

REUSABLE REALITY

Routine access to space has proved elusive. As the cost becomes clear questions are being asked about the need to make spacecraft truly reusable.

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Spaceflight is substantially younger than flight itself – half a century younger – but its pioneers were dreaming of voyaging to the moon and beyond even as the Wright brothers made their first flights 100 years ago. There has been significant progress in the 46 years since the Soviet Union put the first artificial satellite into orbit around the Earth, but the dreams of spaceflight pioneers such as Robert Goddard and Wernher von Braun remain unfulfilled.

The truth is that spaceflight is hard, arguably the hardest thing man has tried to accomplish. And if spaceflight is difficult, then safe, routine, commercially viable manned spaceflight is almost impossible – at least for another few decades. The disintegration of the Space Shuttle *Columbia* during re-entry was a setback for manned spaceflight, but it could also prove to be a milestone in the development of reusable launch vehicles (RLVs).

The Columbia Accident Investigation Board is likely to criticise NASA for handling the experimental Shuttle like an operational vehicle after only a few test flights.

Columbia was the first of five orbiters to fly, in 1981, and had flown 28 times in just over 20 years when it crashed on the 113th Shuttle mission. It was the second fatal loss of the world's first reusable spacecraft, following the

Challenger explosion in 1986. Aircraft, in contrast, fly for thousands of hours before they are certificated and delivered to the customer, and accumulate tens of thousands of hours a year once in service.

Aircraft-like operations are the holy grail of reusable spacecraft developers, but any designer with an RLV on the drawing board must be asking how it will be possible to prove the vehicle's safety and reliability without incurring the prohibitive cost of many development test flights. The alternative is to accept the risk of placing a relatively unproven design into service, then drive the risk down as the vehicle matures. But as two decades of Shuttle experience shows, risk reduces only slowly, if at all, when flight rates are low.

The *Columbia* accident came barely months after NASA had restructured its space transport plan, deciding to keep the Shuttle upgraded and in service for up to two more decades and launching development of an orbital space plane (OSP) for International Space Station (ISS) crew return and transfer, while delaying development of a second-generation RLV by at least five years. The latest plan calls for the Shuttle to operate until 2015 at least, with a decision in 2010 on whether to extend its life

THE FIRST 100 YEARS Spaceflight

1926 Goddard launches first liquid-propellant rocket

1932 Goddard tests gyroscopically controlled, fin-guided rocket

1942 First launch of German A-4 (V-2) ballistic missile

1948 First US two-stage rocket (Bumper-WAC) launched

1957 First artificial Earth satellite (Soviet Sputnik-1)

1958 First solar-powered satellite (US Vanguard)

1959 First spacecraft reaches the moon (Soviet Luna-2)

1961 First manned spaceflight (Soviet cosmonaut Yuri Gagarin)

1964 First geostationary-orbit satellite (US Syncom-3)

1965 First spacewalk (Soviet cosmonaut Alexei Leonov)
France launches first satellite

1966 First spacecraft docking (US Gemini-8 and Agena-8)

1969 First manned landing on the moon (US Apollo 11)



Soviet N1 moon rocket explodes on launch pad

1970 First soft landing on Venus (Soviet Venera 7)
China and Japan launch first satellites

1971 First space station (Soviet Salyut 1)
First soft landing on Mars (Soviet Mars 3)

1973 US Skylab space station launched (re-enters 1979)



Soviet Soyuz and US Apollo spacecraft dock

1979 First European Ariane launch

