

The Design of Orion's Crew Module

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Abstract: Orion Multi-Purpose Crew Vehicle (MPCV) is meant for human exploration beyond the Earth which is currently under development by NASA. It can take us to destinations which involves a lot of science like the asteroids, the Mars and it will also bring back the astronauts on-board or to send the cargo to the International Space Station. The first test flight (un crewed) was launched by NASA on December 5, 2014 using a heavy rocket Delta IV, which was successful.

The designing of Orion's crew module has basic elements from the Apollo Command Module (ACM) which took the human race to the moon. It has more advanced technologies than that of ACM. It is a reusable transportation capsule. It is a habitat, the docking port for the crew at the same time.

It is estimated that by early 2020's or 2030's, the Orion will take the human race to the Mars which will be a giant leap in the history of Mankind.

Keywords: Spacecrafts, Mars, Astronauts, ISS, Rockets, Habitat centre.

I. Introduction

Scientists believed that the Universe is 13.7 billion years old. The Universe is Infinite, Static and Timeless. It is made up of all matter and energy. The atoms combine together and form giant celestial bodies, stars, meteoroids, asteroids and dust particles.

We humans are curious. Out of curiosity, we are discovering many breath taking facts about the Universe. The race for space exploration^[1] has begun since 1957 by launching Sputnik 1 into the Earth's orbit by the Roscosmos (The Russian Soviet Union's Space Organization). It was the first artificial satellite for the Earth. Cosmonaut Yuri Gagarin was the first person to fly into space. Later, NASA Astronaut John Glenn was the first American to orbit the Earth. NASA started "The Apollo Program^[2]" (1961-1972) which was the first Manned Lunar landing program. On July 20, 1969 The Apollo 11 which successfully took the NASA Astronauts Neil Armstrong and Buzz Aldrin to the Moon and returned to the Earth safely. This lunar landing grabbed the attention of millions of people. The launch was broadcasted live throughout the world. Like this, the Space exploration has begun. Today, we are looking out for deeper exploration of Space.

Orion spacecraft^[3] was originally a part of NASA'S Constellation Program^[4]. It has brilliant technologies. It is capable to do multiple tasks. It can take us to MARS. Mars is our next destination. Even in the adverse conditions, it can support the survival of human life.

II. The Orion's Crew Module

2.1 Orion is a Master Piece:



Fig 1: Launch Configuration.

We humans have built spacecrafts, which travelled above the LEO (Low Earth Orbit) and studied a lot of science. So, why is Orion a Masterpiece? The Orion MPCV is a versatile spacecraft. It has highly advanced technologies compared to any other space craft's.

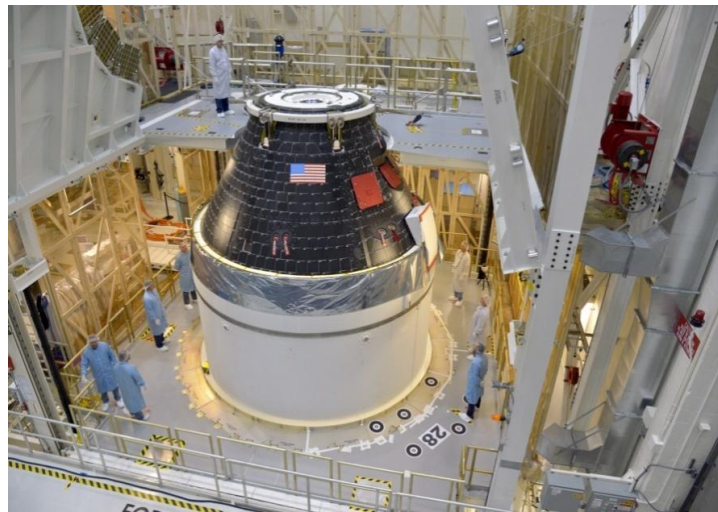


Fig 2: The Crew Module.

2.2 The Design of Orion's crew module:

The Orion MPCV is manufactured by Lockheed Martin Corporation. ^[5]Its module is 57.5 degrees frustum shaped.

Specifications:

Crew Capacity: 2-6

Dimensions; 3.3 meters in length, 5.02 meters in diameter.

Mass:8.5 metric ton.

Volume: Pressurized: 691 cu ft, Habitable: 316 cu ft.

Its crew module design is just as similar to that of Apollo's Command Module (ACM) ^[6]. It will have 50% more volume than ACM.. It can take 4-6 Astronauts to explore deep space for longer durations.(1000 days).It's shield protects the crew from all kind of radiations. It has a great support system for the survival of the crew. It has a thermal protection and it also maintains normal temperatures inside the module no matter whether the temperatures are very high or very low in the outer space. It is a reusable transportation capsule. It is a habitat center and also the docking port for the crew. The crew module is the only module of MPCV that will return to Earth after each expedition.

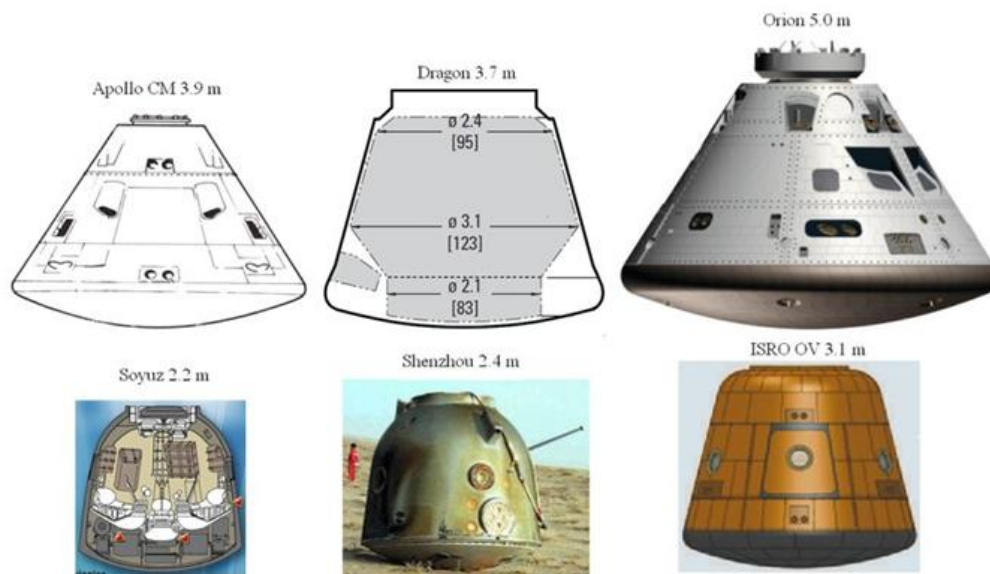


Fig 3: Different types of Crew modules.

NASA has chosen Avcoat ablator system for the Orion's heat shield. This avcoat was also used during the earliest space flights like Apollo. When the capsule returns to Earth, the heat shield must be able to safeguard the crew from any danger.



Fig 4: Abort Concept of Operations.

The module will encounter very high temperatures before the splash down. The CM will be constructed using aluminum-lithium alloy. It also has Launch Escape System (LES) so that the astronauts can safely get back. It is believed that the Orion will be 10 times more safer during the lift-off and re-entering the atmosphere. The first test flight (un crewed) was launched by NASA on December 5, 2014 using a heavy rocket Delta IV, which was successful. For the recovery of Orion crew module NASA has chosen water landings (splash down). The module is later recovered by the US Navy.



Fig 5: The Orion's Splash Down.

III. Conclusion

The Orion has brain storming design and technologies. It is a multipurpose crew vehicle. Till date we have seen different types of spacecrafts and its working but, Orion is unique. It has advanced computer systems which can handle extreme conditions like during the ascent, re-entering, heat, all types of radiations. By 2020'S -2030'S this Spacecraft is all set to make history by taking the human race to the most fascinating destinations like the MARS ! The current expedition crew on the ISS is studying about everything that is needed to explore the MARS in near future. This Spacecraft could be the first ever "Manned Mission to be launched on the Martian Surface."

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