

SITUATION APOLLO 13

You are the chief engineer for moon mission Apollo 13. Half way through the journey a flow valve malfunctioned and two of four oxygen tanks exploded, damaging vital components including power reserve. This forced the crew to abandon the mission and return to earth. The crew has only 13 amps of continuous power available. For reentry to Earth's surface, vital components must be loaded. Your task as a chief engineer for this mission is to arrive at a safe step by step procedure which will enable the crew to return safely. The procedure should be send via a weak communication link, which supports only one way communication with no feedback. Therefore the procedure must be tested ok with a simulator first.

DETAILS OF MODULES THAT ARE AVAILABLE

The vehicle has two modules (Lunar module and command module) each with its own sub modules.

Sl. No.	Lunar module		Command module		Description
	Sub modules	Current Demand	Sub modules	Current Demand	
1	Communication system	4 amp	Communication system	5 amp	Responsible for communication with Earth station(Must not be disabled)
2	Thrusters	2 amp	Thrusters	3 amp	Responsible for navigating through space(Using of thrusters reduces the continuous power available to 10 amps permanently)
3	Gyroscope	3 amp	Parachutes	5 amp	Gyroscope-calibration of navigation computer
					Parachute-For safe landing.(Must be enabled as the final step.)
4	Airlock	5 amp	Navigation computer	6 amp	Enabling airlock separates Lunar module from the Command module
					Navigation computer-controls both thrusters and gyroscope.

CONSTRAINTS

- ⤴ Initially the Lunar communication module alone is enabled.
- ⤴ A maximum of 13 steps in the procedure.
- ⤴ Maximum power usage should not exceed 13 amps.
- ⤴ At least one of the communication modules should be active at a given time.
- ⤴ Enabling of thrusters is mandatory for reentry pitch alignment.
- ⤴ Gyroscope must be used for calibrating orientation before enabling the thrusters.
- ⤴ Navigation computer controls the thrusters and the gyroscope. It must be active for turning on and off both thrusters and gyroscope.
- ⤴ Once the thruster is enabled, the continuous usage limit decreases from 13 amps to 10 amps (permanently).
- ⤴ Before the parachutes are enabled the airlock must be activated to separate and abandon Lunar module.
- ⤴ Once Lunar module is disabled, no lunar- sub-modules can be loaded.
- ⤴ Parachute must be enabled at the end only.

PROCEDURE SYNTAX

- ⤴ A statement consists of 3 letters.
- ⤴ First letter is either E or D. (i.e To Enable or To Disable)
- ⤴ Second letter is either L or C.(L for Lunar module, C for Command module)
- ⤴ Last letter is a digit which represents the serial number of sub modules.
- ⤴ for example EL1- Enable Lunar Communication module,
- ⤴ DL1- Disable Lunar Communication module.
- ⤴ EC4- Enable navigation computer.(in Command module)