

UNITED STATES GOVERNMENT

Memorandum

Shorn

TO : Memorandum for Record

DATE: November 20, 1969

FROM : CB/R. H. Truly

SUBJECT: ALEM EVA baseline

This memo describes the proposed (North American) baseline for ALEM EVA CSM hardware, and describes some (one-g) suited work (18-19 November at Downey) wearing the proposed suit--SLSS--umbilical configuration.

Suit Work First: As seen now, the EVA crewman will be generally configured as follows: A7LB EVA suit (wearing an LCG with redundant cooling loops), using a back-mounted SLSS as the primary life support, and an umbilical back to the CM as the secondary system. SLSS hoses will be the same used earlier on the surface, and the biomed/comm connector comes via the umbilical from the CM and not through the SLSS. The umbilical O₂ pressure regulator is bolted underneath the SLSS. Add to this a waist belt for tether attachment, assorted safety and equipment tethers and a leg-mounted (like a kneeboard) device for transporting one of the retrieved film cassettes.

The suit drill consisted of a North American subject (Bill Fleming) donning all of the above (except LCG) inside the CM and preparing for egress including suit pressurization. I also did the same, plus an egress out the hatch. While pressurized, then some moving about on the stand outside the mockup. Specific problems were as follows:

a. The donning operation is one which will require very methodical procedures to avoid mass confusion in the CM due to all the hoses, tethers and gear. This phase is going to be no simple matter.

b. The hoses, controls and connectors which emerge from the SLSS and connect to the front of the suit (there are no less than six) are sized for PLSS/SLSS surface ops, and for this operation hang down too low. These must be secured in some manner to prevent arm entanglement (which did happen during the test).

c. Umbilical leads emerging from the O₂ pressure regulator box below the SLSS must not exit the box in a direction away from the crewman. (One electrical lead was ripped off during donning.) An acceptable alternate routing was found.

d. The O₂ umbilical inlet to the suit was inaccessible and was changed during the test to an acceptable location. The O₂ actuation device on this inlet was unacceptable due to lack of feel discrimination using an EVA glove.



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Considerable spirited discussion was held as to whether this actuator should be a "single-pull" type or a "lock-lock" type. The pros and cons are too lengthy for this memo, but we should really be alert on this one since the actuation device is not visible to the crewman, and we already have such a group of hoses, etc., on the front of the suit that it could really get confusing.

e. The SLSS control unit was nigh impossible to see, even in a chest-mounted configuration which I thought protruded excessively. Furthermore, trying to operate the switches with a pressurized EVA glove was like setting a pushbutton radio through three blankets! Location and design of this controller is a tough one.

ALEM EVA: The proposed baseline includes handrails, handholds and tethers, with a leg-mounted holder for the retrieved film cassettes. Mockup fidelity precluded even a good one-g evaluation, but the following comments were passed on to those concerned:

a. The proposed handrails and handholds, which generally surround the sim bay in the SM, seem adequate but cannot possibly be checked by a paper review. Underwater/aircraft tests scheduled in December should solve this.

b. North American, for a reason that I could not fathom, refuses to baseline any foot restraints. The result of this is a baseline configuration that has an excess of tethers in my opinion. The long hose problem mentioned earlier is going to hamper and make awkward a lot of tether hooking/unhooking, and I figure that foot restraints would ease the problem considerably. Direction was given by NASA to at least include foot restraints in the December zero-g tests.

c. The leg-mounted film cassette carrier has yet to be proven easy to operate, although a drawing was available. The mechanism for attaching the cassette to the holster looked rather easy, but who knows--it can be seen by the crewman only with difficulty. A quick disconnect was provided to release the cassette from the holster, but the design precluded the EVA crewman from removing the holster itself if desired which I thought to be bad news!

Summary: For a total suit/spacecraft hardware design that is scheduled to fly on Apollo 16 and subs, this one needs lots of attention in the next few weeks, which will include underwater tests, aircraft tests, and the PLSS-7/SLSS PDR. Although each small piece of the puzzle does not look too tough, the conglomeration could sure end up a mess to that guy outdoors!

Dile
Richard H. Truly

rht/cam