

3.2 Medical Requirements Overview

TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW

MRID# and Title:	MR039L Toxicological Assessment Using the Carbon Dioxide Monitoring Kit (CDMK)
Sponsor:	Medical Operations
Discipline:	Environmental Health
Category:	Medical Requirements
References:	ISS Medical Operations Requirements Document SSP 50260
Purpose/Objectives:	To detect and quantify carbon dioxide in the air on-board the ISS by measuring carbon dioxide in areas where elevated levels of CO ₂ may exist, and in areas that do not contain fixed CO ₂ sensors where it is prudent to measure CO ₂ .
Measurement Parameters:	In-flight carbon dioxide levels.
Deliverables:	<ul style="list-style-type: none"> • Real-time crew call downs of CO₂ levels • In an off-nominal event when extensive monitoring sessions are required, a postflight report evaluating data will be provided.
Flight Duration:	≥ 30 days
Number of Flights:	All flights
Number and Type of Crew Members Required:	Two crewmembers are trained in Environmental Health System (EHS) activities. One crewmember will perform the in-flight activity.
Other Flight Characteristics:	N/A

3.3 Preflight Training

TABLE 3.3: PREFLIGHT TRAINING

Preflight Training Activity	Description:	Two crewmembers are trained in Environmental Health System (EHS) activities. One crewmember will perform the in-flight activity. EHS Toxicology Operations		
	Schedule:	Duration:	Schedule:	Personnel Required:
		EHS Toxicology Operations: Experienced CM 30 min Inexperienced CM 60 min	L-12 months	Crewmembers/Instructors
Ground Support Requirements Hardware/Software	Preflight Hardware:	Preflight Software:	Test Location:	
	Carbon Dioxide Monitoring Kit Medical Equipment Computer	CDM Software	U.S.	
Training Facilities	Minimum Room Dimensions:	Number of Electrical Outlets:	Temperature Requirements:	Special Lighting:
	8' x 10'	One	Ambient	None
	Hot or Cold Running Water:	Privacy Requirements:	Other:	
	N/A	N/A	Table & 6 chairs	
Constraints/Special Requirements:	None			
Launch Delay Requirements:	Refresher training will be available upon crewmember request.			
Notes:	<ul style="list-style-type: none"> Experienced CM – had training within the last 1½ yrs. EHS Toxicology Operations includes training for GSC, CSA-CP, FMK, CDMK, and DST. 			

3.4 Preflight Activities – No Preflight Activities

TABLE 3.4: PREFLIGHT ACTIVITIES

Preflight Activity	Description:	-See launch delay requirement below-
Launch Delay Requirements:	For launch delay of ≥30 days (scrub turnaround), it will be necessary to refurbish the CDMK.	
Notes:	None	
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency):	
	N/A	

3.5 In-Flight Activities

TABLE 3.5.1a: IN-FLIGHT ACTIVITIES - Selective CO₂ Sampling: Carbon Dioxide Monitoring Kit (CDMK), unstow, sample, record, and stow.

In-Flight Activity	Description:	<u>Mission-Specific Selective Sampling:</u> Measurement of CO ₂ levels is taken real-time by the CDM during various activities in flight. Upon completion of the CO ₂ sampling, the concentration (%) and sampling information will be recorded in the Logbook. For extensive monitoring sessions data download and downlink to MCC may be required depending upon the criticality of the data (above 7-day Spacecraft Maximum Allowable Concentration -SMAC). Real-time call-down of CO ₂ levels may be made.			
	Schedule:	Duration:	Schedule:	Flexibility:	Personnel Required:
		<u>Unstow:</u> 5 min. <u>CO₂ Sampling Session:</u> activity dependent <u>Stow:</u> 5 min.	Monitoring requirements are mission specific. <u>Sampling may occur during:</u> <ul style="list-style-type: none"> • Ingress/egress of module • Behind panel work • While working in confined/poorly ventilated spaces • Exercise sessions • At discretion of crew/ground 	Additional use of the CDM will be at crewmember discretion.	1 crewmember
Procedures:	Procedures are contained in the Systems Operations Data File (SODF), Med Ops Book: <ul style="list-style-type: none"> • Carbon Dioxide Monitor (CDM) – Personal and Area • Carbon Dioxide Monitor (CDM) – Data Download • Carbon Dioxide Monitor (CDM) – Battery Changeout • Carbon Dioxide Monitor (CDM) – Filter Assembly Changeout 				
Constraints / Special Requirements:	<ul style="list-style-type: none"> • For extensive monitoring sessions data download and downlink to MCC may be required depending upon the criticality of the data. The CDM utilizes the CSA-CP data cable to download data to the MEC. • When personal monitoring is conducted with the CDM very close to the crewmember, it should not be in the path of exhaled breath. 				
Photo / TV Requirements:	If elevated CO ₂ levels are obtained (above 7-day SMAC), then photo documentation of sampling location may be requested by ground or crewmember.				
Cold Stowage Requirements:	Stowage temperature must be within the range of -5° F to 122° F				
Mission Extension Requirements:	N/A				
Landing Wave-Off Requirements:	None				

Notes:	The CDM has approximately 15-20 hours of operational life on a single battery pack. During battery changeout, stored data are maintained for a maximum of 30 minutes without battery installed. All data will be lost if battery installation is delayed more than 30 minutes. MCC is notified upon the completion of battery changeout.
Data Delivery	Data/Report to Designated Recipients (Nominal/Contingency): JSC Toxicology will provide evaluation of downlinked data in a contingency as soon as possible upon the request of the Crew Surgeon. A postflight report evaluating data obtained from extensive monitoring sessions will be provided to the Crew Surgeon, Data Archivist and MMOP no later than 3 months after return of the hardware from the ISS. When possible this report will be included in the overall air quality assessment report provided by the Toxicology Section.

TABLE 3.5.1b CDM ALARM ENABLE/DISABLE - Contingency

In-flight Activity	Description:	CDM Alarm Enable/Disable: Enables/Disables audio and visual alarm indications.		
	Schedule:	Duration:	Schedule:	Personnel Required:
		10 min	Contingency only	1 ECLSS CM
Procedures:	Procedures can be found in the Systems Operations Data file (SODF) Joint Ops book: Alarm Enable/Disable			
Constraints/Special Requirements:	Notify MCC-H prior to disabling the alarm function.			
Photo/TV Requirements	None			
Cold Storage Requirements	N/A			
Notes:	None			
Data Delivery:	Data/Report to Designated Recipients (Nominal/Contingency):			
	N/A			

TABLE 3.5.1c CSA-CP/CDM BATTERY PACK CHANGEOUT - Contingency

In-flight Activity	Description:	CSA-CP/CDM Battery Pack Changeout: The battery pack is replaced in the unit aside from the nominal monthly maintenance		
	Schedule:	Duration:	Schedule:	Personnel Required:
		30 min	As needed	1 ECLSS CM
Procedures:	Procedures can be found in the Systems Operations Data file (SODF) Joint Ops book: CSA-CP/CDM Battery Pack with Alkaline Battery Replacement			
Constraints/Special Requirements:	Should only be performed if there is a lack of Lithium batteries.			
Photo/TV Requirements	None			
Cold Storage Requirements	N/A			
Notes:	None			
Data Delivery:	Data/Report to Designated Recipients (Nominal/Contingency):			
	N/A			

In-Flight Activities (cont.)

TABLE 3.5.2: IN-FLIGHT HARDWARE

Hardware/Software Name	P/N
Carbon Dioxide Monitoring Kit (CDMK)	SEG46117195-XXX
Medical Equipment Computer (MEC)	SEG46116031-XXX
Carbon Dioxide Monitor (CDM) Software	N/A

3.6 Postflight Activities – No Preflight Activities

3.7 Summary Schedule**TABLE 3.7: SUMMARY SCHEDULE**

ACTIVITY	DURATION	SCHEDULE	FLEXIBILITY	PERSONNEL REQUIRED	CONSTRAINTS
Preflight Training					
EHS Toxicological Operations: Experienced CM Inexperienced CM	30 min 60 min	L-12 months	N/A	Crewmembers/ Instructors	None
Preflight – N/A					
In-Flight					
Ascent: N/A					
On-Orbit:					
Mission-Specific Selective Sampling <u>Sampling may occur during:</u> <ul style="list-style-type: none"> • Ingress/egress of module • Behind panel work • While working in confined/poorly ventilated spaces • Exercise sessions • At discretion of crew 	<u>Unstow:</u> 5 min. <u>Sampling Session:</u> activity dependent No crew time. <u>Stow:</u> 5 min.	Monitoring requirements are mission specific	Additional use of the CDM will be at crew discretion.	1 ECLSS CM	For extensive monitoring sessions data download and downlink to MCC may be required depending upon the criticality of the data. The CDM utilizes the CSA-CP data cable to download data to the MEC. When personal monitoring is conducted with the CDM very close to the crewmember, it should not be in the path of exhaled breath. The CDM has approximately 15-20 hours of operational life on a single battery pack. Photo documentation is required during a contingency situation.
CDM Alarm Enable/Disable-Contingency	10 min	Contingency only	N/A	1 ECLSS CM	Notify MCC-H prior to disabling the alarm function.
CSA-CP/CDM Battery Pack Changeout – Contingency	30 min	As needed	N/A	1 ECLSS CM	Should only be performed if there is a lack of Lithium batteries.
Wheels-Stop – N/A					
Postflight – N/A					
Postflight Debrief					

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Debrief	No extra time	~R+30 days	N/A	Crewmembers/ Toxicology Team	Part of Med Ops debrief
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