

Re-entry Parachute System

- Designed to ensure a safe landing of the lunar samples
- Consists of multiple drogue parachutes and 3 main parachutes
- The drogue parachutes are of length 30m and are approximately 4m in diameter each.
- Drogue parachutes are designed to stabilise the sphere during descent and establish proper conditions for main parachute deployment
- The main parachutes are of length 80m and are around 35m in diameter each
- Designed to slow the velocity of the inner sphere for safe landing
- Redundancy: a safe landing is possible even with a single drogue and single main parachute failure

Outer Sphere

- The outer sphere is not required to land back on the Earth surface
- Complete outer sphere burns away and all that remains is the heat-shielded inner sphere
- Burn-up begins around the Karman Line (100km) in altitude
- Experiences convective and radiative heating
- Reaches a temperature of approximately 3000 degrees Celsius

The Sphere

1.3m

AOCS Thrusters

- Decrease re-entry speed
- Provide attitude and trajectory corrections throughout the entire mission

Solar Panels

- Purpose is to provide power throughout the full mission
- Photovoltaic cells for power generation
- Burn up fully upon atmospheric re-entry

Cut-out Showing Inner Sphere

- Purpose is to protect the cargo bay during the searing heat of atmospheric re-entry
- The cargo bay contains 1kg of Moon dust and rocks
- Thermal Protection System - Ablative heat shield
- Shield is made from plastic resin - the outer surface of which is heated to a gas, which then carries the heat away by convection

Re-entry Operations

- Pyrotechnic ejection system used in LEO to release from Primary Module
- Re-entry velocity is approximately 11km/s
- Peak heat occurs at approximately 50km in altitude and infrared tracking begins
- At 30km in altitude the drogue parachute deploys - the sphere is directly over the target
- At 7km in altitude the main parachute system's initial inflation occurs
- Several seconds later the main parachute system disreefs
- A locator beacon is deployed and begins transmitting
- Sphere velocity upon landing is $\approx 4\text{m/s}$.
- The collection process begins (inner sphere containing cargo bay with lunar samples)
- It takes ≈ 14 mins from first contact with the atmosphere until Pacific Ocean landing
- The moon rocks are removed from the cargo bay within clean rooms for testing