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NEW SPACE CHALLENGE

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Time delayed shot of SpaceX launch on September 21 of the SpaceX Falcon 9 rocket.

Image: SpaceX

SpaceX and Boeing IS IT DAVID VERSUS GOLIATH?

By Henry M. Holden

FORTY-FIVE years after sending humans to the moon, NASA is looking to private industry for human missions near Earth with reusable craft while focusing on far-off trips to Mars.

Since the National Aerospace and Space Administration (NASA) retired the Space Shuttle fleet in 2011, US astronauts have had to rely on Russian rockets and spacecraft to reach the International

Space Station.

Under an agreement NASA announced in mid-September, Boeing will receive a maximum of \$4,2-billion and SpaceX will get as much as \$2,6-billion, to build the next American space vehicles.

The landmark announcement was the first time NASA has handed responsibility to private companies for flying humans into space, and furthering efforts to take tourists beyond the Earth's atmosphere.

Each company will build seven vehicles, six of which will fly to the International Space Station (ISS).

Although NASA has a half-century of partnership with the aerospace giant Boeing, SpaceX has a vocal champion in Elon Musk with his aggressive exploration of other worlds. But is this a fair competition? Boeing is the Goliath with twice as much money, thousands more employees, a bureaucracy, decades of



An artist's rendering of the Boeing CST-100.

Image: The Boeing Co.

building aerospace technology, and a history of huge cost overruns.

SpaceX is the new kid on the block, but has proven its capabilities very early in the game. In 12 years, SpaceX has evolved from making rockets to becoming the first private company to haul cargo to the orbiting space station.

SpaceX has gained worldwide attention for a series of historic milestones. It is the only private company ever to return a spacecraft from low-Earth orbit, which it first accomplished in December 2010.

The company made history again in May 2012 when Dragon became the first private spacecraft in history to visit the space station, when its Dragon spacecraft attached to the International Space Station, exchanged cargo payloads, and returned safely to Earth — a technically challenging feat previously accomplished only by governments.

Since then, Dragon has delivered cargo to and from the space station multiple times, providing regular cargo resupply missions for NASA.

SpaceX's latest launch was on September 21 with a SpaceX Falcon 9 rocket, the second in less than two weeks, and the fourth over the previous ten weeks. The two stage Falcon 9, is a 68,4 metre-tall rocket. The spacecraft's 2,5 tons of supplies, science experiments, and technology demonstrations included critical materials to support 255 science and research investigations during the station's Expeditions 41 and 42.

The Dragon cargo craft successfully completed the two-day trip to the ISS on September 23. Dragon spent the following four weeks attached to the Harmony node as the Expedition 41 trio of astronauts unloaded 2 216 kg of crew supplies, hardware, experiments, computer gear and spacewalk equipment

This was the fourth SpaceX mission for NASA's Commercial Resupply Services contract, designated SpaceX CRS-4, and with eight more missions slated to deliver a minimum of 20 metric tons to the station.

Two more missions are scheduled before the New Year. The next step is to build a human-friendly space vehicle.

NEW VEHICLES

The Boeing and SpaceX capsules should begin manned flight by 2017, eventually replacing NASA's sole use of Russia's Soyuz rockets to get people to the ISS. That arrangement costs about \$70-million a seat and is currently entangled with the



This is the first published interior view of The Boeing Company's CST-100 spacecraft, which features LED lighting and tablet technology. Image: NASA/Robert Markowitz.

tensions over the crisis in Ukraine.

SpaceX's effort to build a private, human-rated spacecraft began about four years ago and is the first stepping stone in NASA's strategy to send humans on a path to explore deeper into space than ever before, including visits to Mars of which Elon Musk is a strong advocate. He even advocates private facilities from which to launch in the 2030s.

Musk said: "It could very well be the first person to go to another planet (Mars) could launch from this location, (the first private spaceport being built in Brownsville, Texas). This is really going to be a new kind of spaceport that is optimised for commercial operations.

"Cape Canaveral and Cape Vandenberg are great launch sites, but they are military launch sites. What's important for the future of space exploration is to have a truly commercial launch site, just as we have commercial airports."

SpaceX's Dragon V2 capsule, which seats seven, was designed with an eye to interplanetary travel, able to land vertically anywhere on Earth "with the precision of a helicopter," according to the company's website, instead of parachuting into the ocean like early US spacecraft in the 1960s and 1970s.

The capsule will include a new launch escape system that will allow crew members to escape an anomaly at any point during flight.

The Dragon V2 spacecraft is scheduled to fly for the first time in a pad abort test later this year, followed by an in-flight abort test, as part of the company's Commercial Crew Integrated Capability agreement with NASA.

BOEING'S ENTRY

Boeing's seven-passenger CST-100 has its lineage in the Apollo lunar-missions era, and its return to Earth would be cushioned by air bags and parachutes, according to the planemaker's website. Both companies recognize this as a proven safer method of re-entry than with a winged vehicle.

The CST-100 has a diameter of 4,56 metres, which is slightly larger than the Apollo command module.

The question is: Why is Boeing is getting more than twice the money than SpaceX for the new contracts to get NASA astronauts to orbit and back?

One rationale is that the Boeing Company is "ahead of" SpaceX and could deliver sooner with an infusion of more cash. While some at NASA (and no doubt many at Boeing) would like people to believe the statement that "its design was further along than that of the SpaceX proposal and, in the opinion of NASA's leadership, has the best chance of meeting the schedule," is open to debate.

In fact, some believe Boeing is behind SpaceX, and because Boeing's proposal (to catch up) will cost more, hence this could be the reason for the large infusion of cash.

Since both companies signed fixed price contracts the other speculative rationale is that Boeing overspent and needs more money to cover the overspending.

Boeing is perhaps "ahead" of SpaceX in paperwork, but SpaceX is far ahead in actually building and demonstrating flight hardware which is where large sums of money are spent and likely the reason for



Image: SpaceX

the infusion of more cash to Boeing.

This would have left Boeing, which, unlike SpaceX, making clear that it would not continue with its own money without a NASA contract.

On top of that is the fact that Boeing plans to use an Atlas V to launch its capsule, which costs much more than SpaceX's Falcon 9 launcher.

Boeing is currently dependent on the Russian-supplied RD-180 engine used on the first stage booster of the Atlas V, which adds to the overall cost.

BOTTOM LINE

The bottom line is that NASA wants to end its dependency on the Russians for access to the ISS, but to do it redundantly.

NASA never again wants to be in the position it was in when it lost the Challenger and Columbia Space Shuttles leaving, for almost three years each time, the inability to get astronauts to the ISS and return them home safely.

Congress has been pressuring NASA to manage down to a single provider to "save money." NASA is adamant – as is the US Air Force with its satellite-launch capability – on resiliency and redundancy, and apparently it is willing to pay for it.

That is probably why it is seemingly willing to pay more for less with Boeing — as a back-up. →

Above: The interior of the SpaceX Dragon V2 spacecraft. Note that the control panel swings down and locks in launch position after the crew is seated in their places.

Below: Elon Musk, chief executive officer of Space Exploration Technologies Corporation (SpaceX), stands alongside the manned Dragon V2 Space craft

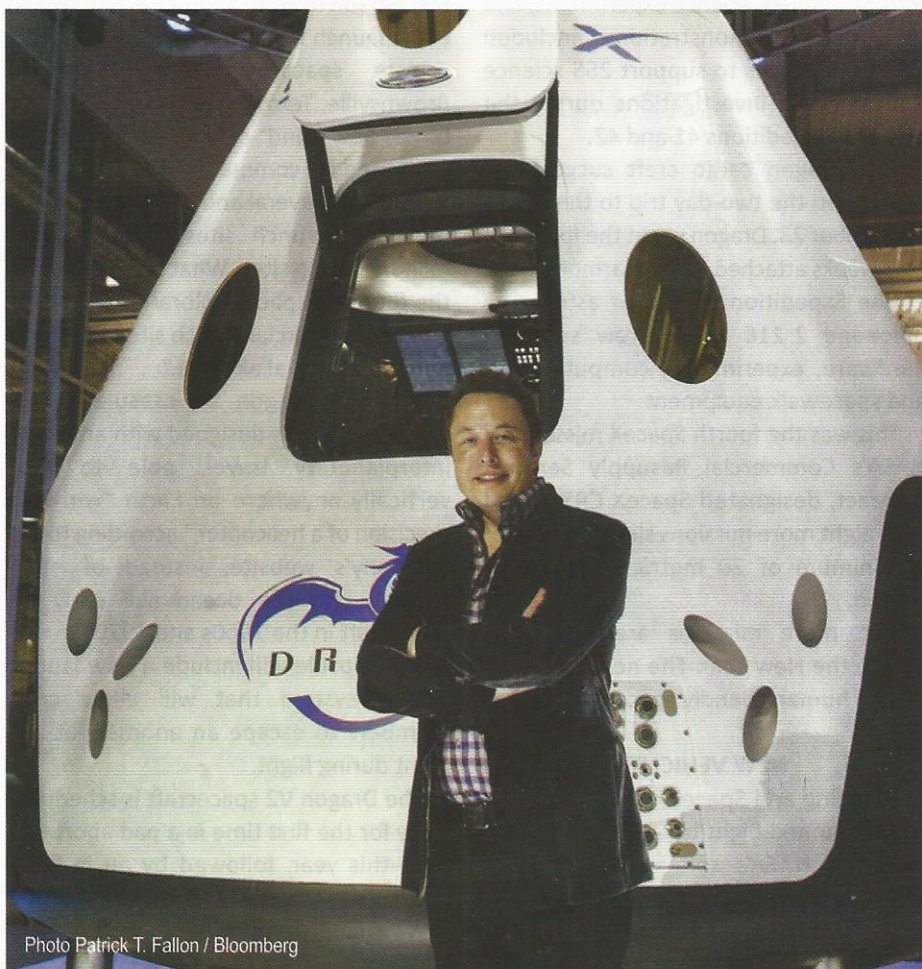


Photo Patrick T. Fallon / Bloomberg