

# NASA's new spaceship

By Colin Johnston, Science Communicator

At the end of August 2006 NASA formally named its planned new Crew Exploration Vehicle and selected a contractor to build the craft. As predicted, the CEV, which will replace the Space Shuttle, is now the Orion spacecraft. It will be constructed by aerospace giant Lockheed Martin after a rival bid from a consortium of Northrop-Grumman and Boeing was rejected. Many consider Lockheed-Martin a surprising choice as this corporation has a perceived history of being awarded space vehicle development contracts which fail to deliver a successful final product. For example, in the 1990s Lockheed Martin was contracted to produce the X-33, a spaceplane which was the basis of an earlier project to replace the Space Shuttle. Sadly, the company appeared to have grossly underestimated the difficulty of the project and the craft was never completed. Presumably they have now somehow regained NASA's confidence after this fiasco.

The Orion development contact is to last seven years and is worth \$3.9 billion, a surprisingly small amount. This is not as fatuous as it sounds, compare this sum to the \$28 billion budgeted for the development of another Lockheed Martin product, the USAF's F-22 fighter jet or the 49 billion euros spent last year on subsidizing the EU's farmers.

## Orion is not a sleek spaceplane

The spacecraft's very conservative basic concept has already been criticized. It is not a sleek, futuristic spaceplane. Instead each Orion will bear a strong visual resemblance to the historic three-seat Apollo spacecraft, but is considerably bigger, being about 5 m (16.5 feet) in diameter, with a mass of about 25 tonnes. In comparison, an Apollo was 3.9 m in diameter and weighed 30 tonnes- the Orion's internal volume is about

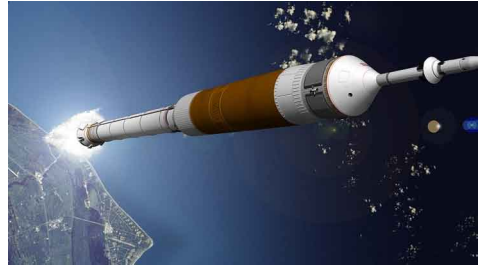


Image Credit: NASA, John Frassantio and Associates

**Orion shall rise** A NASA artist's view of an Ares 1 booster sending an Orion capsule into orbit. Orion missions will be launched from the Kennedy Space Center in Florida

150% more than that of the Apollo capsules. An Orion will be constructed from modern Aluminium-Lithium alloy, helping to make it lighter and tougher than the Apollo capsule, and will utilize the latest electronic and computer technology based on the systems fitted to the advanced Boeing 787 airliner. Much to the relief of crews who may have to spend days on board, the craft will be fitted with a unisex lavatory permitting a degree of privacy (in the interests of good taste, the hygiene facilities onboard Apollo are best left undescribed).

An Orion will be launched on an Ares 1 rocket and carry up to six astronauts (or cargo) to the ISS. Alternatively, an Orion with up to four crew members could rendezvous in orbit with a Lunar Surface Access Module (LSAM) and booster stage launched earlier by an Ares 5 heavy lift rocket. After linking up the combined spacecraft could take the astronauts to the Moon's surface and back again. Looking further into the future, an Orion would certainly be capable of travelling to a near Earth asteroid or may play a part in a possible mission to Mars. For all missions, the Orion's command module will descend on parachute to a landing site in the western US, with air bags or retro-rockets cushioning the final descent. Unlike previous US capsules, it will not routinely land in the ocean, avoiding the expense

of maintaining a flotilla of recovery ships and opening the possibility of reusing each craft up to ten times. The corrosive effects of seawater are so severe that reuse was never attempted with earlier capsules.

NASA estimates that a flight in an Orion will be substantially safer than a Shuttle mission. An Orion's heatshield will be protected from debris until the vehicle is returning to Earth, and if an accident occurs during the mission's launch phase, an escape rocket system will carry the craft to safety. A similar device on the Russian Soyuz spacecraft has saved the lives of the crew on a couple of occasions. The hope is that the first manned Orion flight to Earth orbit will be in September 2014 at the latest, with Moon missions by 2020. This assumes that the project will continue to receive the current level of US government support for years to come which is probably unlikely, so it will be fortunate to avoid delays.

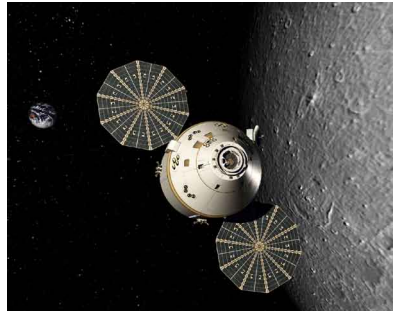


Image Credit: Lockheed Martin Corp

**Back to the Future?** The Orion shows its 1960s inspiration in this artist's impression. However Apollo capsules did not have solar panels.

This project should be welcomed by manned spaceflight enthusiasts. It may not be the USS Enterprise but it appears to be a technically sound and workable design which if successfully developed will deliver safe and reliable transport for astronauts for years to come.