Clinical Finding Form (CliFF)

Branch: Baseline

ICL62_Gravity Well - Orthostatic Intolerance

Orthostatic intolerance can be defined as an inability to maintain adequate central perfusion when assuming an upright posture. Cardiovascular changes and blood volume loss associated with adaptation to weightlessness produces a state of acute hypovolemia and absolute anemia upon exposure to gravity when landing on Earth. This combines with alterations in baroreceptor sensitivity and reduce lower extremity mass to diminish venous return and render astronauts more vulnerable orthostatic intolerance. The physical symptoms of orthostatic tolerance have included a "racing" heart, light-headedness, dizziness, nausea, tunnel vision, and fainting. The incidence of presyncope during orthostatic stress increases with longer duration flights. Recovery of function is rapid after short duration flights. Historically, the treatment of postflight orthostasis has involved access to medical care including intravenous fluid therapy, if indicated. For this CliFF, orthostatic intolerance is only considered during the transition from microgravity to the 1/6 G environment of the moon. The estimated incidence of gravity well orthostatic intolerance is based on no reported cases of orthostatic intolerance upon transition from microgravity to the 1/6 G environment of the moon among the 12 astronauts who walked on the moon.

INCIDENCE DATA INCLUDED IN THE MODEL

The model imports the following incidence information from the MEDPRAT Evidence Library Database: incidence data category, space adaption status, EVA status, incidence data type, incidence and occurrence distribution data and incidence data characteristics. Data category defines the type of data available for incidence calculations (i.e. raw data vs. adjusted data). Space adaptation identifies medical events that where onset occurs in the first 5-7 days of flight and does not reoccur. EVA-related incidence values identify medical events that occur only during an EVA. Incidence values types vary by data category and define the number of medical events per person-year (rates) or medical events per person at-risk (proportion) for each medical condition. Incidence values can be modified by crew characteristics such as gender sex and certain crew medical history characteristics. Modifying characteristics are noted below and incidence values are listed individually for each characteristic. Distributions are assigned to medical events incidence values and occurrences in the model. For each crewmember in a given trial, the incidence and number of occurrences of each medical condition are randomly selected from these probability distributions. Detailed descriptions of the distributions are included in the MEDPRAT Technical Description Document.

INCIDENCE DATA

SPACEFLIGHT LITERATURE

There have been no documented cases of orthostatic intolerance among the 12 Apollo astronauts that have walked on the moon as they transitioned from microgravity to the 1/6 G environment of the moon. However, there may have been under-reporting of symptoms related to orthostatic intolerance among the Apollo astronauts. In addition, the Apollo astronauts who walked on the moon did not undergo orthostatic testing when they landed on the moon. The incidence of orthostatic intolerance on return to Earth from Shuttle and ISS missions is determined by length of spaceflight and gender. According to the Barratt textbook overall incidence of orthostatic intolerance in shuttle astronauts falls between 12% and 27.5% (Barratt, 2019). While long duration space flight, defined as lasting up to 6 months, increases incidence to > 80% (Barratt, 2019). Breakdown of the data by gender indicates an incidence in female shuttle astronauts falling between 35.3% and 71.4% and an incidence in male shuttle astronauts between 6.7% and 13.6% (Barratt, 2019). According to the Platts et al evidence report the Incidence of OI in long duration spaceflight, defined as up to 6 months, falls between 66.7% and 83.3% (Platts, 2015). This data is in part based on the study by Lee et al. which also reports an incidence in ISS astronauts of 66.7% (Lee, 2015). This data may not be applicable to the transition from microgravity to the partial gravity environment (1/6G) of the lunar surface.

ANALOG LITERATURE

NA

TERRESTRIAL LITERATURE

NA

OVERALL INCIDENCE SUMMARY

INCIDENCE

mean 0.07191 and SD 0.06703 per person

INCIDENCE SUMMARY

The Bayesian posterior distribution for the incidence proportion given the spaceflight evidence (0 events over 12 astronaut moon landings) under an uninformative prior is Beta(shape1=0.9962, shape2=12.8577) with mean 0.07191 and SD 0.06703. Evidence: Spaceflight – Moon Landings – 0 events over 12 crew. IP: 0 (95%CI: 0, 0.2647).

TABLE 1. INCIDENCE MODEL

Incidence Details

Incidence Type
UNK

Segment
Gravity Well Transition

Env. Exposure
NA

Sex
Any

Crowns
Any

Contacts
Any

Pregnancy
Any

Incidence Distribution

Occurrence Dist
Binomial

Incidence Dist.
Beta

Mean
0.0719075

SD
0.067029

Beta
(Alpha): 0.9962
(Beta): 12.8577

TABLE 2. INCIDENCE LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Barratt, 2019	Spaceflight	0
Platts, 2015	Spaceflight	0
Lee, 2015	Spaceflight	0
Diedrich, 2015	Spaceflight	0
Apollo mission	Spaceflight	1

The Apollo program is used to estimate the incidence of orthostatic intolerance upon transition from the microgravity environment to the partial gravity environment (1/6G) of the lunar surface. There were no reported cases of orthostatic intolerance upon transition from microgravity to the 1/6 G environment of the moon among the 12 astronauts who walked on the moon. This estimate of incidence is given a level of confidence (LOC) = 1 (somewhat unconfident) since this incidence is based on a limited number of astronauts (n = 12). All of the other sources represented here used astronauts returning from spaceflight to Earth as their population of study and are therefore given an LOC = 0. Two sources are textbooks using data aggregated from primary sources for their estimates of incidence (Barratt, 2019; Diedrich, 2015). The systematic review was produced by the NASA Human Research Program, the estimates of incidence are based upon the same primary sources presented in the textbooks (Platts, 2015).The retrospective cohort study, Lee et al., is a study conducted using 20 ISS astronauts with determination of OI made at L-10, and R+0. It uses the standard 10 minute tilt to stand test performed on astronauts within 1-3 hours of landing (Lee,2015).

CREWMEMBER SELECTION/PREVENTION

DISQUALIFYING CONDITIONS

Refer to Medical Evaluation Documents (MED) Volume A, Medical Standards for ISS Crewmembers, International Space Station Program, Rev 3.4 (2016).

PREFLIGHT PREVENTATIVE MEASURES

There are no known preflight preventive measures for orthostatic intolerance. Inflight countermeasures include oral fluid loading before landing, wearing lower body compression garments during entry and landing, and active cooling during the entry phase (a liquid cooling garment worn under the re-entry suit).

BEST CASE SCENARIO DEFINITION

Mild orthostatic intolerance, related to gravity, that spontaneously resolves.

WORSE CASE SCENARIO DEFINITION

Orthostatic intolerance, related to gravity, requiring IV fluids or resulting in syncopal episode.

CONDITIONS INCLUDED, BUT NOT EXPLICITLY STATED (CNES)

None

BEST CASE/WORST CASE PROBABILITY COMMENTS

It is presumed that 100% of cases will be best case scenario (mild) for Artemis missions since the gravity well transition will be from microgravity to the 1/6 G environment of the moon and not from microgravity to the 1G environment of Earth. The worst case scenario is not expected for Artemis missions.

TABLE 3.BEST/WORST CASE PROBABILITY LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Platts, 2015	Spaceflight	3
Lee, 2015	spaceflight	3

LOC = 3 (somewhat confident) based the minimal gravity well transition from microgravity to the 1/6 G environment of the moon for Artemis missions.

TABLE 4. CLIFF TREATMENT & OUTCOME TABLE BY CLINICAL PHASE

Case Scenario	Composite Incidence	Condition Probability %	CP1: Diagnosis		CP2: Treatment			CP3: Condition End State				
			TI%	Duration	TI%	Duration		TI%	RTDC		LOCL	
			Preset	Preset	Preset	Min	Max	Preset	Min%	Max%	Min%	Max%
Treated Best Case (TBC)	mean 0.07191 and SD 0.06703	100 - 100	100	0.73	19.3861	0	72	0	0	0	0	0
Treated Worst Case (TWC)		0 - 0	100	0.78	19.3861	0	0	0	0	0	0	0
Untreated Best Case (UTBC)	N/A	N/A	N/A	0.73	19.3861	0	72	0	0	0	0	0
Untreated Worst Case (UTWC)	N/A	N/A	N/A	0.78	49.2293	0	0	0	0	0	0	0

TABLE 4 KEY

Composite Incidence: The same composite incidence will be used for both TBC and TWC. For EVA conditions: events per EVA (events/EVA). For space adaptation conditions: events per person (events/person). For non-spaceflight conditions: events per person year (events/py).

Condition Probability: The probability that CLiFF condition progresses to a worst case scenario. Best case scenario: 100%-Worst Case.

Clinical Phase General Comments:

- TI% = Task Impairment %. Task Impairment is the % of tasks that the crewmember is incapable of performing without impairment secondary to the medical condition.
- Durations are defined in hours.
- Removal to Definitive Care (RTDC): The probability the entire crew aborts the mission and returns to earth. This is considered as a condition end state result if any of the following criteria are met: 1) the potential for LOCL, 2) potential for significant permanent task impairment, or 3) potential for intractable pain.
- Loss of Crew Life (LOCL): The probability of death of affected crewmember due to medical condition.

Clinical Phase 1: Initial Assessment and Diagnosis:

- Covers only the initial assessment and diagnosis of the affected crewmember to define his or her medical condition. While the affected crewmember is being assessed, he or she is not able to perform any assigned tasks, thus Task Impairment (TI) during this phase is considered 100%. In the untreated case, there is no diagnosis performed, therefore Task Impairment and Duration will always be " not applicable."

Clinical Phase 2: Stabilization, Treatment, and Convalescence:

- The affected crewmember is receiving any appropriate initial or follow-on treatment for his or her medical condition to allow the crewmember to recover as much as he or she is able to recover in the spaceflight environment. Clinical phase 2 also encompasses relapses or recurrences of the same original medical condition in Clinical Phase 1. The duration of Clinical Phase 2 is expressed as minimum and maximum hours.

Clinical Phase 3: Condition End State:

- Reached once the affected crewmember has recovered from the medical condition as much as he or she is able to recover in the spaceflight environment amongst treated and untreated best and worst case scenarios. This may or may not be recovery from the given medical condition to the full extent possible. If this “recovered” state results in Removal to Definitive Care (RTDC) or Loss of Crew Life (LOCL) this will be noted in the condition end state results.

SCENARIO OVERVIEW COMMENTS

This condition addresses the potential for orthostatic intolerance upon the transition from microgravity to the partial gravity environment of the lunar surface. It is presumed that 100% of cases will be best case scenario (mild) for Artemis missions since the gravity well transition will be from microgravity to the 1/6 G environment of the moon. The worst case scenario is not expected for Artemis missions. RTDC is not expected based on the mild transition from microgravity to the 1/6 G partial gravity environment of the lunar surface and the best case scenario definition. LOCL is not expected for this condition.

TREATED BEST CASE (TBC) SCENARIO COMMENTS

The clinical phase II duration is estimated as 0 to 72 hours based on the best case definition and the historical duration of orthostatic intolerance after short duration spaceflight missions. RTDC and LOCL is not expected based on the best case definition.

TREATED WORST CASE SCENARIO (TWC) COMMENTS

N/A. The worst case scenario is not expected for Artemis missions.

UNTREATED BEST CASE (UTBC) SCENARIO COMMENTS

The clinical phase II duration is estimated as 0 to 72 hours based on the best case definition and the historical duration of orthostatic intolerance after short duration spaceflight missions. RTDC and LOCL is not expected based on the best case definition.

UNTREATED WORST CASE (UTWC) SCENARIO COMMENTS

N/A. The worst case scenario is not expected for Artemis missions.

TABLE 5. CLINICAL PHASE II DURATION LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
Barratt, 2019	Spaceflight	3

LOC = 3 (somewhat confident) based on spaceflight data from short duration missions. As per Principles of Clinical Medicine for Space Flight (Barratt, 2019 - Chapter 20, page 615): "generally, cardiovascular responses to orthostatic stress after short duration space flight appear to be largely recovered by 2 to 3 days after landing."

TABLE 6. RTDC LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
N/A	N/A	4

RTDC level of confidence (LOC) = 4 (confident). RTDC is not expected for this condition based on the best case scenario definition.

TABLE 7. LOCL LEVEL OF CONFIDENCE (LOC)

Citation	Source	LOC Value
N/A	N/A	4

LOCL level of confidence (LOC) = 4 (confident). LOCL is not expected for this condition based on the best case scenario definition.

CAPABILITY RESOURCE TABLE (CRT) OVERVIEW

Capabilities and Resourcing Scope

Overview
This condition occurs during transitions between gravity environments.

CNES: NONE

Diagnostic Scope and Resourcing
Diagnosis relies on history and physical exam within the context of the transition into or out of a gravity well. Lunar crew may experience this on launch from Earth, descent to Luna, and Launch from Luna. Earth return will not be handled by the medical system on board the spacecraft.

Clinical Phase 1 Duration and Rationale
This version of IMPACT presumes physician level knowledge, skill, and ability will be present on the mission. The CRT working group SME consensus duration is as follows:

CP1 BC (Treated or Untreated): 0.73 hours for set up history, vital signs, and physical exam

CP1 WC (Treated or Untreated): 0.78 for a more thorough physical exam given the context of a syncopal episode.

This condition requires a Scope of Practice 4 to manage and rule out other similar presenting conditions and assess fitness for duty.

Treatment Scope and Resourcing
The best case requires no treatment as it resolves spontaneously. The worst case requires an IV line and delivery of IV fluids.

Communications and Support Needs;

Communications are not expected to be necessary beyond the routine medical ground communications. Particularly as this will be occurring immediately after critical flight phases of acescent and descent. It is assumed that communications will be prioritized and available during these mission phases.

References
Barratt, Michael R., Ellen S. Baker, and Sam L. Pool. 2019. "Principles of clinical medicine for space flight." In. New York, NY: New York, NY : Springer.

IMM CLIFF RECONCILATION COMMENTS

There is no IMM CliFF for this condition.

LIMITATIONS SUMMARY

The primary limitation pertains to the limited number of astronauts that have walked on the moon. The incidence distribution is based on the lunar mission data (Apollo) of no documented medical events of orthostatic intolerance among the 12 astronauts who landed and walked on the moon. It is assumed that all cases of orthostatic intolerance will be mild (best case scenario) since the gravity well transitions during the Artemis missions will be from microgravity to the 1/6 gravity environment of the lunar surface and not from microgravity to 1G. Previous spaceflight data are used to estimate CP2 durations.

TABLE 8. TASK IMPAIRMENT CALCULATION BASED ON AFFECTED HUMAN SYSTEMS TASK CATEGORIES (HSTC)

Clinical Phase 2: Treatment												
	Affected HSTCs											
	Cognitive - Simple	Cognitive - Complex	Communications	Inter-personal Skills	Vision	Hearing	Cardio-pulmonary	Dentition	GI	GU		
Treated Best Case (TBC)		664		89			145					
Untreated Best Case (UTBC)		664		89			145					
Treated Worst Case (TWC)		664		89			145					
Untreated Worst Case (UTWC)	223	664	113	89	854	44	145					
	Affected HSTCs (Continued)								TI Calculation			TI Score
	Hand (Dom)	Hand (Any)	Upper Extremity	Lower Extremity	Ambul & Standing (g)	Translation & Stabilization (microgravity)	Don/Doff Equipment	Pressure Ops	Total Tasks Impaired By Condition	Total Human System Category Tasks Full Mission	TI Decimal	TI %
Treated Best Case (TBC)	132			22	196			211	1459	3763	0.387723	38.7723
Untreated Best Case (UTBC)	132			22	196			211	1459	3763	0.387723	38.7723
Treated Worst Case (TWC)	132			22	196			211	1459	3763	0.387723	38.7723
Untreated Worst Case (UTWC)	132	564	414	22	196		34	211	3705	3763	0.984587	98.4587

Clinical Phase 3: Condition End State												
	Affected HSTCs											
	Cognitive - Simple	Cognitive - Complex	Communications	Inter-personal Skills	Vision	Hearing	Cardio-pulmonary	Dentition	GI	GU		
Treated Best Case (TBC)												
Untreated Best Case (UTBC)												
Treated Worst Case (TWC)												
Untreated Worst Case (UTWC)												
	Affected HSTCs (Continued)								TI Calculation			TI Score

	Hand (Dom)	Hand (Any)	Upper Extremity	Lower Extremity	Ambul & Standing (g)	Translation & Stabilization (microgravity)	Don/Doff Equipment	Pressure Ops	Total Tasks Impaired By Condition	Total Human System Category Tasks Full Mission	TI Decimal	TI %
Treated Best Case (TBC)									0	3763	0	0
Untreated Best Case (UTBC)									0	3763	0	0
Treated Worst Case (TWC)									0	3763	0	0
Untreated Worst Case (UTWC)									0	3763	0	0

TABLE 8 KEY
Human System Task Category (HSTC) Definitions: Cognitive-Simple: Tasks requiring simple cognitive involvement (low levels of attention, following simple checklists, and not requiring extensive decision making) in conjunction with inputs from other systems. Cognitive-Complex: Tasks requiring complex cognitive involvement (requiring constant attention, frequent interpretation of outside stimuli to inform real-time situations) in conjunction with inputs from other systems. Communication: Tasks requiring primarily communication, via hearing and speaking. Interpersonal Skills: Tasks requiring interpersonal, social interaction between crew including complex technical tasks that require extended crew interaction. Vision: Tasks in which visual information is required. Hearing: Tasks in which primarily auditory information is required, excluding communication, e.g. hearing alarms, medical auscultation, OOHAs. Cardiopulmonary: Tasks requiring greater-than-baseline cardiopulmonary effort, e.g. physically strenuous activities. Dentition: Tasks requiring use of teeth for mastication. GI (Gastrointestinal): Tasks requring use of the alimentary sytem, e.g. solids/liquids consumption and solids excretion. GU (Genitourinary): Tasks requiring use of the male/female genitourinary systems. Hand (Dominant): Tasks performed using primarily the hand, requiring use of the dominant hand (piloting, medical procedures, dental procedures). Hand (Any): Tasks performed using primarily the hand(s), with no preference for dominance, with equivalent bilateral effectiveness. Upper Extremity: Tasks requiring specific use of the upper extremities, excluding hands. Lower Extremity: Tasks requiring specific use of the lower extremities (excluding ambulation and standing in the presence of gravity), e.g. using exercise equipment. Ambulation and Standing (g): Tasks requiring use of both lower extremities to accomplish ambulation or standing in the presence of gravity. Translation and Stabilization (microgravity): Tasks requiring use of either the upper or lower extremities to accomplish translational movement and stabilization (securing oneself to remain stationary) in the setting of microgravity. Don/Doff Equipment: Tasks requiring the donning of personal equipment (including pressure suit, exercise harness, EVA equipment, etc). Pressure Ops: EVA/contingency tasks performed while pressurized in a suit.

Criteria for Assignment of Conditions to HSTCs (any of the following):
1) Is affected crew member physically incapable of performing the human system task category, without impairment, with the condition?
2) Would the treatment (e.g. medications) impair the crewmember's ability to perform the human system task category? (Does not apply to UTx)
3) Does the condition have a high likelihood of causing a significant aeromedical contraindication with an associated human system task category
4) Would performing tasks in an associated task category worsen the condition? (If so, it is affected).
5) Does pain associated with the condition impair any further human system categories?

TASK IMPAIRMENT COMMENTS

CP2: No comment. CP3: No comment

EVIDENCE COLLECTION PROCESS

Mesh terms that most closely resembled the best-case and worst-case scenarios, and associated Conditions Included but Not Explicitly Stated (CNES), were utilized to build incidence, duration, RTDC, and LOCL searches by best- and worst-case.

Incidence:
Databases searched for spaceflight and analog incidence data included: PubMed, Google Scholar, NASA Technical Reports Server (NTRS) public search, Defense Technical Information Center (DTIC), and Barratt MR, Baker E, Pool SL. Principles of Clinical Medicine for Space Flight. New York, NY: Springer; 2019. 2nd Edition. Databases searched for terrestrial incidence included: DynaMed, PubMed, and Google Scholar.

Duration, RTDC, LOCL:
Databases searched for duration, RTDC, and LOCL included: Dynamed, Cochrane, PubMed, and Google Scholar. Note, that if duration, RTDC, or LOCL data was found in a DynaMed search, the other search engines were not included. Relevant articles were selected and reviewed. If applicable, the article was included in the CLiFF.

LEVEL OF CONFIDENCE (LOC) SCORING

Articles obtained to update the evidence behind this CLiFF were scored by ExMC editors, based on their applicability to the Exploration Spaceflight environment using the following grading scale:

4 – Confident
3 – Somewhat confident
2 – Neutral
1 – Somewhat unconfident
0 – Not confident

The following considerations factor into the grading scale above:

• How closely does the paper describe the medical condition as defined by the IMPACT 1.0 Condiltion List (relevance)?
• How closely does the population included resemble the astronaut population?
• Quality of the paper (number of subjects, methods, etc.)
• How much does the editor trust the source of the evidence?
• How closely does the editor think that the data represents the exploration spaceflight environment?
• Other considerations, at the discretion of the editor, supported in the comments for LOE scoring.

REFERENCES

Reference
1. Ortega HJ, Harm DL, Reschke MF. Space and entry motion sickness. In: Barrett's Principles of Clinical Medicine for Space Flight. 2019. doi:10.1007/978-1-4939-9889-0_14. 2. Fu, et al. Impact of Prolonged Spaceflight on Orthostatic Tolerance During Ambulation and Blood Pressure Profiles in Astronauts. Circulation. 2019;140:729–738. DOI: 10.1161/CIRCULATIONAHA.119.041050. 3. Scheuring, et al. The Apollo Medical Operations Project: Recommendations to Improve Crew Health and Performance for Future Exploration Missions and Lunar Surface Operations. NASA/TM–2007–214755. 4. Evidence Report: Risk of Orthostatic Intolerance During Re-exposure to Gravity. Human Research Program. Human Health Countermeasure Element. National Aeronautics and Space Administration. May 1, 2015. 5. Diedrich, et al. Orthostatic Intolerance and Vasovagal Syncope After Spaceflight. Pages 309-317. In: Vasovagal Syncope. Springer. November 2015.

ACRONYMS

ACRONYM	PHRASE
AAOMS	American Association of Oral and Maxillofacial Surgeons
AMA	American Medical Association
ARCL	All Remaining Conditions List
ARS	Acute Radiation Sickness
BHP	Behavioral Health and Performance
CAC	Coronary Artery Calcium
CHS	Crew Health and Safety
CL	Condition List
CliFF	Clinical Finding Form
CMO	Crew Medical Officer
COMFORT	Clinical Outcome Metrics for Optimization of Robust Training
CP1	Clinical Phase 1
CP2	Clinical Phase 2
CP3	Clinical Phase 3
CRL	Clinical Resource Level
CRT	Capability Resource Table
CST	Clinical Science Team
DCS	Decompression Syndrome
DRM	Design Reference Mission
ED	Emergency Medicine Doctor
EL	Evidence Library
EMCL	Exploration Medical Condition List
EMT	Emergency Medical Technician
EVA	Extravehicular Activity
EXMC	Exploration Medical Capability
HRP	Human Research Program
ICD	International Classification of Disease
ICL 1.0	IMPACT 1.0 Medical Conditions List
ICU	Intensive Care Unit

IMCL	iMED Condition List
iMED	Integrated Medical Evidence Database
IMM	Integrated Medical Model
IMPACT-MD	Impact Medical Database
IP	Incidence Proportion
IR	Incidence Rate
ISS	International Space Station
IV	Intravenous
JSC	Johnson Space Center
LEO	Low-Earth orbit
LEVA	Lunar Extravehicular Activity
LOCL	Loss of Crew Life
LOM	Loss of Mission
LSAH	Lifetime Surveillance of Astronaut Health
LSO	Lunar Surface Operations
MCL	Master Condition List
MEVA	Medical Extravehicular Activity
NASA	National Aeronautics and Space Administration
N/A	Not Applicable
NP	Nurse Practitioner
OBGYN	Obstetrics and Gynecology
OR	Occurrence Rate
PA	Physician Assistant
PDQ	Pain Disability Questionnaire
PFCL	Proposed Future Conditions List
PPE	Personal Protective Equipment
PTRS	Project Technical Requirements Specification
PRL	Pharmaceutical Resource Level
QTL	Quality Time Lost
RCL	Removed Conditions List
REP	Rochester Epidemiology Study
RTDC	Removal to Definitive Care
SANS	Spaceflight-Associated Neuro-ocular Syndrome
SAS	Space Adaptation Syndrome
SEVA	Spaceflight Extravehicular Activity
SME	Subject Matter Expert
SoP	Standard Operating Procedure
SPE	Solar Particle Event
TBD	To Be Determined
TI	Task Impairment