

This Directed Acyclic Graph and write-up is an excerpt from a larger NASA document.

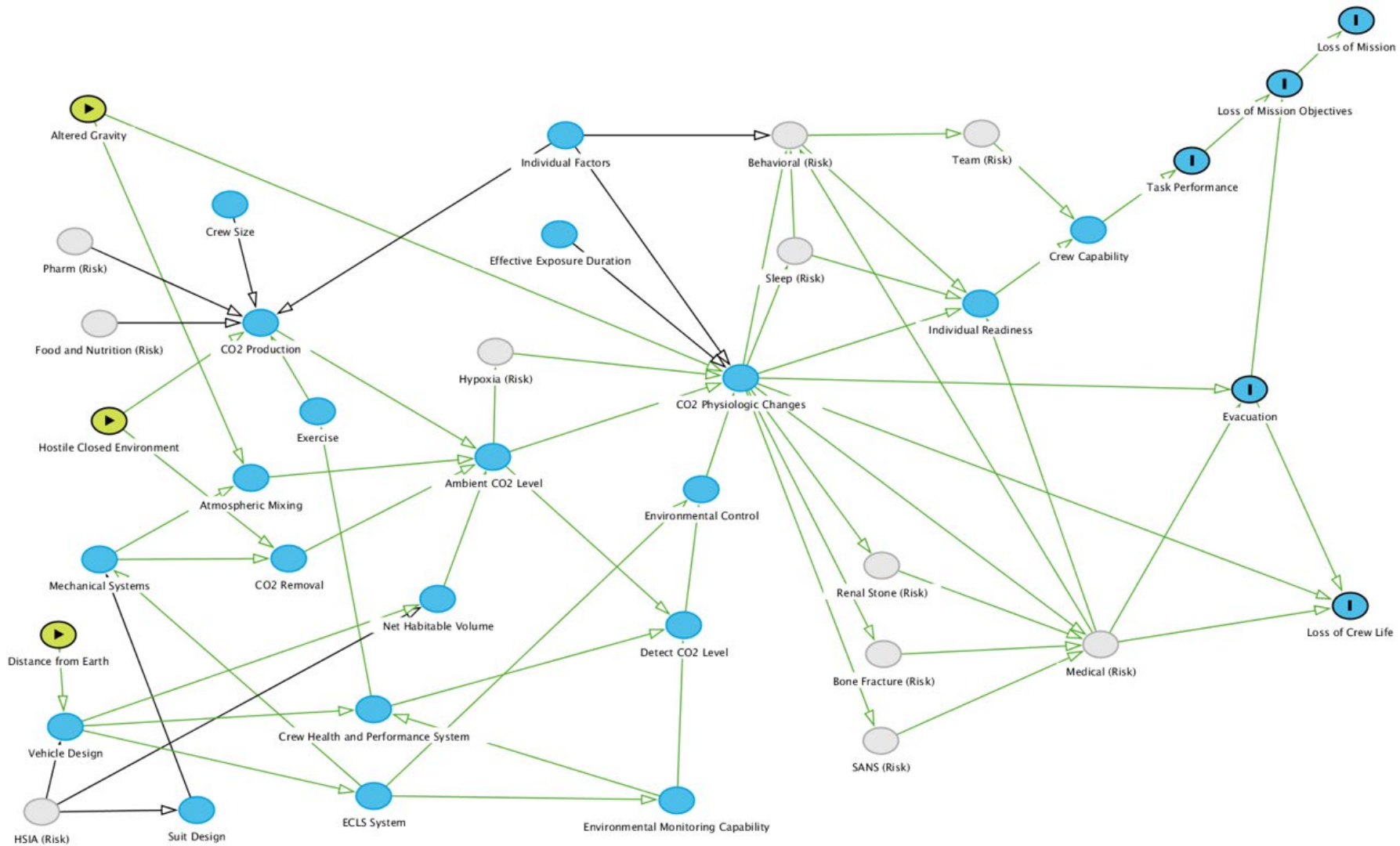
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**Directed Acyclic Graphs: A Tool for Understanding the NASA
Spaceflight Human System Risks**

Human System Risk Board

October 2022

Risk of Nominal Acute and Chronic Ambient Carbon Dioxide Exposure in Crewed Vehicles (CO2 Risk)



CO₂ Risk DAG Narrative

- The CO₂ concentration in the closed spacecraft environment is a balance between production (primarily crew) and Environmental Control and Life Support (ECLS) scrubbing.
- When the balance is impacted by vehicle capability (limited ECLS mass/power, for example) or production influences (exercise, for example), the CO₂ concentration will increase and may result in several different physiological changes.
- Monitoring is essential to understand the levels and possible outcomes.
 - Ambient cabin level averaging is currently relied upon almost exclusively.
 - Ambient local/area monitoring also possible via the carbon dioxide monitor (CDM) and personal CO₂ monitors (pCO₂m).
 - Periodic individual monitoring (inspired CO₂ or other, for example) is not currently available.
- Levels that are elevated significantly and/or chronically may lead to adverse mission outcomes, including loss of mission objectives or loss of mission (evacuation). Unexpectedly high acute levels may lead to loss of crew life, but the likelihood of this event is very low.