

William Thornton, M.D.  
701 Coward's Creek Road  
Friendswood, Texas 77546

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Alan R. Hargens, Ph.D.  
Life Sciences 239-11  
NASA Ames  
Moffet Field, California 94035

Dear Al,

It has been a most interesting and enlightening effort to review the chapter. It is far and away the best review I have seen, criticisms notwithstanding. It was truly a privilege to do this.

You have heard my feelings that the second portion seemed less rigorous, less well referenced and more redundant and less concise than the first. I had to be less critical in detail there for it was in danger of my trying to rewrite by criticism.

Although it is heresy (that is a major role of a scientist) you should apply the same critical rigor to animal models and 1g simulations that you do elsewhere. Also I feel you should compare and criticize exercise hardware, not advocate. This is said with knowledge that you built your hardware because of other hardware limitations, however the complications must be considered.

Enclosed are two of the publications on our fluid shift work in 1g which is still in progress. We have an n of 5+ and could not shift fluid with acute angles of leg raising (to 90) nor by preflight launch posture nor by head-down to 30. The data are available in rough form. This supports your contention that tissue weight is critical and our(?) contention that the tissue compliance curve is very steep and sensitive to a few cm. H<sub>2</sub>O.

Also enclosed is a description of my latest treadmill rationale and its design which was partially flown last year. As you can see John G. chaired the session.

Finally we come to the least common denominator, ego. As you know I have done a good bit, talked a lot, but written little. Enclosed is one of my two remaining copies of a presentation made in 1981 which treats many of the issues addressed in this chapter. It may not be possible to reference but was published and distributed widely as a conference proceeding.

I claim priority on the following in the fluid area:

1. Demonstration of magnitude and course of fluid shift and loss in weightlessness.
2. Implied shift and loss of blood based on theory and Skylab measurements.
3. The importance of leg muscles in leg venous compliance.
4. The demonstration of changes in inflight leg blood flow, compliance (and its rapid recovery) and muscle pumping.

The correlation of  $\Delta$  leg volumes and  $\Delta$  mass in 1. came more slowly but was clearly present by the time of the 1981 conference where Gunnar B. addressed the topic of fluid shifts but relied only on bed rest and did not relate the two measurements until 1983 (ref.25) using and crediting my illustrations, as I recall. Also enclosed is the first of three parts of a presentation made locally and also published by JSC as a conference proceeding which clearly shows the relation of fluid/mass  $\Delta$ s.

Again thank you for this opportunity and since I cannot - go on and solve this fluid problem by putting a little counterpressure on the abdomen before deorbit and rehydrating. I look forward to seeing you again.

Sincerely,

*Bill*

William Thornton, M.D.

Enclosures.