

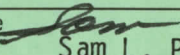
Routing Slip

Mail Code	Name	Action	
		Approval	
SA	Dr. Kerwin	Call me	
		Concurrence	
SA	Dr. Dietlein	File	
		Information	
SB	Dr. Vanderploeg	Investigate and Advise	
		Note and Forward	
SD3	Dr. P. Johnson	Note and Return	
		Per Request	
SD3	Dr. Bungo	Per Phone Conversation	
		Recommendation	
CB	Dr. Thornton	See me	
		Signature	
SE	Bill Bush	Circulate and Destroy	

Dr. Bungo makes the point very clear that we need to do some ground-based physiological testing with Dr. Thornton's LBNP as well as the new ILC LBNP. There maybe some form fit and function difficulties with both the devices.

In the long run there maybe benefit from having available both devices. Based on the philosophy that both of these devices have a role to play in our operations and research programs, it would be appropriate to generate physiological test plans for each of these devices. It is requested that Dr. Thornton develop such a test plan for his device and if SD needs to be involved in the testing (we would like to assist), please coordinate that test plan with Dr. Johnson. Dr. Bungo and Dr. John Charles should develop a test plan for the ILC LBNP.

The ground-based physiological testing of these two devices should be accomplished as soon as the devices are available for such tests.

Name  Sam L. Pool	Tel. No. (or Code) & Ext. 4461
Code (or other designation)	Date

MEMORANDUM

Lyndon B. Johnson Space Center

NASA

REFER

TO: SD3-84-415

DATE

INITIATOR

SD3/JBCharles:cb:06/21/84:5457

ENCL

TO: SD/S. L. Pool, M.D.

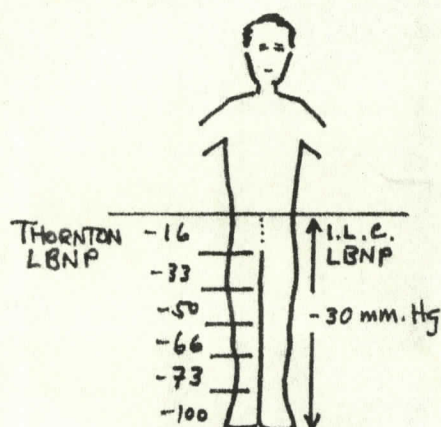
CC

FROM: SD3/M. W. Bungo, M.D.

SIGNATURE

Michael W. Bungo, M.D.

SUBJ: Preliminary Thoughts on Dr. Thornton's LBNP vs. ILC LBNP and Some Questions

1. General ComparisonsILC LBNP

- a. bulky
- b. immobile
- c. "noisy" pump
- d. range of variable pressures
- e. background literature exists
- f. one size fits all

Dr. Thornton's Gradient LBNP

- "easily" stowable
- potentially mobile
- "quiet" pump
- ??
- new
- individually tailored
(One size fits some!)

2. Potential Uses

For what, specifically, is the Thornton LBNP designed: acute countermeasure? chronic countermeasure? research? How applicable is it to each?

3. Leaks Around the Seal

Dr. Thornton compares the "gradient" device to the ILC LBNP only @ -50 mm. Hg, claiming functional superiority. However, the countermeasure uses -30 mm. Hg. The ILC is obviously less leaky at -30 than at -50.

4. Use as a Countermeasure

Dr. Thornton's negative pressure gradient LBNP, should provide adequate overall suction to be an effective countermeasure: -16 to -100 mm. Hg vs. -30 mm. Hg overall. (see figure).

He designed the device with the largest pressure differential (90-100 mm. Hg) near the feet. The feet do not have a large vascular space, while the smallest pressure differential (15-30 mm. Hg) is around the lower abdomen and thighs, which have the greatest potential for holding fluid. Would it store adequate fluid?

5. Possible Hazard of Device

At differential pressures over 50 mm. Hg, syncope has been nearly 100%. Skylab data indicates that the crewmembers are even more sensitive to LBNP while in orbit. Dr. Thornton compares his gradient of 0-100 mm. Hg to a pressure of -50, not -30. Would his suggested pressure be safe?

6. Is There Adjustment for Leg Size?

How "adjustable" is the fit of Dr. Thornton's LBNP? Will the inflight change in leg size affect the seals?

7. Science Applicability of Gradient Pressure Device

A. If we wish to do "science" using LBNP, and if we want to use more than one subject per flight: do we have to choose subjects all the same size, or would we stow and fly multiple Thornton LBNP's.

B. Does Dr. Thornton's LBNP offer variable pressures? Is it only "on" or "off," or can it provide -30, -40, -50 mm. Hg "equivalents"? Can it give -5, -10 mm. Hg equivalents, needed for low-pressure baroreceptor stimulation?

C. Is the notion of trying to retain comparability with the existing scientific literature to be dismissed?

D. What advantage results from the duplication of 1-G hydrostatic pressure gradients in the legs? If the intent of LBNP is to "unload" the head, the heart, and/or the baroreceptors, then where the blood is redistributed is irrelevant: there probably is no baroreceptor in the legs that would respond differently to a pressure gradient.

In summary, we have questions about the utility of the Thornton device. Until it is made and tested, the questions will go unanswered.