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IFT 6 IS CLOSE…

The Starship Integrated Flight Test no. 5 was a huge success. People are going to remember the stunning capture returning Super-Heavy Booster in the embrace of the Chopstick Arms for a long, long time. This has really put the Mars colonisation project on the map.

So what's in store for Flight 6 and when will it take place.

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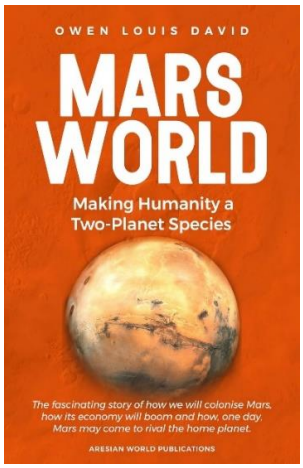
NEWS AND ALL YOUR FAVOURITES

We've got lots of news stories for you in this edition of The Aresian including the fascinating conclusion of a NASA study that meltwater pools under ice on Mars could be teeming with life! We also have our regular weather report from Gale Crater and our "Pick of the Pics".

MARSWORLD – CHAPTER ANALYSIS



Owen Louis David continues his chapter-by- chapter analysis of his book Marsworld. This issue he looks at the challenges that will face any colonisation effort. ***See page 3.***

Flight 6 next up.

By the Editorial Team

What a brilliant success! Flight 5 took people's breath away with that stunning capture of the Super-Heavy Booster in the Chopstick Arms of Mechazilla. We can probably look back on Flight 5 as the day that public interest in the Mars colonisation project really took off. It has a long way to go, but a lot of people across the globe now understand the *Starship* rocket system is a very serious contender for getting humans to Mars in the next few years.

All flights have defects that need addressing. On this occasion there were some issues with flames around the engine area creeping up the side of the Booster (likely a result of methane being released) but the manouevre itself appeared to be conducted flawlessly. That said there are indications the Booster was only one second away from an explosive disaster owing to a spin gas misconfiguration affecting the engine start for the retro landing (something that could have triggered an auto-abort). A chine cover was also ripped off during the landing – something which could have compromised some vital interior parts but thankfully did not.

We have recently had confirmation as well that the returning Starship, which landed on the ocean, was firing its three rockets and then the one in perfect sequence. That's another excellent result.

This time the launch and sub-orbital flight itself was also perfectly executed with all 33 Raptor engines in the Booster working as intended. That is a really good pointer in terms of overall development of the project. Reliable rocket engines are what you need and what you would expect.

So what will be the "team" for Flight 6? Well that looks like Starship 31 (which will be the last of the old-style Starships before we see the new generation enter into service) and Booster 13. At the time of writing Starship 31 has already had a static fire test but Booster 13 is awaiting reconditioning of the launch mount before it can go through its static fire

What will be the objectives for Flight 6? We are hearing there will be, as one might expect, an attempted repeat of the Booster capture and that they will be seeking to achieve greater accuracy with the location of the second stage Ship's ocean landing. Reports suggest it

was a few kilometres short on Flight 5. That might be enough for Flight 6 – incremental progress. A chopstick capture of the Starship itself, as opposed to the Booster, will have to await the second generation of Starships.

MARSWORLD – CHAPTER BY CHAPTER

By Owen Louis David

***EACH MONTH OWEN LOUIS DAVID IS GOING TO SUMMARISE AND EXPLAIN A CHAPTER IN HIS BOOK,* MARSWORLD**

CHAPTER 2 – THE CHALLENGES

In this Chapter, I deal with the challenges we will have to overcome to be able to establish a second human civilisation on Mars. The process is described as a marathon hurdles race where you have to keep scaling hundreds of hurdles. Kicking over the hurdles is OK but you don't want to fall flat on your face at any point.

I put the challenges into the following categories: physiological, psychological, technical, political and financial.

The physiological challenges are examined in detail and broadly come under two categories: (a) the transit between the two planets (outward and return) in zero gravity and (b) living on the surface of Mars in 0.38 gravity. The book also addresses how we can cope with the elevated radiation levels associated with both,

One of the key challenges is human health. Humans are evolved to live well in Earth's gravity. The long zero G passages during transit and the sub-normal 0.38G that goes with living on Mars's surface will potentially compromise health. We have made huge advances in terms of protecting human health in Zero G environments and so that is a cause for optimism. The problems with bone and muscle degeneration have been largely overcome through exercise regimes, specialist clothing (vacuum trousers) and space medicine. But the more subtle challenges of 0.38G are unknown. There are certainly long term issues with things such as negative eyesight effects (owing to eyeball pressure) and heart muscle function.

I don't doubt we can find solutions to those problems over time but they cannot be ignored.

Radiation in outer space and on the Mars surface is another challenge addressed in my book. However, we do have a lot of solutions to that challenge. Materials such as water and plastics can absorb a lot of radiation. On Mars we can cover habitats in thick layers of the local regolith to provide protection from radiation.

Successful reproduction on Mars is going to be a huge challenge. In this Chapter I break down the challenge and explain how we might be able to overcome the obstacles, to ensure that healthy babies can be born on Mars.

The psychological challenges are real but often overstated. The "cabin fever" scenario is often overdone. Whilst it is true that people living in isolated environments (especially without sunlight exposure, as during the Antarctic night) can suffer depression and other forms of mental ill health, it will be a very different story for the Starship crews forming part of the early Mars missions. They will be the centre of global public attention, reaffirming the importance of their mission. They will know that if they stay cool and survive the mission they will be celebrities on their return to Earth. In other words, they will have all the right incentives to endure whatever hardships come their way.

The technical challenges are many and various. In broad terms you have to have a reliable system to get chemical rockets to the surface of Mars and – even more difficult – you have to have a reliable system for producing propellant on Mars and refuelling a Starship on the surface of the Red Planet so that it can execute a return launch. Once you have humans on Mars you need to have safe habitats where they can live and undertake activities such as repairs to rovers. You need a power system that in turn will allow for a life support system.

Providing energy on Mars throughout the sol is a challenge but one that is well within our capabilities using solar panels, plus energy storage. We will certainly see thermal storage. In the early stages this will likely mean producing hot water when the solar panels are providing peak power which can then be stored in well-insulated containers. Later, we will like see sand heated – possibly to very high temperatures which could then drive electricity generators as required. Chemical batteries will of course be a common storage technology from the first mission onwards. As methane and oxygen are going to be produced as propellant from Mission One onwards, some of that production will be used to power methane electricity generators.

Clearly we have to protect humans from the extreme cold of Mars but in this chapter I take the opportunity to explain how the cold of Mars is often exaggerated

as compared with Earth. The absence of a significant wind chill factor on Mars means the true equivalent temperature is several degrees higher. During Mars's summer, surface temperatures can reach highs of up to 30 degrees Celsius. Clearly, while Mars's *average* temperature is super-cold, we will be looking to build the first settlement somewhere that is appreciably warmer than the average. That "above average" will nevertheless be very challenging – comparable with winter temperatures in place like Siberia and Antarctica on Earth. One plus about living on Mars is that buildings lose their heat much more slowly than on Earth (thanks to the extremely thin atmosphere).

Communications is an important challenge that is often overlooked. When the Sun is between or nearly between Mars and Earth, communication is not possible. That communications "gap" can amount to 30% of time.

This chapter also addresses the issue of crew selection and what will be the individual (sometimes multiple) roles of the crew.

What then of the political challenges? My book is somewhat exceptional in this. Unlike many other authors, I take these challenges very seriously. There are ideological objections to Mars colonisation from those on the Left who argue for an Earthbound focus on issues of poverty and inequality, from those in the scientific community who favour "planetary protection"(which can mean many things but at its most extreme wants to radically minimise or even criminalise human presence everywhere except on Earth).

Finally in this chapter I look at the financial challenges. Essentially my message here is that the challenge of funding missions has been grossly overstated. My view is that once the colony has been established it will very quickly become a net profit venture. Funding is probably the one thing we can be sure will meet the challenge . Space X is generating billions of dollars of revenue through its satellite launches, its NASA contracts and its Starlink internet system. Much of that revenue is being diverted into the Starship development programme and other preparatory work for Mars colonisation.

THE LATEST WEATHER ON MARS

Here's your update for the weather on Mars provided by the Curiosity Rover in Gale Crater.

For the nearest Sol to **23 October 2024** we have a *high* of **minus 10 degrees Celsius** (14 degrees Fahrenheit) – three degrees colder than last month but still something most of us will have experienced on Earth.

The low for the same date, at **minus 74 Celsius** (or minus 101 degrees Fahrenheit), is a couple of degrees

colder than last month. Very, very cold but – as we have said more than once in recent months - not as cold as the record low on Earth (minus 89.2 Celsius), registered at Vostok on Antarctica in 1983. So a reason to be cheerful. 😊

In the News…

Elon Musk made a surprise virtual attendance at the Future Investment Initiative in Saudi Arabia this month.

He confirmed that Space X are aiming to launch robotic Starships to Mars in just over two years, with humans to follow two after that if the robotic missions are successful. So an earliest date for humans on Mars would be 2028/29.

He's also predicting that there will be more humanoid robots than humans by 2040 – a total of 10 billion in fact. Musk has a great record of putting cash cows into production…and humanoid robots might be yet one more, possibly the most lucrative of all. At an estimated cost of up to $25,000 that could generate a revenue stream of 250 trillion dollars. Let that sink in, as he once said. If so, that will be great news for Mars colonisation as Mars colonisation remains his real passion according to his biographer Walter Isaacson. Humanoid robots are a second-best

(Source: Space.com and others).

A fascinating eclipse!

The Perseverance Rover caught a great pic of potato-shaped Phobos passing before the Sun. Unlike on Earth, there can never be a whole eclipse of the Sun but on the other hand it will be fascinating to stand on the surface of Mars witness this marvellous passing of Phobos – or indeed Deimos.

Homo sapiens are master story-tellers and one can only wonder at what marvellous tales would have been told by us, had we been living on Mars rather than Earth for the last million years (were it possible).

Phobos's orbit of Mars takes only 7.6 hours – so pretty much three orbits per sol. As a result transits across the face of the Sun are quite common.

The pic dates from 30 September this year.

(Source: MSN and NASA)

. Green is the Colour

The Independent has reported that NASA has found shocking "green spots" on rocks on Mars.

Such spots, as seen on rocks on Earth, can indicate microbe activity. However NASA have cautioned that there was nothing to suggest this was what was being observed on Mars.

The green spots were observed after the Perseverance Rover used an abrasion tool to reveal the underlying rock colours

On Earth such green colouring can result from oxidization processes and water flowing through rocks.

It appears the Perseverance Rover had to suspend further investigatory work as its robot arms were in the wrong position.

(Source: The Independent, 29 October 2024 and others)

Concerns Over ISS Astronaut's Health on Return to Earth.

NASA report as follows: *"After safely splashing down on Earth as part of NASA's SpaceX Crew-8 mission Friday, a NASA astronaut experienced a medical issue. NASA astronauts Matthew Dominick, Michael Barratt, and Jeanette Epps, and Roscosmos cosmonaut Alexander Grebenkin were flown together to Ascension Sacred Heart Pensacola in Florida.*

After medical evaluation at the hospital, three of the crew members departed Pensacola and have arrived at NASA's Johnson Space Center in Houston. The one astronaut who remains at Ascension is in stable condition under observation as a precautionary measure. To protect the crew member's medical privacy, specific details on the individual's condition or identity will not be shared.

During its return to Earth, the SpaceX Dragon executed a normal entry and splashdown. Recovery of the crew and the spacecraft was without incident. During routine medical assessments on the recovery ship, the additional evaluation of the crew members was requested out of an abundance of caution.

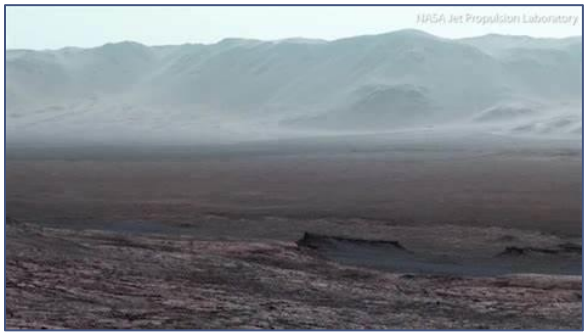
We're grateful to Ascension Sacred Heart for its support during this time, and we are proud of our team for its quick action to ensure the safety of our crew members.

The Crew-8 crew members splashed down aboard their Dragon spacecraft near Pensacola, Florida, to complete a 235-day mission, 232 days of which were

spent aboard the International Space Station conducting scientific research. NASA will provide additional information as it becomes available."

Our correspondent Victor Samuels comments that while NASA are respecting the health privacy of the individual concerned, the most likely area of concern will be cardiac function. It is not uncommon for there to be impacts on cardiac function from long-term zero G experience. This will be one of the issues that will be a challenge for Mars colonists.

PICK OF THE PICS



Credit: NASA

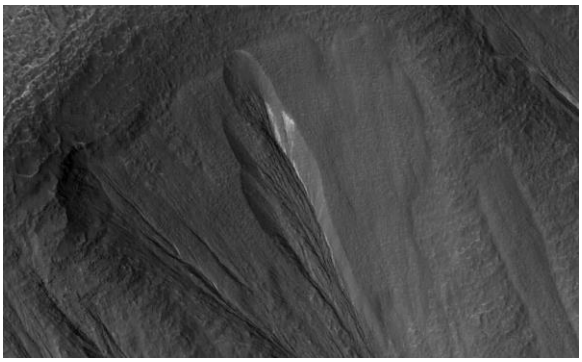
What a wonderful planet to explore!

Pendora says this is their favourite pic of Mars…because it suggests there is so much to discover about our neighbour planet.

We couldn't agree more!

THE ARESIAN HAS THE ANSWERS

Life on Mars comes closer…



Credit: NASA

Photograph of gully on Mars – white material is thought to be dusty ice.

Is NASA getting us ready for something? While NASA stress that no specific evidence for life on Mars has been found, they report that a new NASA study has concluded that microbes could find a supportive habitat beneath frozen water on the planet.

Using computer modelling, the authors of the study have shown that the amount of insolation through water ice is sufficient for photosynthesis to occur in shallow pools of meltwater beneath the ice. This is a phenomenon known on Earth where such meltwater pools are found to Similar pools of water that form within ice on Earth have been found to teem with life, including algae, fungi, and microscopic cyanobacteria, all of which derive energy from photosynthesis. It is thought that the process on Mars could be helped by dust in the ice, as that will absorb more energy that is then release as heat, helping create the meltwater pools.

(Source: NASA, 17 October 2024)