

MEDB 1.5 Neurovestibular Platform Test

3.2 Medical Requirements Overview

TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW

MEDB# and Title:	MEDB 1.5 Neurovestibular Platform Test
Sponsor:	Medical Operations
Discipline:	Neurological Function
Category:	Medical Requirements (MR)
References:	Medical Evaluation Documents (MED) Volume B Section 1.5
Purpose/Objectives:	To perform functional neurological assessments that provide an objective test of sensory-motor re-adaptation to Earth's normal gravity following prolonged weightlessness.
Measurement Parameters:	Balance control performance, sensory-motor integration performance
Deliverables:	Results of these tests will be used by flight surgeons to determine when crewmembers can safely return to normal daily activities (stairs, driving a car, showering, etc.). Results will also be used to develop long duration mission recovery signatures to establish return-to-duty criteria.
Flight Duration:	≥ 30 days
Number of Flights:	N/A
Number and Type of Crewmembers Required:	All primary ISS crewmembers. Back-up crew will only complete preflight Medical Assessment Tests MATs greater than L-30 days unless specifically waived by crew surgeon. If crew swap does occur, back-up crew will complete all preflight MATs.
Other Flight Characteristics:	Pre- and post-flight data collection only.

MEDB 1.5 Neurovestibular Platform Test

3.3 Pre-Flight Training – No Training Activities

3.4 Pre-Flight Activities

TABLE 3.4.1: PREFLIGHT ACTIVITIES

Preflight Activity Description:	<p>A Familiarization session will be conducted at L-270/180 to negate the "learning effect". Upon arrival at the test room, the crewmember will be asked to report on recent pharmaceutical and alcohol consumption, physical activities, eating and sleeping schedules, and cognitive performance. Meanwhile, baseline foot and hip measurements will be made. The crewmember will be instrumented with motion markers on the lower leg and lower back, and they will wear a safety harness and a pair of headphones. The crewmember will then complete a standard clinical battery of sensory organization tests (SOTs) provided by the EquiTest dynamic posturography system, detailed below. Up to three randomized trials of each of six sensory organization tests will be performed (upright posture with normal, absent, and/or mechanically altered visual and proprioceptive sensory inputs). Each test lasts for 20 seconds, during which time the crewmember must maintain quiet and erect stance. Measured performance will be based on the peak body sway during each condition. The crewmember will then perform up to 5 trials each of the dynamic head movement tests (HM), each lasting 20 seconds. Finally, the crewmember will perform up to 6 platform translation tests (MCT), each lasting 20 seconds. When testing is complete, the crewmember will be de-instrumented.</p> <p>The clinical SOT test conditions are (up to 3 trials each):</p> <ol style="list-style-type: none"> 1. Standard eyes open Romberg test-visual surround and support surface fixed 2. Standard eyes closed Romberg test-support surface fixed 3. Sway-referenced visual surround with fixed support surface 4. Sway-referenced support surface with fixed visual surround 5. Sway-referenced support surface with eyes closed <p>The HM test conditions are (up to 5 trials each):</p> <ol style="list-style-type: none"> 1. SOT 2 (above) with dynamic head pitch (backward and forward, eyes closed) 2. SOT 5 (above) with dynamic head pitch (backward and forward, eyes closed) <p>The MCT test conditions are (up to 3 trials each):</p> <ol style="list-style-type: none"> 1. Eyes open, large amplitude backward translation 2. Eyes open, large amplitude forward translation 			
Schedule:	Duration: 45 minutes	Schedule: L-270/180 days	Flexibility: May be performed anytime between L-270 and L-180	Personnel Required: Required: Crewmember, 2 test operators Optional: One discipline expert, one Astronaut Strength, Conditioning and Rehabilitation (ASCR) specialist, and crew surgeon
Ground Support Requirements Hardware/Software	Preflight Hardware: EquiTest Posture Platform, Xsens 3D Motion Tracking System Equipment Racks, Subject Safety Restraint System, Test Supplies, Universal Power Supply, Power Converter (Russia only)		Preflight Software: N/A	Test Location: U.S./Russia

MEDB 1.5 Neurovestibular Platform Test

Training Facilities	Minimum Room Dimensions:	Number of Electrical Outlets:	Temperature Requirements:	Special Lighting:
	12' x 15' x 9'H (3.66 x 4.57 x 2.74 meters)	# of Electric Outlets with Amp Rating (U.S. and Star City): 2 - 120V, 20A, 60Hz. Note: Each of these circuits should be accessible through a standard three-wire, grounded, duplex receptacle located within 5 feet of the platform.	20 - 22 ⁰ C	Standard Illumination
	Hot or Cold Running Water:	Privacy Requirements:	Other:	
	No	Private room	2 chairs and 1 small table	
Constraints/Special Requirements:	Limit participation in provocative training exercise (i.e., flight motion simulators, centrifuge simulations, training aircraft) for 24 hours prior to testing; limit alcohol consumption for 24 hours prior to testing. The optometry exam (MEDB 1.10 Ophthalmology Examination) should not be scheduled prior to MEDB 1.5. No maximal exercise 4 hours prior to test. No drugs that depress the central nervous system (i.e. no drugs that cause sleepiness, drowsiness, dizziness, etc.). No muscle biopsies shall be scheduled within 8 hours prior to MEDB 1.5.			
Launch Delay Requirements:	N/A			
Notes:	Facilities for performance of the Neurovestibular Platform Test have been established and are currently maintained at JSC and at GCTC in Star City. Test Termination Criteria: 1. Subject request to stop at any time. 2. Subject experiences presyncopal symptoms. 3. Vomiting or significant motion sickness symptoms (motion sickness bag will be provided). 4. Subject reports of pain or discomfort (other than due to pressure points which can be resolved by adjustments in position). 5. Significant foot tenderness or muscle soreness. 6. Injury due to a fall.			
Data Delivery:	Data/Report to Designated Recipients (Nominal/Contingency): Test results will be delivered real-time to the crewmember's flight surgeon via oral report by the discipline lead or designated lab personnel. Final data reports will be submitted to the Mission Medical Repository for delivery to the Flight Surgeon within 24 hours of the session. Data Archives: The Mission Medical Repository is the archive of final reports delivered to the Flight Surgeon.			

MEDB 1.5 Neurovestibular Platform Test

TABLE 3.4.2: PREFLIGHT ACTIVITIES

Preflight Activity	Description:	Upon arrival at the test room, the crewmember will be asked to report on recent pharmaceutical and alcohol consumption, physical activities, eating and sleeping schedules, and cognitive performance. The crewmember will be instrumented with motion markers on the lower leg and lower back, and they will wear a safety harness and a pair of headphones. The crewmember will then complete the same set of tests as the familiarization session in Table 3.4.1:			
		The clinical SOT test conditions are (up to 3 trials each): <div><div>1. Standard eyes open Romberg test-visual surround and support surface fixed</div><div>2. Standard eyes closed Romberg test-support surface fixed</div><div>3. Sway-referenced visual surround with fixed support surface</div><div>4. Sway-referenced support surface with fixed visual surround</div><div>5. Sway-referenced support surface with eyes closed</div></div> The HM test conditions are (up to 5 trials each): <div><div>1. SOT 2 with dynamic head pitch (backward and forward, eyes closed)</div><div>2. SOT 5 with dynamic head pitch (backward and forward, eyes closed)</div></div> The MCT test conditions are (up to 3 trials each): <div><div>1. Eyes open, large amplitude backward translation</div><div>2. Eyes open, large amplitude forward translation</div></div>			
	Schedule:	Duration: 30 minutes	Schedule: L-90/30 days, and as clinically indicated until stable	Flexibility: Familiarization and MAT session must be scheduled at least 2 days apart.	Blood Volume: N/A

MEDB 1.5 Neurovestibular Platform Test

Ground Support Requirements Hardware/Software	Preflight Hardware:		Preflight Software:	Test Location:		
	EquiTest Posture Platform, Xsens 3D Motion Tracking System, Equipment Racks, Subject Safety Restraint System, Test Supplies, Universal Power Supply, Power Converter (Russia only)		N/A	U.S./Russia		
Testing Facilities	Minimum Room Dimensions:		Number of Electrical Outlets:		Temperature Requirements:	Special Lighting:
	12' x 15' x 9'H (3.66 x 4.57 x 2.74 meters)		# of Electric Outlets with Amp Rating (U.S. and Star City): 2 - 120V, 20A, 60Hz. Note: Each of these circuits should be accessible through a standard three-wire, grounded, duplex receptacle located within 5 feet of the platform.		20 - 22 ⁰ C	Standard Illumination
	Hot or Cold Running Water:		Privacy Requirements:		Other:	
	No		Private room		2 chairs and 1 small table	
	Constraints/Special Requirements:					
Limit participation in provocative training exercise (i.e., flight motion simulators, centrifuge simulations, training aircraft) for 24 hours prior to testing; limit alcohol consumption for 24 hours prior to testing. The optometry exam (MEDB 1.10 Ophthalmology Examination) should not be scheduled prior to MEDB 1.5. No maximal exercise 4 hours prior to test. No drugs that depress the central nervous system (i.e., no drugs that cause sleepiness, drowsiness, dizziness, etc.). No muscle biopsies shall be scheduled within 8 hours prior to MEDB 1.5.						
Launch Delay Requirements:		Repeat L-90/30 data collection if launch slips by ≥ 180 days.				
Notes:		Test Termination Criteria: 1. Subject request to stop at any time. 2. Subject experiences presyncopal symptoms. 3. Vomiting or significant motion sickness symptoms (motion sickness bag will be provided). 4. Subject reports of pain or discomfort (other than due to pressure points which can be resolved by adjustments in position). 5. Significant foot tenderness or muscle soreness. 6. Injury due to a fall.				
Data Delivery:		Data/Report to Designated Recipients (Nominal/Contingency): Test results will be delivered real-time to the crewmember's flight surgeon via oral report by the discipline lead or designated lab personnel. Final data reports will be submitted to the Mission Medical Repository for delivery to the Flight Surgeon within 24 hours of the session. Data Archives: The Mission Medical Repository is the archive of final reports delivered to the Flight Surgeon.				

MEDB 1.5 Neurovestibular Platform Test

3.5 In-Flight Activities – No In-Flight Activities

3.6 Post-Flight Activities

TABLE 3.6.1: POST-FLIGHT ACTIVITIES

Postflight Activity	Description:	Upon arrival at the test room the crewmember will be asked to report on recent pharmaceutical and alcohol consumption, physical activities, eating and sleeping schedules, and cognitive performance. The crewmember will be instrumented with motion markers on the lower leg and lower back, and they will wear a safety harness and a pair of headphones. The crewmember will then complete the same set of tests as the pre-flight session in Table 3.4.2. If the crewmember is unable to complete or falls during a sub-set of tests (e.g. clinical SOT, HM, or MCT tests sets), the crewmember will move on to the next sub-set. If the crewmember falls twice, then the test session will be terminated (usual test termination criteria also applies)			
	Schedule:	The clinical SOT test conditions are (Up to 3 trials each): <ol style="list-style-type: none"> 1. SOT 1 2. SOT 2 3. SOT 3 4. SOT 4 5. SOT 5 The HM test conditions are (up to 5 trials each): <ol style="list-style-type: none"> 1. SOT 2 with dynamic head pitch (backward and forward, eyes closed) 2. SOT 5 with dynamic head pitch (backward and forward, eyes closed) The MCT test conditions are (up to 3 trials each): <ol style="list-style-type: none"> 1. Eyes open, large amplitude backward translation 2. Eyes open, large amplitude forward translation 			
	Duration:	Schedule:	Flexibility:	Blood Volume:	Personnel Required:
	30 minutes	R+8 days, and as clinically indicated until stable	±2 days acceptable	N/A	Required: Crewmember, 2 test operators Optional: One discipline expert, one ASCR specialist, and crew surgeon
Ground Support Requirements Hardware/Software	Postflight Hardware:			Postflight Software:	Test Location:
	EquiTest Posture Platform, Xsens 3D Motion Tracking System, Equipment Racks, Subject Safety Restraint System, Test Supplies, Universal Power Supply, Power Converter (Russia only)			N/A	U.S./Russia
Testing Facilities	Minimum Room Dimensions:		Number of Electrical Outlets:		Temperature Requirements:
	12' x 15' x 9'H (3.66 x 4.57 x 2.74 meters)		# of Electric Outlets with Amp Rating (U.S. and Star City): 2 - 120V, 20A, 60H. Note: Each of these circuits should be accessible through a standard three-wire, grounded, duplex receptacle located within 5 feet of the platform.		20 - 22 ⁰ C
	Hot or Cold Running Water:		Privacy Requirements:		Other:
	No		Private Room		2 chairs and 1 small table

MEDB 1.5 Neurovestibular Platform Test

Constraints/Special Requirements:	Limit participation in provocative training exercise (i.e., flight motion simulators, centrifuge simulations, training aircraft) for 24 hours prior to testing; limit alcohol consumption for 24 hours prior to testing. The optometry exam (MEDB 1.10 Ophthalmology Examination) should not be scheduled prior to MEDB 1.5. No maximal exercise 4 hours prior to test. No drugs that depress the central nervous system (i.e. no drugs that cause sleepiness, drowsiness, dizziness, etc.). No muscle biopsies shall be scheduled within 8 hours prior to MEDB 1.5.
Notes:	<p>Test Termination Criteria:</p> <ol style="list-style-type: none"> 1. Subject request to stop at any time. 2. Subject experiences presyncopal symptoms. 3. Vomiting or significant motion sickness symptoms (motion sickness bag will be provided). 4. Subject reports of pain or discomfort (other than due to pressure points which can be resolved by adjustments in position). 5. Significant foot tenderness or muscle soreness. 6. Injury due to a fall.
Data Delivery	<p>Data/Report to Designated Recipients (Nominal/Contingency) Test results will be delivered real-time to the crewmember's flight surgeon via oral report by the discipline lead or designated lab personnel. Final data reports will be submitted to the Mission Medical Repository for delivery to the Flight Surgeon within 24 hours of the session. Crew debrief slides will be submitted to the Biomedical Data Reduction and Analysis Bioastronautics Product Team within one week of the last post-flight session.</p> <p>Data Archives: The Mission Medical Repository is the archive of final reports delivered to the Flight Surgeon.</p>

MEDB 1.5 Neurovestibular Platform Test

3.7 Summary Schedule

TABLE 3.7: SUMMARY SCHEDULE

ACTIVITY	DURATION	SCHEDULE	FLEXIBILITY	BLOOD VOLUME	PERSONNEL REQUIRED	CONSTRAINTS
Pre-Flight Training – N/A						
Pre-Flight						
Dynamic Posturography-Familiarization Session	45 minutes	L-270/180 days	May occur anytime between L-270 and L-180	N/A	Required: Crewmember, 2 test operators Optional: One discipline expert, one ASCR specialist, and crew surgeon	This Familiarization (Fam) session will be coordinated by Mission Integration. Fam session and L-60/30 test must be at least 2 days apart. Limit participation in provocative training exercise (i.e., flight motion simulators, centrifuge simulations, training aircraft) for 24 hours prior to testing; limit alcohol consumption for 24 hours prior to testing. The optometry exam (MEDB 1.10 Ophthalmology Examination) should not be scheduled prior to MEDB 1.5. No maximal exercise 4 hours prior to test. No drugs that depress the central nervous system (i.e. no drugs that cause sleepiness, drowsiness, dizziness, etc.). No muscle biopsies shall be scheduled within 8 hours prior to MEDB 1.5.
Dynamic Posturography	30 minutes	L-90/30 days, and as clinically indicated	May occur anytime between L-90 and L-30	N/A	Required: Crewmember, 2 test operators Optional: One discipline expert, one ASCR specialist, and crew surgeon	Limit participation in provocative training exercise (i.e., flight motion simulators, centrifuge simulations, training aircraft) for 24 hours prior to testing; limit alcohol consumption for 24 hours prior to testing. The optometry exam (MEDB 1.10 Ophthalmology Examination) should not be scheduled prior to MEDB 1.5. No maximal exercise 4 hours prior to test. No drugs that depress the central nervous system (i.e. no drugs that cause sleepiness, drowsiness, dizziness, etc.). No muscle biopsies shall be scheduled within 8 hours prior to MEDB 1.5. Fam session and L-30 test must be at least 2 days apart.
In-Flight – N/A						

MEDB 1.5 Neurovestibular Platform Test

Post-Flight						
Dynamic Posturography	30 minutes	R+8 days, and as clinically indicated until stable	± 2 day acceptable	N/A	Required: Crewmember, 2 test operators Optional: One discipline expert, one ASCR specialist, and crew surgeon	Limit participation in provocative training exercise (i.e., flight motion simulators, centrifuge simulations, training aircraft) for 24 hours prior to testing; limit alcohol consumption for 24 hours prior to testing. The optometry exam (MEDB 1.10 Ophthalmology Examination) should not be scheduled prior to MEDB 1.5. No maximal exercise 4 hours prior to test. No drugs that depress the central nervous system (i.e. no drugs that cause sleepiness, drowsiness, dizziness, etc.). No muscle biopsies shall be scheduled within 8 hours prior to MEDB 1.5.
Post-Flight Debrief						
Dynamic Posturography	No extra time	~R+90 days	As scheduled/ requested by crew surgeon	N/A	Discipline lead or designated lab personnel	Included as part of the Med Ops overall debrief.