

## MEDB 6.3 Arm Ergometry Test

MEDB 6.3  
SLSDCR-SMCCB-07-008-R1

### 3.2 Medical Requirements Overview

**TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW**

<b>MEDB# and Title:</b>	MEDB 6.3 Arm Ergometry Test
<b>Sponsor:</b>	Medical Operations
<b>IPT:</b>	Bone, Muscle and Exercise
<b>Category:</b>	Medical Requirements
<b>References:</b>	SSP 50260 ISS Medical Operations Requirements Document (ISS MORD) SSP 50667 Medical Evaluations Document (MED) Volume B
<b>Purpose/Objectives:</b>	To assess upper body strength and endurance in preparation for EVA tasks. Results will be reviewed by the ASCR team in order to modify the exercise prescription if necessary.
<b>Measurement Parameters:</b>	Work Rate, Duration of Exercise, Heart Rate
<b>Deliverables:</b>	Report assessing upper body strength and endurance.
<b>Flight Duration:</b>	≥30 days
<b>Number of Flights:</b>	Expedition 3 and subsequent flights
<b>Number and Type of Crew Members Required:</b>	All prime, and back-up crewmembers for preflight; prime crewmembers for in-flight sessions and postflight debrief. Orlan EVA crewmembers only.
<b>Other Flight Characteristics:</b>	None

**3.3 Preflight Training:****TABLE 3.3: PREFLIGHT TRAINING**

Preflight Training Activity	Description:	Using an arm ergometer, the crew will be familiarized with the in-flight protocols. The U.S. in-flight cycle ergometer will also be demonstrated using the hand pedals. Based on the results of the testing, the ASCR group will recommend an exercise training plan				
	Schedule:	Duration:	Schedule:	Flexibility:	Personnel Required:	
		CMS OPS1: 120 minutes Russian Training Class: TBD minutes	L-365 days L-300 days	+/- 2 months	ASCR, Crew	
Ground Support Requirements Hardware/Software	Preflight Hardware:	Preflight Software:		Test Location:		
	Cycle Ergometer (CEVIS) CEVIS Accessory Kit Arm Ergometer Heart Rate Monitor Medical Equipment Computer (MEC) Velo Ergometer	MEC software load		U.S. Russia		
Training Facilities	Minimum Room Dimensions:	Number of Electrical Outlets:		Temperature Requirements:		Special Lighting:
	8' x 10' room	2-110 outlet		20-25 degrees C		N/A
	Hot or Cold Running Water:	Privacy Requirements:		Other:		
	N/A	N/A				
Constraints/Special Requirements:	CEVIS training within the CMS OPS lecture will include <b>15</b> minutes of Arm Ergometry.					
Launch Delay Requirements:	N/A					
Notes:	It is recommended that the crewmember perform upper body strength and endurance training under the supervision of the ASCR. Training on both U.S. and Russian ergometers is recommended.					

**3.4 Preflight Activities****TABLE 3.4: PREFLIGHT ACTIVITIES**

Preflight Activity	Description:	Crewmembers are instrumented with a Heart Watch. PROTOCOL A: (U.S. EMU) A 1- minute warm up at 40 Watts followed by 3- minutes at 80 Watts performed in a seated position, forward direction, self-selected pace using an electronic arm ergometer. PROTOCOL B: (Orlan suit) A 1-minute warm up at 50 Watts followed by 3-minutes at 150 Watts, performed in a standing position, reverse direction, self-selected pace using an electronic arm ergometer. Heart rate will be monitored during this activity and during a minimum of 3 minutes of recovery. In U.S., ASCR will develop upper extremity exercise program based on the results of this test.			
		Schedule:	Duration:	Schedule:	Flexibility:
	Arm Ergometry: 30 min		L-90/60 days	Some flexibility to allow testing in U.S.	Strength Trainer (ASCR), Exercise Lab Expert Crew Surgeon
Ground Support Requirements Hardware/Software	Preflight Hardware:		Preflight Software:		Test Location:
	Arm Ergometer Heart Rate Monitor	N/A		U.S.	
Testing Facilities	Minimum Room Dimensions:	Number of Electrical Outlets:		Temperature Requirements:	Special Lighting:
	Approximately 15 ft. x 15ft.	3-110 Volt outlets		20 -25°C	N/A
	Hot or Cold Running Water:	Privacy Requirements:		Other:	
	Sink Required Drinking Water Available	NA		NA	
Constraints/Special Requirements:	Recommend no strenuous exercise 24 hours prior to testing, no meals permitted 2 hours prior to testing, no alcohol or other vasoactive substances (e.g., cold medications) 24 hours prior to testing and no caffeine or nicotine 8 hours prior to testing. Test will not be used as a cardiovascular screening tool. Crewmembers using the Orlan Suit for nominal operations will require the 150 Watts protocol. Testing should occur at least 48 hours from a NBL session. <b>Test Termination Criteria:</b> <ul style="list-style-type: none"><li>3 minutes or crew member unable to cycle at prescribed Watts</li><li>Volitional fatigue</li><li>Heart Rate limitation determined by Crew Surgeon’s discretion</li><li>Crew request</li></ul>				
Launch Delay Requirements:	N/A				

**3.4 Preflight Activities cont'd**

<b>Data Delivery</b>	<b>Data/Report to Designated Recipients (Nominal/Contingency):</b>
	Arm Ergometry data will be analyzed by the Exercise Lab experts and shared with the Astronaut Strength, Conditioning and Rehabilitation team (ASCR). Preliminary MAT reports for all sessions will be delivered to Crew Surgeon via Mission Integration Coordinator (MIC) within 48 hours of test completion. The MAT data is due to the Data Archivist within 14 days after completion of each session.

**3.5. In-Flight Activities****TABLE 3.5.1: IN-FLIGHT ACTIVITIES**

<b>In-Flight Activity</b>	<b>Description:</b>	Crewmembers are instrumented with a Heart Watch. PROTOCOL A: (U.S. EMU) A 1- minute warm up at 40 Watts followed by 3-minutes at 80 Watts performed in a seated position, forward direction, self-selected pace using the CEVIS. PROTOCOL B: (Orlan suit) A 1-minute warm up at 50 Watts followed by 3-minutes at 150 Watts, reverse direction, self-selected pace using the Russian ergometer. Heart rate will be monitored during this activity and during a minimum of 3 minutes of recovery. For the Russian ergometer protocol, the crewmember will be connected to the GAMMA system for EKG downlink.				
	<b>Schedule:</b>	<b>Activity:</b>	<b>Duration:</b>	<b>Schedule:</b>	<b>Flexibility:</b>	<b>Personnel Required:</b>
		Arm Ergometry	45 min	Pre-EVA	NA	Orlan EVA Crewmember
<b>Procedures:</b>	Located in the CEVIS OPS procedures in Med Ops book.					
<b>Constraints / Special Requirements:</b>	<ul style="list-style-type: none"> <li>Recommend no strenuous exercise, no alcohol or other vasoactive substances (e.g., cold medications) 24 hours prior to testing, no caffeine 8 hours prior to testing and no meals permitted 2 hours prior to testing. Test will not be used as a cardiovascular screening tool. Crewmembers using the Orlan Suit will require the 150 Watts protocol.</li> <li>This MEDB applies to EVA sessions performed after FD 21.</li> <li>EVA's repeated within 14 days of previous EVA do not require this test.</li> <li>If the 150 Watts protocol is used, the subject will use the veloergometer and the GAMMA system will be used for EKG downlink.</li> <li>The 80 Watts protocol is performed using the CEVIS hardware and HRM hardware. EKG is not required.</li> <li><b>Test Termination Criteria:</b> <ul style="list-style-type: none"> <li>Heart Rate limitation determined by Crew Surgeon's discretion</li> <li>Volitional Fatigue</li> <li>Crew Request</li> <li>3 minutes or crew member unable to cycle at prescribed Watts</li> </ul> </li> </ul>					
<b>Photo / TV Requirements:</b>	NA					
<b>Cold Stowage Requirements:</b>	NA					

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<b>Mission Extension Requirements:</b>	NA
<b>Landing Wave-Off Requirements:</b>	NA
<b>Data Delivery</b>	<b>Data/Report to Designated Recipients (Nominal/Contingency):</b> Arm ergometry data will be received by ground support personnel (includes the Crew Surgeon), who will forward the data to the Exercise Lab Representative and ASCR Representative. The ASCR Rep will deliver test results and final recommendations to the Crew Surgeon and Data Archivist within 3 days of receiving the arm ergometry data.

**TABLE 3.5.2: IN-FLIGHT HARDWARE**

Hardware/Software Name	P/N
ISS Ergometer	SEG46115811-xxx
CEVIS Accessory Bag	SEG46116009-xxx
Isolator Kit Assembly	SEG46116012-xxx
On-Orbit Mounting Frame	SEG46116010-xxx
IVIS Box, Blue	SED46110777-xxx
IVIS Box, Red	SED46110777-xxx
Heart Rate Monitor Kit	SED46115818-xxx
Medical Equipment Computer	SEG46116031-xxx
Russian Velo Ergometer	XM.2.893.048
Russian Gamma Complex	N/A

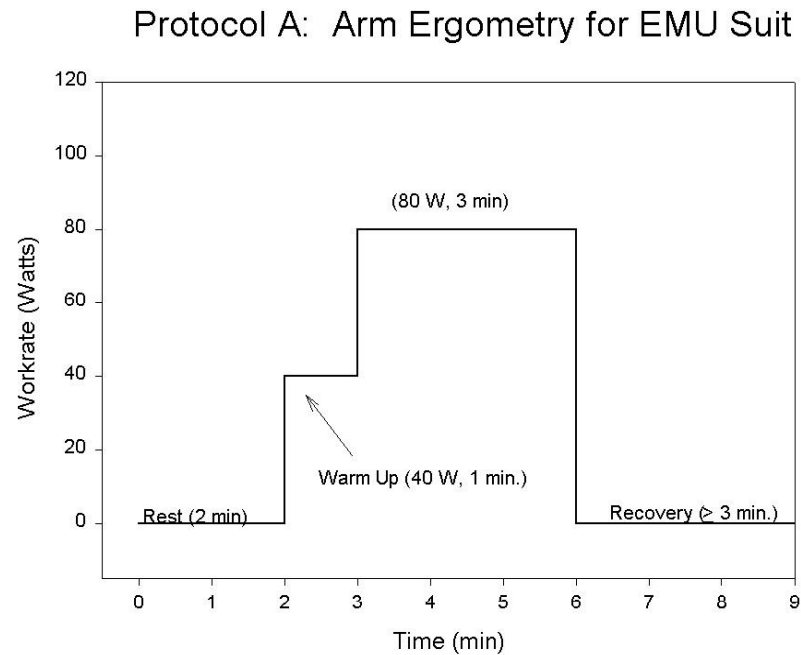
**3.6 Postflight Activities: Debrief questions only****3.7 Summary Schedule****TABLE 3.7: SUMMARY SCHEDULE**

ACTIVITY	DURATION	SCHEDULE	FLEXIBILITY	PERSONNEL REQUIRED	CONSTRAINTS
<b>Preflight Training</b>					
CMS OPS1	120 minutes	L-365 days	+/- 2 months	Trainers, Crew, ASCR	U.S. based CEVIS training will take 15 minutes.
<b>Preflight</b>					
Arm Ergometry	30 minutes	L-90/60 days	+/- 7 days	ASCR, Crew, Exercise Lab Experts	In U.S. ASCR will develop upper extremity exercise program based on the results of the test.

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In-Flight					
Arm Ergometry	45 min	Pre-EVA	N/A	Orlan EVA Crewmember	<p>If previous EVA is within past 2 weeks, not required to repeat this test.</p> <p>If performing the EVA in the Russian Orlan suit, Protocol B (150 Watts) must be used for these sessions.</p> <p>Using the Russian veloergometer</p>
Postflight Debrief					
Questions will be included in the Medical Operations Debrief.					

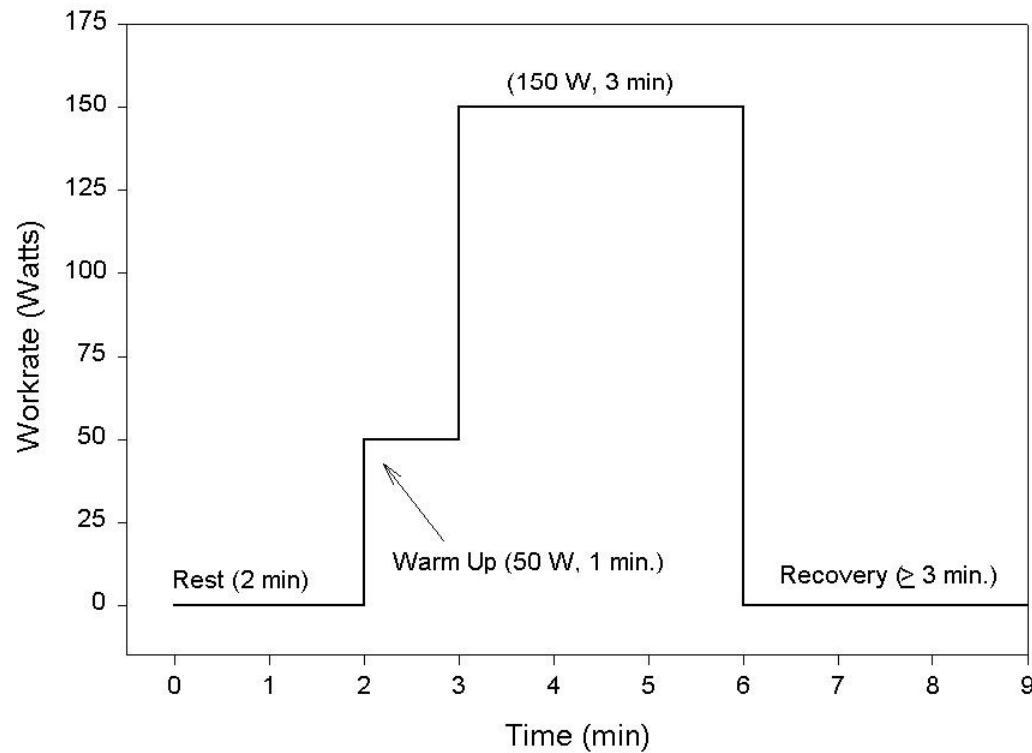


**Notes:**

- Preflight Testing Conducted in Seated Position
- CEVIS Used On Orbit



### Protocol B: Arm Ergometry for Orlon Suit



**Notes:**

- Preflight Testing Conducted in Standing Position
- Veloergometer Used On Orbit