING

(3) INTERVEHICULAR CREW TRANSFER

(4) INTERACTION OF CONTROL CENTERS

(5) INTERACTION OF SPACECRAFT CREWS

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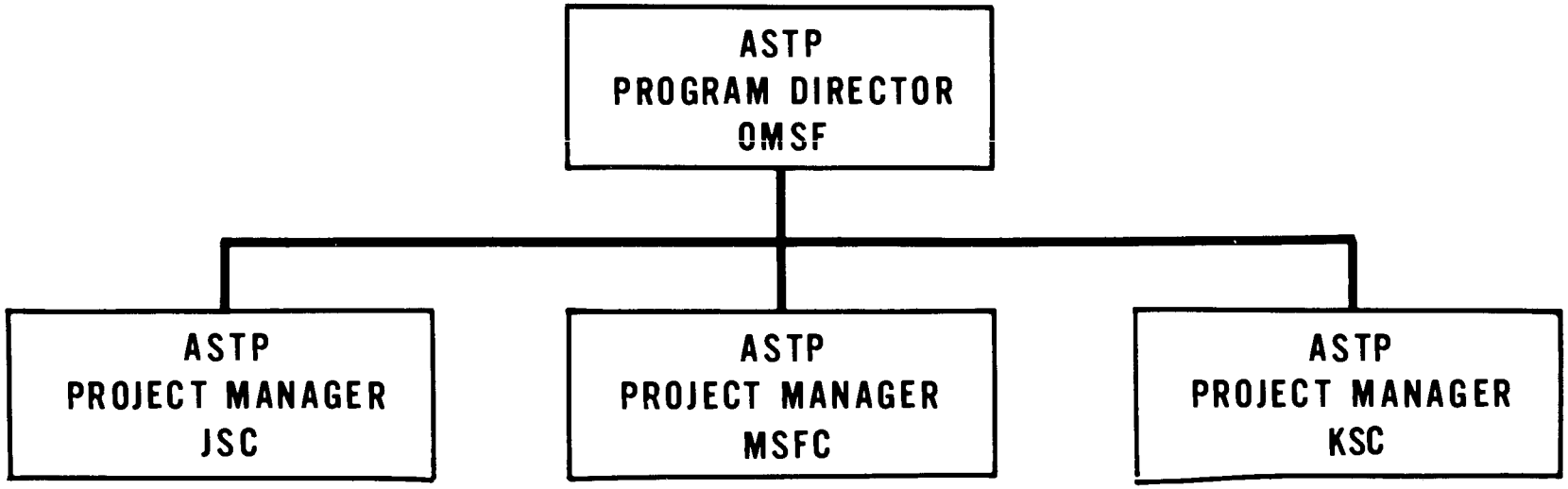
ASTP
PROGRAM ORGANIZATION



- SPACECRAFT
  - DOCKING MODULE & SYSTEM
  - EXPERIMENTS
  - FLIGHT SUPPORT & OPERATIONS
  - LIAISON WITH USSR
- LAUNCH VEHICLE
  - EXPERIMENTS
- CHECKOUT AND LAUNCH

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APOLLO SOYUZ WORKING GROUPS

1 MISSION MODEL, OPERATIONS PLANS, AND EXPERIMENTS

2 GUIDANCE AND CONTROL
- TRACKING SYSTEM
- DOCKING AIDS
- OPTICS AND ORIENTATION LIGHTS
- CONTROL SYSTEMS

3 MECHANICAL DESIGN
- DOCKING MECHANISM

4 COMMUNICATIONS
- COMMUNICATIONS SYSTEM
- TV TRANSFER EQUIPMENT
- VOICE HARDLINE TRANSFER EQUIPMENT

5 LIFE SUPPORT AND CREW TRANSFER
- EQUIPMENT AND CONDITIONS AFFECTING CREW TRANSFER
- MATERIALS IDENTIFICATION

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(Slide.) 3C

On my left are the launch vehicles that will be used. I think the chart speaks for itself. 4A

We will be putting a 37,400 pound payload into orbit. The Soyuz launch vehicle, which is their workhorse, and has been in use for a number of years, will be putting in a 15,000 pound payload.

On your right is a breakdown of the two spacecraft in a docked configuration. You will recognize the Apollo, of course. 4B

New hardware which I will describe in more detail is the docking module which is essentially an airlock. And the colored portions are the docking system, the androgenous or universal docking system, which I will describe in more detail. And Vance will give you some very fine details of the interior and exterior of the Soyuz, some of the technical aspects.

Next viewgraph, please.

(Slide.) 4B

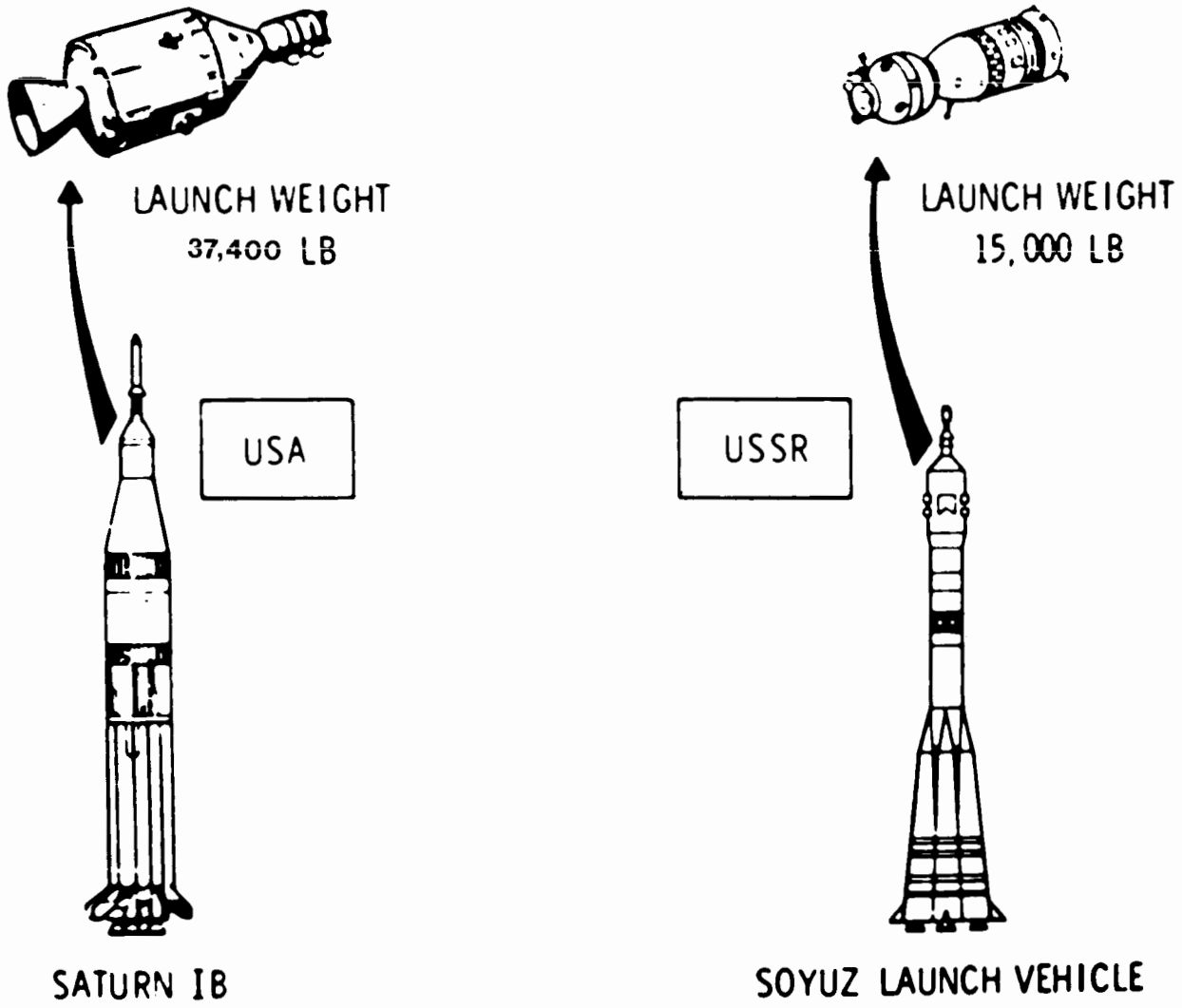
Here I want to point out that the docking module or the airlock will be carried in a position that the LM was, and will be extracted just as we extracted the LM.

In other words, we separate when we get into orbit, turn around, put the nose of the command module in with the old probe androg docking system and pull out the docking module.

The command service module is one that you are all familiar with, we have used for a number of years, but I wanted to point out that we have made a number of mods; to accommodate the docking module on the end we have added television, which I will point out. We have four cameras with numerous positions. We have added heaters and insulation to the propellent systems. We have deleted some of the unused main propellent tank which we also did in Skylab version.

We have had to modify the command module stowage to take care of some of our different equipment. We have modified the controls to accommodate the docking system, the docking module.

APOLLO/SOYUZ TEST PROJECT
OVERALL SPACE VEHICLES



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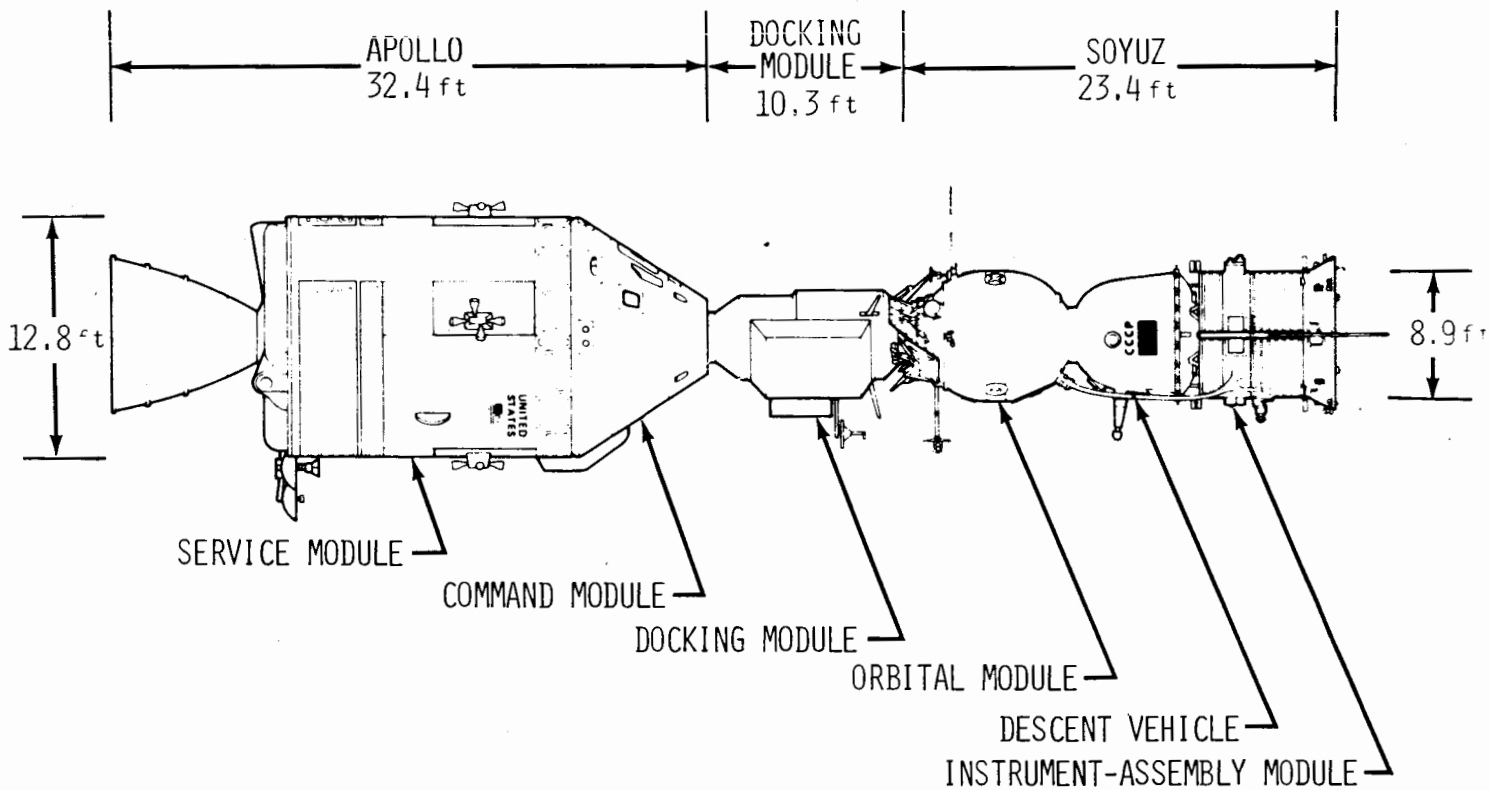
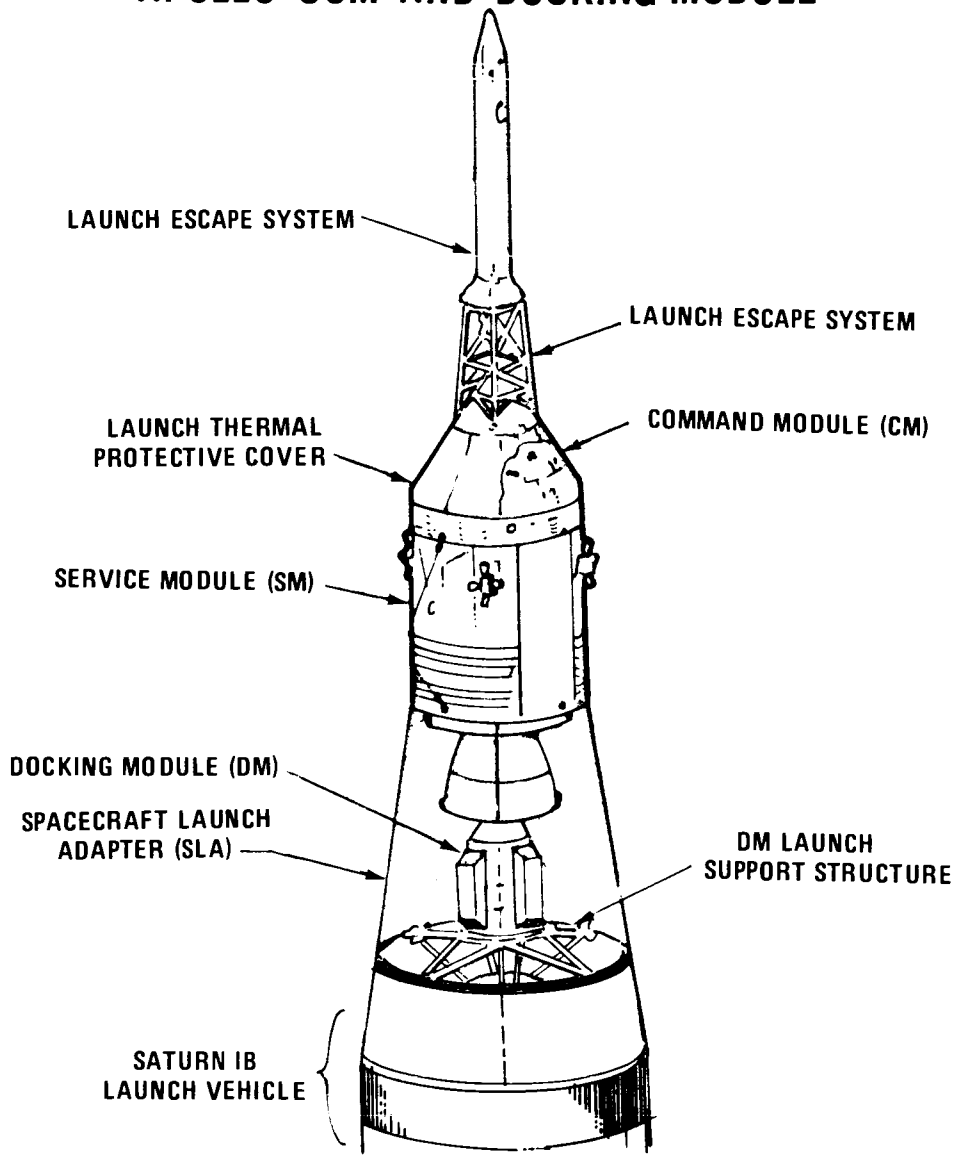
DOCKED CONFIGURATION



APOLLO/SOYUZ TEST PROJECT

LAUNCH CONFIGURATION FOR APOLLO CSM AND DOCKING MODULE



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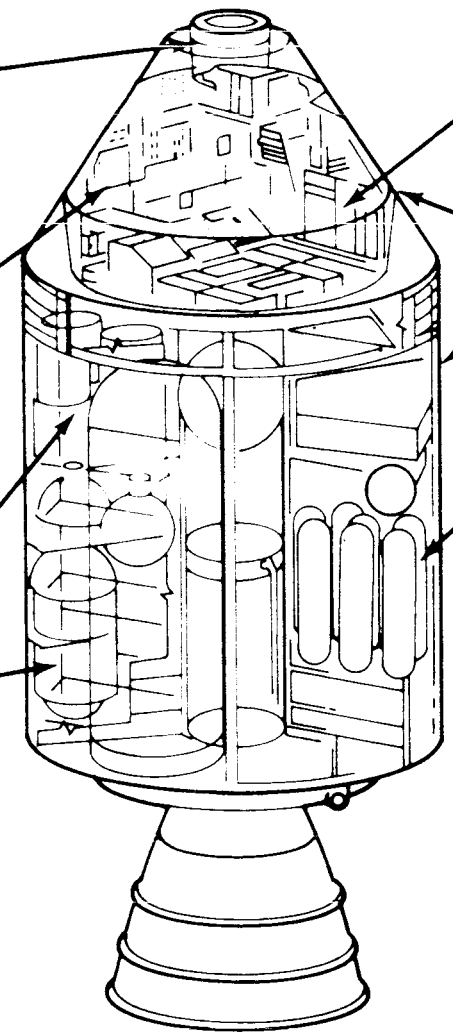
Revised 12-5-74

ASTP MAJOR APOLLO MODIFICATIONS

- MODIFIED UMBILICAL TO ACCOMODATE DOCKING MODULE FUNCTIONS
- ADDED TELEVISION CAMERA & RECORDER FOR COVERAGE OF JOINT ACTIVITIES
- ADDED HEATERS AND INSULATION TO PROPELLANT SYSTEMS FOR SOLAR INERTIAL ATTITUDE
- DELETED UNUSED MAIN PROPELLANT TANKS
- MODIFIED CM STOWAGE



- MODIFIED CONTROLS AND DISPLAYS TO ACCOMODATE NEW EQUIPMENT AND EXPERIMENTS
- ADDED EQUIPMENT FOR COMM. AND TV VIA ATS 6 SATELLITE
- ADDED PROPELLANT STORAGE MODULE FOR INCREASED ATTITUDE CONTROL AND BACK-UP DEORBIT CAPABILITY
- ADDED EXPERIMENTS IN CM & SM
- ADDED INTERVEHICULAR INTERCOMM. IN CM
- ADDED VHF-FM AT USSR FREQUENCY IN CM

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Revised 12-6-74

We have added a great deal of equipment for the ATS-6 satellite to give us more coverage which I will also mention briefly later on.

We have added propellent and we have, as you will see, added a number of experiments in the intervehicular intercom between the two spacecraft which is very important. 5P

And very important also, we have added the VHF-FM system which we used with the LM and the Soviets will carry part of that system to our rendevous.

Next viewgraph, please.

(Slide.)

This is a drawing of the docking module with the docking system. It is five feet in diameter. I will have you some actual photographs to show you. And about ten feet long. 5G

This is the end from which the probe and drogue from the command module will be used, and this is the end with the docking system mating with the Soviet docking which is provided.

This is a drawing of the docking system, androgenous docking system. Very briefly I want to point out some of the key features of it.

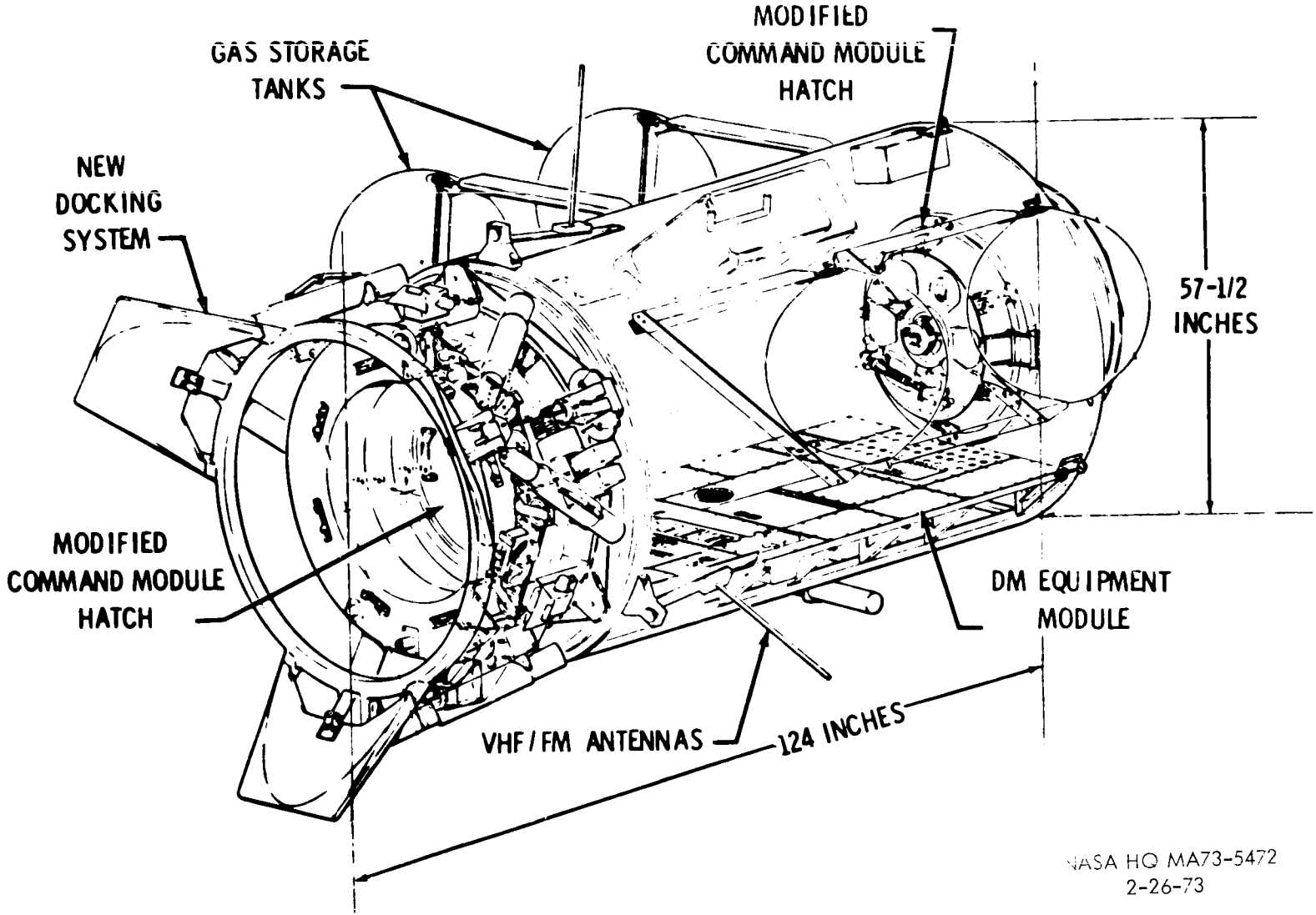
We have shown here the same system in the passive or retracted position, and this is one of the docking system in the extended or active position.

We have a guide ring with three petals and with latches, and we have a structural ring with eight dual latches that remains in this position.

What happens in the docking sequence is that the active vehicle, which will be the Apollo in the first docking, will extend the guide ring. Now, this guide ring is just a fraction of an inch back of the structural ring. As they approach -- and I guess -- I'm not sure whether Vance or Tom will be doing this -- the alignment will be aided by the petals matching and bringing you into position where the capture latches on three petals engage the body-mounted latch on the passive vehicle.

When we get that we are in what we call a soft-docked position.

ASTP DOCKING MODULE



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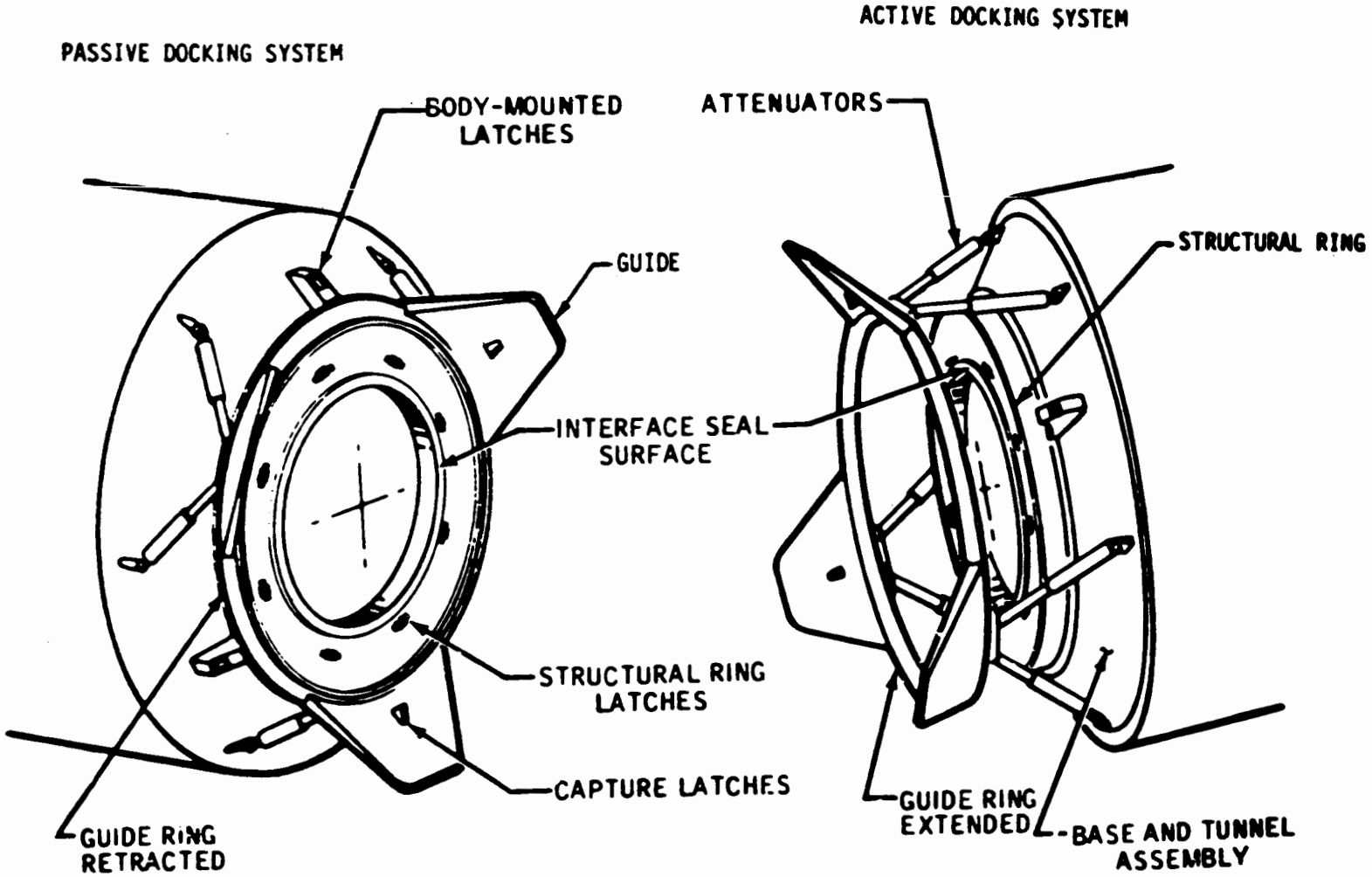
ASTP
NEW COMPATIBLE DOCKING SYSTEM



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Upon both vehicles saying they are satisfied, the active vehicle will then retract and then literally pulls the other vehicle into the Apollo, pulls the Soyuz to the Apollo until these eight latches engage, and that is when we are in the hard-docked position.

Now, that is very simple, quick description. Basically that is how the docking system will work.

Viewgraph, please.

(Slide.)

This is a picture in the manufacturing stages of the docking module which is an airlock. There are four such tanks, oxygen and nitrogen. And the hatches are really modified Apollo hatches.

This is a picture, as you will see, the docking module, I hope, in live TV with the insulation around the tanks and the docking module itself.

Next viewgraph, please.

MA 74-5146

(Slide.)

This is a picture of the interior of the docking module. There are some stowage lockers.

This is a panel that can be removed in case we have problems, but basically I wanted to point out that the controls we have here are primarily for power, communications, and for the pressurization and depressurization cycles that will occur for the crew transfers.

Next viewgraph, please.

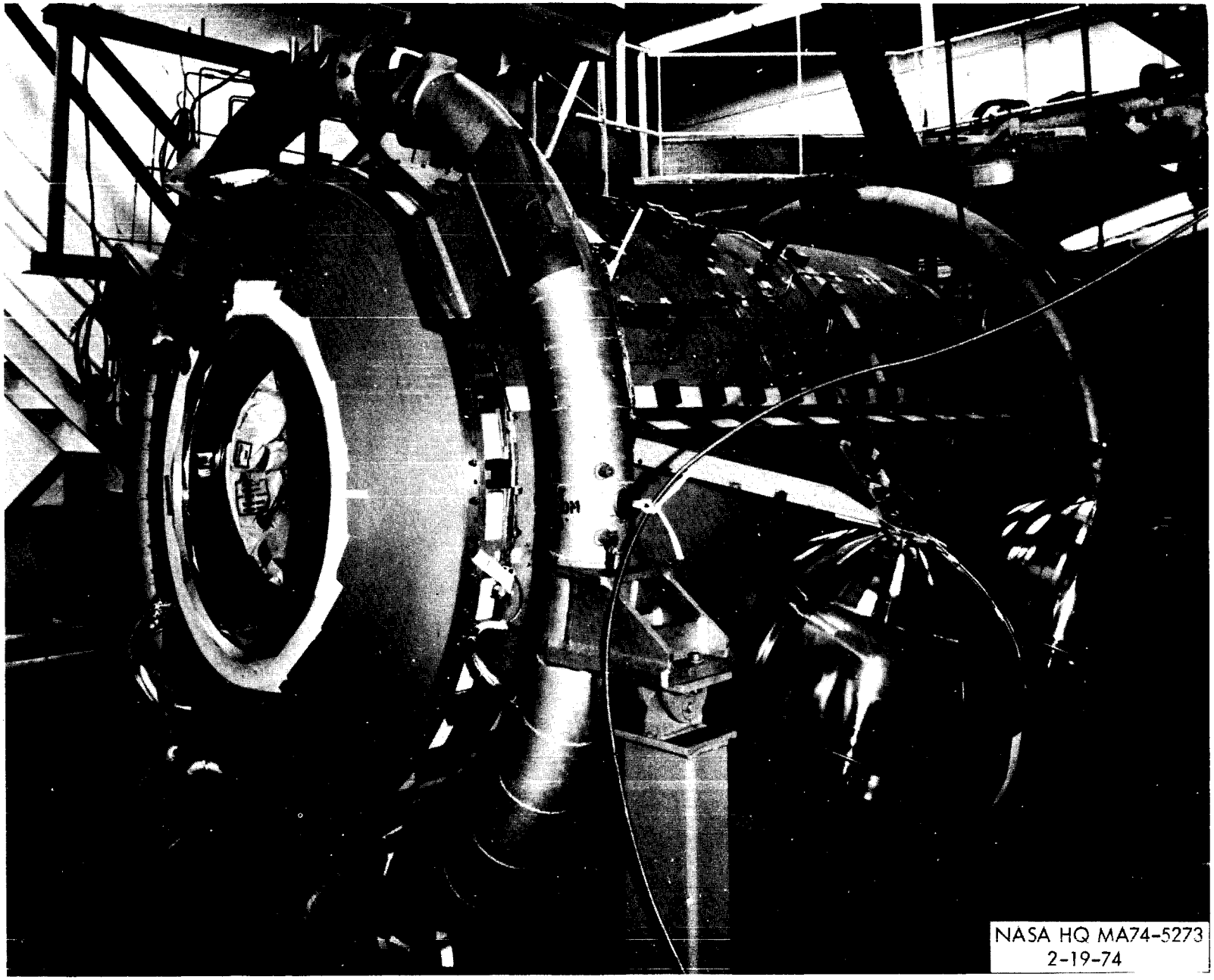
(Slide.)

MA 74-5086, 5085

Now, I have here two pictures of the docking system hardware, and there are two points or three points I would like to make on that.

This is the Russian system and on the right is the U.S. system.

This is the guide ring I have talked about. This is the structural ring.



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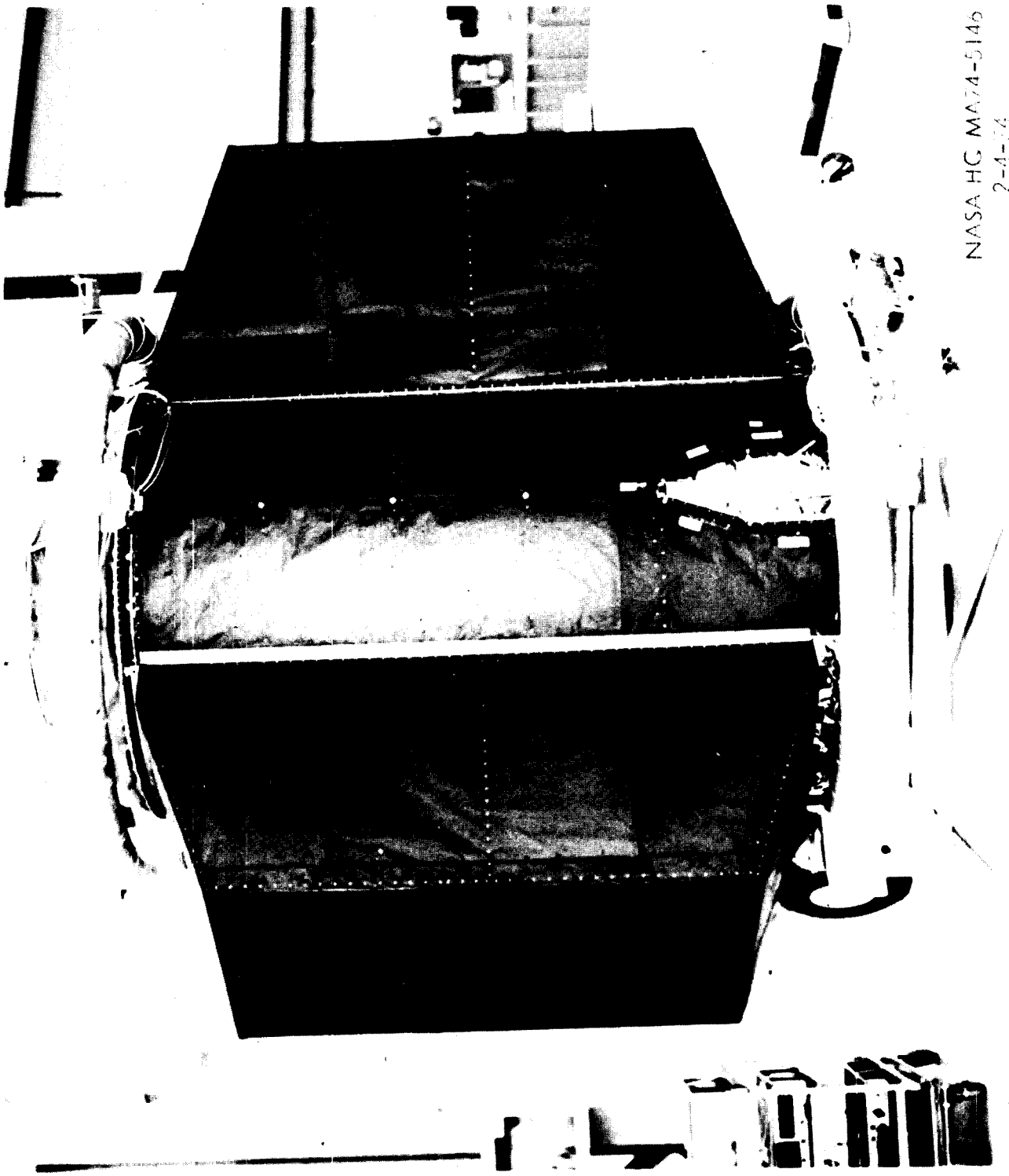
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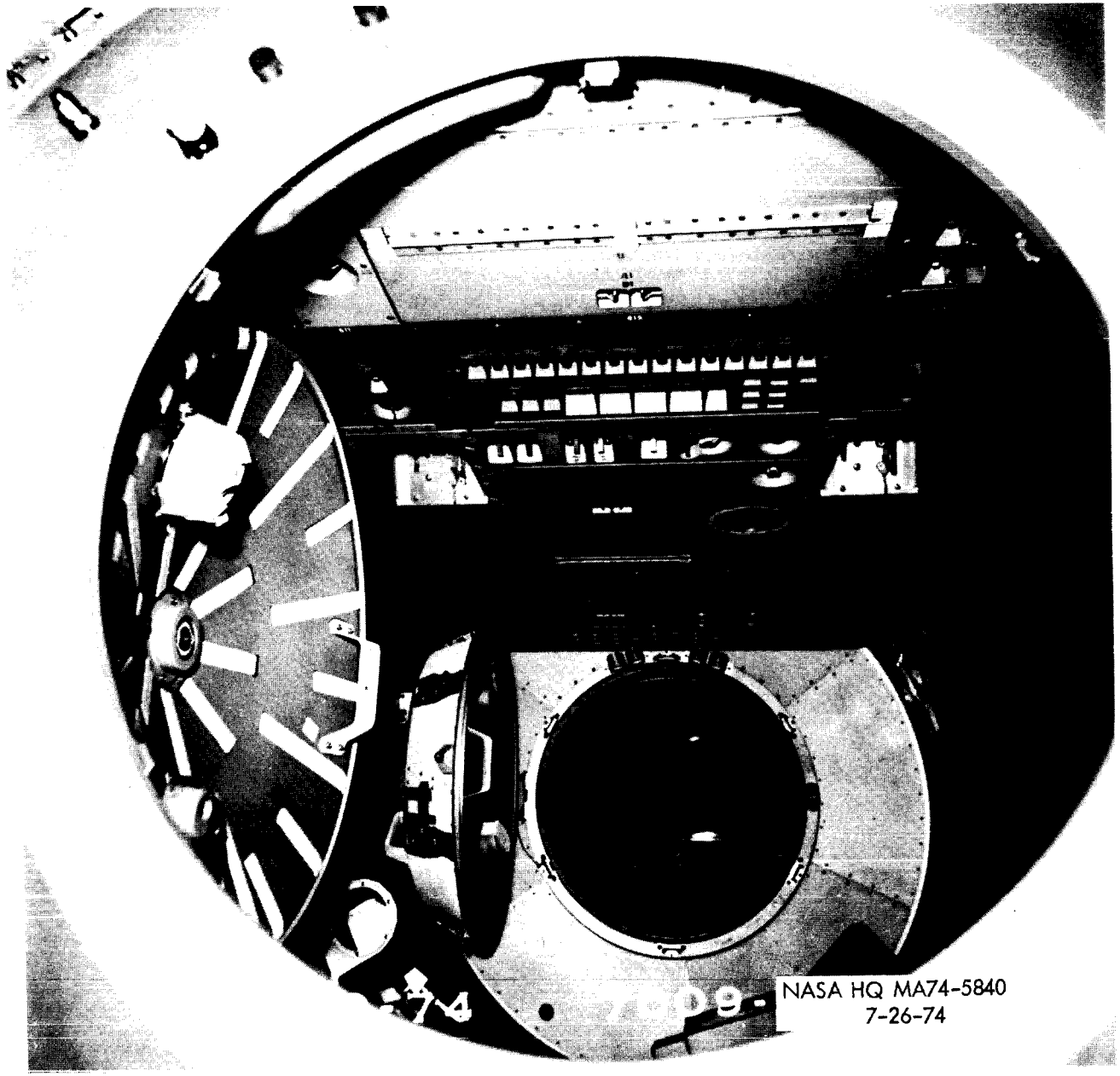

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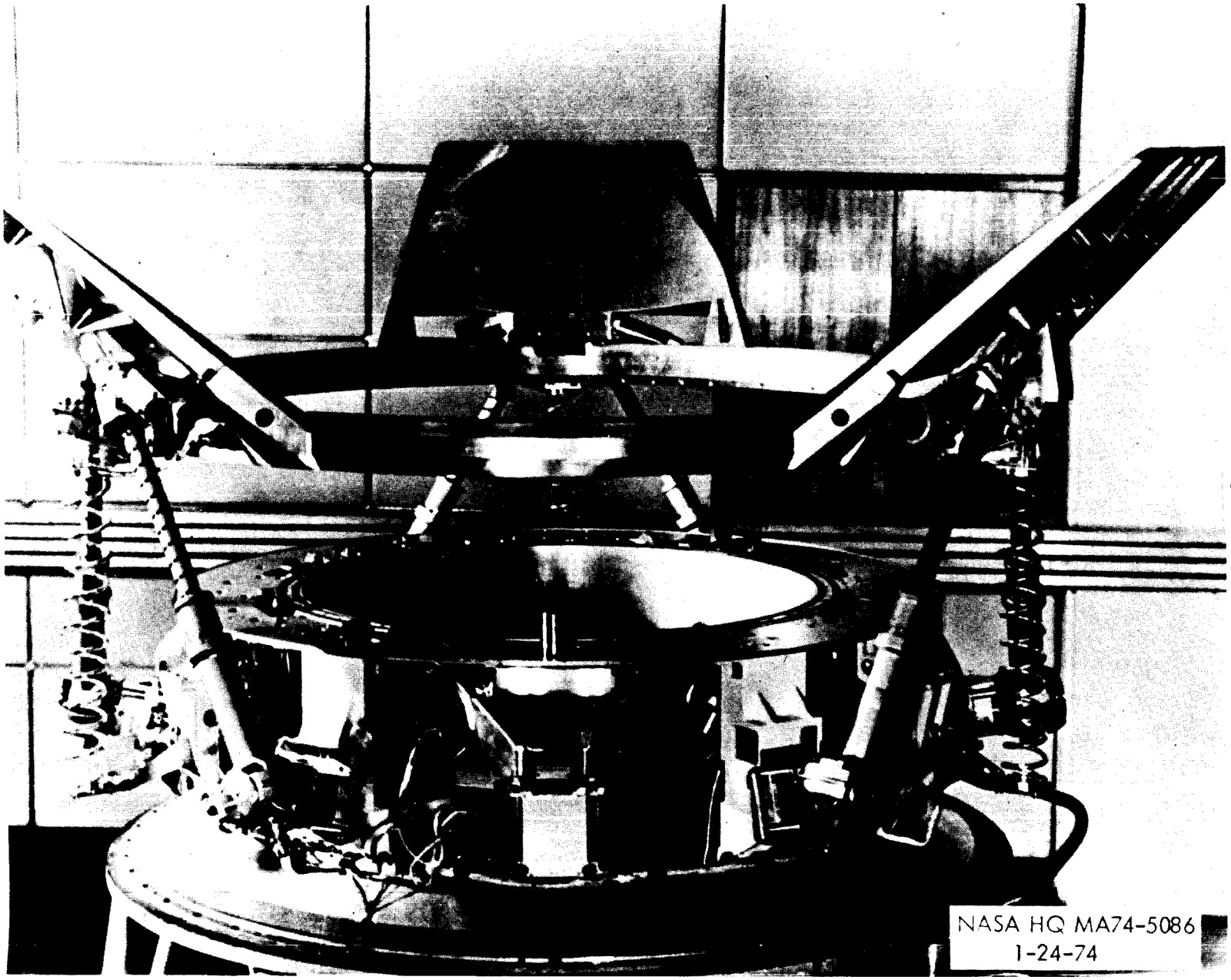
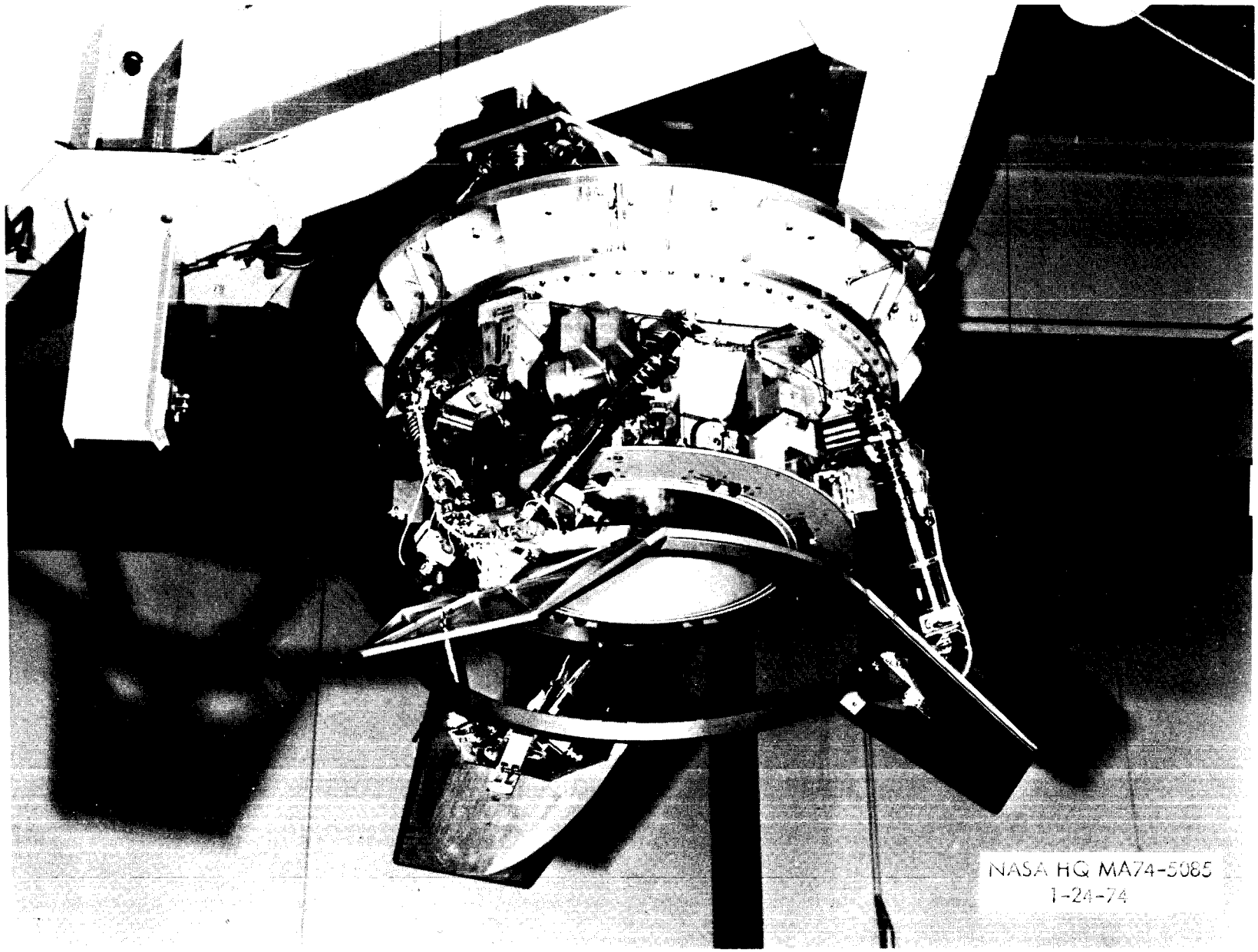


6D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I want to emphasize that both systems were designed to a common specification and each country went its own way in designing the system.

The Soviets, for example, use a mechanical-electrical system. It has 6 degrees of freedom and it is important to note, for example, that in this unit here, which is a gear, it takes both the shock and also performs the extend and retract function. And that is a very fine concept.

Whereas in the United States feature we use an electrical hydraulic system. We use cables and motors to retract. And we use these attenuators, hydraulic attenuators to absorb the shock. It also has 6 degrees of freedom.

Both systems have met all specifications. Both systems are very fine. I would only point out that we probably see features in both that if we were to redesign and do over again we might make a few changes.

Next viewgraph, please.

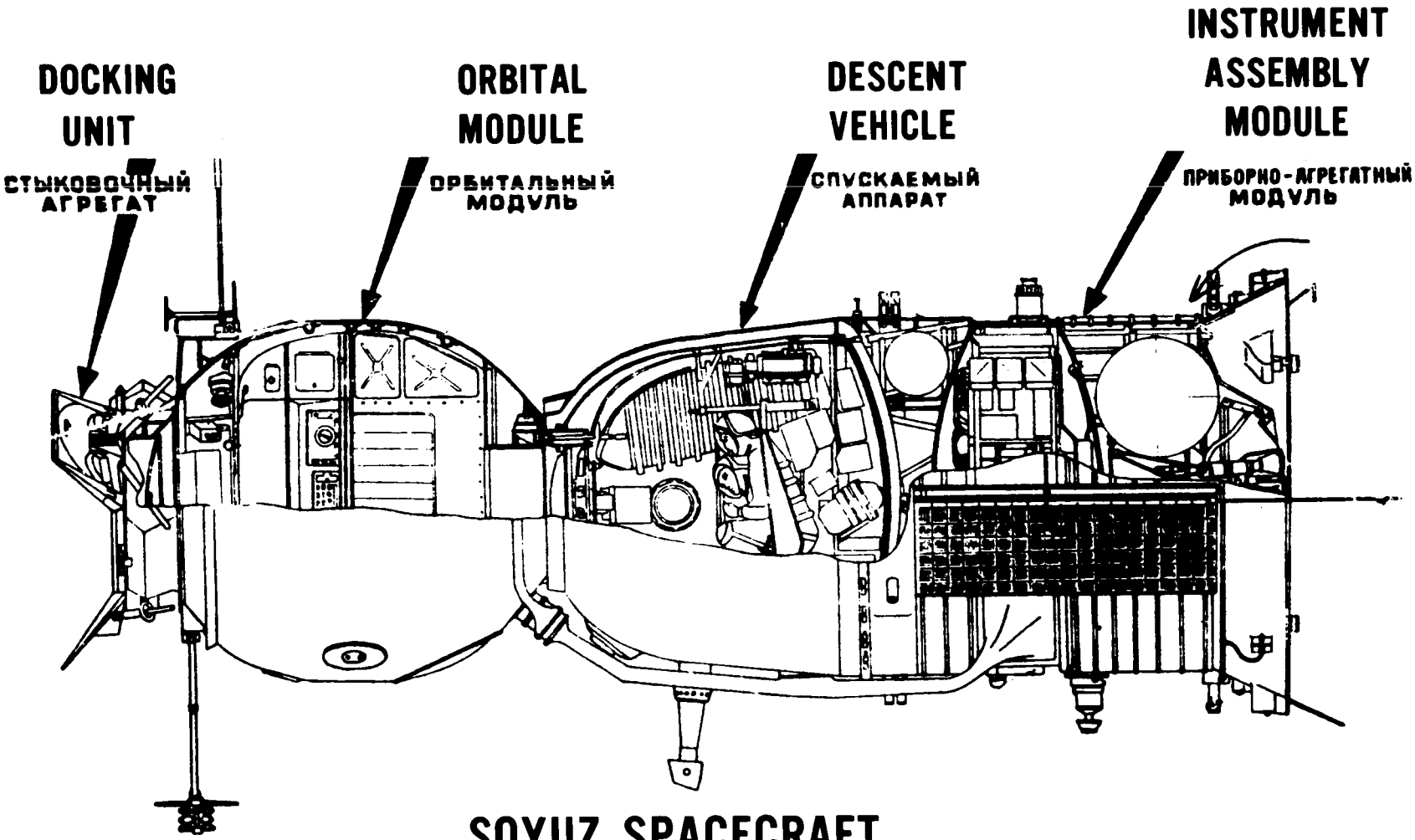
(Slide.) MA75-6756

I am not going to go into much detail except this is the orbital module, the reentry vehicle and the instrumentation module of the Soyuz which correspond to our service module and our command service module. The orbital module is used for operating room in space when they are in orbit. The crews are in the reentry vehicle both for liftoff and reentry.

Vance is going to give you much more detail, so I will skip over here to a point I wanted to make, which is that the Soyuz has undergone or made a number of modifications for this mission.

They have modified their docking and internal transfer system, of course. They are carrying the range and communication system. They had to make changes in their spacecraft to accommodate this system which is U.S.-provided. The same thing we used in the Apollo-LM communications and rendevouz. And that also carries our VHF circuits, so we will not only communicate on our frequencies, but their frequencies.

They have made a number of changes in the external lighting system and the docking targets. And they have changed their cable communications systems to accommodate the two spacecraft hard-docked wired communications.



SOYUZ SPACECRAFT

КОСМИЧЕСКИЙ КОРАБЛЬ „СОЮЗ"

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SOYUZ MODIFICATIONS FOR ASTP

- NEW SYSTEMS INCORPORATED IN SOYUZ SPACECRAFT
  - DOCKING AND INTERNAL TRANSFER SYSTEM
  - RANGING AND COMMUNICATION SYSTEM FOR RENDEZVOUS
  - APOLLO RF COMMUNICATION SYSTEM
  - EXTERNAL LIGHTS SYSTEM AND DOCKING TARGET
  - CABLE COMMUNICATION SYSTEM
- SOYUZ SPACECRAFT SYSTEMS TO BE MODIFIED
  - THERMAL CONTROL SYSTEM
  - LIFE SUPPORT SYSTEM
  - SPACECRAFT STRUCTURE AND INTEGRATION

They have also had to modify their thermal control system to provide some cooling plates for the VHF equipment.

And perhaps one of the major mods they made was in the life support system to accommodate the requirement that they reduce their pressure from a normal 14.7 psi to 10 psi for the docked portion of the mission.

And, of course, they had to modify the structure in that to accommodate the docking system.

Next viewgraph, please.

(Slide.)

Again, these are interior views of the Soyuz. It is a mockup. It is their old simulator. And I won't take up your time here with too much detail because Vance is going to cover this in quite much detail.

I want to point out this is where they carry their parachute system. And to accommodate the new androgenous docking system, they had a little work to do in that area. Whereas in our case, to accommodate the docking system, we would have had to make a major mod in a forward part of the spacecraft. This would have meant a big recall program on a system that had proved itself in the Apollo Lunar Program. And our assessment was it was much cheaper for us to go and build a docking module because we did need an airlock anyway to accommodate the two different atmospheres.

This is another view of the interior and this is the system incorporated after Soyuz 11, when they had their failure.

The Soviets, because of that failure, now carry only two cosmonauts. They used to carry three. And this is occupying the space where the third one was.

These are some details. They are sequencing the earth position and some meters which Vance will give you more detail on.

QUESTION: What does that system do, Chet?

LEE: This is a suit loop, Bill, a suit loop. They were pressurized suits. I'm sorry.

SOYUZ INTERIOR

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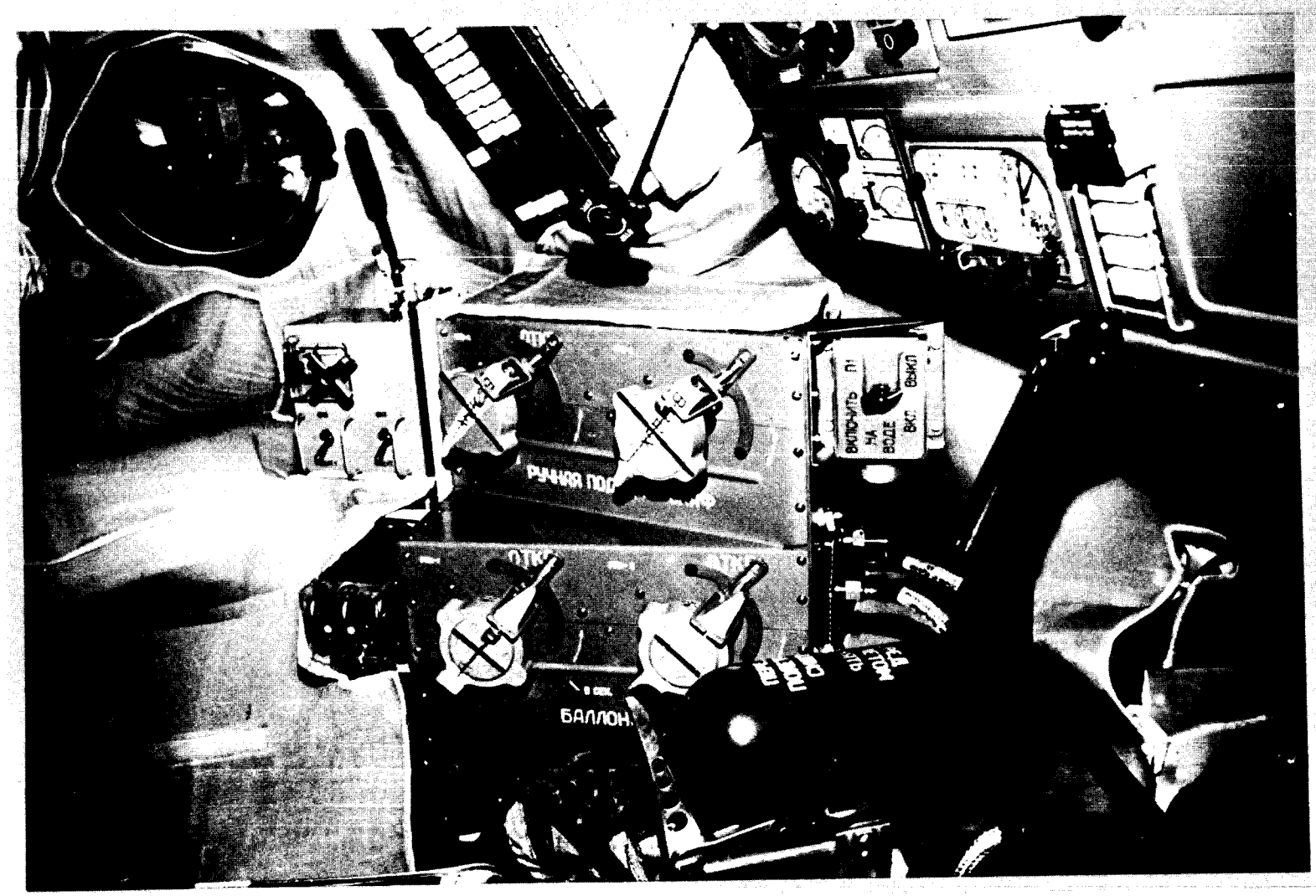
SOYUZ INTERIOR



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QUESTION: Is all that padding, or security?

LEE: That is what they normally have. That is a covering they have. And these are their couches. I meant to point out they do have contoured couches, form-fitted to the particular cosmonauts going to fly.

Next viewgraph, please.

(Slide.)

Here I just want to point out that this is a hatch into the orbital module. This is the orbital module. It is more of a -- counters. They do have minimum instrumentation in the orbital module. With all their burns, reentry and liftoff, they are in the reentry vehicle.

Next viewgraph, please.

(Slide.)

Here very quickly is a summary of the Soyuz flight history. I think you gentlemen and ladies are all familiar with this.

This is time scale, and I have neglected to point out I hope it is a successful ASTP mission in mid-July.

But I think it is interesting to note the history here of the number of flights they have had, and we have not had a flight since Skylab.

Next viewgraph, please.

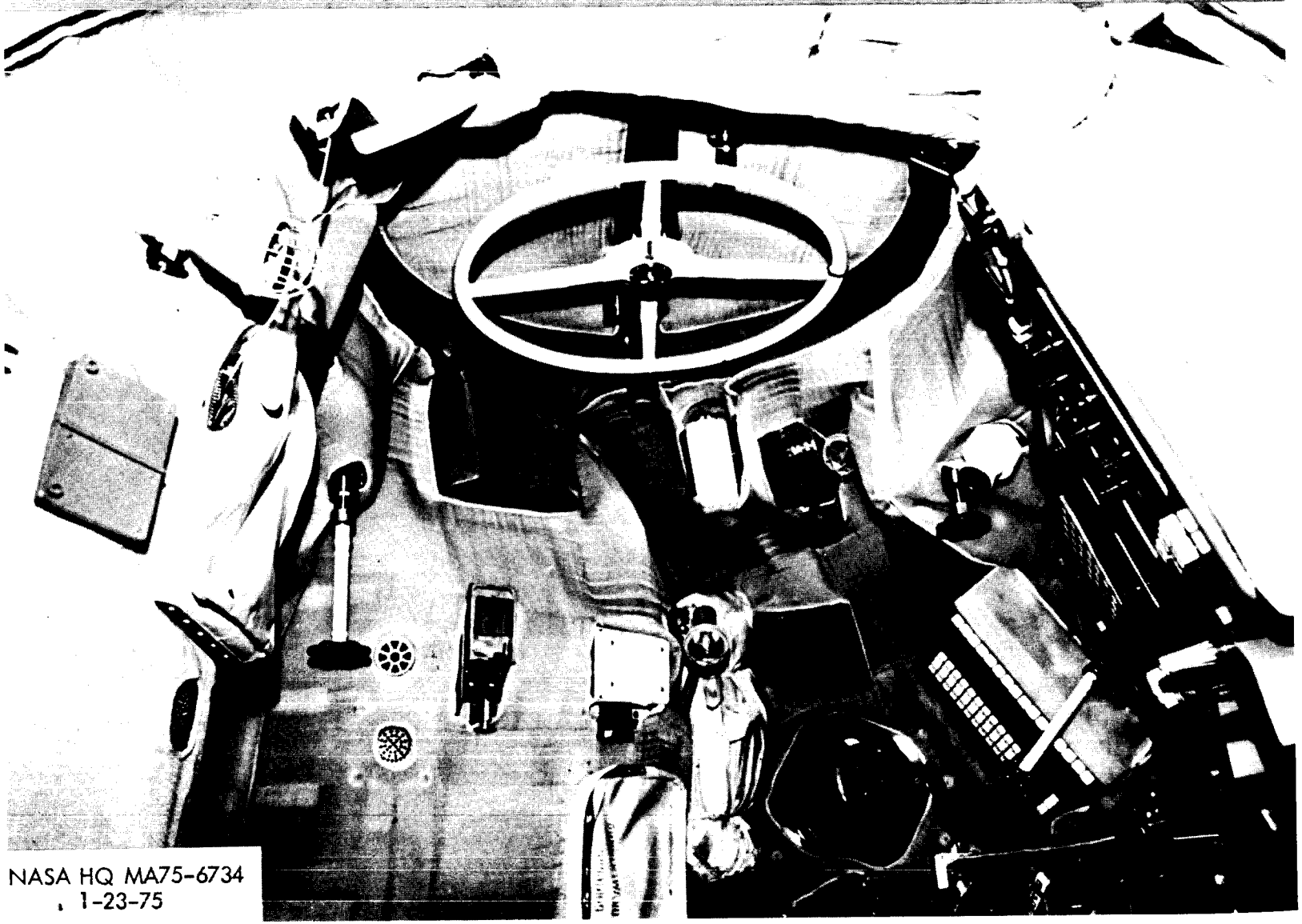
(Slide.)

Experiments. Experiments are an important part of this mission. And we have done a great deal of work in insuring that we have what we believe is the best experiment package that we can carry in the space available and the funds allocated, time allocated, to get these experiments built and qualified.

As you can see from the viewgraph here, on your right, we are using every available space that we can in the docking module, command module and the service module.

We are carrying about 1000 pounds of weight for

SOYUZ INTERIOR



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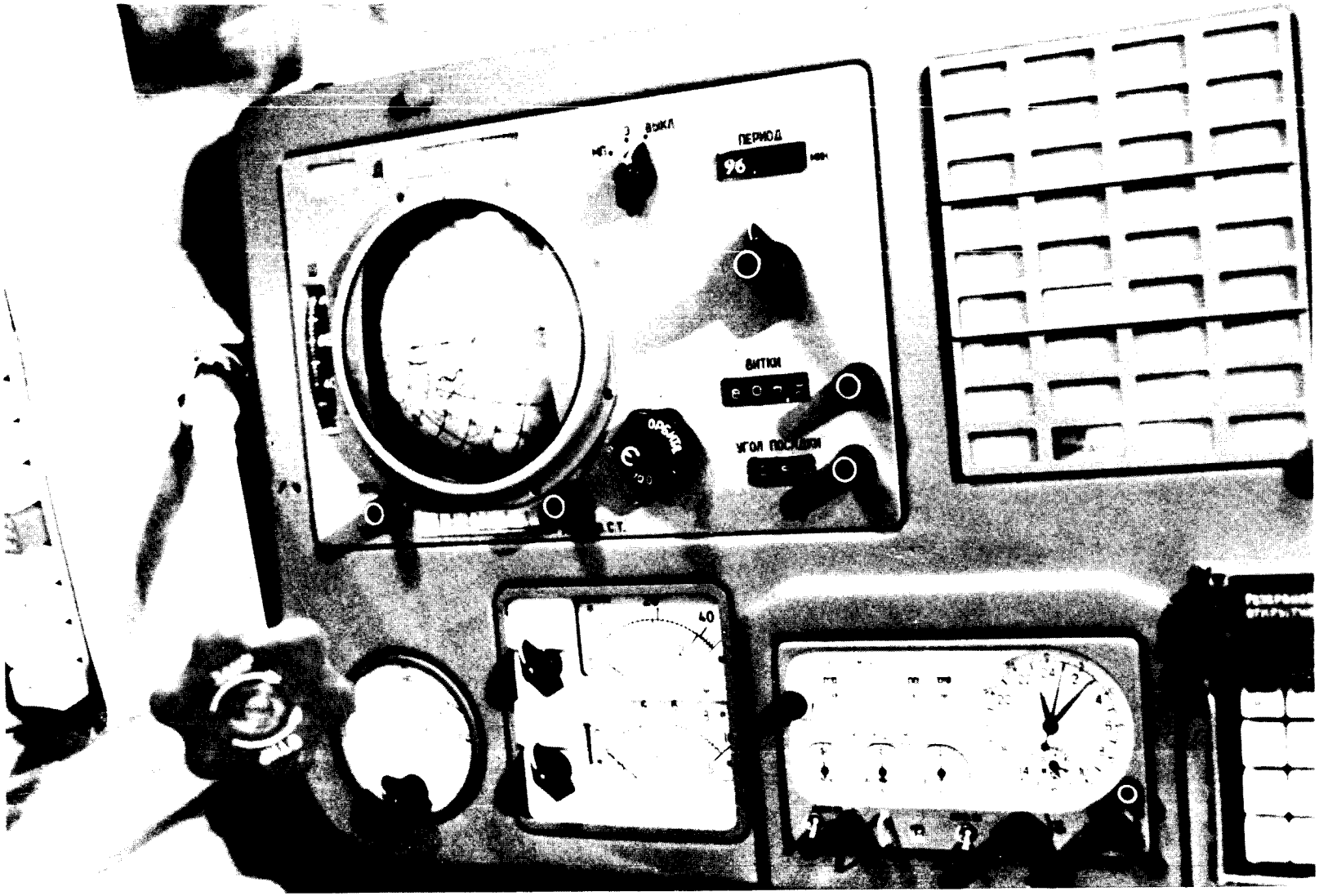
SOYUZ INTERIOR



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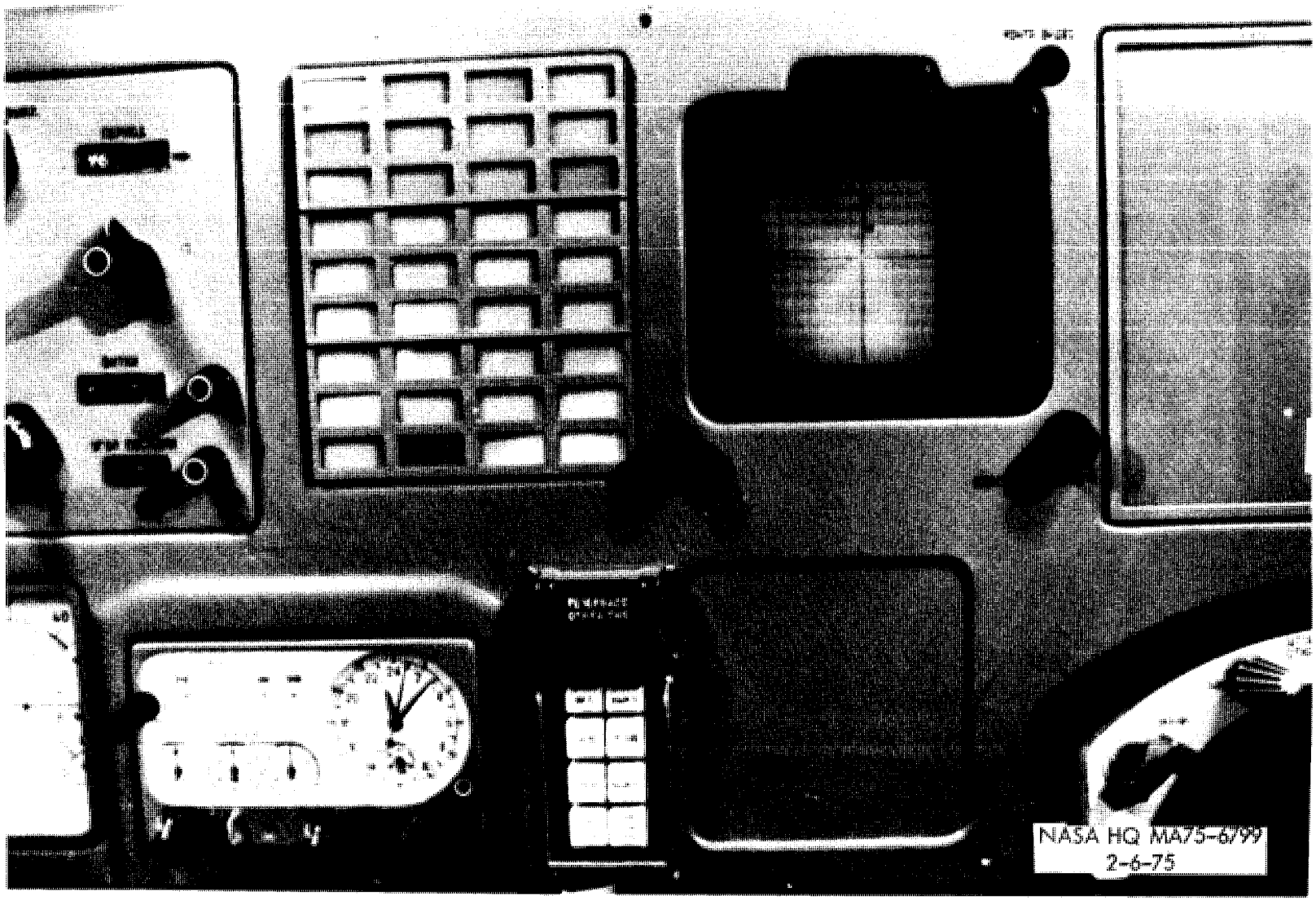
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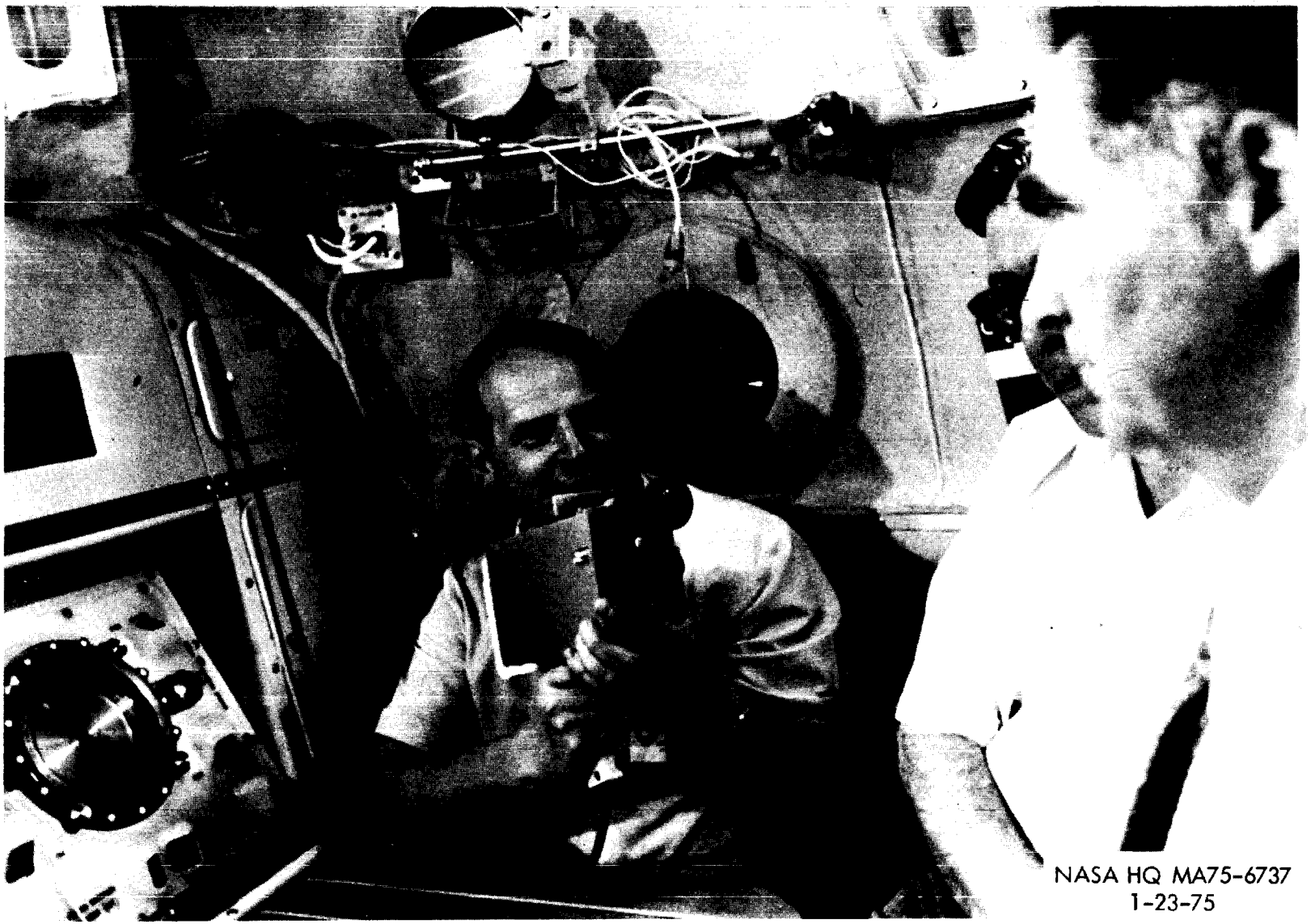
SOYUZ INTERIOR



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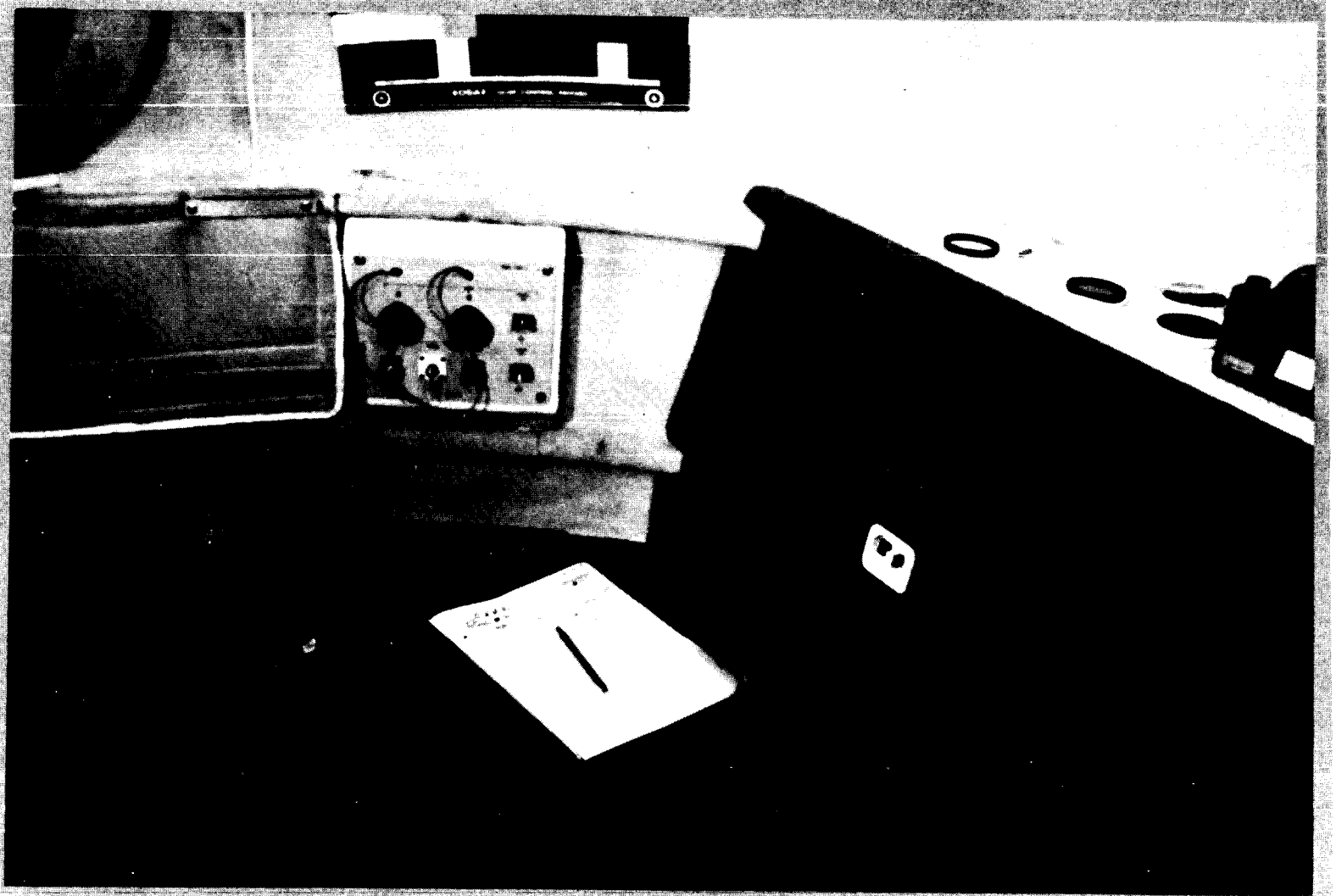
SOYUZ INTERIOR



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SOYUZ FLIGHT HISTORY

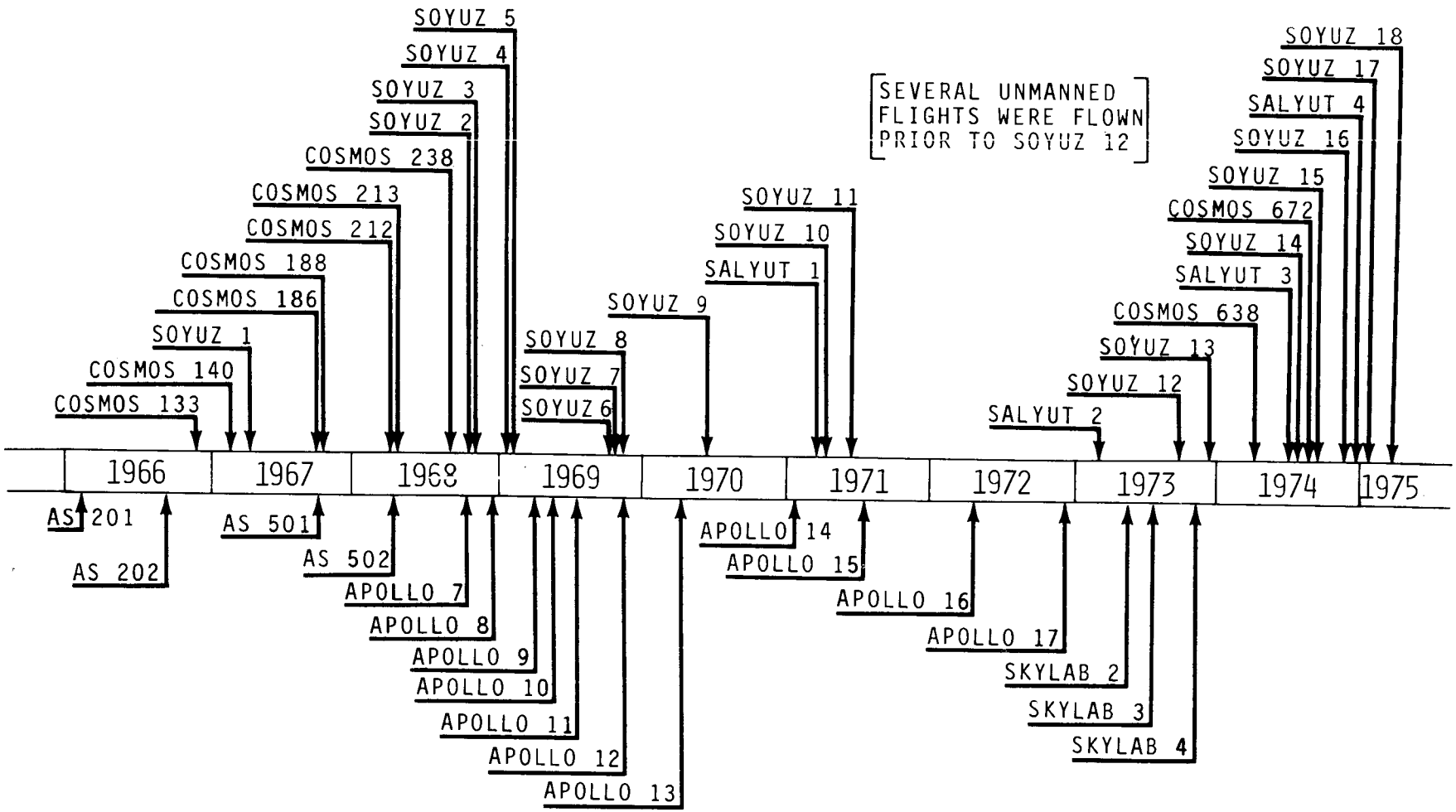
SINCE 1966 USSR HAS FLOWN

AT LEAST 10 UNMANNED SOYUZ SPACECRAFT

16 MANNED FLIGHTS

APPROXIMATELY 172 DAYS OF FLIGHT HAVE BEEN ACCUMULATED

SOYUZ AND APOLLO FLIGHT SCHEDULES



ASTP EXPERIMENTS

TYPE	EXPERIMENT
EARTH RESOURCES	1) EARTH OBSERVATIONS AND PHOTOGRAPHY 2) DOPPLER TRACKING 3) GEODYNAMICS * 4) STRATOSPHERIC AEROSOL MEASUREMENT *
SCIENCE	1) EUV ASTRONOMY 2) HELIUM GLOW MEASUREMENTS 3) UV ABSORPTION (J) 4) SOFT X-RAY OBSERVATIONS 5) ARTIFICIAL SOLAR ECLIPSE (J) 6) CRYSTAL ACTIVATION
LIFE SCIENCES	1) MICROBIAL EXCHANGE (J) 2) ZONE FORMING FUNGI (J) 3) LIGHT FLASH 4) BIOSTACK 5) HUMAN CELLULAR IMMUNE RESPONSE 6) POLYMORPHONUCLEAR LEUKOCYTE RESPONSE
SPACE PROCESSING AND MANUFACTURING	1) MULTIPURPOSE FURNACE (PLUS 7 EXPERIMENTS) (J) 041 SURFACE TENSION INDUCED CONVECTION 044 MONOTECTIC AND SYNTECTIC ALLOYS 060 INTERFACE MARKING IN CRYSTALS 070 ZERO-G PROCESSING OF MAGNETS 085 CRYSTAL GROWTH FROM VAPOR PHASE 131 SODIUM CHLORIDE-LITHIUM FLUORIDE EUTECTIC 150 USSR MULTIPLE MATERIAL MELTING 2) ELECTROPHORESIS (GERMAN) 3) ELECTROPHORESIS TECHNOLOGY (MSFC) * 4) CRYSTAL GROWTH IN ZERO GRAVITY *

(J) JOINT US/USSR EXPERIMENTS

* FROM RESERVOIR

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experiments.

Now, our experiments, there are about -- there are 27 of them. They cover these general fields.

There is a handout for the details of each experiment. There will be a briefing later by PIs on the experiments, so I am just going to very briefly touch on some of the highlights.

Earth observations and photography is one that Vance will cover and give you some examples of what we are trying to do.

Geodynamics and doppler tracking are techniques, developments for later Gravsat satellites to give us very good information, or we hope will obtain -- it is to prove out techniques that will help us understand the earth gravity sources just as we did on the moon, to understand the tectonics, the plates, where we had these gravity anomalies.

In the science area we have some new experiments and I would point out that the extreme ultraviolet astronomy experiment, in this particular case we are carrying a detector that is two orders of magnitude better than any other detector that has ever flown, including rocket flights. And with this we hope, if we are successful -- and some of the scientists have come up with some new -- I have forgotten the name. Can anybody help me -- white dwarf stars that we have changed our targets a little bit to see if we can't get this.

If we are successful the scientists feel that we will be opening a new field in astronomy.

Now, helium glow is also one and very important.

The ultraviolet absorption is a joint experiment with the Soviets into which we are using the unique capability of the two-man spacecraft where we can separate, maneuver, and take different measurements.

In the past, because of contamination from the spacecraft or within the instrument itself, the spectrometer, we have gotten some contamination and we don't get to minute measurements that we require.

We are trying to measure atomic nitrogen and

atomic oxygen and the importance of these are to understand the species or the constituents of the upper atmosphere which in fact play a part with the lower atmosphere to give us our weather.

Now, these two spacecraft will separate and by transmitting us light and reflecting from the Soyuz, we hope to get some very accurate measurements of these species.

In the life sciences we have a repeat of some of the experiments carried in Skylab and Apollo. Light flash and biostack for measuring the effects of zero G on fish eggs, shrimp eggs, and so forth.

Light flash is the high Z particles in which Skylab we found we had some additional data over the South Atlantic anomaly and we are trying to get better data on that.

These are joint experiments with the Soviets.

The microbial exchange, checking on the micro-flor growth from the Soviet spacecraft to ours for future long space flights.

We also have some very interesting experiments in the space processing and manufacturing. These are the samples that will be used in a multipurpose furnace which is an improvement over the Skylab, higher temperatures, faster cooling rate.

We have many of the same PIs that were in Skylab who, from what they learned in Skylab, have come up with new improvements and we hope some very valuable information for manufacturing processes will come out, at least techniques.

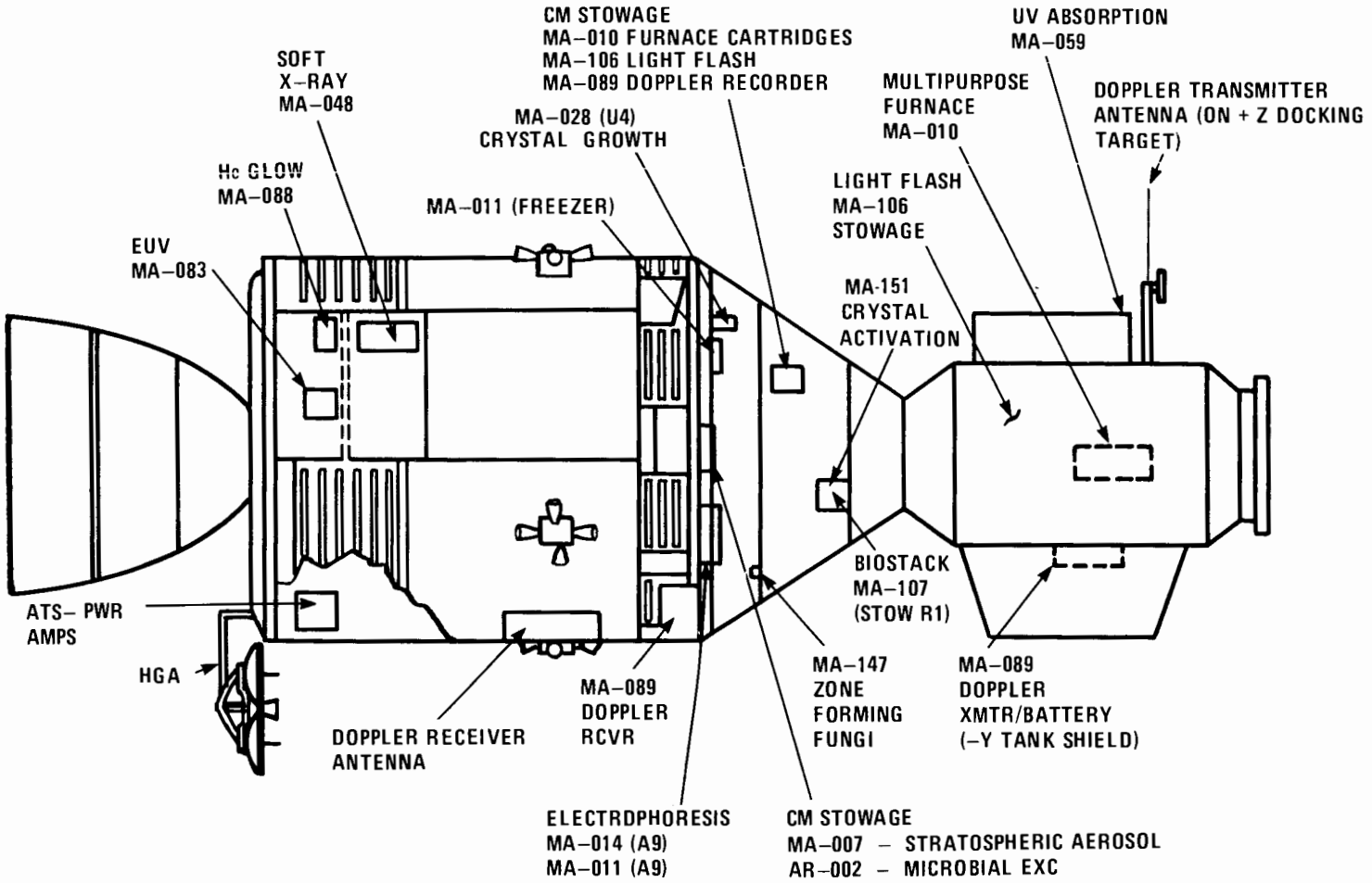
I would like to also point out we have two electrophoresis experiments. That is separation of human cells and so forth. Very important to pure vaccines. Here on earth we have the effects of convection of one G. We are hoping that these techniques will be demonstrated adequately in space, perhaps Shuttle can then proceed further.

I would like to point out also the electrophoresis is sponsored by the German government to the tune of over 5 million marks.

This technique is called a continuous flow technique. Marshall is working on one that is called a

ASTP

EXPERIMENTS AND ATS-6 LOCATION SCHEMATIC (CSM-III)



NASA HQ MA74-5624
Revised 12-2-74

static flow technique. So we are taking advantage of an opportunity to check out two different techniques.

Next viewgraph, please.

(Slide.)

Now, with regard to communications on this mission, we were fortunate that the ATS-6 satellite was successfully launched and is operating. 11A

Previous to our capability to use this satellite our communications coverage in orbit would have been about 17 percent. And in Skylab, as some of you may remember, we had about 36 percent coverage, communications, with the crew.

Because we were flying a lower orbit, with our ground stations we would only have had about 16 percent. With the ATS-6 satellite we now have coverage 55 minutes approximately each orbit. And that will be because we are in this position the satellite will be moved in May to a position -- I have forgotten where it is -- 34 degrees east. And this is the coverage it gives us.

I have also indicated here our ground stations in blue and the Soviet coverage is indicated in red.

This is not all television. There are about three stations that have the television capability. The rest of it is VHF.

With the ATS-6 we will have TV coverage and I would jump back and say there are two ships the Soviets are positioning to increase their coverage.

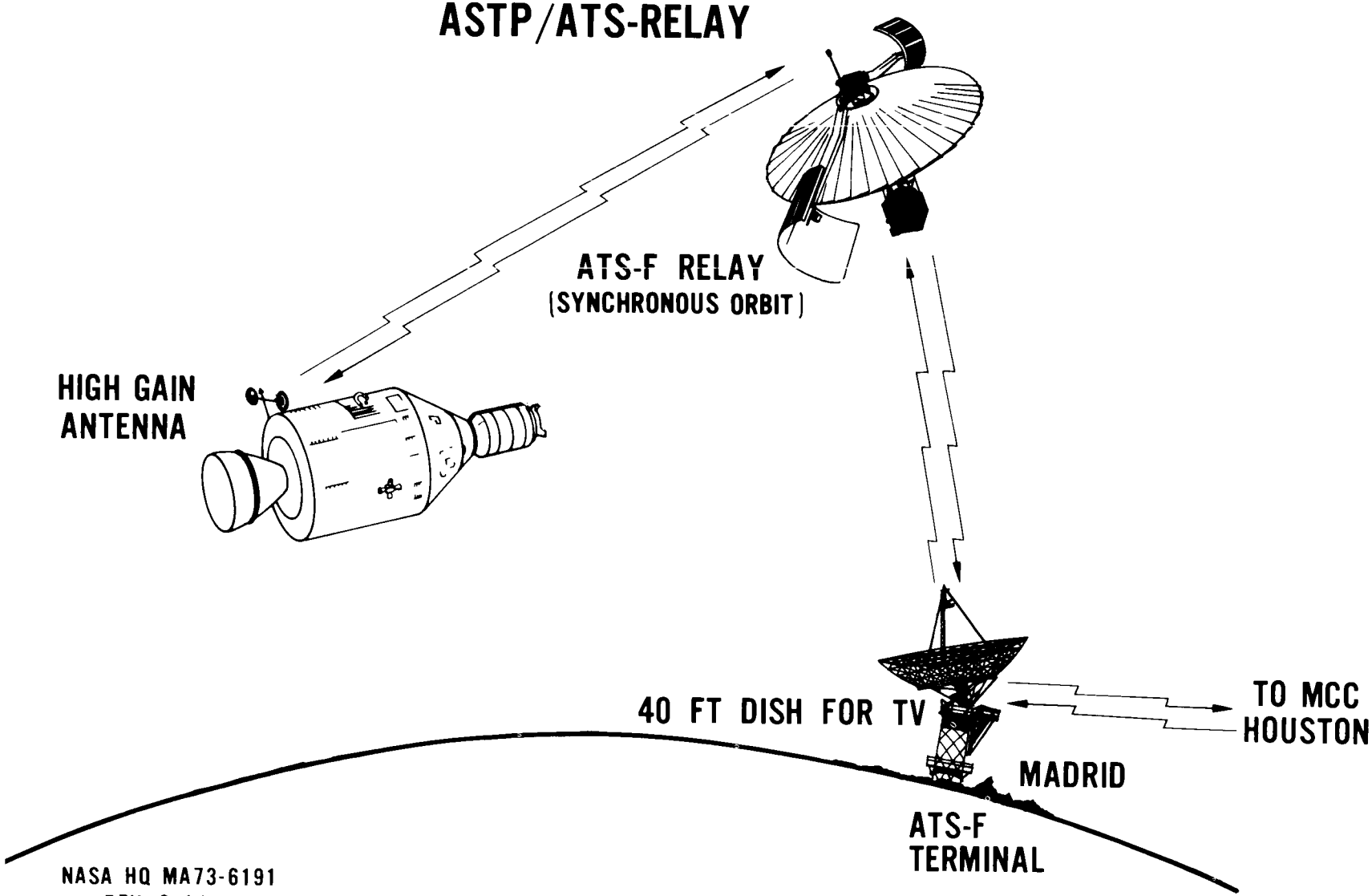
QUESTION: Will the satellite be in stable orbit by that time? Will it have stopped moving?

LEE: Yes. It should be. The current plan is for it to be in position, we probably have about ten days prior to check it out.

That, of course, will vary in real time with what speed they make.

And this provides us the first time to go direct to a satellite to ground and I guess the other point that is not shown here is I wanted to point out that we will have the means to communicate from our Apollo to our ground

ASTP/ATS-RELAY



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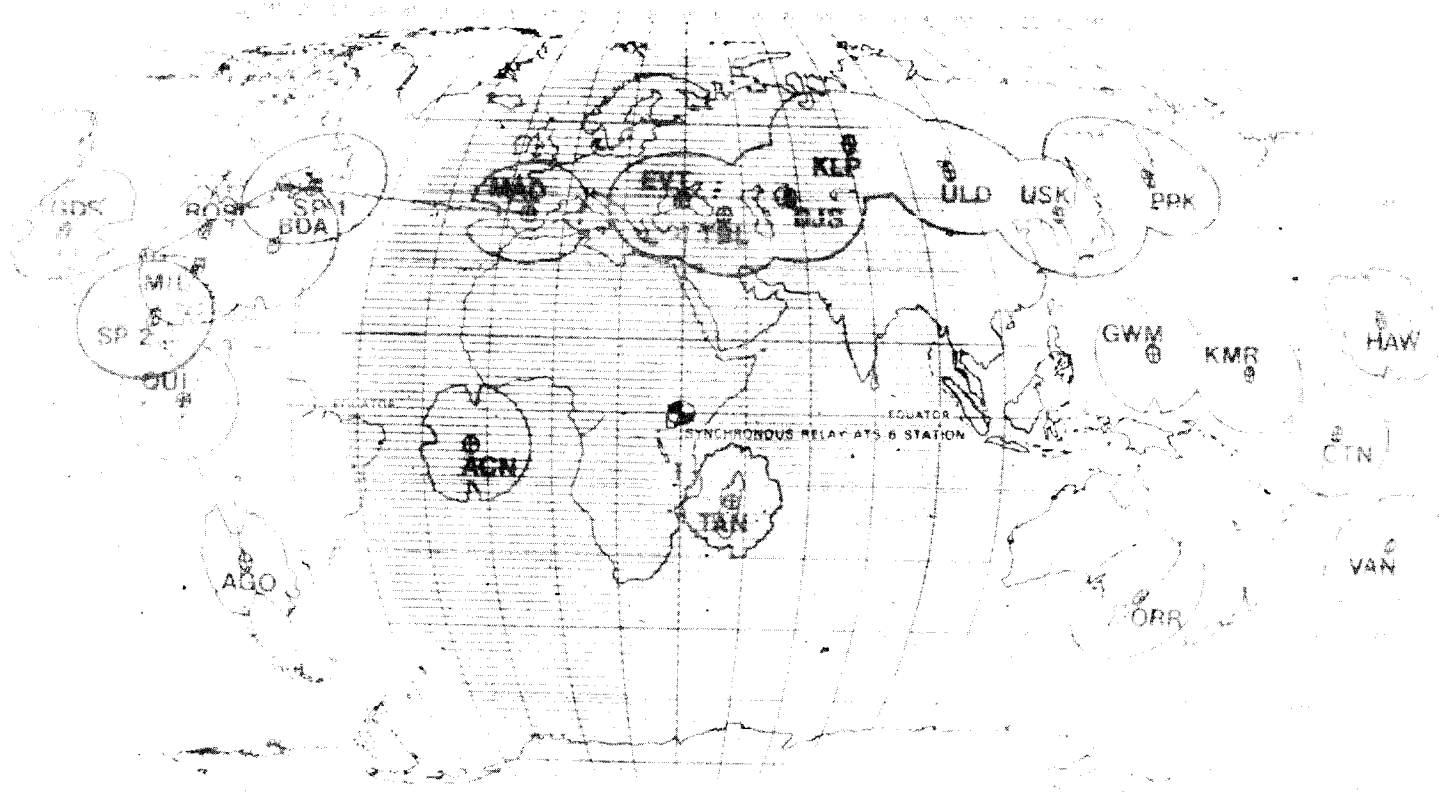
ASTP

ATS - COMMUNICATIONS COVERAGE



VISIBLE HORIZON

ASTP COVERAGE

station, transmit it right to the control center in Moscow. In other words, we get the Soviet VHF communications as well. It will be transmitted to Moscow. And they can also get increased coverage.

Next viewgraph, please.

(Slide.)

The crew. This gentleman will talk to you later. You know Tom Stafford has flown several times before. And Deke, of course, wanting to fly for a long time, his first flight. And Deke will be 51 years old at the time of flight.

The prime crew -- and the reason I have four crewmen up here is that the Soviets are preparing two complete vehicles, including spacecraft and crews. And to the best of our knowledge at this moment -- and I am sure it is correct -- they will use two launch pads and essentially the second vehicle will probably be about 24 hours behind the first. So if they have a problem they have the capability, if they understand the problem, just as we would want to consider it, to launch and cover themselves with a second vehicle.

Aleksey Leonov has flown before. He is the commander of the prime crew. He was the first man to walk in space.

Valeriy Kubasov has flown before. He is a civilian. He is a flight engineer. He did the first rolling in space, as I recall.

Anatoliy Filipchenko, Colonel in the Air Force. Flew before. And just recently commanded the Soyuz 16 which flew a profile of the exact mission that they will fly for our joint mission.

Nikolay Rikavishnikov is the flight engineer and a civilian. He also flew with Anatoli and they are the prime backup crew.

Next viewgraph, please.

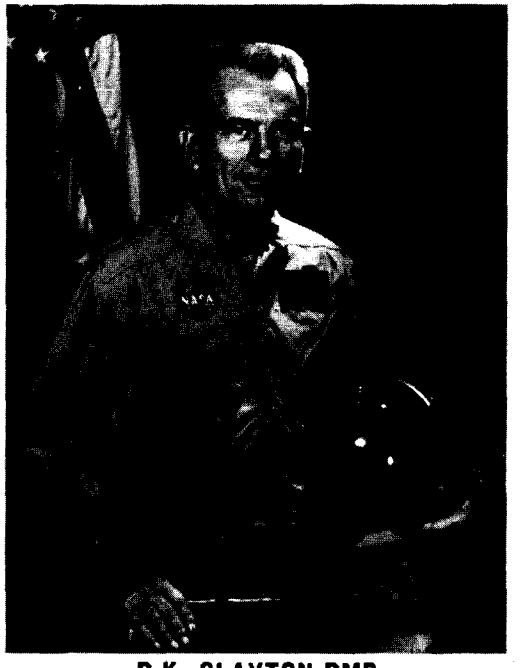
(Slide.)

I am not going to go into detail on this because you have it in your handout. A message I want to get across

ASTP PRIME CREW

T.P. STAFFORD-CDR

V. BRAND-CMP



D.K. SLAYTON-DMP

ASTRONAUT SELECTION	SEPTEMBER 1962	APRIL 1966	APRIL 1959
SPACE MISSISONS FLOWN	GT, 6A, 9A AND APOLLO 10	SUPPORT CREW ON APOLLO 8 & 13 BACKUP CMP FOR APOLLO 15 BACKUP CREWMEMBER FOR SL 2 & 3	REMOVED FROM FLYING STATUS PRIOR TO MERCURY 7 MISSION; RETURNED TO FLIGHT STATUS IN MARCH 1972
TIME IN SPACE	290 HRS. 15 MIN.		
PRESENT POSITION	DEPUTY DIRECTOR FCOD	ASTRONAUT OFFICE	DIRECTOR FCOD
EDUCATION	USNA, BS OKLAHOMA CITY, HON. DS	UNIV. OF COLORADO, BSBA & BSAE UCLA, MBA	UNIV. OF MINNESOTA, BSAE
ORGANIZATIONS	EXPERIMENTAL TEST PILOTS	EXPERIMENTAL TEST PILOTS AIAA SIGMA NU BETA GAMMA SIGMA	EXPERIMENTAL TEST PILOTS AIAA
PHYSICAL DATA BIRTH HEIGHT APPROX. WEIGHT	 SEPTEMBER 1930 6 FT. ~ 175 LBS.	 9 MAY 1931 5 FT. 11 IN. ~ 175 LBS.	 1 MARCH 1924 5 FT. 10 IN. ~ 160 LBS.

NASA HQ MA73-5748
5-25-73

ASTP PRIME CREW-USSR

COSMONAUT SELECTION	A. LEONOV 1960	V. KUBASOV 1967	A. FILIPCHENKO 1963	N. RUKAVISHNIKOV 1967
SPACE MISSIONS FLOWN	CO-PILOT OF VOSKHOD 2 FIRST TO PERFORM EVA IN SPACE	B/U TECHNICAL SCIENTIST SOYUZ 5 FLIGHT ENGR. SOYUZ 6	PILOT SOYUZ 7	TEST ENGINEER SOYUZ 10
PRESENT POSITION	COL. IN AIR FORCE	CIVILIAN	LT. COL. IN AIR FORCE	CIVILIAN
EDUCATION	ATTENDED ZHUKOVSKIY ENGINEERING ACADEMY	MECHANICAL ENGR.-MS MOSCOW AVIATION SCHOOL	CHUGUYEV MILITARY SCHOOL – GRADUATED AIR FORCE ACADEMY	GRADUATED MOSCOW PHYSICS & ENGINEERING INSTITUTE
DATE OF BIRTH	30 MAY 1934	7 JAN, 1935	26 FEB 1928	18 SEPT 1932

ASTP
SPECIFIC PRELAUNCH PREPARATION SEQUENCES AND CONSTRAINTS

TIME REFERENCED TO SOYUZ 1 NOMINAL LAUNCH TIME	COUNTRY	PREPARATION PHASE AND CONSTRAINTS	REASON FOR CONSTRAINT
L-29 DAYS	USA	APOLLO SPACECRAFT AND LAUNCH VEHICLE HYPERGOLIC FUEL LOADING. LAUNCH WITH THE END OF FLIGHT WITHIN 110 DAYS.	TIME LIMIT OF LIQUID HYPERGOLIC FUEL EFFECT ON THE SYSTEMS
L-15 DAYS	USSR	SOYUZ 1 PROPELLANT LOADING. LAUNCH WITHIN 60 DAYS	CONCENTRATED HYDROGEN PEROXIDE STORAGE LIMIT.
L-12 DAYS	USSR	SOYUZ 2 PROPELLANT LOADING. LAUNCH WITHIN 60 DAYS.	CONCENTRATED HYDROGEN PEROXIDE STORAGE LIMIT.
L-15 DAYS	USSR	INSTALLATION OF POWER SUPPLY UNITS ON SOYUZ 1 SPACECRAFT. MAXIMUM LIFETIME INCLUDING FLIGHT DURATION IS 70 DAYS	ALLOWABLE STORAGE TIME LIMIT OF CHARGED POWER SUPPLIES.
L-12 DAYS	USSR	INSTALLATION OF POWER SUPPLY UNITS ON SOYUZ 2 SPACECRAFT. MAX LIFETIME INCLUDING FLIGHT DURATION IS 70 DAYS.	ALLOWABLE STORAGE TIME LIMIT OF CHARGED POWER SUPPLIES.
L-4 DAYS	USSR	SOYUZ 1 TO THE PAD. TOTAL ALLOWED STAY TIME ON THE PAD IS ABOUT 10 DAYS.	BASED ON EXPERIENCE GAINED FROM EARLIER UNILATERAL MISSIONS.
L-3 DAYS	USSR	SOYUZ 2 TO THE PAD. TOTAL ALLOWED STAY TIME ON THE PAD IS ABOUT 10 DAYS.	BASED ON EXPERIENCE GAINED FROM EARLIER UNILATERAL MISSIONS.

ASTP

SPECIFIC PRELAUNCH PREPARATION SEQUENCES AND CONSTRAINTS

(CONTINUED)

TIME REFERENCED TO SOYUZ 1 NOMINAL LAUNCH TIME	COUNTRY	PREPARATION PHASE AND CONSTRAINTS	REASON FOR CONSTRAINT
L-48 HRS	USA	ACTIVATE APOLLO LAUNCH VEHICLE BATTERIES. LAUNCH WITHIN 168 HOURS. BATTERIES CAN NORMALLY BE REPLACED WITHOUT LAUNCH DELAY.	BATTERY LIFE LIMIT
L-39 HRS	USA	APOLLO SPACECRAFT FUEL CELL CRYOGENIC LOADING. RESERVICING CAN BE DONE ON THE PAD DURING A 3-DAY DELAY.	PRELAUNCH CONSUMPTION REDUCES POWER AVAILABLE FOR MISSION.
L-7 HRS	USSR	INSTALL SOYUZ 1 LAUNCH VEHICLE BATTERIES. LAUNCH WITHIN 5 DAYS OR REPLACE BATTERIES. BATTERIES CAN NORMALLY BE REPLACED WITHOUT LAUNCH DELAY	BATTERY LIFE LIMIT.
L-5 HRS	USSR	SOYUZ 1 LAUNCH VEHICLE PROPELLANT LOADING. MAXIMUM LAUNCH DELAY 24 HRS.	ALLOWABLE EXPOSURE LIMIT TO LIQUID O_2
L-2 HRS 45 MIN	USSR	SOYUZ 1 CREW ENTERS THE SPACECRAFT.	
L-2 HRS	USA	MOBILE SERVICE STRUCTURE MOVES FROM APOLLO LAUNCH PAD.	SUBSEQUENT NEED FOR THE MSS WILL CAUSE LAUNCH DELAY.
L-45 MIN	USSR	SOYUZ 1 SERVICE STRUCTURES RETRACTED FROM THE PAD.	SUBSEQUENT NEED FOR THE MSS WILL CAUSE LAUNCH DELAY.
L-20 MIN	USSR	LAST APOLLO STATUS - "GO FOR SOYUZ LAUNCH".	

here is that there is quite a bit of interrelationship between the two countdowns, and to point out that there are certain commitment times as we go through.

Note here that when we reach this point and we load our hypergolic fuels, because of the effects on soft goods and so forth, the lifetime of our vehicle, spacecraft, is about 110 days, we would have to roll back and clean everything up.

The Soyuz at L minus 15 reaches a point, when they load their propellents, that vehicle is good for 60 days and then they have to roll back if we go beyond that time.

The rest of it here just indicates we are checking status as we go down to count. We have critical points where you install batteries. They have a certain lifetime. It takes a certain amount of time to reload them. So that we will be checking constantly with the Soviets as to how they progress through these points and I think these are key points that you ladies and gentlemen may be interested in as we get close to the mission.

Next viewgraph, please.

(Slide.)

Finally, the point I want to make here is that the Soyuz is launched 7.5 hours before our launch. That is 8:20 Moscow time. It is about 3:00 to 4:00 in the afternoon our time. It is in the morning, but -- I am sorry. It is morning our time, but it is afternoon their time.

Am I right on that?

It is 8:20 our time when they launch. Actually it is late in the afternoon for them. We are launching at 3:50 p.m., Eastern Daylight Time. And you old hands that have been down at the Cape know that that is the worst time of the year for lightning and thunderstorms. So what we have done is we have -- we have done a pretty thorough investigation on lightning to see what we could do to reduce the delays that it might impose.

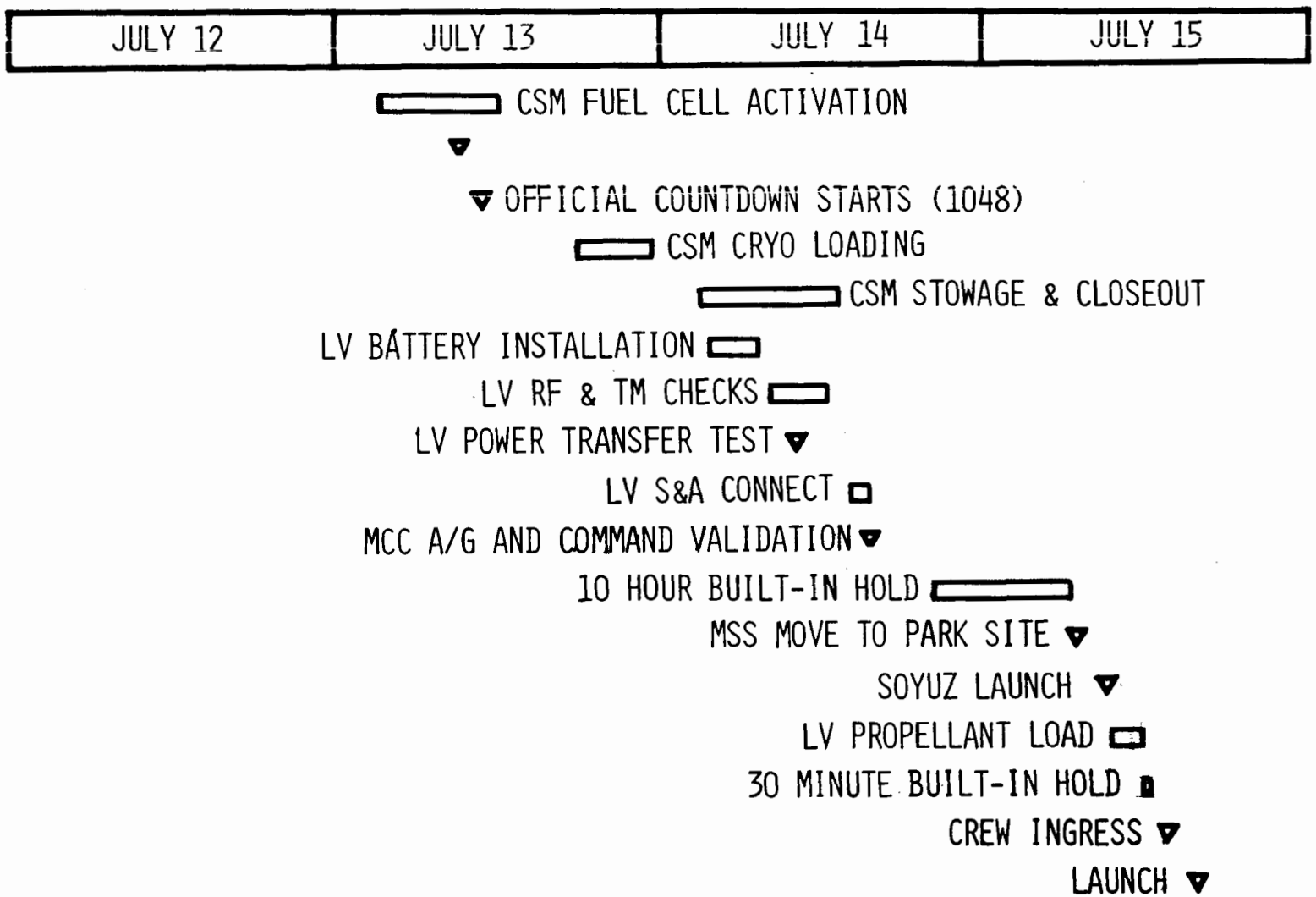
We have installed a mast on top of the lut which you have never had before with cables. All our studies and analyses indicate that this could be a very great help in

ASTP
SPECIFIC PRELAUNCH PREPARATION SEQUENCES AND CONSTRAINTS
(CONTINUED)

TIME REFERENCED TO SOYUZ 1 NOMINAL LAUNCH TIME	COUNTRY	PREPARATION PHASE AND CONSTRAINTS	REASON FOR CONSTRAINT
L-20 SEC	USSR	ACTIVATION OF LAUNCH PANEL PROGRAM MECHANISM.	AFTER ENGINE IGNITION LAUNCH PREP SEQUENCE IS IRREVERSIBLE
L-0	USSR	SOYUZ LAUNCH CONFIRMED	
L+10 MIN (L_A-7 HRS 20 MIN)	USA	BEGIN APOLLO LAUNCH VEHICLE PROPELLANT LOADING.	LATEST TIME TO START PROPELLANT LOADING.
L+4 HRS (LA-3½ HRS)*	USA	READINESS STATUS FOR CREW INGRESS	A DELAY AFTER 3 MIN 10 SECONDS REQUIRES A RECYCLE TO NEXT DAY.
L+7 HRS 22 MIN (L_A-8 MIN)*	USSR	LAST SOYUZ CORRECTION MANEUVER STATUS	
L+7 HRS 26 MIN 50 SEC (L_A-3 MIN 10 SEC)*	USA	LATEST TIME FOR A DELAY WITHIN THE LAUNCH WINDOW. TERMINAL COUNT SEQUENCE START.	
L+7 HRS 29 MIN 55 SEC (L_A-5 SEC)*	USA	LATEST TIME MANUAL CUTOFF CAN BE PERFORMED	AFTER L_A-5 SEC*, PRELAUNCH SEQUENCE IS IRREVERSIBLE.

*L_A - APOLLO PRELAUNCH TIME.

ASTP
LAUNCH COUNTDOWN



taking away the induced voltages away from our vehicle.

And we are scheduled to launch at 3:50.

The Soviets do have a potential maneuver on the fourth orbit. It is nominally zero. To correct their orbit a little bit. They can delay to the fifth orbit. If they delay to the fifth orbit and they do perform a maneuver, that will give us about 12 minutes and that would be one of our go criteria, that that maneuver was satisfactory.

So it could possibly, if they are delayed for some reason to the fifth, they have to get down to where we would be very interested just before we launch.

Next viewgraph, please.

(Slide.)

Now, the -- how much opportunity do we have to go and what does it mean to the mission?

You know that when we load our vehicle we can detank and if the problem isn't too big, why, we can recycle 24 hours.

If the problem goes 48 hours, we would probably reload some cryogenics and all that which will feed our fuel cells.

But we do have five consecutive days that we have set up and planned for that we can go if for some reason we run into a problem once the Soyuz has been launched.

The first one, of course, is 7 hours 30 minutes after. If we had to slip for weather or something, we would go the second day.

Well, what does that mean? That means that if we go on the first day we will do an M equals 30 rendevous, 30 revs and rendevouz and dock.

If we delay to the second day we can effect a rendevous on a 14th rev.

Now, you are going to ask me why not do it at the end of the 14th rev at the end of the first day. The

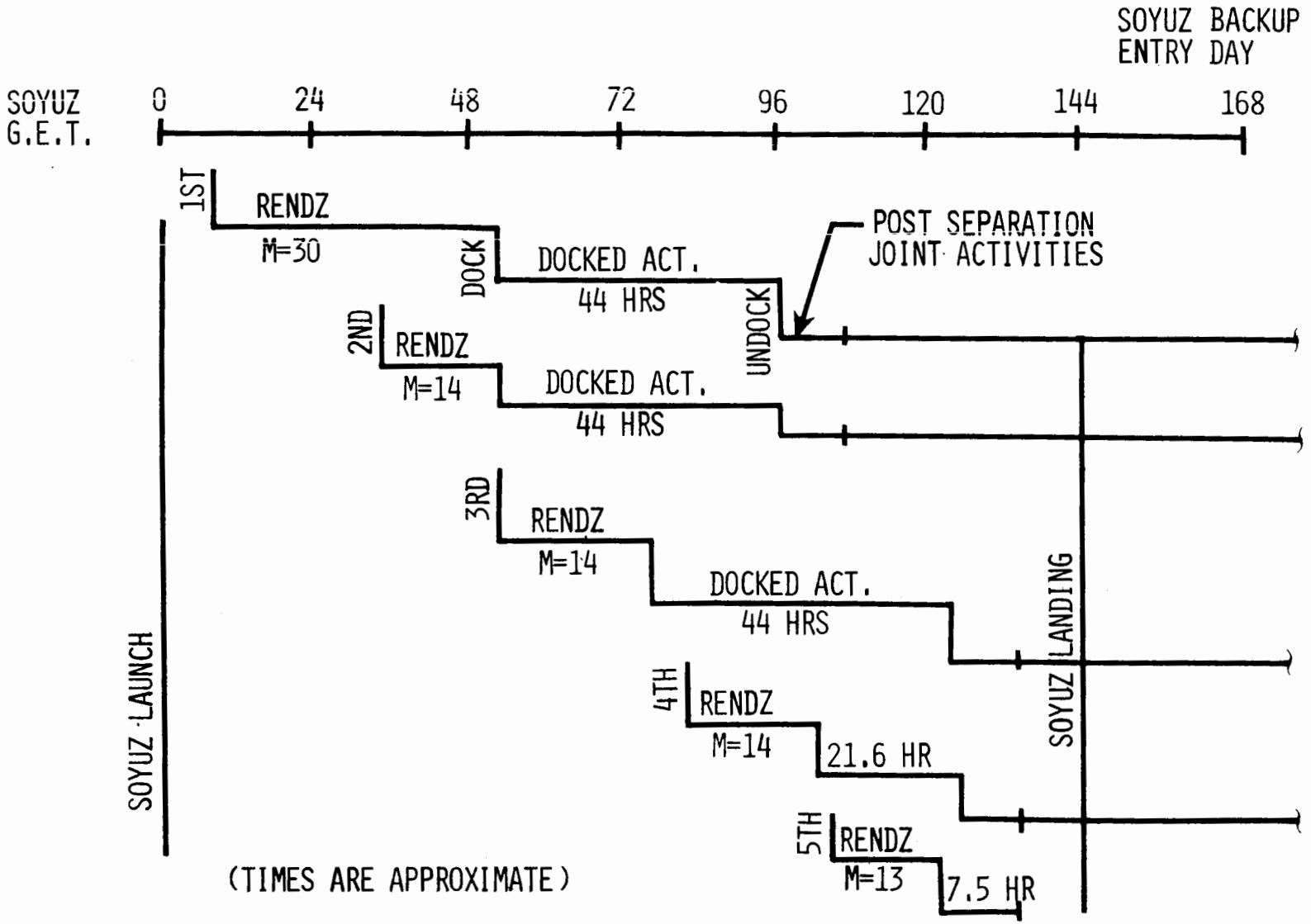
ASTP
LAUNCH TIMES

DATE	SOYUZ (EDT)	APOLLO (EDT)	TIME INTERVAL BETWEEN SOYUZ AND APOLLO LIFT-OFF (HR:MIN)
JULY 15, 1975	0820	1550	7:30
JULY 16, 1975	–	1525	31:05
JULY 17, 1975	–	1500	54:40
JULY 18, 1975	–	1435	78:15
JULY 19, 1975	–	1409	101:49

NOTE: 1. ASSUMING SOYUZ ON-TIME LIFT-OFF ON JULY 15, 1975. THE SOYUZ HAS AT LEAST A 10 MINUTE LAUNCH WINDOW.

2. TO CONVERT TO MOSCOW TIME ADD 7 HOURS. TO CONVERT TO GMT ADD 4 HOURS. THE TIMES ARE FOR THE OPENING OF THE APOLLO LAUNCH WINDOW ASSUMING SOYUZ LIFT-OFF IS ON TIME.

PROFILES FOR APOLLO LAUNCH OPPORTUNITIES



Soviets requested that we delay until they have done their circularization maneuver which is, as I recall, about their 17th rev, just to make sure that everything is all right.

We have no objections to that because we can still carry out our dock phase of 44 hours.

Now, if we are delayed to the third day, we will do an M equal 14 rendevous. We will still have our dock period, and we will continue 44 hours and we will get the same amount of unilateral mission time to conduct our experiments.

But if we go into the fourth day, then because of the Soyuz lifetime -- and they have to return on the sixth day -- our dock period will be reduced to 21.6 hours. We will then fly the remainder of our mission making about a nine-day mission. And if we are forced to wait until the fifth day, then we would probably -- we would only have 7.5 hours.

It is very conceivable that if on the first vehicle we got down to where we were faced with a fifth day thing, we would probably reach an agreement with the Soviets why go up and just do a short rendevouz, we would probably try to talk them into committing their second vehicle so that we could get a full crack at the 44 hours.

That is conjecture on my part, but I am trying to show you the flexibility that we have.

Next viewgraph.

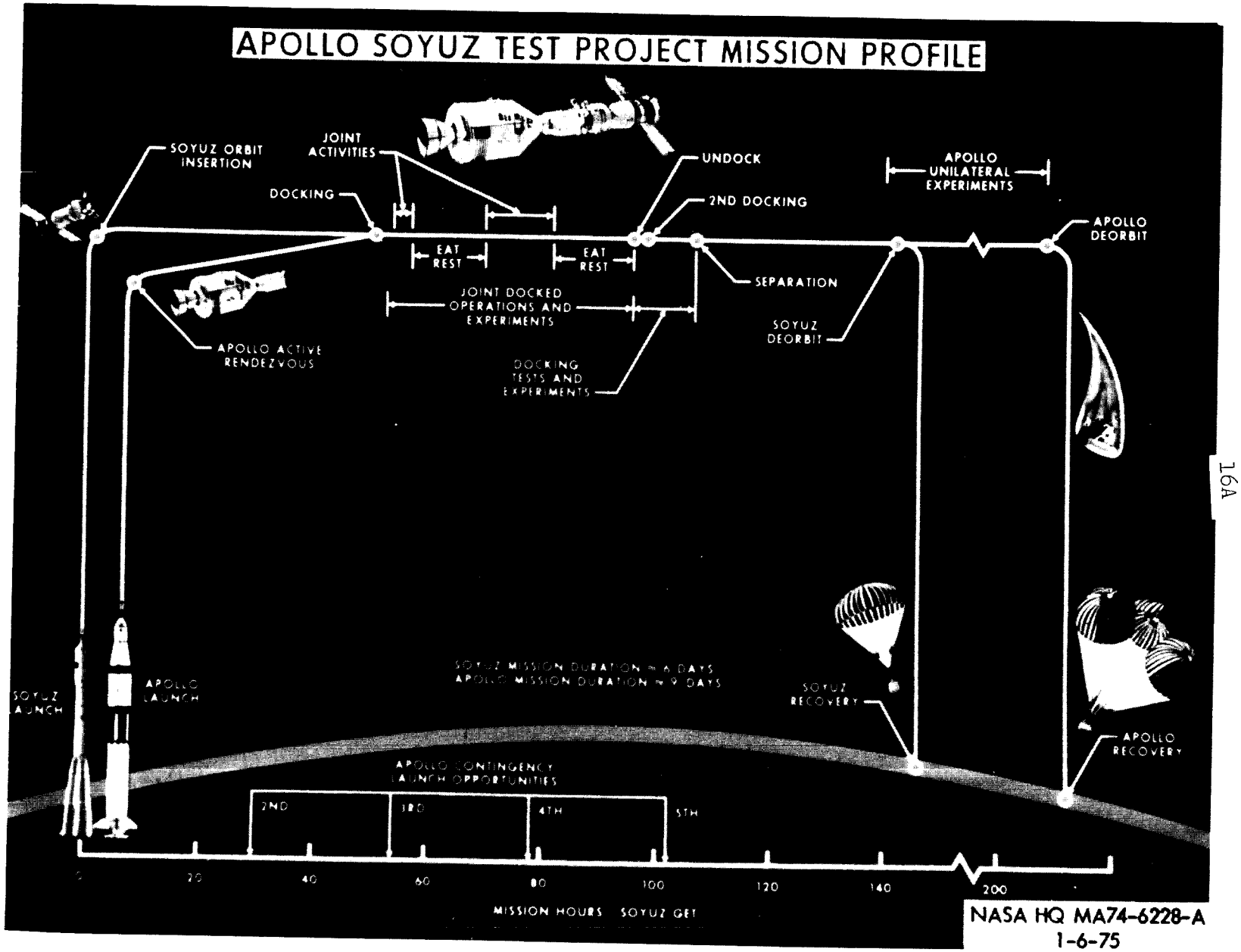
(Slide.)

Mission profile. Again you have this in your handouts. These are some of the highlights. 24 hours Soyuz ground elapse time, incidentally. I am sorry about the acronym.

Their launch, the first maneuver that I mentioned on the fourth orbit.

The Apollo launch. We will extract the docking module in this period, 1.2 to 2.6 hours after launch. And we will do our circularization and phase maneuvers 3.8 to 5.7 hours, Apollo ground elapsed time.

You see here the circularization maneuvers. I am



NASA HQ MA74-6228-A
1-6-75

ASTP
NOMINAL MISSION SEQUENCE

- SOYUZ L/O TO SGET 24:00
  - SOYUZ L/O AT 1220 G.M.T., JULY 15, 1975
  - SOYUZ 1ST MANEUVER (NOM. ZERO) ON 4TH ORBIT
  - APOLLO L/O AT 1950 G.M.T. (7.5 HR LATER)
  - DM EXTRACTION (FROM 1.2 TO 2.6 HRS AFTER APOLLO LAUNCH)
  - APOLLO CIRC AND PHASE MANEUVERS (3.8, 5.7 HRS AGET)
- SGET 24:00 - 45:00
  - SOYUZ CIRC MANEUVER ON 17TH ORBIT
  - APOLLO PHASE CORRECTION (NOM. ZERO)
  - EXPERIMENT ACTIVITIES
- SGET 45:00 - 67:00
  - APOLLO NC2, NCC, NSR, TPI (M = 30)
  - DOCKING AT 51:55 SGET (44.4 HRS AGET)
  - CREW TRANSFER/FIRST JOINT ACTIVITY PERIOD
- SGET 67:00 -92:00
  - REMAINDER OF JOINT PERIODS

ASTP
NOMINAL MISSION SEQUENCE (CONT)

- SGET 92:00 -118:00
  - UNDOCKING/REDOCKING
  - JOINT EXPERIMENTS
    - SOLAR ECLIPSE
    - UV ABSORPTION
  - FINAL SEPARATION FROM SOYUZ
- SGET 118:00 - 143:00
  - INDEPENDENT SOYUZ AND APOLLO ACTIVITIES (EXPERIMENTS)
- SGET 143:00 - 168:00
  - SOYUZ LANDING - 142:31 SOYUZ GET
  - APOLLO EXPERIMENTS
- SGET 168:00 - 192:00
  - APOLLO EXPERIMENTS
- GET 192:00 - 216:00
  - APOLLO EXPERIMENTS
  - DM JETTISON/SEPARATION MANEUVERS

ASTP

NOMINAL MISSION SEQUENCE (CONCLUDED)

- SGET 216:00 - APOLLO LANDING 224:58
  - APOLLO EXPERIMENTS
  - APOLLO DEORBIT
    - LANDING ON REV 138 - W. OF HAWAII (ASCENDING)
      ($162^{\circ}45'$W - $21^{\circ}52'$N) (5:18 P.M. EDT)

not going to take your time now. But bring you up to here where we are getting to docking at 55 minutes Soyuz ground elapsed time or approximately 44 hours after the Apollo has been launched.

That brings us up into this area here.

Next viewgraph, please.

(Slide.)

Before I go into the dark portion, I wanted to point out some things to you so that you understand some of the terminology in the handout.

There are five hatches involved. This is a hatch in the Apollo. This is -- Number 2 hatch, we name it, but it is the first hatch in the docking module.

The hatch on the Soyuz end. And then this is the orbital module hatch called Hatch 4. And this is a hatch between the reenetry vehicle and the orbital module.

The green dots are not TV cameras themselves, but locations for TV. You will have a TV here for the first time in which we will be able to observe -- at least Tom and Vance in the left seat and the center seat, prior to liftoff and during liftoff.

You have a camera here that cuts across and you have -- some of you are familiar with in the past -- locations.

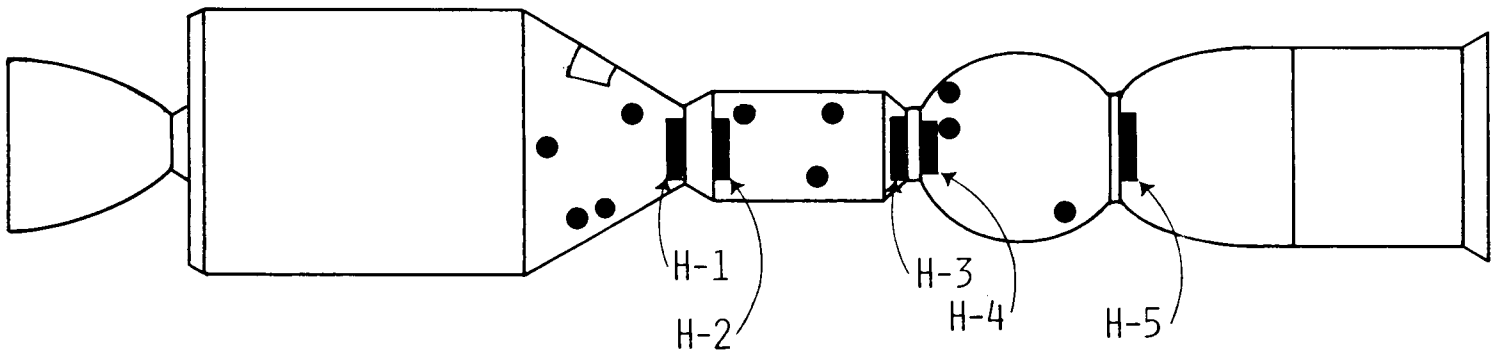
This camera will give you a view of the hatches going into the orbital module, and I believe this is the camera that will be used to record the initial greeting and these are camera positions for our camera in the orbital module which we will hand-carry over and use when we are joined with them in the orbital module.

Next viewgraph, please.

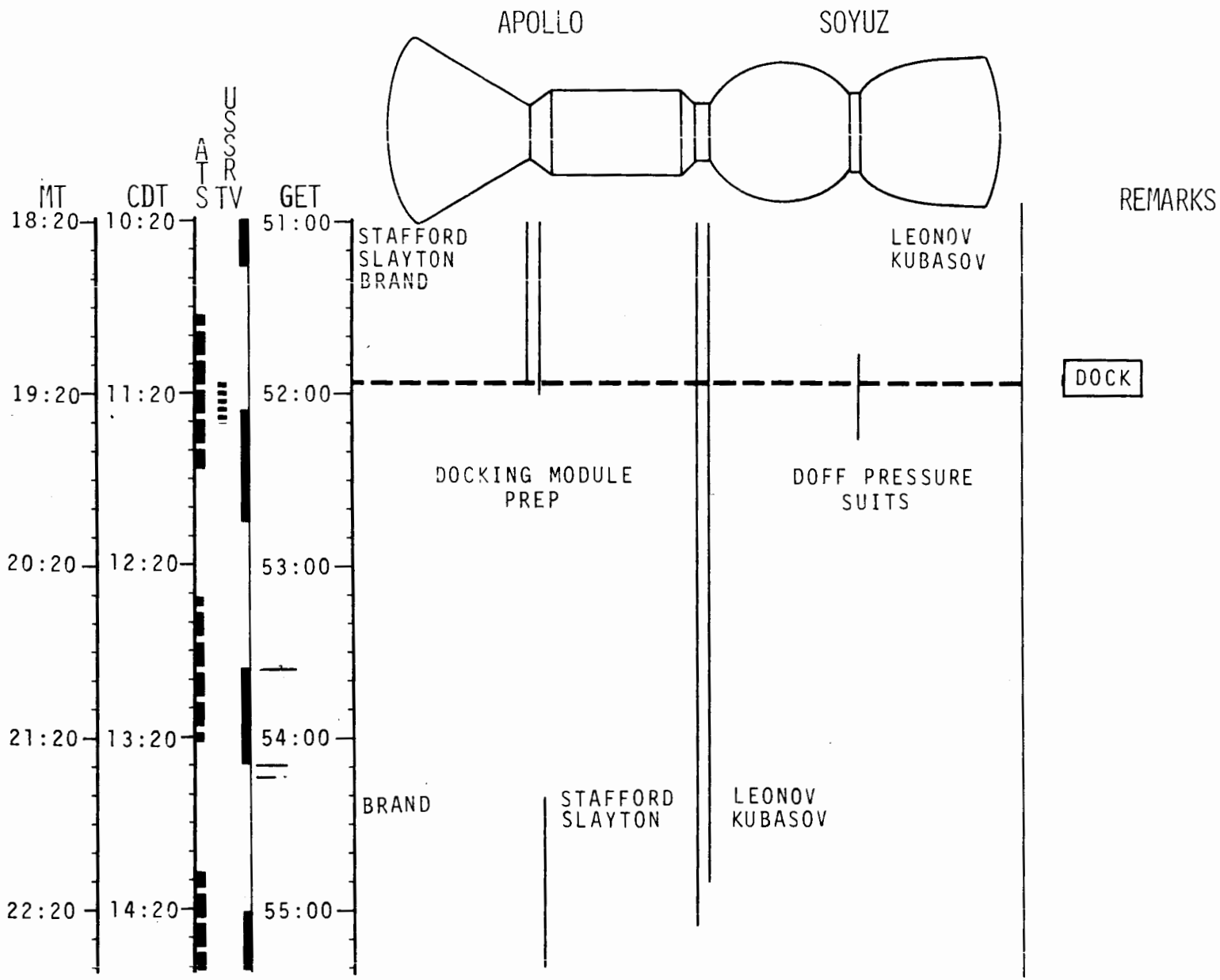
(Slide.)

Now, here again is in your handout and I am just going to describe how you read this thing so that you can look at it.

ASTP HATCH & TV CAMERA BRACKETS



ASTP TIMELINE



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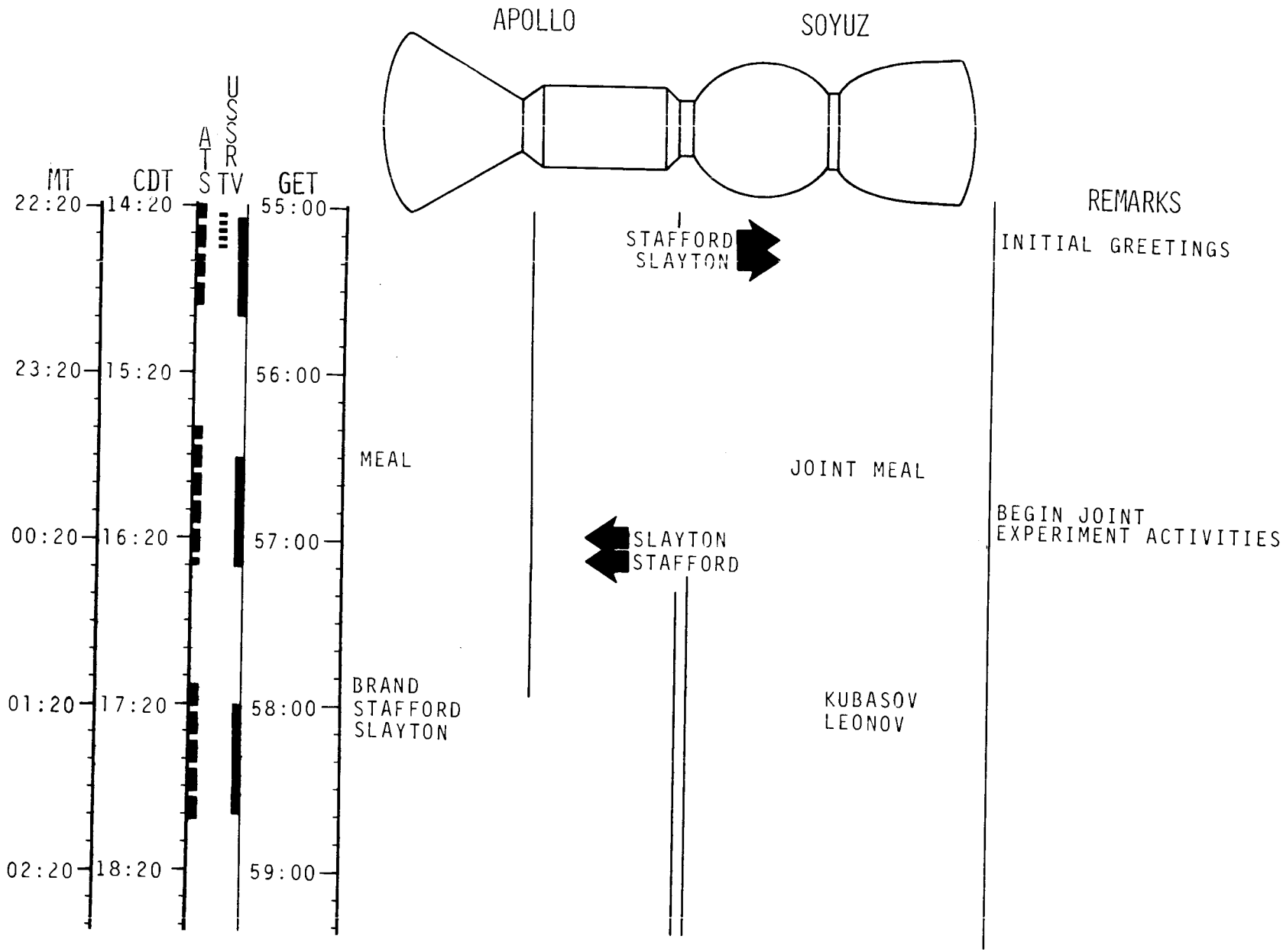
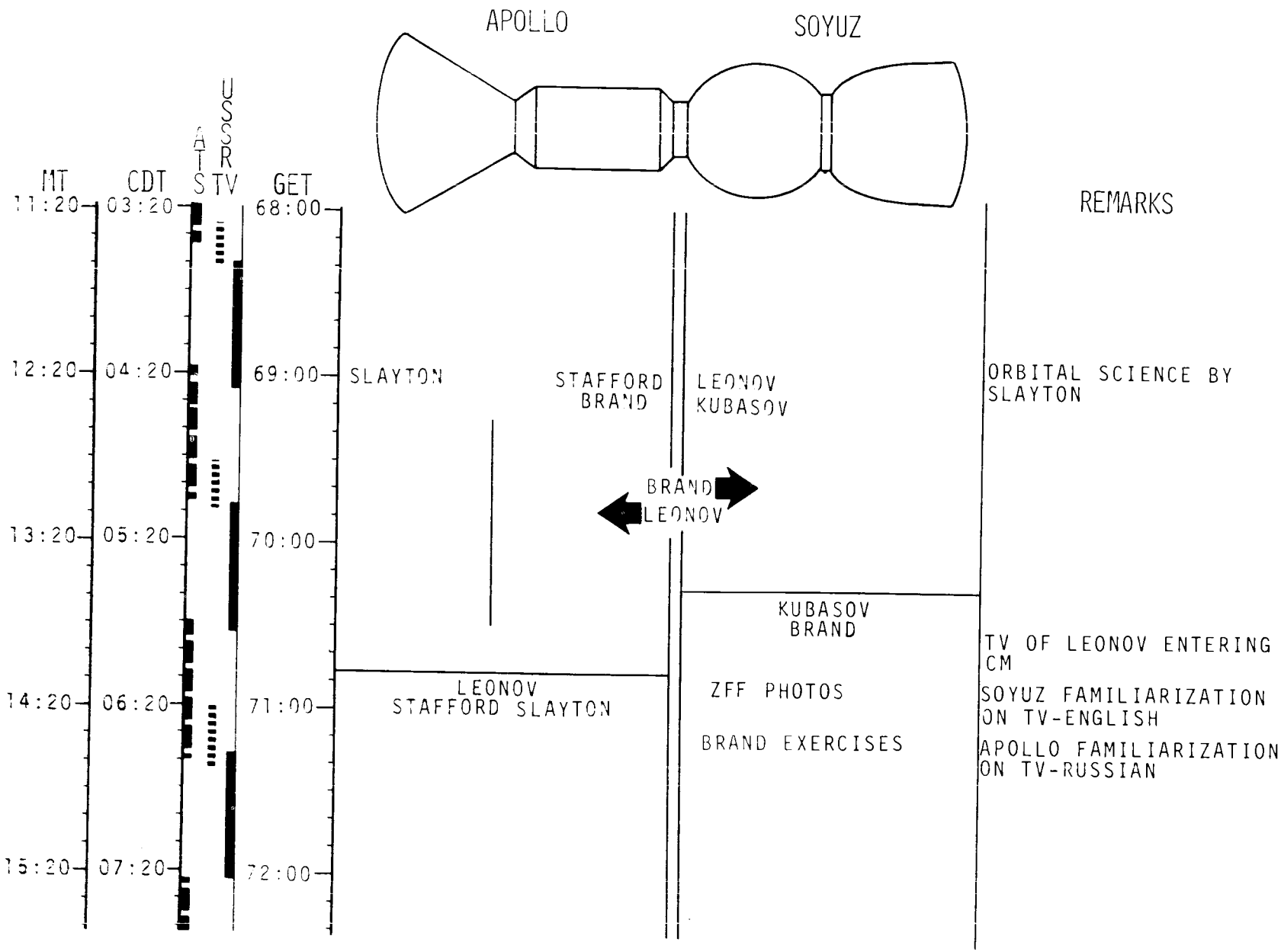


ASTP TIMELINE



This is Moscow time. This is Central Daylight Time, Houston. Here shows the period of time that we have ATS-6 coverage and in which we can have real time live TV.

The mark here shows you Soviet TV coverage, and this is your night and day cycles. This is your ground elapsed time.

Over here we have the configuration of the vehicle. What we have tried to show here is when you have this line and this line, these are the hatches. These lines say that these hatches are closed. When there is no line there, that hatch -- those two hatches are open.

Here you have, for example, one hatch in the docking module and the hatch into the orbital module to this phase, they are closed to here. Obviously Leonov will open the inboard hatch of the orbital module first and then the hatch in the docking module will be opened here, and this is about where your first greeting will be.

Note here that they have taken time to doff their pressure suits. The Soviets will be wearing pressure suits during the docking phase.

And this is carrying out the first initial greeting, as I have shown at 55 hours GET. It is 2:20 Houston time, 1:20 Eastern Daylight Time for the initial greeting. Moscow will be about 10:20 at night.

They will have their initial greeting. They will have a joint meal. And that is Stafford, Slayton, Leonov and Kubasov. Vance will be back by himself.

They return here, and we have sleep period and so forth before we start the other transfers.

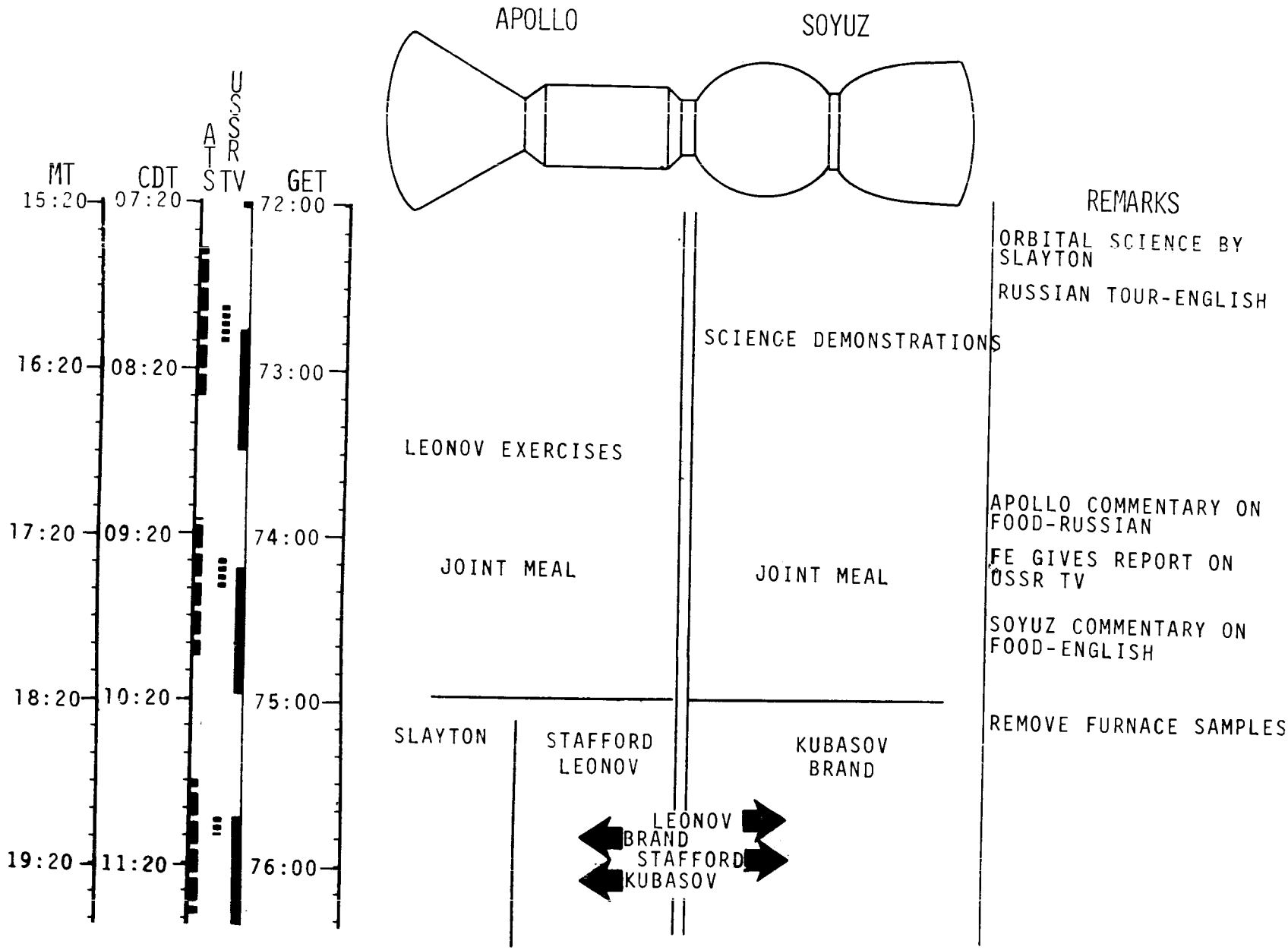
Let me emphasize that on the first day there will be one transfer. The second day there will be three transfers and they are almost contiguous.

Next viewgraph, please.

(Slide.)

Here we are trying to show that. We have come up to the period. This is the period when we will go into the docking. Stafford and Vance will go in to get the docking module ready, will open the hatches. Vance will go

ASTP TIMELINE



into the orbital module with Kobasov. Leonov will come in with Stafford. They will go through the sequence to get back to the command module. And then you will have Leonov, Stafford and Slayton together, hatches closed.

In the command module you will have Kobasov and Brand. In the Soyuz. And they will have meals. We will have some events, TV coverages. Brand will do some exercising using their equipment.

We do have some symbolic activities planned. They are in the process of being negotiated. Various things, exchange of various gifts and so forth.

As you can see, it is almost contiguous. As we finish the joint meals in the science demonstrations, then Vance comes back, Leonov goes back, and Kobasov comes with Vance, comes into the command service module so that then he has a period of time in our vehicle.

So at the end of four transfer each crew member will have made a complete transfer

Next viewgraph.

(Slide.)

This just finalizes that telling how it is going and our final greetings, and then we will close the hatch. We will have a sleep period while we are still docked. And then we will separate.

Next viewgraph, please.

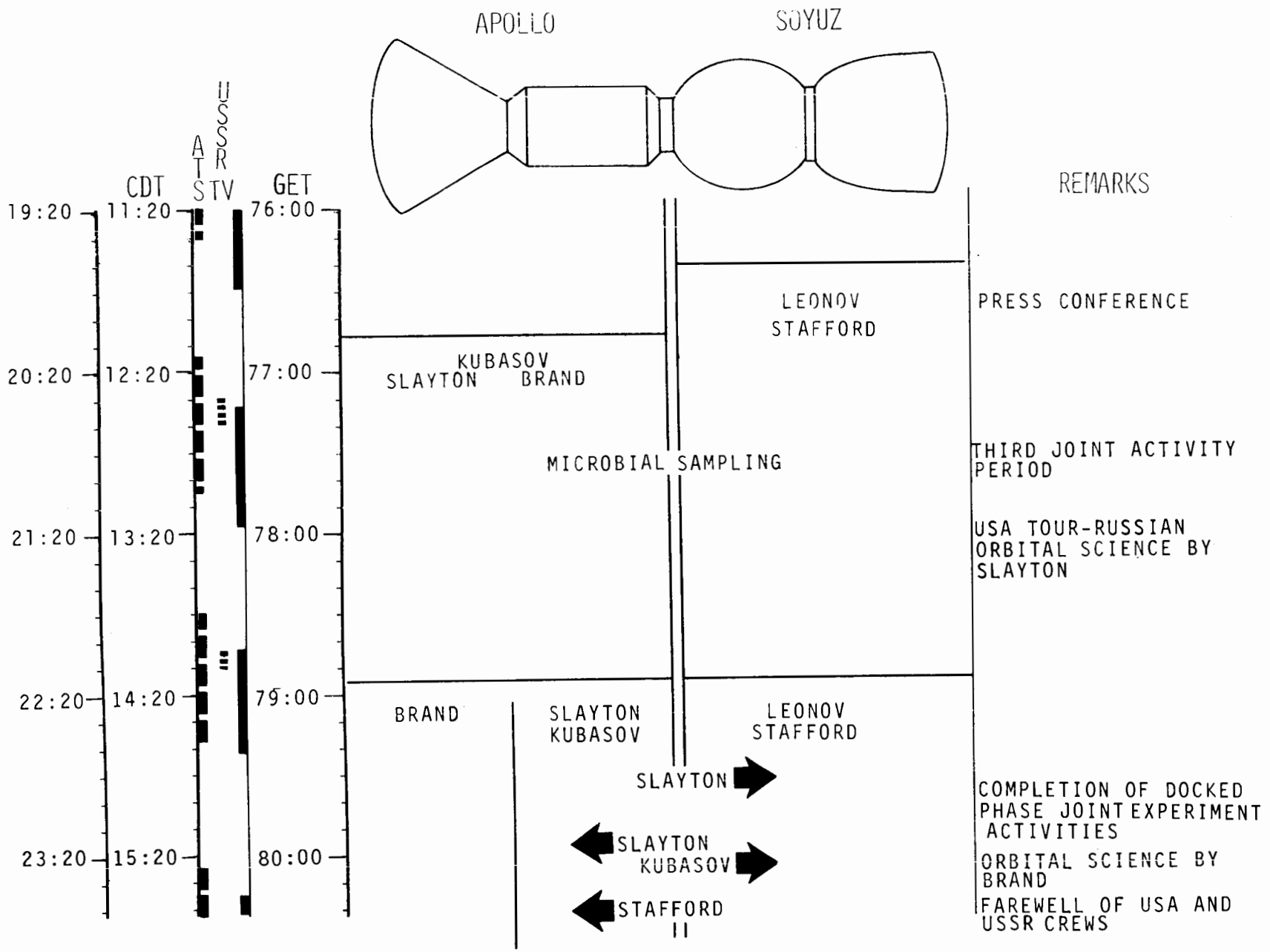
(Slide.)

This is carrying you through just essentially what I have been discussing. Let me bring you up here to this point.

When we separate, the first time, we will just go to a stationkeeping position. The Soyuz will go into an active mode in their docking system. The Apollo will maneuver and bring the two spacecraft together for another redocking to check out the active system of the Soyuz docking system.

Following this we will separate. We will do

ASTP TIMELINE



the experiment I discussed earlier as we separate, the UV absorption experiment. We will also do another experiment that is called the solar eclipse where we will back off and occult the sun for the Soyuz to take a picture of.

Next viewgraph, please.

(Slide.)

This is the reentry of the Soyuz coming in at the end of the sixth day. This is a sensible atmosphere, 200,000 feet basically. The retroburn will occur over the South Atlantic. This is their blackout period and you can see they will be landing in this area, which incidentally you will see a picture of, some scenes of, in the Soyuz 16 film. And that is not far from their launch site, Baykonur, in this area.

Next viewgraph, please.

(Slide.)

When we separate, we will remain in orbit for another three days and we will conduct our unilateral experiments, a number of them as I have described, very important. And then we will deorbit.

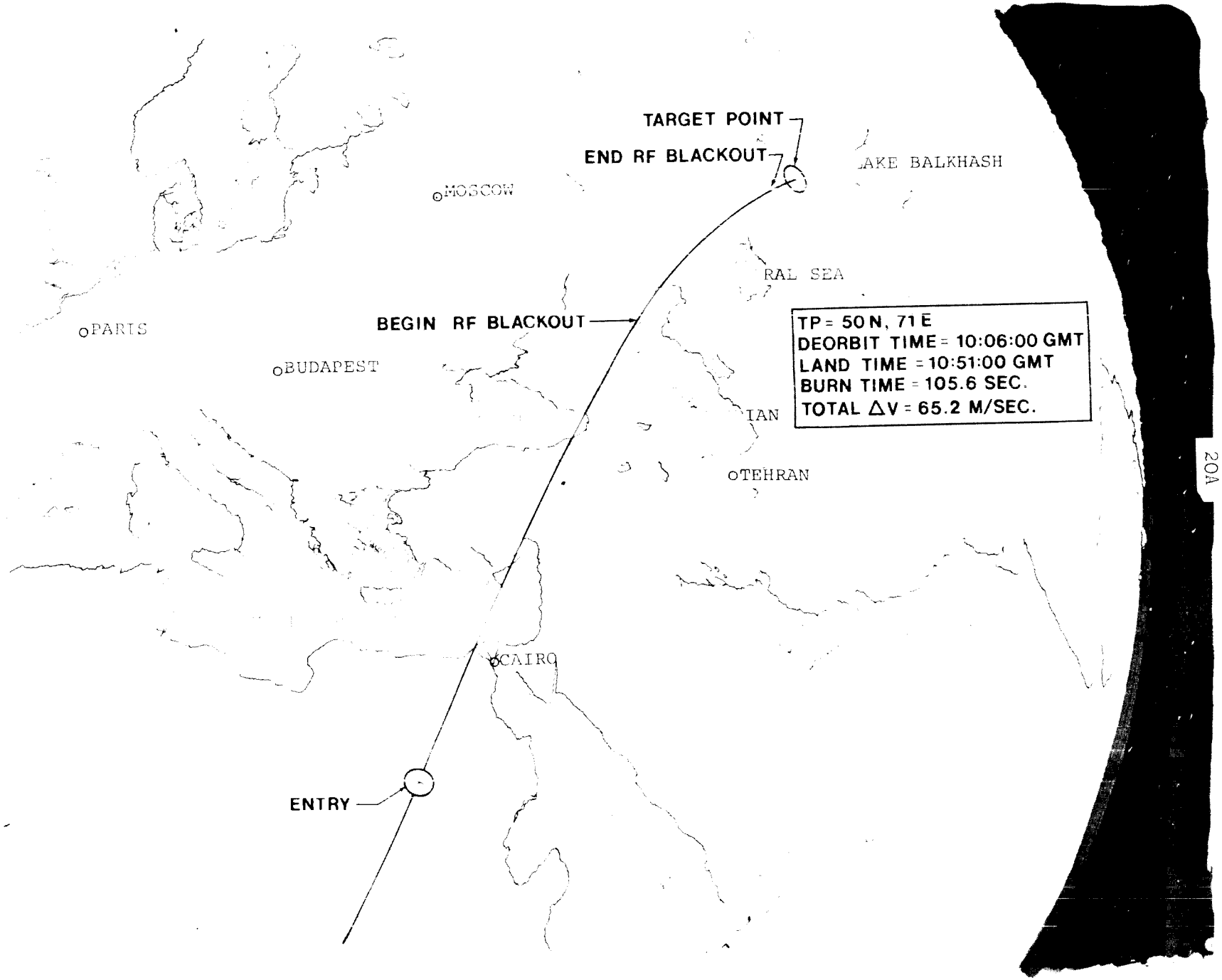
Our retroburn will occur over the Indian Ocean. This is our entry and all you ladies and gentlemen are familiar. This is not far from Hawaii. And Vance told me today, since he is going to be bringing it in, why, it will be within helicopter range of Barking Sands.

Next viewgraph, please.

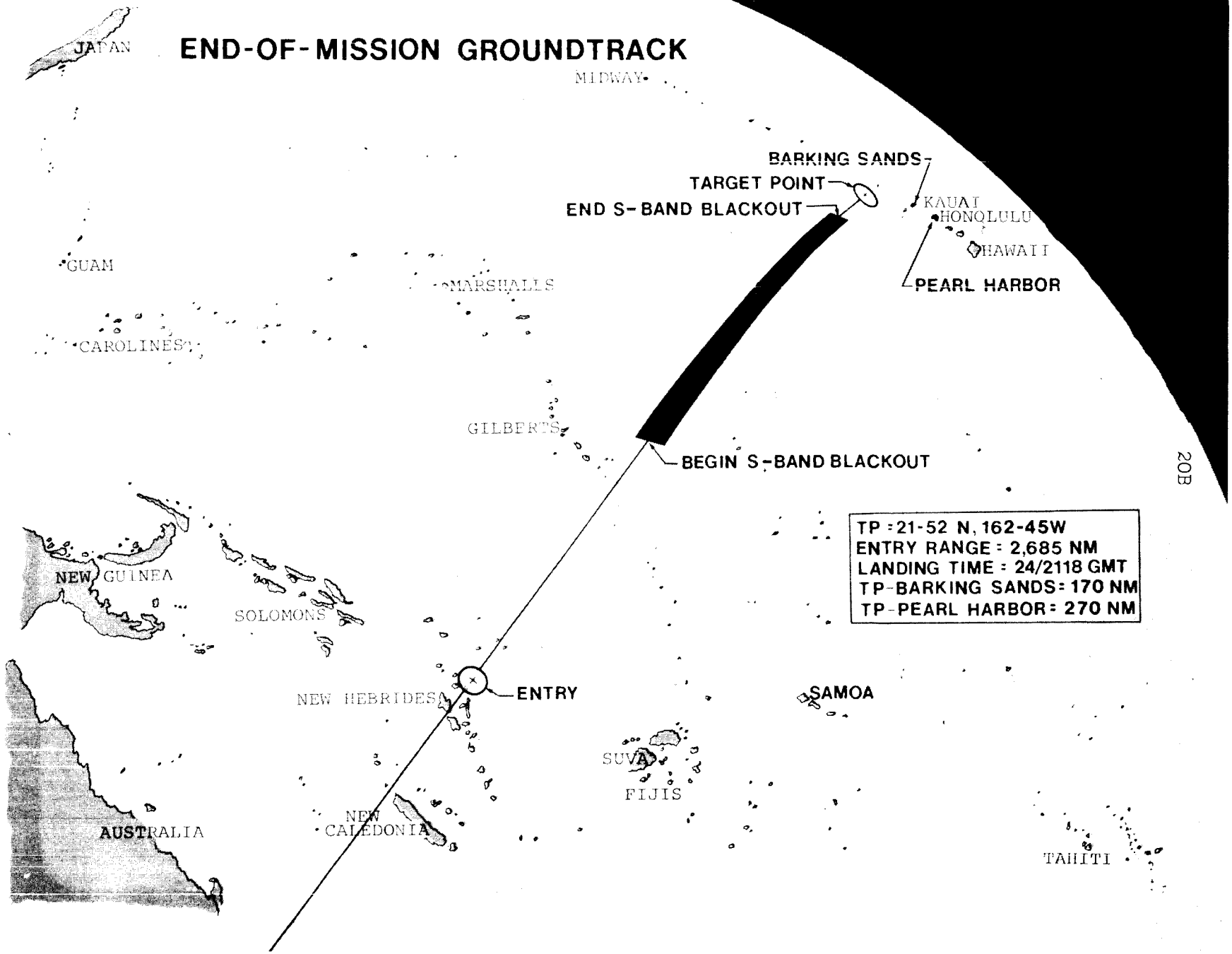
(Slide.)

Here are some of the key events coming up. I mentioned that our spacecraft and launch vehicle are at the Cape. The experiments are at the Cape. Docking module and docking system are at the Cape.

We are in the process right now of the integrated systems tests. We have some key events here coming up. We will load our hypergols in June. We will have our flight readiness review before we load hypergols, of course, and

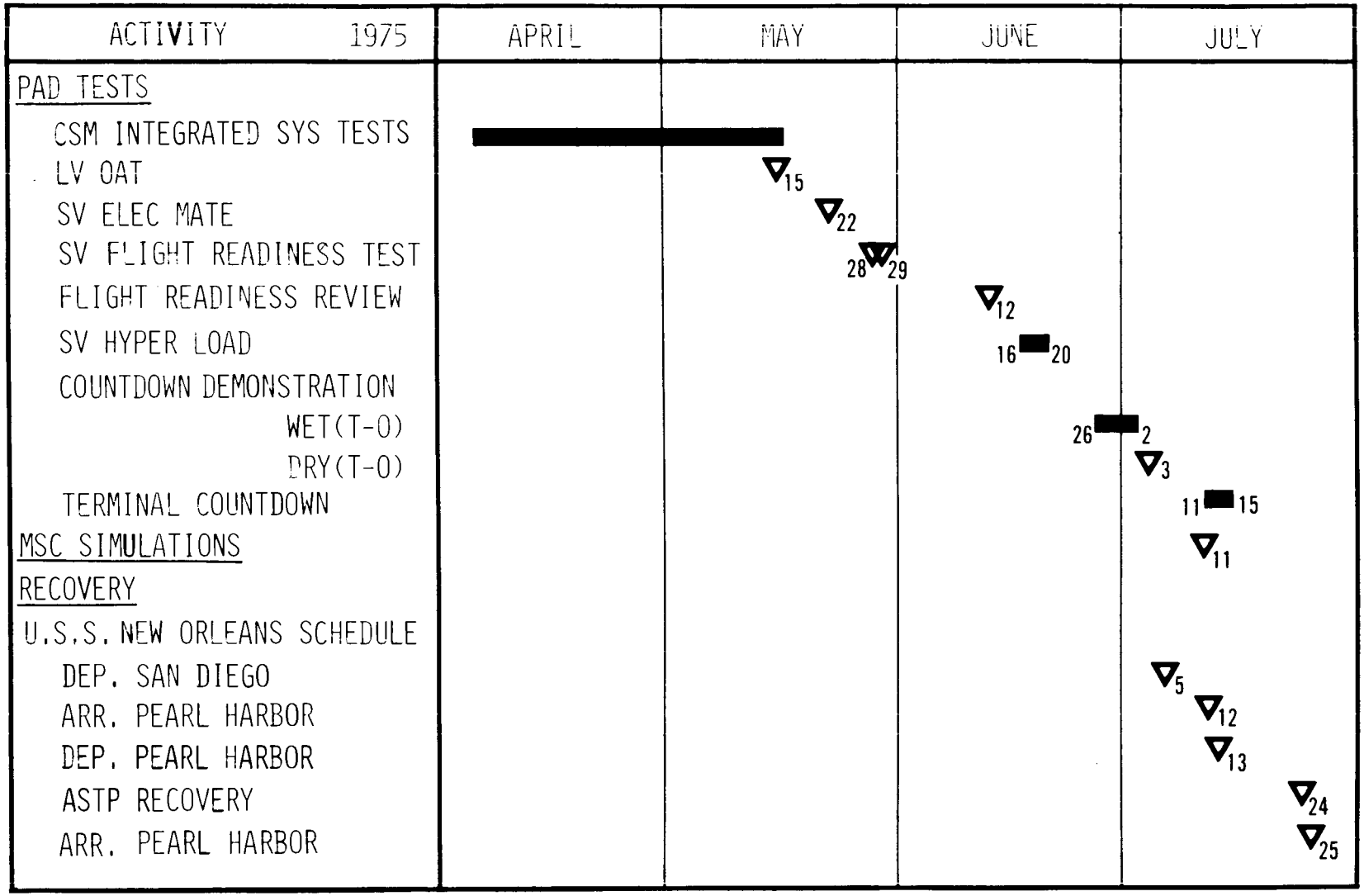

TARGET POINT
END RF BLACKOUT
LAKE BALKHASH
MOSCOW
RAL SEA
BEGIN RF BLACKOUT
PARIS
BUDAPEST
TP = 50 N, 71 E
DEORBIT TIME = 10:06:00 GMT
LAND TIME = 10:51:00 GMT
BURN TIME = 105.6 SEC.
TOTAL ΔV = 65.2 M/SEC.
IAN
TEHRAN
CAIRO
ENTRY

END-OF-MISSION GROUNDTRACK



TP = 21-52 N, 162-45W
ENTRY RANGE = 2,685 NM
LANDING TIME = 24/2118 GMT
TP-BARKING SANDS = 170 NM
TP-PEARL HARBOR = 270 NM

ASTP
MISSION READINESS SCHEDULE



this will -- we will follow the one, the joint spacecraft flight readiness review which is going to occur in Moscow on the 23rd of May.

And I think terminal countdown, the launch date, and this gives you a recovery schedule when the ship will be leaving, departing Hawaii.

Does that complete mine?

Okay. If we will, let's run the Soyuz 16 film and then Vance will give you some more details.

(FILM PRESENTATION WITH COMMENT FOLLOWS:)

VOICE: The Soyuz 16 spacecraft.

At the launch site is the Soyuz 16 spacecraft. The integrated electrical tests of the spacecraft systems at the test stand are completed.

Now, preparation takes place to transport it to the fuel-loading facility.

After loading, the spacecraft will be returned to the stand for final preparation.

Finally equipped and loaded, the spacecraft is mated to the shroud and the adapter.

After mounting, the abort and rescue system engine and stabilizers, integration with the booster stages begins.

Pre-flight press conference.

The Soyuz 16 Commander, Anatoliy Filipchenko and Flight Engineer Nikolay Rikavishnikov told the newsmen about the objectives of the planned mission, the main aim of which is to test the on-board systems, modernized according to the joint ASTP requirements.

The booster of the Soyuz 16 spacecraft is transported to the launch area.

The rocket booster occupies its place on the launch pad.

The last hours before launch.

Happy journey.

The bus with the cosmonauts is arriving to the launch area of the site.

The crew is ready for the flight.

Farewell until meeting on earth.

The crew took their seats in the spacecraft. The spacecraft and booster systems' last checks.

Few minutes before launch.

The last prelaunch command.

The tower is removed

Ignition. Preliminary. Intermediate. Main.

Liftoff.

The Soyuz 16 was launched at 12:40 Moscow time on December 2, 1974.

After orbit insertion and damping angle arrays, antennas, the target, and solar panels are deployed.

The flight control center began the processing of on-board systems status information that were received and to transmit the commands.

The crew began its flight plan operations.

During the first two days, three corrections of orbit parameters were performed and the planet circular orbit was formed with an aperture of 225 kilometers.

The crew checked the life support systems and the attitude and propulsion control systems in different modes of operation.

A new docking unit and its automatic was successfully tested.

Now you see the process of separating the ring simulating the Apollo docking unit that was done after

completion of the tests.

During the flight film shooting of the earth horizon and part of the sky were performed as well as medical-biological experiments.

The six-day mission program is completely fulfilled. The descent vehicle entered the atmosphere.

The parachute system is deployed.

On December 8 at 4 minutes past 11:00 Moscow time the descent vehicle softly landed in the planned area.

The search and rescue group met the crew when the spacecraft was still in the air.

The crew leaves the spacecraft.

We will meet in Moscow.

The Soyuz 16 test mission in the frame of preparation for Apollo-Soyuz joint mission is successfully completed.

(END OF FILM PRESENTATION.)

LEE: The film that we will show following Vance's presentation is about five minutes and it is clips of the various manufacturing techniques that the Soviets have sent to us. Their milling, their welding, their spacecraft assembly.

And, without taking any further time: Vance?

BRAND: Thanks, Chet.

Can you hear me okay?

I would like to cover a few things that are different from what Chet talked about, or perhaps amplify further some of the things he mentioned.

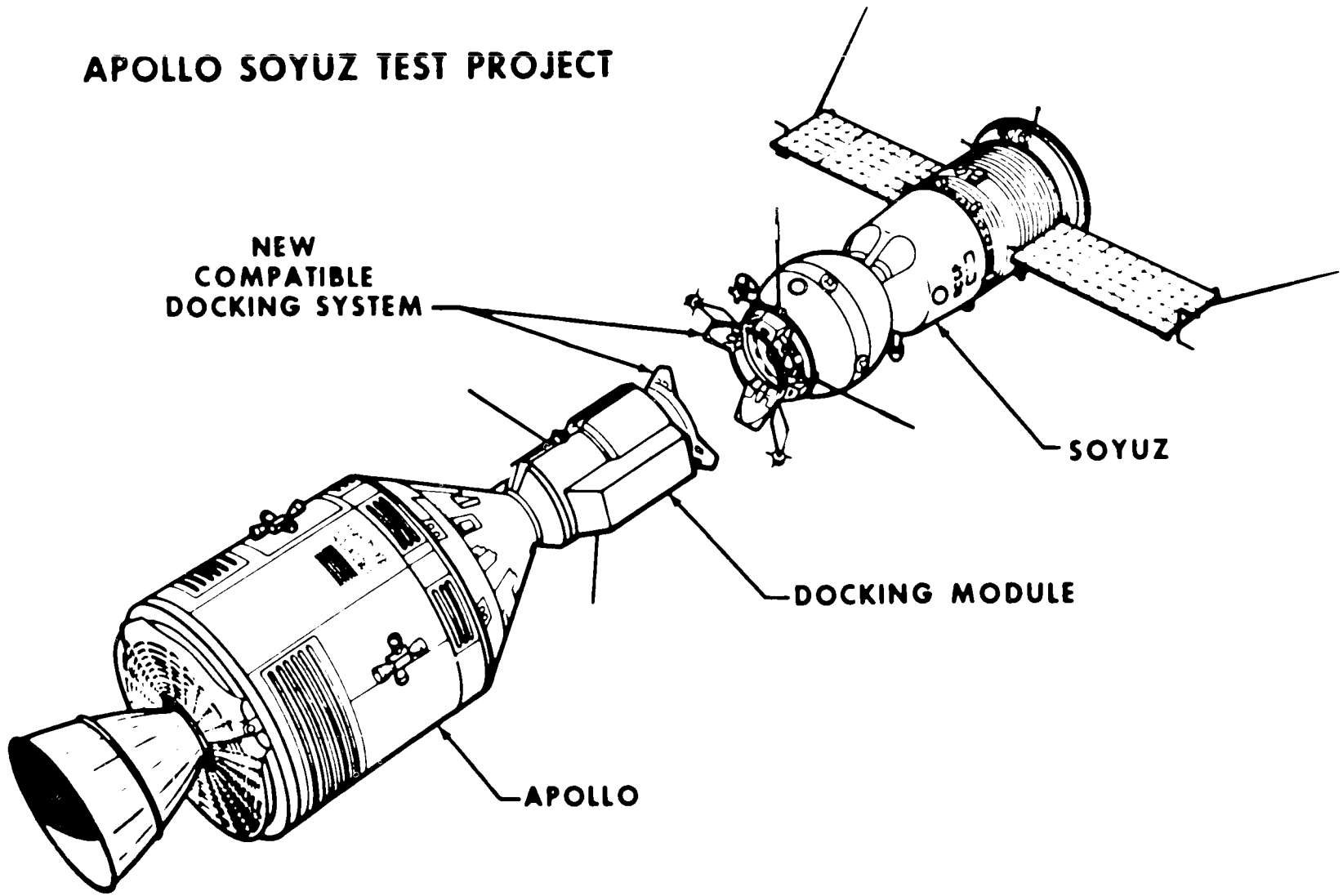
First slide, please.

(Slide.)

Let's talk about training. Here we are three and a half months to go, roughly. We are coming up on the

NASA-S-74-6707

APOLLO SOYUZ TEST PROJECT



mission. We haven't had really any problems; the first year or so of training we homed in on language study, on getting to know our own vehicle, and on trips to the Soviet Union, getting some acquaintance with their vehicle and their simulators and so forth.

Now, right now, what is our state in the training process?

Well, in the last month we have been having joint simulations with the Soviets as well as a lot of integrated simulations on our own site to hone our skills.

It has been especially interesting for me because we have been sitting in a simulator in Houston talking to Aleksey Leonov and Valeriy Kubasov in their Soyuz simulator in Star City, and most of the time the communications through phone lines circuits have really been excellent.

Sometimes it is like they have been sitting in the room next to us. This really, somehow, amazes me, that we can train in this fashion. It has been very useful.

We have simulated some malfunctions, failures in the com systems, and one rendevouz sim. They gave us problems that forced us to slip two revolutions, to see how the Soviets could adapt to that as well as ourselves.

All in all, this is necessary and very worthwhile.

We have had several trips to the Soviet Union. The cosmonauts have had several trips here. Where we have gone through communications, simulator and mockup training.

The American crew is now leaving this weekend for the last training trip to the Soviet Union.

With that, let's have the next slide.

(Slide.)

We will be at Star City. This is a group picture at Star City on one of the previous trips.

You know, Houston is a place where we design spacecraft, we train astronauts, we conduct missions, we

24A

do a number of things.

I think Star City is different. It is a lot like a military base in that they have commissaries, movies, PX, things that you would find at a military base.

They have apartment buildings. The cosmonauts live in the apartment buildings in the background.

It is a place where they are not devoted to conducting the mission. They do that somewhere else. They strictly train cosmonauts. They have a good gym there.

The center, of course, is named after Yuri Gagarin who you see in the statue.

Next slide.

(Slide.)

Their bay area where they keep mockups. We have this shot showing a Soyuz mockup and in the background a Salyut mockup, Salyut being their space station which, of course, we are not using on this mission.

The mockups are almost invaluable for training for the phase of flight, that 44 hours, when we are all together, practicing transfers, practicing everything that we will do in their spacecraft.

Next slide, please.

(Slide.)

The next two weeks we will be spending some more time in their new Soyuz simulator. This is a picture of it.

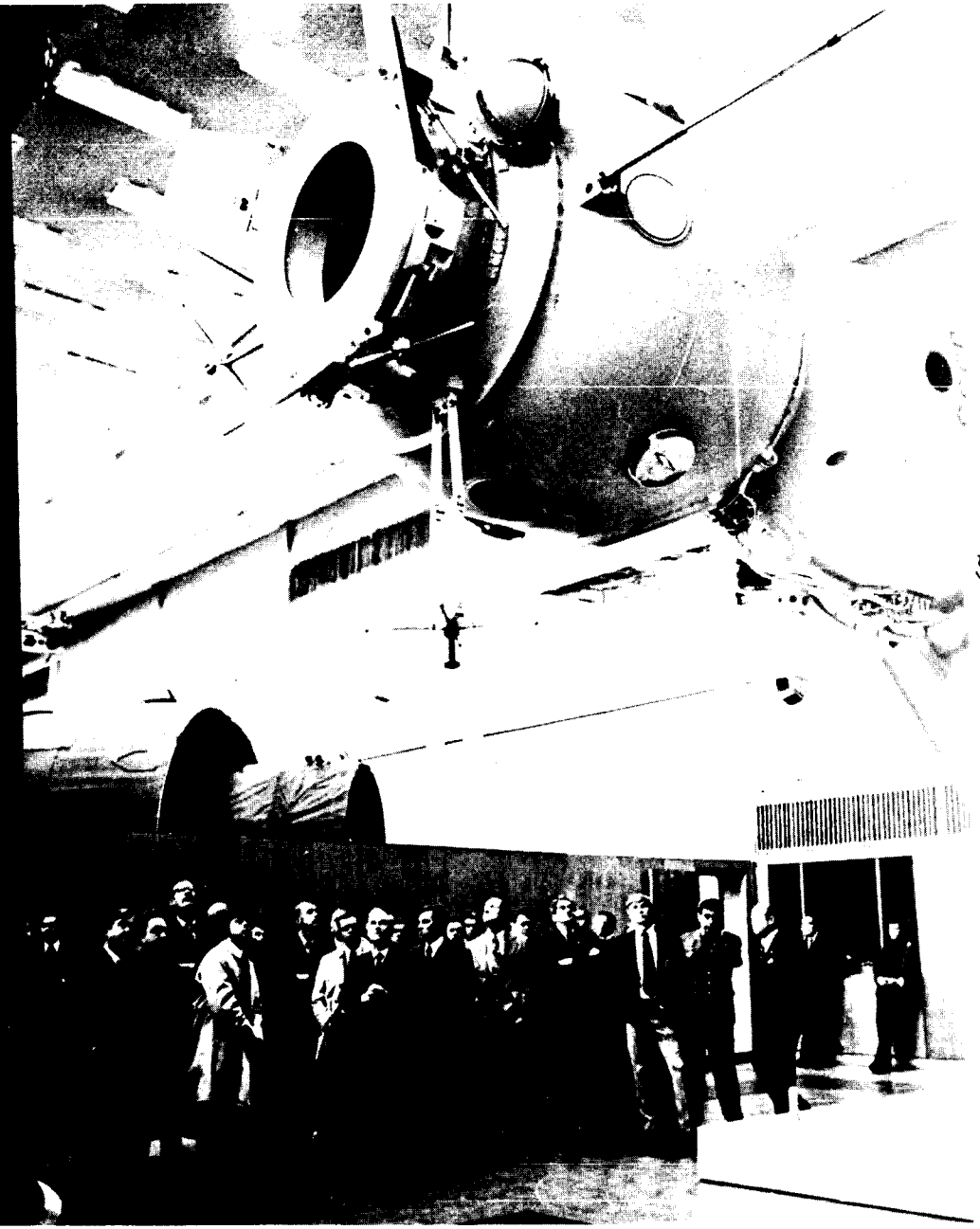
The upper part with the Soyuz lettering, Soyuz CCCP, is the simulation of their orbital module. The lower part, of course, connected to it, that is their descent vehicle.

It is a brand-new simulator, very nice facility, room for instructors in the panels around the periphery of it. And, of course, the crew inside.

They have a capability to put in a limited

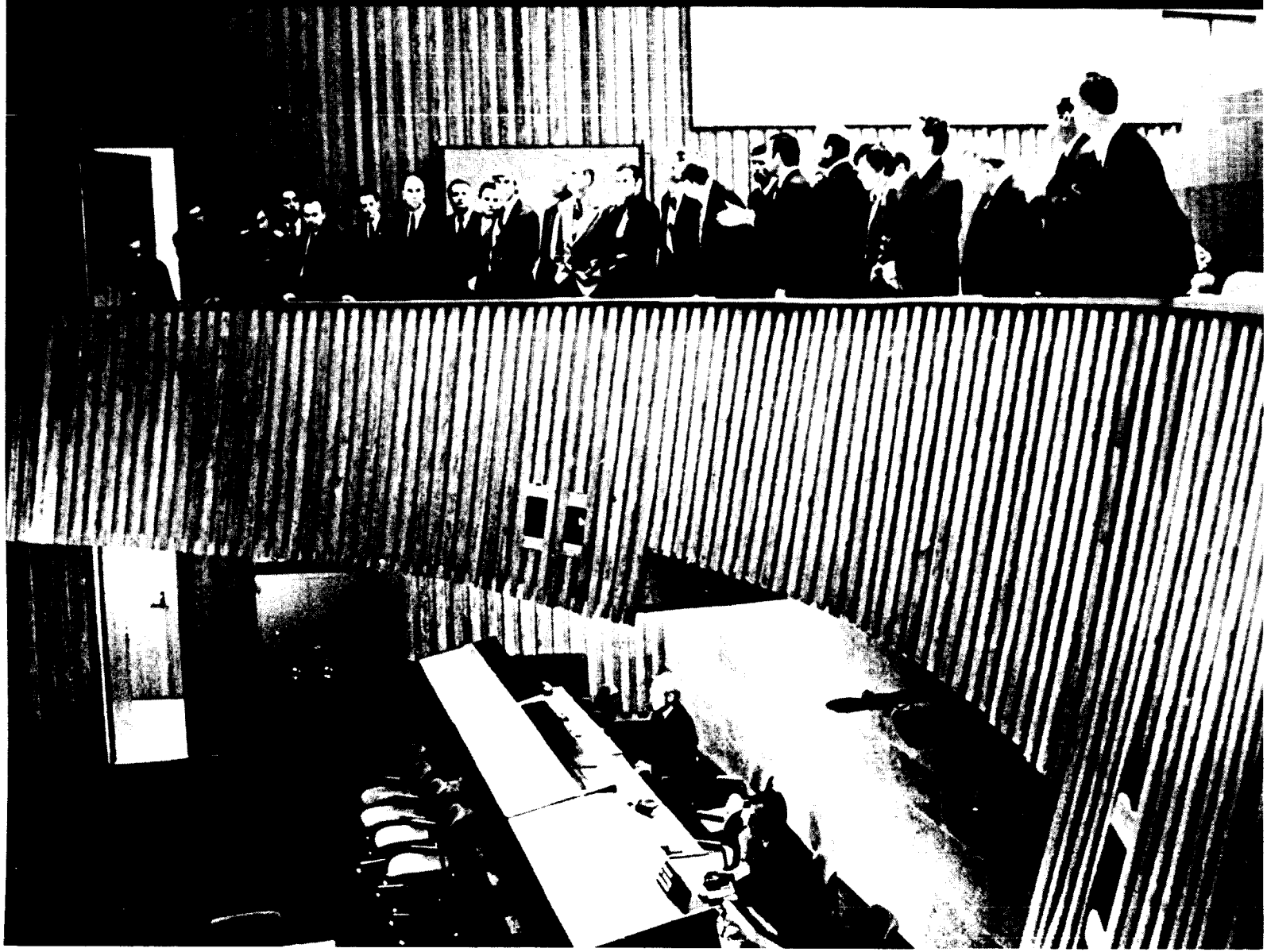
NASA-S-73-3497

STAR CITY



25B

USSR CONTROL CENTER



USSR CONTROL CENTER AT KALININ, NEAR MOSCOW

number of malfunctions so that the crew can train much in the same way as we train.

Next slide.

(Slide.)

In the Soviet Union we will be doing other kinds of training. Communications training, for example. I don't believe this shot was taken at Star City. This looks like a Houston shot. But we will be doing the same sort of thing here.

Here you see on the left Aleksey, the middle Valeriy and on the right an instructor going over some of the English terminology that they would have to use in a normal or in an emergency type docking, for example, or during the rendevouz.

We do a lot of this training, talking to the same people that we will be talking to in space. And that does several things for us. It get us used to their language, their way of talking, their accents. We can understand their English better; they can understand our Russian better.

Next slide.

(Slide.)

A few of us have been to their control center. I personally haven't. It will be a first chance to see the control center on the outskirts of Moscow.

Next slide.

(Slide.)

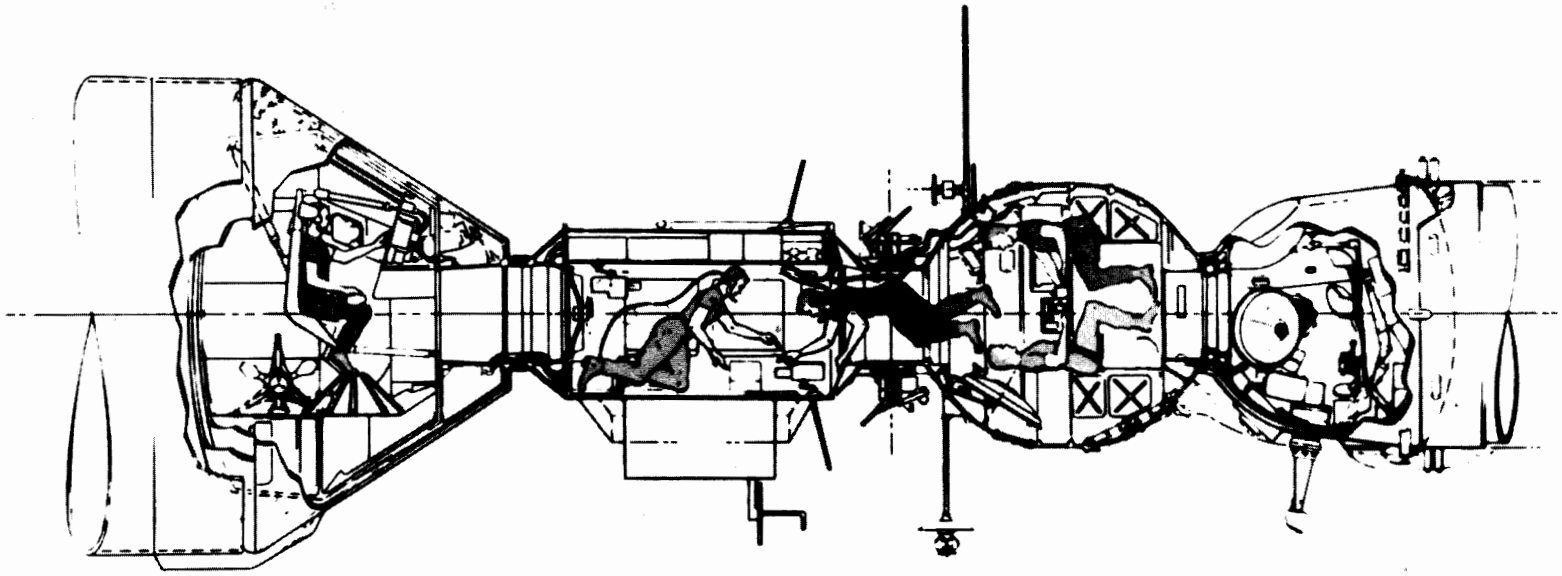
And here is another view of that control center.

Next slide.

(Slide.)

Well, we feel we have very good relationship with the Soviet crew. We know them very well by now. We have taken them a lot of places in the U.S. They have showed us around parts of the Soviet Union. We think that knowing each other well will pay off in space and it is

INTERNAL ARRANGEMENT OF DOCKED CONFIGURATION



really a prerequisite.

This shot depicts some of our transfers when we will be practicing communication with each other, going through transfers, and so forth.

I think Chet covered the transfers and I don't plan to do that. But this shot is good in that it shows the one man in the command module, two men in the process of going through the docking module, and, of course, two men in the Soviet orbital module.

Let's talk a minute about what we will be doing during the 44 hours up there when we are docked in this configuration.

Of course, the transfers themselves take a lot of time. It is a situation where we have to change our pressures, atmosphere compositions, between -- during the middle of these transfers.

Incidentally, I hear a little bit of ring. Are you getting me okay, or are you getting a ring.

I guess its okay.

Well, anyway, we have four transfers and the four transfers have in between them three periods of what we call joint activity.

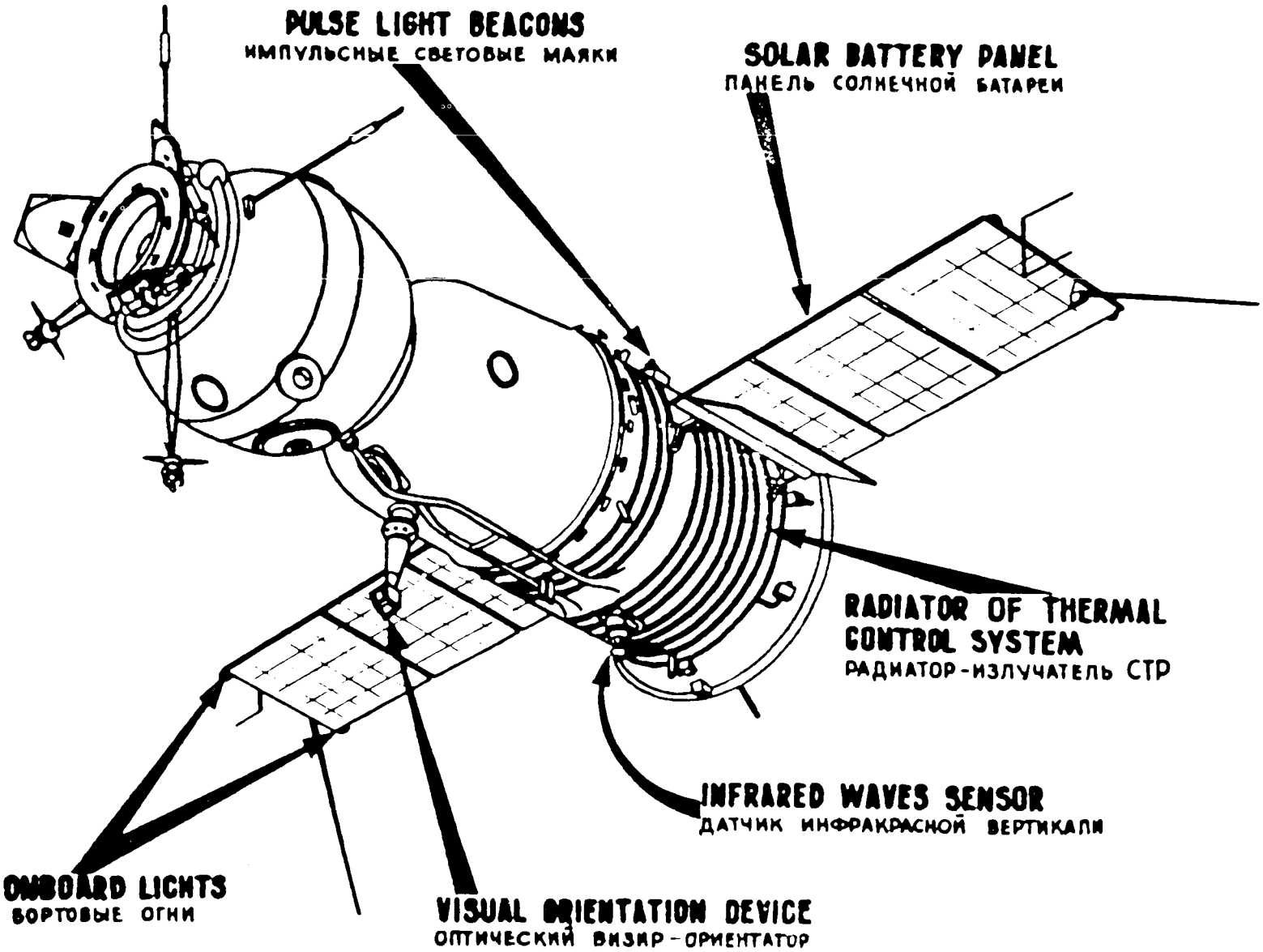
The first period is a little over an hour long on the first day, and the longest period of joint activity is Number 2 on the second day when we have over four hours in each others' spacecraft.

The things that will be done are joint experiments. For example, the zone forming fungi, the furnace experiment, and the microbial exchange.

We hope to give Americans a view of what the Soviet spacecraft looks like on orbit. Valeriy Kubasov will be explaining that to folks here in the United States while I am standing beside him over in the orbital module and in the descent vehicle.

At the same time Tom Stafford will be using a little Russian language, explaining our vehicle to the Russian people, which is quite a challenge, the language.

We are planning possibly to have some tours


PULSE LIGHT BEACONS
ИМПУЛЬСНЫЕ СВЕТОВЫЕ МАЯКИ
SOLAR BATTERY PANEL
ПАНЕЛЬ СОЛНЕЧНОЙ БАТАРЕИ
RADIATOR OF THERMAL CONTROL SYSTEM
РАДИАТОР-ИЗЛУЧАТЕЛЬ СТР
INFRARED WAVES SENSOR
ДАТЧИК ИНФРАКРАСНОЙ ВЕРТИКАЛИ
ONBOARD LIGHTS
БОРТОВЫЕ ОГНИ
VISUAL ORIENTATION DEVICE
ОПТИЧЕСКИЙ ВИЗИР-ОРИЕНТАТОР

where we let our cameras, TV cameras look at the Soviet Union and somebody, perhaps Kubasov will describe what you are seeing as we are going over the Soviet Union.

We will have the gift and document exchanges, some demonstrations for school kids to be used after the flight in movie form showing zero G demonstrations.

We will have press conferences, joint meals, exercise sessions.

All in all, we will have quite a bit going on and I would say the most important things that we will be doing will probably be in the experiment area and the most interesting and important thing, too, might be the first greeting.

Let's move on to the next slide.

(Slide.)

Okay. A little bit about Soyuz.

Spacecraft. Some of you I know are quite familiar with it. Others probably not too familiar at all. So I will aim to hit for the center, I guess.

I think the first thing we can do is describe some of the things on the outside.

We have three modules, orbital module, descent vehicle and instrument vehicle.

This is really the control center of Soyuz. It is the only part of the vehicle that comes back for reentry.

Attached to that is a work compartment and a sleep compartment, experiment compartment, place where the cosmonauts eat. Orbital module. And this is the equivalent of our service module. It has the batteries, propellent tanks, et cetera.

Of course, we have fuel cells for electrical power. The Russians use solar cells. These wings are in the sunshine. They are what produce electrical power for Soyuz

And, of course, Soyuz therefore has to be in the sunlight, oriented in the right way, for a certain number of

hours out of each day.

We have a lot of antennas, high frequency, VHF. We have our VHF-AM, American antenna. We have umbilicals connecting the spacecraft with electrical wiring and so forth.

We have a periscope. The Russians dock. They really don't have a window that they can look through the front of their vehicle with, so they use a periscope.

At the same time, they want to orient for a deorbit burn and their automatic systems aren't capable of doing this for them; they can manually, by reference -- by looking at the horizon through their periscope, align their vehicle so that it is in a deorbit burn attitude.

The -- of course you all know that is the docking system.

Next slide, please.

(Slide.)

This is a little more detailed view. This is the mockup in Star City. One thing that can be seen here that can't be seen in some other shots is their main engine. They have a main engine here. It is 417 kilograms of thrust which means about 900 pounds.

It is backed up by two-bore(?) backup engine.

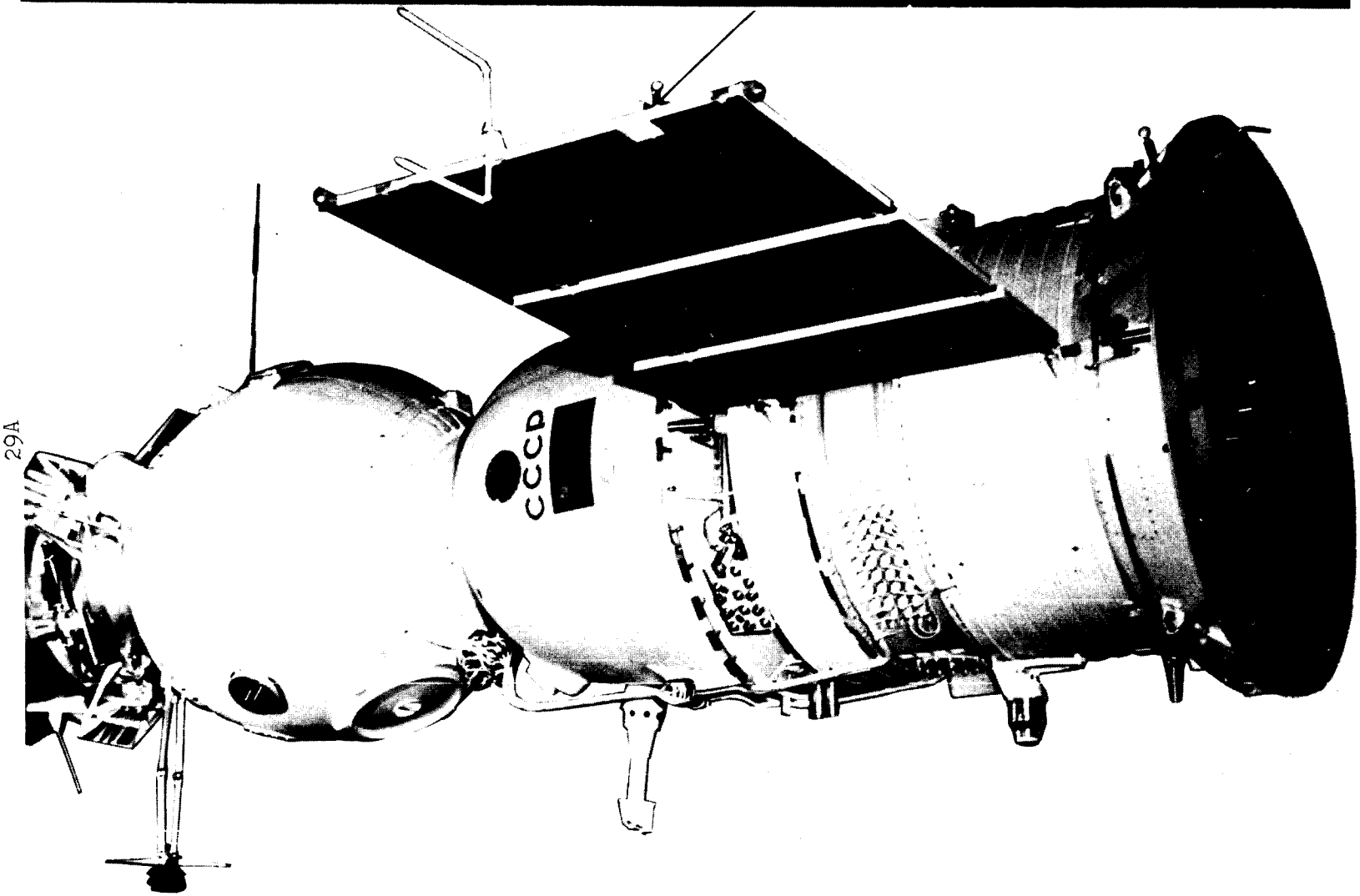
The Soyuz spacecraft has reaction control engines just the same as ours does for maneuvering and for small translation maneuvers and rotation also.

They have a -- their primary system for this consists of 10 kilogram thrusters. That is about 20 pounds. Fourteen of these oriented mainly around the center of their spacecraft, and with a few on this aft ring.

Backup attitude control system has one kilogram thrusters, and there are eight of those all on this back ring.

Of course, for deorbit they get rid of this vehicle so they need yet another set of attitude control thrusters, and there are eight of those on their descent vehicle for reentry. And here you can see one of them. That

SOYUZ SPACECRAFT



29A

just happens to be one that is visible.

Other things that you can see on this particular photo, there are two windows in the orbital module and there are two -- this is one of them -- in the descent vehicle.

When their vehicle is more or less in a local horizontal or a earth orbit local horizontal mode of attitude, of course, we can look out this window, see the earth.

I think another thing shown here is we have a lot of wiring connectors, pyrotechnic devices are located along here for separation of these various vehicles.

That is for deorbit.

Next slide.

(Slide.)

Okay. Looking at yet another view, the inside, their main engine has four tanks for propellent; hydrozene and nitric oxide derivatives are used for propelling the Soyuz with this engine. That is an example of one of the tanks.

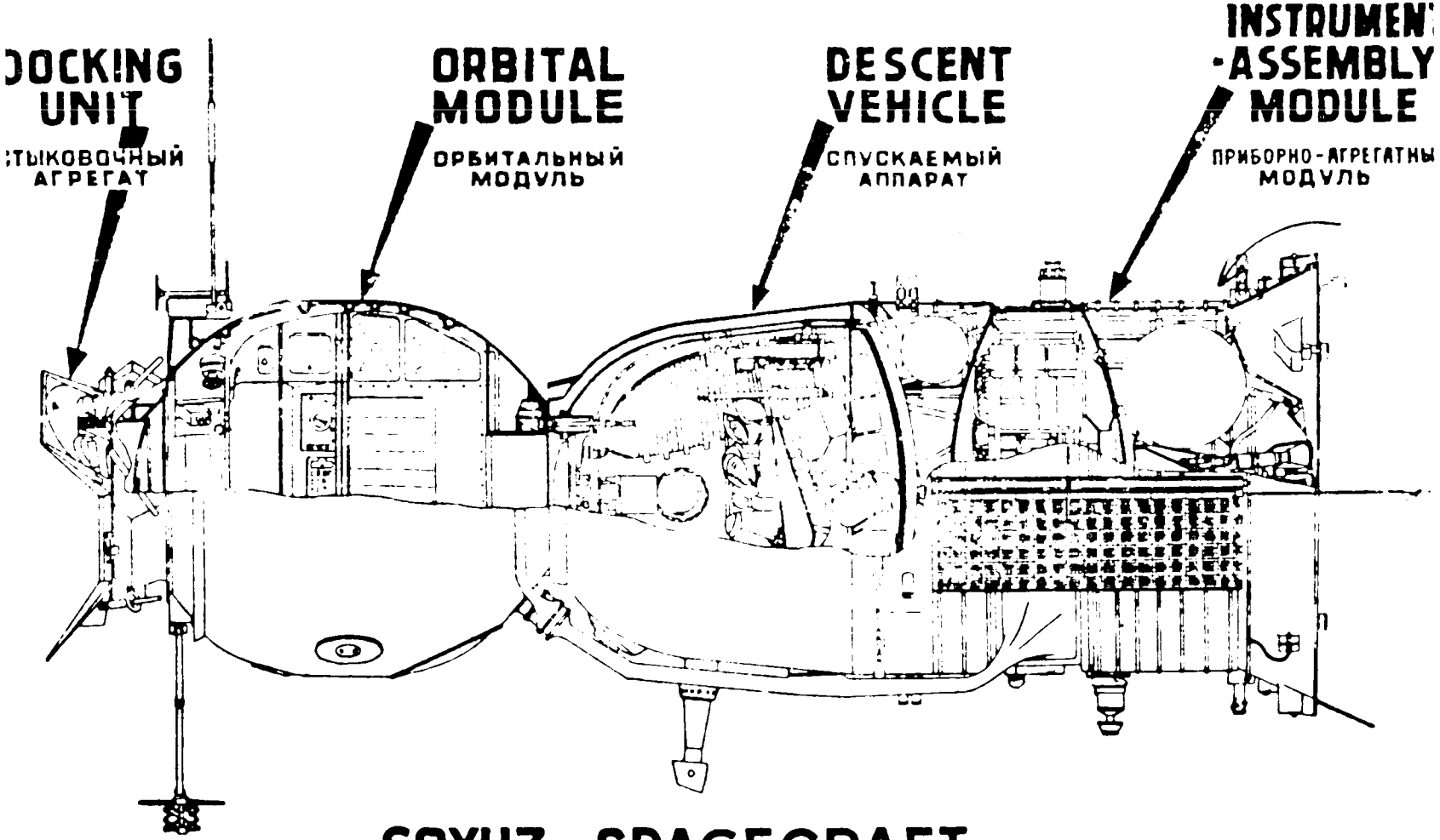
You can see here their infrared sensor which senses the horizion, keeps their spacecraft level with the earth when they want it to be that way.

Up here the solar sensor, the sensor that looks at the sun and allows them, when they want their solar batteries to be in the sun, it allows them to keep this sensor locked on the sun and, well, permits stabilization in two axes, the spacecraft stabilization in two axes with respect to the sun. And in the third axis they just let it rotate.

So the overall effect is that sometimes they are in a mode when they are charging their batteries, so to speak, such that the Soyuz is slowly rotating at about this point -- or about this axis.

Let's go to this vehicle again, the descent vehicle. We will have better shots of it later.

The two cosmonauts in this case are located here



SOYUZ SPACECRAFT

КОСМИЧЕСКИЙ КОРАБЛЬ „СОЮЗ"

for ascent and descent. They wear their suits a lot more than we do. And this is, once again, the work compartment.

Something you can see here is the table which is presently in a stowed position which comes out, can be used for eating, various things.

You have a compartment here that we can see where food is stored. They have a food heater. We use hot water to mix with dry food to come up with soup, whatever, come up with foods that are light to carry into space and tasty when we get there because they are hot. And they have the normal amount of water in them.

The Soviets, on the other hand, go up with foods that -- a lot of their foods are in toothpaste type tubes. The tubes that look like toothpaste tubes. That can be put into a heater and heated up by means of heater rather than by means of hot water.

Next slide.

(Slide.)

This is the hatch that Tom and Deke will be coming through on the first transfer into the orbital module. And we will brush past it. It is just interesting to note that it is a cable-operated hatch.

These are the boundaries of the hatch, and there is a little handwheel that is turned to open it.

Next slide.

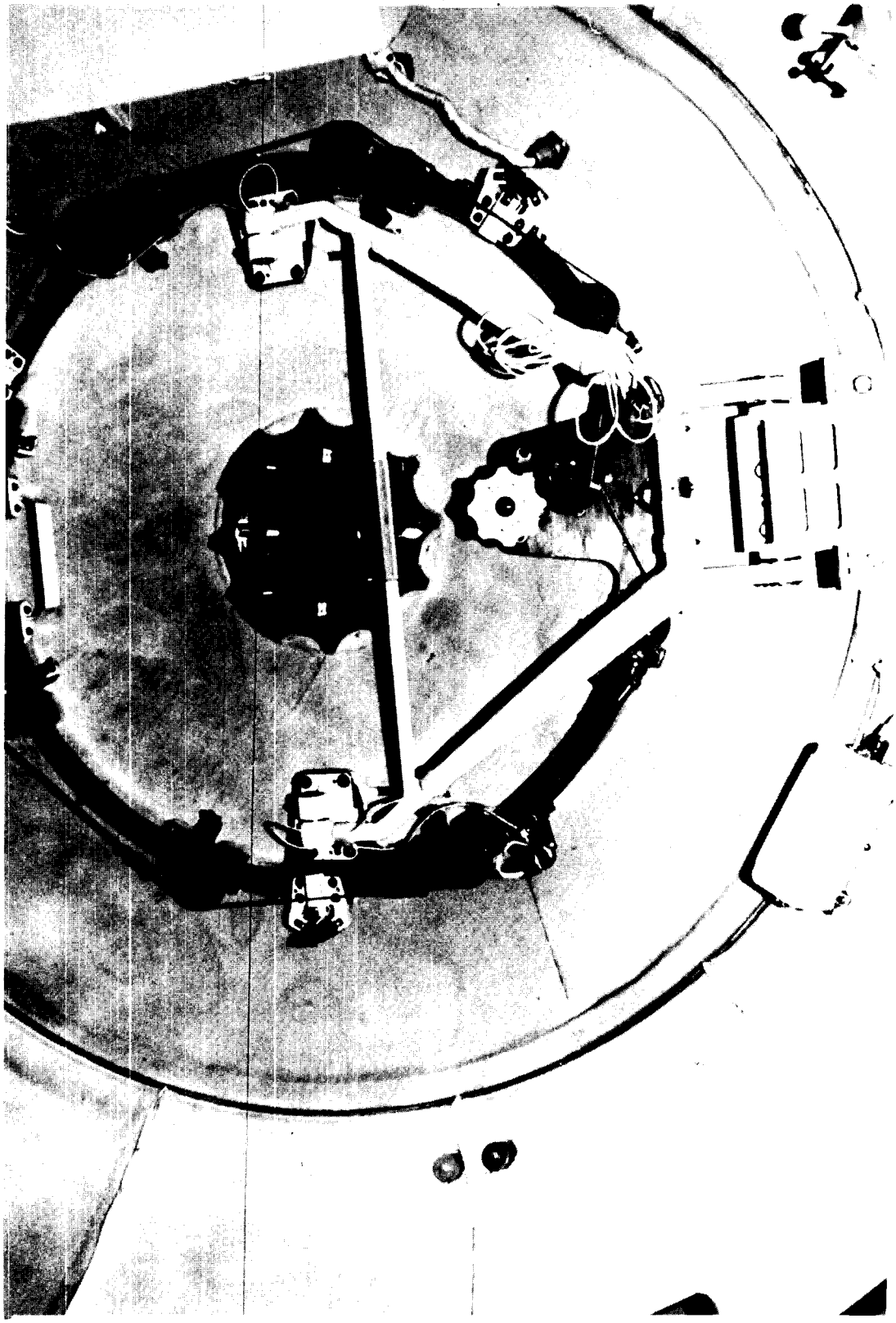
(Slide.)

Of course, we will all use that hatch from time to time.

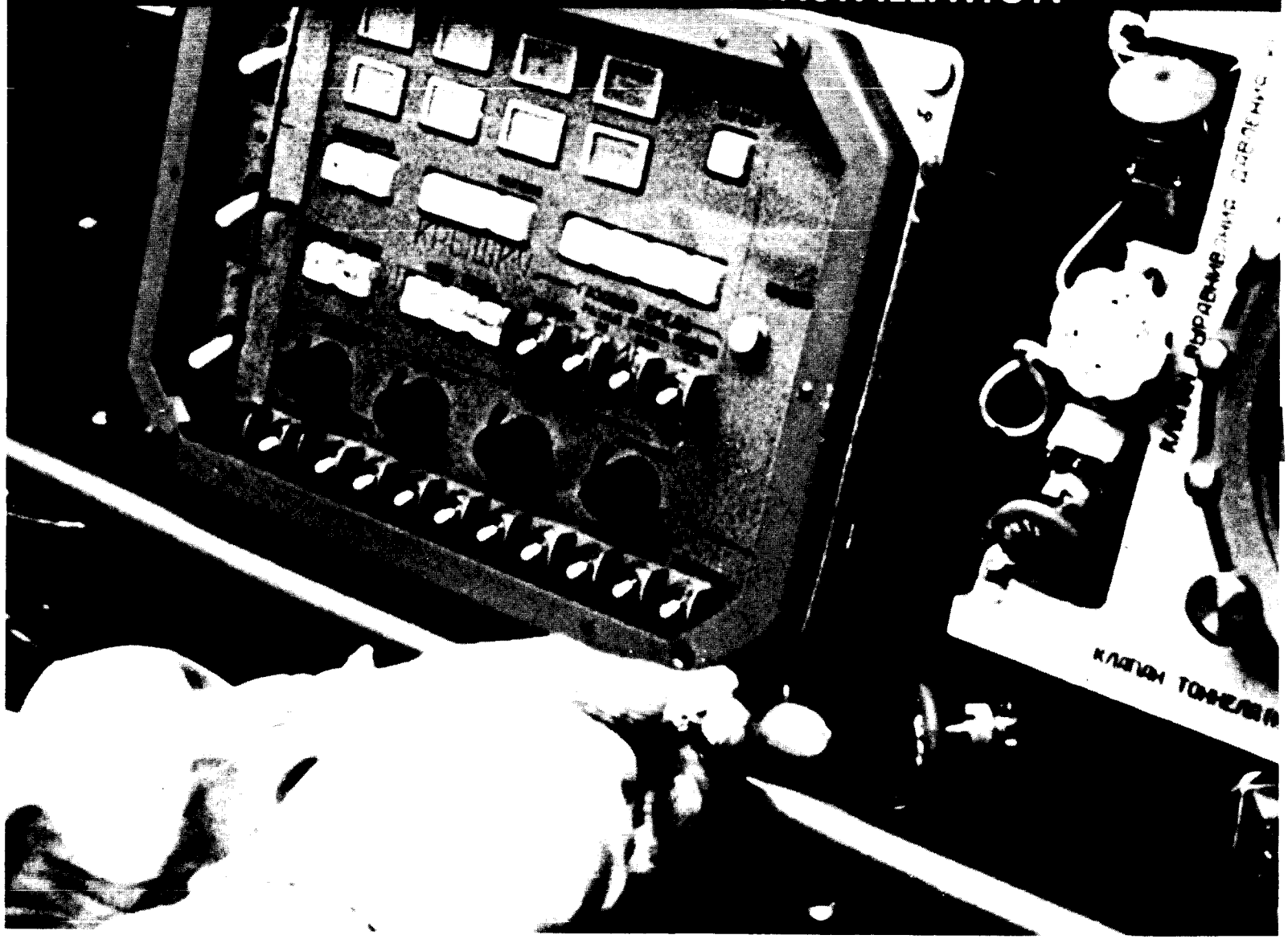
In the orbital module we don't have a lot of switches. It is a place mainly for living, working, experiments. But there are a few. This is their main switch panel, you might say, with electric lights and, oh, few switches for communication, that sort of thing.

Next slide.

(Slide.)



SOYUZ ORBITAL MODULE
CONTROL AND DISPLAY INSTALLATION



Right next to the panel I just described in the orbital module is their pressure integrity panel. The Soviets are very, very conscious of pressure leaks, having the right amount of atmosphere for the cosmonauts to breathe in their spacecraft, and I think you can look back on the history and you can understand why that is.

They, of course, lost a crew because they had a pressure leak in a spacecraft. So they are very careful about checking pressure in the tunnel between the docking module and orbital module, also pressure of their orbital module, et cetera.

This is just a pressure gauge and these are various valves that are used to connect the gauge to certain compartments that they want to check the pressure of, and other valves for changing the flow of gas between compartments.

Next slide.

(Slide.)

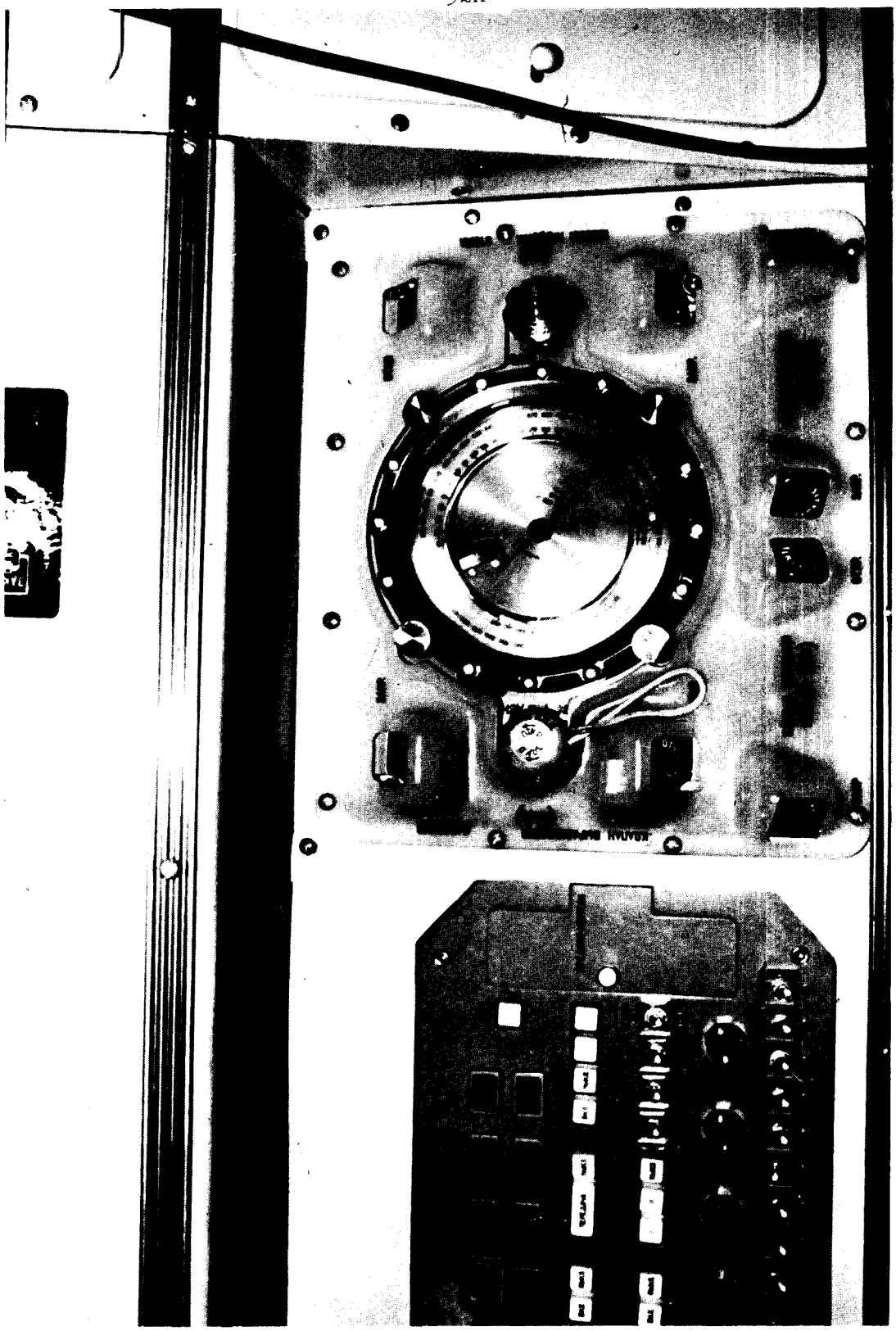
Okay. We won't have a lot of reason during the flight to go down and use this compartment, but we will go down there just to look around.

Of course, the control area, for their spacecraft. Chet told you about a few things. We have -- right here is something that looks like an airplane stick. All that is is a thing that has a push button on it for push to talk, for talking over your communications systems.

You have your hand controllers, rotation and translation, located on either side of the couch which is right here.

You have here a device which is used before automatic maneuvers -- for automatic maneuvers, for loading the amount of the maneuver into their control system in three axes. And all you do is dial in the number of units that you want to change your spacecraft attitude. It sounds something like a teletype when it goes to work and it loads those angles into their control system. And then the spacecraft makes an automatic maneuver.

This can be programmed by the crew or by the ground.



Down here, during their engine burns they have an indicator which shows the Delta V, the amount of thrust that is being accumulated during the burn.

There are other -- this panel we will cover over there.

We have, as Chet mentioned, the valves for supporting their suited operation here. And, of course, what is sometimes called by us the juke box, a device that, right here, that replaces a lot of -- well, which is used instead of switches in many cases, and which is used to program their spacecraft maneuvers. And that is a very, well, interesting box in that -- I say it is called a juke box because you press one button to call up a column on a rotating drum and then when you get that column you can look at various functions down the column such as turn on a light or start a maneuver, and you can turn that function on or off.

I think in our spacecraft this same sort of thing is done by circuit breakers, by switches, and, of course, by computer.

So it is kind of a question of how they went one way and we went another way for programming what we want done in the computer and turning switches on and off.

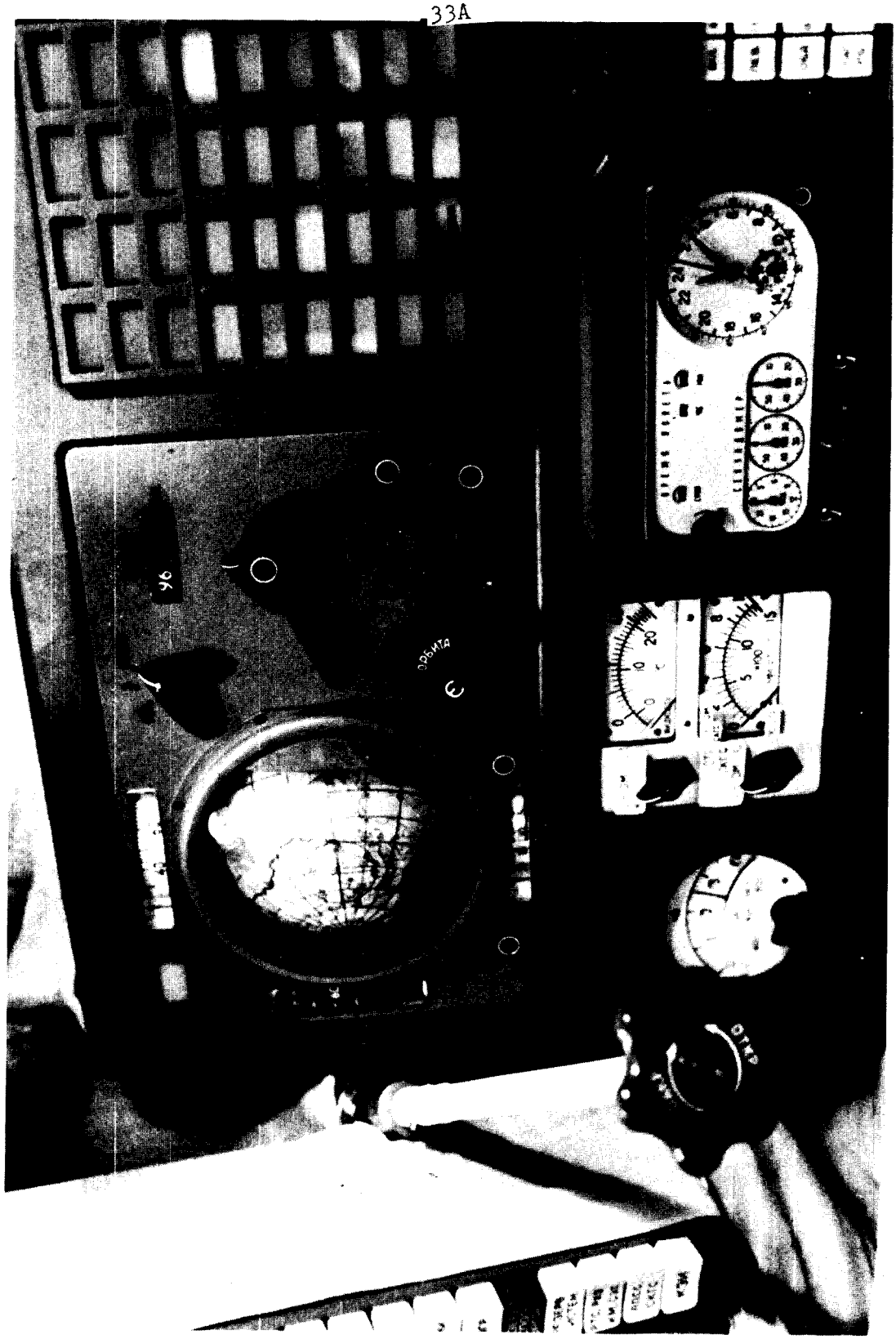
When the cosmonaut is in orbit he can't -- he doesn't have some displays that we have, but he has one or two different type.

For example, here is a navigation display that shows him where he is over the surface of the earth and other information, too. Here is latitude, present latitude, longitude, orbital period -- right there it is 96 minutes. And the number of the orbit he is on. And, well, a switch here that can switch him between various modes on this hemisphere.

For example, he can throw this switch and all of a sudden the earth will move to show him where his landing point will be if he were to make a landing later on.

We have a voltamp gauge here. This is an example of a temperature pressure meter. And this is their clock.

We -- in our spacecraft we have a digital clock which tells us what time it is in time past liftoff. This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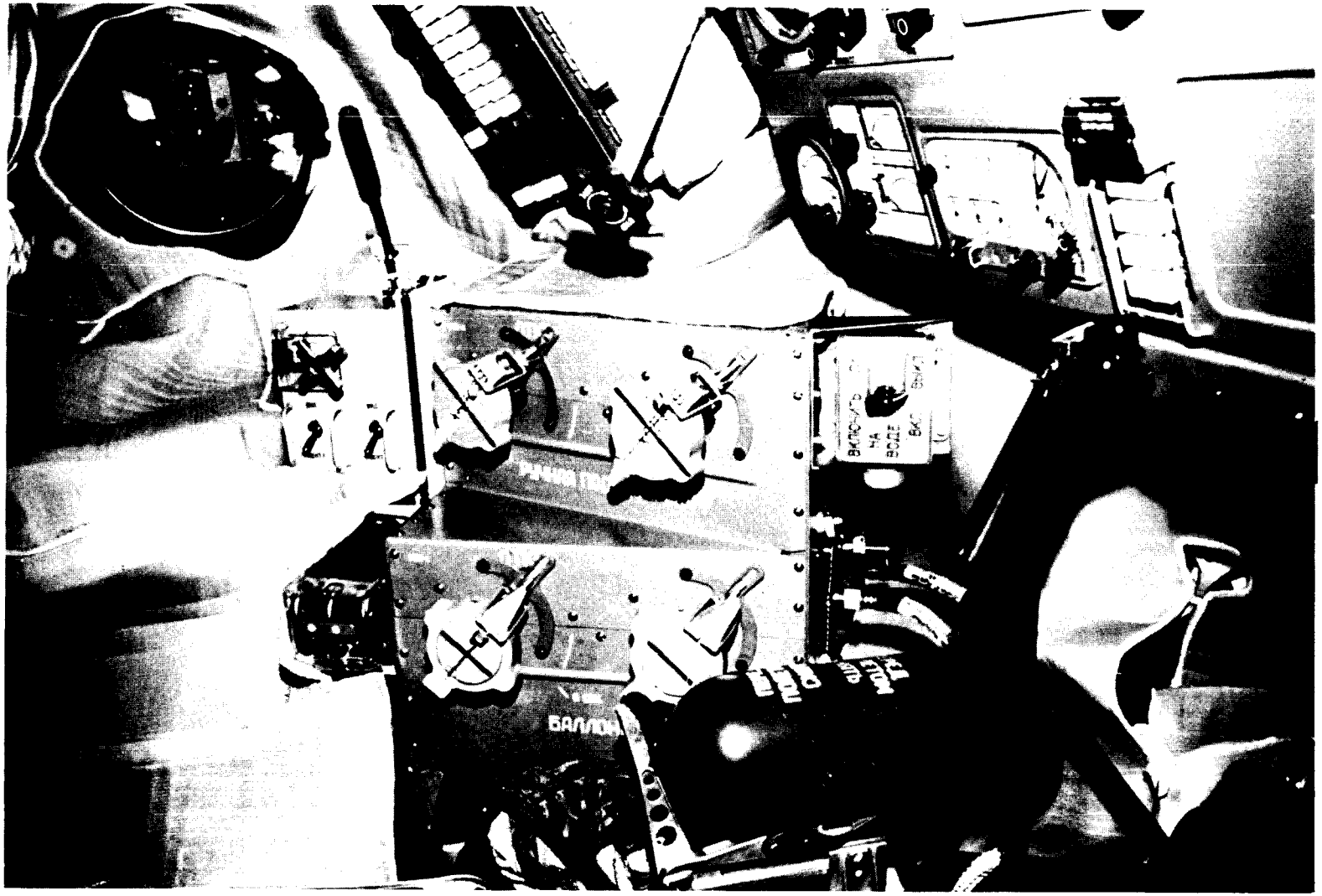
SOYUZ INTERIOR



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is a clock for Moscow time. This is a clock that shows elapse time after liftoff. This is a stopwatch.

So when you look at these panels, at first glance they are sort of hard to understand, first of all because they are in Russian, but when you look at them a little longer they have many similarities and a few interesting differences from ours.

This is a caution and warning panel which alerts the cosmonaut if something is wrong in one of the systems.

Next slide, please.

(Slide.)

QUESTION: Do either of those pictures show what they see when they look through their periscope?

BRAND: No. No, they don't.

QUESTION: What is it that they look at when they want to look through the periscope? Is it a matter of pearing through the instrument or not?

BRAND: Well, the periscope sort of looks like a circular TV tube. It is about that big around, and it has little windows -- let's see, eight little windows around the edge of it.

When you look through the periscope it looks like, oh, just looking into a display where you are looking straight down on the earth and seeing the earth go by and if you want to determine whether or not your nose is pointed forwards or at some angle with respect to the direction of travel, you can move a device which aligns itself with the direction of travel of some object across the scope so that you can see what your direction of movement is.

It is a drift sight. It is really what I am saying this latter device is. And it is simply like looking in -- sort of like looking into a circular TV tube.

Of course, then you can change its position and suddenly you are looking out in front of you and if you happen to be docking, you see -- well, like when we are docking with them on the first docking they will see us coming up toward them.

Okay. Next slide.

QUESTION: You haven't described that one yet.

BRAND: Okay. Well, this is sort of a duplication of one or two things I have described, but let's look at the things I haven't.

These are some switches. They have a lot fewer switches than we do. These are important functions. These happen to be guards so that they don't quickly throw these switches without thinking about it.

And this is simply electronic display and you can call up various information on that. You can look at pressures, temperatures, position in pitch and yaw in the IR sensor -- or readout in pitch and yaw. Things like that.

If you want to call up a display to look at, you go to their electromechanical pushbutton device to switch up what you want to see and then chances are you see little lines on the side here somewhere which can be compared -- which are electronic displayed lines which can be compared to a scale on the side to give you a reading of whatever you are interested in.

Not nearly as sophisticated as some CRT displays that you see now that have, well, digital readouts all over them and things like that.

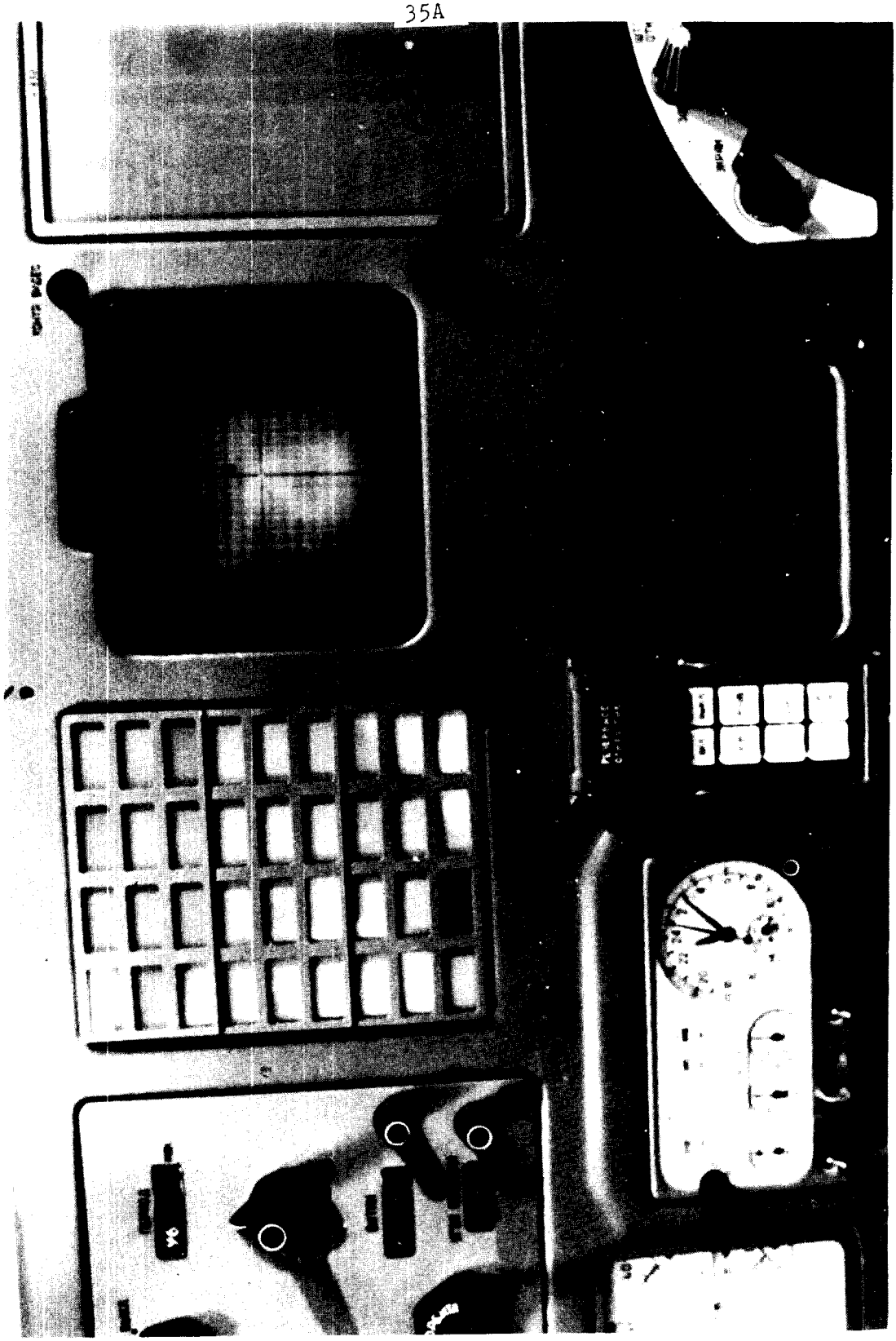
Next slide.

(Slide.)

Okay. We have talked a little bit about Soyuz. Chet really covered the 27 experiments that we have. And I think any one of those experiments could be the source of a long discussion.

What I wanted to do was just hit one example of an experiment we have in a little more depth, and I picked this one because it happens to be visual observations experiment that requires a lot of our training time and, since we are so intimately involved in it, let me go through a few examples of what we will be looking at, the types of things we will be looking at from orbit, and the information, the types of information we will be hoping to get after we undock from the Soviets and perhaps now and then before we dock with them, too.

This is an example of a hurricane, looking down on



it. The weather people are trying to build models of hurricanes. If we can find a hurricane which probably would be better if we didn't because it always means a hurricane is trouble for someone -- but if we can find a hurricane, get stereo photos of it, they can measure the slope of the wall that surrounds the eye, for example; they can check the textures and the pattern of the hurricane itself, to improve their model.

Next slide, please.

(Slide.)

We will do a lot of looking at the oceans. It turns out that -- well, I think the last Skylab mission made great gains in this area. They found some new currents. They found the extensive currents that were previously less understood.

Here is an example of the Falkland Current. You can just barely see it on this photograph coming up the east coast of South America toward Brazil and then going out to sea.

The Falkland Current is lighter in color generally -- well, there are currents that are rich in nutrients, in microorganisms. They show up as a different color from orbit.

It is said that photography really can't do the color changes justice, that a human eyeball can see a lot of color change that photography doesn't.

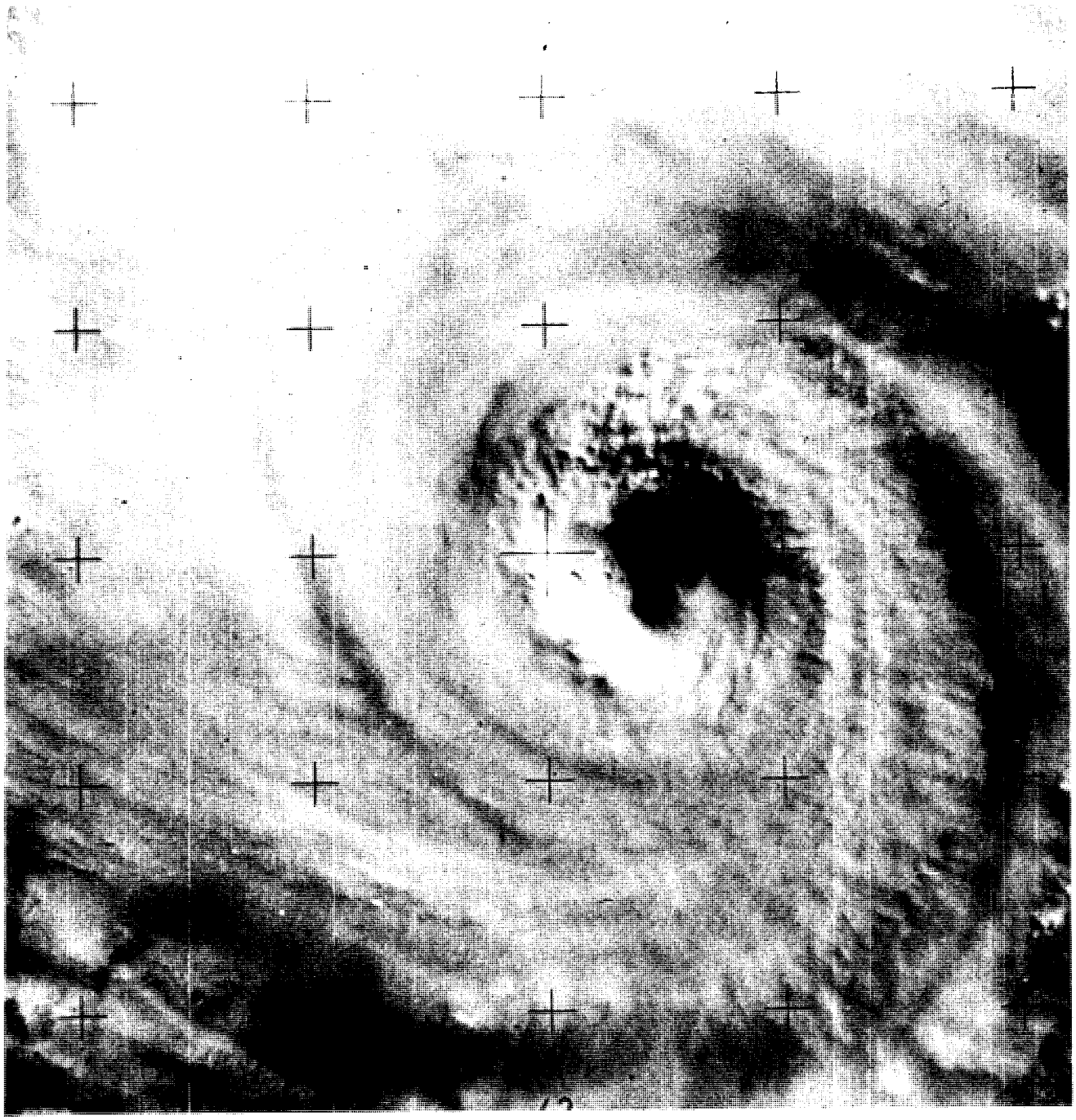
We will be looking for currents all over the world trying to find out where they go and, believe it or not, that is not -- for as long as we have had ships, that is really not as well understood as you might think.

Next slide, please.

(Slide.)

How about red tide? Red tide is something that gives fishermen and beaches a lot of trouble. Microorganism which is toxic to fish.

Here we have the shoreline along Huntington Beach in California, the southern part of L.A. These splotches are photographs of red tide.



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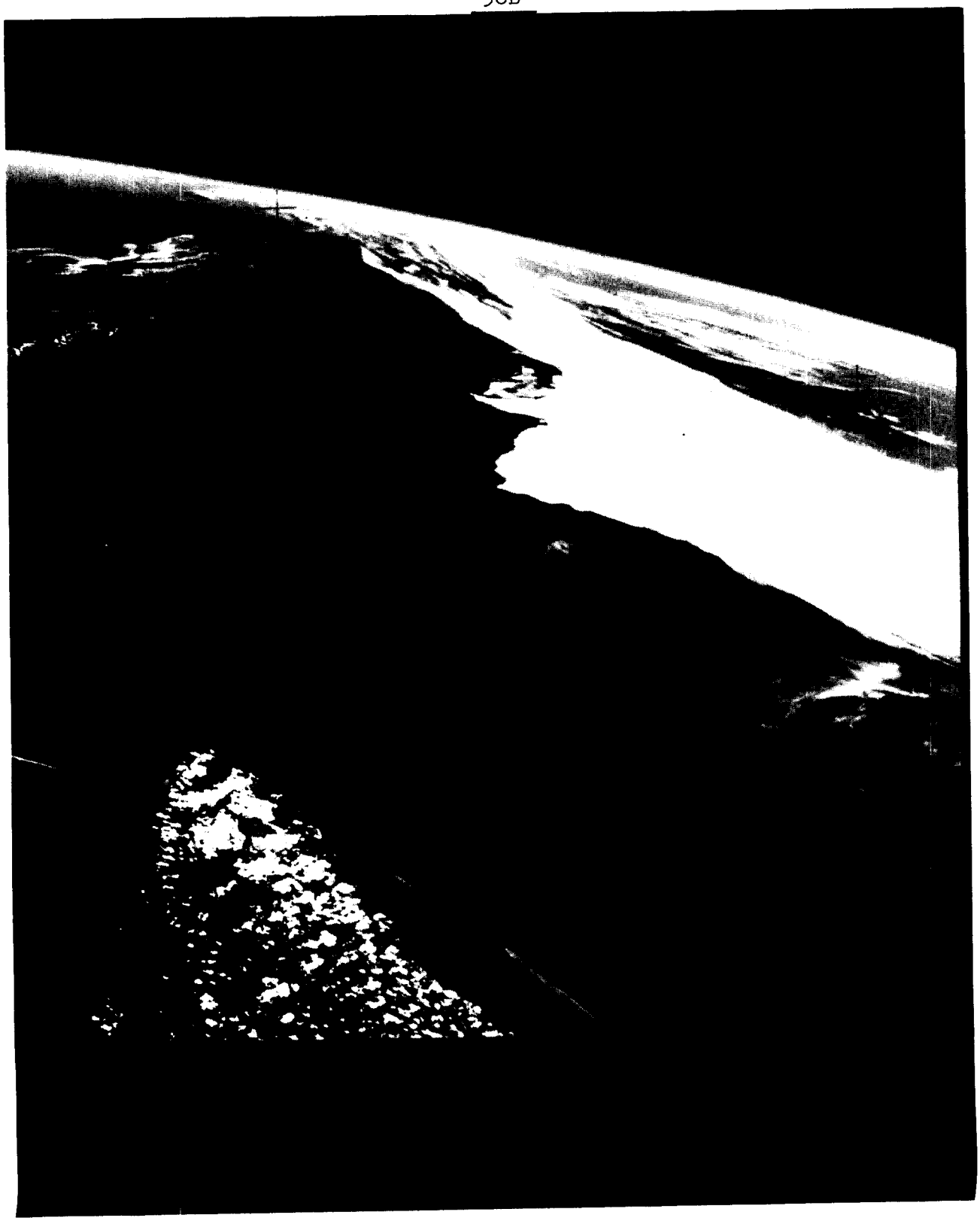


I don't know if we can hope to understand exactly how red tide originates, but anything we can learn about it by finding out where it seems to originate from orbit, where it goes, how it happens to end up on certain beaches, and perhaps to warn fishermen and beaches -- beach tourists and so forth -- might be of some help. Something that will -- we will just get a glimpse at on this mission. But I think when the shuttle comes along there will be a lot of monitoring of things like this.

Next slide.

(Slide.)

Incidentally, the red tide areas are particularly in California, Florida and New England. Those are the areas of particular interest.

We will be doing some geology. You are looking at California on its side. This is the Salton Sea, Emperial Valley. The geologists are especially interested in the extent of faults, where they go, do some of them offset.

We got a lot of this information in Skylab but, for example, on the basis of more recent thinking on the part of geologists -- well, they are starting to think that there were old faults that were parallel to the San Andreas fault which is along here in California.

There is an interest in finding out if you had offsets in here of some of these old faults -- it all goes for a better understanding of the earth's crust, and it comes under the heading of science, understanding our world better.

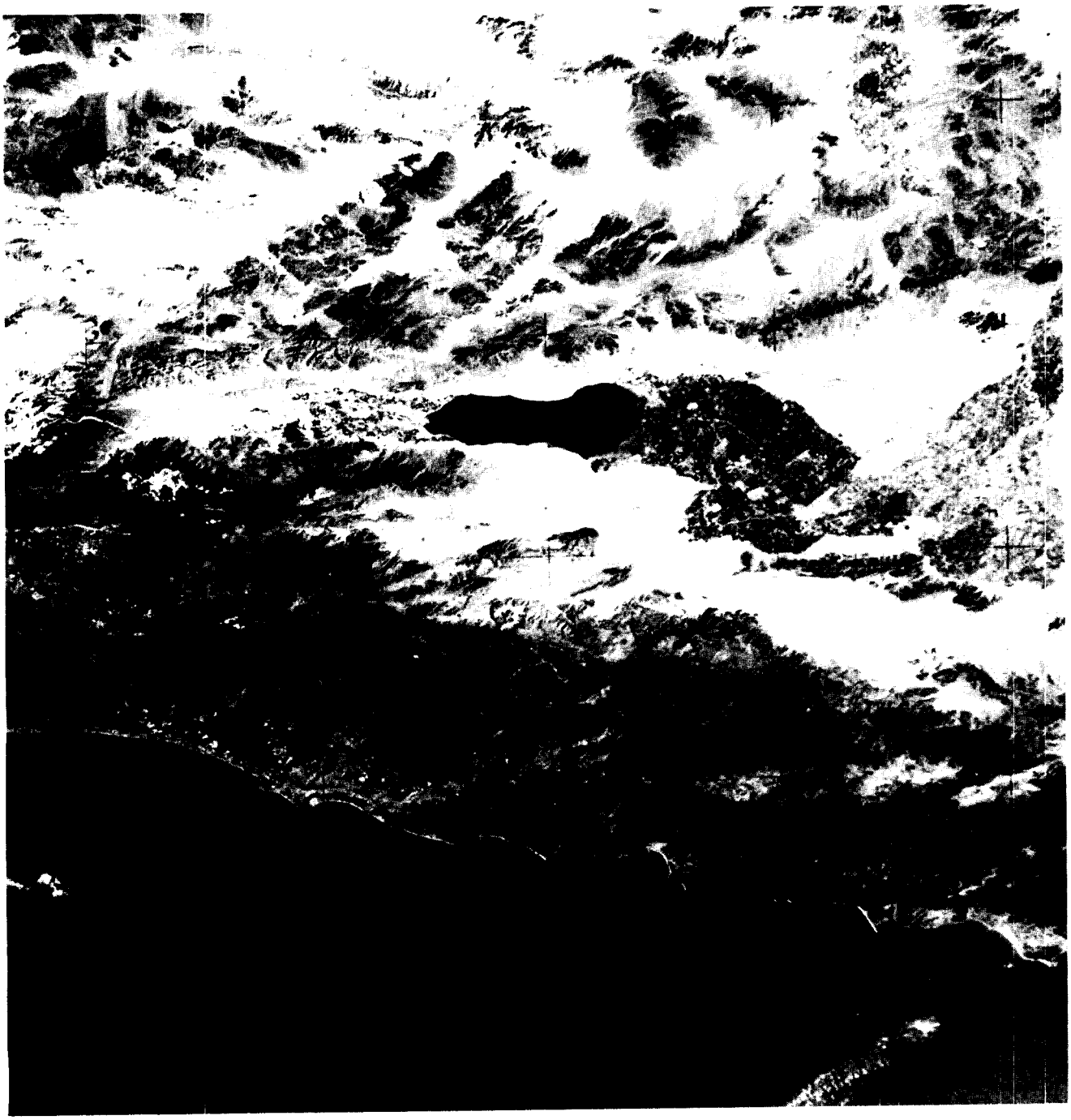
Next slide.

(Slide.)

We will be passing over deserts, want to do several things with deserts. Map various types of deserts, dunes, the extent of dunes.

This is a desert scene in Africa. Here you can see old dunes streaking across the desert more or less wiping out everything in their path. And other examples of younger dunes.

For example, you can look here and you can see an orientation of dunes in this direction as well as in



42

this direction.

It is important to understand these things simply because dunes are taking over parts of the world, deserts are, and it would be nice if we understood their direction of travel.

As you know, they are having a drought in Africa now. So it is -- some people are very aware of the increasing size of deserts in that part of the world.

Next slide.

(Slide.)

Mapping snow. Snow cover for irrigation, flood protection purposes. Just for better understanding of the extent of watersheds.

We have a program in cooperation with the Indian government for doing this, taking pictures of the Hamalayas, and they will be, at the same time, their people on the ground going over some of these areas. There will be airplanes supporting the operation.

Next slide.

(Slide.)

That is all for the visual sightings. One thing always to remember is we feel we have a lot of good experiments. We have a great number of different types of activities going on in this mission. But the first and foremost is to get up there and rendevouz with these guys and make that part of the mission a success.

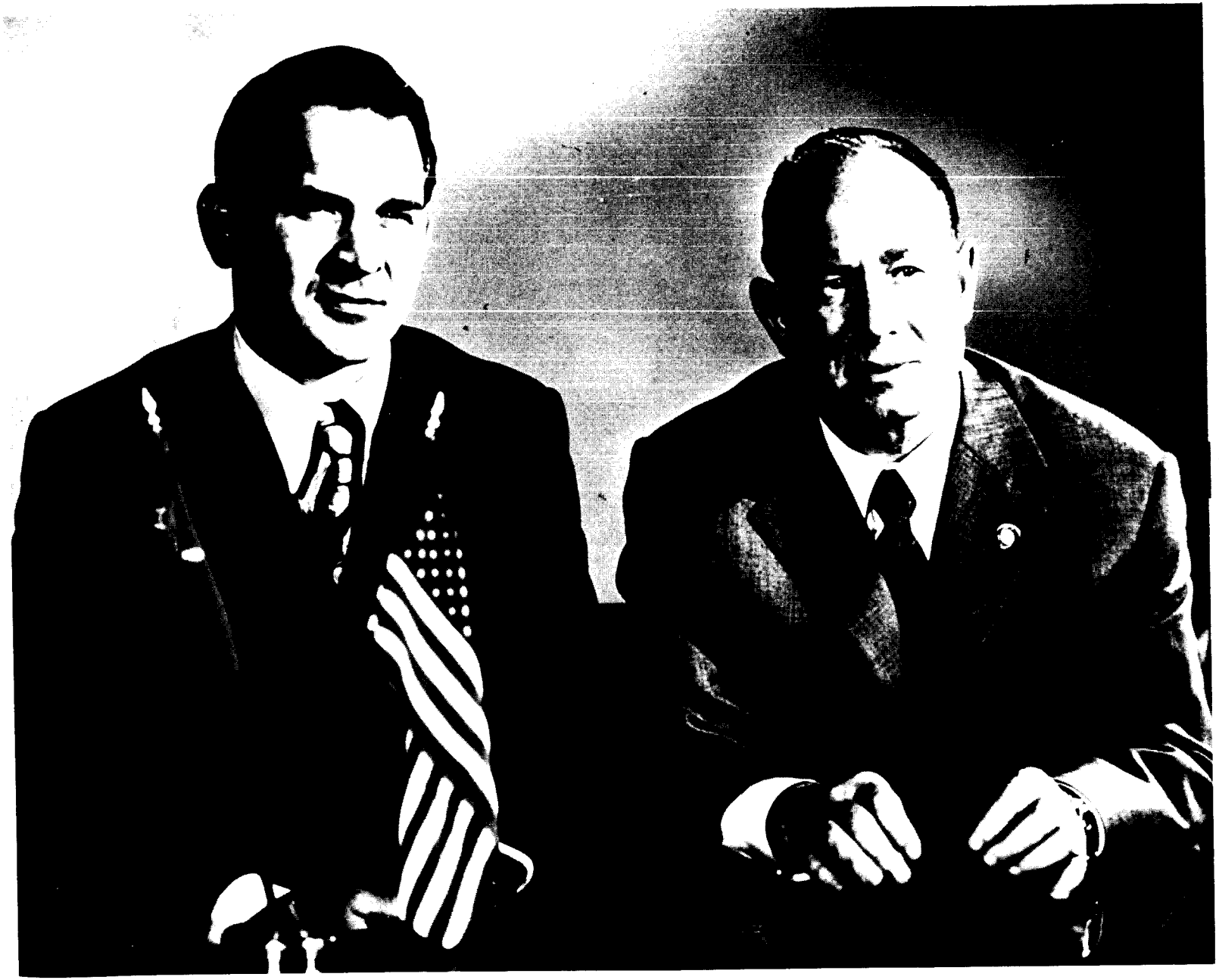
Thank you.

LEE: If we can run that film. It is five minutes. Then we will open it up for questions.

I will try to narrate this. And I made just some cuts from various films so it ruined the interpreter's discussion. But this is the Soyuz launch. A little different angle than what you saw previously.

The Project Soyuz-Apollo is the only thing I recognize.

(FILM PRESENTATION WITH COMMENT AS FOLLOWS:)



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LEE: This is a milling of the docking system, an automatic milling system, as you can see, and these happen to be the back part of the pedals, the flight hardware.

This is a thermal chamber in which -- can you hear me all right -- in which they have done their thermal tests.

This is a picture of the docking module -- docking system. I am sorry. In the thermal chamber. And you can see here they are doing some cold temperature tests at this time.

Now, this is a setup of their docking system mounted on the orbital module, and this is a suspension system. They are ready to get some dynamic tests here of the docking system. They had a docking module mockup and they had the passive section mounted there and they conducted some tests that you will see here, coming in at different angles, different speeds, to check out the capability.

That gives you a good idea how the docking systems will work.

Now, that is in the extended position. Of course they would have to go through the retract phase after that soft dock, as I call it.

What I was trying to show here was the system they use for overcoming the one G effect. This is a mechanical system mounted to give it a zero G effect. We do a lot of this with the computer for comparison purposes. This is quite effective.

Here we see some work on the outside of the spacecraft. They do a great deal, as you will see, welding on their spacecraft. And these are the different techniques, spot welding. They appear to have that -- very fine technological capability in welding.

Now, here you can see again spot welding on the orbital module.

That gives you a good idea of the amount of welding they do on their spacecraft.

That is the orbital module. This lady is

running the X-ray machine to check the welding that they have done, seen here. And you will see they also do a snifter test such as we do, checking for leaks and so forth.

This is their altitude chamber with their orbital module in the altitude chamber.

These are control panels for their altitude chamber, and you will see shortly the vacuum that they are pulling.

I thought this was a very interesting shot of a rig that they have to -- for the hatch in there, the grinding process. That thing went out of whack, they would ruin the whole orbital module.

I thought this was interesting to show you how they mount their instruments. Those of you who might be familiar with ours, we sort of mount our instruments in panels and then install the whole panel. We have various number of panels. But they sort of do separate instruments, based on what you see here.

These are the instruments that Vance just described in the orbital module.

This is some exterior work on the antennas.

There is two orbital modules.

These films, when we got them, I am sure, are a period before -- they are not the orbital modules that will be used in our mission.

Their launch vehicles and the spacecraft were completed, as we understand, the latter part of '74 and are now at Baykonur.

(END OF FILM PRESENTATION.)

LEE: Now, these cuts were taken from several films. I haven't shown you all of it. There is a lot of detail I didn't think you would be interested in. But we do have other details.

I guess that completes our formal part of the presentation, and we are ready to take questions.

QUESTION: Chet, in your rundown of the flight

plan there, did I understand you correctly -- did I understand correctly that Apollo is the only one active during the two docking maneuvers?

LEE: Let me qualify what we mean by active. As far as maneuvering goes, yes, because of -- that is the point I was trying to make when I showed you their payload capability. They don't carry as much propellent as we do. And we have taken the -- with our capability, we will do all the maneuvering.

Their docking system has a passive and active mode. But we will actually do the maneuvering up to close the distance, close the gap.

QUESTION: Chet, it has never been clear to me why the Soviets agreed to have two all-up rockets and two all-up crews.

Did they ever give you any comment on their reliability of the booster?

LEE: No, Mark, they haven't, really.

Let's see if I can give you an overall answer. It may not be specific enough for you. But I think fundamentally this is the reason it went to that.

There was a question, of course, who goes first. Obviously we know, and the Soviets have indicated, that they are pretty well constrained on the launch azimuth that they go. They are usually -- you follow all their launch azimuths, they are about 51 degrees. And the reason for that is populated cities and mountains and their abort, where they abort to. They want to make safe for that.

With their payload capability, they are somewhat limited in the boost phase to do a yaw maneuver to correct for an error in coplanar.

We obviously have a greater capability. We can do a yaw maneuver -- I think we are carrying something like 2000 pounds that we could use for a yaw maneuver to correct if we had to.

We certainly discussed who should go first and it was agreed, with all the abort conditions and all the

conditions, recovery and so forth, that get you down into your launch window, and with the capability of one launch azimuth, and with our capability of detanking and having five consecutive days, that it optimized the probability of both spacecraft getting into orbit successfully.

Then to support that they said okay, we will countdown too. So that if we should fail in our boost phase, we have another one. Or, if we get up there and something goes wrong, or if Soyuz is -- I mean if Apollo is delayed for a considerable amount of time even after we have orbited, we will have another one to come back in and launch to carry out the mission.

Specifically I think it comes down to the real capability of yaw, carrying amount of propellent and so forth, and the launch azimuth constraints.

We have a much wider window capability. And more consecutive days.

QUESTION: But they never gave you any figures on the reliability of their booster?

LEE: No.

Let me point out one other thing, Mark, that has to do with this.

After they pass L minus 4 hours, their launch vehicle is committed -- is good for 24 hours. If they don't go that day, they could still go the next day.

Once they get down to automatic sequence, they must roll that vehicle back and bring the other one up.

Now, you know from our experience that we can go down to just before autosequence and if we have a problem we can shut down, we can recycle for the next day, depending what the problem is.

QUESTION: Chet, are you and Vance satisfied with Busheyev's remark of the other day that the failure on 18 will not impact this because the two booster rockets are dissimilar and that the problem with the abort on the launch abort the other day was because of this dissimilarity?

It is our understanding that there was very little

dissimilarity between the various phases of the booster.

LEE: Well, obviously, Tom, I don't know what the difference is. Let me emphasize that Professor Busheyev was quite positive in underlining his statement that it -- that they saw no impact on the program technically or the scheduled launch date.

He did indicate that they had only done preliminary analysis to date, that we would get a follow-up message a week or ten days, so forth, depending on the status of their analysis, and that they would be prepared to discuss this in Moscow in May.

I think all things taken at this time, Tom, yes, we are satisfied and we are proceeding right down to launch date.

Now, if the analyses bring up something different, we may have to reconsider.

QUESTION: I am sorry. I haven't seen it anywhere. Did they tell you specifically what their preliminary analysis indicated?

LEE: Only that the problem was in the third stage and that they had a -- they aborted, that the spacecraft itself performed nominally, the reentry was good, the landing was relatively light and everything was all right except for that problem in the third stage, which they indicated was lack of stabilization, going off course.

QUESTION: Have they ever told you anything that they asked that you not repeat? In other words, anything that they would rather you know but you not tell the press, not make public?

(Laughter.)

LEE: Let me give you an example. The Soviets agreed to notify us five days in advance before the -- they told us. They would notify us five days in advance before the launch of Soyuz 16 so that we would be in a position to prepare to track because we wanted to do some joint tracking to verify the two tracking networks, the atmospheric models and the biases.

Our response was if we cannot -- since this was a

part of our joint mission, specifically tied to it, we were obligated by our practices to announce it to you ladies and gentlemen. They said, "We don't want you to do that." We said, "Okay, don't tell us. Don't give us five days' notice." And that's the way we did it.

QUESTION: A couple of, I guess, more technically oriented questions.

Can you tell me how much capbility, I guess it would be in Delta V feet per second the Soyuz launches with and its RCS system and its primary propulsion system?

LEE: I don't know. Vance?

BRAND: No. I really can't.

We gather that, you know -- we have RCS how goes it charts in our system, and from what I can gather, they use a method of keeping track not by these charts but by another method and, frankly, I have never seen the figures on it.

I know that it is fairly limited. For example, they have a limited capability to hold attitude for our stack in case we lost attitude control.

They can't do it for the whole mission.

Things like that.

LEE: That's a good point, Vance. In discussions of contingency situations with them, Craig, they really get their final propellent capability weighing just prior to launch.

They have indicated yes, that they will have a capability along with their own requirements, above their own requirements, that if we should have a problem and we go into a stabilization control problem, that they would have enough propellent to help stabilize us so that we could separate and reenter.

QUESTION: And another one that is related to that, on the fact that they don't have a whole lot of RCS to go around. They spin-stabilize in some missions. I know in Soyuz 9 they did for quite a long time. Do you know if the ASTP Soyuz will go into any spin-stabilization modes

between their maneuvers or prior to the time you guys get there?

BRAND: Okay. I was just about to say when we are there, no, of course, because we are holding attitude.

Before and after, I don't know, but I would assume they would have to.

QUESTION: I guess this is for Vance Brand. I get the impression from things that have been said here today and earlier that in their conversations and training sessions and so forth with you, the Russians have kept you on a pretty short lease and have put you into the picture about their part of program only on a strict need-to-know basis. Is this correct?

BRAND: I would say that on both sides we sort of have given information equally and more or less on a need-to-know basis.

Let me give one example. I don't know what they do when they launch. They don't know what I do. It was felt that somehow or another you had to scope this problem and it was -- there wouldn't be a lot gained, for example, if we trained or learned now to launch in their vehicle and vice versa, that we would scope it down to the parts where we more or less did have a need to know. Otherwise the training task is unmanageable.

In areas -- on the other hand, in areas where we are working together, I don't feel like they have been holding back or we have been holding back, either one.

I think that there has been, in these areas such as involving rendevous, docking, our joint periods together, transfers, I think that there has been a free flow of information there.

LEE: May I add to that, Bill? I have found that when we have a real good reason, they have generally -- they will come through with the answer. For example, we -- you know, we have been making our own assesments of the safety aspects and one of the areas we wanted more information was on the far-retardent material, and what they carried. And they provided us great detail of that and they provided us with material samples that we could conduct our own tests.

QUESTION: Jim White. Could I have a clarification, Chet? Is Apollo the main stabilization system during the docked period? Is it the only stabilization?

LEE: It is scheduled to do it all during the docked period.

QUESTION: To go back to the earlier question, if we had gone first, would we have had to have two all-up rockets and two all-up crews?

LEE: I don't think we would have planned on it, no, Mark. We don't have that capability. For example, we don't have two luts configured such as we do to launch that bird.

You know, we are just not in a position to do that.

QUESTION: What I am really getting at is it seems more logical, to me, to have the second country going up to have the two vehicles because once one is up, it is up, and then you want to have two tries --

LEE: Mark, I guess I don't agree with you. I guess we are permitted our own judgments on this thing. For this reason. We do have a greater capability. We are more flexible in our launch window, in our launch time.

I don't -- I tried to give you an idea purposefully on that chart where I showed you the number of launches and I don't know -- this booster, perhaps in the early days when I don't know anything about -- but in the record I displayed here, they had no booster failures. That is the first one.

You know, I am going to be puckered to beat hell on the launch of our 1-B. We haven't had any failures, either, and we have a 99.9 record. But that is a risk you take every time you launch.

QUESTION: I was just wondering in view of the -- this is a fairly preliminary attempt in this area of international cooperation. Have there been specific discussions of what kinds of missions might follow this up in the area of U.S.-Soviet space cooperation?

LEE: Very minimal at this stage. There have been discussions by the top-level management of NASA, and

will be. They have talked about future events during like the shuttle era, and that.

We have, I think, led to where we are now flying some life science experiments and some of theirs are scheduled to fly life science experiments in some of their unmanned vehicles.

We don't have anything to go with until the shuttle era. And, quite frankly, the Soviets have emphasized a great deal -- they are very dedicated to being a success on this and they have concentrated all their efforts on it.

There have been preliminary discussions but nothing specific.

QUESTION: What sort of methods of evaluation on a cooperative basis have been set up for after this flight? In other words, what kind of contact will there be between NASA and the Soviets to evaluate the flight and then possibly to add to what might be done in the future?

LEE: The working groups that I described very briefly will continue. There will be a joint report made after the mission. They will submit a portion and we will submit a portion. We will have a joint report made. I have forgotten whether it is three months, six months. But there will be a final report submitted on the mission. And the working groups I am sure will have several meetings with various parts of the working groups and it certainly depends on the progress of the mission. It depends what occurs during the mission.

But there is to be a joint report and it will be done through the working groups.

VOICE: Vance, when do you go to Baykonur? How long will you stay there? And do you have any idea of what you will see there?

BRAND: It is the end of this month. I forget --

LEE: The 28th.

BRAND: The 28th. Yes. It will be the 28th. We will do most of our work there on one day. We will see the Soyuz spacecraft. We will, I believe, get inside it and have an opportunity to, well, for example, check

equipment of ours that would have to fit in that spacecraft, plugs, TV, connectors, things like that.

We will more or less, I expect, have the same sort of a visit that they had when they saw ours down at Cape Kennedy.

QUESTION: Do you expect to see the launch vehicle, too?

LEE: They will. THey will kick the tires of the flight hardware.

QUESTION: Chet, where was that factory that we saw on the film?

LEE: Oh, I don't know. I am sorry. You mean when they were doing the -- I'm sorry. I don't know.

QUESTION: Going back to Soyuz 18, if that were us and we had had a launch abort, there would be a long investigation of that, probably be a delay beyond that July launch date, if it were Apollo 15, let's say, and 16 was scheduled three months down the pike. There would be a potential delay in that, wouldn't there?

LEE: Yes, Tom. I think --

QUESTION: I don't understand why everybody is so satisfied.

LEE: I think based on our experience, depending on what happened, of course, what the anomaly was, what data we had, what it would require to fix it, what confidence, I am sure that we would -- that's how we did it in Apollo 13. We did it on Skylab. We had an abort investigation.

I have to assume our contingency planning says that, and that would take time. A major catastrophe like Apollo 13 took a great deal of time.

Again, you know, it was an engine-out business, we might be able to fix that real fast. If it was an inertial guidance problem, we might be able to take care of it.

I understand what you are saying, yes. I would say normally we would probably be very thorough, and I don't

mean to infer that they aren't.

I don't know what the problem was.

QUESTION: A launch abort is a serious thing, isn't it?

LEE: Yes, sir. I am sure it would be to Vance. It would be to me, too.

(Laughter.)

QUESTION: Can you give me an idea of the length of the launch windows on our five different target dates?

LEE: Eight minutes.

QUESTION: Eight minutes?

LEE: Let me vary that just a little bit. We can vary it 8, 10, 12 minutes. But it is going to be right in that period of time.

QUESTION: How about the Soyuz?

LEE: They have about 10 minutes.

BRAND: Ten minutes, right.

LEE: We actually had a 16-minute window which we reduced -- we had 8 minutes on each side of nominal. We reduced it a little bit to allow us time -- actually it helps Cappie* to target better for his launch and it also permits more time in case they should slip to the 6th rev to do that one maneuver to give us word that everything is okay. So we took 4 to 6 minutes off the front end of the nominal opening of the nominal time to launch.

QUESTION: Chet, what is the run-out, our run-out cost on this flight and do you have any idea what the Russians have spent?

LEE: With regard to your first question, Don, we are going to come in within our $245 million Congress authorized for obligations.

With regard to the Soviets, I cannot give you an answer of dollars spent or rubles spent.

*Walt Kapryan, Launch Director at Kennedy Space Center

Quite frankly, we asked Professor Busheyev that question. He was unable to give us a specific answer in dollars or rubles. He did say, "I can assure you we are spending a great deal of resources. I admit that the Soyuz simplicity makes it a little simpler to manufacture and it is probably cheaper."

But they have launched two unmanned Soyuzes to check out modifications made for this specific mission. They have launched a precursor mission. And they have -- they will prepare two complete vehicles.

My conclusion, in all honestly, would have to be that they are spending the equivalent resources that we are, at least the equivalent.

QUESTION: Two questions. During the flight will there be any Soviet technical personnel at Houston, or vice versa?

LEE: Yes, there will. There will be Soviet technical specialists at Houston in one of the back rooms. And we will have approximately sixteen of our specialists in Moscow right off of their control center. In fact, they were over there for the simulation in March.

QUESTION: The map that you showed of ASTP communications coverage, unless I misinterpret it, seems to favor the Soviets quite a bit as far as life television is concerned.

Now, do I misinterpret this map, or is that the case? And why?

LEE: Yes, I think you do, Bill. Let me try to explain that.

The ATS-6, the ATS satellite that is performing now, was put up there specifically for conducting some experiments, educational things in our Appalachia and the Rocky Mountain area, and there is an agreement with India to move that in May to start their experiments in June, when their school year starts.

When we looked at this the first time, we made studies of what difference the ATS-6 would do for us if it were in the current location which is over the Galapagos, I believe, versus the location in the future, and we could find

little difference.

As a matter of fact, we have changed the time line in some instances to insure that the events we are wanting to cover will be covered. For example, the initial greeting, which we feel is very important. Live TV. We juggled that time line to insure that we would have it in the United States. And we also give them an opportunity to have it for a few minutes in the Soviet Union.

It really doesn't impact what you are going to see too much.

O'DONNELL: I might add that all the TV that comes down in the Soviet Union will be transmitted over here and released at Houston.

BRAND: Yes. ATS isn't really sending TV signals to the world. ATS is sending TV signals to a station in Madrid which are then sent various places. It is not --

LEE: From Madrid it will come to the control center where it is formulated into proper color and it will be made immediately available to all networks. And so will the Russian TV, comes immediately to us, and they have agreed to give us all air-to-ground and all real-time TV, including launch, right to our control center at Houston and it will be immediately made available to all networks.

O'DONNELL: John, did you have another question?

QUESTION: If for any reason you choose to delay going in July, what then? When the next time? Or will there be a next time?

LEE: Well, it depends when a decision comes up on that thing. If we have loaded hypergols which we do in June, we are pretty well committed with our hardware, about 110 days, it would take us into September or possibly October. We would have to go by that time.

If we haven't reached that point, we have a capability of delaying.

I would point out that the agreement that was signed between the Soviet Union and the United States said that they would conduct this mission in the latter part of

1975. So, as a commitment, this is what we plan.

We really targeted the early part of '75 because the earlier we went, the less costs per month. We have so much cost per month. If we go July, our costs are less than if we go in September or October or November.

That decision -- by that time, of course, we will have expended most of the funds we have to put in except for some operational costs. That would be a decision that would have to be discussed at that time.

QUESTION: I would like to ask Vance Brand if anything has come up in the early joint simulation that required any rethinking.

BRAND: I think only in minor respects. For example, in the rendevouz sim in which we slipped two revolutions. Everything worked rather well, but out of that we will get a myriad of small points that working groups will talk over in the next month or so.

Nothing major. Just minor things.

LEE: Most of the stuff is procedure.

BRAND: Yeah.

One thing, for example, a lot of our communication goes through Goddard and they simulated failing all of Goddard, which is just almost an impossible thing to have happen. And still the mission continued on.

I understand that they had a couple of hitches in getting the phone lines in order, but as a result of that, next time they will probably -- surely they will be an order faster.

So it has really been a tremendous exercise for this whole vast com process, that is tying the Soviet Union center to our center.

LEE: We have two more of those scheduled, Mark.

QUESTION: Is there any kind of estimate of the total number of hours that the American astronauts and the cosmonauts have actually trained together, either in a

simulator together or days or hours or anything of that sort?

LEE: Yes. We have a breakdown of that, Ed. I don't have it available. But we have emergency training, simulator training, language training, technical lecture training. We have those broken down, yes, sir. But I don't have them available right now.

BRAND: Just as an example, I think each of us spent about 20 hours in the Soyuz simulator in the last training session over there.

QUESTION: To recheck something -- I think I asked this of Bill or somebody at an earlier date. And it shouldn't be interpreted as reflecting on the success rate of the Soyuz booster, because they do launch those substantially in their military program, unmanned. But was that chart on all the previous Soyuz manned and unmanned flights down through the years compiled from public U.S. sources or nonpublic U.S. sources or did the Soviets supply that?

LEE: No, that was public. I think it was a TRW publication, as I recall. It is public.

O'DONNELL: Do you have any other questions?

I understand everybody didn't get all the handouts. We will have them all in the transcript when it is available.

Thank you very much.

(Whereupon, at 3:30 p.m., the press conference was concluded.)