

## NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

The attachment contains information affecting the National Defense of the United States within the meaning of the espionage laws, Title 18, U.S.C., Secs. 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

FOR INTERNAL ROUTING ONLY

[illegible]

ALL CONFIDENTIAL MATERIAL IN THE POSSESSION OF NASA MUST HAVE THIS FORM ATTACHED WHEN NOT IN STORAGE

☆ GPO : 1966 O-797-276

# CONFIDENTIAL

CONFIDENTIAL

MSC-04596



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

# APOLLO 15 MEDICAL DEBRIEFING

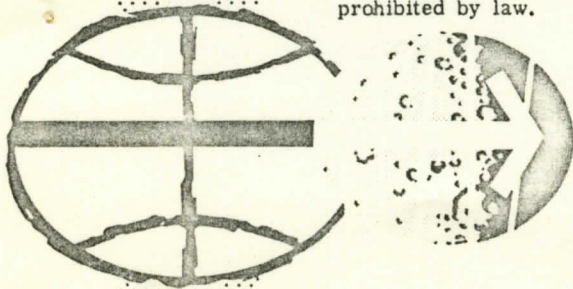
AUGUST 25, 1971

PREPARED BY:  
MEDICAL RESEARCH  
AND  
OPERATIONS DIVISION  
MEDICAL OPERATIONS OFFICE

GROUP 4  
Downgraded at 3-year  
intervals; declassified  
after 12 years

CLASSIFIED DOCUMENT - TITLE UNCLASSIFIED

This material contains information affecting the national defense of the United States within the meaning of the espionage laws, Title 18, U.S.C., Secs. 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.



MANNED SPACECRAFT CENTER  
HOUSTON, TEXAS

CONFIDENTIAL



UNCLASSIFIED

ii

APOLLO 15

MEDICAL DEBRIEFING TRANSCRIPTION

SECURITY CLASSIFICATION

The material contained herein has been transcribed into a working paper in order to facilitate review by interested MSC elements. This document, or portions thereof, may be declassified subject to the following guidelines:

Portions of the document will be classified CONFIDENTIAL, Group 4, to the extent that they: (1) define quantitative performance characteristics of the Apollo Spacecraft, (2) detail critical performance characteristics of Apollo crew systems and equipment, (3) provide technical details of significant launch vehicle malfunctions in actual flight or reveal actual launch trajectory data, (4) reveal medical data on flight crew members which can be considered privileged data, or (5) reveal other data which can be individually determined to require classification under the authority of the Apollo Program Security Classification Guide, SCG-11, Rev. 1, 1/1/66.

UNCLASSIFIED

## INTRODUCTION

This is the transcription of the Medical Debriefing from the Apollo 15 mission. Participants may be identified according to the following list.

SCOTT	David R. Scott	Commander
IRWIN	James B. Irwin	Lunar module pilot
WORDEN	Alfred M. Worden	Command module pilot
BERRY	Charles A. Berry, M.D.	
HAWKINS	Willard R. Hawkins, M.D.	
ZIEGLSCHMID	John. F. Zieglschmid, M.D.	
BAIRD	M. Keith Baird, M.D.	
RUMMEL	John A. Rummel, M.D.	
HOFFLER	George W. Hoffler, M.D.	
LEACH	Carolyn Leach, M.D.	
ALEXANDER	W. Carter Alexander, Ph. D.	
JOHNSON	Robert L. Johnson, M.D.	

A series of three dots (...) is used to designate those portions of the communications that could not be transcribed because of garbling. One dash (-) is used to indicate a speaker's pause or a self-interruption and subsequent completion of a thought. Two dashes (- -) are used to indicate an interruption by another speaker or a point at which a recording was terminated abruptly.



BERRY

This is the Apollo 15 Medical Debriefing, convening in building 4, on the 20th of August, 1971. The other thing that we want to do is to brief you so that you can get some idea about the kinds of things that have been going on. We'd like to have each of the guys brief you quickly and tell you the kinds of things that they have seen and why, or why, they think. And we'll end up then in time and give you some understanding of what that means to us and what the problem is as we view it right now and what some of the problems have been within the past 2 weeks here. We'll talk about a plan for how we hope to get at some of that. And that's what we'll try to do. Then we'll end up with the questions after that. That way, we can get them lined out because each of the areas has turned in a list of questions and I've got about 4 sheets - 3-1/2 sheets here and we've knocked out a bunch of those based on some of us talking, because some of us had some stuff that wasn't in here and we'll try to get all of that together. If we ask you something that you think you've answered somewhere else, just say that. I think we've tried to avoid doing all that all through the thing. I think we ought to start out then and just run down through the areas and let each one of you start, and since John's [Rummel] sitting at the head of the table over here, why don't we let him start off and give you a quick rundown on what has happened and what he's seen with the physiologists. Let me say one other thing at the outset here. I guess you guys are all aware that there are a couple of things that you ought to know. One of the things is, and I think you did some of them in here, but preflight base lines and data that you can really compare with all the time is one of the things that we always suffered from. We get a minimum of that sort of thing because we do it only in the immediate preflight time. That is a problem. It has always been a problem in this program. I don't know, it should get down the line in the Skylab stuff; it isn't as much, but there are some things that are going to have to happen, I think, as a result of this that are going to be even better. That's one problem. The second problem is that if we look at our - the tests that have been run, if you look at any given flight, there are certain things depending on what operational constraints were like, did you have an MQF or did you not, for instance, that have made some differences in the kind of things that we got. There are other things where we have tried to continually take things out of the medical protocol. There's been a push to that and if we felt we weren't seeing something with an area, we tried to cut

CONFIDENTIAL

BERRY  
(CONT'D)

that area down. And we've done that. As we go back, as we're doing a lot of right now, and try to look very carefully at every single thing that we have in the bit of data, some of the things are comparable. There are some things that have been done on you guys — this potassium measurement, for instance — is a thing that was done for the very first time, because we had people out of the MQF. The last time, we did total body waters for the very first time and then that got tied into yours too. So I think as a background, you ought to know that, at any rate, there are some differences there.

RUMMEL

I guess there are only two points that I'd like to bring up, in what we've seen as differences from this flight to the ones we've seen previously. We started out the flight with hypotheses about what we were seeing as far as the physiological response toward postflight. We had seen consistently a decrease for work in oxygen consumption for given levels of heart rate postflight. And also we've seen a decreased blood pressure for these people who have responded. And that was the reason this time we looked at the cardiac output to try and see if this was somehow related to this mechanism that there was a decreased peripheral resistance.

BERRY

We did that last time.

RUMMEL

Yes. We did that last time too. I'll get back to how that fits into this in a minute. But when we started looking at the postflight results, this graph I just showed you is a graph showing the time course of return to base line with the Xs being the ones we've seen previously and the zeros being your crew. Now I think you can see here there's a fairly repeatable — not repeatable, but consistent slope in what we've been seeing as a return to base line. And it looks like it's about 25 to 30 percent for 24 hours. Depending on what the original or initial decrement was is going to then determine how long it takes you to get back. You can see there is one here that started out around 60 percent and went up to 80 percent. And that was really where we stopped them, outside the preflight at that time.

BERRY

Was that Frank?

RUMMEL

No, that was Cernan. But you can see that most of these are on that same slope from all the other crews. Now looking at your crew; Al, down here at the bottom, showed



RUMMEL  
(CONT'D)

the most decrement so far, as far as an absolute, as far as a percentage. But still, your slope looks like those other slopes. In other words, you're coming back at about the same rate as those other ones, except you were down farther and so it took longer to get back. Now you can see Dave's and Jim's start out at a different slope. And I don't know why, to tell you the truth.

SPEAKER

Assumptions.

RUMMEL

Well, okay. We'll just leave that for a minute and go into the second point and then maybe get some ideas of what might be going on. This second form is pretty busy. I couldn't really come up with a good way to show it in a hurry. But what we've been seeing in this graded response, this exercise response where we take you up to different levels, is that in the immediate postflight response, everybody tends to look relatively better at the higher levels. In other words, the percentage decrement at the higher levels is less than at the lower levels. And, as a matter of fact, this is one of the reasons back on [Apollo] 9 that we went to the 180 heart rate immediately postflight. We wanted to see whether this trend continued and maybe at 180 if the decrement even existed. It turned out that it did exist at 180. It was less, but it still did exist at 180. Now on this flight, again Al shows this trend to increasing or - relatively better at the higher heart rates where Dave and Jim aren't. In other words, the slope is reversed, in that, the higher heart rates were relatively worse. In other words, you were very close to your preflight at the low rates but not at the high rates. And so again, this fits in that there was something different here for Dave and Jim. And starting to look at some of the supporting data we have now, the cardiac output, for instance, tends to show that the response was not the same response that we saw in you. We did see, for the same levels of oxygen consumption, an increased cardiac output for Al, which is what we had seen on [Apollo] 14 on Roosa. And so your response fits into the hypothesis of possibly a decreased peripheral resistance which lowers the blood pressure. The heart rate response is higher for each level of work, or oxygen consumption. However, Jim's and Dave's cardiac output is right on the preflight line. So that response, for some reason, doesn't exist. And it possibly could be that the exercise that they got on the lunar surface did tend to negate this sort of bedrest type response which we're seeing in the rest of the crews. I'm not really sure what

CONFIDENTIAL

RUMMEL  
(CONT'D)

the mechanism is for this decrease at the max point, or at the higher point. The fact is that we, on Dave, are coming back. If this curve would level off completely, I think there would probably be good evidence or good speculation to say that because Dave was in such a high level of aerobic capacity preflight, he would have to train to get that level back. But the last time that we ran, I guess before you started your training, it was still coming back. So to me that looks as if it's still the same mechanism which caused the immediate response. In other words, there is still something associated with the flight which we don't understand, which is still changing his normal response to exercise.

SCOTT Flight or preflight, which you don't understand?

RUMMEL Postflight. Right.

SCOTT May be associated with preflight.

RUMMEL Well, - -

SCOTT Can you throw that out, conclusively?

RUMMEL No.

SCOTT Okay.

BERRY Except we haven't seen it on anybody else.

RUMMEL Except - -

SPEAKER That's right.

SPEAKER Haven't seen preflight levels on anybody else, either.

RUMMEL Well, Jim's, however, are fairly normal levels. And he's saying the same thing. That's the only thing I can say to that is there's two of you and you're both showing the same type of slope back to normal. And one of you is at a higher level of aerobic capacity than the other, but you're still showing the same curve back.

BERRY But both of those levels are still pretty high.

RUMMEL Right. They're both above average.



BERRY Above the average from what we've seen on crews, all three of them.

RUMMEL And I guess those are the two main points.

BERRY Okay. And the point that you're at now in the data is that you've got a normal curve now on everybody but Dave, is that right?

RUMMEL Right.

BERRY Okay. That's a ...

RUMMEL Well, the only point on his curve that's still abnormal is that one - -

BERRY Is the high part of the curve. Okay.

SPEAKER What did we run at last time?

RUMMEL We got you up to 172, I think.

SPEAKER ... haven't been evaluated preflight.

RUMMEL Right. But your 160 point was still down. It increased from the time we ...

HOFFLER I'll just put one of them on at a time. These are the four postflight ... of Dave compared to your preflight mean, which is the black line, with the variance shown by the standard deviation there. And you can see that there's no argument that Dave is returned by this 122 hours categorically in the preflight range. For Al, we had to add a little extra (laughter). Had to add another sheet. You see a very distinct trend to 121 hours, but this is still statistically well out your preflight variability, and that's the reason we wanted to do you one more time to show that you have returned. And, of course, as we are a week and a day later than this one today, we will be less able to pinpoint exactly where you returned into that line. I suspect it was sometime in the middle of last week, but those are the data. And, then, for Jim, we did have five lines and we show that he, rather than coming in a clean sweep regressing toward the preflight base lines, sort of held a plateau for a space there, and not until 210 hours postflight can we say that you are within the preflight range. You're still up if you look at the trend. You're still up, but this is statistically

HOFFLER  
(CONT'D)

within the range. The value here is one standard deviation, and it's just above two standard deviations that we consider a 95-percent competency. Now, those data are just the heart rates. We've seen gross variability of your blood pressure. We've seen inconsistency in your leg volume change. As a matter of fact, Dave showed much less change in his leg volumes postflight. Al showed much greater change, and Jim is sort of bringing the medium. I wanted to bring this point out about the leg volume, though. You know, I've told you fellows that you lost upwards of a half inch. Dave, definitely, a half inch. Here are your three measurements, and you can see this is not a sophisticated measurement but is straightforward and simple. And, there is no way in the world you could err in that degree postflight. Al is approximately 3/8ths of an inch down and Jim, again, about a half inch. This will be important later when we're talking about the blood volume changes that have been seen in the fellows.

BERRY

Yes. And remember Jim's response here compared to your two guys' responses in the way that this curve went down when you hear what Carter's going to tell them.

HOFFLER

It's rather interesting, too, that this leg volume - leg circumference change is very consistent and synchronous with your responses to the lower body negative pressure, too.

SPEAKER

Did you say it was important to remember which curve?

SPEAKER

The leg circumference?

BERRY

No. Remember the way that these curves went. The trend - the way that you guys had a definite progression. And, Jim did not. He tended to linger in that same way until he went down, and we've got a pretty good explanation for that.

HOFFLER

I have drawn the immediate postflight blood pressures. These have traditionally been much more variable. We see in Dave a distinct widening of the pulse pressure. Your systolic is up, your diastolic down, and greater variability of the pressures themselves as if the mechanism is more of a hunting mode.

SPEAKER

Show me the curves beforehand, and I'll find the right mode. (General laughter)



HOFFLER

In Al's case, if you had looked at both of them - both values, systolic and diastolic, without a distinct absolute change in the pulse pressure. And in Jim's case, he essentially lowered his diastolic for a greater pulse pressure, as you have got a greater pulse pressure. And John is talking about the peripheral resistance in our measurements. You know, I always took one blood pressure ... That blood pressure is almost invariably higher so the rest in supine now, bear in mind, is invariably higher postflight than you fellows had preflight.

SPEAKER

Variations on the order of 10 to 15 systolic - -

HOFFLER

Right. I mean, that's a distinctly elevated pressure.

BERRY

There's a lot of this lability of seeking and hunting of the blood pressure. It's a typical thing that you see.

HOFFLER

If you fellows would like copies of these, I could make some for you. In fact, take a couple.

ALEXANDER

In the clinical laboratory work, we initiated three investigations preflight and then one postflight. We centered around three major areas of investigation. One is a basic treatment of this hypothesis we talked about at the briefing Friday ... 30, which in our opinion describes a part of the space adaptation mechanisms which go along in the physiological system as you're exposed to weightlessness. The second thing that we did of major importance in our opinion in the preflight and postflight exams is look at all biochemical mechanisms in our power to (1) support this hypothesis and (2) to let just the general physiological response on the part of the body to this stress, not only the environment, everything on the mission that you went through. And even the stresses of coming back to earth gravity and to living in society again, to doing things, debriefings, and everything else. All of that is reflected in our measurements. And, thirdly, not by importance but just by listing, we were interested, too, in safety aspects and medical surveillance aspects of the crewmen going to this environment, from a monitoring standpoint. Now, the principal changes that we have seen are very, very exciting to us, in the sense that they do support almost 100 percent our previous thoughts on what was going on as man adapted to a weightless environment and then turned around and readapted to a one ... gravity environment. These principal changes are characterized in the following areas. First, there

CONFIDENTIAL

ALEXANDER  
(CONT'D)

was a marked decrease in the red cell mass in each of the crewmen with Dave having the most drop, Al having a slightly less drop, with Jim losing the least. And, this is in terms of the packed amount of red blood cells. It's equivalent in Dave to donating a pint and a half of blood - actually in excess of a pint and a half of blood across the time of your mission when you came back if you looked at only the cellular aspects alone. Now, in Al it was around a pint of blood and in Jim it was about three-quarters of a pint; somewhere in that range - 350 ml. This means initially that you're coming back with a smaller total circulating blood volume because the vascular space is filled with the formed elements - the red cells and the white cells and other cellular fractions and the fluid space. So, the total amount of fluid circulating in the blood streams is a combination of cells and water. On the cellular side only, you were down almost 14 percent in Dave, 10 percent in Al, and 7 percent in Jim. To compensate for that, we've always hypothesized that you lose the water fraction of the blood and, initially, white. But, as you compensate for the loss of red cells and as you bring other compensatory mechanisms into play, which we measure, you not only deplete this plasma volume that you've lost, but you actually overshoot. So when you come back on our +0 ASAP, we consistently find the crewman with the depression in the red cell mass but an elevation in the plasma fraction. So you have essentially a normal or maybe a greater total circulating blood volume, but it's different from the type of blood volume that you had before you went. You have less cells and more water and you hear the word hematocrit mentioned. This is the ratio of red cells to water. So, the hematocrit falls as the red cell mass falls and the water goes back up. So, in the compensatory response to the loss in red cells and to the maintenance of total circulating blood volume, both Al and Dave repleted their total circulating blood volume by +1 and actually had gone into this overshoot phase where you diluted out some of your red cells and your hematocrits were down; not clinically, significantly down, but down from where they were when we got you on the carrier. Jim is the only one who didn't, and this explains in our opinion - Dr. Hoffler's and Dr. Rummel's and people that were discussing this over the past few weeks - this explains in part your slower return in the LBNP response. You're getting into a passive thing. You're in the box and the box is forcing your system to respond and you have very little control, very little voluntary control over how these vessels are going

CONFIDENTIAL



ALEXANDER  
(CONT'D)

to respond. We feel that, in part, the explanation with your slower return to normal in the LBNP response is based on the fact that you did not compensate at the same rate that Dave and Al did to the loss in red cells. Now, you lost the least amount of red cells, but you compensated the slowest for that loss so that it threw you still behind the power curve getting back to where you were preflight. The other very significant change that ... for our work in this mission is the fact that for the first time, we were able to measure that part of body potassium which is doing the work in the body. We've always measured the serum potassium. Serum potassium is very tightly regulated number because the plasma that's in the blood stream is in - I mean, the potassium in the blood stream is in equilibrium to the potassium in the tissue fluid, and it bathes the cells, but that potassium is considerably different from concentration of potassium inside the cell. Unlike sodium, potassium is in its highest concentration inside the cell. Sodium is just the reverse. It's highest on the outside of the cell and least inside. For the first time, we were able to not only measure serum potassium but to measure quantitatively that potassium in the body which is lending to trained membrane potentials and muscle activity and muscle efficiency and is the skeletal, as well as vascular muscle, as well as cardiac muscle. We measured this with the radioactive potassium which you drank on numerous occasions, collected the urine over the next day, and then that spot the day after that. We found a 12 percent decrease in your total body exchange for potassium which is a very significant decrease. Decreases of this magnitude are very consistent with cell disfunction. In fact, with cell death in the loss of tissue. The cells simply can't go on on this margin of potassium decrement. We measured the same decrease in you, Jim; 12 percent and a smaller amount in Al. But, that is a significant change from your preflight. We explained this on two things. The decrease in total body potassium fits our hypothesis in the adaptation of weightlessness very well. Second, we feel like it was augmented in the lunar surface activities because of the increased exercise. Exercising here on earth in one g when you go out and run 2 miles in the afternoon, the cell, normally, and classically, and it's supposed to, gives up its potassium. The potassium in the vein draining the heart muscle, for example, is higher after increased cardiac work. And, this is normal. You'd expect it as you do measure it each time. So, the normal response to exercise is to dump the potassium from the cell,

CONFIDENTIAL

ALEXANDER  
(CONT'D)

but it's immediately replenished and you don't get any negative potassium balance from just exercising. The difference between this value and what you would see if you solely exercised here on earth is attributable to the adaptation that we mentioned. And on this - on the point of that adaptation, we feel like it's the perfectly natural thing to do to adapt to a new environment. The human body does this. We adapted from the sea to land as we evolved. We'll adapt to any environment the human system is placed into. And we feel like the set of values that you achieve in weightlessness, after you have adapted to it, is a set that is perfectly well-suited to the environment in which you're living. It's only a question which we can't answer yet and that is how much could it cost you in terms of your reserve to adapt from your pre-flight condition to the condition that you achieve in weightlessness. If it costs you a great deal, then we're concerned about the fact that something might be imposed upon you that's not planned in the mission, like an illness or a soft-losing diarrhea or vomiting, things like this. Or a blood loss from trauma. Things like this, we don't know what would happen because we don't know the extent to which these reserves are depleted. This will be going out more in our questions at the conclusion, but we feel part also of the potassium lost in the lunar surface crews could be explained by the fact that you didn't replace the electrolytes that you were losing by drinking fluids and we'd like to explore that with you - if you felt like you were unable to drink fluids, which I've been told and read in a debriefing that you had difficulty getting these fluids back in. Whether it was the time line or whether it was inoperative equipment, I don't know. But, we'll explore that. We feel like part of the potassium loss can be explained by the fact that you simply did not place it in your diet. Potassium and its ... balance is a very funny thing. Potassium itself doesn't just immediately go to where it's needed the most. It's got to be complex with the chloride ion apparently to give an electrical neutrality which the cell can accept across its membrane. Detecting potassium in other form with potassium chloride, to my knowledge and to my estimation, is not a very effective way to get potassium into the cell. Fortunately, there is a lot of hydrochloric acid in the stomach so most of the potassium forms that you eat are ionized immediately in potassium chloride. This is the body's way of preparing it to get into the cell where it can do some good. So, we conclude very definitely that we have supported this hypothesis. We

CONFIDENTIAL



ALEXANDER  
(CONT'D)

have seen absolutely nothing that detracts from our feelings as to what is going on as man adapts to weightlessness and comes back. We have added to this hypothesis and its validation significantly with potassium measurements. The rest of the information that we derived has strengthened very remarkably the entire flow schematic here. We have seen nothing to detract from it whatsoever. We do feel after this mission, and again this is preliminary, but we do feel that rather than the body losing water as we had hypothesized in the past that only after the last mission began to think in terms of tissue. We do feel we have evidence almost conclusive at this point that you lost tissue mass rather than just bailed out some water that you had stored between the cells or maybe in your vascular space. Early on in this program, I think we all felt that perhaps part of this adaptation was you were just shedding some water that you didn't need, the same way you do if you go into the cold. You fill water when you go into the heat and you're all a little heavier when you live in hot climates. The opposite effect happens in the cold, and we thought maybe the situation like this was developing as you went into a weightless environment. This is not so in our opinion at this time. And, it's early on, but we feel fairly comfortable in saying that you lost tissue mass and this is very remarkably supported by Hoffler's findings and the leg size changes. And the explanation for this tissue mass loss - this hypothesis - or, at least, its origin in this hypothesis is that the potassium leaves the cells as we postulate it does; the potassium is placed with a positive ion, maintaining electrical neutrality of the cell and principally hydrogen.

So the acidity of the cell increases as the one-for-one exchange from positive potassium to positive nitrogen. The cell becomes asymptotic and has too much potassium in it; the pH is low, and the cell structure dies. We can't put a number as to how many cells ..., that wouldn't mean anything to us. We'd rather look at it in terms of what percentage of the total body-weight change that we recorded in you immediately postflight is due to the cellular loss, as opposed to whether you gained it back in the 18 hours on board the Okinawa, by just filling up your gut with water, and filling up your vascular space with water and things like that. The point is, that you didn't regain that tissue loss on board the carrier, although your weight gain came back, or your body weight

CONFIDENTIAL

ALEXANDER  
(CONT'D)

came back to preflight levels, or, essentially, was regained. You're still running a deficit in muscle tissue. Now, there's no scare factor in this, but this doesn't have to be limited to skeletal muscle. We feel like the skeletal muscle occupying about 40 percent of the body mass is certainly the one that contributes to the loss, but this doesn't have to be limited here. It could be cardiac muscle; and it could be smooth muscle, the things that controls cardiovascular tone. So it's possible, and I think quite supportable that all three of these muscle systems are involved in the potassium loss and the overall tissue deficit. Now the third area which -

BERRY

Did you want to say something in here, that, you know, telling about tissue death and cell death and everything that sounds, as you say, somewhat a comedown, but when you say all that it sounds dire, too, and the point that you ... those cells, even when you exercise, that there's a certain amount of cell death going in everything.

SPEAKER

We realize that, in exercise, you tear yourself down and between exercise you build yourself back up.

ALEXANDER

Well the ring in the bathtub is cell death, too. It's a normal process and we do it all the time. There's a great turnover in cells, but I think what we're saying here is that we've just enhanced that turnover because of loss of potassium. These cells come back if they die. I wouldn't be a bit surprised; in fact, I expect to see the total blood potassium to be back after today. Unfortunately, it takes a long time to calculate it because it counts on the radioactive counting device over a long period of time, because it has such a short half-life. We can't give you an answer today or tomorrow as to what your potassium is, but we would expect that these cells that were lost 2 weeks ago or 3 weeks ago would come back, and that your weight now more accurately reflects your body mass or your body cellular mass than it did when we first saw you at R+1. The other thing, and not last by any means, but the response on the part of your endocrine system, the hormone mechanism that really governs this whole flow chart — the maintenance of endocrine homeostasis — reflect the measurements that we have performed — that Dr. Leach has performed in her lab — reflect the fact, that these changes are certainly predictable — the basket word is the stress of the environment, the stress of the mission and the things other than going into the zero-gravity environment that cause these stress indicators

CONFIDENTIAL



ALEXANDER  
(CONT'D)

to come out — emotional stress, stress of staying on your time line, - what I'm saying is it's just the stress of everyday activities, and we have a very accurate reflection based on these hormonal changes, from what we know, from not only when you arrived on the Okinawa, but from the entire time that you've been back. And we can see these excretion patterns of compounds which are vasoactive. They cause the blood vessels to constrict and we've correlated these with the other investigating teams and we've come up with joint explanations of the hypotheses as to what has caused the slow return in the bicycle or the LBNP response. I will conclude, I guess, by saying that I don't think there's anything after this exam that cannot be explained and that's not deliberately to leave you cold. I would not go so far as to say that everything preflight will be back to preflight, but I think with what we know now, and with the more and more numbers that should be coming to us from the technicians, and from the machines, that we can tell you why those numbers aren't back. We feel very confident that we know what went on in your system. There are a lot of questions yet to be answered and a lot more validations to be done, but we feel extremely confident of what we've measured in this mission.

BERRY

Okay. The one guy that isn't here this morning is John Vogel, and I'm not sure he's come over and talked to you - the two of you about that. But you know you're down in volume about 5 percent - if I remember the figures it's about that and so -

SCOTT

Yes. I looked at those numbers.

BERRY

And he intended to repeat that with the two of you. And again, you know, the two of you and not Jim; I don't know. But that's what he means to do. So that, probably that will be, undoubtedly, that will probably be back this morning when you get back down there and Jim's is already back. As you know, that's a little bit different, too, and sort of strange, because on the last time on 14 he said they didn't have any evidence of any loss in anybody on 14, which was sort of a surprise to us, compared to what we had seen. This is a new method that he's using, which is a lot more exact than the method that Pauline Mack used to use, with the X-ray densitometer. It's a lot more accurate method, and that's why we went to it. So, we were sort of surprised when we didn't see anything last time with anybody, as he was. So then it's

BERRY  
(CONT'D)

turned around and we had a little - I mean - it's nothing - I mean it's of interest, but again it's not anything - it doesn't portend anything severe. Okay, the things that we tried to get together, as far as the total number of things that we hadn't, that we still didn't have back in a - what we could say was a total - normal state then, or, I don't want to use that word, take normal out, erase it and say in a base line state, your base line, because you weren't normal when you left. You are normal for you, but if you use normal, meaning everybody everywhere, you certainly were above that kind of a level for normal. Now it was Al's LENP, then, which you saw, Dave's ergometry and the two, Dave and Al, on densitometry we had an ENT thing we wanted to get done on Jim, which was done yesterday. We got that out of the way; and incidentally, Jim, I understand that was discussed with you yesterday, and when I talked to - he called me I guess, just as you guys were leaving, and we went all over that, and that's perfectly okay which we have. That's what we hoped and expected that it would be and it was, and so there's no problem with you doing anything as far as I'm concerned. I told him that, as far as I'm concerned, you can fly anyway you want, upside down or however, it doesn't make any difference. Okay, now, the other things, were the blood volume thing, which they've talked about, which you already had done, so that's latent now. Okay, now let me go back and summarize then real quickly some of the things. I guess it's clear to you, then, that from what you've seen, that there are somethings that are different from this mission, from missions that we've seen in the past. Now, I think it's very important that we put these in some kind of proper context. Now, obviously, there are some things that we have done, and I want to be clear about that, that there are some things we have done on this mission where we have followed them to completion, and if we looked in detail at some of the data in the past, there have been guys occasionally who were not followed totally to the time that they were completely back. And in utter fairness to all of you we want to say that, and we've looked pretty carefully here -

SCOTT

Absolutely not what?

BERRY

They were not followed out to where they were completely back to their preflight norm, okay? There were some, and there has been an occasional guy along the way that that is the case. But, as a general kind of a thing, and

CONFIDENTIAL



BERRY  
(CONT'D)

I'm making this as a general statement now realizing that we can find some things that don't fit that, the responses that you have had in these areas that we've talked about here, show some things which we had not seen in exactly that same way before. They do fit the hypothesis that we've had. We think we're going to be able to come up with some clear statement about exactly where - you know, why we've seen what we've seen. We think we're going to be able to do that. Now, along that line, as far as the potassium thing is concerned, as an example, as a single example, there was this cardiculture[?] - We hadn't had that particular measurement before. We have that now, which helped us a lot better than looking at a serum. We have seen some in Roland's serum potassium report, but the thing that he said is, yes, we can get potassium chloride, and we should start looking for a fix, can you put potassium chloride in, or can you put potassium in a form that it will get utilized, which often we feel most potassium does because of the hydrochloric acid, but, if it can be, good. We then put some additional potassium in anyway, in the drinks, and there's some in the food bar and so forth. Now, do you, though, utilize that? Can it get in the cell or is the cell - is the door open on that cell, and it's going to go out, and it doesn't make any difference if you keep loading it in there and it isn't going to go in. Then that's something you've got to look at still, that we don't know the answer to, either. You know, that sounds great; you're down on potassium, so we put the potassium back and that sounds like an obvious solution and it may be. It may turn out that we can still do that, but there's something funny here about the way that that potassium has left the cell. Exercise, as we can see here, too, may help to account for what happened to you two guys. Just as you adapt, you know, ... and then when you finally get out and do some work in that environment, the very high work level that you really get out and exercise there for any long period of time, you do normally pull some more potassium. But when you exercise, potassium tends to leave the cells, too.

SPEAKER

So we really did need the Gatorade then.

BERRY

Yes. Yes, it would have helped as a matter of fact. I thought Dave had bought stock in it there when I heard him say that a couple of times, but it sounded pretty good. But you're right - -

SCOTT I had some back in the food box.

IRWIN Yes. But we never got to it.

BERRY Did you have some Gatorade, real Gatorade?

SCOTT No, it wasn't Gatorade. Quickkick or -

IRWIN But it was - yes, but anyway.

SPEAKER Gatorade's pretty low in potassium, isn't it?

BERRY Gatorade, as a particular thing, yes; it doesn't have as much potassium as Quickkick does, as a matter of fact.

IRWIN I thought we couldn't select it. I think that's it. What was the answer we got?

BERRY It was one of those others, anyway, I know that was aboard. I didn't know that you finally had it aboard. Okay, now, the other thing is the Russians. What have we seen from the stuff that they had. Well, you know they have some things that have been different there, too, particularly on their Soyuz 9 flight, on their 18-day flight. We don't know for sure what they've seen from this last flight in any detail. I'm sure there's some data that they were able to obtain during that mission that is still going to be valid data, you know, that we'll still get and will be of value. And we hope we're going to get that in October in the exchange. That's what I sincerely hope. And that's where I was day before yesterday. We've been trying to organize that exchange. Now the thing that they've seen is prolonged - they've seen the level of orthostatic intolerance that you guys can have. They have a very much more marked amount of that certainly, then what we've seen with that particular flight. They have seen it somewhat every flight as we have seen it. We don't really know whether they have any LBNPs or not. They have used tilts and we've been trying to find that out and I couldn't get a clear statement from DeKern[?] a month ago, whether he really - whether they had it on Salute or not. And we have some evidence that would make it appear that they tried it on Salute, but they're not using it routinely in their last pre and post. They've been using tilts instead. So there's been a great hue and cry because of the Soviet data that was - that came out of that particular flight. Where they have

CONFIDENTIAL



BERRY  
(CONT'D)

been pretty clear publicly, amazingly, about the status of those crewmen and they really were unable to get out of the spacecraft without some assistance. They had some - they use the term statopyknetic[?], which just means they had a postural difficulties in assuming an erect posture; walking properly, gait difficulties that they had a period of almost 10 days postflight. They had difficulties - and you'd be interested in this, Jim - that they had some difficulties in holding a cup. They couldn't hold a cup, that was like this. The cup was always tilted; cups were tilted, and they tended to spill things out of them and there was some tremor associated with this, too. And their cosmonauts, strangely enough - I don't know if Tom has talked to you, but Tom was in Belgrade with Popovich. When he went to the funeral in Belgrade - I don't remember whether it was when he was going or coming - but he had a talk with Popovich at some length there, and he is concerned, as a cosmonaut, about his colleagues and what he saw from the Soyuz 9. Now we talked at length with the Soyuz 9 crew, as a matter of fact, both in Constance last year and then here when they were here. We also talked to the people who did the exams on them at some length, and again, it's very hard to piece all of these things together, but they did have, there is no question about it, changes which were far more severe than anything that we've seen and lasted far longer than anything we had seen. Now, the situation that we're in at the present time, then, is that what's happened with you guys is much more like what has happened to the Russian crew than anything we've seen before with our crews. Now the thing that -

SCOTT

To what degree?

BERRY

Well, about probably maybe somewhere in the - I don't know; it's hard to say; a third, a half or something like that, not anything to the same degree that they had. The trouble is, we don't have detailed charts like this to look at, Dave.

SCOTT

... our whole internal physiological response, but certainly not external physical - -

BERRY

Oh no, no, no. External physical responses, I'd say, clear down to noise level, they're down compared to them. Oh yes, you've had none of that business. No. Absolutely none. No, they've really had difficulty walking and being erect.

CONFIDENTIAL

Page 18 of 48 pages

SCOTT

You know anything about their internal physiological responses such as potassium and ... and that sort of thing.

BERRY

No, we do not. We do not yet, at all. And this is one of the things that we really are going to try to pin them down to. And I think we probably will. It looks like they're going to come through with that and that's going to be a big help to us.

Now the reason I wanted you to understand this is because there are, or the implications in this, are the things that you guys need to understand because you're going to be put in this position. Dave and I talked about this a long time the first of the week. You have some concerns which, and I don't know whether you all have these, but I assume Dave was telling me, you know, the kinds of things that really concern all of you, and I can understand why you can have some of these concerns. Okay. Are you being labeled in some way because of this is a concern that you have as individuals, as individual crewmen, and that's one concern. That's one implication, let's say. I haven't seen, personally, any evidence of that from any sources. Now I spent the other evening with - the night that I was in Washington, I spent with George Low and I spent about 4 hours with him. Now, the thing is that we need to decide on what we do with the plan. As George told me the other night, he had seen everything that came out from the thing that had happened with this last - Was it a week ago today?

SPEAKER

A week ago Friday.

BERRY

Yes. A week ago today. Black Friday, where we had all this business happen with because we were getting put in a spot because there were going to be press things coming from the New York Times business. So when we got into that, the things that came out of that they had clipped all this stuff, apparently, and I haven't seen it. George told me, and I haven't seen the actual clippings myself, but he said that those guys up there had pulled all this stuff from ... and he said he thought that it came out very well. As a matter of fact, he thought that it was played in a proper thing, that we were getting it out, but it wasn't played up big as some big problem yet. And that we weren't hit too badly. In most of the places, we weren't hit at all. There were a few places like, you may have seen that Maloney article, which is the one I

CONFIDENTIAL



BERRY  
(CONT'D)

saw here where he hit us about, you know, that we were doing it because we were trying to ... the releases and the only other one that was bad was the one in the Newsday in New York that ... sent in apparently, which we knew that that was going to be bad, because of what happened that afternoon and he really blew his cork. So, and again, I haven't seen that, but apparently that is the situation. Now the next thing that happened is when we have that much out, the problem that we've got is that the guys over here in PAO are getting called about every hour. They get called by somebody or other who says, okay, what's going on now, and who's back to normal now and who isn't back to normal now, and all this kind of jazz which goes on every day. So somebody over there ends up, - there's stuff going back and forth and what I finally did with them here early in the week, I said, look, we're not going to - just quit this old stuff, you know, just tell everybody things are at a standstill. I don't care how you turn them off. He said, well, that they finally got MacLeish to agree that unless there's some real adverse story going to come out about that in some way, that they'd try and do that. So still, in spite of that, I guess there's been some stuff that has been appearing on and on, in spite of whatever anybody's done. Now, we've got a problem then that we need to say - the thing we need to say immediately, I think, as fast as we can and Chris and George - I talked with them and they certainly agree with this and Deke and I hope I can assume you guys would agree with it is that we've got to say that you guys are all back to normal. That's what we need to say real badly and to do that we need to have the things to say that with. This is why we were trying to get these things done, so that we could say, you know - a flat-out single-line thing that says, look, we've finished all our exams, everybody is where we want them to be, and now we're evaluating flight data; you know, we've got everybody back now. Now, that's step number 1. I think's that the key. Now, the second problem that we need to do something about, which involves both you guys as individuals and particularly involves the agency, is that the big difficulty we have is what does this mean as far as future manned space flights are concerned, and how is it going to be used by the Proxmires and the Mondales and so forth and this is what is acutely concerning people like George Low, because of what they are gathering — and we know they are — and what are they going to do with this. And so the faster that we can come up with something that makes sense and

CONFIDENTIAL

BERRY  
(CONT'D)

say, you know, this is what we know, this is what we're going to do sort of thing. Then that's fine and keep it in our planning and so it isn't something that's great and startling. Now, we talked this over then in light with your - with our conversation, Dave, the thing that everybody feels. I mean, that big pressure is off for right now, which is good, thank heaven. But we still need to do something. By next week, we want to have pulled as much of this as we can together and Bob Gilruth and Chris Craft, and they don't know whether Low and Myers want to come or not, but Deke and you three guys and us then want to sit down in a room and we want to try and give you as complete a story as possible for us to do with what we know and we want to, hopefully then, out of that, draft some kind of statement and maybe we can have something drafted by that time, that would be a thing that Gilruth and Craft would be willing to say. Okay, the agency is willing to put that out and everybody wants to be convinced that where we are with that now is a part of that thing. I think that there are some things that need to go as part of that and I think one of the parts of that, obviously, is the fact what level were we prior to starting this flight. There are very direct and simple things that we can say about that that are all truthful and we don't have to make up a damn thing to make it very, very truthful, when we say exactly what level you guys were before the flight which is the highest that we've ever had. That's going to make somebody else mad probably, but nonetheless, I think that's what we've got to say, because it's true, and so we say it, you're - Okay, that's where you were. And then, here is what happened in the ...; here's what we think has occurred and what we're doing about it. Now, I think we can come up with most of that. I sincerely hope that we can. And that's what we're looking to do. So, now I - if there's anything - -

SCOTT

How about also the situation at which we had and EVA after 10 days.

BERRY

Yes. Well, we've got that - I've got that down; that's one of the key - we're going to go through each of the key - that was a real problem area, you know, that was raised and was a legitimate concern, if you kept it within order, and we did and we did it, and you did, you know - couldn't be better. And, as a matter of fact, there - the whole thing here - this entire thing can be played very



BERRY  
(CONT'D)

positively if we play it positively. You know, if we do it that way. Because we are learning some very important things here that are important to us for a future flights. And the thing is, that we've learned a lot about zero g and about 1/6th g which nobody else knows about except the Americans. The Russians have no data on anybody in 1/6th g and we have data with people working in 1/6th g and how does this fit into the things that are happening with us with our zero g, and there's no question, when you look at you guys' data and look at Al's data, here, and there's some very good and positive things that come out of that and these aren't - and I think that the thing that we all need to realize and I think all of us realize that, and I just think that we all as a team need to realize it, is that it isn't - there isn't anything derogatory or anything of this sort involved in this. I - you know, for the flight or anything else, and I think we ought to all understand that; we ought to - we have to all not only act that way, but we believe it and we need to get that across in a very positive sense. Now, even the thing - let's go back to another one they came up with which we haven't even talked about which was the cardiac arrhythmias that we noted. Now, in this instance, again that can be a very, very positive kind of thing. There's no problem with that, there's no - there's no sign on any of you guys because of anything like that; you can produce that in any individual. You kill laboratory animals with that all the time, as an example. (Laughter) You can produce that kind of thing with just - no, you can produce it - you can produce it. If you put a potassium level down, you can produce just be doing that, so you can tell them, if you increase it, if you can alter it - -

SPEAKER

...

BERRY

No, that's not what we're going to say outside. I'm telling you that. The point is that if you alter the potassium levels and this happens clinically, all the time, you alter potassium levels and you can produce this sort of thing. And it doesn't have anything to do with the status of your cardiovascular system. You can take anybody in this room and do that very same thing with it. That very same thing. And that's the kind of thing I think that we all have to understand. Now, that doesn't say that it isn't a concern to us in the space flight. Okay, it is a concern. It's something we need to know about; it's something we need to try and do something

CONFIDENTIAL

BERRY  
(CONT'D)

about and we will. But I think that we can put all that in a very, very positive kind of a thing. Now - and the thing is you've got to be part of putting that into a positive thing and I don't intend for anything to go out of here, as far as a written statement, that isn't that you guys haven't seen and know about and that you say, yes, you understand that, too. And I think we ought - -

SCOTT

That will be a welcome change.

BERRY

I think we ought to have the arguments and the whole mess. Okay? So I think that's what we ought to do. And as I - the thing that - we've got the questions to do and we're way down behind time here, but we've got the questions to do and we - the two things that are still hanging fire that we do need to do, though is we do need to get an ergometry on you and we do need to get an LBNP on Al, and if you guys can work that out schedulewise here, I should think that we ought to try and get that out of here today, if it's possible at all to do that, what do you think?

SPEAKER

We can do that.

BERRY

Okay. I really think because then we - and then I think we ought to, sometime this afternoon if we get that done and off the thing then I think we can write a one-liner right now that says exactly that, that says, okay, we've - all the exams have been done; everybody is back and get off our back, we're evaluating data, and it's just as simple as that. And I think that's the kind of thing that we'll get that to you, before that goes out, too. Okay? Whatever it says - you know a single one-liner because that's about what it will be. But we'll get it cleared. Okay, now, let's talk.

SPEAKER

Can you tell us in the bioinstrumentation area approximately how long it took you to don and doff a sensor harness. We want to get this because we're always asking about plugging that in, you know, on the time-line thing in planning for things. Do you have some guesstimate about how long? Would you say between 10 and 15 minutes?

IRWIN

Yes.

SPEAKER

At the most?

IRWIN

Yes.



SCOTT I'd say 10 to 15 minutes and you could reduce that time significantly by doing what you said you were going to do before the flight and that is making those little sponges somewhat larger than the holes.

BERRY I read that in the debriefing.

SCOTT Yes, and it didn't happen. And also the packaging of the sponges is such that you have to cut six open to use five.

BERRY Yes. I read that. We got that out of the debriefing, too. That's good, and we'll take some action to do that.

SCOTT I think if you do that, you could save easily 10 minutes.

SPEAKER You're talking about donning them now, is that right? Just donning.

BERRY Yes. You don't have to be careful when you're doffing.

WORDEN There's another thing about the donning and doffing of the biosensors that I'd like to bring up. You take those things off and you're sitting there with a handful of wires with sensors in the end, and you say, "Now, what am I going to do with these things?" And I ended up putting mine in a plastic bag, and putting it in the locker and keeping it there. And when you got ready to don them, you grab the bundle of wires out again and you wrap them around a handhold somewhere just to hold them. And you go over to the medical kit and get all the stuff out and get ready to go. I wonder if it would be worth investigating some kind of a container with five little insert - or insets in it, you know, that you could slip those inserts or biosensors into and then wrap the cable around it some way, and that would help not only to stow those things, but it would also help us when we get ready to don the things because then you could just take that little case and you put some Velcro on the back of it, stick it on the panel and then you don't have to be fishing around all the time for the biosensors anyway.

SCOTT We really need a work station.

BERRY That's right. There's no good place to do it.

WORDEN But you have those sponges and the package for the sponges and the little stickums and the strip of stuff for the stickums and the wires, and there's no place to put all that stuff.

BERRY Yes, the minute you set it down it's floating everywhere.

WORDEN That's right. And if you had a work station somehow that you could do it, it would save a lot of time.

BERRY All right. I don't see why in the world that couldn't be done.

WORDEN You could have a clip for the pads, a clip for the adhesive, and then places for each of the biosensors.

BERRY Well, see we haven't really had that business where you're taking them on and off before and I guess that probably wasn't thought through as well as it could have been.

SCOTT ... all in a central area, too, ...

BERRY Okay. Sounds like we need a - -

WORDEN We don't want to appear derogatory about that system because we thought it was a great system.

SCOTT Hey, listen that was great. Boy, that really saved us an awful lot of time.

BERRY No. No, we're not taking that as derogatory. And I think you did a great job with that, too. Okay, along that line now, there were some times when you were notified by us from the Center that the EKG was noisier and you had a shifting base line. Can any of you think when you were told that? What did you find when you looked and what did you do? Because we were never really clear whether you replaced something or whether you just did something locally with the sensor.

SCOTT That call came up twice as I recall.

IRWIN Yes. Once for Al and once for Dave.

WORDEN Once for me. The time for me was - -

IRWIN You were alone.

WORDEN - - rather easily explained in that I apparently hadn't peeled the tape off the back of the adhesive.

BERRY Okay. So the sensor wasn't attached to the skin.



WORDEN Yes. I was really surprised when I looked. It stuck fine. I was really surprised when I looked at it.

SPEAKERS (Laughter.)

SPEAKER You were on once ... changing around the backside of the Moon.

IRWIN Once when we were in there, the call came up and I think you changed them.

WORDEN That was before EVA. That was right before EVA.

BERRY Did you change them or did you just stick them on again.

WORDEN No, I took them off, ... on before EVA.

BERRY Because we told you just before EVA. I think you were going behind the Moon and you were going to come back and it was going to be ...

WORDEN Well, yes, that's right. I don't recall now whether I'd taken them off before that because we got in that period of Jim and I both wearing sensors.

SCOTT I don't think I ever took my sensors off.

IRWIN No, not then. But there was some time when you were going to change them anyway. I think you were getting ready to change them or something, and they called up and said you were noisy and you went ahead and changed them and then it cleared up.

WORDEN Yes, and it cleared up. What I'm saying is that I'm not sure in my own mind that I ever took them off after the 3 days with the rendezvous and all that. Seems to me like we just kept them on and it was like, you know, the end of the 4th day or something like that that I'd had them on. And there wasn't any - they didn't have any adhesive pads on them either, which would have helped me keep them on.

HAWKINS You wore them for a pretty long period of time. I guess you probably wore them for the longest period of time of any of the three.

SCOTT That was at the end of that period, too.

HAWKINS Now did this pose any problem to you?

WORDEN No.

HAWKINS In the way of discomfort or irritation?

WORDEN Well, irritation, yes. And you saw the rings that I had at the end of the flight. And it was during that period, I think, that most of that developed.

SCOTT I think that's ...

IRWIN I guess maybe I pushed it -

SCOTT Well, Jim ... or Jim pushed it.

SPEAKER No, no. That was the time before. The last EVA, before you got suited or while you were suiting, we called up and said it was no good. And you pushed them and it still didn't help.

IRWIN We got outside and it was clear as a bell.

SCOTT Yes. And you know what?

SPEAKER No. That was the first EVA. On the last one - -

IRWIN Well, Dave asked, is it acceptable for the EVA, and I think you got an affirmative and we pressed on.

SPEAKER Well, it was the second EVA where we told you it wasn't.

IRWIN Yes, I can't remember - -

SPEAKER Why don't you guys go back to the voice transcription and see.

SCOTT Well, we can answer your question without getting into the details.

BERRY Yes. We don't need the details of which one it was.

SCOTT Jim pushed my sensors and did all that.

BERRY Yes. And then what happened was, I'm sure, when your suit pressurized, you know, we got great data that time. So apparently what happened, you know, you probably got some more pressure just as you pressurized your suit,



BERRY  
(CONT'D) which made the difference. Who used the extra bioharness?  
There was one bioharness that was out of the medical kit.  
Did somebody take a bioharness and use it?

SCOTT No.

BERRY No?

SCOTT No. I can't think anybody even took one out - -

SPEAKER - - ... lead wires? Used the same lead wires?

SPEAKER ... a spare.

WORDEN There was a spare. There was a spare that was gone out  
of the -

SCOTT Then it probably wasn't there when we left.

SPEAKER It was there.

SPEAKER Yes. It was. Because I remember ... - -

IRWIN Maybe we took it down to the surface with us.

SPEAKER - - it looked used.

SPEAKER Oh, it looked used, huh?

IRWIN Oh, there was one there, but it looked used?

SCOTT You got all the harnesses back, right? You got the spare  
one back, right?

SPEAKER Yes.

BERRY Okay, that's all right. After orbital insertion, you  
know, we lost this ZPN data. We didn't lose any ECG stuff  
on that time and they told you that the ZPN was bad. Did  
you guys - did you just pop the sensor and then stick it  
back, or did you - do you remember doing anything about  
that, because we got the ZPN data? Or did you reapply it?

SPEAKER Oh ... reacquired ...

BERRY Everybody.

CONFIDENTIAL

CONFIDENTIAL

HAWKINS            This was on lift-off and the ZPN went. We told you, and we never did know what you did about it.

SPEAKER           You did something.

SCOTT             Yes. I remember the call, but I don't think we did anything.

HAWKINS           You didn't pull it off and reattach it, though.

SPEAKER           That would have been after you pulled off your suits, though.

BERRY             Yes, it would have had to be after you desuited, because you couldn't get into them in the suit.

SPEAKER           After you desuited.

SCOTT             You know, I do recall a couple of times when the ZPN leads were loose, though, on the belt where the connector had come loose a little bit and I had to tighten it down again.

BERRY             Okay. The real significance associated with that question, Dave, was - is we expect these things to probably do this and, with that ZPN for some reason, there's a change in the ... and all this, which is critical to that sensor, and what we're probably going to have to do is vent them some way if that is really what's happening because of the pressure, and the air's ... - -

SCOTT             Oh, I remember. Yes. We did that. We took them off and put them back on and you said, "Hey, that's fine; that fixes it." And it was the pressure inside.

SPEAKER           So you stuck them back on?

SCOTT             Yes.

BERRY             Okay. Great. That helps.

SCOTT             Yes. I remember it now, when you called it. The obvious solution was, yes, we launch at 14.7 and here we are up there at 5.

BERRY             You see, we've done some of that in a chamber and we were running some people at that time trying to pin that down.



BERRY  
(CONT'D)

Yes. It'll do something to the ZPN, because it's an impedance measurement, whereas EKG you don't get the same kind of thing. So it worked out fine. Okay, great. Okay, we've got a lot of data in here, we think, on sleep. There are a couple of questions we'd like to ask you about. Now there are discrepancies obviously between what we think and what you think and that would be an interesting conversation that we'll talk about some more, but I don't think we'll waste a lot of time with it here. We can show you some of those records and what we try and do with it - with heart rate records and so forth. And it isn't just rate, and I thought your comments were very good ones, and we thoroughly agree with you about the fact that you need base lines on people in that area. There's no question about it. But there isn't much doubt about whether you're sleeping or not if you get rates down into the 30's and it's absolutely regular at 30. In the 30's and 40's, it's pretty obvious to tell that you are sleeping. There are some other times when it is harder to do. Okay. Did you feel that on the time - in the lunar-surface time period, did you guys feel that you were refreshed, like the sleep had really done you some good when you woke up?

SCOTT

I certainly did.

IRWIN

Especially that first night ...

BERRY

Yes. You commented particularly about that first night being the best one you'd had.

HAWKINS

How about the night before the last EVA?

IRWIN

It was a reasonable sleep. About like the one I had last night.

HAWKINS

Okay. You think you got a full night's sleep?

IRWIN

I wasn't thinking about what it ought to be. What was it, about 7 hours?

SPEAKER

Six.

SCOTT

It turned out 6 really because - -

HAWKINS

Extended time.

SCOTT

- - with the presleep activity ... - -

IRWIN           It was - from the time we said goodnight until the time we had reveille, it was 6 and a half hours. And that was the best night I had on the surface.

BERRY           Okay.

IRWIN           Because when they woke us up, man, I was really sleeping.

SPEAKER        Of course, we weren't monitoring ... that night. We monitored you ... last night.

SPEAKER        Because it really looked like to us, Jim, that - Well, it really looked like you got 2 hours of sleep, and that was the last 2 hours of the sleep period.

SCOTT           You just ought to spend a few years sleeping with him, which I've done. (Laughter)

IRWIN           At least I don't snore.

SCOTT           You did.

WORDEN          Neither do I. (Laughter)

SCOTT           He sleeps pretty good, because when I kick him out of bed because he's snoring, and I say to him the next morning, "Jim, do you remember you were snoring?" "Me? No, no, not me." And I'd pushed him out of bed and he was still sound asleep. (Laughter)

IRWIN           He does the same thing to me.

BERRY           Do any of you recall dream periods at all? Not contents, but do you recall dreaming at all during the sleep either in the command module or in the LM on the surface.

WORDEN          I guess I must have had a dream on the way back.

SPEAKER        On the way back?

WORDEN          A couple of nights ... - -

SCOTT           I don't normally dream anyway and I didn't dream ... at all that I can remember.

BERRY           That's been a big argument question.

SCOTT           Why?



BERRY It's an Adey-type question.

SPEAKER It's what?

BERRY Adey.

SCOTT What do you mean?

BERRY Well, because you know Ross Adey the biosatellite man with Bonnie. For instance, EEG's and getting down to REM sleep and your dream activity goes along with REM sleep.

SCOTT REM sleep. What's REM sleep?

BERRY REM sleep is rapid eye movement sleep, which says that that's the kind of sleep that in order to have adequate rest, you've got to have some REM sleep or you'll end up psychologically in difficulty with rest.

SCOTT I guess I've been missing it for years. (Laughter)

BERRY There can be dream activity that you don't even remember. Everybody does some of that, which are little kinds of dreams that are very short kinds of dreams. Okay. Did it take longer for you to fall asleep; did any of you feel, in flight than it does on the ground? Or about the same?

SCOTT The first night it took a little longer.

BERRY Well that's logical, too. But in general?

WORDEN Not me, no.

IRWIN I don't think it did. In fact, in some cases, it was shorter than it is on the Earth.

BERRY Okay.

IRWIN I couldn't give you a subjective difference though.

SCOTT I guess I could also say that Al bags out pretty good, too. There was one morning over there in the sleeping bag while everything was already going on and the lights were on and he was still sacked out cold.

WORDEN I like to sleep late.

BERRY            Okay. Were you guys aware that the items - the item, I guess is the only - the aspirin or any item in the medical kit that - like eyedrops or something like that that didn't require a prescription - did that still - medication that you would have reported it. Would you normally have reported it? Was there some reason you didn't report the aspirin?

SCOTT            I just didn't count aspirin.

BERRY            You just didn't count them?

SCOTT            I just didn't count it as medication.

BERRY            Yes. Okay. That's what we figured and that's why I wanted to ask you. Okay.

WORDEN           I took aspirin before entry. I think I commented on that sometime.

BERRY            Well, the aspirin is the only thing that's been used, and that's what you guys said. Well, we expected you guys to do that. Okay. What about the - do we need to talk any - Have you guys talked about the seconal thing? Do you all understand what went on with the seconal thing? Do we need to talk about that at all?

SCOTT            I don't think so.

BERRY            As far as you're concerned.

WORDEN           Except your intent was purely to have some medication to the heart.

BERRY            Right.

WORDEN           That was the idea behind it. And that was the only thing on board which did apply to the heart.

BERRY            That's right.

WORDEN           It wasn't really to get a night's sleep.

BERRY            It wasn't really to get a night's sleep; that's right. That's correct. And so - Okay, that's a second problem, you know, that goes along with this thing, which is another part. But I want you to understand.



WORDEN I understand it, you understand it, and there are other people who do not understand it.

BERRY Oh, I'm sure there are a hell of a lot of people who do not understand it. Right. That's going to be our problem.

SCOTT People who were there, and they don't remember that.

BERRY Oh, boy. Is that right?

SCOTT Oh, yes. They were tired. They hadn't had their sleep.

BERRY Where did you stow the PRD's during the CM and LM activities?

SCOTT In the command module they were all in the postlanding ...

IRWIN That was on the way back. On the way out, they were on the suit pockets.

SCOTT In the suit pockets on the way out, yes.

BERRY And so every time we asked you had to get down into the suits to get them.

SCOTT We maintained poor control over those things, I guess, because we didn't attach as much significance as apparently there was to those. I guess if you're really that serious about keeping track of all those things we ought to dump the ones in the suits and put those in the suits. I mean we had a lot of radiation stuff on board, none of which is really, from what I could tell, coordinated. We had three little packages in our underwear which we tried to change when we changed underwear, because nobody thought of that. And we had that great big radiation dosimeter up on the wall that nobody ever touched. And then we had that - -

BERRY Yes. That's the super D.

SCOTT - - ... and we have a great variety of things on there which are - I don't know who controls them all, but they're certainly not coordinated. So we tend to get very lax in their use. There's just radiation things all over the place. You guys seem to be interested in - your particular directorate seems to be interested in one and I guess if you really are interested in radiation, you ought to

SCOTT  
(CONT'D)

settle down to one system and then prescribe some positioning of them so that we can keep track of them. Because we flat forgot them. When we took the suits off, we stuck them down in the suits and then we'd get the suits out and they'd been buried there all that time.

HAWKINS

You know these are the only ones which are actually on your person, that tells what the radiation exposure - -

BERRY

Except they weren't on their person.

SCOTT

Well, that's not true. In our underwear we have three little bright patches - -

HAWKINS

Yes, but you can't read those.

SCOTT

Well, as far as I'm concerned that's a radiation measurement device. Settle down on one and we'll be able to keep track of that one. But I sort of figured that on me I've already got something that's keeping track of things. The PRD, whether that's down in my pocket or up on a shelf, isn't going to measure an awful lot of difference.

HAWKINS

Well, that's the thing we're looking for.

SCOTT

When you get in that command module, it's not going to change any, whether you've got them in your pocket or up on the shelf.

BERRY

We had a problem with the ... the one that went bad. We had one go bad on 14, too. So we - There are some problems with that.

SCOTT

They're very difficult to read, also.

BERRY

Yes. Boy, I tell you. I don't know how you can see those numbers. Sevens and ones you can't pick out of there at all. I can't. They need to do that. That's right. We're going to have to talk to that whole area with the ...

Dave and Jim, did you notice a sensation, any sensation of this fullness in the head sensation, when you came back to the command module from the lunar surface?

SCOTT

I think we put that in here because that was a very interesting thing, Jim noticed that he didn't notice it right away.

IRWIN

Yes.



BERRY That you did not notice it? Okay. Okay. You did have it, though. You did have it when you first became weightless and - -

SCOTT From Earth launch.

BERRY Yes, from Earth launch. You did have it too? Yes? Okay. Because specifically we wanted to know. Okay.

We checked through this thing here for the exercise and I guess we still - it's very difficult to tell for sure again. Can you say just quickly, each one, what you did, and how often you did it, as a summary kind of a thing. For exercise. Not counting all the stuff you guys did on the lunar surface.

SCOTT Al had the greatest variety of exercise.

WORDEN Yes, the first 3 days my exercise consisted of working with the Exergym. And I guess an average of three periods every 2 days maybe. By period I mean 15 or 20 minutes at a time.

BERRY Every 2 days? So you weren't doing two periods every day.

WORDEN It wasn't consistently two periods a day.

SCOTT Not because we didn't try, but because we just ran out of time. We didn't have time to do all of that.

BERRY Yes. Right.

WORDEN In lunar orbit, after they hit the surface, I guess, two periods a day 10 to 15 minutes of each of those periods was spent running in place.

BERRY With the center couch out like you described.

WORDEN And about another 5 to 10 minutes of each of those periods working with the Exergym. So, I'd say a total of maybe 20 to 30 minutes, two periods a day. I did it normally.

SPEAKER What exercises did you use with the Exergenie, which kind of motion?

WORDEN Just a straight.

SPEAKER Just a straight?

WORDEN Yes.

SPEAKER Did you feel that you were really building up some ... heart rate.

WORDEN Not with the Exergenie.

BERRY He did with the running in place.

WORDEN Oh, the running in place. I could tell the difference in - but I know John was sitting down there calling the differences to me too; so, it was obvious on the running in place that it was doing something.

SCOTT Al and I both tried our pulse rate after using the Exergym in a variety of modes. Neither one of us could get over 80. And ... got mad at me for using it so hard there one time.

WORDEN Thought he was trying to wear it out.

SCOTT Well, you couldn't get any heart rates. There's no dynamic response to that thing.

BERRY Exactly. What about on the way home?

SCOTT On the way home -

WORDEN I think our exercise periods kind of went by the wayside on the way home.

IRWIN After the EVA.

WORDEN After the EVA, we had a day and a half left and that was all. We were pretty busy doing P23s and stowage and getting things squared away.

BERRY That's what we couldn't get cleared up.

SCOTT Frankly, after the EVA, we just decided to do other things because it didn't seem to be that important.

BERRY Okay. What about yours, Dave, did you - -



SCOTT Yes. I did mine about once a day on the way out. I used the Exergym up until the time in which the Flight Plan we decided not to use it anymore because it was wearing out, apparently, and we decided it was better for Al to have it than for Jim and I, to wear that thing out. And then I did some - What do you call it? (Laughter)

WORDEN Said he was getting ...

SCOTT ... feet up against the bulkhead and I put my hands against the struts and put my feet on the LEB bulkhead and I pushed against my arms and did deep knee bends that way. And I could work up to about 100 or something like that. That's a fairly good exercise, but it's - You don't get to do anything out there very long. An exercise period is like 5 minutes. To me that's a nothing. You need to go 20 minutes. I mean, you really, in order to get any exercise at our levels you have to work for a long time. Because at that stage of the game to go out and run a mile is nothing. So, it wasn't even worth the effort. So to get up there and pump against something for 5 minutes, I didn't feel like I was getting any exercise.

BERRY You probably weren't.

SCOTT But I did that until we went down, and after we got back I think I worked the Exergym 1 day after we got back. Still, I don't think any of it was very useful. Jim?

IRWIN About the same as Dave, Chuck. On the way out, Exergym once a day for maybe 10 minutes. On the way back, I was trying to exercise, straining against the seat restraint until that failed.

BERRY (Laughter) Yes. Is that why that failed? (Laughter)

IRWIN I doubt it.

BERRY Do you think it would help, after what you did with trying to run in place, do you think it would help to give you a bungee that you could tie yourself down, so you could have it to the floor, so you could run in place, like the guys did in Soyuz 9?

IRWIN I think it would.

SCOTT I think a straight bungee like we had on Gemini would be better than the Exergym. You remember the Gemini ..., we had?

BERRY Yes; sure, yes.

SCOTT That's a lot better than the Exergym, because, you can get some dynamics out of it.

BERRY Right.

SCOTT I guess everybody has got their own bag as to what an exercise is. I guess - -

BERRY Well, the best thing would be an ergometer up there, there's no question in the world about that.

SCOTT Yes, I think you need to exercise, and all your data shows your heart. You've got to work your heart.

BERRY That's exactly right.

SCOTT Well, we're not working our heart. We're getting our muscles in tone.

BERRY Amen. That's right.

IRWIN You know at one point we talked about using those ... as an exercise ... I tried that a few times ... few deep knee bends against that restraint. That felt great.

SCOTT But you still want to have ...

BERRY Okay. Did you ever sweat following any exercise, either ...? Were you aware of sweating?

SCOTT You know, the cabin was fairly warm on the way out. I guess I got warm going out. It cooled off as we got closer to the Earth. But I never worked up any sweat on the lunar surface at all.

BERRY You never - -

SCOTT We probably got warm and clammy standing there after the sublimator in the backpack was off before we got all the PLSS stuff off.



BERRY Yes, but that's at the tail end.

SCOTT There was never any perspiring.

BERRY Even the time when you were on the third EVA where it was hotter?

SCOTT It wasn't that much hotter. It was hotter, but you could go to MAX COOL. That's my experience. I was never in a sweaty mode outside at all.

BERRY Did you ever sweat, even when you got out on the third ...

SCOTT Yes. Sure did. When I was running in place. When I finally got myself worked up at it for about 10 or 12 minutes.

BERRY Okay. Jim?

IRWIN The only time I ever noticed any sweat was after EVA-1 when I took my gloves off. The gloves were wet.

SCOTT Yes. I guess mine were wet, too.

IRWIN I could tell by my nails - it was obvious that my nails looked like they grew. You know, because the skin recedes.

BERRY Yes, that's right. Okay. Can any of you - do you have any idea or an approximate idea what you took in - this is part of Carter's fluid ... down here now - in the way of water or juice in a given day - in any given day in flight. Now I'm not talking about on the lunar surface. We know what you did on that. We know.

SCOTT I'm not sure you do, because Carter's question left a shadow of doubt in my mind.

BERRY Oh, okay.

SPEAKER I'm not sure ... understood what we meant when we discussed those food bags.

BERRY Okay.

SCOTT We didn't use the food bags, but that doesn't mean we didn't use the water. Because I drank an awful lot after we got back in every time. And you did, too. That's the

SCOTT  
(CONT'D)

first thing I did when I took my helmet off was to pick up the water gun and drink and drink and drink. I was very thirsty - -

BERRY

And you were thirsty, too, right? You felt thirsty?

SCOTT

Sure. I can sit in the office for 7 hours and not get thirsty. I was thirsty, and I drank to my satisfaction, which was a good amount of water, because I just stuck the gun in there and drank and drank and drank until I was satisfied. But I was thirsty. And I felt, and I think Jim did, too, in spite of the fact that we didn't have the full utilization of those water bags, I don't think our overall water values went down, because when we ... in there, we had quite an adequate water supply.

IRWIN

Yes, but I don't think we drank nearly as much as we did on this when we were ... because we missed that one meal where we ... that meal.

SCOTT

Yes, that's true, too. And you know the meal scheduling on the LM was one meal every 10 hours. You know, that's not very good.

BERRY

That's lousy.

SCOTT

So you really - you essentially miss a meal a day. And we ate everything in the LM and, I guess, we think you ought to have more food in there.

IRWIN

We needed more food.

SCOTT

I'm not sure you have time for another eat period, but you could double up on the two you have. Instead of having one meal, you could have a meal and a half, or something like that. I think you would eat that.

BERRY

We had a meeting yesterday we think - -

SPEAKER

You'd get a lot of liquids in those two meals.

SCOTT

Yes. You know, two soups and two wet packs, two drinks. I could have eaten two meals there in the LM, because I got pretty hungry. I mean, when I got through eating I was satisfied, but it's the kind of satisfaction, when you push yourself away from the table, you know, because it's time to quit eating.



BERRY (Laughter) Not because you ate too much. All right.

SPEAKER That wasn't water, ..., ... water.

SCOTT How was it?

SPEAKER No. That was water. It wasn't juice or it wasn't ... - -

SCOTT Oh, we drank the juices, but in addition to that, I drank just straight water out of the gun.

BERRY They drank and ate everything that was available to them in the LM.

SCOTT I think we may have had some - we may have gotten back with a couple of extra juice bags. There was an extra package.

IRWIN Well, we just ran out of time.

BERRY Did any of you notice any increase in your frequency or amount of urination?

SCOTT Well, when we ... command module, it seemed like about every hour.

WORDEN It was every hour, yes.

BERRY (Laughter) It was every hour.

WORDEN I had that problem in the command module simulator, but not to that extent. I might go every hour, hour and a half. But I was surprised I had more of a problem in zero g.

BERRY You guys didn't notice anything ...?

SCOTT It felt normal to me.

BERRY Okay. Did either of you feel physically tired during any of the lunar surface activity?

SCOTT Not physically, to the extent that you would say you just ran 3 miles and you're physically tired, where your mental activity is still very sharp but you've got to lie down and rest.

SCOTT  
(CONT'D)

... hard I'd never believed in it. Even after that, it was not just - oh, there were periods, you know when we were working the drill, I got tired. Soon thereafter, I felt less tired. I could have gone back and pushed the drill some more, if you had given me a 5-minute break. So, at the end of the EVA, I felt like I'd a fair day's work, but I wasn't physically - you'd have to equate it to something - I didn't feel like I'd just finished playing a 60-minute football game. I didn't feel that kind of tired. I didn't feel like we'd been on the rock pile in the back of the simulator building. After those exercises, I was tired. I mean I was really tired. And I never felt that way on this mission.

BERRY

You never felt that way?

SCOTT

No, I didn't.

BERRY

Okay, that's it ... Irwin.

IRWIN

No, I never felt tired, I never felt nearly as tired either. I didn't have the drill to think about (laughter). That had at least 90 percent to do with it.

SCOTT

Yes, that figures.

BERRY

How about you, Al? Did you ever at or on the EVA - on your EVA day? Did you feel tired?

SCOTT

At the end or that day?

WORDEN

No. I was less tired when I got back in than I did before I went out. I got to stretch.

SCOTT

He got to stretch.

IRWIN

Yes.

WORDEN

Yes.

SCOTT

That was probably the best day you had (laughter).

WORDEN

Yes, it was, it was.

BERRY

Which of the EVAs, can you say, on the lunar surface, did you feel was a bigger - the most difficult one for you, from a workload point of view?

CONFIDENTIAL



SCOTT I can't think of any of them - in total - being the most difficult in workload, because they're all about the same workloadwise, with the exception of fussing with the drill, and we had to do that on every EVA, so it probably balances out.

BERRY It was the time - it was just that time period when you were doing that, monkeying with that drill that you were tired?

SCOTT I didn't feel any more tired in EVA 3, than I did after EVA 2, even though it was shorter. The only time I got tired was when we were handling the drill.

IRWIN EVA 1 was clearly the hardest, as far as workload, particularly in the hands. Our fingers were very sore, and, of course, my wrist was sore too, where the sleeve rubbed. So, that stands out as the hardest workload.

BERRY How about the time when you were trying to get back in at the end of EVA 1, and you didn't have that hatch open. Do you think that was probably the time that you felt, more than any other time, really fatigued? Really working? That that was the highest workload you had?

IRWIN Yes, it was.

SCOTT There's sort of Jim's correlation to my drill, because he has to do the whole ALSEP all by himself, while I'm doing just the drill. He got his ALSEP done, and I never got the drill done, which meant that I had to go back and do ALSEP every time on the other EVAs.

BERRY Okay, it is correct that all the potable water chlorinations were done, despite the problem that you had the one time? Is that right?

SCOTT Yes.

BERRY Okay, just as in the Flight Plan. None of us are really sure, but when we talked to you all last Monday concerning the bowel movement situation, didn't you say it was about every other day?

SCOTT Yes.

BERRY For each of you?

SCOTT Yes, that's a good average. We should have kept track of that. I'm sorry we didn't. It was so frequent and we were so busy. And it was much more frequent than I had anticipated, because my experience on 9 was once every 3 days per guy. It was pretty regular, and you could almost anticipate it. I was thinking the same thing, but we'd forgotten that we were going to eat a lot more, and I ate a lot more this time than I did on 9. And you eat more and you have more bowel movements.

BERRY Sure.

SCOTT And it showed. And I would guess that over the 12 days that probably - six.

BERRY So it worked out just about every other day.

IRWIN Although it wasn't regular.

SCOTT Yes, not regular. That's about the average.

WORDEN I missed three days.

BERRY Out of the whole flight?

SCOTT He helped the average.

WORDEN ... on the way to the Moon, and then ... the Moon. We just flat ran out of time. (Laughter)

BERRY Okay, I think we got the two foreign - Nobody else had any foreign bodies in the eye, except you, right?

IRWIN I don't think so.

SCOTT ...?

WORDEN Yes. You know when we opened that bag.

BERRY Yes, that lunar dust. That lunar dust kit?

SCOTT And it cleared right away.

IRWIN Yes, my eye teared it.



BERRY How about your own personal assessment, Al, in a couple of words about how long you personally felt that it took you to - Now I'm not saying that now that the basis of all these tests or anything, I'm talking about your own personal feelings as to how you felt when you came back here to one g. How long do you think it took you before you felt perfectly like - as well as you felt before you went up there? As you personally felt now, not on the basis of anything you know about test data or anything.

WORDEN I'd say it was at least the next day.

BERRY The day you left the carrier?

SCOTT You have to define what you're saying there. I would say that Al was clearly back to one g - compensations and status - 5 minutes after touchdown. As I watched him in the LEB, and I watched a lot of guys in the LEB, and a big percentage of them throw up down there, and he was down there whistling around like he'd been there all week, and that was 5 minutes after touchdown.

BERRY Okay, what I want to get - what do you mean by that, I guess.

WORDEN We're talking about two different things.

BERRY Are you talking about walking?

WORDEN Yes. I'm talking about my motion, and - -

BERRY That's what I'm trying to get, is some overall - -

WORDEN - - that's ... separate thing, to move around and do things, as far as my reaction to the one atmosphere, to the one-g environment. As far as my vestibular was concerned, there wasn't any adjustment there.

BERRY No, no, I know you never had any vestibular adjustment.

WORDEN And I guess as far as moving around, in general, and feeling different than I had and so forth like - In other words, there's a kind of a - it's just a different kind of a feeling that you're not - you feel like you're not quite adjusted.

BERRY Did you feel heavy at all? Did you ever have this feeling?

WORDEN No. I only - Yes, well, about that first 5 minutes when I got down in the LEB, I felt very heavy. And, gee, that was over, you know, in just a few minutes.

BERRY That didn't stay with you the rest of that - -

WORDEN It didn't stay with me at all.

BERRY Okay. Good. Dave?

SCOTT Let me add to it a little bit. I looked at everybody on the helicopter very carefully because I guess I was - I've been in these things ..., too, like everybody else has, and I've had a shot at it after 10 hours and one after 10 days.

SPEAKER That's what I want to - -

SCOTT And I can compare my own feelings after 10 hours and 10 days pretty well.

SPEAKER Yes.

SCOTT And I felt exactly the same this time after 12 days as I did the other two times. It took me 5 to 10 minutes to get over the heavy feeling in the command module. No vestibular feeling at all and I - again I was in the center couch and the guy in the center couch is the first guy that has to get in the LEB. When I go out in the Gulf - this time around it didn't bother me, but when I was on 9, ... When I went out in the Gulf, the LEB was a bad ... But this time, no sensation at all. So when everybody was in the helicopter and changing clothes I watched them because everybody was hanging there on one foot, putting their leg ... - -

BERRY Yes, and walking you didn't feel unsteady or anything?

SCOTT On the ship I did.

BERRY After you got on the ship, but you didn't - -

SCOTT Because I didn't have my sea legs. But it was noticeably different, and I think you can remember it - very different on the helicopter than on the ship. And everybody was stable enough on the helicopter to put their flying suits on by standing on one leg.



BERRY Yes, yes, right.

SCOTT So when we got to the ship, you could see us tilting and that was because we didn't have our sea legs. There's a profound difference between the chopper and the ship. And I think our reaction on the ship - I felt - I felt that I wasn't really with the ship's operation there for awhile, maybe a couple of hours, because I wasn't used to this one. But on a firm ground I noticed there was none.

BERRY How about sleeping that night now? Did that feel the same? Did you feel that it - -

WORDEN That's the problem. Worst night's sleep I'd had on the whole trip.

BERRY But do you know why? Did you feel that - -

WORDEN Because there was some idiot upstairs rattling a chain around the flight deck. If it hadn't been for that I'd have gotten a good night's sleep; but, I'll tell you, that was the noisiest place I've ever been in my life.

SCOTT My sacroiliac was feeling it all night long.

WORDEN My bed was about 4 feet below the metal plate which was the flight deck.

SCOTT My bed was like a big soft caved-in bed, which I don't sleep good in anyway. I like a hard bed.

WORDEN I do, too.

SCOTT I could sleep better on that table than I did in that bed. And, gee, everybody said, "Hey man, the Okinawa is really plush. It's not like that old one you guys were on." We were on the Guadalcanal. And the Guadalcanal was pretty damn good, and I got a great night's sleep on that thing, because I remember the first night back. Boy, that was really good sleeping. And this thing ... it. I just couldn't sleep at all.

WORDEN Well, I guess there's a ... mission to the Moon.

BERRY Yes.

SCOTT Right.

BERRY Well, Jim, we don't need to go through the orientation bit with you because that's all been done, but just your own personal - -

IRWIN I thought I was back to normal, what I considered normal myself, last Sunday afternoon.

BERRY Yes, that's what we think. Okay.

IRWIN The giddiness was gone, and as soon as that was gone I felt like everything else was going back to normal. That's why I asked for that test ...

BERRY Yes. Okay. Great. Fine.

BERRY Okay, I see Bill and his people on the light flashes are back here. Okay, you guys yell loudly.

END OF TRANSCRIPTION

CONFIDENTIAL



CONFIDENTIAL

CONFIDENTIAL