Hi this is Steve Nerlich from Cheap Astronomy www.cheapastro.com and this is *The Space Shuttle Enterprise.*

Firstly, some terminology – some people say there is no such thing as a space shuttle. They do admit the existence of the Space Transportation System which incorporates a 70 tonne orbiter, variously named Columbia, Challenger, Discovery, Atlantis and Endeavour, bolted onto an orange external fuel tank and two reusable solid rocket boosters – collectively known as *The Stack*. Oh yeah and the orbiter is re-usable too, which is kind of the whole idea.

But once upon a time there was an orbiter which never went into space let alone orbited – and it was going to be called the Constitution except allegedly a bunch of enthusiastic Star Trek fans conducted a mail drop campaign to NASA demanding that it be called the Enterprise – and NASA made it so back in 1976. And since it never had a heat shield, or engines for that matter, and had no hope whatsoever of going anywhere near space, everyone seemed to agree to just hang the terminology and call it the Space Shuttle Enterprise.

To give you some historical context, the last episode of *Star Trek, The Original Series*, aired on the 3rd of June 1969 – which was, perhaps ironically, about six weeks before the Apollo 11 mission.

Throughout most of the sixties while space capsules where being launched on rockets and landing on parachutes, NASA was experimenting with space planes, which although still launched on rockets, could land on a runway.

Some first attempts involved unusual aircraft called lifting bodies which were designed to make the entire aircraft work as an aerofoil, rather than having wings. This meant the aircraft could fly at extreme speeds without having it wings ripped off. Lifting bodies were generally fitted with rockets, rather than jet engines allowing them to be flown at extreme altitudes where jets don't have enough atmosphere to work with.

The title sequence of the 1970s TV show *The Six Million Dollar Man* shows a lifting body, actually a Northrop HL-10, detaching from the wing of a B-52. The HL-10 made its maiden flight in December 1966 – and apparently, Wernher Von Braun had expressed enthusiasm in launching the HL-10 aboard a Saturn V rocket, but NASA was not convinced the whole lifting body concept had a future.

One concern was a seemingly inherent instability of many of these craft and the spectacular crash of a Northrop M2-F2 in May 1967, which is also used in *The Six Million Dollar Man* title sequence, would have added to these concerns.

Although badly injured, the pilot Bruce Peterson lost no limbs in the crash and made a good recovery, though he did lose the sight in his right eye due to a hospital acquired infection. Peterson, who died at a respectable age in 2006, was reportedly a bit annoyed at having his traumatic crash endlessly replayed for the five seasons of the TV show from 1974 to 1978.

The experience of these lifting body test flights made significant contributions to the design of the Space Shuttle orbiter, although a compromise was made in favour of the now familiar delta wing design. The advantage of the delta wing is that it considerably extends the range over which an unpowered craft can glide through the atmosphere. Although it is ideal to land the orbiter in Kennedy Space Centre in Florida, so that it can be relaunched quickly – should the weather or mission requirements make this impractical, it can instead land at Edwards Airforce Base in California – or at other designated emergency landing sites around the world.

Work on the Space Shuttle Enterprise commenced from July 1972, well before the last man to walk on the moon returned to Earth in December 1972, being Gene Cernan commander of Apollo 17 – and not Steve Austin.

As big as any of the later space shuttle orbiters, there was no way the Enterprise was going to hang under the wing of a B52 – and instead was mounted on top of a modified jumbo 747 jet. It first flew without detaching in February 1977, and in October 1977 it commenced five Approach and Landing Test flights commanded by Fred Haise, the lunar module pilot of Apollo 13 and Joe Engle. These Approach and Landing Test flights involved the Enterprise detaching from the 747 and gliding in to land on the same dry lake bed where Bruce Peterson had crashed nearly ten years earlier.

All these tests were ‘dead stick landings’ meaning they were unpowered flights, gliding from altitudes of around 8 km and landing at speeds up to 350 km/h.

Following the success of the Enterprise, which now part of the Smithsonian Museum collection, the Columbia orbiter undertook the first mission of the Space Transportation System, called STS 1, on the 12th of April 1981. Commanded by John Young, previous commander of Apollo 16, Columbia did 37 orbits over 2 and a bit days and then conducted a dead stick landing at Edwards Air Force Base. Using an approach already fully tested with the Enterprise, the Columbia was then mounted atop a modified 747 and flown back to Florida for its next mission.

This inevitably brings me to the 2006 movie *Superman Returns*.

The movie has a space shuttle orbiter, poised on top of a 747 and, through some highly implausible plot developments, the rockets are set to fire automatically and no-one can shut them down. You can imagine a bunch of NASA technicians slapping their respective foreheads as they realise that running the entire launch system off an egg-timer wasn’t such a great idea.

Anyway, the real problem with this scene – where is the fuel tank? A real shuttle orbiters’ three main engines fire from launch for eight and a half minutes burning up the equivalent of a backyard swimming pool of fuel every 25 seconds – all of which comes from that big orange thing called the external fuel tank which is about the size of a 747 jet itself.

The only fuel that is carried by the orbiter are in the two bumps at the back which power the two orbital maneuvering system engines. These provide some extra thrust for orbital insertion maneuvers, but would have no chance of propelling the orbiter, with or without an attached 747, through the Earth's atmosphere. And just to give you the complete picture, the shuttle orbiters also have reaction control system jets at the nose and rear for fine maneuvering, like docking with the International Space Station. This is how a real spacecraft works.

Even though the Space Shuttle Enterprise had no fancy stuff, like engines, it was pretty much the only game in town from the time the Apollo Soyuz Test Project ended the Apollo program in 1975 – until Columbia took off in 1981.

For a full historical perspective, I encourage you to check out the Enterprise's Wikipedia entry particularly the picture of the Star Trek cast posing in front of it. This was the seventies – and those are safari suits.

Many thanks for listening. This is Steve Nerlich from Cheap Astronomy, www.cheapastro.com. Cheap Astronomy offers an educational website where cost isn't an issue, it's an event horizon. No ads, no profit, just good science. Bye.