

Hi this is this is Steve Nerlich from Cheap Astronomy www.cheapastro.com and this Nancy Atkinson from Universe Today and this is *More awesome Space Shuttle missions*.

(Nancy)

Since you went first last time, Steve, I'm going to take dibs on going first this time. Well, we've just witnessed the final shuttle launch. On July 8, 2011 space shuttle Atlantis lifted off for the last-ever mission of the space shuttle program. For me, this is an emotional time. I'm pretty sentimental about the shuttle, it's a magnificent, beautiful, very complicated vehicle with lots of history and successes. It's been part of our lives for 30 years and it's hard to see it end. So today, Steve and I will share a few more of our favorite space shuttle missions.

For my first favorite, and since we've just witnessed the final launch of the space shuttle, I'm going to go all the way back to the first space shuttle launch. It was on April 12th, 1981 when the space shuttle Columbia became the first reusable spacecraft to head to orbit.

John Young and Bob Crippen were the astronauts on board and their primary tasks were to get to space safely and return again in a safe landing. Check on both counts. They also performed a general check out of all the Space Shuttle systems, and the only payload carried on the mission was a Development Flight Instrumentation (DFI) package, which contained sensors and measuring devices to record the orbiter's performance and the stresses that occurred during launch, ascent, orbital flight, descent and landing. All of these objectives were met successfully, and the shuttle's spaceworthiness was verified.

I once had the chance to ask Bob Crippen what his favorite memories of the flight were. "The part between takeoff and landing was the best part," he said with a laugh, but added that the entire mission was great, and that he has very fond memories of it.

Although he liked that middle part, he must have liked the landing as well. One of my favorite videos is of the Columbia's first landing and Crippen and Young bounded off the shuttle and down the stairs in exhilaration. It's great to watch.

(Steve)

I've chosen an historically interesting Space Shuttle mission, which was STS-51C, the fifteenth ever space shuttle mission. 51C had a five all male crew commanded by Ken Mattingly, who was famously bumped from the Apollo 13 mission three days before launch due to having come into contact with someone with German measles.

Details of STS 51-C's mission were heavily classified due to it being the first Department of Defense Space Shuttle mission. But as a result of Cheap Astronomy's die-hard investigative research, I can tell you that STS 51-C launched the intelligence gathering satellite Magnum ELINT - where ELINT stands for ELectronic INTelligence – being a satellite which carried the most cutting edge computing technology available in the 1980s – which probably had about 0.2% of the computing power built into your smart phone today.

STS 51-C was just 10 flights ahead of the ill-fated 25th Shuttle launch STS 51-L - the Challenger disaster in January 1986. It's thought that the ultimate failure point of STS 51-L were the solid rocket booster O-rings which, due to unusually cold conditions at launch, did not provide an adequate seal. 51-C was probably the coldest launch prior to 51-L and the solid rocket booster O-rings recovered after 51-C's launch showed significant charring. So I know it's always easy to say these things in hindsight, but maybe that anomaly on the 51-C flight was worth a little more consideration.

(Nancy)

My next favorite shuttle mission is STS-106 which launched on September 8, in the year 2000. In a bit of numerical jumbling, this mission launched after STS-101, and before STS-92. The International Space Station was in its infancy in those days and NASA realized it needed a bit more outfitting and hardware so that a crew could one day live on board. So, the payload bay was packed to the gills full of supplies.

At that time, the ISS consisted of just the Russian Zarya and Zvezda modules with the US Unity Node stuck at the end. And so, the goal of STS-106 flight was to prepare the Zvezda service module for the arrival of the first residents, the Expedition 1 crew, which would arrive later in the fall of 2000.

There were two spacewalks where the astronauts hooked up power, data and communications cables between the Zvezda and Zarya module, as well as installing a six-foot-long magnetometer.

So why is this rather non-descript space station construction mission one of my favorites? This flight signaled for me, personally, a sort of return to space. Even though I've always been interested in spaceflight, really for several years, I had not been paying much attention to what was going on in space. You know, life gets busy, kids get born, that sort of thing. But I happened to see an article that a shuttle mission would be launching, and since the kids were just going back school that fall, and we were now hooked up to this great thing called the internet, I decided to pay attention. The rest is history as they say, as I've paid great attention to every mission since then, and somehow I even found a way for people to pay me to write articles about it. Fancy that!

(Steve)

Again, looking at the earlier history of Space Shuttle missions I've chosen to look at STS-27, being the 27th Space Shuttle mission – being just two flights after the Challenger disaster – and one of those rare missions where the STS number actually matched the launch order. STS-27 launched on the 2nd of December 1988 – with five crew aboard and, being a Department of Defense mission again, they were all guys. The crew included Mike Mullane, author of an excellent astronaut biography *Riding Rockets*.

STS-27's mission goals are of course heavily classified, but once again I can tell you that they actually involved deploying a single satellite, Lacrosse 1, an all-weather surveillance satellite

commissioned by the CIA. The mission's wake up songs included a parody of the Beatles' song *Do You Want to Know a Secret* – so who says the CIA doesn't have sense of humor.

STS-27 suffered one of the worst thermal protection damage incidents at launch, the very worst damage incident being the Columbia disaster, which was STS 107 in 2003. At STS-27's launch, a piece of shielding from one of the solid rocket boosters hit the Atlantis orbiter, knocking one tile clean off and damaging a total of 700 other tiles. Again, there's been some commentary that if maybe this had not been a classified mission or otherwise, if the incident had gained more attention than it did, then maybe things might have gone better for STS 107. But who knows.

(Nancy)

My other favorite space shuttle mission is STS-133, which launched on February 24 of this year. I was lucky enough to be at the launch and it was, simply amazing. It was *Discovery's* 39th and final mission - and the first "final" mission for the three remaining orbiters.

Originally this mission was supposed to launch back in November 2010, but after 5 scrubs, which included a Orbiter maneuvering system pod leak, and weather delays and then cracks were found in the external tank and the mission had to stand down for four months while the engineering teams figured out the problem and then put together an ingenious fix of the reinforced ribs, or stringers, in the tank's "intertank" section

The four month delay had some consequences, as original STS-133 crew member Tim Kopra was injured in a bike accident, and Steve Bowen was chosen to replace him. So, while the delay was kind of bad, it made it possible for me to attend the launch.

The launch countdown was one of the most exciting I've ever experienced, as the liftoff nearly did not happen. First, we had to wait and make sure that the European Automated Transfer Vehicle docked successfully on the morning of launch. If there were any problems, the shuttle mission would have to wait until they were resolved. But luckily the ATV docking went without a hitch.

Then, something more exciting happened. There was a computer problem in the Range Safety Office, the people who can tell NASA that they can't launch because of any safety issue. Well, there was no issue on the Range - but there was a computer that just wasn't working and the rules say if the computer doesn't give the OK, NASA can't launch. The clock was held at T-5 minutes to allow time to restart a balky computer and figure out the problem. They were able to resolve the problem with just 2 seconds left in the launch window. It was frantic – and it was really impressive -- to listen to the people in launch control work the problem and fix it under the intense pressure of time running out. My heart was pounding wildly, because I needed to return home the next day, and if *Discovery* didn't launch that day, I was going to miss it. But the guys in launch control and the Range Office really came through for me that day!

When *Discovery* did lift off, we had perfectly clear blue skies and we were able to follow the orbiter well into the flight -- about three minutes -- and could even see the solid rocket boosters separate from the shuttle with unaided eyes at 2 and a half minutes. I'll never forget that sight.

In Discovery's payload bay was the first human-like robot, affectionately named R2, who is now a permanent crew member aboard the International Space Station.

It was a great, flawless mission with an exciting beginning.

(Steve)

Next, I'm picking STS 28 another one of those terribly hush-hush Department of Defense missions – with a five member crew who were, needless to say, all guys.

The mission carried a highly classified payload, although it was actually the KH-11 photo-reconnaissance satellite, full of this ground-breaking eighties technology called digital imagery – which might have been 5% as good as the camera you've probably got in your smart phone.

The most intriguing component of the STS 28's payload was "Detailed Secondary Objective 469", also known as the In-flight Radiation Dose Distribution instrument - but most commonly known as the Skull.

The Skull was designed to examine the penetration of radiation into the human cranium during spaceflight. A real human skull was seated in a plastic matrix and sliced into ten layers – then hundreds of radiation dosimeters were mounted at different depths within the Skull to record the radiation levels at those different depths. And in a rare concession by the Department of Defense, the skull was actually that of a deceased female.

As well as STS-28, the Skull flew on STS-36 – also a Department of Defense mission with five guys – again including Mike Mullane and again another highly classified payload – which was probably the Misty reconnaissance satellite and then the Skull had a final flight was aboard STS-31 in 1990, which was not a Department of Defense mission and hence had Kathryn Sullivan aboard – and also woo-hoo, the Hubble Space Telescope.

Thanks for listening. This is Nancy Atkinson and this is Steve Nerlich from Cheap Astronomy, www.cheapastro.com. Cheap Astronomy offers an educational website which might not be a space program – but it is a program on space. No ads, no profit, just good science. Bye.