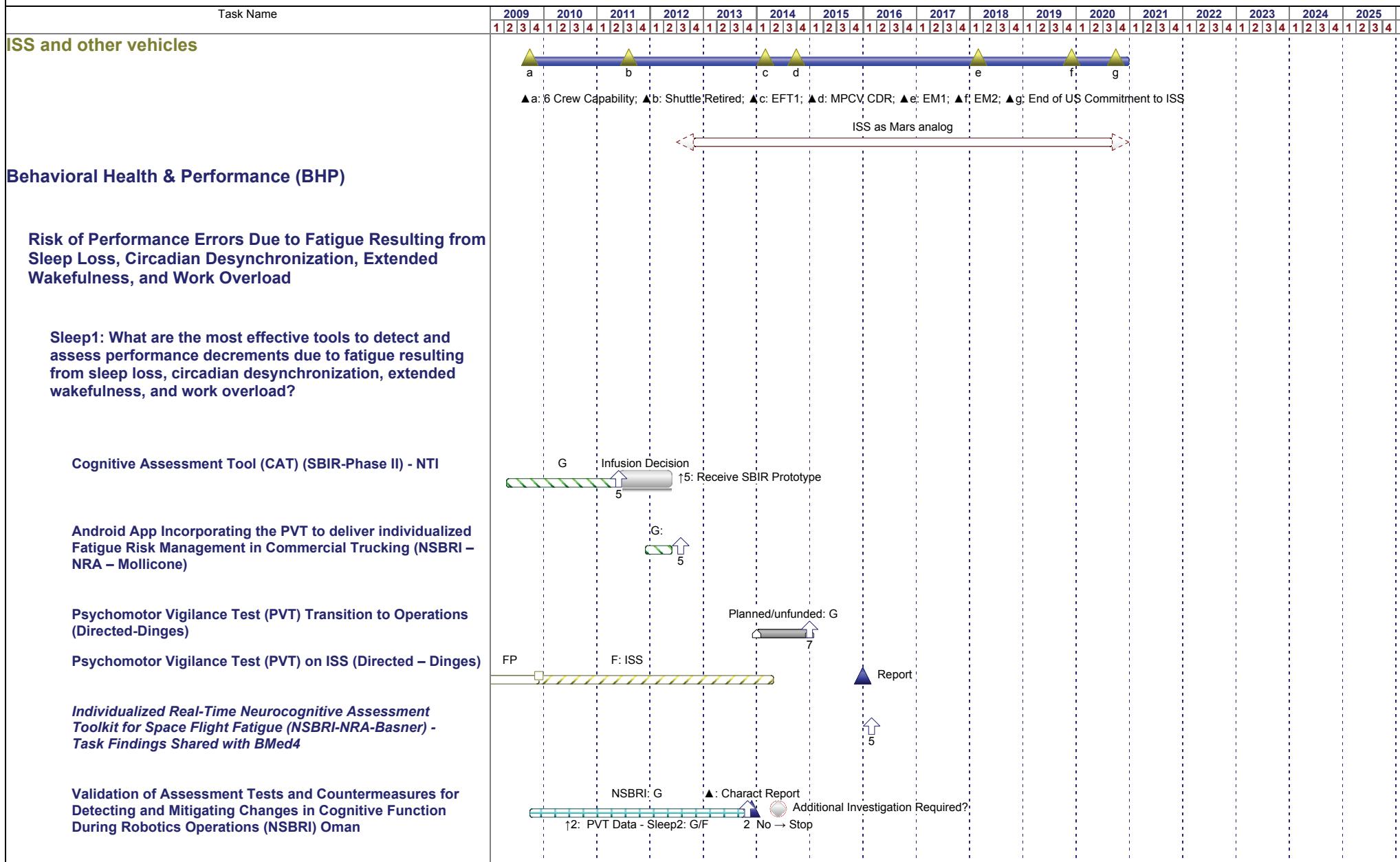




G: Ground Study		Early Start		6) Technology	
F: Flight Study		Task To Be Determined After Decision Point		7) Countermeasure	
L: Lunar		Major Milestone/Event/Accomplishment		8) Information To/From other Elements	
NSBRI		1) Risk Characterization		9) Information to HSRB	
DA&M: Data Analysis & Modeling		2) Task↓Task		10) Requirements	
FP: Flight Prep		3) Standards - New		11) Study	
AO: Add on to another study		4) Standards - Update		Major Decision Point	
Planned/unfunded		5) Tools		Stop	

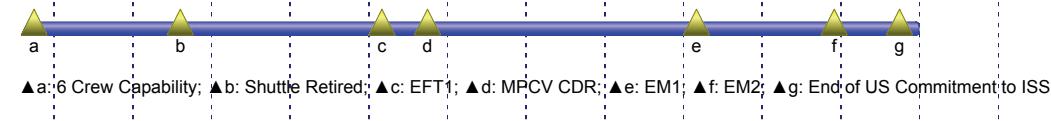




Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness, and Work Overload

Task Name	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

ISS and other vehicles



Behavioral Health & Performance (BHP)

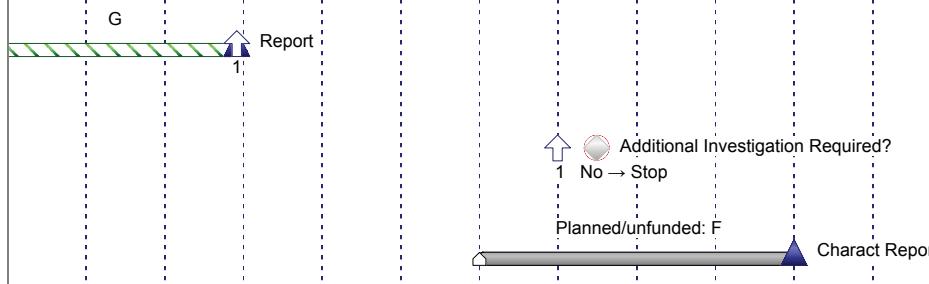
Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness, and Work Overload

Sleep2: How is performance in space flight affected by fatigue due to sleep loss, circadian desynchronization, extended wakefulness and work overload?

Cognitive Performance/Stress in Simulated Space Env. (Directed - Dinges)

Assess PVT Data: Ground / Flight (Directed - Dinges)

Characterize Sleep Structure on ISS (Unfunded)





Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness, and Work Overload

Task Name	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
ISS and other vehicles	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1
Behavioral Health & Performance (BHP)																	
Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness, and Work Overload																	
Sleep3: Does sleep loss continue on long duration spaceflight or is there adaptation? Does circadian desynchronization, extended wakefulness and work overload continue on long duration missions or is there adaptation?																	
Sleep-Wake Actigraphy and Light Exposure During Spaceflight (NRA - Czeisler/Barger)																	
Transition Actiwatch Protocol to Medical Practices (TMP) -TBD																	
Techwatch for Sleep Monitoring Technologies for Long Duration Spaceflight (performed per ExMC Technology Watch process)																	
Characterize Workload on ISS (Unfunded)																	
Decision Point: Tools for Measuring Sleep Structure and Duration in Space (BHP - In-House)																	

▲a: 6 Crew Capability; ▲b: Shuttle Retired; ▲c: EFT1; ▲d: MPCV CDR; ▲e: EM1; ▲f: EM2; ▲g: End of US Commitment to ISS

ISS as Mars analog

F: AW on ISS

Final Report

G

5

No → Stop

Additional Investigation Required?

G

1

G

5



Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness, and Work Overload

Task Name

2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1

ISS and other vehicles

Behavioral Health & Performance (BHP)

Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness, and Work Overload

Sleep4: How can individual astronauts' vulnerabilities to sleep loss and circadian rhythm disruption best be determined?

Evidence Review on Biomarkers of Individual Vulnerabilities to Sleep Loss and Circadian Desynchronization (SOW) (Lockley)

Assess Relevant Investigations / Potential Collaborations Across Other Agencies (Unfunded)

Markers of Susceptibility to Neurobehavioral Decrments in Space Flight (NSBRI - NRA - Dinges) - Task Findings Shared with BMed5

Biomarkers to Assess Individual Vulnerabilities and Resiliences to Sleep Loss and Circadian Desynchronization (Unfunded)

Final Report
Additional Investigation Required?
No → Stop

Planned/unfunded: G
Report on Potential Collaborations

1

Planned/unfunded: G; In-House
Summary Report
Additional Investigation Required?
No → Stop

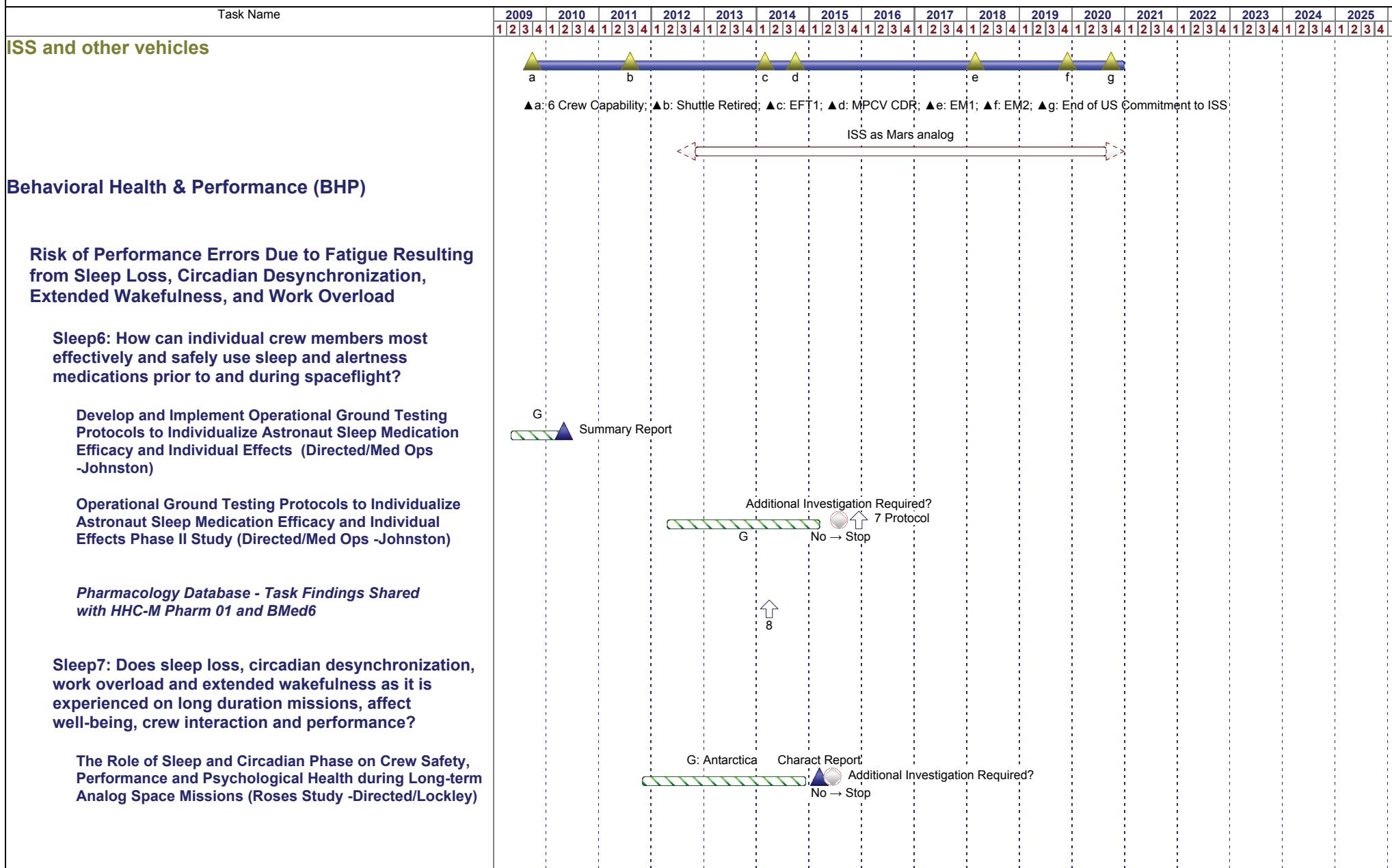




Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness, and Work Overload

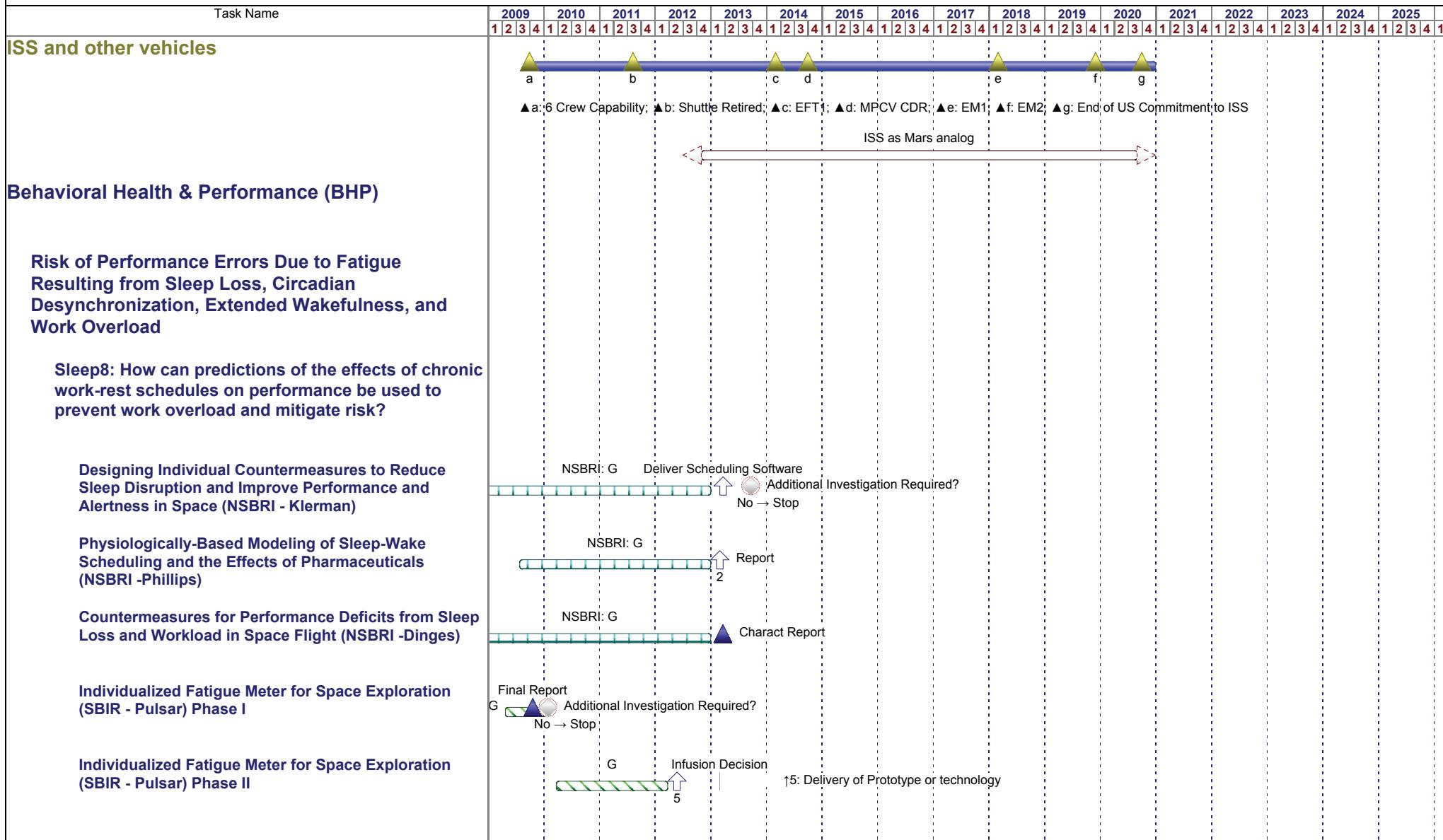


Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness, and Work Overload





Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness, and Work Overload





Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness and Work Overload

