



## Team Risk DAG (Narrative)

- ❖ **Isolation and Confinement** affects **Interpersonal Relationships** directly and through monotony, boredom, and other possible Behavioral affects that are represented in the **Behavioral (Risk)**.
- ❖ **Distance from Earth** affects the mass and volume allocations that limit **Vehicle Design** decisions. It also affects **Communications Delays**, influences **Effective Mission Duration**, and also affects **Crew Size**.
- ❖ The central issue in the Team Risk is that **Team Cohesion, Team Skills, and Team Cognition** come together to influence **Team Functionality**, and ultimately, **Crew Capability**. The Team Risk operates downstream of many other Risks, and at a higher level than the individual, but is heavily influenced by the individuals and individual-level Risks in the system.
  - **Effective Mission Duration** is related to **Distance from Earth**, but not always, and it has implications for the (likely decremented) **Interpersonal Relationships** over time
  - **Crew Size** is another potential stressor that is more loosely tied to the 5 hazards, but has implications for the relationships, skills, and simply the -number of person-hours and hands (**Team Composition** and **Crew Capability**) available onboard.
  - **Ground Support**, which will be heavily impacted by **Communication Delays**, is an important part of the spaceflight multi-team system. There are likely different effects for shorter, lunar comm delays lengths versus a longer, Mars comm delay lengths.
- ❖ **Team Functionality** is the degree of coordination, cooperation, communication, and psychosocial adaptation that enables a team to successfully complete tasks and live and work as a team. It is affected by:
  - **Team Cognition** is shared understanding among team members that is related to roles and responsibilities; team norms; familiarity with team members' knowledge, skills, and abilities; and engaging in team decision-making and problem-solving. **Team Cognition** is supported by many factors related to **Team Composition** and **Interpersonal Relationships**, the team **Training** together (in both technical and team skills), engaging in **Team Skills** and **Social Support**, **BHP\* Countermeasures** (e.g., debriefs), and the team members' **Individual Readiness and Factors** (i.e., individual cognition). **Ground Support** is an important part of **Team Cognition** across the multi-team system.
  - **Team Skills** consist of information sharing, backup behaviors, leadership/followership, team care, and providing social support, among others. **Team Skills** are developed through training. **Team Skills** support **Individual Readiness** to function on a team, offer **Social Support**, create and maintain shared **Team Cognition**, and **Interpersonal Relationships**.
  - **Team Cohesion** is the tendency for a group to operate in a unified fashion while working towards a goal or to satisfy the emotional needs of its members. It is affected by **Interpersonal Relationships** that develop through shared values and complementary personalities (**Team Composition**) and **Social Support** during shared experiences. It is supported by **BHP Countermeasures** (e.g., debriefs).
- ❖ **Crew Capability** is the readiness of the entire crew to perform required tasks including the functional capacity as well as knowledge, skills and abilities, at both an individual and team level. Inadequate **Task Performance** during critical team tasks (e.g., EVAs for repairs or for surface ops, emergency response) can lead to **Loss of Vehicle** or **Loss of Mission Objectives** or **Loss of Crew Life**. This is affected by:

- **Team Functionality** as represented above.
  - **Crew Size** effects the pool of available knowledge/skills/abilities and person-hours onboard, as well as **Interpersonal Relationships** via **Team Composition**.
  - **Individual Readiness** is affected by **Individual Factors** present at **Astronaut Selection** (a pool of well-qualified, highly skilled, team-oriented individuals), several **Other Risks** (Human System Risks), **Family Effects**, and **Team Skills** developed through **Team and Technical Training**.
  - **Communication Delays** also negatively influence real-time **Crew Capability**, particularly in time pressure situations (e.g., emergency response), by restricting timely troubleshooting and coordination with **Ground Support**.
- ❖ **BHP Countermeasures** and other factors influence the level of **Team Cohesion, Team Skills, and Team Cognition**. These include:
- **Training** performed before and during a mission. This includes both technical & team skills training /behavioral health training. **Technical Training** is dependent on **Vehicle Design** and the **Crew Health and Performance System**, and it can affect the **Individual Readiness** and shared understanding (**Team Cognition**) of these vehicle systems. **Team Training** affects each **Individual's Readiness** to work and live as a team via **Team Skills**, affect **Interpersonal Relationships** as they train together, affect **Social Support** behaviors, and affect shared understanding (**Team Cognition**) of team norms.
  - **Astronaut Selection** creates a pool of well-qualified, highly skilled, team-oriented individuals (**Individual Factors**). A physically and psychologically fit individual (**Acoustics, Medical, Sleep, CO<sub>2</sub>, Food and Nutrition (Risks), Behavioral (Risk)**), combined with **Team Skills** enhanced through **Team Training**, results in **Individual Readiness**.
  - **Team Composition** is influenced by a given Design Reference Mission (DRMs) categories, **Distance from Earth** via **Crew Size** (which affects the available knowledge/skills/abilities, or **Individual Factors**, onboard), and by the mission objectives and the **Individual's Readiness** to meet those objectives. **Team Composition** is an ongoing consideration as different tasks occur throughout the mission, and it does not end when the crew is assigned.
    - The risk introduced by **Private Astronaut Missions** and space tourists is an unknown and may severely disruptive the entire system. Private Astronaut Missions (PAMs) will not have the same level of Selection, Composition, Training, and/or Countermeasure support vs the professional astronauts.
  - The EIHSA (**HSIA**) Risk influences **Vehicle Design** and systems (**Crew Health and Performance System**), affecting the **net habitable volume** (NHV) and the availability of **Privacy / Team Space**. Both types of spaces (e.g., crew quarters vs. a group dining/work area) influence **Interpersonal Relationships**.
  - **Interpersonal Relationships** are affected by the mix of individuals on the mission (**Team Composition, Behavioral Risk**), the **Team Training** experienced together, the Team Skills they use to support the relationships. Increased **Isolation and Confinement** may exacerbate small frictions and degrade **Interpersonal Relationships**, particularly during longer **Effective Mission Durations**. **Interpersonal Relationships** are a strong predictor of **Team Cohesion**, and how the team provides work and non-work supportive behaviors to coordinate and cooperate (**Social Support, Team Cognition**).
  - **Communication Delays** restrict the degree of **Social Support** provided by **Family, Ground Support**, and psychological support (**BHP Countermeasures**) from experts on Earth. **Team Monitoring** allows experts, team members, or autonomous systems will **Detect Team Performance and Cohesion** changes and may prompt the team to engage in team-supportive **BHP Countermeasures** (e.g., debriefs).