Space Careers Wayfinder

Humans in Deep Space

Background

From the second a crew enters a space craft, they are faced with countless hazards and challenges. Even before the craft leaves the Earth's surface, they find themselves atop huge cylinders filled with highly flammable fuels, typically around 400,000 kilograms or 300,000 litres. As the craft accelerates to a top speed in excess of 40,000 km/h, crew members experience a gravitational force around 3 G – this is three times the force normally felt on the earth's surface.

Once off the ground, the crew face higher levels of radiation, the effects of microgravity, hostile space environments etc.

The task

Use the internet and other sources to complete the following table, identifying the hazards and challenges faced by a crew in deep space. These might have physiological and psychological effects. Describe how the risks are minimised.

Hazard/Challenge	Effect/Impact	Mitigation
Launch pad potential explosion/fire	Fatality, critical or severe injury.	Mission abort protocol. Launch pad water deluge systems.
Radiation		Forecasting the sun's solar energetic particle ejections. Magnetic shields.
	Reduced flow of blood to the eyes. Reduced flow of blood to the head with possible blackout.	Gravity suit which contains an air bladder. Air bladder inflates preventing blood pooling in the feet and legs.
Collision with other objects in space	Fatality, critical or severe injury.	
Microgravity		Aerobic and resistive exercise. Pressure cuffs/lower body negative pressure suit.
Hostile environment (Temperature and vacuum in deep space)	Air drawn from lungs causing suffocation, water in the body would boil with swelling of body tissue.	
Isolation		Psychological screening and rigorous assessment including Temperament Structure Scale (TSS) and a NEO Personality Inventory-Revised (NEO PI-R) Intensive training in space analogue environments.
	Injury, illness, possible fatality.	Training SMART medical systems including telemedicine. Flight surgeon who overseas health care and medical training of crew, and conducts weekly private medical conference with each crew member.
Water and food	Starvation, dehydration potentially fatal consequences.	
Breathable air and essential items		Initially liquid oxygen in tanks eventually splitting water into hydrogen and oxygen, air filtration system. Exercise equipment etc.
Personal hygiene and bodily functions	Dental caries, unpleasant odours, bacterial infections	
	Life support systems fail, means of manoeuvring space craft lost.	Solar panels, batteries, fuel cells.
Navigation	Spacecraft and crew lost indefinitely resulting in fatality, collision with another object.	
Communication		Deep Space Networks, development of optical communication systems using laser technology.