CB-2

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APOLLO 15
LOWER BODY NEGATIVE PRESSURE
PRELIMINARY RESULTS

Lower Body Negative Pressure (LBNP) was used previously in pre- and postflight orthostatic evaluations on crewmen of Apollo Missions 7, 8, and 9. The same equivalent protocol and measurement techniques were used on this mission with the addition of two measurements: the vectorcardiogram (instead of the two electrocardiographic chest leads) and the precordial vibrocardiogram (VbCG) to estimate cardiac stroke volume.

Preflight data were technically of good quality and each crewmember demonstrated minimal variability between his three baseline tests. These data were used for comparison with individual postflight results.

Resting supine heart rates immediately postflight (R+3-5 hours) were significantly ($p < 0.05$) elevated in the CMP (+14 bpm, +20%) and the LMP (+11 bpm, +20%). All three crewmembers showed increases in heart rate during application of LBNP, with maximal delta values (pre- versus postflight) of:

CDR Scott:	+16 bpm	+27% (-50 mm. Hg.)
CMP Worden:	+51 bpm	+64% (-50 mm. Hg.)
LMP Irwin:	+27 bpm	+49% (-40 mm. Hg.)

The LMP experienced presyncope during the -40 mm. Hg. level of LBNP.

All crewmembers demonstrated a tendency to return to their baseline preflight heart rates at R+42-44 Hr., but remained statistically well elevated while both CDR and LMP experienced presyncope. The same pattern continued at R+71-73 Hr. without presyncopal events.

By R+122 Hr. the CDR was completely within his preflight envelope with respect to heart rate response. LMP did not reach this level till his test at R+210 Hr. CMP was not tested between R+121 and R+310 Hr., over which interval he demonstrated a distinct alteration of his response profile from incrementally increased heart rate with each successive level of LBNP to an

essentially flat heart rate elevation across all levels of LBNP stress. This constant elevation was, however, still statistically above his preflight baseline during LBNP.

Blood pressure values have not been completely analyzed, but supine resting, clinically obtained values before each LBNP test showed significant elevations postflight for both CDR and CMP. Blood pressure values for LMP tended to be somewhat elevated before flight and a similar postflight elevation in him was not evident.

All three crewmen showed considerably decreased maximal calf circumferential dimensions immediately postflight:

CDR	-	0.44 inches	-	2.8%
CMP	-	0.31 inches	-	2.2%
LMP	-	0.51 inches	-	3.5%

This decrease in calf size remained evident beyond R+121-137 hours, whereas they had regained their weight losses by R+42-44 hours. Indeed, calf size seemed to closely parallel their LBNP responses. However, changes in leg volume during LBNP were again quite variable without a consistent pattern.

Cardiac stroke volume was decreased immediately postflight in the supine resting state for CMP and LMP only:

CDR	- 1 ml	- 1%
CMP	-24 ml	-29%
LMP	-13 ml	-16%

but showed decrements (maximal) during LBNP for all:

CDR	-21 ml	-31% (-40 mm. Hg.)
CMP	-28 ml	-58% (-50 mm. Hg.)
LMP	-27 ml	-38% (-40 mm. Hg.)

Gradual progression toward preflight baseline values was observed with time after splashdown. This measurement very closely approximated other evidences of their recovery to preflight status.

A significant postflight decrement in supine resting cardiac output occurred only in the CMP, but all showed decrements at the higher levels of LBNP stress. A significant increase in cardiac output was seen after R+137 hours for the LMP. This decrease in cardiac output implies an insufficient compensation for decreased stroke volume by increased heart rate.

Vectorcardiograms are awaiting computer analysis.

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