

Stepping Stones to Mars: the Space Science of Buzz Aldrin

By Michael Lee

There is much talk these days in the media about a manned mission to Mars happening sometime soon in the 2020s. Elon Musk, South African born founder of SpaceX, is planning to send humans to the red planet early in the next decade.¹ In the 2015 science fiction movie *The Martian*, Matt Damon played an astronaut who was abandoned on Mars after he was mistakenly presumed to be dead.

But don't save up for the long trip into the Solar System just yet. It won't be a movie! And you couldn't pay me a million dollars to be a human guinea pig on board Elon Musk's spaceship to Mars. At least when the Titanic sank there were some survivors...

But let's look at what the real astronauts say about this extraordinary dream of landing people on Mars.

In particular, Buzz Aldrin, Apollo 11 astronaut who stepped onto the moon with Neil Armstrong in the historic lunar landing of 1969, has detailed plans for the ultimate human settlement of Mars. His new book *Mission to Mars – my vision for space exploration* is not just a page-tuner for amateur space fanatics like me, it's an imaginative, exhaustive, technical blueprint for the future of space travel and space colonization.

I was privileged to meet this space pioneer and legend in San Antonio, Texas in 2012 at a conference my organization was hosting. He turned out to be the most memorable motivational speaker I've seen. But his recent book on Mars impresses me as a futurist. The far-reaching vision he describes in it could provide a scientific framework for the next hundred years of space exploration.

It's a fact that our far future as a species has to involve the habitation of other planets, in and beyond the solar system. That's because the sun is middle-aged and has used up around half of its total nuclear fuel. When the sun eventually dies out in approximately five billion years' time, it will bring an end to life as we know it in the vast system revolving around our life-giving star. We have a very, very long time to build human civilizations amongst the stars but we don't have forever. Hence, we need stepping stones into other star systems as we stride from planet to planet in our never-ending journey across the vast, cosmic river of space-time.

¹ <https://www.theguardian.com/technology/2016/sep/27/elon-musk-spacex-mars-colony>

The moonwalk of 1969 was the simply first step of this planet hopping expedition to explore and colonize the enormity of space.

Discovering outer space is not so much about searching for extra-terrestrials as it is about becoming extra-terrestrials.

As a leading space scientist, Buzz has thought deeply for decades about how to get astronauts safely to Mars and then how to “terra-form” the red planet with a view to creating a permanent human civilization there.

Mars, 200 million miles away, is the next major cosmic stepping stone after the moon, with a human landing on Phobos, a moon of Mars, as a possible an intermediary step.

Buzz wants a permanent Martian settlement by 2035 after robots there have pre-built the necessary infrastructure. In historical context, this would chart the progress of flight in leaps of 66 years as follows:

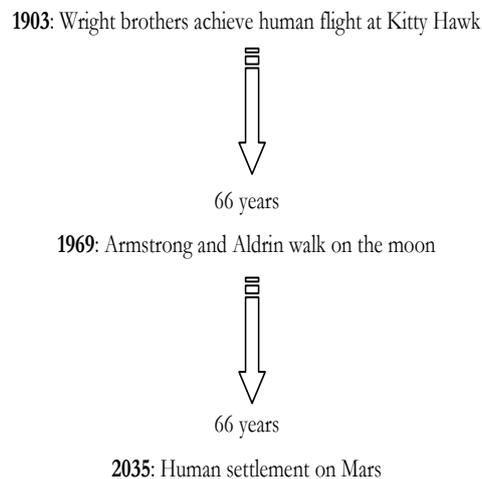


Figure 1: Timeline for aviation landmarks from Kitty Hawk to Mars

Going from the first human flight at Kitty Hawk to settle on Mars in only 132 years would represent breath-taking technological, social and scientific progress. And it takes visionaries and explorers like Buzz to make this kind of advancement possible. He’ll go down in aviation history just as much for planning how to settle Mars as for his 1969 visit to the Moon.

I was surprised to read in the foreword to the book that in forty years of discussions about space with his son, Andrew, Buzz never really spoke about his trip to the Moon. Instead of dwelling on his remarkable past achievement, the astronaut's mind was consumed, rather, by thoughts of the future: "He cares about where we are going as a civilization, not where we have been," Andrew writes.² That kind of determination is the hallmark of a futuristic thinker – the conviction that the future's infinitely more valuable than the past.

But Buzz goes much further than just thinking about the future of mankind. He's provided a priceless – and big - vision of the future of space and our place in it. He's worked out the science needed to get there safely and sustainably: "One of my primary directives is to launch humanity into a new era of affordable access to space," he says.³

And don't worry about this future Martian civilization being totally isolated and cut-off from Mother Earth. Not at all! Buzz's proposed Mars recycler system will ensure there's a space "railway", or expressway, continuously transporting goods and people back and forth between earth, the moon and Mars: "I envisage long-haul transportation systems, deep space cruisers that not only continuously cycle tourists between Earth and the moon, but constantly transfer explorers and settlers between Mars and Earth. A fully reusable lunar and interplanetary system is the best way of transporting people and cargo across the vast vacuum void of space."⁴ He wants permanent connections between the Earth, the Moon and Mars as a "triad of worlds". Buzz's bold and confident prediction will long echo in our ears: "Humans will one day live on Mars."⁵

The cyclers he proposes would provide the fundamental technology for sustainable space exploration. Buzz's triadic system would involve a lunar cycler and a Martian cycler: "The lunar cycler will undergo a cosmic dance: loop around the moon, return to Earth, slingshot around Earth, and return to the moon again. The round-trip will take just over a week... The first Mars cycler will probably carry only scientists... on its six-month Earth-to-Mars journey."⁶

Sound like science fiction? No, his vision for Mars settlement, rather, is based on Newton's proven laws of motion and universal gravity. Besides, the right levels of space knowledge, experience, technology and private-public sector co-operation are there to make this happen in reality just as the Apollo 11 mission really happened back in '69. As Buzz says, there's an evolving comfort level with Mars here on earth.⁷

² Aldrin, B. 2013. *Mission to Mars: My Vision for Space Exploration*. Washington, D.C.: National Geographic. xiii.

³ Aldrin, B. 2013. *Mission to Mars: My Vision for Space Exploration*. Washington, D.C.: National Geographic. 21.

⁴ Aldrin, B. 2013. *Mission to Mars: My Vision for Space Exploration*. Washington, D.C.: National Geographic. 25.

⁵ Aldrin, B. 2013. *Mission to Mars: My Vision for Space Exploration*. Washington, D.C.: National Geographic. 49.

⁶ Aldrin, B. 2013. *Mission to Mars: My Vision for Space Exploration*. Washington, D.C.: National Geographic. 52.

⁷ Aldrin, B. 2013. *Mission to Mars: My Vision for Space Exploration*. Washington, D.C.: National Geographic. 171.

Our next stepping stone to the stars, though, will not be reconnoitred alone as humans, but together with tele-robots. The age of robots has already arrived and robots have gone ahead of us to Mars. They are there now exploring the planet years before we'll get there. And they will help humans in the attempt to reach into the far future when humanity evolves into a multi-planetary, truly cosmic, but robot-aided, species.

Acknowledgements & websites

Aldrin, B. 2013. *Mission to Mars: My Vision for Space Exploration*. Washington, D.C.: National Geographic.