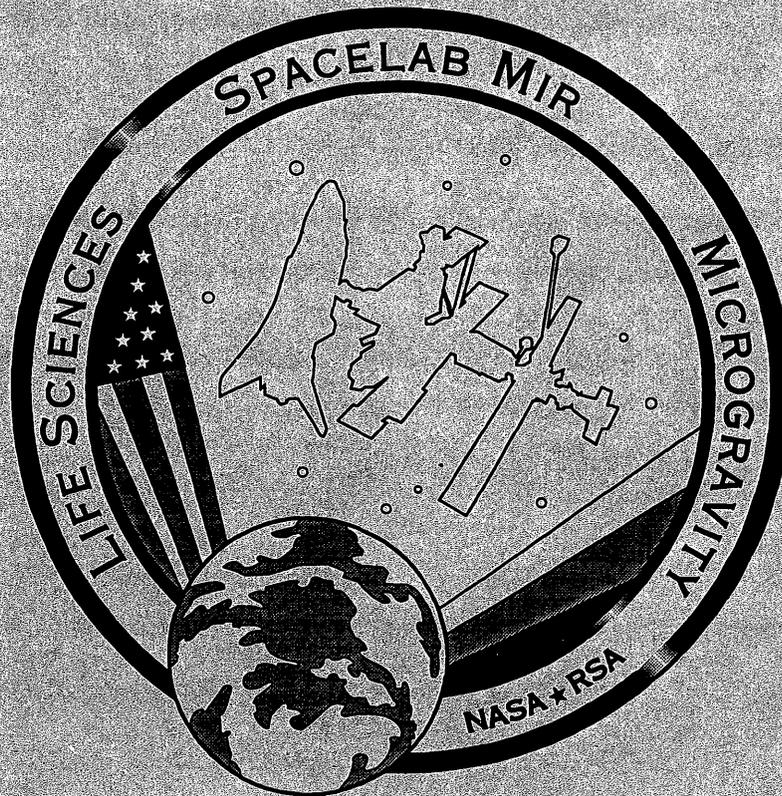


Shuttle-Mir Science Program Mir 18 and STS-71

30-Day Operational Accomplishment Report



National Aeronautics
and Space Administration

Lyndon B. Johnson Space Center
Houston, TX

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Studies of Orthostatic Tolerance Using Lower Body Negative Pressure (LBNP) - 3.1.1 Postflight 30-Day Operational Report

A. SCIENCE OPERATIONS

Mission	Flight day		Participants		Samples/Parameters
	Scheduled	Actual	Scheduled	Actual	
Mir 18	L-120	L-120 18-20 Oct. 94	18-CDR, -FE, -CR 19-CDR, -FE, MS3	18-CDR, 18-FE, 18-CR 19-CDR, 19-FE	ECG, BP, Echo, LBNP Pressure
Mir 18	L-42	L-60 17-21 Jan 95	18-CDR, -FE, -CR 19-CDR, -FE, MS3	18-CDR, 18-CR 19-CDR, 19-FE, MS3	ECG, BP, Echo, LBNP Pressure
Mir 18	L-21	N/A	18-CDR, -FE, -CR 19-CDR, -FE, MS3	none	none
Mir 18	L-7	L-10 3-4 Mar 95	18-CDR, -FE, -CR 19-CDR, -FE, MS3	18-CDR, 18-CR	ECG, BP, Echo, LBNP Pressure
Mir 18	MD21	MD15 30 Mar 95	18-CR	18-CR	ECG, BP, LBNP Pressure
Mir 18	MD16	MD21 5 Apr. 95	18-FE	18-FE	ECG, BP, LBNP Pressure
Mir 18	MD22	MD23 7 Apr. 95	18-CDR	18-CDR	ECG, BP, LBNP Pressure
Mir 18	MD27	N/A	18-FE	none	none
Mir 18	MD47	MD47 1 May 95	18-CDR	18-CDR	ECG, BP, LBNP Pressure
Mir 18	MD48	MD48 2 May 95	18-CR	18-CR	ECG, BP, LBNP Pressure
Mir 18	MD49	N/A	18-FE	N/A	N/A
Mir 18	N/A	MD53 7 May 95	N/A	18-CR	ECG, BP, LBNP Pressure
Mir 18	MD84	MD85 8 June 95	18-CDR	18-CDR	ECG, BP, LBNP Pressure
Mir 18	MD83	MD98 21 June 95	18-CR	18-CR	ECG, BP, LBNP Pressure
Mir 18	MD85	MD102 25 June 95	18-FE	18-FE	ECG, BP, LBNP Pressure
STS-71	FD6	FD6 (MD 109) 2 Jul. 95	18-CDR, -FE, -CR	18-FE, 18-CR	ECG, BP, Echo, LBNP Pressure
STS-71	FD9	FD9 (MD 112) 5 Jul. 95	18-CDR, -FE, -CR	18-CR**, 18-FE*	ECG, BP, Echo LBNP Pressure
STS-71	FD10	FD10 (MD 113) 6 Jul. 95	18-CDR, -FE, -CR	18-FE*, 18-CR*	ECG, BP, LBNP Pressure
STS-71	R+1	R+1 8 Jul. 95	18-CDR, -FE, -CR	18-CR	ECG, BP, Echo LBNP Pressure
		R+2 9 Jul. 95		18-CDR, -FE	ECG, BP, Echo LBNP Pressure

STS-71	R+4	R+4 11 Jul. 95	18-CDR, -FE, -CR	18-CR	ECG, BP, Echo LBNP Pressure
STS-71	R+13	R+12 19 Jul. 95	18-CDR, -FE, -CR	18-CDR	ECG, BP, Echo LBNP Pressure
		R+40 16 Aug. 95		18-CR***	ECG, BP, Echo LBNP Pressure

- * Russian countermeasure only, no echo data collection
- ** Originally scheduled as a Russian countermeasure session, but changed to 3.1.1 data session at PI request.
- *** 18-CR rescheduled for R+13 session on August 16, 1995, to facilitate his personal schedule and other laboratory commitments.

B. BIOMEDICAL PARAMETER LIST

- Arterial blood pressure (by auscultative sphygmomanometry, Korotkoff technique);
- Electrocardiogram, heart rate;
- Aortic blood flow velocity (by Doppler flowmetry, Shuttle only), stroke volume, left ventricular cardiac output, total peripheral resistance;
- LBNP tolerance time.

C. HARDWARE

The following hardware was used during preflight, in-flight, and post flight tests:

- "Skylab" LBNP Device (pre-, post flight only)
- Russian "Chibis" LBNP Device (in-flight, O.S. Mir)
- SD-designed Collapsible LBNP Device (inflight, Shuttle)
- AERIS (in-flight, STS-71) and Biosound (pre- and post flight only) echocardiography devices
- Automatic Blood Pressure Monitor (ABPM)
- Portapres Continuous Blood Pressure Device (CBPD)
- Finapres Blood Pressure Monitor
- TEAC Data Cassette Recorder
- Data Acquisition System (DAS)
- Miscellaneous ECG monitors, strip chart recorders, and test equipment (pre- and post flight only)

D. DATA COLLECTION

1. Completeness of Data

All data products are in the possession of the PI team or SD Flight Projects personnel.

During the mission, the Russian discipline lead and TsUP medical staff refused to transfer in-flight telemetric data from LBNP sessions on the 18-

CDR and 18-FE, in defiance of data sharing agreements. However, that data was recorded on magnetic tape onboard using the US-provided TEAC data tape recorder.

2. Quality of Data

Final quality assessments have not been completed at this time.

Some data was lost on STS-71 due to late Russian requirement changes which deleted STS-71 LBNP sessions on the 18-CDR.

3. Anomalies

A hardware anomaly during Mir-18 involving the CBPD was minor and able to be ignored for the duration of the flight. There was no science or data impact.

STS-71 incurred one hardware anomaly involving the LBNP experiment. A discrepancy between the pre-programmed LBNP "countermeasure" and the protocol printed in the PFDF was noted. This had no impact on the science collected. The cause is still being investigated.

There were no preflight or post flight anomalies that had an impact on science.

4. Additional data collections

After each of his first two "Chibis" LBNP sessions (MD 21 and MD 47) on Mir, the 18-CR spontaneously offered to repeat the study after having ingested water and salt tablets as per the STS end-of-mission fluid loading protocol. His interest was in demonstrating the role of adequate body hydration in orthostatic tolerance during space flight. As it happened, the planned LBNP session for the 18-FE on MD 53 (originally MD 49) was canceled by the Russian medical authorities in the TsUP, after all timeline and other arrangements had been completed. Therefore, a plan was quickly generated and approved to allow the 18-CR to perform this additional "Chibis" session on MD 53.

On STS-71, after undocking, the first of the 18-CR's two planned LBNP training sessions (EOM-2) was changed to a 3.1.1 data collection session at the request of the 3.1.1 PI. Consultations with the resident Russian and US medical authorities demonstrated that the substitution would be no less beneficial to the crewmember than the planned training session, and would provide a duplicate set of 3.1.1 data using the STS LBNP device. (The Russians had already waived the requirement for any LBNP countermeasures for the 18-CDR and were discussing doing likewise for the 18-FE.) A similar redirection of the 18-FE's EOM-2 training session was planned by the PI team but not implemented.

E. STATUS OF DATA ANALYSIS

Several sets of preflight data have been reduced and analysis is progressing well.

Inflight data inventory is complete, except for the LBNP ABPMs which are currently in the possession of SD Flight Projects.

Post flight data is being organized and data reduction will commence shortly. We anticipate another 2-3 months of data reduction is necessary before any statistical analyses can be performed and conclusions made on all of our data.

F. PRELIMINARY SCIENCE FINDINGS

We are unable to make any statements regarding our preliminary analysis of data at this time.