

**ABOVE** The full configuration of the Command and Service modules, showing the SPS engine and the launch escape assembly (on the left) which is secured to the apex of the CM during launch. (NASA)

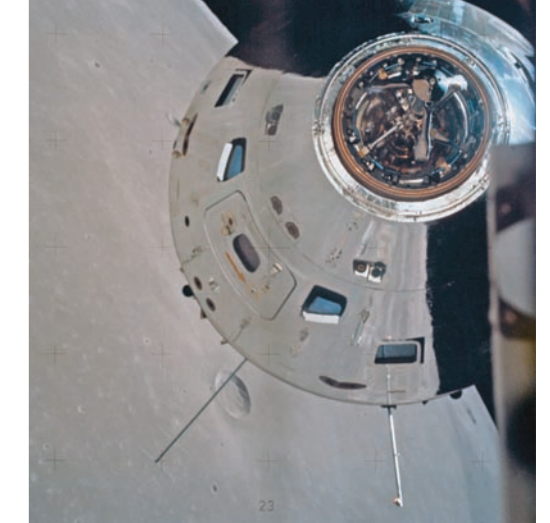
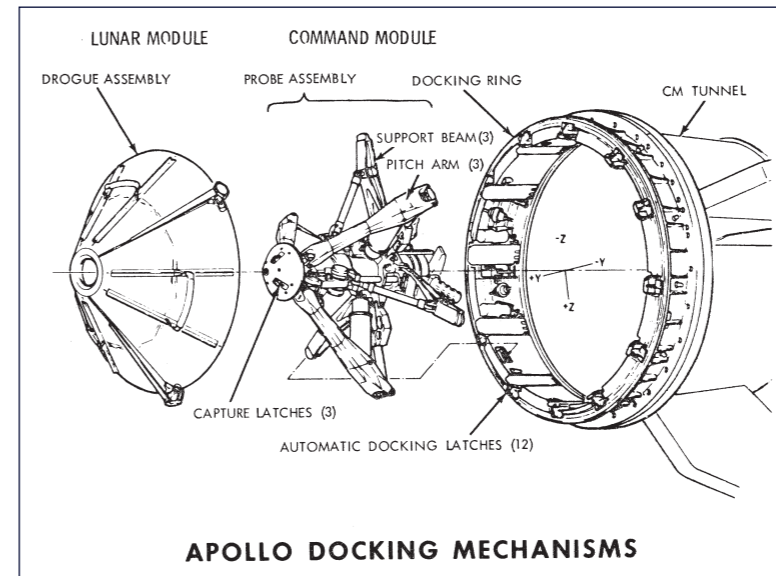
become known as the Command and Service Modules or CSM.

## Command Module

The blunt-ended, conical Command Module (CM) was constructed from two shells separated by insulation material. The inner airtight pressure shell was built from a lightweight double-skinned aluminium alloy and the outer skin from a steel honeycomb substructure onto which was bonded fibreglass honeycomb whose cells were filled with an epoxy resin. This outer layer acted as a full wrap-around heat shield and micro-meteorite protection layer. This

heat shield protection would be thickest at its base where the most severe heat of re-entry would be focused. The outer skin would also accommodate small rocket thrusters, communications antennae and a couple of ports from which to expel waste water and urine.

The top of the cone housed a removable docking mechanism to mate with the lunar lander. This precisely engineered mechanical device had to have the refinements of a Swiss watch and yet be strong enough to absorb the momentum of a rolling railway carriage. On top of this the mechanism also had to be removable, to provide astronaut access between the two spacecraft once they had



**LEFT** The docking mechanism – known as the ‘probe and drogue’ assembly – housed in the apex of the CM. (NASA)

**ABOVE** A view of the probe and drogue assembly on the nose of the CM during the flight of Apollo 17. (NASA)

docked. The section around the docking tunnel also carried the Earth Landing System (ELS), including the drogue and main parachutes and their pyrotechnic deployment charges.

The lower part of the Command Module, forming the wider base of the cone, was mostly occupied by the pressurised crew compartment and housed all the electronic equipment they needed to operate and fly the spacecraft.

## The crew compartment

A glance inside the Apollo Command Modules housed in museums today (see Appendix) suggests that they were cramped and cluttered places to live in for ten days; but in the zero gravity of a space flight the crews found them

relatively spacious compared to a Gemini or Mercury capsule. The actual space available to float around in was 210 cubic feet, which was equivalent to being inside a large family car.

There was also the luxury of five windows: a circular one 9 inches in diameter in the main hatch door, two large ones 13 inches square either side of the hatch, and two triangular windows 13 x 8 inches in size facing forward. All five windows were made with triple layers of glass, the outer one almost 3/4 inch thick. The glass was designed to filter out infra-red and ultra-violet light and could withstand temperatures of 1,500°C. Some missions used windows made from quartz which transmitted UV light to allow UV photography.

**BELOW LEFT** The main components of the Apollo Command Module pressurised crew cabin and heat shields. (Matthew Marke)

**BELOW** The inside of Command Module ‘America’ (CM-114) – from Apollo 17 – currently on display at the Johnson Space Center visitors’ centre. (Duncan Copp)

