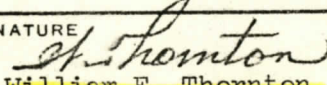


MEMORANDUM

Lyndon B. Johnson Space Center



REFER TO: CB	DATE SEP 26 1977	INITIATOR CB/WETHornton: cab: 9/21/77	ENCL
TO: SE5/Richard L. Sauer John B. Westover		CC SE5/W. H. Bush CB/J. P. Kerwin CB/T. K. Mattingly	
FROM: CB/Dr. William E. Thornton		SIGNATURE  William E. Thornton	

SUBJ: Food and Hygiene Systems

Thanks for the opportunity to see both systems in weightlessness. Although my autonomic response prevented as complete participation in the testing of the devices as would have been desired, nevertheless, I came away with some firm impressions.

Food System. The rehydration by means of the elastic plug and sharp needle gave no particular difficulty but I have had extensive experience in manipulating needles. I can assure you that sooner or later this needle will stick someone. I am most anxious to see the water supply needle/package interface. I would agree with your evaluation of food handling in the flat packages in that it was easy to remove the food from the film by acceleration, was easy to cut the film, and was quite practical to eat from it. This was, I feel, a definite improvement over the plastic bag arrangement. Conversely, I have the impression that use of this package as a drinking device is not going to be practical. Although these may have been prototypes, there were difficulties in insertion of the "straw" and it takes a conscious effort to stop the flow to prevent free liquid flying in weightlessness after it has been removed from the mouth. However, the big problem was securing the tubing to prevent additional leaks. This was a far inferior arrangement to even the old accordion drink containers. The squeeze bottle with the commercial push/pull cap was the most impressive of the drinking containers. If you would put that cap arrangement on a bag or something else with a separate rehydration port I think you would probably have an improvement over the skylab drink containers. Conversely, the proposed container is a long step backwards.

Hygiene Station.

My impression was little different in weightlessness from my previous experience. Seeing it set up in the aircraft reinforces the impression that this was a very badly executed piece of hardware and that the large amount of supporting apparatus is going to be very costly in weight and volume. As regards to poor execution, I am talking about items such as the many sharp corners, foot pedals and the like. The same conceptual objections were present in weightlessness which include being a basically dirty machine with innumerable crevices and slots and spots for entrapment of water, filth, and bacteria. There is no way to clean this. My objections to the rather stiff flappers through which one must insert dirty arms remain. Arms which have been cleaned will then become dirty on withdrawal from these flaps. However, in weightlessness, it was obvious that some apparatus to provide their function is required, for even with the spray there was considerable back splash, and when the stream was increased, floating large globules would occasionally appear with the soap bubbles.

The water still appeared dirty and you probably recall that it was in fact heavily contaminated with bacteria on post-test examination. Foot pedals were probably slightly more difficult to operate in weightlessness than in 1-G and were in both situations very unsatisfactory. The increased stream of water was a great benefit which we did not have the advantage of in the test. Conversely, some form of multiple spray arrangement would be better than the single high-velocity stream. If one chokes it down to a spray, this then becomes ineffectual.

Apparently, there was considerable misconception on the crew's attitude toward the hygiene station in SMD III. Quite simply, it was one of the most condemned pieces of hardware in the test. I do not know what has been said in the various post-mission reports, but I recall very well the dislike of this unit and the criticism of its many faults by all of the crew members who shared the unanimous opinion that it was unsuitable during the actual test itself. My comments have been quite consistent. To reiterate the problems of the hygiene station which were found in the hygiene station in SMD III and partially confirmed during the weightless flight: it is a large device, expensive in terms of size and weight, to do what should be a relatively simple job. The conceptual design is unsatisfactory, in that it is inherently dirty with a multitude of crevices, corners, adjacent surfaces which soak up water, to say nothing of the water storage itself which became contaminated. Without any method of cleaning it up, the station rapidly becomes more of a problem than a solution. There were many faults in the design details which included:

- The flapper valves become wet and dirty and defeat any attempt to decontaminate the hands.
- The spray or, in the weightless flight, simple stream was unsatisfactory, producing insufficient water or a great deal of backsplash.
- The soap dispenser which can pour out such multitudes of soap from the same nozzle as the water. Even after the soap flow rate has been corrected, it still pours.
- The foot controls were at best clumsy and difficult to operate.
- There was really insufficient space to do a reasonable job of cleaning one's hands.
- In short, this current design is so poor, both conceptually and as executed, that it remains my strong recommendation that an entirely new approach be taken and this be abandoned.

There was a misunderstanding on my part, for I could not believe that the contractor's report, which bore no relationship to actual experience, would be seriously considered by anyone. The fact that business continues as usual showed me to be wrong. It is one thing to make a nice clean trial by engineers or others in a laboratory or for that matter brief trials in the weightless aircraft. It was quite another thing to have to use the device several times a day in futile attempts to remove blood and gore. Our best workaround was alcohol and towels, but such volatile substances will not be possible in the spacecraft unless provision is made to accommodate them. It is my strong recommendation that those of you in engineering that are concerned with this problem reconsider these efforts, and let's sit down and try to come up with a solution which has more promise.

Again, thank you for the opportunity of participating in these tests, and I would welcome future opportunities to participate, in any fashion, in efforts to solve some of our problems.