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SKYLAB EXPERIENCE BULLETIN NO. 3

ARCHITECTURAL EVALUATION FOR SLEEPING QUARTERS

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National Aeronautics and Space Administration

LYNDON B. JOHNSON SPACE CENTER

Houston, Texas

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MAN-MACHINE ENGINEERING DATA APPLICATIONS OF SKYLAB EXPERIMENTS M487/M516

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ARCHITECTURAL REQUIREMENTS FOR SLEEPING QUARTERS

This document is the third in a series of releases which are intended to make available to NASA and contractor personnel those results from the Skylab Man-Machine Engineering Experiments which have design and requirements relevance to current projects and programs. This method of data distribution has been instituted as a convenient way to provide early access to Skylab experience and is intended as an interim measure, to be followed up by a thorough experiment report six to nine months after receipt of all Skylab flight data.

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July 1974

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OF
SKYLAB EXPERIMENTS M487/M515

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SUMMARY

The Skylab sleeping facilities proved to be adequate in size, but the crewmen desired a personal gear stowage unit and a place to "hang" their clothing at night. The individual sleeping quarters were felt to be a necessity but needed to have better sound control. The crewmen, in general, sleep lighter while in space. Noise, then, becomes a greater problem.

Lightproofing the compartment, once the light baffles were installed, appeared to be no problem. The individual lights in each sleep area were adequate for most purposes; they should be brighter for reading.

The temperature threshold for good sleeping in Skylab appeared to be 75°F. The crewmen felt that they slept better at cooler temperatures in the low 70's where they used a light cover to retain body warmth. However, since the body comfort ranges are highly individualistic, the sleeping areas require an adjustable airflow to permit each crewman to maintain his own comfortable temperature level.

PRE-SKYLAB EXPERIENCE

The sleeping accommodations prior to the Skylab missions were rudimentary to non-existent. The crewmen in the Mercury Program (when they did sleep) slept strapped in their couch. One crewman reported that he hooked his thumbs under the helmet restraint cables to keep them from floating around and accidently activating switches on the control panel in front of him. He also reported that he had the sensation of sleeping sitting up.

The Gemini capsules had similar sleeping accommodations. The crewmen slept in their pressure suits, strapped in their couches. When sufficiently fatigued, they slept reasonably well. Since they were constantly in their pressure suits, the average cabin temperature of 70^{o} was not uncomfortable.

The Apollo Command Module had much improved sleeping accommodations. Private quarters were still not available, but the crewmen did have sleep restraints resembling zip-up hammocks which could be installed under the right and left couches and above the right couch.

It was not possible for the pre-Skylab crewmen to sleep and work in shifts because of the noise problem, but by establishing a standard work day and sleep period, the crews were able to sleep reasonably well.

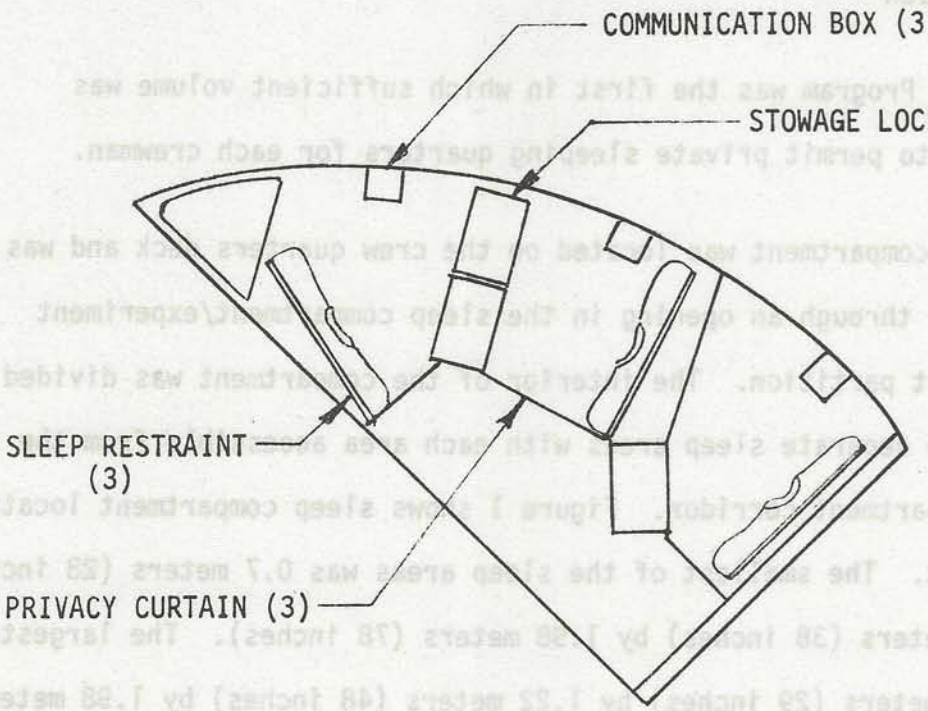
SKYLAB DESIGN

The Skylab Program was the first in which sufficient volume was available to permit private sleeping quarters for each crewman.

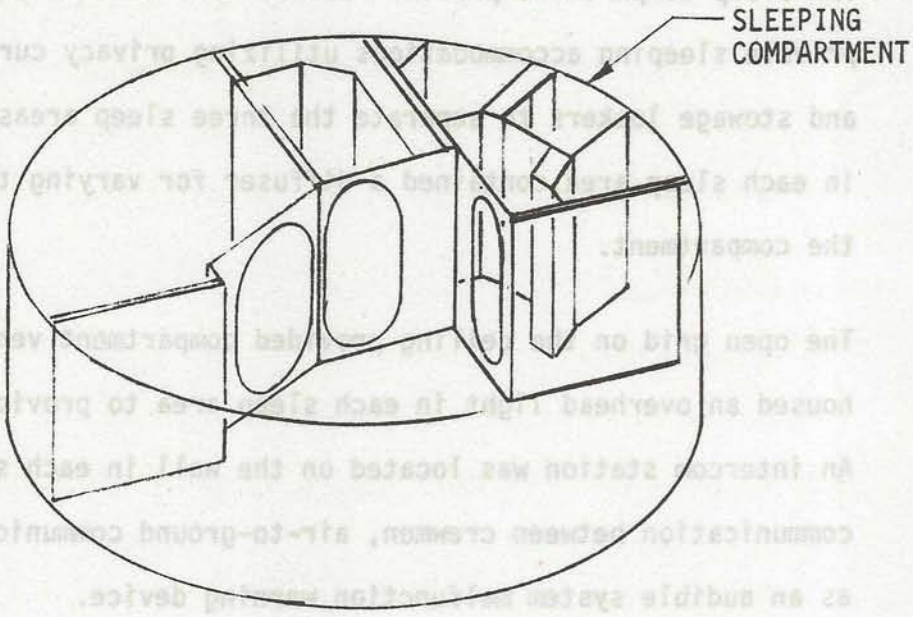
The sleep compartment was located on the crew quarters deck and was accessible through an opening in the sleep compartment/experiment compartment partition. The interior of the compartment was divided into three separate sleep areas with each area accessible from the sleep compartment corridor. Figure 1 shows sleep compartment location and layout. The smallest of the sleep areas was 0.7 meters (28 inches) by 0.96 meters (38 inches) by 1.98 meters (78 inches). The largest was 0.73 meters (29 inches) by 1.22 meters (48 inches) by 1.98 meters (78 inches).

The sleep compartment provided each of the three crewmen with individual, private sleeping accommodations utilizing privacy curtains, partitions and stowage lockers to separate the three sleep areas. The grid floor in each sleep area contained a diffuser for varying the airflow entering the compartment.

The open grid on the ceiling provided compartment ventilation and housed an overhead light in each sleep area to provide area illumination. An intercom station was located on the wall in each sleep area for communication between crewmen, air-to-ground communication and served as an audible system malfunction warning device.



SLEEPING COMPARTMENT



CREW QUARTERS DECK

Figure 1

The stowage lockers contained personal items and clothing and provided a noise and visual barrier between the individual sleep areas. The lockers also housed tissue dispensers and trash containers.

A light baffle was provided which could be affixed to the ceiling at crew discretion to block out unwanted light from the forward dome compartment. Figure 2 shows the light baffle installed in an individual sleep area.

Figure 3 provides a view of the sleep compartment arrangement.

SKYLAB EXPERIENCE

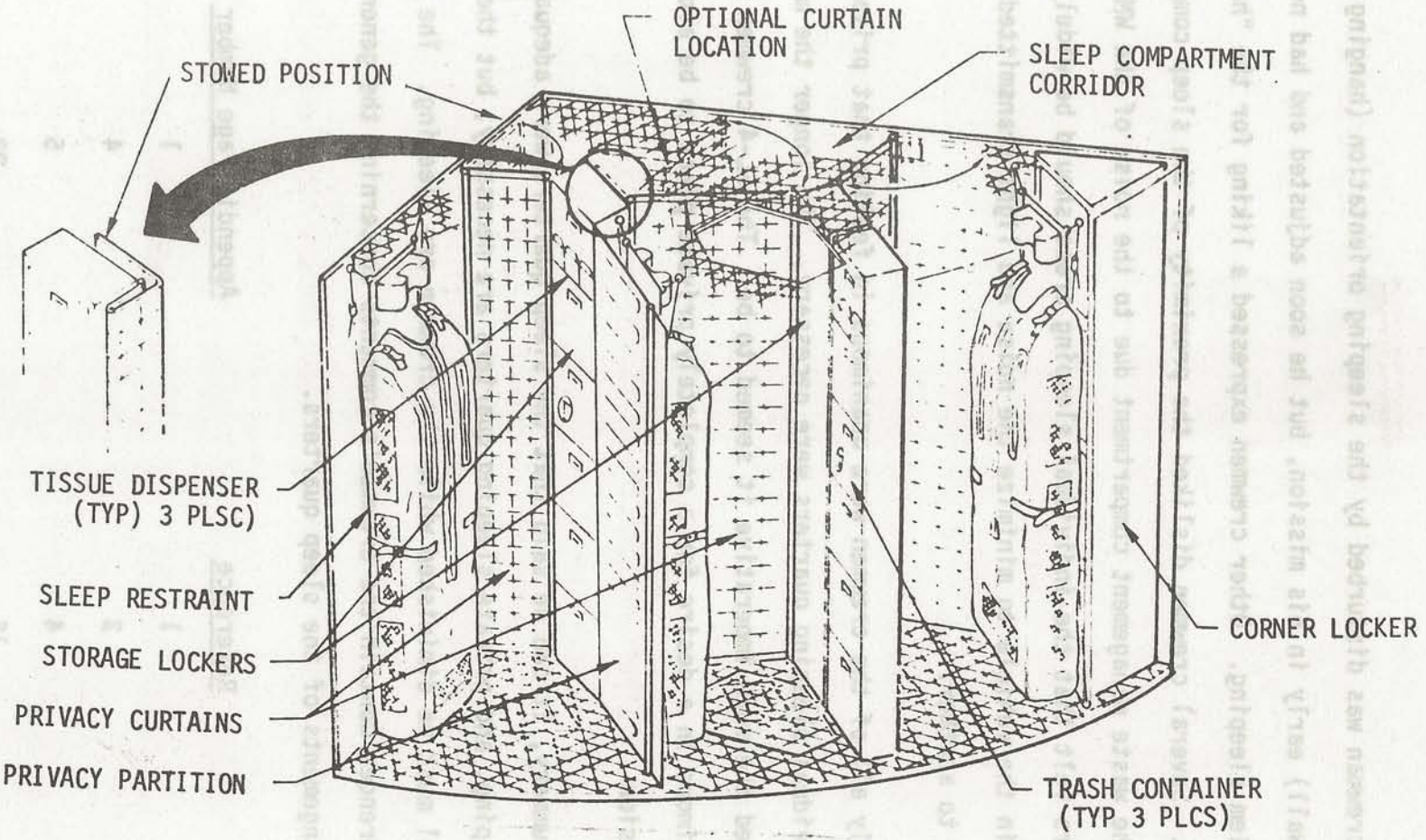
The pertinent data from in-flight transcripts and post-flight debriefings has been collected along with in-flight movie and TV film to ascertain what problems, if any, the crewmen had with the sleeping quarters.

General Arrangement

In general, the crews felt that the arrangement, location, and orientation of the sleep compartment was adequate. They liked the proximity of the communication boxes and light switches to the sleep restraint. Only one crewman felt a need to be able to adjust the air diffuser from his sleep restraint.

INDIVIDUAL SLEEP AREA

Figure 2



SLEEP COMPARTMENT VIEW LOOKING INBOARD

FIGURE 3

One crewman was disturbed by the sleeping orientation (hanging on the wall) early in his mission, but he soon adjusted and had no further problem sleeping. Other crewmen expressed a liking for the "hanging" mode. Several crewmen disliked the proximity of the sleep compartment to the waste management compartment due to the noise of the WMC equipment. Others felt that the individual sleeping areas should be widely separated within the vehicle to minimize the noise and light transmitted from one area to another.

Nearly all of the crewmen were unanimous in feeling that private, individual sleeping quarters were necessary. The longer the mission lasted the more imperative it seemed to be. The SL-4 crewmen were unanimous in a desire for a completely private place to be alone on occasion.

In summary, it can be said that the sleep quarters were adequate for sleeping, and private sleeping quarters are necessary, but the noise level must be diminished while the crewmen are sleeping. The following references contain the crewmen's comments concerning the general arrangements of the sleep quarters.

Reference	Appendix Page Number
1	1
3	4
4	5
15	22

Reference	Appendix Page Number
30	50
32	53
33	55
38	65
40	69
43	73
45	77

Size

The Skylab crewmen were nearly unanimous in saying that the individual sleeping areas were large enough for sleeping. Only the SL-4 science pilot (reference 38, appendix page number 65) felt that the sleeping area should be larger to provide the crewman with a place to "sit down". However, this may very well be an indication of the need for privacy on a long term mission, rather than an actual need for more volume. He did have enough room for sleeping. The taller men indicated that the 1.98 meter (78 inches) compartment height was marginal, especially when they wore the M-133 experiment hat, or when the light baffles were installed. Figures 4 and 5 indicate the proximity of the ceiling to the crewmen's head when these two conditions existed. Perhaps the best indication that the sleeping areas were not too small was the relatively few comments concerning their size. The following references contain comments concerning the size of the sleeping areas.

Figure 4

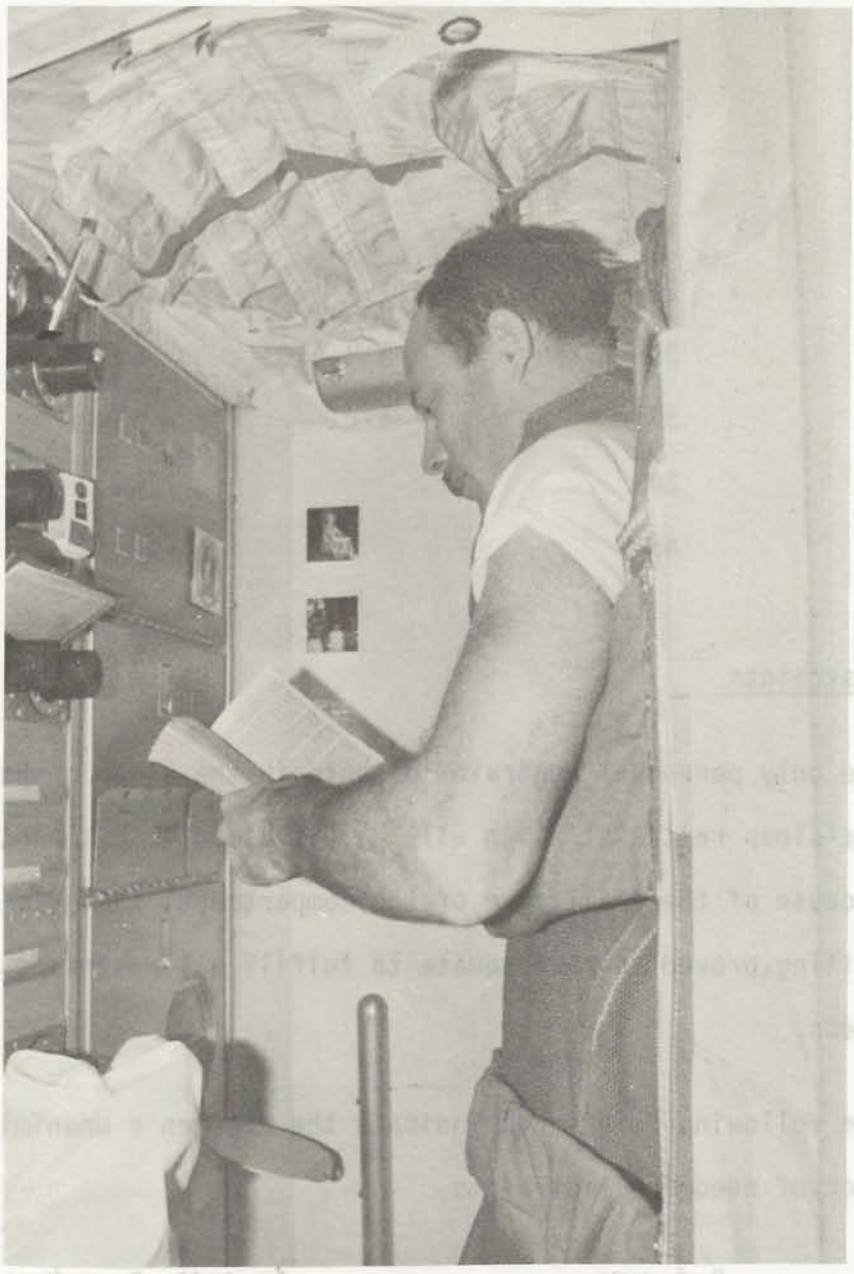


Figure 5

Reference	Appendix Page Number
3	4
12	19
15	22
16	30
20	34
36	60
37	63
38	65
45	77

Restraints

The only personnel restraint as such in the sleep compartments was the sleep restraint, which will be discussed in a separate bulletin. Because of the small size of the compartment, the grid floor and ceiling proved to be adequate to fulfill all restraint and mobility needs.

The following references indicate the crewmen's unanimity in their lack of need for restraints.

Reference	Appendix Page Number
3	4
16	30
20	34

Reference	Appendix Page Number
24	42
36	60
37	63
38	65
41	70

Stowage

The Skylab crews had sufficient permanent stowage for their clothing in the sleep compartment. Some minor complaints were voiced about the stowage of spacecraft equipment items in what was felt to be a personal area, but most of the crewmen were not concerned with the extra gear in their areas. However, most of them voiced a definite need for temporary or personal stowage. They needed some place to put personal items such as music tapes, books, or pocket items that they accumulated during the day. They wanted some kind of compartmentalized drawer to empty their pockets into when going to bed. One crewman installed a trash bag for this purpose in his area.

Another important need was a place to put clothing during the sleep period. Some of the crewmen indicated that they had stuck clothing behind the communications boxes, or secured it outside the sleep compartment. This should prove to be an unsatisfactory arrangement for the mixed crews of future space flights.

The crewmen of the SL-4 mission indicated a need for some type of small writing desk in their sleep compartment. It was felt that this could be worked into the compartmentalized personal stowage and be extremely useful.

The following references address the stowage problems.

Reference	Appendix Page Number
3	4
8	11
20	34
21	36
23	39
27	45
31	52
33	55
36	60
38	65
42	71
43	73

Environmental Considerations

The environmental considerations received most of the comments by the crew. Noise was a big problem, as was temperature control.

Noise - The most prevalent complaint from the Skylab crews was the amount of noise that would awaken them. The background noise in the workshop was extremely quiet (56 db reported by the SL-2 crew) and noise above this level would awaken the crewmen. Apparently, the crewmen slept very lightly and nearly any noise was sufficient to awaken them. Movement about the spacecraft by one crewman would awaken the others. The waste management collection equipment (mounted on the wall next to the sleep compartment) was a particular offender. In one instance on SL-4, a coolant pump started running much louder than nominal. It had to be shut off at night for the crew to be able to sleep. Even movement during sleep by one crewman could disturb the others. Again on SL-4, one sleep restraint support assembly became loosened. The noise generated by that crewman during his sleep was, at times, sufficient to arouse the other two.

The following references address the noise problem.

Reference	Appendix Page Number
1	1
2	2
3	4
7	9
9	13
10	15

Reference	Appendix Page Number
14	21
15	22
20	34
32	53
36	60
37	63
38	65
41	70
43	73
45	77

Lighting - Generally, the lighting in the sleep compartment on Skylab was not a problem. The one light in each sleep area was considered marginal for reading by several of the crewmen, but since no one had much time for reading, it was not a major problem.

The crews kept all of the spacecraft lights out during their sleep period. Some comments by the SL-2 crew indicated that "unfortunately, if somebody turned on a light, you were aware of it" (reference 15, page 22). Thus, a light turned on or a window shade opened would disturb the sleeping crewmen. However, the SL-2 crew didn't use their light baffles. The later crews stated that the light baffles and privacy curtains kept the light out very well. Figure 5 shows the light baffle installed. Thus, the spacecraft lights could have been a problem, but

it was easily resolved. The following references contain the lighting comments.

Reference	Appendix Page Number
2	2
3	4
4	5
5	6
9	13
10	15
14	21
15	22
19	33
20	34
22	37
26	44
28	46
34	57
35	58
36	60
37	63
38	65

Temperature - There were some thermal problems in the early portion of mission SL-2, but this was due primarily to the heat shield being

lost during launch. After the sun-shade was installed and the overall temperature stabilized, the crewmen had little difficulty sleeping.

The sun-shade apparently did not completely shield the science pilot's sleeping area, particularly during the periods when the spacecraft was in the high beta angle portion of its orbit. The spacecraft orientation was such that the temperature of the science pilot's sleeping area increased to an uncomfortable level. Each of the three science pilots commented on this during the missions.

It appears that the crewmen all slept better when the temperature of the sleep compartment was slightly cooler than in the workshop in general. The most comfortable temperatures ranged from 75°F downward. At 72°F, some of the crewmen commented that they needed to put on a blanket, others didn't use them until the temperature was even lower. Temperatures in excess of 75°F were too warm for comfortable sleeping.

The following references contain the crews' comments concerning temperature.

Reference	Appendix Page Number
1	1
2	2
4	5
5	6
6	7
13	20

Reference	Appendix Page Number
15	22
17	31
20	34
25	43
28	46
36	60
38	65
39	67

Airflow - The flow of air from the adjustable diffusers was necessary for temperature control and to prevent stagnant air buildup within the sleeping compartment. However, it did cause some problems. Several of the crewmen had difficulties with cold feet because of the airflow directly on the sleep restraint. Some of them were able to adjust the diffusers sufficiently to alleviate the problem, while others shifted their sleep restraint or wore two pairs of socks while sleeping.

The airflow rate (measured during SL-3 at five feet per minute in the Commander's sleep area) was not considered excessive by most of the crewmen. However, there were some complaints about air noise and one crewman reversed the orientation of his sleeping restraint to prevent air from blowing up his nose and drying out the tissues.

One potential problem was caused by the light baffle installed in the ceiling of the individual sleeping areas. On occasion it folded

snugly against the ceiling grid and interfered with the free flow of air. One crewman kept his privacy curtain partially open to permit good ventilation.

The following references address the airflow problem.

Reference	Appendix Page Number
7	9
11	18
18	32
19	33
20	34
22	37
28	46
29	49
34	57
35	58
36	60
37	63
38	65
39	67
40	69
43	73
44	76

CONCLUSIONS/RECOMMENDATIONS

1. Private sleeping accomodations appear to be necessary, particluarly for long missions.

2. The 0.71 meters (28 inches) by 0.96 meters (38 inches) cross sectional area of the Skylab sleep compartment is adequate for sleeping. The Skylab sleeping area floor to ceiling height of 1.98 meters (78 inches) appears to be marginal.

3. A personal stowage compartment suitable for restraining and stowing small pocket items should be available in the sleeping area. Incorporating a writing surface into this unit would be highly desirable.

4. Stowage provisions should be provided in each sleep area for the clothing worn during the day which will be redonned the following day.

5. The individual sleeping areas need to be made reasonably sound and light proof to permit crewmen to sleep while others are awake and moving about.

6. The individual sleeping areas need to be, in general, cooler than the general working volume. 75^{o} F appears to be a maximum comfortable sleeping temperature. An individual variable air diffuser appears to be an excellant method for permitting the crewman to vary the sleeping area temperature to his own satisfaction. However, the air flow should not be directly upon the sleeping crewman.

7. An individually controlled light should be installed in each sleep area.

8. The practice of providing air-to-ground communications in each sleep area should be continued.

9. Provisions for off-duty music tape players should be provided in each sleep area.

RAW DATA APPENDIX

REFERENCE	SOURCE	PAGE
22	SL-1/3 Dump Tape 232-05, page 3 & 4	36
23	SL-1/3 Dump Tape 232-05, page 9, 10 & 11	39
24	SL-1/3 Dump Tape 232-07, page 4	42
25	SL-1/3 Dump Tape 232-07, page 5	43
26	SL-1/3 Dump Tape 239-01, page 4	44
27	SL-1/3 Technical Debriefing, page 12-31	45
28	SL-1/3 Systems Debriefing, page 103, 104, 105	46
29	SL-1/3 Corollary Experiments Debriefing, page 5	49
30	SL-1/3 Corollary Experiments Debriefing, page 10, 11	50
31	SL-1/3 Corollary Experiments Debriefing, page 21	52
32	SL-1/3 Corollary Experiments Debriefing, page 30, 31	53
33	SL-1/4 Dump Tape 333-02, page 6, 7	55
34	SL-1/4 Dump Tape 338-02, page 13	57
35	SL-1/4 Dump Tape 344-06, page 34, 35	58
36	SL-1/4 Dump Tape 356-05, page 12, 13	60
37	SL-1/4 Dump Tape 356-06, page 7, 8	63
38	SL-1/4 Dump Tape 361-02, page 5, 6	65
39	SL-1/4 Dump Tape 365-07, page 5, 6	67
40	SL-1/4 Technical Debriefing, page 5-25	69
41	SL-1/4 Technical Debriefing, page 12-36	70
42	SL-1/4 Technical Debriefing, page 12-41, 42	71
43	SL-1/4 Technical Debriefing, page 12-50, 51, 52	73

REFERENCE	SOURCE	PAGE
44	SL-1/4 Systems Debriefing, page 290	76
45	SL-1/4 Systems Debriefing, page 435	77

REFERENCE	SOURCE	PAGE
44	SL-1/4 Systems Debriefing, page 290	76
45	SL-1/4 Systems Debriefing, page 435	77

Skylab Dump Tape 155-12
Time: 22:15:46 to 22:50:46
6-4-73
Page 8 of 11

Reference 1

22 45 20 SPT Yes, I think partially ... dehydrated food more and more ... It's a better variety of ...

22 45 35 CDR Yes. ... But even so, it would be nice to jab the gas out of the water first. If you drink - -

PLT Oh, it would be great for that. ... A lot of trouble involved ...

CDR Yes.

22 45 54 SPT Following that layout I think - I think it's a bad idea to have the head right next to the sleeping compartment, especially with the layout we have, with the urine sepearators and the blower in the common bulkhead between the two. If somebody gets up at night and has to go to the bathroom, and you turn on the separator and the blower, and it's - you tend to wake up people that are sleeping.

PLT What safety problems have arisen that are directly related to habitability?

CDR ... none.

PLT (Laughter) What ... problem have occurred in performing various activation, housekeeping, or experiment activities to date. Are there any common difficulties that can be traced to inadequacies of design, onboard provisions, or preflight preparations?

CDR I think the answer to that question is very ... answer. I think we were very pleasantly surprised. ... The place that really ... is having your hands full of ... obvious, no problems ... It gets very hard to ...

SPT Very good point. I think the next generation should come up with some clever ... pieces of gear - put away places. Whether they be ... By the way, I hate those damned things - little boxes with ... openings or quadruple rubber clamps like we have where you just push them on with ...

bearing in mind the location of the various cabins and their functions with respect to the people that are using that ... so much for the wardroom. The waste management copartment is very good. General arrangements and orientation of the compartment are - fairly good, and the location of the compartment next to the sleep compartment is not good because the blower runs and you can hear in the sleeps compartments and so no forth. So, it is just the location. The volume is fine. (Yawn) ... as far as ingress/ egress is okay. The trash collections is all right, but yet the - little improvement in trash collection I would think that especially the wet trash - the urine ... when anybody has to use the head, the collection of the urine bags so forth, that rather than hang that thing on the wall, we really need to get ... internal thing to hang that trash bag, and it would keep it out of the way of the door is located right next to where we come - the door we come in and out. It's also located right in front - next to the wash basin. There it is sort of in your way but it's not that bad. The storage volume and access in there is very usable. The temporary equipment restraints, the handholds ... are good. The foot restraints again are excellently placed, but the material that they are made out of is very poor and it makes it difficult to use. No requirement, no personnel mobility aids in there, no personnel restraint devices - excuse me, I got personnel restraing devices mixed up with temporary equipment restraints. Just the equipment restraints. Okay. And the comment I made about the temporary restraints applies to personnel restraint devices - the foot holders; so don't confuse the two. Considerable comfort. Fit good there. Noise level is low, and the illumination is excellent. Sleep - - I find my sleep compartment quite adequate. You

don't need a large room. I have plenty of stowage space. Don't mind my head hanging on the wall. Trash collection fine, stowage is fine. Access is fine. Temporary equipment restraints ~~are~~ and personnel mobility aids are fine. Personnel restraint devices are adequate but ... there is improvements made on it, but the basic idea is very good. You can sleep on your side, on your back, on your stomach. Works very well, and we can sleep quite well up here. Thermal comfort ... good. Noise level is low, except for ... (yawn) in the waste management compartment when somebody goes in at night, the illimination is all right. ... a small C-type clamp to be located over my bed ... got all the light or no light. Experiment compartment ... arrangement and - of the experiment compartment is fine. We're a little crowded over the area where the shower is, because the shower is an after thought to us. If the shower wasn't there, I think it everything would be just fine. One other point, the volume of this compartment is quite inadequate. The ceiling has got ... of stuff ... We find we like exercising with the bicycle ergometer in the command module we have no place to put our feet up on the ... wire rugs, fire sensors, lights, and shower stuff's all in the way. There ... ingress/ egress in the experiments compartment is no sweat. Trash collection is really not too applicable. We don't really generate a ... lot of trash there and so I don't think that really applies. Stowage-wise, access is very reasonable. Temporary equipment restraints are adequate. Personnel mobility aids ... Personnel restraint devices - we found that we can ride the bicycle with no restraints at all. Very well. The thermal comfort has been good. The

and tend to interfere with the urine drawers. Thermal comfort's fine. Noise level's fine. Illumination is probably adequate in this compartment. The sleep compartment - arrangement and orientation are - are okay. The volume of the compartment is okay, except that a little more temporary stowage is required. I'll get to that. Ceiling/floor proximity is okay. Don't make it any smaller. When I have M133 on, my head tends to bump and scrape the ceiling with that cap on when I'm in bed. Ingress/egress is okay. It's a little bit cramped, however, for rapid egress, in case we really needed to. Trash collection is fine. Stowage volume is - not enough in the that most of the lockers are taken up with permanent stowage of one kind or another. And you really don't have any place to empty your pockets. I have rigged two trash bags - taped them to the wall and ceiling near the bed, and I used those for - as dresser drawers. Temporary equipment restraints are okay. Personnel mobility, not needed. Restraint devices, not needed; the compartment is so small. Thermal comfort is okay. Noise level is too high when - when you're asleep and anyone else is moving around at all, the noise and the light get to you. If you ever want people on other than a simultaneous sleep cycle, you must provide them with a sound-proof sleeping accomodation, which is the exact opposite of what we have right now. Illumination in the sleep compartment is okay. Experiment compartment general arrangement and orientation is okay, except that, at the two corners where things get awfully crowded between the shower, the centrifuge, and the tool kits, our temporary stowage for the vacuum cleaner and stowage is crowded in that corner. In the other corner, it's not quite so bad, but M131 pretty well sweeps that area clear, and

doors is we have to get in that same large, lower odd-shaped compartment for the urine bags and the urine sample bags. It's better to have a more regularly shaped compartment than to have it higher, because you don't have to work in any compartment in an upright position. Temporary equipment restraints again are ... so-so, and they are used, they are very good, they are mobility aids. We have a couple of handrails, they are not used for mobility aids, they are used for aids for restraint devices. Restraint devices, the foot trims we touched on them before, and the same comment goes for these as goes for the - the ones at the wardroom table. Thermal comfort is very good, noise level very good, illumination, now we can get all three lights ordinary again is very good. Sleep compartment general information and orientation. I guess I'm unique compared to my two compatriots in that I was not able to sleep well on a wall. Apparently, I have personal mental problem, I guess, but I've not slept in there since about - The fourth night. We moved in the workshop, I slept in the forward workshop compartment. The volume is good, the ... proximity is also all right, the vents are okay, trash breakers are fine, stowage volume is very good. Temporary equipment restraints - - quite a bit of - well, a couple of ... which are adequate. Personnel mobility aids don't apply as do restraining devices, thermal comfort is very good, noise level, very good, and illumination, adequate. Experiment compartment. General arrangement it's a - let me think on this a minute. Somebody think they'd do better - someone else would do better - I think, evaluating when you're not used to it. We've been training in this thing for a year and a half, somethings you come to accept. I guess I got no comments to make, no suggestions, so I'd have to give that a very good then. Volume is all right, ... proximity

Skylab Dump Tape 167-10
Time: 12:21:37 to 12:44:30
Page 1 of 2

Reference 5

M487-3C

12 21 37 CDR Hello, friendly tape recorder. This is the CDR on day 167 ... M487-3 Charlie. Items to be evaluated: jackets. Jacket was used daily, especially in the CDA and the command module area, where temperature ran around 60 degrees. I use the IV - IV - daily when I did not need to be ... in the floor again when operating the ATM, or ... around the wardroom, or working in areas where we ... the floor was not necessary. I found no reason to use the bowpad. bump hat The pillow I used in my bed could, by raising the straps on the bed in such a manner that it didn't - the natural - edge to my body put my head against the pillow. The blankets I used during the middle of the flight when workshop got down in the low 70's, but otherwise I didn't need the blankets after that. The light bulbs I put up, and I did read in my bedroom, and a I kept light underneath ... , and also we ... And I believe it helped. The privacy curtain I on occasion when other crew members were up and I wanted to sleep, which was very seldom; we normally all went to bed at the same time and turned the lights out. The penlight was a daily necessity that was all the time throughout the vehicle. Scissors we used as a daily necessity at all meals, and we also used them to cut up teleprinter thing. The tool caddy I did not use; I found my pocket good enough. We normally returned something after use, so just to transport it, I can simply put it away. The portable fan we used in the OWS dome to blow OWS hot air during our hot portions on heat exhanges; in the module, that worked very well. Tape player I use daily in the ATM, in my bedroom, wardroom; the headset I use daily also every evening so that I wouldn't put my music on somebody else's ears ... after lights-out or you're going to read, or something. The microphone I've had no occassion to use. Playing cards I have no occasion to use. I don't play cards on the ground, and I don't play cards up here. Books - I've read two and a half books so far in the flight for pleasure in the evening or off-duty time. The hand exerciser I didn't feel that I needed. I don't use one on the ground, I

put it back. The Energym, we have used on and off not very much. I wanted to try to set it up to do what is called to Energym and exer-jeanie people to think four, which basically is started at squat, and pulls through, and winds up erect as it were. We have seen on some surface, the arms extended fully overhead, there is not enough line. We don't have the right kind of handle on it and we - the biggest drawback is not enough line on the Energym, therefore, it has not been used very much. The binoculars we have used at almost every opportunity. We did carry up an extra set in our command module so we could look at the workshop and we have used both sets. We have been using two sets at the same time. And the off-duty windows, the only thing I can say about that is, there are not enough of them looking in the right direction and they are not large enough. The wardroom window is nice and large, however, now we are at high beta angle it's looking out at the southern horizon. We cannot see below us out of that window anymore and besides that window has a big ice spot in it now, as you are probably aware. And we need - we ought to have bigger and more - more windows like the wardroom window in the workshop. STS windows are - they're very good, however they are obstructed very much by external structures to the vehicle. That's all, thank you.

11 33 22 SPT Friendly tape recorder, this is the SPT with M487-3 subjective evaluation of the following items for frequency of use. The jacket is used daily, every other day, depending on how long I'm spending in the MDA, the cold part of the vehicle. It's not on all the time and I wouldn't be without it. I use the IV boots very seldom. I haven't used them for 2 weeks. Use the triangle shoes all the time. The IV gloves, I haven't even found. The bump hat, don't know where it is. Use the pillow all the time, however, I do not very often use the little knit thing that flips over your head. I've evaluated it, I haven't

decided whether it's useful or not. Use the - the thin blanket all the time, the one you crawl in through the neck of, all the time except the first 4 or 5 days when it was too hot to use. I have not used the other blanket except the bottom blanket I zipped up a couple feet on one occasion when it got down to 72. I have not used the light baffle, use the privacy curtain every night, use the penlight dayily, not very frequently and for long periods of time. For instance, to go to the bathroom at night, in the earlier morning looking at the PRD's to read them, you need a good light and earlier in the mission when we were conserving light I used the penlight frequently. Use the scissors daily for eating, for M133. The tool caddie I used during activation have not used since, probably will use during deactivation. The portable fan, we're using the one portable fan because of our thermal problem. Other than that, they're not required. The tape player, one of them is in the wardroom, one has been strapped up near the AMI, use both of those. Have never used the headset, have never used the microphone, have never used the playing cards. I read a little every night before bed, as is my habit. Have never used the hand exerciser. We use the balls for fun about once a week. The dart set was tried once, doesn't work. The Energym I don't use. The binoculars are used every day for looking out the window and we use all the windows at every opportunity. And that's the end of evaluation.

11 37 04 SPT B channel, SPT, let me finish my EDOI. ... Photographs were taken, and they are on the same roll that the previous ones were. Namely, color interior number 28, which however, failed to rewind in the camera. I took it in - in my bedroom and made myself a little darkroom out of a bag and I wrapped it in mular tape and I hope that those pictures will come out okay. I took the final picture, number 15, on the new roll, color interior 31. The ones that showed growth were 7 and 9 as previously only they're bigger - they have scalloped edges and a dark center. They're multicolored and 13, and 14, and 15 which are very light colored, very tiny colonies no numberous in number. and that's the end of the report.

END OF TAPE

SPT That's right, but there's ... as well. You need mobility aids of some sort, and you usually invent some, right? If you ever take that big stowage box up to the dome locker. I don't think you - you ... problem going up the wall. I think you give a little flick and then you float - -

CDR Yes.

SPT - - And then you just go with it. You just go until you hit something and ... handhold. You've got to go across an open ... I think we all seem to get ... handhold and foot restraints, like the triangle grid.

CDR There's no doubt about it that - that in zero g we could have come up with really good places in our checklist and with some of the ... we did would have enabled ... put a little restraint strap here, a couple there, and ..., especially the small ... a lot of either items - -

SPT ... categories are equipmert that need restraints, and there ...

13 57 55 CDR Okay, well that's enough for that one. Three is: How often have envirormental factors, that is, noise, temperature, air flow, illumination, interferred with your ability to perform a task? Which tasks and where? Have any of these factors interferred with your ability to sleep? I would say, personally, no, on my ability to sleep. The biggest thing that I think I've noticed is I have to use my bloody flashlight all the time. Illumination is really poor.

SPT I was going to say that. Of course, in terms ..., personally. I think the bed-

rooms ought to be reasonably soundproof because otherwise the least little thing wakes me up. Now it's absolutely impossible in this vehicle to ..., in my opinion. And ... and I have one ... and I want to ...

13 58 51 CDR ... soundproof bedroom, I think, for ... There's no ... background noises. It is extremely quiet and - and when everything is shut down and you're sleeping, the least little noise is really magnified. And I think that's true of all spacecraft that I've been in and will be in the future. They are basically quiet vehicles.

PLT And I also think that I ...

CDR Well, yes, but that - I think ... most adequate. ... that and I would comment that I, ..., not really aware of it and obviously ...

SPT Except in the sleeping quarters. See, that's a lot of the air flow ...

CDR ...

SPT That was July.

CDR ...

SPT ... their fault. I couldn't get it to take a coin without getting the air flow out -

CDR I didn't have that trouble.

PLT The PLT ... about normally.

SPT ...

Reference 8

CONRAD Replacement of the solids trap and charcoal canister were nothing.

WEITZ Only when it came time to dump the charcoal canister.

CONRAD I think we could show them a way to tape up those urine separators and get rid of those things. They will go through all right. All you would need is to take two small food cans and tape them on either side of a urine separator and it will go right out the trash airlock. It won't hang up. They might not want to press the subject because they were nervous about it but you can obviously get rid of them all right. The charcoal canister, you could get rid of all right too. What we did was take gray tape off stowage cans and we just made bridges over the projections. We just made it a smooth thing over the projections with the gray tape. Then the next one just whistled right out of that trash airlock.

WEITZ Well, the major factor was: putting the EVA gloves and just keeping the pressure against it. It was forcing it to one side.

CONRAD The disposal of all trash bags was no sweat. Nobody used their trash bag for trash in the sleep Com department. As a matter of fact what we used those for, well at least I did, was that I

CONRAD (CONT'D) used it to keep personal gear in. It was very convenient to keep music tapes and odds and ends, pencils, and so forth in the trash bags. The only trash bags we used were in the wardroom and in the waste management department. We didn't use them in any other locations. We did not use them in the upper experiments department and we didn't use them out in lower experiments compartment.

You and I deactivated the cat ion cartridge. I read you the procedures, that was no problem putting the iodine in it. Closeout of the wardroom water system was no problem. Deactivation of the waste management compartment water system was no problem. On the G&N/SCS powerup, there was nothing to that. CM/SM RCS was nothing. Terminate power transfer went right by the checklist.

CONRAD Realign was nothing, GDC align was nothing - right by the checklist. H_2O/waste/radiator activation - we had one little problem with the secondary loop heaters. They had just a couple of simple changes to the checklist which handled that. The transfer of the urine samples was no big task; condensate blanket is back where it belongs in the MDA. We didn't have an IMSS, so we stowed in two food overcans and tied that down by A-9. That worked okay. S190 window protectors stowage, that's

WEITZ (CONT'D) I got with the TV camera. It was not so difficult. There is really more room in there than I thought, even from going to mockup and trying it.

18.2 SWS

CONRAD The flight equipment in the crew compartment configuration. The beds worked great. Everybody had enough room for their gear. There was enough Velcro around. We would set the duty timer up for the alarm clock, and I'd Velcro mine at the dosimeter place. It would stick right on there. I know you had a lot of gear laid out in your room. Everybody fixed up their sleep compartment the way they wanted them. We had adequate places to hold the clothes.

KERWIN The thing I had about the sleep compartments, aside from thermal, which is completely off-nominal, is that it would not have worked at all to have had a staggered sleep cycle, because you were aware, in your sleep compartment, of any noise, any movement, any light that anybody made in the experiment compartment, the wardroom, the head, or the forward compartment.

WEITZ You didn't have your light barrier up.

CONRAD I think everybody that has seen the TV with voice on it has the impression that the vehicle was extremely noisy, because the noise is somewhere on the comm. The whole workshop is so quiet

CONRAD (CONT'D)

that anybody moving around, as Joe says, is going to wake somebody else up. It is really quiet in there. One other thing. When we shut off all our lights and closed the workshop window and the windows up in the MDA, that was real night in the vehicle. It was good and black in there.

The other comment is, if you get up in the middle of night to go to the head in that configuration, be careful, because you have no sensation of movement and you can slam into things or get lost. You don't realize that your body is pitching or anything else until you start moving around the vehicle. And the next thing you know you're in the wardroom against the wall instead of the head. It's really weird. It's also weird for the other guy who wakes up and this white apparition is sliding by his sleep compartment in the night, very quietly.

I personally thought the sleep restraint worked very well. Surprisingly enough, it turned out that my geometry was such that as I was lying on my back and I pulled the three restraints in to straighten my body out, that pulled my head against the pillow. Completely relaxed, there was just a slight pressure, with my neck muscles barely pulling my head onto the pillow, and I really had the sensation I was sleeping on a bed on the ground with my head comfortably against the pillow. Then I found that there were ways that I could turn sideways in the sleep restraint and, by getting one shoulder a little bit past

Reference 10

CONRAD We didn't use the gas separator in the command module. We never installed it. We didn't need it.

KERWIN We talked about the hardware and the sleep restraint. We all liked it.

CONRAD As to difficulty going to sleep, I think we normally worked enough and had enough physical excercise during the day. We did have different sleep-time patterns. Joe and I seemed to sleep the same amount; Paul a little bit less. I guess when you were ready to go to sleep you went to sleep.

WEITZ If I went to sleep early, I would wake up after an hour or so. So I started staying up an hour or two after you guys went to bed, trying to move quietly about. I just flat needed about an hour to two hours less sleep during flight than I needed on the ground.

KERWIN Let me make a point that might be a good one. If you're tired, you're going to go to sleep easier. I thought I needed less sleep up there, and I thought it was a little harder to go to sleep. It never proved to be a problem and I never felt that I was getting behind on sleep. But working out makes you feel good and makes you feel more ready for sleep. I think that if I had one thing that I could change in the routine daily flight plan, I would like to have my workout

KERWIN CONT'D | late in the afternoon, routinely, rather than scattered throughout the day. In our case, it just couldn't be done, but it sure would be nice.

CONRAD | Well, I sort of recommended to the other guys that they get a split period where they can work out twice a day. Of course, this is going to be an individual thing. Some like to work out late, some early, some in the middle. But I still think it does make you feel good if you can work out twice a day, even if you didn't do any more. I did 1500 in the morning and 1500 in the afternoon. I think I would have benefitted even more from it by splitting it.

KERWIN | Even just running around the ring lockers or throwing the ball around in the evening for 15 minutes makes you more relaxed.

WEITZ | I think that helped. The few nights we played around up in the forward compartment, I thought it kind of helped relax us. It gets you all ready for sleep. But that comes back to your comment. I wasn't really ready to go to bed when you guys were, and there was precious little I could do. If you went to bed, I always had the feeling that if I read in the wardroom, that would bother you. If the wardroom window was

WEITZ (CONT'D) open, that would bother you. And if I went up and looked out the STS windows, that lights up the whole cluster. I guess we need more private quarters.

KERWIN In a space station, you need more separation between sleeping quarters and the working part of the vehicle.

CONRAD You need better soundproofing between sections.

KERWIN We've talked some about exercise. We all exercised almost every day of the mission. I felt that it was invaluable and that, if anything, we weren't getting enough of it. I wished from time to time that we had had something like Bill Thornton's device in addition to the bicycle to work out some other muscles and allow you to exercise in a different way.

WEITZ That right. I tried the Exer-Genie or Exer-Gym. The rope is too short, and you don't have the right kind of handles. You need a wooden or Teflon cross piece, a 1-inch diameter foot-long piece of wood to use as a handle so you can do what's called a big four. And you could do a series of that.

KERWIN I've thought since I've been back, and especially since I've jogged now, that some compression jogging device might be helpful. It might not work. And then something like a bar bell with a resistive device in it that you can pick up and

is, is whatever setting you left them in at launch, they are still there. I can remember initially, you know going around and feeling that we were getting flow out of those diffusers and I remember cycling one up and back down. Looks all the way full screwed down. Is that, thats minimum diffusion. I believe you launched them that way, didn't you? You know which you launched them?

SPEAKER like that----

CDR Which ever way they launched, I think that just about all of them are that way, diffusers that is, let me mention this sleep compartment. Those weren't really diffusers those were square with kind of louvers in them. You've heard Paul's comment about being hot, thats why he slept in different places. I adjusted the one in my bedroom to keep the air stream directly off my feet. So I aimed it a little bit toward the locker and the wall but never tried to cut the flow down. You know, I never tried to mod. I think you'd have to ask Joe what he did with his, but I suspect that we all adjusted those just for personal likes, with respect to air flow in our sleep compartments. The diffusers we didn't touch.

SPEAKER O.K. Did you notice any areas in the cluster where there was very low velocity or stagnant areas?

CDR Its funny, the velocity, whatever it is, is low enough thats its not apparent to you. You don't ever feel that you are going in an out of local air stream. As a matter of fact, its low enough, that you really don't have the feeling that anythings flowing at all. But if you took a peice of paper, or something light and stuck it anywhere in the cluster, it would start moving up, towards the dome. I think that you had an excellent

SP: We got some of this the other day, I believe could we get you to comment a little more perhaps about the floor to ceiling height-that work out pretty good in the experiment area, ward-room, thru there.

PLT: Yes, that was good, except that--put you head up a little high on the bicycle ergometer. I thought, Joe did not complain but he used to like to brace his head against the top, he gray-taped a folded towel to the upper grid over the seat anyway and just pushed against it with his head.

CDR: It is on one the wire bundle channels, flat, you know the flat channels.

PLT: Was it.

CDR: There is one that runs right over the top of the pike.

SP: When you mentioned the compartment sizing in the waste management compartment sounded pretty good. How about any other work areas?

PLT: Well, again, floor to ceiling dimensions, I thought was marginal in the sleep compartment.

SP: You mentioned that the other day-as far as getting in and out of the bag?

PLT: No just while you sleep in there, but but it didnt bother Joe apparently, he said only when he had the cap on and it will be interesting to see what Jack says, but now my mode was normally as I mentioned before, I didn't use any covers, so therefore my bedroll was rolled up at my feet as it were and I kind of had my feet on top of it, which may have raised me up higher but my head was very, very close to the light baffle. Now we got the light baffle infringing on the volume in there too. And it also put my head up higher on the pillow than I really wanted it. I'd like to have seen that thing 6 inches longer-the sleep restraint. And it could not have been without haveing a 6 inch higher compartment.

the temperature and were running very low temperatures, 62 or something like that, in the MDA, and the guys got a little cold soaked sitting up at the ATM panel.

WEITZ- That was Pete's comment, not mine, in fact I would not have wanted a long sleeve shirt.

KERWIN- If it was marginally cold I would have put a tee shirt on under my shirt ~~or under my shirt~~ and solved it that way.

KERWIN Hot sleeping quarters were my complaint during the end of the mission. And I would like to see that solved with the sail. If not, you could always move out! Find a new place to sleep-- so that isn't a mandatory constraint either.

JOHNSON- Now we have the explanation [of PLT'S ABANDONING SLEEP COMPT].

WEITZ- Now you've put the foot in the door!

KERWIN- We would like to see the follow-on crews have opportunity to substitute food items if there were one or two they became particularly reluctant to eat, that's a highly desirable input. I dont know whether its mandatory or not.

JOHNSON- Do you have any feeling about why you made the comment that the spiceyer foods - that is, foods with more taste were better. I'm trying to connect something with the situation that foods don't seem to taste as well in 5psi or zero-g or whatever

KERWIN- A couple other things here. I don't subscribe to the zero-g mixing theory either, because if you sniff something through your nose you create an air passage and convection through there. We all had this feeling of fullness in the head and to me that says there are changed circulatory paths that may have something to do with it. Also, I think that this diet is a rather bland diet to begin with.

MACHELL- Okey, getting back to the prepared questions. As a result of your Skylab experience, do you have any habitability design suggestions to offer to the Shuttle Orbiter flight deck and crew quarters areas?

CONRAD- Yeah. I think we have a fair number of those. One that come to my mind right off the bat is that the sleeping quarters ought to be very soundproof and capable of being darkened completely. I think we all enjoyed the bed more than we though we would, but I think there are improvements that can be made in the arrangement that holds you to the bed. I don't know whether you can do it but I probably would prefer to not have straps. I think Al Bean and I were the ones who originally conjured up that bed and and my original idea on that was to have a light stretchable fabric that would apply to your whole body rather than going to straps -- and

	care of that. Then I would have liked the option to tack the sheet closer to me at the torso points, because it would keep your arms from flapping around.
WEITZ-	I didn't like crawling in and out of it. the few times I used the net I didn't like crawling in and out of that little hole.
KERWIN-	I kept trying to crawl through the arm hole.
JOHNSON-	One of the TV shots of Pete getting out of it looked rather awkard.
CONRAD-	In my particular case the opening was fine, the awkardness is because the ceiling is in close proximity.
WEITZ-	I'm not sure how well Jack Lousma is going to sleep in there - you are really encroaching on his height limit. Well, Joe is nearly as tall as Jack.
KERWIN-	I'm as tall as Jack is although I'm not as muscular and the only time it bothered me was when I had the M133 sleep cap on -- and that extra inch did it, the top of the preamp scraped the ceiling when I turned my head.
CONRAD-	When I got down to where my feet were touching the floor my head wasn't on the pillow.
KERWIN-	I agree with Pete that the sound is very important. If you can't structurally mask the sound because of weight considerations you might want to consider masking it with white noise.

JOHNSON- The orientation is very important to us. We had speculated that some people might find it uncomfortable to sleep vertical with respect to other orientations and I believe Paul made some comments on that. This sampling is very poor, but nevertheless its a data point and at the moment we would tend to try to avoid that arrangement in the Shuttle. It has a lot to do with the architecture in the spacecraft, whether that is a real effect or not.

WEITZ- I eluded to that as contributing to my leaving the sleep compartment, but I think that was before I really learned how to use the sleep restraint. What I would up doing was taking about two of the pillow inserts out because lying on my back my head was like this. [BENT FORWARD IN A CHIN DOWN MANNER] and that contributed to the illusion of hanging from the wall. But when I moved back in I didn't have any problems at all sleeping. Even when I was sleeping in the forward area I would wake up on my side and things weren't where I expected them to be and that didn't bother me at all.

KERWIN- The solutions are all visual and you structurally might do some clever things with the sleep compartment to make it appear horizontal rather than vertical.

CONRAD- Thats OK if you can do it but I don't think its necessary. I'm going to go back to sleeping in the Apollo sleeping bag. I've got two reasons why I didn't like that (1) I don't like the free floating position from a muscular point of view, although on a long duration flight I'm not sure but what one may adapt to that -- (2) I'm on the cold end of the spectrum and even in Houston on a summer night I wear a tee shirt and prefer sleeping with a blanket because I really power down. I tended to get cold in the Apollo bag because the Apollo clothes were clammy because they didn't absorb at all. That kind of material tended to float away from you, it tended to take its own shape and you floated inside the clothes and inside the bag and I was always cold in Apollo, thats what I liked about Skylab --- it did two things (1) it straightened out my body -- and I don't attribute that affect to not just having gravity there - but thats not bad. I don't want the body straightened out because it makes me think I'm sleeping on the ground - I want to distinguish that very clearly I'm perfectly happy to float up there - its muscular. And the other thing (2) is that I like to have something around me when I'm sleeping. Even before air conditioning I was one of these

guys that couldn't sleep without at least a sheet over me. I can't sleep in the open air because my heart rate goes down in the low 40s and my metabolism powers down and I get cold. So I never had any of these illusions, I don't care which way you stick the bed up there. That doesn't make any difference anyhow.

KERWIN- I was thinking about how you arrange the locker openings and the lettering and so forth.

CONRAD- Frankly, before I went to sleep I liked the illusion of hanging because I don't like lying in bed reading flat on my back and I was now on my back hanging on the wall and it seemed much more natural because I would hang there and read my pocket book and listen to music on the earphones and it seemed, much more natural to be hanging on the wall doing that, it made me think I was sitting up and reading.

BOND- Paul, why did you move back into the sleep compartment after you had been gone awhile?

WEITZ- Because it started getting hotter up forward, I'm at the opposite end from Pete, I'm very warm, apparently. When they were still sleeping in the command module and I was sleeping in the MDA in the sleeping bag on nights! 2 3 ? I found it very comfortable there even though the air temperature was in the order of 60 or the high 50s.

I moved out of the sleep compartment because of a combination of heat and not being familiar with the sleep restraint and that air blast coming from the vent in the floor. Anyway, it got hot in the forward area once we got to the high beta angle and I could feel the walls radiating at me and it was uncomfortable even though I was just laying there. By that time I had cut the netting off, I didn't use the netting anymore after that and it got uncomfortable because when you turn over, which all of us did, I think, you get all tangled up in the netting - like the tangles you used to get in these washing machines when they first came out -- so I took the scissors and flat cut that off. Laying on the bare bones sleep restraint in my ~~sciutes~~ SKIVIES, and I was too warm, so I moved back into the sleep compartment.

CONRAD- I managed to sort out sleeping. I used to fold my arms inside the bag and I could do 360's in there but I was always kind of aware of when I was doing it and I was keeping the bag sorted out. If you go to the stretch sheet approach the guy won't have that problem, he can sleep with his arms in or out.

KERWIN- Still put the arm holes in though, they are very useful.

CONRAD- Yes.

CONRAD- Am I the only one that used the blanket?

WEITZ- The outer blanket?

CONRAD- YES.

KERWIN- I pulled it up about my knees once.

WEITZ- About the time we bottomed out on the temperature curve in the workshop I used it to the extent in that I pulled it up to mid thigh, for about two nights. I used it mostly as a lower limb restraint.

CONRAD- The first time I used it I found out that because you don't have the convection boy does it really trap the heat. I had it up all the way and I had to take it back down to where it was about across my thighs and bulged it out. You collect body heat in there and it just gets hotter and hotter and you have to stir your legs to get it out. Whoever thought up putting the netting in there, I don't know if they thought of it for that reason but thats what made the netting work perfectly because in effect its almost a blanket.

MACHELL- Let me ask you another general question about the sleeping area. Do you advocate or like the idea of individual sleep compartments, does this seem like a good idea or even a necessity for future programs or would you prefer a more open hospital ward or bunkroom type arrangement?

WEITZ- You definitely don't want the bunkroom type arange-

ment.s and you want them, I can't stress too much how you want them insulated from sound and light. Not only from the inhabitants point of view but I apparently needed less sleep than these guys and I found that I didn't want to go to bed when they did and it greatly curtailed my activities. I couldn't turn on the lights I wanted to, and as Pete mentioned before, we put the firemen's pole up to try it and then left it up and that pole rattled in the bottom bracket, any time you touched it it would rattle. Thats the only time I remember carefully crawling along the wall to keep from touching that thing because I knew it would bother these guys. I think you want this freedom to move about and pursue your activities, whatever they may be and at whatever time of day or night. The only way you are going to get there is with an individual sleep compartment.

CONRAD- Its no different up there than we found in the navy with the nuclear subs or the later bigger carriers where we tried to get everybody away from the bunkroom concept. They just found that it is more pleasant living conditions for everybody to have their own own little home there. On many occasions Joe and I would hit the sack about the same time and Joe wouldn't read as long as I would and Paul would be up and about and unfortunately if somebody turned on a light you

were aware of it -- somebody turned on a blower in the WMC you were aware of it -- because the vehicle was extremely quiet and anytime you made any extra noise in there it really transmitted.

JOHNSON- Do you think a little white noise would help?

CONRAD- It might. After I sorted out what was going on with the sound meter I think those levels I sent down were pretty good - it ran about 56 db in the workshop and about 65 db up around the mol-sieve area in the MDA. Its damn quiet!

MACHELL- Okey. Theres a question here I think we already know the answer to but let me get you to reaffirm the issue. The question is should the option be given the crewman in the future of reorienting his sleep station if he finds it be be undesirable as launched? If I'm hearing you right the real question was not one of orientation directly but a function of temperature and air currents. Is that a more appropriate deduction?

WEITZ- Yes.

MACHELL- Is there any real concern over what the orientation is?

WEITZ- No, I don't think so.

WEITZ- The illusion, when I was faking myself into it, was strong, and if a guy ever starts it that way, it may be a difficult one to shake. But I'm not sure you want to say a flat answer to that. Lets see how the others turn out

in the tank.

HECKMAN- Any stowage problems?

CONRAD- S082 cans don't hold a vacuum - they all popped open during the EVA.

HECKMAN- Any preferable latches in the vehicle?

WEITZ- I didn't like dial latches. All calfax fasteners worked well. Camlock on water hose was a pain. All locker latches were fine.

HECKMAN- How about tieing things down inside lockers?

CONRAD- The double fastener slide belt of fireproof material was a pain to use.

HECKMAN- Any accessability problems?

WEITZ- Yes - film vault - because one door had to be closed to open the other.

HECKMAN- Any head knockers in the O/A?

WEITZ- No.

HECKMAN- How was the floor/ceiling proximity?

WEITZ- Good.

HECKMAN- Any other compartment sizing problems?

WEITZ- WMC was fine - sleep compartment height is margianl with light baffle installed

HECKMAN- How about radial MDA vs erect OWS orientation?

CONRAD- No real chore - MDA was fine - OWS was fine - whatever lends itself to either way should be done that way - there is no orientation adaptation problem so you may as well take advantage of it in design.

SL-III MC-490/1
Time: 06:02 CDT, 12/11:02 GMT
8/8/73

Reference 17

CC Good morning, Skylab, Houston. We're AOS at Goldstone for 7 minutes.

CC Good morning, Skylab. We're AOS over Goldstone for 7 minutes.

SPT Good morning, Dick.

CC Good morning.

SPT Say, Dick. Are these temperatures inside getting cooler today?

CC Roger. Let me check what we're reading on our TM, I think they have cooled down since you got the new shade out. Stand by.

CC Skylab, Houston. Affirmative. The temps are coming down. They dropped about 2 degrees while you were asleep. And the present average temperature around is about 75 degrees.

SPT Okay. It sure seems that way. Last night, I crawled into my sleeping bag for the first time since we've been up here. Prior to this, I've just been sleeping under the straps, without being under any covers. And along about the middle of the night, I got up sort of chilly, so I crawled inside the sleeping bag for the first time.

CC Roger.

CC Skylab, Houston. We're about 1 minute from LOS. We're going to dropout for about 3 or 4 minutes and I'll give you a call at Bermuda.

END OF TAPE

we had the stuff nearly ... And that really makes it much better for us. Space food ... and we're certainly available ... makes it much more palatable. ...

222 02 38 55 PLT What significant improvisations (procedural, equipment arrangements or modifications) have you accomplished as a result of adpting to living and working in zero g?

222 02 39 07 CDR Well, I made a significant improvement, I think, in our sleeping quarters. The air is at the bottom. I've taken my sleeping bag and mounted it upside down, and I sleep that way, and it does definitely improve the flow of air. It doesn't come from the top of you anf low down past you, instead of coming up from your feet into your noise, itto your mouth. I found it is effective for the dryness in my nose, it made it much more moist and I found I was able to sleep better just because I was closest to the air vents and was able to control it. It made it easy to lean out and touch the vents and move them around. I think that that's a significant improvement. Another one is the - the bedclothes themselves behave a little more like Earth. They're a little big baggy down at the toes, makes them a little bit more Earthlike. And the strap that holds us in, they're excellent. Particularly the one around the head. ... to add so I doubled it under itself and also ... the headband arrangement. It has now a really - a rather poor ... and come out with it sort of belted ... to it and I sometimes think - I think that ... come out with a better ...

223 23 41 01 PLT

Light baffle, uh, baffles the light alright but also baffles the air. It stays up flush most of the time and doesn't let much circulation through, so I had to sleep with the sleep compartment privacy curtain opened. And every once in awhile I pull down on that baffle to get more holes and more air to go through there but it, uh, it uh, manages to stick itself back up there, almost closed again. So it's a good light baffle but it ain't much of a good air passer.

223 23 41 29 PLT

Privacy curtain works okay in my sleep compartment. I got no complaints about it at all. I usually sleep with it half way open so I get some ventilation. To that kind of wraps up subjective evaluation guide. I enjoyed talking with you Bob. If I think of anything else in these areas I'll let you know. One other thing comes to mind is this, up in the MBA there's no place to throw trash. There is no trash bag area - trash bag points. That's be a nice thing to have up there. I think that, uh, what I always do is up there I wind up throwing everything in my pocket and unload it when I get down here. Another nice thing - nice thing to have up there would be to have some tissues so you can blow your nose and wipe things and that kind of thing. But there ain't any of those up there either. So there's a deficiency in, uh, the habitability area in the MBA, in that respect. Otherwise, the MBA seem to work pretty good. Uh, one thing I mentioned the other night and it bugs me, is that ... the whole spacecraft's clear up there and when you want to do a ..., why, uh, you got to go clear up there to turn the switch on and off, and you waste time and tape by doing that. Making a lot of tripe between the experi-

229 22 17 53 CDR Noise level, okay, Illumination, poor. All Illumination is directly above your head; can't shave under your neck. You want to examine a spot on your face or something, you can't see it worth a darn. Ah, this is not sufficient Illumination and it's all way up high, shaving your neck or anything that kind of ah, de-filate, if that's the word, to something else. So I'd recommend we definitely would increase the amount of lighting in there for shaving, or getting specks out of the eye, or all those other things, it just isn't satisfactory.

229 22 18 34 CDR Sleep compartment, general arrangement, it's okay. Needs to be much more sound proof, it's very light proof. Needs to have a door on it that when you close it's sound proof and gives real privacy. Needs to have an area to hang your clothes. You use a lot of clothes in this business, you use clothes for when it's cold in the MDA, when it's hot here, you got your gym clothes for exercise, and you got your sleep clothes. About the only way you could put them where they could dry out and get some air, is kind of out blowing in the breeze on those little ah, re - those little rubber restraints, which are great. And ah, that's bad, it'd be nice if you had a - something like a closet that you could open the doors, put - hang those things in there and the breeze would blow through and keep them dry and cool, yet they wouldn't be out blowing in the breeze. Ah, I think that's about it. Volume of compartment seems adequate ah, it does need a little more, like I said, closet. But as far as where you want to sleep, it's okay. Ceiling/floor proximity, that's okay. Ingress/Egress provisions are good, trash collections provisions, I think satisfactory may be even exceptional. You don't have much trash in

there. Stowage volume and access, you got lots of stowage in there, and most of your personal equipment. Temporary equipment restraints needs springs built in and ah, several others. It's got those little ah, ah, little towel restraints, that are excellent. Personal mobility aids; doesn't have any; doesn't need any, I don't think. In bed I guess maybe a restraint on the floor and ceiling to - for a handhold, would be good. Personal restraint devices ah, we talked about the body supports. Thermal comfort needs to be adjustable; needs to be cooler than the rest of the spacecraft. Needs to have the airflow not from your feet to your head, which blows up your nose. Either from head to feet, or either at the side, or something like that, and also needs to have controls not where it can be deflected. Noise level needs to have - be able to decrease the noise level from the rest of the workshop. Right now, everybody has to sleep the same time. It's hard to go to sleep when somebody else is awake, because of the light and - but mostly cause of the sound. We need to have little compartments where you can go in, in the middle of the day, a fellow can do a new experiment, and it's still quiet. Their reason for ah, for all that noise, just ah, impractical. Illumination - needs a better reading light; that's about it.

229 22 21 32 CDR

Experiment compartment - crowded, could be better, needs more lighting. Just a little crowded, I think you could do the things in there, that we want to do, but ah, you really don't have a lot of extra room, if - if one person's riding the bike, and the other fellow is monitoring near the ah equipment that's so monitored has to be careful he doesn't get kicked as he pedals the bike. It

230 16 27 43 SPT

Waste management compartment, ceiling/floor proximity - all that stuff is satisfactory. I think it is satisfactory to have the floors to come out as far apart as they are. Ingress/egress are okay.

230 16 27 56 SPT

Sleep, trash collect - sleep compartment - all that looks reasonably good. However, all the stuff that you need to have stowed, you need to have little compartments or cubbyholes or things for it. It's a nice job packing all that amount of clothes into that little tiny spot, but every time you pull out one, why you pull out a whole fist full. We need to have a spot where we could stow things. There's that one big locker up at the top that's got Velcro around the sides, but I think it would be bettwe if it were divided it into four - four smaller compartments or at least two or three compartments so that various things could be put inside them. And we also need to have, - uh - Velcro tied to those things that need to go into them. For example - no - uh, for example, that can of, uh, 133 equipment with the large, - uh - uh, syringe and needle and stuff. All that stuff is floating around in there, and I've had to just tape it down. It should have had some Velcro attached so that you could put the stuff where it went - where it - where it belongs.

230 16 27 59 SPT

Experiment compartment rates with pretty good.

230 16 28 04 SPT

Forward area dome - it's obviously not arranged for anything in particular. It's just a big volume. If you're gonna do flyaround excercises, why you need that volume. If you were going to do experiments or something like that, for the most part, why its very inefficiently arranged. There's no reason to have that big molume. It's

232 14 38 32 SPT — End of this debriefing from the SPT. This information went to the - uh - ATM PIs and planners.

M487-3B PLT

232 14 48 27 PLT — Okay, space fans, this is Jack on channel A. The subject is M487-3, evaluation guide number 2. This infor probably goes to my friend - uh - professional golfer, Robert Burn. Okay we're going to - uh - evaluate - uh - various compartments in the spacecraft. First placement is general arrangement and orientation of the compartment.

232 14 48 59 PLT — Starting with the wardroom. I like the wardroom fairly well, except for - I don't like the - uh - pantry area. I notice that every time Owen wants to get his shower he has to - uh - stumble over Al or myself to get to it, cause it's directly cross the table. His uh - uh - food should have been stowed over - uh - where he could reach it. Would have been much more handy for everybody.

232 14 49 25 PLT — The waste management compartment - uh - general arrangement - uh seems to be satisfactory. The - uh - john on the wall - uh is - okay - uh - setup. The - uh - urinal drawers work well. Uh - the one that I - uh - had to pull out and the one Al pulls out, though - un - conflict with the - uh - foot restraints. I think we discussed that before.

232 14 49 52 PLT — The - uh - sleep compartments - uh - seem to be arranged satisfactory. I've got no complaints about that. I - uh - sleep well every night. And, - uh - able to keep all my gear in here with - uh - minimal difficulty. Uh - light is not a problem. Trying to sleep, we turn out all the lights, - uh - except we leave some on up in the - uh - uh - airlock area. Uh - the baffles above my head - uh - doesn't pass any air to speak of. Believe I've discussed that, also. But it remains flat

against the ceiling. Blocks out the light all right, but doesn't let any air through it. I - uh - keep my - uh - little - uh - curtain half way open in the evening - at night, to prevent - permit - permit ventilation - uh - through the compartment. The air coming up through the - uh - vent duct in the floor - uh - flows fairly rapidly. It's uncomfortable to have it pointed at you. You have to have it pointed away and - uh - otherwise, it - uh - it's too drafty. Experiment compartment - uh - arrangement uh - seems to be okay. Uh - it's kind of crowded in between the ergometer and the - uh - and the - uh - ESS panel. A - uh - sure is a crowded area when you get the shower erected but - uh - we know that wasn't originally planned to be in there, and I think it was a good location for it - uh - uh - as an after thought. I guess that's all I can think of on the - uh - experiment compartment.

232 14 51 28 PLT

Forward doom - dome area seems - uh - generally be arranged - uh - satisfactory and adequately. Uh - I've got no major complaints about the arrangement in there. One thing about the lower are that the - uh - poor arrangement is the - uh - the fact that the - uh - the pan is right next to the sleep compartment. And - uh - it's not that fact so much as the fact that when - uh - anybody goes in there to - uh - turn on the blower and use the - uh - waste management system at night, it wakes everybody else up. And that - uh - thing makes a fair amount of noise that - uh - and - uh - tends to wake you up when somebody goes in there and uses it.

232 14 52 10 PLT

The - uh - airlock itself. Uh - it's arrangement is - uh - seems to be satisfactory. Uh - during the EVAs, why - uh - tend to float around in there and - uh - grap on to whatever you can grab on to. Uh, there's usually other

of our waste in a temporary storage bag, which we have to dump out every once and a while. But, uh - I like the - uh - idea of having trah bag - uh - behind lockers, not away like they are down in the lower compartment. That's the way they ought to be all over. In - uh - a little rubber - uh - split rubber - uh - ceiling devices are - uh - are working well. Uh - stuff doesn't never get out when anyone puts something in the can. They get a little messy sometimes when you - uh - put something damp in there. Uh - they get wet. Particularly the ones in the waste manage or the - uh - food compartment, where you - uh - cut the tops off your - uh - food bags and stick them in there. They usually got some residue on them and it gets kinda sloppy on the - uh - the little - uh - split rubber entrance to the - uh - trash bag.

232 15 01 05 PLT

Okay, - uh - storage volume and access - uh - we're limited on storage volume in the sleep compartment. We could have used a little more storage volume for - uh - odds and ends that - uh - finally come your way, as far as clothes and shoes and biomed stuff and - uh - uh - the tool caddy and all that. Cause you want to stow your personnal tapes, and the - uh - music tapes, and a book or two and - uh - there's no good storage for the tapes in the - uh - the - uh - sleep compartment which is where everybody stows their's cause they got extras in the - uh - now that the ward - wardroom tape recorder's broke, why there's no sense in having your tapes in there. The tapes just drift around in the - uh - locker. Uh - should we slam the door, you could break one very easyily. And you can never can find the one you want unless you go through all 18 of them. Uh - what you need is - uh - some little - uh - thing you can install in the - uh - the - uh - locker in the sleep compartment

to keep your tapes in, so that you can - uh - get at them and also, so you can know what you - they are. I was thinking of us having a - uh - catalog - uh - for each guy to use independently - uh - in the - uh - sleep compartment so you know just what's on each tape and grab the one that he wants. Or have some better way of marking them. The tapes come up and they're unmarked. Uh - except for the ones that were launched, the others are unmarked. They just - uh - come in a cassette 1, 2, or 3 indications so there's no way of knowing what's on them unless you go through everyone of them. You can't file them like you would at home in a - uh - in a cabinet, and just look at the pages of them, like you would at a book to see what the title is. You got to, uh to go through the whole - the whole stash. So my suggestion is that you figure out some way to - uh - contain all these tapes and some way to mark them on the outside - uh - so that you know what they are, without having to go through the whole heap and have them float all over and then they float out of the compartment. You find 1 or 2 that drift, during the day, somewhere around the workshop. The rest of the stow ... like we said, we could use more stowage are in the sleep compartment. They're - uh - the - uh - the lockers that we do have in here that we're not using, are full of trash bags or some other thing like that, that you don't use very many of. Uh - and so - uh - you just don't empty those lockers, they're not available for personal use. There is no good way to - uh - stow your clothes at night. Uh - you can't stow everything on these little - uh - uh - rubber towel holders because - uh - it floats all over and - uh - it just kinda gets in your face and everywhere. And - uh - so you need somewhere to stow your clothes. It would be nice to have a

locker to dump those clothes into. And - uh - normally, what I do, is I roll up my shirt and stick it behind the SIA and the light, wedge it in there. And my trousers, I roll them up, uh - throw them in the trash compartment. And then I got T-shirt - uh - a pair of skivvies, I usually stick in the towel holder and they float around. And the shoes I - uh - still got a - uh - ... back down here with extra clothes in it that we brought up and - uh - I got that - uh - bunched into the deck and uh - out of the way of the vent so I get some fresh air and I usually stick my shoes down there wedged in somewhere. But uh - really not enough stowage area in the sleep compartment. Looks like we got enough over there in the - uh - ward room. We're regularly using towels and things outa there. And - uh - uh - some of those lockers could be used for other things. Uh - I've stowed the T 00200 in one of those lockers instead of folding it up every time and putting it back where it belongs, so, I take an empty locker and I stuff it in there. Now there aren't too many storage - uh - provisions - uh - are required in the pad area. The - uh - compartment where you keep the fecal - uh - used fecal bags is a little too small. It should be emptying that thing all the time, seems like it's always full. And - uh - so that could have been a bigger area. Everything else ... In the experiment compartment, you don't stow much extra stuff there either. Uh - and stowage volume that we do have appears adequate. The area will get things outa there all right when you need them. Up in the - uh - forward dome we started to - uh - use that extra stowage space up there. That's stowage seems to - uh - uh - adequate. Uh - the extra things we brought up however, are - uh - stowed somewhere on the wall or tied to this, that, and the other thing. And we

best restraint devices we've fot are the triangle shoes and - uh - the more of them we've got located around, the better we do - uh - we have - uh - quite a bit of it down in the experiment compartment, and - uh - so that's the best restraint device there is. Uh - we're not using many tethers - uh - at all except to - uh - to - uh - hang on to things and go EVA, but when we're nto hanging on to ... we're hanging on to equipment against the rip tethers. So - uh - the best personnel restraint device we've had is the triangle shoes. Uh - I used the - uh - leg restraints - uh - along with the triangle shoes ... the toestraps in the wardroom and - uh - I think they do a very good job. Uh - Personnel restraint devices not employed much are the sleep compartment. You just sort of drift in there ... without fastening yourself down. The worst place - one of the worst places is in the - uh - head. The restraint devices are inadequate ther. You always hoist yourself between the walls to do the job. Uh - uh - uh - to retrain yourself there should be cutouts in the floor for your triangle shoes The - uh - toestraps are inadequate becuase they don't fit over the triangle shoes, even the ... ones. Uh - even though you can get your feet under them, why the bottoms of the triangles are so slippery that - uh - if you put any force at all, your feet slip out. Uh - so - uh - we've got inadequate restraint devices in the head. The only one that's adequate is - uh - the handhoods and the feet restraints that keep you down when you're on the - on the one - holer. Tee - uh - it's - uh - in fact, a very annoying thing to go in there and try to do your work, to - uh - to - uh - change your urine drawer out, to - uh - uh - change the fecal bags ... and put them in the fecal bryer. You're just continually floating around there. You cnn't sven hold yourslef down to

write somthing. You've got to push yourself against the wall in order to write on the little chart we've got in there. And it's a very inadequate poorly designed from the restraint device standpoint. Uh - the - uh - airlock module doesn't have any - uh - personnel restraint devices and probably doesn't need any. The other place that the restraint devices are poor is in the - uh - uh - MDA. We've got a good device in front of the EREP and in front of the ATM panel with the triangle gridwork. However, any other place that you want to work, you've got to wrap your legs around things. If you want to take TV out the window, pictures with the if you want to work on S192, or if you want to - uh - work on the VTS or do the VTS or any other place you want to go in the MDA, there's just nothing to grab on to. You've got to find - find your - some place to wrap your legs around and so - uh - MDA-wise, the restraint devices are somthing that has to be impoved on also.

232 18 58 06 PLT

Thermal comfort. The temperature has been quite satisfactory in here. It was a little warm in the workshop when we first got here, uut the sail took care of that. It gets cool in the night when ye're aleeping and most of the stuff's powered down. We'll wind up putting a little extra blanket over our legs in the mornings. The MDA is alwasys quite cool, a and it's uncomfortable to come up here, matter of fact, for me anyway, without any - uh - or in my underwear, which is sometines the way wou work up here because you have to work up here before you go to bed. And you come up here to get the pads and then some other things. So the MSA is a little cool but tolerable, in fact sometimes a pleasant place to come when things get a little warm down in the work-shop. Whenever you get the high intensity

CDR ...

239 01 45 17 PLT Thank you. Okay. Uh - how adaptable are the various compartments to multiuse purposes beyond their prime design function? Well, you can't eat in the - uh - sleeping compartment; you can't sleep in the wardroom, and otherwise you could probably go and sleep most anywhere. Uh - there's not much - uh - light for reading in the sleeping compartment although I do read a little bit at night before I go to bed. You don't want to read there - you wouldn't want to - uh - read there very long. There aren't many places in the spacecraft you want to spend a whole lot of time reading cause it hurts your eyes, cause the lighting - uh - during the daytime - uh - the window is about the brightest place. Uh the wardroom gets pretty crowded doing all the multiple functions they got to do here: looking out the window, eating, ... medical - uh - using - uh - tabletops for changing checklist and all that stuff and - uh - won't want to make this wardroom any smaller and - uh - want to consider - uh - shipping some of the - uh - activities we do in here to other areas. The - uh - window isn't big enough and - uh - we ought to have more of them. And - uh - we've commented on that before. The upper dome area - uh - We use it for - uh - the purpose that - uh - we have up there. It seems to suit it fairly very well. No problem and - uh - experiment area down here - The shower's kinda crowded next to the bike there. But - uh - being an add-on, as it was, why I guess - uh - that's understandable. Now the head isn't good for anything

BEAN How about the crew quarters?

LOUSMA I think all that stuff is adequately discussed - on the important stuff. I don't think we ought to go through all of that. Must have gotten some outstanding comments.

BEAN Essentially the quarters were adequate to live in. There's parts that could be improved. Certainly the lighting should be improved in the quarters so that you could read a little bit better. The stowage provisions were adequate to hold whatever you had. It would have been nice to have some place a little bit larger to hang up your clothes that you wore during the day so that you wouldn't have to just leave them floating around at night. It worked out okay. Instead of putting my clothes in my compartment at night I hung them out there on the 131 control box.

LOUSMA Trash airlock: Let me talk about the garbage disposal man. I want to introduce to you now, the super garbage man, Bean.

BEAN You got a two-phase garbage disposal. Generally, Jack put them in the metal can. He put them in the bags, I put the bags in the track airlock. We discussed the trash airlock previously here, and we've also discussed the fact that about the only place that is really dirty during this whole operation

SPT: As for being on the upstairs in the dome area as compared to the lower deck?

SPEAKER: Right

PLT: Just some localized areas I think maybe only in the sleep compartment is a little bit warmer than the whole area that you're speaking of.

SPT: Over by the 509 in other words on the same sides is also warmer just due to radiant heat. It was a little uncomfortable to work around the 505 locker. That's the water purifying locker in the 509 area. It was a little warm over in that area and also, I know in the sleep compartment, it seemed warmer than the rest of the areas. But those are the only two that I would specify and it is probably due to the outside heat loading. It seems to me if that hadn't been a problem why the temperature would have been quite uniform throughout the whole area you're speaking of.

SPT: It looks like there is more difference between + and -Z than there was between decks.

SPEAKER: Uh huh, that would be a good way to put it.

SPEAKER: Well your sleep compartment, Owen, was it a real nuisance, the temperature?

SPT: I don't think it was bad. The only thing that Jack just mentioned. We noticed as much as five degrees difference on one or two occasions and I believe these were times when we had been in ZLV. There seems to be a sharp dividing line between the second and third sleep compartments there. I had assumed

that's where the edge of the foil falls, although I have not had that confirmed. The second point was I did notice on several nights some temperature cycling through the night. At least that was my subjective impression. I didn't have any measurement of it, but I did feel it was alternating a bit by 2, 3, or 4 degrees. At different times during the night. I don't know what phase of the night that was. It's all dark on the inside. I wouldn't say it's anything more than a minor nuisance.

SPEAKER: OK, on the general subject of comfort, any comments that you might have. You know, of course there was SMEAT tests, and. . . In general it appeared the temperature inside was right in the middle of the comfort box. Would you say that maybe it was biased a little bit too much one way or the other? Or do you think it was--would you like to have had it a little cooler?

SPT: I think, personally I'd have preferred it on the cooler side of the total range of fluctuation. In other words as it was near zero beta was more comfortable than the high beta. So that you could always get a little bit warm without putting on your jacket or pulling up your covers at night. Whereas at the high beta, you tended to have to sleep on top of all your blankets only under the straps and that's a little uncomfortable than it would be I think. I think all of us tended tosleep a little better in the cooler--apparently the 133 sleep data seemed to show the same thing that we slept a little longer and a little more soundly at the cooler temperatures.

PLT: I would have preferred that too. I would have preferred that it be a little cooler, not only for sleeping, for working as well. You would get just a little warmer than you wanted

to in normal activities. I guess another thing that I ought to point out is when you're talking about ventilation those in the sleep compartment, those light baffles overhead were good light baffles but they really didn't pass much air through them. They tended to fold themselves shut and just stay that way and your little ventilator got blocked by some of the blankets or something. They would kinda balloon out over then it would get kinda stagnant in the sleep compartment and I think I woke up once or twice as a result of that and they the blankets away from the ventilator and got all that again. I slept with the door open. If I ever tried to sleep with the door closed, why it was not enough ventilation in there to make it comfortable. It was because there was--because there wasn't enough passing through that baffle because it was closed.

SPEAKER: There was one time, you remember when the ground told you that the heat exchangers were off and Al said yes it's getting cold here. We are having to wear jackets and--

SPT: That was about zero beta I believe.

SPEAKER: Yeah. It was again the coldest part and we noticed, I think the flight director mentioned something about he was a little concerned that maybe the heaters might come on during EREP. Then the next station pass we noticed that you had removed the thermostat to the coldest setting and we were afraid that maybe you had to be a little cooler than you would have liked to have been. To keep from, you know, the possibility of the heaters from coming on. Was there any particular discomfort then.

PLT: I don't think we were ever too cold. I think we wanted to make sure the heaters didn't come on. You remember that, Owen?

QUERY — Do you find it desirable or necessary to periodically readjust any of the diffusers or air vents in the wardroom, the workshop area, or the sleep compartments?

LOUSMA — The sleeping compartments, particularly. I don't recall adjusting any of the others. Do you?

BEAN — We adjusted the one that was near the rate gyros to try to provide more cooling on the rate gyros, but we didn't do it any other place.

QUERY — Is that an indication that you never ran into a place where you considered the airflow to be too high or too low?

GARRIOTT — I adjusted the one by the M131 chair but for a different reason. I was trying to cut the airflow off to avoid drafts. I don't think we adjusted anything other than the ones in the sleep compartment.

LOUSMA — You asked me to measure the airflow in Al's compartment one time and it seemed very high; about 5 feet a minute. And I don't know how Al felt with that kind of airflow going through there. In my compartment I needed the airflow but I didn't need it directed at my face and sometimes I had to reduce the amount of airflow going through the compartment to keep it from blowing on my body.

QUERY How widespread were the effects of the ergometer on your ability to hear each other or to hear communications?

GARRIOTT Very pronounced.

BEAN But it was the guy that was on it. If you were upstairs and he was ergometering, it didn't bother you. But if he was on it, you always had to go around in front of him and talk to him, or he didn't hear too well.

GARRIOTT That Mark I makes a lot of noise too. If there's somebody pulling on the Mark I, it's even difficult for someone in the wardroom to hear the squawk box. You have to go within 3 feet of it to be able to hear the ground clearly, if somebody is pulling on that Mark I exerciser.

LOUSMA It really does raise the general ncise level many decibels.

BEAN Does riding the bike or pulling the Mark I have a significant effect on the running of an experiment such as S019? Karl has suggested that it be prohibited during S019, but that does interfere quite a bit with normal ops.

QUERY Al, when you reoriented your sleeping bag, did it leave you with any residual problems such as lighting or the availability of the squawkbox in your compartment?

BEAN — Yes, it did. Therefore, Owen or Jack had to answer the squawkbox, and I just used a utility light.

QUERY — You mentioned at one point that you had to sew up your sleeping bag and use some safety pins on it; what happened to it?

BEAN — One of the disadvantages of the design was that there was excess material on the end, creating a large volume of air around the feet. In order to be warmer, I used safety pins to make the bag fit more closely and thus decreased the amount of total air to be heated while I slept.

QUERY — How did you rig that bag for sleeping in the MDA those two nights?

BEAN — I tied it down rigidly with four pieces of line.

QUERY — In one of the M487 debriefings, Jack commented that he did his morning shower-shaving-tooth brushing exercise just like he did at home, but Owen, you said that you couldn't find a good place to brush your teeth. Why?

GARRIOTT — I didn't spend as much time on that as Jack did. I never used toothpaste because it could not be ingested, and it was time consuming to find a place to spit it out. As a result, whenever there was a convenient time during the

LOUSMA I think they wore out from the inside. There's a little Teflon rib that goes back on the inside. Just from the normal flexure, it wore out from the inside, because we all had the same two holes on the backs of both shoes.

QUERY What about the ergometer? Was that where it got its hardest wear?

LOUSMA Yes, they probably did, but I don't think they were wearing out against anything. They wore out on the little rib inside.

QUERY Did you have any general difficulty in donning and doffing clothing? Did you want to be contained, for example, in the sleep compartment or did it make any difference at all?

GARRIOTT I preferred to float.

BEAN You didn't have any place to put them at night, so you stuck them on the walls.

GARRIOTT I always stuck mine behind the comm box on the cables.

QUERY Did you develp any particular individual technique for handling cargo items that you had to transfer from place to place? Jack, you carried things between your feet sometimes. Was there a size limitation on how you could do that?

BEAN (CONT'D) or three straps around them and tightened them with an Allen wrench. When you get up there, you can untighten those and junk them. Then you have your plain box there.

BEAN We had too many Beta cloth bags within other bags; too many tiedowns.

QUERY Do you have any recommendations about the sleeping privacy for Shuttle? Do you think it is absolutely necessary, rather than sleeping in what's now the middeck of the Shuttle in an open bay hospital ward-type situation?

GARRIOTT I wouldn't say it was essential, but I thought it didn't waste any volume, because the things that we had in our little nook we are going to have to have anyway. We only had one extra compartment to ourselves, the rest of it was stowage. The more people you have, the more different times of sleep you are going to have. If you take up six or eight people you'll probably be doing something 24 hours a day and you are going to need something that can be closed off, kept quiet and away from the working area. I didn't see any particular compromise that was made by allowing each man a very small compartment. I thought it was a good idea.

BEAN You hit on a key point. They are going to be operating 24 hours a day. They need to have an area that is very

BEAN (CONT'D) quiet for sleeping when they are off duty while the other fellows are banging around. They don't need individual bunks to do it, but they need a room that is isolated, quiet, and dark. Maybe that whole bunk room is removed. Many of those guys will be coming in and out all day because they forgot their traingle shoes or need to get a checklist.

LOUSMA We all found that sleep is lighter. We all slept well but at a lighter level, than we do here on the ground. That is verified by the M133 data. So you don't want disturbances.

GARRIOTT We tended not to settle down until the last guy was settled down too. You could try to go to sleep, but if somebody was up working, it was enough to keep you awake.

QUERY Let me thank you for your patience and the data that you have given us. We shall try to find good ways to use it.

GARRIOTT Thank you.

BEAN Hope you can.

QUERY There are some M487 questions.

you get your triangle fully unlocked. And then you find yourself skipping along one one foot ricocheting off the walls of the overhead, trying to reach down and get your triangle popped back into the neutral position so that you can stick it into the grating somewhere else. So that's a very definite design deficiency with the wardroom. Around the table I think probably the best thing to have been - to have done there would have been to just leave the whole floor area out, and just make it all the mesh - the grid work under the table and maybe only have one or two triangles filled in on each side for the loop for a barrel or booted foot, so there's somebody who wants to eat barefooted or with a booted foot. I think you've probably got 20 times too much brown area down on the floor - completely unnecessary and it would have been I think a lot better off with just more open grid.

333 03 11 32 CDR

The sleep compartment - I think for the room that is available for those I think the sleep compartments are well layed out as you lay in your bunks. Everything is within readh - the radio, the lights, your locker and I think that - now I just can't think of anything else to say there. I think maybe a little more work could have been done in the locker to personalize them a little bit more. The lockers are really just the plain old sterile locker that are available in all the rest of the area - your open areas - or with straps in them for retaining bundles. I think one locker probably should have been - maybe the second or the third from the top - probably the

second from the top - should have been designed to open out only horizontal and provide a writing surface, sort of a little desk, much like you find in the stateroom aboard a navy vessel in the officer's stateroom. I think - you know a Ben Franklin desk sort of thing where you can pull down the door and it would stay horizontal, you could lay in your bed and write and in the locker itself it would have been - I think it would have been good to have a bunch of little pigeon holes and verious little ways of ... pieces of personal equipment and things like that. Last but not least on the lower deck is the waste management compartment. I think the equipment in there is very good. The pot and the urine collection devices I think are surprisingly easy to use and they're very effective.

333 03 13 31 CDR

I don't know how much better you can get on those. Of course, I must admit that when I - before I got here - I had very grave reservations for the ability of these systems to work well and I must say I was very pleasently surprised ... the first time in using both systems I found that that they worked as well as advertised. The big problem I would say in the waste management compartment is lack of proper foot restraints. We kind of boxed ourselves in, literally speaking, when we put the sheath over the floor and thereby dealing ourselves out of the grid work available for locking your seat down. And unfortunately we didn't do much to remedy the situation once it was done. The designed foot restraints that are in front of the urinal and the pot interfered with the drawers and so we had a lot

darn brown. I would like to see some ... such that we could get some good looking clothing in here. Other than that, I find most of the stuff fairly useful, some of the pockets are a little bit too small for what you want to put in them, especially around the back. Light baffles; I'd give that a very good, seems to work pretty well. Privacy curtains, I'd give that an excellent. That works excellent, very well. Air diffusers; I'd give those - that's a very good. Small problem there is that it takes an awful lot of cranking to move that thing around. And you're never really sure what you got when you get done. I haven't found those diffusers in the position ... to be effective. Air vents sleep compartments. I think the location of them right next to the rack was a mistake because they freeze my feet off every night. I had to move the bed so that they're not on my feet, and I don't get as much air flow as I was. SPT out.

338 03 43 10 PLT PLT debriefing from AIM pass at approximately 02:49. Partially debriefed, we started out going to do a JOP 6, step 1, building block 1 and we were adviced by ground to go into coronal transient mode, which we did. We started a JOP 8 Alfa, step 3, building block 17. Just as 56 I got into the PATROL LONG; I got one exposure 82 Alfa, 29 seconds, WAVELENGTH SHORT. And the WLC, I was drifting through there taking time occasionally to look at the monitor, and it was a MIRROR LINE SCAN all 0000.

338 44 10 PLT Kept taking a look at the monitor about every oh, 5 to 8 minutes, and there didn't appear to be anything happening. I so informed ground when we came up over Guam. Ground told us to go back and do building block 1,

idea. I think the crew were the ones who were all for that and got it going. Your designed efficiencies are: number 1. The material catches sweat and then allows thee liquid to leave but the smell remains. And the garments - the garments appear to react with sweat. And you end up with a ... about your - your body after a while. The shirts are particulaly unpleasant. The - The little pockets that were added at the end as - mainly as a result of a request by Al Bean consultation with all the rest of us. That's great. The pockets are deep.

344 22 50 48 CDR

But the thing is, somewhere along the line somebody dropped the ball. And the pockets that are designed for the scissors are not so the scissors won't stay in because the flap won't lock over the top of it. The pocket that's designed for the flashlight is too short. The flash-light comes out. It's - I'ts too bad because those would have been very, very handy pockets. It's just that the doggone rejection straps don't hold the item in. The pockets that hold in our litle trifold hooks just barely hack it. And I don't see any reason why they couldn't have added an extra half inch onto the strap or another inch of depth onto the pocket. As it stnads now the pocket is - is not deep enough. There's about 3 inches of the ... that sticks out. And we're ... inclined to hand up on things as we sail by them. I think probably we should have made the pockets another 2 inches deeper. It should have - had inches of ... sticking out. We would have been a lot better off. Light baffle in the sleep compartment is excellent. It

does its job well. It allows the air to flow through it. And I'm quite effective. The air diffusers in the whole area are very good.

344 22 52 24 CDR

I think it was a good idea to put the adjustment features in them. I must admit, however, that I haven't used the adjustment features because they've been adjusted very nicely now apparently by previous crews and we're quite satisfied with what we have. The air vents in the sleep compartments. Mine is very good. The only complaint I have is that it keeps my feet cold all the time and that's one of the ghings that cause me to on clool days to sleep in a half union suit in order to keep my feet warm. I don't think I want to try Al Bean's trick of getting in head - head down, turning my bed upside down. If I - if I let my head get as cold as my feet get, I would probably end up with a cold. This is the CDR with termination of M487-3 Alfa.

344 22 53 19 CDR

CDR out.

334 22 55 14 SPT

SPT at 22:55. And talking about the ATM pass which began at 21:57 for the 55 CALROC. No problem. Just carried it out as written and also got done a little bit early so' J gave another one. I'll give you the poinging coordinates first of the first three. Building block 26 is - the first one was done up at - up a plus of 2, 128 - that's a plus 1 - plus 128. A left of minus 15. The next one was done down to the lower left of that at the up of - down of minus 55 and left of minus 235. Third one was done to the right which was an upper of minus 55 and left of minus 55 also.

I think of the restraint devices in the - in the waste management compartment, they're terrible. Somehow we needed to have an open grill ino there.

356 17 06 56 CDR — You just, you're in there trying to clean up after defecation, or you're trying to urinate or comb your hair or do anything in there, and you just ricochet off the wall like a bebe in a tin can. You've just no place to anchor yourself down, those restraints that are in there are completely unsatisfactory. The fecal collector once you anchor yourself down on that rascal, I got no complaints about restraint devices there, I use the lap strap and there's just no problem; I put my feet in the foot restraint area that's back behind the urine drawers, and it all works very nicely; it's once you get off that thing and start the clean up process, when it begins to get exasperated.

356 17 07 43 CDR — Thermal comfort in the head is fine, noise level is okay, just a little bit noisy with the separaters going, but it's not uncomfortable at all. Illumination is quite adequa te, more than, more than adequate. Sleep compartment, general arrangement.

356 17 08 02 CDR — They're fine for sleeping, there's not much of a place to go hide and be by yourself, unless you're going to get into your bed, because there's no place to anchor yourself or really put yourself unless you're in bed. The volume of the compartment is just about right for that use.

356 17 08 19 CDR — The ceiling to floor proximity is okay. Ingress - egress provisions, they're good, the doors are very

good and light - the light blocking devices, the fact that you got the velcro doors and the - the light attentuators in the ceiling, they're all very good.

356 17 08 40 CDR

Trash collection provision, no problem. Inside they're well located, and no problem there. Stowage volume and access, well I've already discussed that earlier; I think we're a little light on personal item stowage volume; I think a little Ben Franklin type desk top or something for the second from the top, a locker would have been very nice, because you could lay in bed and reach that and write or read or something like that, that would have been very nice.

356 17 09 17 CDR

It would have been nice if that locker was - was provisioned with ways to restrain small articles that you would want to keep in there, personal articles. Temporary equipment restraints again, we're in wide use of snaps, velcro and - and springs, bungees in order to ancher your personal equipment down. Personal mobility aid, none.

356 17 09 43 CDR

Personal restraint devices, none other than the bed, I have all ready talked about the bed, I think it is a step in the right direction; it's a very good piece of gear. Don't know how you would improve it off-hand, except possibly rather than body straps, you might want to use something like a big body sheet, much like the sheet thats over the front of the SMMD, that sort of thing might be kind of nice. I don't know, but it will - would bear looking into.

356 17 10 18 CDR

Thermal comfort in sleep compartment, I think is good. There's lots of air moving through there and you can adjust

your bed - your bedding to keep you at the right comfort level. Noise level is excellent. It's very quite in there; the walls pretty well da - and the door pretty well damp out the noise as well as the light altenuators. Illumination is fine. One light in there is more than adequate. Experiment compartment, general arrangment and orientation. I think that's fine, the chair's kind of off in the corner and out of the way where I would really put it.

356 17 10 59 CDR I have no complaint about the arrangement and orientation of that compartment. The volume is about right. Ceiling to floor proximity is fine. Ingress egress provisions are more than adequate.

356 17 11 13 CDR Trash collection provisions, I think there is where we fall short in the experiment compartment. There really aren't any good places for trash. I think we need a trash stowage area over around M131 area and something over say between the bicycles and the UMD.

356 17 11 40 CDR Stowage volume and access no problems there. Temporary equipment restraints, again - again in this area we use mostly velcro, not many - many springs. Personal mobility aids: none. Personal restraint devices, well, the floor grid is the primary device and that's excellent. Most of the other restraint devices that you got are mobility aids are just grabbing - grabbing hold of things like the handles on the BMMD or the handlebars are on the bike or something like that.

356 17 12 12 CDR Thermal comfort is fine; no - noise level is fine; illumination is excellent. Trash airlock, problem here for the operator of the trash airlock, there is no really good way of achoring yourself or restraining yourself

356 19 19 23 PLT

Sleep compartment: general arrangements, okay. Volume of the compartment, fine. I don't think that it needs to be a lot bigger than that. Ceiling/floor proximity is okay. Ingress/egress. Ed has a little trouble getting in and out of his bunk because of the way his bunk is provided, but the - ours are okay. Trash collection is okay. Stowage volume and access. Okay, once again, the door on these lockers are really bad designs and another thing that I've meant to - to - to gripe is the - the little doors on the wipe and tissue containers. Those aren't - don't have a strong enough spring in them. And the trash - the dry trash doors and the wet trash doors don't have strong enough springs on them, because they - they stay open and you find yourself snagging on them while they're in the open position. As I say, all these doors, drawers, and everything else are just really very poorly designed. They don't do the job. They're just - they don't latch, they pop open when you don't want them to, and then they - they just are not satisfactory.

356 19 20 24 PLT

Personnel restraint devices in the - okay, we don't really have too much need for it. Thermal comfort is pretty good. What I'd like to be able to do would be control the airflow while I'm in the bunk. You get down and set the vents in the floor and then you get back in your - you get in the - in the - in the bunk. And it's a big operation to get in and out of the thing, so if there's a way of setting the airflow control while you were in the bunk it would be nice. Noise level. Well, there's no noise insulation in the air. I mean, if you're trying to - to do - get any rest while anybody else is doing anything,

forget it. Because there is just too much noise. There is no noise control in the vehicle. And that propogates right into the sleep compartment. Illumination is fine.

356 19 21 01 PLT Experiment compartment: general arrangement and orientation of compartment. Well, that's sort of a hodgepodge. Hard to get back into that one corner over there where the tool - tools are kept, because we have to get back there quite often. And when anybody's riding the bicycle, you're taking a chance of hurting them or you when you go sliding past them, cause they'll be pumping on the bike. That ought to have a special volume all its own, because it does occupy that, tied it up. And there is a small safety problem there when you start trying to go by somebody with a - the bike, while they're operating the bike. The corner over there where the - it was 131 chair; well, that's a good place for the 131 chair. It's sort of out of the way, and sort of useless area in there, anyway. Ceiling/floor proximity's fine.

356 19 21 43 PLT Ingress/egress provisions. Well, here's a small point. They put those neutron detectors in the - around the ring where - the ha - the hole that we come into when we come in straight down the X-axis into the experiment compartment. And several times we've touched the neutron detector, which is not supposed to be touched. Well, forget it' I mean, if you're coming down through there and you got to get a hold of something, you're going to grab; you're going to grab for the lightning hole or anything else. And this is what's happened; that's why that particular experiment's been possibly contaminated. Now, that - that - that's a consideration. You should not locate sensitive devices anywhere around a high-traffic area because, man, a guy's

adequate. Noise level's great. Illumination's fine.

361 04 23 25 SPT

Okay, the sleep compartments, general arrangement and orientation of compartments. General arrangement: I would like to have it so that the SPT doesn't have to go trudying by two other guys on the way out in the middle of the night and wake 'em up. I think that the arrangement ought to be such that three guys could have access to the sleep compartments without haveing to go through, or immediately adjacent to the other two. The compartment, itself, is too small. I think what we need in there are some locations where a person could sit down, or at least, if you will, sit as best he can in zero g and work. You need a small - small desk in there. You need better, more provisions for your personal equipment. I intend to take and restow lots ofthings, take the trashbags out of there, which have no place in the sleep compartment, a whole host of other things and try to make a little more provision for some of the things I'd like to have immediately accessible to me.

361 04 24 35 SPT

Ceiling/floor proximity is fine. Ingress/egress provisions: I just discussed. Trash collection is fine. Stowage volume and access: I've just discussed again that is poor, in that stowage volume for personal items is negligible. Access to them: I would just as soon use a few more walls for that. Temporary equipment restraints: there are none. Personnel mobility aids: none. Personal restraints devices other than the sack which we've already discussed, none.

361 04 25 13 SPT

Thermal comfort: the SPT ... Two - two things. I thought - there were a couple - SPT said to It's either too hot or too cold. ... too cold, I - I

put my feet right down there by the blower, or the vent coming through the floor. I usually wear one, or I think maybe two pair of socks at night just so my feet don't freeze. And I don't know it's no - no design feature but on the - when we get to high beta angles, the SPT's sleep compartment gets rather warm on the wall there, because there's one part of the wall there which is not shaded by the thermal shield outside. Stowage level: fine. Illumination: great.

261 04 26 [illegible] SPT Experiment compartment, general arrangement and orientation of compartment: Okay, here I would like to see us start using walls a little bit more. We've just got bare open spaces on walls. I don't know why we can't use eqipment. It's really a one-g device ... to us in one g. That's one feature I do like about the MDA, is that at least they managed, it seems, to use up all the walls. The walls are the working area.

261 04 26 35 SPT I said this whole OWS is essentially made for - made for working, for training in one g.

END OF TAPE

365 18 09 10	CDR	Factors that interfere with your ability to sleep: I think the major one is temperature. I'm quite - quite surprised to find out how temperature sensative I am when I sleep up here. I don't think I'm that temperature sensative at home. But up here, if the temperature gets up very much above 75, this guy wakes up. And he has trouble - trouble sleeping until he removes blankets or does something like that in order to readjust body temperature. And I'm very surprised to see that I'm so sensative to that because apparently it's a very narrow comfort range. Below about 75 I'm - I'm reasonably comfortable and I can - I can go to bed and - and - and sleep through the night, but if it gets much above 75 I become a fitful sleeper.
365 18 09 59	CDR	Airflow: no problem on sleep with airflow. Noise: we have had. The ATM C&D pumps are quite noisey in the airlock, and the noise as it comes down through the airlock is - amplified by the dome and by the time it - -
	PLT	... recorder?
	CDR	How long - how soon do you need it?
	CDR	Well - -
	PLT	...
	CDR	I've got four more questions to do. Probably 10 minutes - 7 minutes, something like that. Okay. Oiay, where was I? Airflow doesn't affect sleep. Noise: I was talking about

the ATM C&D coolant pumps. The sound is magnified as it comes through the airlock module by the dome for the megaphone effects. By the time it gets down to the experiment compartment it's - it's fairly noisy. So, we have asked for and received permission to turn those pumps off at night, so it won't interfere with our sleep. And that seems to do pretty well.

365 18 11 10 CDR Okay, what unique off-duty activiites have you devised to supplement those provided ODAE Kit? I have not divised any. The only off-duty activities in the ODA - ODAE Kit that we've even had the chance to use is the music and the books. I have read one and one half books. I'm busy working on my second book right now. My favorite o - off-duty activity is looking out the window with a pair of binoculars and just watching the the earth go by. And I'll never tire of that; I think that's the most relaxing and enjoyable off-duty activity that I could possibly do. I'm also keeping sort of a crew log - a log of just thoughts and - and ideas and - and things that I want to remember. And that takes up a certain amount of time which I consider to be an off-duty activity.

365 18 12 05 CDR What recommed - recommendations do you have for improving the recreational facilities and equipment for future programs? I think the tape recorders are a good idea. I think we need some better ones than what we've got. These have taken a beating. There's a little

Reference 40

POGUE I took my scissors and cut the neckring hole on my second one. The first one was okay, but they seemed to vary in tightness and size. The one thing I'd like to mention about the sleep compartment itself is that you should be able to adjust the airflow from your sleep position. A couple of times I got airflow noise. I then got out of my bag and checked it, then went back to the bag. I'd get rid of the noise but then there wasn't enough airflow. It would be nice if you could just adjust that from your sleep bag. Other than that, I like the straps very well. I think you have to have those straps in order to give you the semi one-g feel in bed. I kept mine real tight.

GIBSON I might mention that I tried a couple of nights just sleeping out there in the dome, just drifting around without being restrained at all. I found that I was able to doze, but could never really sleep soundly. I would just slowly mash into a wall and slowly come off it and 5 minutes later I'd hit something else and eventually, like everything else, I would end up on the diffuser screen. I found that I could not really get a good night's sleep even after I'd become accustomed to zero g. So I think the straps are a good idea.

POGUE Mol Sieve Activation: There was no problem on this. It was just a matter of timing it - coming back at the right time in order to get the next step. I used my portable timer, and the procedure was just as it was written.

CARR (CONT'D) high percentages of triangles that were unusable, even when those floors gone, because of the beams underneath that were supporting the pedestal.

POGUE Restraints and mobility aids need to be explored in regard to their being tailored for a specific task location, for example, around a SAL, around a film vault, around an area where you are going to do paperwork, et cetera. I don't want it to be interpreted that we think that is all that needs to be said about that area because a multitude of comments could be made.

CARR Restraints and mobility aids in the sleep compartment. There were enough triangles in the crew compartments to adequately give us any restraint that we needed in there. The sleep restraints themselves; I think you have three opinions on that. I found them to be quite good, and was fairly well pleased with them. We found on occasion that they would loosen up and get pretty noisy. Bill's particular restraint seemed to be broken to the point where we couldn't tighten it and keep it really quiet.

CARR Lighting System: I thought the MDA lighting was more than adequate and you could pretty well set up almost any way you wanted to.

Reference 42

CARR Lighting was certainly not one of our problems in crew system. There was plenty of lighting and it was flexible enough so that you could turn it off, if you didn't want it.

GIBSON Personal Stowage: I found no reason why we should have had a whole multitude of trash bags and other gear stowed in what should have been a crewman's personal stowage location.

POGUE Even the sleeping bags didn't need to be in there.

GIBSON That whole area for each crewman should have been opened up to his own personal stowage and not those of the ship. I think we had enough other dome lockers and locations around that we could have taken care of all those other good things that we had to stow in sleep compartments. I would like to have seen something also with smaller compartments that you could open. When you opened a large locker, you opened yourself up to everything that happened to be in there. In terms of personal stowage, you ended up with a host of many small things, with pencils, pens, eye glasses, and who knows what else in there. Every time you opened up one of the lockers, it all came out at you. I think we could have done a much better job in designing that. One thing we do need is a soft stowage, for film and all kinds of small things. The configuration of these small items cannot be predicted. The stowage needs to be something like a very soft foam that will grip whatever is put against it and that

GIBSON (CONT'D) will be very flexible. Something like that would have helped our film stowage, all the personal stowage, and every small item that you cannot predict ahead of time what it's configuration will be.

CARR I broached the subject for stowage for crew quarters in the M487 area. I proposed that at least one locker with a lot of pigeon holes be designed for personal use. The door of this locker should be hinged so that it opens downward creating a Ben Franklin-type disk, and it should be at an elevation that makes it compatible for reading or writing even if a crewman is hanging in the rack. Inside the locker there should be soft stowage provisions for things like pens, pencils, and any other small personel items you might want to store. I think that's definitely a requirement in a system like that.

Regarding stowage in general, I thought the stowage in the whole spacecraft, generally, was good. We have already pointed out some very definite problem areas. The most glaring example of a stowage problem was the film vault. That's been thoroughly kicked and I don't think there is any need to jump into that one any more. As we used equipment, particularly in the wardroom areas, stowage lockers opened up and we found them to be very handy for stowing items. Once we got into the free-wheeling food system where we had to select a lot of things

POGUE (CONT'D) those with scissors. I liked the idea of having that knit fitting on the arms and the legs but it would be nice to have a little more stretch.

GIBSON I don't think we should let the clothing debriefing go by without mentioning that we all got a little tired of looking at brown. I sure would have liked to have seen some different colors up there. I know the problems you had with trying to make fireproof clothing and the problems of dying, but I hope that the effort doesn't stop. Brown surely is a tiresome color, and I think something in the order of blue and green would have been most welcomed. We ought to push for it in the future and not just live with the drab brown we lived with during Skylab.

CARR I think that's a very good point. I think that future clothing design ought to be rather colorful and it ought to be varied.

POGUE Crew Quarters: The only point that I'd like to make is about the sleep compartment. I'd still like to be able to adjust air flow from inside the sleeping bag.

CARR Yes. Another item that we discussed in a group and haven't put on tape yet is the idea that crew quarters ought to be more spread out. The three crew areas were so close together that if a crewman did have a loose bed and did do any thrashing at night, he bothered the other two crewmen. If a fellow wanted

CARR (CONT'D) to stay up late and read or listen to music or do something like that, he had to be very, very careful not do disturb the others. Or if someone woke up early in the morning, he had to be very, very careful not to disturb the others. In future spacecraft design, the crew quarters ought to be separated as much as possible to give a person the opportunity to move around in his quarters and do things that he wants to do without constant concern about disturbing other people.

POGUE Also, the individual quarters ought to be away from the traffic flow to the head because that can cause a lot of noise too.

GIBSON I think the traffic pattern that we had was not very good. In a building here on the ground, you have a hallway with rooms going off on either side. Up there, essentially, we had rooms with the hallway going just about right through the rooms. If I went out to the head in the middle of the night, I went through their sleep compartments, and I don't think that was proper. I think you ought to construct all the rooms in the vehicle off of a hallway.

CARR We talked about the idea of having a personal stowage and a personal desk and the personalizing of the crew quarters, and I think that's important. In future space flight, when man starts staying up for long periods of time, each crewman should have a place to call his own. It's got to be a place that can be

CARR (CONT'D) modified in the way any individual desires. We should start thinking about that right now and plan for it.

CARR Trash Disposal: When we arrived, there were no trash disposal bags at all. The only bags available for use as trash bags were the trash bags with the membrane and the sealable urine disposal bags. The urine disposal bags were in rather short supply, so we used the trash bags almost exclusively and saved the urine disposal bags for the disposal of urine. We found the urine disposal bags worked well. We could usually get from three to five full urine bags into those bags, and we disposed of them through the trash airlock without any problem. Then about halfway through the mission we suddenly came to an impasse on that. We found we could only put two full urine bags into a urine disposal bag and dump it; more than two urine bags would swell, causing difficulty when the urine disposal bag was pushed into the waste tank area. We were worried about jamming the trash airlock when we were dumping only two urine bags at a time because even two urine bags would jam it slightly. We finally began dumping our urine through the urine dump system and then throwing away the empty urine bags. Even those were inclined to swell and occasionally caused us a problem with the trash airlock. Our final solution was to dump the bags, roll them up and put a piece of tape around them. That way, we could

CARR (CONT'D) in the neck when you let it - you know, when you listen to it and let it bug you. But after a while, you just mentally begin to block those sort of things out and you forget about them. But at night when you're not thinking and you're not busy, then noises like that begin to bother you, and that's why we wanted to shut it down.

PATTERSON Okay, the next question concerns the ventilation system. Results of previous debriefings indicated that the ventilation diffusers were not frequently adjusted. Were the floor diffusers adjusted with any frequency to attain comfort? And if so, what position were the diffusers generally left in?

GIBSON Sleep compartment, I think is the only ones where they actually changed. For myself, when we got to high beta, I used to direct the flow more up towards the sleep restraints. Other times, I'd have it just ad - adjusted to the minimum flow rate that I could get without getting a lot of noise associated with the turbulent air flow.

PATTERSON But as far as the circular diffuser, you didn't see - readjust those?

GIBSON No, I didn't change with those things at all.

Reference 45

CARR That's the only thing I had in the waste management compartment as far as volume is concerned.

POGUE The experiment compartment was great.

CARR Of course, we've already hit people over the head and shoulders about the floor and the fact that you had no foot restraints that were worth anything in there. The sleep compartments: if all they're designed for is sleeping, or reading a book when you're in your bed, or writing letters, or doing whatever you're going to do while you're in your bed, they were about the right size. But if you wanted it for a place for a person to go in anytime during the day and maybe sit somewhere or lock himself somewhere else besides in his bed, it weren't big enough. The only restraint system you had was the bed, so if you wanted to be by yourself in your room, you had to get in bed. One other thing that we recommended too from an architectural standpoint is that the sleep compartments be spread around the workshop, so one guy thrashing around in his bunk doesn't disturb the other guy. If you're just a thin aluminum wall away, it can get pretty noisy and bothersome. The - yes, experiment compartment was - no volume problems there at all.

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