DID you hear about the guy who took off into outer space in a $100,000 cherry-red Tesla Roadster? Now, who would allow such a thing to happen?

Elon Musk, of course!

Nicknamed Starman, the subject in question is a mannequin seated as the driver in the Tesla, and Musk’s company SpaceX launched the car payload into a Mars-adjacent trajectory on 6 February 2018. “I love the thought of a car drifting apparently endlessly through space and perhaps being discovered by an alien race millions of years in the future,” tweeted Musk. With no specific space mission chalked out, Starman will continue to traverse our solar system for a billion years perhaps, in the automobile redone for space-worthiness.

The primary objective of this adventure was to showcase the capability of SpaceX’s latest contribution in reusable rockets: The Falcon Heavy. Touted as SpaceX’s prized possessions, Falcon Heavy is on a maiden test flight on this voyage and is out to prove that it is the most powerful reusable rocket launcher available in the world today. Indigenous modifications have made Falcon resilient, dependable, and economic despite a massive payload capacity to deep space.

Day of the Launch

It was a bright, sunny day on 6 February 2018. The launch time was pushed back by several hours due to windspeeds, while the world waited in anticipation.

Falcon Heavy was treading a historic place: the launch complex 39A at the Kennedy Space Center, Cape Canaveral, Florida was the same pad from where the Apollo missions to the moon were launched. It was also the pad from where the Space Shuttle took off. Evidently, there was much fanfare, and invitees to the launch rose in applause at the site of the rocket lifting off.

A short distance away from the launch site is located the receiving site. Here within a few minutes of the launch, the boosters landed neatly on the ground landing pads, even as the area felt a sonic tremor. Due to a minor hiccup, the central core which had to land on a drone ship in the ocean missed its target and plunged into the water. The final stage of the rocket carrying the Tesla, however, fired its engines and rose into space. Strategically placed cameras on the rocket stages and the car streamed live the entire process.

What is the Hype?

“Rockets should be like aeroplanes — they have to be reusable, not use and throw away,” said Bill Nye, the scientist-celebrity (famous for his popular science show for kids of the 1990s Bill Nye the Science Guy) and the CEO of The Planetary Society. He is a fan of SpaceX and was seen keenly observing the launch at the pad.

SpaceX is the only private space transport company that has successfully carried payloads on numerous accounts to the International Space Station. Now, with the success of Falcon Heavy, SpaceX travels to deep space.
SpaceX was started with a mission to design, manufacture and launch advanced re-usable rockets and spacecraft to revolutionise space technology. Its ultimate goal, however, is to transport humans to live on other planets.

In their endeavour, they have stumbled at times, but overall, SpaceX has been the most successful private venture. They have significantly cut the cost of building and launching rockets by working on innovative schemes to make space travel economical. NASA too is keen on encouraging the private sector in developing commercial launchers to transport not just equipment but people too, into low earth orbit, soon.

Elon Musk a Canadian-American engineer, innovator and business magnate, is famous for his companies like Tesla, PayPal and SolarCity Corporation. In June 2002 he founded the Aerospace manufacturing and transportation company called Space Exploration Technologies Corporation — SpaceX.

In the fifteen years since its formation, this privately-funded company has many firsts to its credit:

- First to use a liquid-fuel rocket to reach orbit.
- Launch, orbit and recover a spacecraft.
- Send regular payloads to ISS.
- First to send a spacecraft into geosynchronous orbit.

Headquartered in Hawthorne, California, 100 million dollars went into the making of SpaceX with an objective to build simple re-usable rockets. By 2010 they had rolled out their first Falcon Rocket which successfully launched the Dragon spacecraft. By the end of that year, the Dragon effectively orbited the earth for the stipulated period and returned to home base. This event marked the achievement of a commercial re-usable spacecraft visiting the space station.

The 5000-strong workforce at SpaceX toils round the clock to meet their goals of developing rapidly reusable, reliable and radically low-cost space vehicles. In all, SpaceX has collected 100 missions under its manifest and $12 billion in contracts.

With the success of the Dragon, by 2011 plans were underway to design a massive rocket: a rocket that can carry huge payloads. The target was around 52000 kg — a figure which is double the capacity of NASA’s Space Shuttle.

Improvising the design, Falcon Heavy integrated three banks of nine engines each — called Merlin engines — which would give a combined thrust of 3,800,000 pounds at liftoff. Its total lifting capacity is 141000 pounds. In more
## SpaceX Timeline

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>2002</td>
<td>SpaceX is born</td>
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<tr>
<td>September 2008</td>
<td>Falcon 1 becomes the first privately developed rocket using liquid fuel to reach Earth orbit</td>
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<td>December 2008</td>
<td>Bags $1.6 billion CRS contract (Commercial Resupply Services)</td>
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<tr>
<td>July 2009</td>
<td>Falcon 1 on its fifth flight delivers the first commercial satellite to Earth orbit</td>
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<tr>
<td>June 2010</td>
<td>Falcon 9 series achieved a 100% mission accomplishment success on its maiden flight</td>
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<tr>
<td>December 2010</td>
<td>Dragon — SpaceX’s spacecraft returns from orbit successfully.</td>
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<tr>
<td>May 2012</td>
<td>Dragon is the first private spacecraft to dock with ISS and supply cargo</td>
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<tr>
<td>October 2013</td>
<td>Experiments with vertical take-off and landing type rocket — Grasshopper</td>
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<tr>
<td>December 2013</td>
<td>Falcon 9 achieves the Geosynchronous Transfer Orbit (GTO)</td>
</tr>
<tr>
<td>September 2014</td>
<td>SpaceX bags the prestigious NASA contract to fly American astronauts</td>
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<tr>
<td>December 2014</td>
<td>Falcon 9 puts 11 communication satellites into orbit, and the stage 1 of the rocket returned to Landing Zone 1 successfully. This is the first orbital class landing.</td>
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<tr>
<td>April 2016</td>
<td>Falcon 9 retakes Dragon to ISS and brings back the first stage to the drone-ship receiving pad</td>
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<tr>
<td>March 2017</td>
<td>Falcon 9 does a re-flight of the orbital class rocket and returns the first stage of the rocket successfully</td>
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<tr>
<td>June 2017</td>
<td>Dragon supply spacecraft does a re-flight to ISS.</td>
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<tr>
<td>February 2018</td>
<td>Falcon Heavy launches Tesla car successfully into deep space. Also, the first stage boosters are recovered successfully.</td>
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## Feet Firm on the Ground

Another attractive feature of the Falcon 9 is its landing legs. Four in number, they are deployed to provide a smooth landing on the return pad during the recovery of the first stage.

The legs are made of state-of-the-art carbon fibre with honeycombed aluminium placed symmetrically around the base of the rocket.

understandable terms, equal to the mass of a 737-jetliner loaded with passengers, cargo and the fuel.

Falcon Heavy was from the beginning designed to carry passengers in future for space flight. The success of this launch opens the immense possibility for NASA’s missions to fly crews to Moon and Mars. The growth potential of SpaceX has assured it multiple and continuous contracts from NASA to carry crew and cargo in the coming years. The year 2018 may witness SpaceX ferry NASA astronauts under its Commercial Crew Program.

## The Workhorse

The Falcon series of rockets are designed with the first stage as re-usable models. In other words, the first stage of these rockets lifts off, places the second stage into space and returns to the ground to be reused for further launches.
Falcon 9 series is a two-stage rocket designed for reuse. During the launch, the rocket uses all the nine engines for liftoff. This also ensures that in the event one or more engines fail, the mission need not be aborted.

Falcon 9 successfully docked their spacecraft Dragon with ISS in 2012. Since then, the Dragon has made multiple trips to the space station delivering cargo and equipment. SpaceX happens to be the only non-government company to have successfully launched a reliable spacecraft into orbit and recovered it back.

The Super Rocket

Falcon Heavy stands 230 feet tall and is 40 feet wide. The two-stage twin-booster rocket can deliver 63800 kg of payload to Low Earth Orbit or 16800 kg to Mars or 3500 kg to Pluto. The giant rocket’s thrust at lift-off is compared to be equal to that of eighteen 747 jetliners working at full power.

The construction of Falcon Heavy comprises three stages.

The First stage is made up of three cores. The two side cores called the strap-on boosters are engaged with the central core at the base of the rocket and at the top near the liquid oxygen tank. These three cores together hold the 27 Merlin engines which give the rocket its super lift-off powers.

At the time of launch the engines are fired together; after the calculated distance, the side boosters disengage and separate from the central core. During this operation, the engines of the central core are throttled down. Soon after the boosters separate, the engines on the central core throttle again and take the rocket further into space.

The advantage of these three cores, nine engine systems is that in the event of more than one unexpected engine failure, the mission need not be aborted and can complete successfully.

The Second stage of the rocket utilises the much-proven Falcon 9 second stage Merlin engine. This second-stage engine is operational for the next 6 minutes. When this stage takes over, it gives the payload the necessary boost in space to travel further beyond and deliver the payload into orbit.

This engine is programmed to restart many times if multiple payloads are to be set in orbit.

The Third stage is the payload housed inside a composite fairing. The fairing is a protective capsule that holds the payload and prevents any damage to the equipment during launch in orbit. This large enclosed part can support the Dragon Spacecraft as well.

Aboard the Dragon

Dragon is SpaceX’s indigenously developed space capsule which can carry passengers into space.

At launch, Dragon has a mass of 6000 kg which reduces to 3000 kilograms while returning. The upper pressurised chamber can hold astronauts and cargo. At the base of the capsule are thrusters and the heat shield.

The trunk part (lowermost section of the craft) supports the upper capsule and holds further unpressurised cargo. Along with this Dragon’s solar array neatly folds into the unpressurised cargo area. The array and the trunk remain attached to the spacecraft until Dragon returns to earth. Shortly before entering the Earth’s atmosphere, during landing, they are jettisoned (discarded).

Dragon has proved its mettle by taking multiple cargo loads to ISS and back. Its reliability has ensured a contract from NASA and soon with suitable design modifications it will be carrying astronauts to and from space.

Brace Up!

Taking people into space is not such a far-fetched idea, after all, as it was just over a century when the Wright brothers flew their first plane, and in this short span, the aviation industry has grown by leaps and bounds. We are just a year short of a half-century since man stepped on the Moon, it is not far off for space travel to spread its wings.

In an interview, Bill Nye said, “Everybody’s dream is to be able to fly…I can see how people get hooked on that. And I think space exploration would be the same deal.”

The next couple of years are promising for space tourism, and if everything goes according to plan, we may hear of the first batch of space tourists telling us about their experience of microgravity.

So, fasten your seatbelts and get ready for liftoff!

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