

**3.2 Medical Requirements Overview**

**TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW**

<b>MEDB# and Title:</b>	MEDB 5.3 Isokinetic Testing
<b>Sponsor:</b>	Medical Operations
<b>Discipline:</b>	Bone, Muscle & Exercise
<b>Category:</b>	Medical Requirements (MR)
<b>References:</b>	International Space Station Medical Operations Requirements Document (ISS MORD), SSP 50260 Medical Evaluation Documents (MED) Volume B 5.3
<b>Purpose/Objectives:</b>	To provide an objective measure of pre- and postflight muscle strength and endurance in select muscle groups for the evaluation of inflight countermeasures and postflight rehabilitation.
<b>Measurement Parameters:</b>	Isokinetic peak torque (strength) and total work (endurance)
<b>Deliverables:</b>	Assessment of muscle strength and endurance
<b>Flight Duration:</b>	≥30 days
<b>Number of Flights:</b>	Every Expedition
<b>Number and Type of Crew Members Required:</b>	All primary and back-up U.S. crewmembers. Back-up crewmembers will complete all pre-flight testing in case of crew change-out. Second pre-flight testing session schedule will be L-60 to L-30 (during the crewmembers last rotation to U.S. prior to flight). Participation of IP crewmembers in these specific test protocols performed by the US personnel will be negotiated between the US and the respective IP’s Medical Operations representatives.
<b>Other Flight Characteristics:</b>	N/A

**3.3 Preflight Training – No Preflight Training**

3.4 Preflight Activities

TABLE 3.4: PREFLIGHT ACTIVITIES

<b>Preflight Activity</b>	<b>Description:</b>	Muscle performance testing will be administered using a standard clinical isokinetic dynamometer on selected muscle groups. A standard protocol for warm-up prior to testing will be followed for each muscle group. Testing will be performed on the right limb, unless previous injury indicates that the left limb should be utilized for these assessments.		
	<b>Schedule:</b>	<ul style="list-style-type: none"> <li>▪ <b>Concentric knee extension and flexion - Seated</b> 60°/sec 5 reps 180°/sec 21 reps - endurance</li> <li>▪ <b>Concentric ankle plantarflexion and dorsiflexion - Prone</b> 30°/sec 5 reps</li> <li>▪ <b>Eccentric ankle plantarflexion and dorsiflexion - Prone</b> 30° /sec, 5 reps</li> <li>▪ <b>Concentric trunk extension and flexion - Standing</b> 60°/sec 5 reps</li> </ul>		
		<b>Duration:</b>	<b>Schedule:</b>	<b>Flexibility:</b>
	75 minutes 60 minutes	L-180 Familiarization & data collection L-60 to L-30 (during crewmembers last rotation to U.S. prior to flight) MAT	±14 Days ±5 Days	Lab personnel/ Crewmember
<b>Ground Support Requirements Hardware/Software</b>	<b>Preflight Hardware:</b>		<b>Preflight Software:</b>	
	Isokinetic Dynamometer		NA	
<b>Testing Facilities</b>	<b>Minimum room dimensions:</b>		<b>Number of electrical outlets:</b>	
	Approximately 15 x 15 feet		One 220V and two 110V (US) Three 220V with two conversion to 110V (Russia)	
	<b>Hot or cold running water:</b>		<b>Privacy requirements:</b>	
	NA		Access to room must be controlled during testing.	
		<b>Temperature requirements:</b>		<b>Special lighting:</b>
		20 -25 °C		N/A
		<b>Other:</b>		
		Crash cart will be available in the building while testing is being conducted and 2 BLS operators will be present at all times. An ACLS physician will be available within 15 minutes of notification while testing is being conducted.		
<b>Constraints/Special Requirements:</b>	<ul style="list-style-type: none"> <li>▪ Wear workout clothing (shorts, t-shirt, sneakers).</li> <li>▪ No max exercise 24 hrs prior to testing; no regular exercise 8 hrs prior to testing. Interaction with other tests (MAT or science), HRP experiments, or independent investigations, will be considered on a case by case basis with the crew surgeon.</li> <li>▪ No large meals 2 hrs prior to test. A light meal is permitted up to 60 minutes before test.</li> <li>▪ Limit caffeine intake to 1 cup (8 oz) of regular coffee or equivalent 60 minutes before test.</li> </ul>			

	<ul style="list-style-type: none"> <li>▪ No, alcohol, or nicotine 8 hrs prior to test</li> <li>▪ Contraindications: previous musculoskeletal injury (use left limb)</li> <li>▪ No neutral buoyancy training 48 hours (prefer 72 hours) prior to test (Preflight only); prefer no neutral buoyancy training 24 hours after test</li> <li>▪ Speed and torque calibration must be performed on test day</li> <li>▪ No physical testing or physical training will be conducted with the crewmembers within 72 hours of overseas travel.</li> <li>▪ No physical testing or physical training will be conducted with the crewmembers within 48 hours of domestic travel unless approved by the Crew Surgeon.</li> </ul> <p><b>Test Termination Criteria:</b></p> <ul style="list-style-type: none"> <li>▪ Volitional Fatigue</li> <li>▪ Pain</li> <li>▪ Lightheadedness, dizziness, or other symptoms of orthostatic hypotension.</li> <li>▪ Muscle strain, joint sprain</li> </ul>
<b>Launch Delay Requirements:</b>	<ul style="list-style-type: none"> <li>▪ L-30 or L-60 data collection will be repeated if launch is delayed by more than 3 months.</li> <li>▪ When a crewmember serves as a back-up for a flight and later becomes prime for another, the L-180 test will be repeated if the last test as a back-up is not within one year of the selected launch date as a prime crewmember.</li> </ul>
<b>Notes:</b>	None
<b>Data Delivery</b>	<p><b>Data/Report to Designated Recipients (Nominal/Contingency):</b></p> <p>Preliminary MAT reports will be posted to the SharePoint secure sever within 48 hours of test completion. A final report will be posted to the S Point secure server within 14 days following the final preflight test session. If the preliminary reports require no changes they will serve as the reports.</p>

**3.5 In-Flight Activities – No In-Flight Activities**

3.6 Postflight Activities

TABLE 3.6: POSTFLIGHT ACTIVITIES

<b>Postflight Activity</b>	<b>Description:</b>	Muscle performance testing will be administered using a standard clinical isokinetic dynamometer on selected muscle groups. A standard protocol for warm-up prior to testing will be followed for each muscle group. Testing will be performed on the right limb, unless the left limb was utilized during pre-flight assessments.			
	<b>Schedule:</b>	<ul style="list-style-type: none"> <li>▪ <b>Concentric knee extension and flexion - Seated</b> 60°/sec 5 reps 180°/sec 21 reps - endurance</li> <li>▪ <b>Concentric ankle plantarflexion and dorsiflexion - Prone</b> 30°/sec 5 reps</li> <li>▪ <b>Eccentric ankle plantarflexion and dorsiflexion - Prone</b> 30° /sec, 5 reps</li> <li>▪ <b>Concentric trunk extension and flexion - Standing</b> 60°/sec 5 reps</li> </ul>			
		<b>Duration:</b>	<b>Schedule:</b>	<b>Flexibility:</b>	<b>Personnel Required:</b>
		60 minutes 60 minutes 60 minutes	R+5 MAT (Knee & Ankle) R+14* MAT (Knee, Ankle & Trunk) R+30** MAT (Knee, Ankle & Trunk)	± 1 Days ±1 Days ±2 Days	Lab personnel/ Crewmember
<b>Ground Support Requirements Hardware/Software</b>	<b>Postflight Hardware:</b>	<b>Postflight Software:</b>	<b>Test Location:</b>		
	Isokinetic Dynamometer	NA	U.S and Russia		
<b>Testing Facilities</b>	<b>Minimum room dimensions:</b>	<b>Number of electrical outlets:</b>	<b>Temperature requirements:</b>	<b>Special lighting:</b>	
	Approximately 15 x 15 feet	One 220V and two 110V (US) Three 220V with two conversion to 110V (Russia)	20 -25 °C	N/A	

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	<b>Hot or cold running water:</b>	<b>Privacy requirements:</b>	<b>Other:</b>
	NA	Access to room must be controlled during testing.	Crash cart will be available in the building while testing is being conducted and 2 BLS operators will be present at all times. An ACLS physician will be available within 15 minutes of notification while testing is being conducted.

<p><b>Constraints/Special Requirements:</b></p>	<p>* US-agency specific requirement per MED Volume B Appendix A Matrix 3-NASA                  **If crewmember has not returned to preflight baseline at R+30, testing may be repeated every 15 days at the discretion of the crew surgeon.</p> <ul style="list-style-type: none"> <li>▪ Wear workout clothing (shorts, t-shirt, sneakers).</li> <li>▪ No max exercise 24 hrs prior to testing; no regular exercise 8 hrs prior to testing. Interaction with other tests (MAT or science), HRF experiments, or independent investigations, will be considered on a case by case basis with the crew surgeon.</li> <li>▪ No large meals 2 hrs prior to test. A light meal is permitted up to 60 minutes before test.</li> <li>▪ Limit caffeine intake to 1 cup (8 oz) of regular coffee or equivalent 60 minutes before test.</li> <li>▪ No alcohol, or nicotine 8 hrs prior to test</li> <li>• Contraindications: previous musculoskeletal injury or pain (use left limb)</li> <li>▪ MEDB 5.3 (MR079L) to occur 2-4 hours prior to MEDB 5.1 (MR078L): Functional Fitness</li> <li>▪ Speed and torque calibration must be performed on test day</li> <li>▪ No physical testing or physical training will be conducted with the crewmembers within 72 hours of overseas travel.</li> <li>▪ No physical testing or physical training will be conducted with the crewmembers within 48 hours of domestic travel unless approved by the Crew Surgeon.</li> </ul> <p><b>Test Termination Criteria:</b></p> <ul style="list-style-type: none"> <li>▪ Volitional Fatigue</li> <li>▪ Pain</li> <li>▪ Lightheadedness, dizziness, or other symptoms of orthostatic hypotension.</li> <li>▪ Muscle strain, joint sprain</li> </ul>
<p><b>Early Destow / Early Return:</b></p>	<p>N/A</p>
<p><b>Notes:</b></p>	<p>N/A</p>
<p><b>Data Delivery</b></p>	<p style="text-align: center;"><b>Data/Report to Designated Recipients (Nominal/Contingency):</b></p> <p>Preliminary MAT reports will be posted to the SharePoint secure sever within 48 hours of test completion. A final report will be posted to the Share Point secure server within 14 days following the final postflight test session. If the preliminary reports require no changes they will serve as the final reports.</p>

**3.7 Summary Schedule**

**TABLE 3.7: SUMMARY SCHEDULE**

ACTIVITY	DURATION	SCHEDULE	FLEXIBILITY	PERSONNEL REQUIRED	CONSTRAINTS
<b>Preflight</b>					
Isokinetic Testing	75 minutes	L-180 Familiarization & data collection (Knee, Ankle & Trunk)	± 14 Days	Lab personnel/ Crewmember	See Note
	60 minutes	L-60 MAT (Knee, Ankle & Trunk; Soyuz launch) or L-30 (US Launch)	± 5 days		
<b>Postflight</b>					
Isokinetic Testing	60 minutes	R+5 MAT (Knee & Ankle)	± 1 Days	Lab personnel/ Crewmember	See Note
	60 minutes	R+14* MAT (Knee, Ankle & Trunk)	± 1 Days		
	60 minutes	R+30** MAT (Knee, Ankle and Back)	± 2 Days		

\* US-agency specific requirement per MED Volume B Appendix A Matrix 3-NASA.

\*\*If crewmember has not returned to preflight baseline at R+30, testing may be repeated every 15 days at the discretion of the crew surgeon.

**Note:**

- Wear workout clothing (shorts, t-shirt, sneakers).
- No max exercise 24 hrs prior to testing; no regular exercise 8 hrs prior to testing. Interaction with other tests (MAT or science), HRF experiments, or independent investigations, will be considered on a case by case basis with the crew surgeon.
- No large meals 2 hrs prior to test. A light meal is permitted 60 minutes before test.
- Limit caffeine intake to 1 cup (8 oz) of regular coffee or equivalent 60 minutes before test.
- No alcohol, or nicotine 8 hrs prior to test
- Contraindications: previous musculoskeletal injury (use left limb)
  - No neutral buoyancy training 48 hours (prefer 72 hours) prior to test (Preflight only); prefer no neutral buoyancy training 24 hours after test;
- Speed and torque calibration must be performed on test day
- No physical testing or physical training will be conducted with the crewmembers within 72 hours of overseas travel.
- No physical testing or physical training will be conducted with the crewmembers within 48 hours of domestic travel unless approved by the Crew Surgeon.

**Test Termination Criteria:**

- Volitional Fatigue
- Pain

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- Lightheadedness, dizziness, or other symptoms of orthostatic hypotension.
- Muscle strain, joint sprain