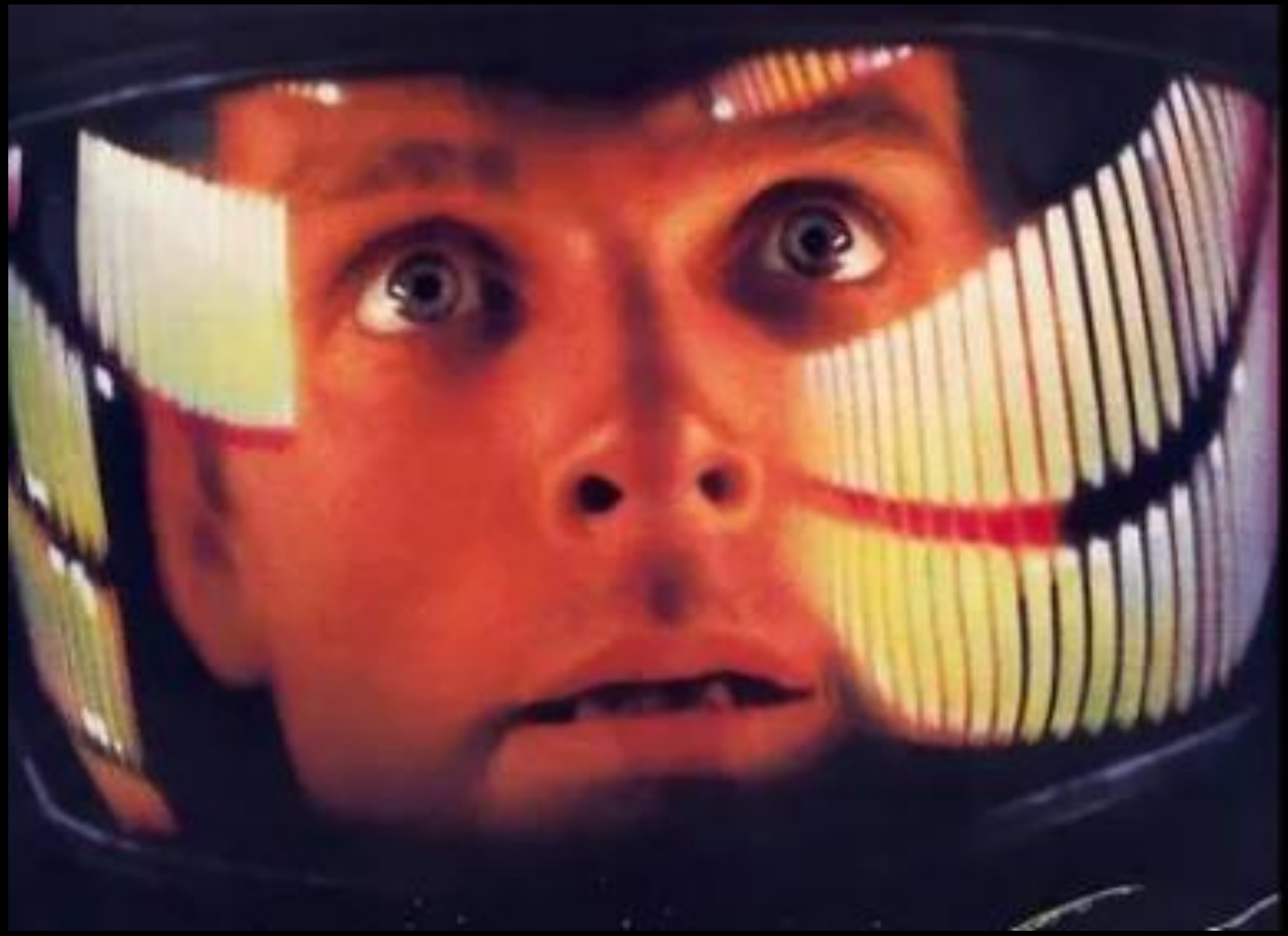
Human Spaceflight: Risky Endeavors Made as Safe as Possible

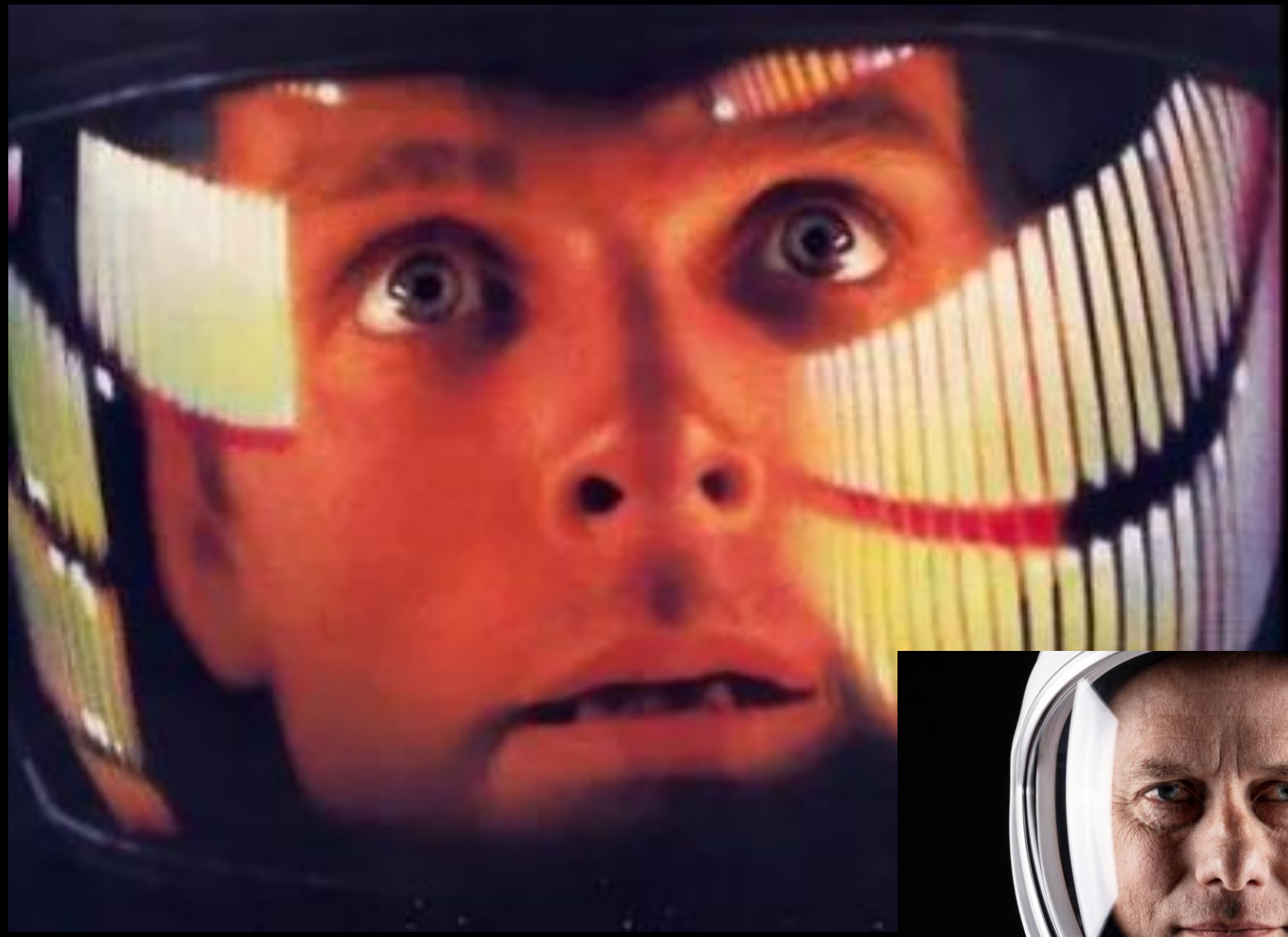
The NASA Crew perspective

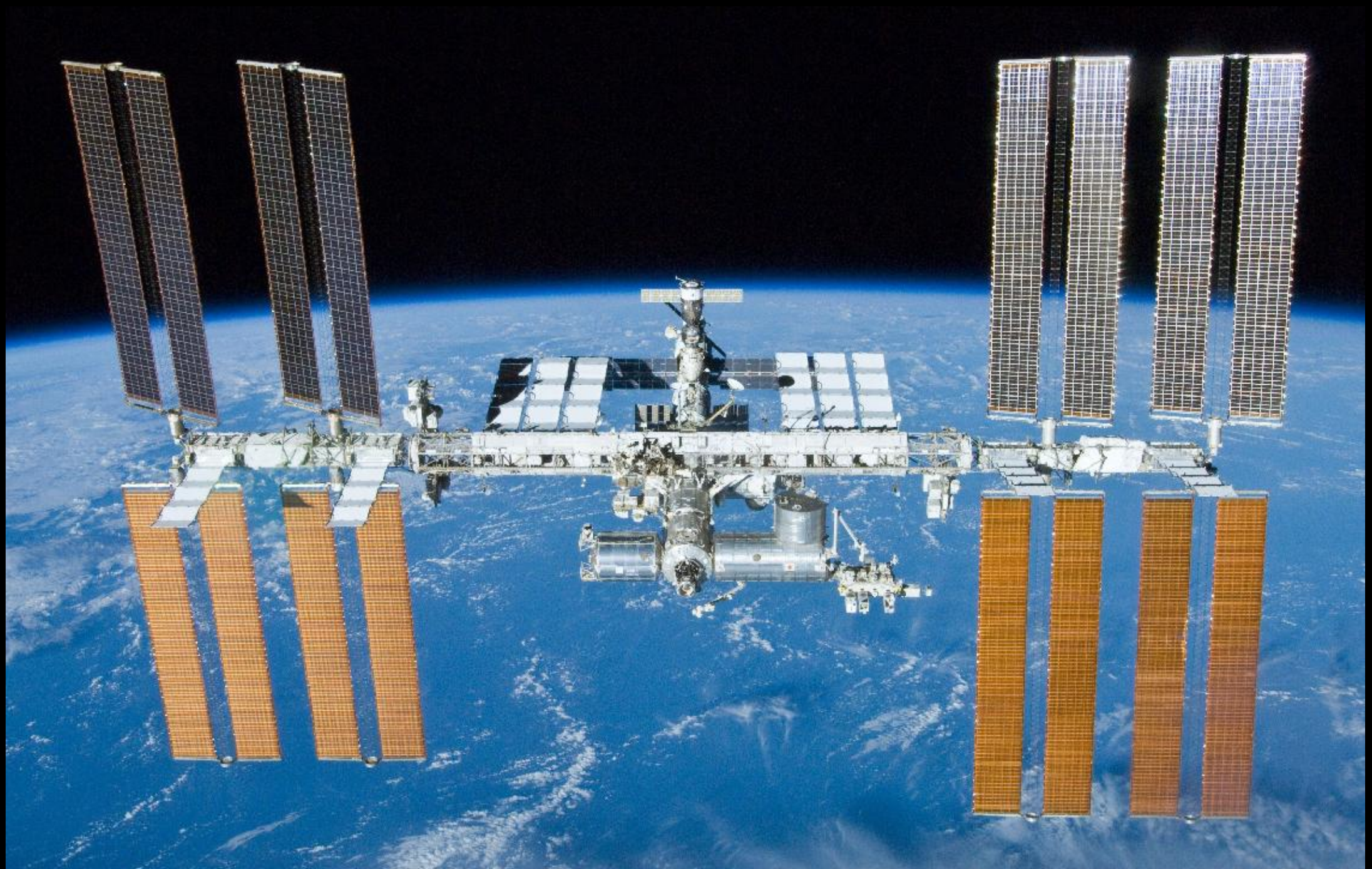
Tom Marshburn MD

NASA Astronaut

VP Human Factors Engineering, Sierra Space








NATIONAL AERONAUTICS & SPACE ADMINISTRATION
NASA
LYNDON B. JOHNSON SPACE CENTER

“To always be aware that suddenly and unexpectedly we may find ourselves in a role where our performance has ultimate consequences”

”


СОЮЗ


BROWN CLARK CHAWLA ANDERSON RAMON


NASA
TOM MARSHBURN
JOE ACABA
JIM DUTTON
SHANNON WALKER
BOBBY SATCHER
CHRIS CASSIDY
RICKY ARNOLD
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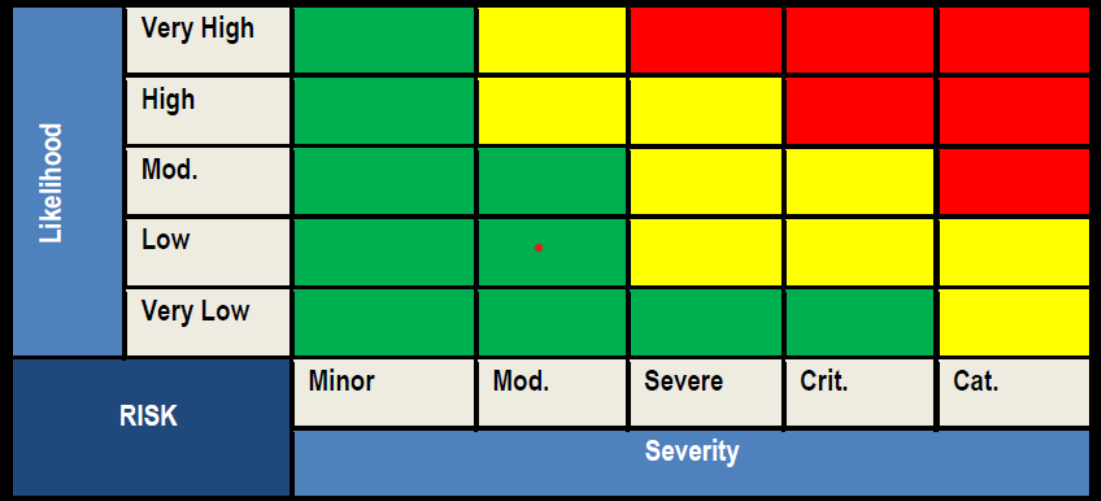
MISSION CONTROL CENTER
PAYLOAD DEPLOY/
RETRIEVAL (PDRS)

Likelihood & Severity

- VH: ~1/100. Nearly certain.
- High: ~1/1000. Highly Likely
- Mod: ~1/10,000. May occur.
- Low: ~1/100,000. Not Likely.
- Very Low: ~1/100,00. Very Unlikely



Criticality Category	Criticality Definition
1	Single failure that could result in LOC or LOV.
2	Single failure that could result in a LOM, delay of mission, or excessive turnaround time.
1R#	Redundant hardware item, which if all failed, could cause LOC or LOV. A number is used to indicate the number of failures that need to occur before LOV occurs (e.g., 1R3 means that three failures need to occur to have a LOV event).
1S	Failure in a safety or hazard monitoring hardware item that could cause the system to fail to detect or combat a hazardous condition, or operate when needed during a hazardous condition, potentially resulting in LOC or LOV.
2R	Redundant hardware item, which if all failed, could cause LOM, delay of mission, or excessive turnaround time.
2O	Hardware item, which if all failed, could cause LOM objective. This designation is made to help the program identify areas of focus that could impact mission objectives. For electrical, electronic, and electromechanical (EEE) part grade this designation is treated the same as criticality 3.
3	All other failures.

Endeavour
United States
Endeavour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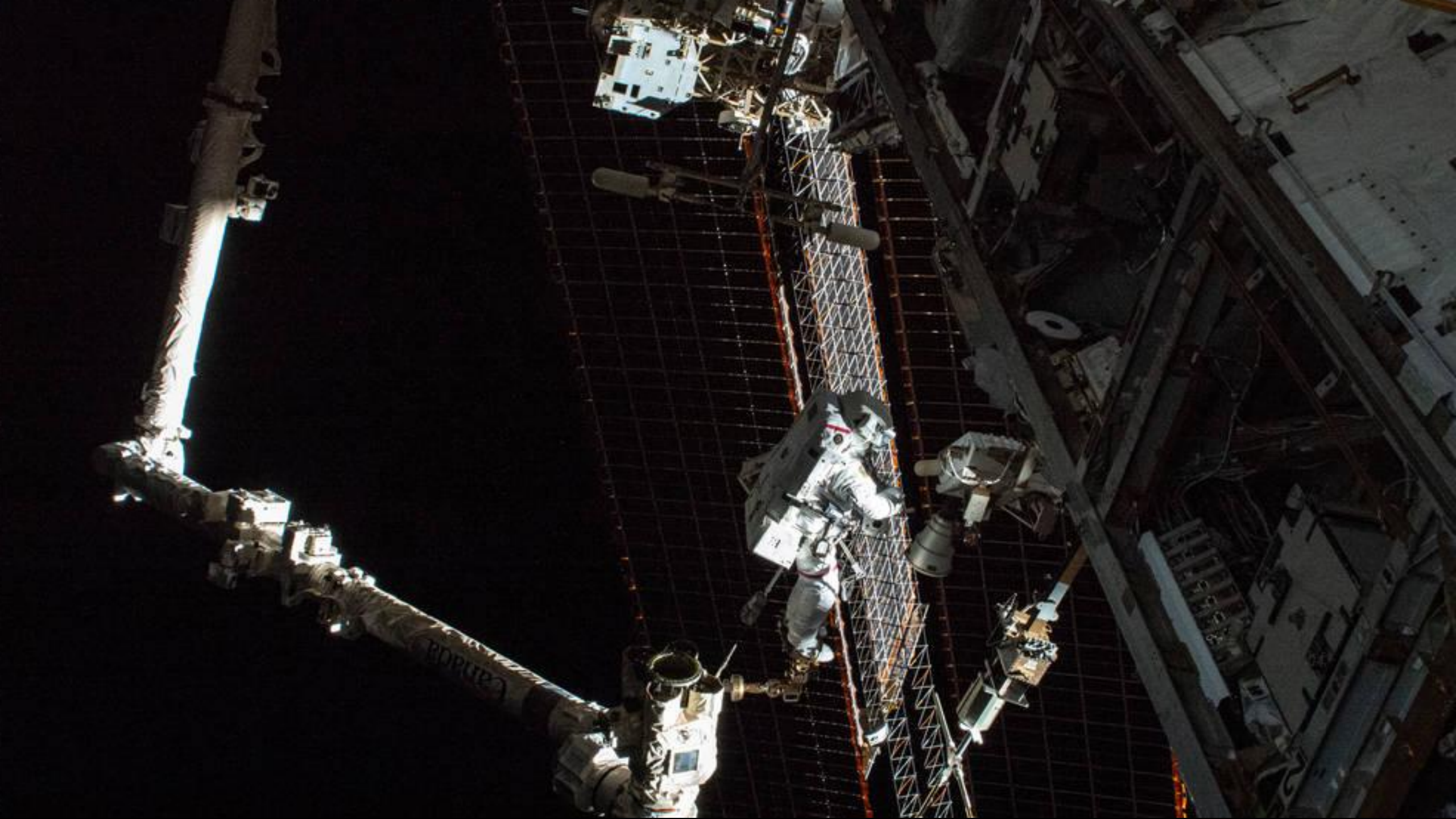


DEMAG

The Foundations of Mission Operations

To recognize that the greatest error is not to have tried and failed, but that in the trying we do not give it our best effort.

- **DISCIPLINE** – Being able to follow as well as to lead, knowing that we must master ourselves before we can master our task.
- **COMPETENCE** – There being no substitute for total preparation and complete dedication, for space will not tolerate the careless or indifferent.
- **CONFIDENCE** – Believing in ourselves as well as others, knowing that we must master fear and hesitation before we can succeed.
- **RESPONSIBILITY** – Realizing that it cannot be shifted to others, for it belongs to each of us; we must answer for what we do — or fail to do.
- **TOUGHNESS** – Taking a stand when we must; to try again, even if it means following a more difficult path.
- **TEAMWORK** – Respecting and utilizing the abilities of others, realizing that we work toward a common goal, for success depends upon the efforts of all.
- **VIGILANCE** – Being always attentive to the dangers of spaceflight; never accepting success as a substitute for rigor in everything we do.