

Roles, authority and shifts: who decides when Earth cannot answer?

Guiding question

Concrete → interfaces → measurement → calculation → failure → recovery.

Course map

The real phenomenon → Vocabulary and problem boundary → Course-specific system view → Mathematical relationship and reading the symbols → Worked calculations and interpretation

1 — The real phenomenon

A Mars mission must define responsibilities, backups, escalation thresholds and emergency authority. Roles may change between normal operations, EVA, medical events, fire and critical failures. Distance requires the crew to act under pre-agreed rules before Earth can advise.

The guiding question is: How do we distribute authority without creating either a decision vacuum or permanent micromanagement? Reasoning starts with the physical or operational function before introducing the mathematical relationship. The goal is not to accumulate terminology, but to know which quantity changes, why it changes and what becomes hazardous when it leaves its domain. For “Roles, authority and shifts: who decides when Earth cannot answer?”, the first task here is therefore to identify the mechanism specific to this subject before searching for an equation or reference value.

2 — Vocabulary and problem boundary

In “Roles, authority and shifts: who decides when Earth cannot answer?”, distinguish the phenomenon, available measurement, any command, the margin and the success criterion. The calculation boundary states what is included and excluded; without that boundary, a percentage, mass or time may be mathematically correct but wrong as an engineering conclusion. For “Roles, authority and shifts: who decides when Earth cannot answer?”, the chosen boundary also states what would otherwise be double-counted or omitted from a mission budget.

decision authority, available information, communications delay, workload, alarms, configuration and action status ambiguous direction, stale information, alarm cascade, incomplete handover or authority conflict crew simulations, real-time procedure runs, communications loss, handover exercises and debriefs

Equation - evidence - decision

Charge_quart = tâches / heures_disponibles

Failure to test: The reference failure is not a vague “broken component.” For “Roles, authority and shifts: who decides when Earth cannot answer?”, test in particular ambiguous direction, stale information, alarm cascade, incomplete handover or authority conflict. Diagnosis asks which symptoms appear first, which are only consequences and which action preserves the most options.

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3 — Course-specific system view

This lesson does not reuse one generic picture for every subject. The system view follows cause → measured quantity → decision or physical response → limit for “Roles, authority and shifts: who decides when Earth cannot answer?”. The English text remains fully equivalent while large translated illustrations are intentionally deferred until their dedicated artwork is supplied. For “Roles, authority and shifts: who decides when Earth cannot answer?”, the system view must expose inputs, outputs, measured quantity and the consequence of drift without relying on a generic module diagram.

4 — Mathematical relationship and reading the symbols

Read aloud : average shift load can be represented by task count or effort divided by available hours.

Before substituting numbers, write the unit of every term, state whether the relationship is a physical law, approximation or project indicator, and check dimensional consistency. This is especially important here because “Roles, authority and shifts: who decides when Earth cannot answer?” combines quantities that do not all have the same evidence status. For “Roles, authority and shifts: who decides when Earth cannot answer?”, this relationship is chosen because of the phenomenon under study; a different dominant quantity would require a different equation or model.

5 — Worked calculations and interpretation

$24 \text{ tasks} \div 8 \text{ h} = 3 \text{ tasks/hour on average}$

$3 \text{ shifts} \times 30 \text{ min} = 90 \text{ min/day of handover}$

Two qualified people for a critical function → one single unavailability covered

1. 1. Load $24 \text{ tasks} \div 8 \text{ h} = 3 \text{ tasks/hour on average}$ Interpretation: this result is used only after comparison with units, margin and the scenario boundary for “Roles, authority and shifts: who decides when Earth cannot answer?”.
2. 2. Handover $3 \text{ shifts} \times 30 \text{ min} = 90 \text{ min/day of handover}$ Interpretation: this result is used only after comparison with units, margin and the scenario boundary for “Roles, authority and shifts: who decides when Earth cannot answer?”.
3. 3. Backup staffing Two qualified people for a critical function → one single unavailability covered Interpretation: this result is used only after comparison with units, margin and the scenario boundary for “Roles, authority and shifts: who decides when Earth cannot answer?”.

6 — What the formula does not contain

Operational table

Phenomena / sections:	3 — Course-specific system view ; 4 — Mathematical relationship and reading the symbols ; 5 — Worked calculations and interpretation
Relationship to revisit:	$\text{Charge_quart} = \text{tâches} / \text{heures_disponibles}$
Expected decision:	measure → compare with margin → choose nominal, degraded or stop

Check before continuing

Explain without rereading: 3 — Course-specific system view ; 4 — Mathematical relationship and reading the symbols ; 5 — Worked calculations and interpretation. State one measured quantity, one margin and one possible decision.

Roles, authority and shifts: who decides when Earth cannot answer?

The relationship “Charge_quart = tâches / heures_disponibles” does not by itself contain all of “Roles, authority and shifts: who decides when Earth cannot answer?”. It does not automatically tell us whether a sensor is valid, a structure is aging, a resource is accessible, a command arrives in time or a secondary failure removes margin. The example $24 \text{ tasks} \div 8 \text{ h} = 3 \text{ tasks/hour}$ on average therefore remains a local calculation rather than a complete architecture.

To make the model useful, explicitly add the quantities that dominate this subject: decision authority, available information, communications delay, workload, alarms, configuration and action status. We can then ask which variation truly changes the result, which is negligible and which forces an architectural change. For “Roles, authority and shifts: who decides when Earth cannot answer?”, this model limitation states exactly what a correct calculation still cannot establish about the real system.

7 — Instrumentation, observability and data quality

For “Roles, authority and shifts: who decides when Earth cannot answer?”, observability relies on decision authority, available information, communications delay, workload, alarms, configuration and action status. Each datum has a unit, acquisition rate, uncertainty, timestamp and validity domain. A value arriving without context can be more dangerous than no measurement because it creates unjustified confidence. Consistency is checked with at least one independent piece of information when the function is critical. A trend, physical balance or second measurement principle helps distinguish a real system change from a drifting sensor. For “Roles, authority and shifts: who decides when Earth cannot answer?”, the selected instrumentation must distinguish a real physical change from sensor drift or a bad state estimate.

8 — Phenomenon-specific failures and recovery

The reference failure is not a vague “broken component.” For “Roles, authority and shifts: who decides when Earth cannot answer?”, test in particular ambiguous direction, stale information, alarm cascade, incomplete handover or authority conflict. Diagnosis asks which symptoms appear first, which are only consequences and which action preserves the most options.

The degraded mode must be defined before failure: minimum function, allowable duration, consumed stock, crew action, abort condition and return-to-nominal criterion. That sequence is topic-specific and cannot be replaced by one universal paragraph about redundancy. For “Roles, authority and shifts: who decides when Earth cannot answer?”, the degraded mode is defined around the minimum function specific to this subject, with an abort threshold and a return-to-nominal condition.

Operational table

Phenomena / sections:	7 — Instrumentation, observability and data quality ; 8 — Phenomenon-specific failures and recovery
Relationship to revisit:	Charge_quart = tâches / heures_disponibles
Expected decision:	measure → compare with margin → choose nominal, degraded or stop

Check before continuing

Explain without rereading: 7 — Instrumentation, observability and data quality ; 8 — Phenomenon-specific failures and recovery. State one measured quantity, one margin and one possible decision.

Roles, authority and shifts: who decides when Earth cannot answer?

9 — NASA / reference case

Human-system standards, CHAPEA and communications-delay research provide reality checks. They show why a distant crew must decide locally, preserve a shared state, manage fatigue and errors, and use Earth as depth of expertise rather than an instantaneous remote control.

The case is used only within what it actually demonstrates. Flight measurement, human-system standard, component test and architecture study are different kinds of evidence; the text therefore states what is observed, calculated, simulated or still prospective. For “Roles, authority and shifts: who decides when Earth cannot answer?”, the cited NASA case is used as targeted evidence for this phenomenon and is never turned into one universal Mars architecture.

10 — Architecture trade

A good solution for “Roles, authority and shifts: who decides when Earth cannot answer?” does not maximize one metric. Compare nominal performance, mass, energy, simplicity, maintenance, crew time, common dependencies and recoverability. An option that improves 3 shifts × 30 min = 90 min/day of handover can still be rejected if it makes failure detection or repair much harder.

The trade is recorded together with its assumptions. If environment data, mass or mission cadence changes, we know which conclusions must be recomputed instead of silently preserving an obsolete choice. For “Roles, authority and shifts: who decides when Earth cannot answer?”, the trade is evaluated against the interfaces actually touched by this subject rather than a generic list of desirable qualities.

11 — Demonstration, testing and success criteria

The evidence strategy for “Roles, authority and shifts: who decides when Earth cannot answer?” combines crew simulations, real-time procedure runs, communications loss, handover exercises and debriefs. Every test records exact hardware, software, configuration, environment, tolerances and success criterion. A successful demonstration outside the mission domain does not replace qualification inside it.

Evidence grows by levels: analytical relationship, simulation, component, subsystem, integrated system, duration and failure. This hierarchy prevents one spectacular test from being presented as validation of the whole mission. For “Roles, authority and shifts: who decides when Earth cannot answer?”, demonstration must reproduce the constraints that make this phenomenon difficult; a spectacular test outside the mission domain is insufficient.

Operational table

Phenomena / sections:	9 — NASA / reference case ; 10 — Architecture trade ; 11 — Demonstration, testing and success criteria
Relationship to revisit:	Charge_quart = tâches / heures_disponibles
Expected decision:	measure → compare with margin → choose nominal, degraded or stop

Check before continuing

Explain without rereading: 9 — NASA / reference case ; 10 — Architecture trade ; 11 — Demonstration, testing and success criteria. State one measured quantity, one margin and one possible decision.

Roles, authority and shifts: who decides when Earth cannot answer?

12 — Decision exercise

Situation: revisit “Roles, authority and shifts: who decides when Earth cannot answer?” with a 20% increase in the most penalizing quantity from the first worked example while one measurement or backup path is unavailable.

Situation: revisit “Roles, authority and shifts: who decides when Earth cannot answer?” with a 20% increase in the most penalizing quantity from the first worked example while one measurement or backup path is unavailable. Expected answer: recompute the relationship, identify remaining margin, check whether observability is still adequate, and decide whether degraded operation remains acceptable. Multiplying by 1.2 is not enough if the variation also changes interfaces or limits.

13 — What to retain without over-generalizing

14 — Topic-specific primary sources

These references directly document the phenomenon, technology or human constraint addressed in this lesson. They do not by themselves define an official Mars architecture. For “Roles, authority and shifts: who decides when Earth cannot answer?”, the bibliography is deliberately targeted to this page so that readers can trace each claim back to the relevant primary document.

Topic-specific primary sources

NASA NTRS — Space Flight Resource Management for ISS Operations - <https://ntrs.nasa.gov/citations/20110010923>

NASA — NASA Spaceflight Human-System Standard Volume 2 - <https://www.nasa.gov/reference/nasa-std-3001v2/>

NASA NTRS — Overview of Crew Operations for Transit to Mars - <https://ntrs.nasa.gov/citations/20230012629>

Operational table

Phenomena / sections:	12 — Decision exercise ; 13 — What to retain without over-generalizing ; 14 — Topic-specific primary sources
Relationship to revisit:	Charge_quart = tâches / heures_disponibles
Expected decision:	measure → compare with margin → choose nominal, degraded or stop

Check before continuing

Explain without rereading: 12 — Decision exercise ; 13 — What to retain without over-generalizing ; 14 — Topic-specific primary sources. State one measured quantity, one margin and one possible decision.