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FLIGHTS 8 & 9 –

A LOT RIDING ON NO. 9!

After the destruction of the Starship in Flight 8 (very similar to what happened on Flight 7) we seem to be at a critical juncture. Another explosion could place a big question over the whole programme. In this issue *Mary Khan* examines all the issues in play.

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FRESH AIR AND THE GREAT OUTDOORS ON MARS – BUT INDOORS!

Owen Louis David* examines how we could give ourselves the feeling of being outside and how we can make the air we breathe as fresh as fresh air on the home planet. It's fascinating stuff!** ***See Page 2

IN THE NEWS

Mars never seems to be out of the news these days.

In this edition we focus on some interesting news stories about

The recent discovery of long-chain hydrocarbon molecules on Mars is one of the biggest elbow-pushes towards the conclusion that there is or was life on Mars.

We also cover reports of another interesting spherules discovery and the story of how the Red Planet became red.

Lots to interest the Mars-focussed mind!

FRESH IS BEST – MAKING LIFE SWEET ON MARS

By Owen Louis David

It might seem like an odd question but recently I've been trying to answer the following: *"How do we make Mars smell good?"* Specifically I've been focusing on the issue of fresh air but *within* the planned city on the Red Planet, not out on the plains of Mars.

I was motivated to address this question when in online comments discussing Mars colonisation I noticed opponents of a Mars Mission saying things like *"you'll die of boredom"*, *"imagine being imprisoned in a windowless habitat"* and *"imagine never being able to go outdoors and smell the fresh air"*.

Now I don't think people will be bored on Mars or feel imprisoned (the city will be on the surface and there will be windows!). A city of one million on Mars covering maybe 300 sq miles or more can be made highly exciting with a huge range of cultural and leisure activities which people can participate in or watch – everything from basketball, to swimming and diving, saunas and so on. Water-based activities will I think be a strong element in creating a fresh-air feel. Researchers have found that water at a temperature below our body temperature is associated strongly with the idea of "freshness". Also anything that feels like the skin is being given a treat – sauna and massage - will be important (because the exposed skin is what tells us when we are "outdoors" and we need to keep the skin happy.

So far so good. But it's when people talk about fresh air, that I do feel a potential pang of regret or a slight sense of foreboding. Could I, *personally*, live without fresh air? I think this might amount to my greatest concern about committing to living on Mars.

It's a question, as the interior designers say, of bringing the outside in, or at least doing everything we can to fool or coax people's senses into thinking they are outside when they're actually "indoors". The fundamental question is: *"What is it that gives us that sense of fresh-air well being?"*

Now some of you who are familiar with my previous articles may recall I have promoted the idea of both urban parks within the city of Mars and Earth-like environments on the urban periphery. I want to make these experiences as close as possible to their Earth equivalents.

But I also want to go a little further and consider that "olfactory hit" that makes us breathe deeply and say *"Ah – fresh air…isn't it lovely?".*

Firstly, though, let's try and define "indoors" and "outdoors" in a Mars context.

People living in the city on Mars will be conscious of the exterior landscape in the Mars city. It most definitely won't be a windowless subterranean kind of place. There are ways I am sure that we can make the outside visible from the inside. The windows will likely be made of thick glass, so the one you get of a runway or apron from an airport departure lounge. But I imagine the landscape will be lit up at night with subtle coloured lighting creating a wonderful image of outdoors. Imagine a light show of sorts, with patterns of colour gliding over the surface, statues and "gardens" outside. Perhaps on a distant peak there will be a lighthouse, a comforting symbol of "home".

In terms of venturing outside on to the Mars landscape, that will be a fairly rare event for most people. Possible dune buggy riding on the outskirts of the city will be popular as a leisure and sports activity. The people of Mars might go out in RVs/motorhomes on exploration tours. People will also don go counter-pressure space suits very occasionally maybe in high summer when they can wear mesh fingered gloves so that they can actually feel rocks and so on. Of course all these external activities involve breathing air in a pressurised environment or through special scuba-type apparatus – not taking in deep draughts of fresh air.

OK that's what we might call the true outdoors but "indoors" – either within or connected to the big city - there will be different environments that could be made to feel somewhere you experience fresh air Firstly there will be the areas outside offices, restaurants and apartments, what we might call the public space where people walk and cycle or use EV taxis to get from one place to another.

Then there will no doubt be small parks located close to commercial and transport centres. These will be planted out with trees, shrubs and flowering plants. They may also have fountains or "streams" running through them.

Lastly I think it very likely that the city will connect via tunnels to separate Earth-like environments such as artificial or natural gorges with glass roofs that are pressurised and which will have Earth-origin flora and fauna. There may also be streams and waterfalls.

So here, from my research are some of the key factors which will enable us to provide the residents of the Mars city with an experience akin to tasting the fresh air of outdoors:

1. Psychological

We have strong associations with indoors and outdoors. The "threshold" concept is part of those associations, the idea that there is a definite boundary between indoors and outdoors. For instance when you emerge from a tunnel into an Earth-like environment (eg a gorge that has Earth-origin flora and fauna), there will likely be automated doors. So imagine these automated doors open quickly on a scene of lush vegetation, birds in flight. We might wish to ensure the tunnel has low light living levels while the threshold area is always breezy and brightly illuminated (the light being in the natural spectrum we find on Earth. We might even incorporate a very fine water mist in the area, so that your skin feels the change as well.

2. Air quality

Clearly air contaminated with pollutants from industry, vehicular traffic and construction activity will not be perceived as the best "fresh air". However, we don't want air that is perceived as so pure that it is "sterile". On Mars, the air in public spaces and parks will be generally pollutant-free as industry will be segregated in other spaces and the vehicular traffic will run on electric motors not internal combustion engines. There will be a little bit of pollution from cooking and from tyre wear (though vehicular tyre wear will be minimal as surfaces will be much smoother). But air will be essentially uncontaminated in both in "private" spaces (offices and the home etc) and the public space.

"Fresh air" is much more than air without industrial and vehicular contaminants. We often know we are outside because we are tuned to the aroma of outdoors which includes the smell of soil, flowers, shrubs and other vegetation.

I expect the indoor parks on Mars to have real grass. Frequent (automated) watering well help create odours similar to those we detect on the home planet. There is a technical term for the Earthy scents following rain – petrichor. We will need the indoor parks and Earth-like environments to be petrichor-rich.

3. Oxygenation.

One of things we like about fresh air is that normally the air outdoors has a much higher proportion of oxygen than we experience indoors (where oxygen levels tend to get depressed as CO_2 is breathed out by humans).

Perhaps we should work towards oxygen levels in public spaces, parks and Earth-like environments being set at something like 25%, or even higher (ie significantly above the 21% average on Earth). The people of Mars will definitely get a pleasant oxygen rush from being in these more natural settings.

4. Humidity and water

One of the things about indoors is that humidity tends to be low and on one average level within a building. Also, it's rare for us to be exposed to water directly while indoors.

Perhaps we should aim for more of a differential in public spaces, parks and Earth-like environments.

I would recommend fountains in public parks as a way of people feeling fine water droplets on their skin as they pass by. In the Earth-like environments, waterfalls, pools and streams can create a nice sense of fresh outdoor air. I would also expect there to be water spray mechanisms fixed high in the gorge that can replicate a brief light shower every couple of hours or so, but not on a predictable pattern.

5. Breezes

The air indoors tends to be still. When we go outdoors we often notice there is a breeze and that while it may have a general direction, how it moves will depend much on obstacles such buildings, hills and trees getting in the way – meaning the breeze can shift direction as we walk along. We need to deploy some (quiet) wind machines particularly in and around park areas to recreate these breeze effects.

For the Earth-like environments we can probably raise the wind speed considerably and have it vary over a wide range. Again breezes and wind can intensify odours in the nasal passages.

6. Underfoot

This might also be filed under "psychological". Indoors is very much associated with flat stable surfaces to walk on. We associate the countryside with more difficult terrain whether it be divoted turf, potholed roads or rocky paths. Certainly in Earth-like environments many of the paths would benefit from being more challenging, with cambers, puddles, mud and stones. Pyschologically this will make us think "outdoors" and will also create rising odours that our olfactory senses will detect.

7. Above us only sky?

For indoor parks I am thinking there might two obvious choices. One is to have pannelled glass that actually gives a view of the Mars sky overhead as it actually is. The struts of the pannelling could be disguised by vegetation (probably artificial, so that it is always in position which would in turn merge into natural vegetation growing in the park). The only problem this is that I would expect the glass to be thick, and so our eyes could probably detect that we are not "outdoors" with a natural sky directly overhead.

An alternative would be to have a real-time illuminated projection of the Mars sky outside on the ceiling that covers the park.

For Earth-like environments I think I would favour the blue sky of Earth with bright white clouds in motion. Again, any struts in the roofing could be disguised with artificial vegetation merging into natural flora. However, an alternative would be to have a natural view of the Mars sky overhead.

The above pretty much covers my thoughts on how to create a sensation of fresh air and the outdoors within pressurised spaces on Mars. However, before concluding, I did also ponder the following interesting question:: does everyone across the planet feel the same about "fresh air"?

I haven't been able to find any specific research on this but my suspicion is that people living in different climate zones have a different attitude. Humans living in tropical or sub-tropical zones essentially get pretty much the same weather every day.

People who live in very dry and hot regions e.g. the Mediterranean and SW USA also experience very similar weather for maybe 6 months of the year.

In warmer climates people often have windows and doors open, to encourage air circulation – there is not such a strong "threshold" between indoors and outdoors.

However people who live in regions like NW Europe with competing weather systems (Atlantic, Arctic and Continental) are of course very used to changeable weather. We Brits are notoriously fond of discussing the weather because there is always something to discuss – it's always changing…getting warmer or wetter, dryer or damper.

So I think people from areas like NW Europe have a particular idea of fresh air – that it's very variable, changing in subtle ways from day to day. Fresh air in NW Europe is also far more "seasonal". Winter smells very different from summer as does spring from autumn. But in tropical and sub-tropical climates the olfactory input is pretty similar all year round.

IN THE NEWS

Life on Mars just got one step closer…

NASA's Curiosity rover has identified the presence of long-chain hydrocarbon molecules - decane (10 carbon atoms), undecane (11 carbon atoms), and dodecane (12 carbon atoms) - in a Martian mudstone sample. These molecules are the largest organic compounds yet discovered on Mars, and their presence suggests that the conditions for life on Mars to get started were better than previously thought.

Scientists believe that these molecules are fragments of fatty acids, which are

organic compounds. On Earth, they are key ingredients in the formation of life.

The sample was collected from the Cumberland sample, a mudstone found in Gale Crater.

Of course any discovery of actual current life on Mars may radically alter the picture for future colonisation.

The consensus at *The Aresian* is that seems extremely unlikely that there was never life on Mars, if only because Earth has exchanged probably billions of tons of material with Mars and because we know some organisms - extremophiles – could certainly survive on Mars. Is there still life on Mars? If it ever existed it seems very like that it would have survived in pockets of Mars. We could expect to find it in hot hydro-vents, or where there are cyclical seasonal warming events that result in flowing water or perhaps buried in ice.

Our view is that life is unlikely to be widely distributed on Mars otherwise, as on Earth, we would have widespread visual evidence of life.

MAKING MARS

MAKE SENSE –

THE ARESIAN

PICK OF THE PICS

One of Perseverance rover's most recent images from 21 March 2025.

Credit: NASA

This is a beautiful image of the Martian landscape at Jezero crater taken by the Perseverance rover, from earlier this month. That's quite a romantic image isn't it, with a haze hanging over the distant hills? So many entrancing landscapes on Mars.

IN THE NEWS - CES

Red Planet Explained

The Jet Propulsion Laboratory report (25 February) on recent research suggesting that one of the various iron oxides found in Mars dust – ferrihydrite - is the main reason for the reddish colour of Mars.

Ferrihydrite forms in cool water. This is taken as evidence of Mars' much wetter past when water flowed freely on the surface, thus

potentially supporting life as on Earth. JPL refer to this being “billions” of years ago.

Spherules Rule

A rock made up of tiny spherules has NASA scientists scratching their heads if only a little bit..

Here’s an image showing the rock in place (to the right).

And here is the close up image taken on 11 March of part of the rock.

These images were taken by Perseverance at Broom Point, located on the lower slopes of the Witch Hazel Hill area on the Jezero Crater rim. During a routine check of the area, Perseverance spotted a rock that has been named “St. Paul’s Bay”. The anomalous texture of the rock is obvious even frpm a cursory glance.

It is composed of hundreds of millimeter-sized spheres, dark grey in colour. Some of the small objects were more elongated or whereas others appeared to have been broken off. Some spheres even possessed tiny pinholes!

Avid followers of all things Mars may recall that back in 2004 the Mars Rover Opportunity came across what were called “Blueberries” at Meridiani Planum. Later, Curiosity rover has observed spherules in a rock at Yellowknife Bay in Gale Crater. Just a few months ago, Perseverance itself also spied popcorn-like textures in sedimentary rocks exposed in the Jezero crater inlet channel, Neretva Vallis. In each of these cases, the spherules were interpreted as concretions, features that formed by interaction with groundwater circulating through pore spaces in the rock. Not all spherules form this way, however. They also form on Earth by rapid cooling of molten rock droplets formed in a volcanic eruption, for instance, or by the condensation of rock vaporized by a meteorite impact.

Each of these formation mechanisms would have vastly different implications for the evolution of these rocks, so the team is working hard to determine their context and origin. St. Pauls Bay, however, was float rock — a term used by geologists to describe something that is not in-place. The team are now working to link the spherule-rich texture observed at St. Pauls

Bay to the wider stratigraphy at Witch Hazel Hill, and initial observations have provided tantalising indications that it could be linked to one of the dark-toned layers identified by the team from orbit. Placing these features in geologic context will be critical for understanding their origin, and determining their significance for the geological history of the Jezero crater rim and beyond.

Flight 9 – Each roll of the dice raises the stakes.

By Mary Khan

Well, as predicted last time, Flight 8 did indeed end up being a real nail-biter – a perfect catch for the Booster in the chopstick arms on the plus side but another "RUD" (Rapid Unplanned Disassembly) for the Ship itself.

So what went wrong? It appears that the Version 2 innovation of running the vacuum insulated fuel lines through the oxygen tank could be the culprit – coupled also with a 25% increase in the fuel supply (meaning Version 2 is a significantly bigger ship) and quite major changes to the piping scheme. The whole ship was less rigid than before. As the oxygen tank drains, harmonic oscillations (they sound quite nice but they aren't!) of the fuel lines – violent oscillations - become an issue.

Based on Space X statements and most commentators' analysis, it seems the standard exhaust system and fire suppression system were unable to deal with the leaks resulting from the violent oscillation phenomenon which ruptured pipes and disrupted the cooling system around the engines with the results we all saw on our screens.

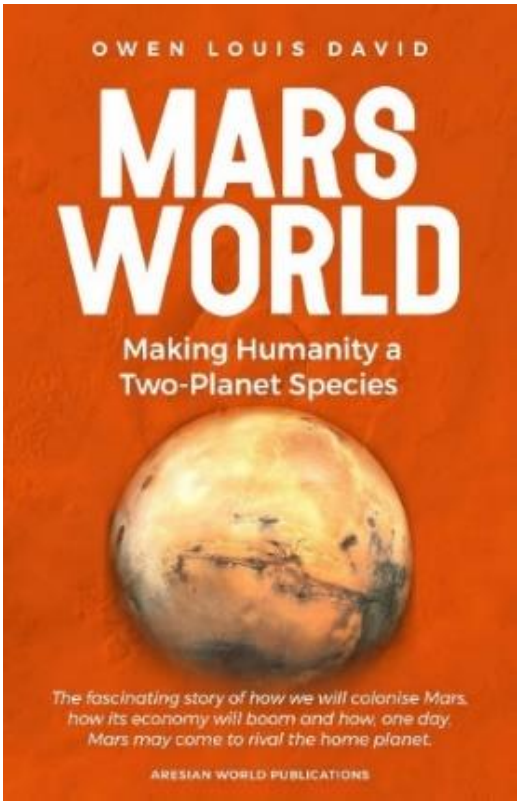
Flight 9 is of course subject to the Flight 8 mishap investigation. The FAA needs to be satisfied that another launch will not compromise the safety of people along the flight path.

The launch of Flight 9 (with Starship 35 and Booster 19 on the starting line) could take place as early as 7 April in theory but a date in the second half of the month looks far more likely. It's going to be a pivotal moment – another RUD failure could spell a major rupture in the programme and impact other projects such as the Starlink internet system and the lunar Artemis programme for NASA. Delay could be a matter of months or even years.

So much is riding on this! - time to head to the nail bar to get some extensions to

your nails – it's going to be another nerve-wracking launch.

It seems possible that the hot staging ring could be part of the problem specifically back pressure and shock waves damaging the Ship's engines. Essentially on separation of the Booster, there are issues with the design which many think is lacking. A new design which is taller and provides for more vents for flame escape is in the works. However the new design will not be in play for Flight 9 which perhaps raises a big question.



WEATHER REPORT!

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

For the nearest Sol to **26 March 2025** we have a *high* of **minus 23 degrees Celsius** (minus 9 degrees Fahrenheit), the same as last month The low for the same date, at **minus 78 Celsius** (or minus 108 degrees Fahrenheit) is a little colder than last time. We're still short of the record low recorded on Earth (minus 89.2 Celsius) which was registered at Vostok on Antarctica in 1983. But it's late autumn in this part of Mars now and there's a definite chill in the air!