The Future of Space Safety

Emily L Bulick[1], Sean R Marcoz[2], Gerard C.R. Moore[3], Abraham J Mow[4]

Introduction

- Outer space is the great unknown and many things can go wrong that must be planned far ahead of time
- The astronauts must consent to the risk they are undertaking
- In the past the challenger accident was a wake-up call hence, NASA increased its safety procedures

Safety Protocols on the ISS

- Crew members are trained on fire drills, cleanup activities, Automated External Defibrillator (AED), inspections, hazard communication, and emergency response

Personal Protective Equipment (PPE)

- Laboratory Environment
- Splashproof goggles
- Gloves & mask

Housekeeping

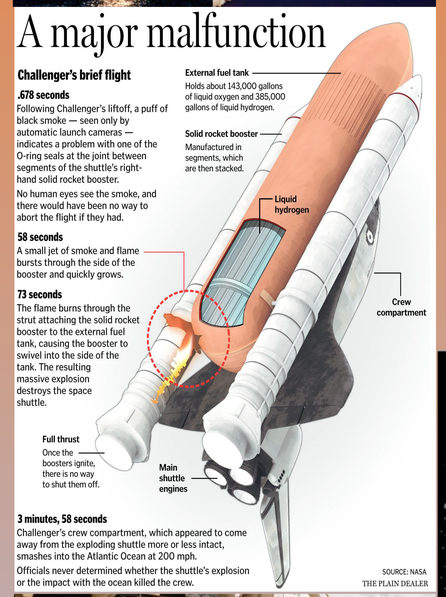
- Important for the continuation of a safe and healthful work environment
- Cleansing of frequently used surfaces
- Cleaning of computers and other technology to prevent over heating (vents)
- Eliminating dust accumulation (provides airflow)
- Keeping ignition sources & flammable material separate

Safety Walkthroughs

- Allows for people trained in identifying hazards through watching videos. This occurs every 6 months throughout the entire interior of the ISS
- The video is evaluated by engineers on the ground to instruct astronauts to make necessary changes

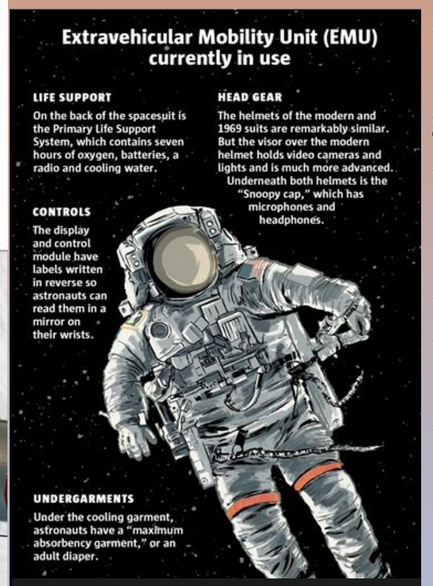
Safety Before and After Mission

- Before leaving and after returning the crew is put into quarantine for 14 days
- Also included with the crew is a doctor in case of any problems



The Challenger

- Launched 01/28/1986
- The shuttle exploded 73 seconds after launching killing the 7-person crew
- The launch was delayed a few days from the original date of launch
- Florida suffered a severe ice storm which reduced the resiliency of 2 rubber O-rings which caused the explosion
- Florida's average Jan temp is 58° F whereas the temp at the time of launch was 28° F



Safety during Takeoff

- Launch Abort System (LAS)
  - Capsule can be separated from the main rocket during takeoff if needed
  - Parachutes will deploy and safely bring the capsule back to Earth's surface
- Pad Abort
  - System that carries the crew away from the launchpad during an engine malfunction

Safety during Flight

- Collision Avoidance
  - One spacecraft will change its course while the other spacecraft maintains its current course

Safety during Landing

- Same LAS can be used when descending back to Earth
  - Diverts away from freefalling rocket

Spacewalks (Extra Vehicular Activities, EVA)

- Work includes exterior repairs, installing equipment, and doing experiments that require the skill and dexterity that robots cannot do
- EVA's are performed during minimal solar activity
- Tasks are physically demanding due to the pressurized resistance of the suits
- Astronauts are in constant contact with crew and ground control
- Astronauts use handrails for exterior movement, tethered onto at least one place, and are equipped with a jetpack in case of an emergency

Space Craft Safety

NASA gives certification based off the design of the spacecraft

- NASA requires two demo flights to the ISS, one unmanned and the other manned
- Crafts must include 5 systems that support the safety of the crew

Conclusion

- Through our research we concluded that NASA values human life more than the overall cost of these missions
- This is seen in the uncountable technological advances, procedures, programs and guidelines in place
- Without NASA's commitment to safety more accidents like the challenger explosion could happen

Sources: https://www.masterclass.com/articles/what-is-a-spacewalk-learn-why-astronauts-perform-spacewalks-and-how-astronauts-train-for-spacewalks#what-kind-of-spacesuits-are-required-for-spacewalks, https://www.britannica.com/event/Challenger-disaster, https://www.nasa.gov/feature/top-five-technologies-needed-for-a-spacecraft-to-survive-deep-space, https://www.wired.com/story/how-nasa-certifies-new-spacecraft-safe-enough-for-humans/, https://sma.nasa.gov/docs/default-source/safety-messages/safetymessage-workplacesafetyoniss-2015-10-05.pdf?sfvrsn=44be5f8_2

Department of: 1 Political Science 2 & 3 Safety Management 4 Business Management

This is a project for Dr. Mukherjee's Space Science class