Mars: The Ultimate Voyage Script

An original Bell Museum production

OPENING:

In orbit over Mars.

NARRATOR

Mars.
The fourth planet from the Sun.
A desert world of rock and iron
that has captured human imagination
for thousands of years.
So close, its reddish color can be
seen in the night sky. But much
farther than anyone has ever
ventured.

Areas on Mars where previous missions have landed begin to be highlighted with pop-up windows etc.

NARRATOR (CONT'D)

Orbiters, launched from Earth, were
the first instruments to capture
close up photographs of the alien
landscape from space.

These were followed by surface
exploration robots that gave
scientists a ground level view of
the red planet.

From the data collected on these
missions, scientists believe that
Mars was once similar to Earth.
With oceans of water and a thick
atmosphere capable of supporting
life.

The more we learn about Mars and
how it came to look as it does
today, the more we will understand
our own planet's past...and quite
possibly, our future.

A Mars craft of the next generation drifts into view close to camera. In orbit. Its shape is familiar as a NASA human carrying craft yet distinctly new.

NARRATOR (CONT'D)
While orbiters and robots have made amazing discoveries, they can't match the scientific potential of a team of astronauts.

ASTRONAUT A
This is mission commander. Comms check aboard the landing module.

NARRATOR
This is the Eventus One space craft. A concept vehicle that could carry the first humans to Mars... and back.

ASTRONAUT B
Roger that commander, reading you loud and clear. Separation checklist complete no abnormalities.

NARRATOR
The crew of the Eventus mission could explore more of the Mars surface in one hour than a robot lander could in a month.

NARRATOR
But getting them there won't be easy. This will be the longest journey ever attempted by human beings. To be successful, we'll need to overcome incredibly difficult challenges. Challenges that make this mission to Mars...The Ultimate Voyage.

TITLE REVEAL: During this time the Eventus module enters and fills the dome. The camera follows.

ASTRONAUT A
Elapsed time, three-zero-four, thirteen, fifty-two, twenty. We're at Mars atmospheric entry interface plus-thirty. We are go for

separation.

Silhouettes of our NASA employee network begin to fade and flicker around the dome.

NARRATOR
This mission to Mars will depend on the next generation of great minds and dreamers...

The landing module detaches and begins entry stage.

ASTRONAUT B
And we are clear - entry angle looking good - point-two degrees shallow.

NARRATOR
...Tens of thousands of creative thinkers, scientists and engineers. People who are still in school now, will one day make this ultimate voyage a reality.

ASTRONAUT A
That's affirmed. Velocity rate - nominal. Point one-five meters high.

Show recent college and high school graduates, athletes and also middle school science fair winners, art pictures. The images quickly move away.

NARRATOR
But none of this will be attempted unless one thing can be ensured - that we can get the astronauts back to Earth alive and healthy.

The landing sequence freezes and fades to a wireframe plan image.

NARRATOR (CONT'D)
Up to this point, successful missions have proven that we can safely land robots on the surface of Mars, but sending people requires a lot more work and

planning.

The camera pulls out revealing plans for the five challenges in rough wire frame connecting to primary human needs.

NARRATOR (CONT'D)
Humans evolved on Earth, with its thick atmosphere, strong gravity, and wide variety of life.
(MORE)

NARRATOR (CONT'D)
As the population grew, complex social structures formed.
These factors helped shape who we are and what we need.

In order to send humans to Mars, NASA teams need to solve five major challenges.

How do we traverse the incredible distance from Earth - farther than we've ever gone before?

How do we make sure that the inside of the spacecraft is a healthy environment?

The astronauts will be isolated from everyone they know back on Earth. How do we ensure that their minds remain clear and focused?

Gravity in space and on Mars is very different than on Earth. How do we keep human bodies strong and capable?

And finally - How do we keep the astronauts safe from dangerous radiation during their long journey in space.

Images appear representing the 5 challenges described

Teams at NASA have been working on
these challenges for decades.
But they haven't been completely
solved.
To be successful, this mission
needs new team members to help get
humans to the Red planet and back.

The full Mars mission is outlined in 3D space from the flight path to orbit/landing on Mars and return to Earth.

DISTANCE FROM EARTH:

Cross fade to a perfect in-orbit shot of Earth. A small red dot of Mars can be seen by the trained planetarium-goer.

NARRATOR
The first challenge - distance -
seems straightforward, but becomes
more and more complex the farther
we get from Earth.
And Mars is very far from Earth.

The red dot is circled and labeled as "Mars"

NARRATOR (CONT'D)
The journey to Mars will be over
600 million kilometers. This
immense distance is hard to grasp.

Compared to other space journeys
humans have taken, it can be like
the difference between walking next
door and walking around the world.

The image of Earth transitions into a graphical look and a distance line appears and we follow to see the ISS and the Earth.

NARRATOR (CONT'D)
As the International Space Station,
the ISS, orbits Earth, it travels
400 kilometers above our planet.
The trip to get there takes only a
few hours.

We pull out to reveal the Moon, the distance is measured between the

three now.

NARRATOR (CONT'D)
The journey to the Moon, however, is a thousand times farther. At over four hundred thousand kilometers, it's the greatest distance humans have ever traveled. It took the Apollo astronauts 3 days to fly from the Earth to the Moon.

NARRATOR (CONT'D)
And the voyage from Earth to Mars will take much MUCH longer.

NARRATOR (CONT'D)
At least 10 months will be needed to travel over 600 million kilometers. 10 months to travel over one thousand times farther than any humans have ever traveled before.

We see the full distance laid out in extreme length.

The path starts to get more complex representing the projected path the mission might take. Images of a team contribute to stages of the path.

NARRATOR
A journey of this distance may seem impossible, but NASA has been preparing for years. Starting with the earliest space missions, pioneers like Katherine Johnson, an African American mathematician, and computer scientist, Margaret Hamilton, laid the groundwork for humans to travel beyond Earth.

An outline of the missions Katherine Johnson computed for become the focus around Earth. Images of her and others on her team take over.

NARRATOR (CONT'D)
Thanks to these early trailblazers, the Eventus navigation and flight path teams will be able to calculate the route to get the

astronauts to Mars and back.

The camera settles in behind the craft at the beginning of its launch from the Moon's orbit.

NARRATOR (CONT'D)
But even the fastest route will keep the crew traveling in space for over two years.

We see hundreds of space boxes and canisters flying into the craft.

NARRATOR (CONT'D)
And two years of travel means two years of supplies. Everything the crew could possibly need for this voyage must be planned, prepped and packed before departure.

NARRATOR (CONT'D)
The stakes couldn't be higher - if one essential item is overlooked, the entire mission could fail.

Team images become part of the packing array.

NARRATOR (CONT'D)
Specialized engineers will calculate how much food, water, and oxygen the crew needs to survive. Other team members will prep medical supplies, tools and probably some things that haven't even been invented yet. Then people skilled at organizing will need to pack everything into extremely small spaces, leaving enough room for the astronauts to live and work.

NARRATOR (CONT'D)
Proper planning is crucial. Once the Eventus One begins its historic voyage there is no turning back.

HOSTILE CLOSED ENVIRONMENT:

The camera pushes inside the craft to get our first look at the close interior inspired by the designs of the ISS but clean and futurized.

NARRATOR
With everything packed and the journey started, the next challenge will be inside the craft built for this first Mars mission.

We push through the wall of the Eventus module.

NARRATOR (CONT'D)

This air-tight chamber will be the working, sleeping, eating and living quarters for the crew for the entire mission...over two years.

Yucky goop spreads/grows across every surface of the craft. The air begins to get thick with yellow haze.

NARRATOR (CONT'D)
Keeping the living area of a vehicle like this healthy for humans is the next major challenge of long distance space flight. Without proper planning, this high tech home in space could quickly become a sealed tube of germs and toxic gasses. A hostile, closed environment.

Fortunately, experts in the NASA Human Research Program have designed technologies that can keep the spacecraft clean and safe for the crew.

Team images accompany parts of the ship that are highlighted. The environment starts to clean up as we hear more.

NARRATOR (CONT'D)
Special lighting that kills microbes is already in use on the ISS. So teams

have a good start for developing the technology to keep surfaces clean.

Advanced air cleaning systems also need to be developed to remove germs and toxins without wasting a single molecule of oxygen.

The ship sparkles and the air looks fresh and clean.

To keep the crew healthy and ensuring they have a clean habitat will require team members with a passion for studying germs and viruses or tinkering with electronic devices.

While it's essential that our crew has a safe environment, determining what they'll eat is equally important.

Even before humans ventured into space, having enough food has been a challenge during long distance travel.

The camera lowers to the deck of a classic sailing ship. A few crew members can be seen sprawled lethargically around.

NARRATOR (CONT'D)

For hundreds of years, the most frequent cause of death on a sea voyage wasn't a pirate attack or a raging storm, it was packing the wrong food to eat.

Ships would be loaded with supplies, but they often lacked the fresh fruits and vegetables necessary to prevent a disease called scurvy. This illness, caused by not getting enough vitamin C, led to many crew members of these early expeditions getting sick and even dying.

The ship fades and we see various foods circling the dome.

NARRATOR (CONT'D)
We can't let anything like that happen on the way to Mars. Proper nutrition is one of the best ways to keep people healthy. So packing food that will nourish astronauts with the best balance of vitamins and minerals is essential.

Food teams are visible among the food with vitamin magic.

NARRATOR (CONT'D)

Food scientists will need to look at a wide variety of factors to develop the best food for the Eventus crew. While proper nutrition will be the most important consideration, we've also learned that delicious foods make people happy.

NARRATOR (CONT'D)
In space, the sense of taste can be dulled, so astronauts prefer bold and spicy flavors.

NARRATOR (CONT'D)
The Advanced Food Technology research team at NASA needs people with a passion for creating delicious and nutritious foods.

Of course, these meals also need to be packaged in ways that keep them tasting great while remaining fresh.

The food spins off.

ISOLATION AND CONFINEMENT:

Space comes into focus and the Mars vessel comes into view and flies towards the camera

NARRATOR

The Eventus mission needs over two years' worth of food and supplies packed into a clean, self-sufficient craft.

But our crew will face another challenge of long-distance space flight: isolation.

The Eventus crew will be separated from all other human beings and sealed inside this single, unchanging environment for months.

Halfway to Mars, three hundred million kilometers from home, real time communications with Earth will no longer be possible. When the crew sends a signal back home, minutes will pass before they receive a reply.

The dome shifts to show a brain with signals triggering reactions.

NARRATOR (CONT'D)
The human brain evolved in a constantly changing world.

NARRATOR (CONT'D)
Humans experience the world through sight, sound, smell, taste, and touch--our brains are wired to react to these inputs and respond.

On Earth, too many inputs and too much change can make life difficult.

The shapes get chaotic and shift faster.

NARRATOR (CONT'D)
But on a long space mission like this, the challenge is just the opposite - too little change.

The shapes simmer down to 4 circles not moving at all.

NARRATOR (CONT'D)
For the majority of the trip

everything will be exactly the same.
If everything is going as planned, nothing unexpected will ever happen.

The circles turn into 4 brain outlines that cycle between spiky and droopy.

NARRATOR (CONT'D)
Living in an environment where nothing changes can have a very negative impact on the brain, even highly trained brains like those of our crew.

The brains get more agitated and distorted.

Every task, meal or interaction will wear away at the crew's mental health if proper steps aren't taken.

One solution: keep the crew constantly engaged in meaningful and relevant activities. They need to be kept busy - in just the right ways.

The brains get tasks and focus on different things in the ship: computer screen, growing plants, repair work, exercise.

NARRATOR (CONT'D)
Sending humans into space is about a lot more than rocket science. NASA's Behavioral Health and Performance program needs people interested in human behavior and psychology to research ways for the crew to stay focused and content.

Team members are shown as before. A balanced pattern of changing yet controlled motion takes shape on the dome.

NARRATOR (CONT'D)

Finding solutions to prevent the effects of isolation on the minds of astronauts is key.

A balanced pattern of changing yet controlled motion takes shape on the dome.

The camera starts to pull back and float up and spin.

NARRATOR (CONT'D)

The next major challenge of long distance space travel is microgravity.

...Weightlessness.

The cards and other objects spin and drift. Weightless.

ALTERED GRAVITY FIELDS:

NARRATOR

For a few minutes, it's fun, but over a long period of time, when there are important tasks to be done, weightlessness becomes a big problem.

The shapes rise up and drift off revealing a human skull, large and imposing.

NARRATOR (CONT'D)

You see, the human body evolved to function with the pull of Earth's gravity.

The camera starts to pull back and orbit the whole skeleton.

NARRATOR (CONT'D)

Before humans went to space, we didn't realize how much the planet's gravitational field affects muscles, bones and the inner workings of our bodies.

We see downward force waves all around us.

NARRATOR (CONT'D)

That constant force, which can make
even small movements hard for some
of us, is one of the things that
give our bones strength.

The bones get a metallic look.

NARRATOR (CONT'D)
Without proper planning, the
extended periods of microgravity
that our astronauts will be exposed
to...

The arms begin to rise and the skeleton floats up off the ground.

...will make their bones so brittle
and their muscles so weak, that the
first step on Mars could be
disastrous.

The skeleton abruptly falls to the ground and shatters.

NARRATOR (CONT'D)
At NASA, teams of bio-medical
scientists, experts who study
muscle and bone health, are
experimenting with ways...

Team images begin to swirl around and the pieces of the skeleton pull together running in place. It is connected to a space treadmill.

NARRATOR (CONT'D)
...to ensure that astronauts'
skeletons and muscles are ready for
anything they might encounter on
the mission.

3 other skeletons are seen doing other space exercises.

NARRATOR (CONT'D)
Special types of exercise, with
extra resistance that mimics the
forces on Earth, is the key to
preventing deterioration from
months in a microgravity
environment.

A few extra empty image frames circle with lines pointing to parts of the skeletons. Some connection perhaps to people that are differently abled.

NARRATOR (CONT'D)
And there are probably other solutions out there as well. Technologies developed for the Mars mission might come from a team member whose physical struggles here on Earth have given them great ideas about exercise in space. In the years ahead, NASA teams researching human health and medical technologies will be essential to getting astronauts safely to Mars and back to Earth.

SPACE RADIATION:

The camera pulls out from the capsule to see it still on course. The Sun can be seen in the distance.

NARRATOR
The final major challenge when sending humans to Mars is the invisible threat of cosmic radiation.

A filter is put over the screen revealing the warm good stuff coming from the Sun.

NARRATOR (CONT'D)
Like other stars, our Sun emits light and heat, which are essential to life on Earth.

Now waves of radiation are seen pumping out from the Sun and distant sources washing over the capsule.

NARRATOR (CONT'D)
But stars also generate something that can be deadly to living things. High energy radiation.

We see outlines of our 4 astronauts in the capsule and then follow a particle as it flies towards the craft.

NARRATOR (CONT'D)
Radiation particles are so small, they can travel between atoms, the

elements that make up everything in
the universe.

Everything is made up of spheres/molecules and we continue to follow the particle as it travels between the spheres that make up the craft.

NARRATOR (CONT'D)
That means they can shoot right
through the walls of the Eventus
One and everything inside - even
the astronauts.

The particle flies inside a collection of spheres of an astronaut at the molecular level.

NARRATOR (CONT'D)
While these tiny particles don't
leave holes that can be seen, the
damage they cause to the human body
is immense.

We end at the DNA strands and the particle we were following passes out of view.

NARRATOR (CONT'D)
Radiation particles can break apart
human DNA, the building blocks that
tell our bodies how to grow and
function.

Particles hit the DNA strands and they start to topple and fall around us.

NARRATOR (CONT'D)
Damage to DNA can be devastating to
the human body, impairing an
astronaut's ability to perform even
simple tasks on the mission.

The camera zooms out of the pile of broken DNA to be in orbit around Earth.

NARRATOR (CONT'D)

If the proper steps aren't taken, our crew will
be at a greater risk of diseases
like cancer after they return home.

We see the magnetic field around Earth with the cosmic particles being absorbed and bouncing off.

NARRATOR (CONT'D)

On Earth, cosmic radiation isn't usually a problem. The atmosphere and magnetic field surrounds and shields us from this unseen threat. Our planet is the ultimate spacecraft.

Our network of team images begin to pop up around the globe.

NARRATOR (CONT'D)
There couldn't be a safer place to find solutions to protect the crew from radiation in space.

The Eventus mission will require people who can monitor space weather, like a meteorologist does on Earth, to warn the crew of solar radiation storms.
We'll also need material engineers to develop anti-radiation gear to minimize the crews' exposure on the long flight.

The camera is pushing close to Earth moving to fly past it. The Sun is moving behind it just ahead of us.

NARRATOR (CONT'D)
And probably a team
- not yet imagined -
who will discover a new way to solve the challenge of cosmic radiation.

We fly past the horizon bringing the Sun into full view, and we speed at a breakneck pace to catch up with the capsule.

As we catch up a bright glint of the Sun pings off the side of our capsule, but as we approach it's transparent and faint. It begins to fade away more rapidly, even the darkness of space begins to weaken to grey.

LANDING ON MARS:

Subtle movement in the grey can be felt, it is the Martian sky.

NARRATOR

Camera: Mars landing moment - transition from space to Mars landing Zoom in on the landing module to see it continue its descent. The warning signal stops.

The heat shield shows clear signs of entry.

ASTRONAUT B
Heat shield temp - passing nineteen hundred degrees Celsius.

The camera has settled below the lander, looking up at it.

NARRATOR
The crew has made it to Mars, but it still needs to land on the red planet itself.

ASTRONAUT A
Copy that. HIAD deployment in T - minus 10

NARRATOR
Earth's thick atmosphere provides drag on vehicles returning from space, allowing for a slow descent and safe landing.

ASTRONAUT A
HIAD deployment engaged. Full pressure and holding.

Elaborate parachutes are released like those used for Perseverance. The camera begins to lag behind the capsule turning to see the surface of Mars approaching fast.

NARRATOR
Mars's atmosphere is too thin for parachutes to slow this massive landing craft so new approaches need to be developed. An expandable heat shield that can protect the craft and provide much needed drag might be part of the final landing plan.

The heat shield is expanded greatly slowing the descent and the camera zooms past and looks up to keep the landing craft in sight.

ASTRONAUT A
Coming up on landing radar activation. Got it - landing radar engaged.

NARRATOR
In a matter of minutes the landing module has to slow from a blazing 19,000 kilometers per hour to 8 to ensure a safe landing at the exact location we choose to explore.

A burst of a massive thruster array starts to fire, and continues throughout. The camera has slowed and begins to look down again and we can see the ground again. Still fast approaching.

The camera pulls in close beside, matching the angle of the Apollo moon landing camera.

Billions of humans on Earth will be waiting for word of the touchdown. And thousands will be working tirelessly to make it happen.

Finally it comes to rest safely on the surface.

ASTRONAUT A
We are here to take the next giant leap for human-kind.

NARRATOR
This dream can only be realized if we assemble the right teams to overcome the five main challenges of long distance space flight:

Solving these problems will make the mission possible, but there is much more work to be done to make the mission a SUCCESS.

Camera note: 360 Apollo move around capsule to draw on of rover and flyby to living structure

Vehicles, habitats and supplies, created by robotic and structural engineers will need to be ready on Mars before the human crew arrives.

These technologies will enable the crew to achieve their mission of exploring and learning as much as possible from the red planet during their time on the surface.

Structures have formed and give a full view of what the base on Mars might look like.

NARRATOR (CONT'D)
The work is already underway.
But we'll need the next generation of minds to join this great endeavor.
To build on the countless triumphs of space exploration that came before.

NARRATOR (CONT'D)
The first astronauts to land on Mars may be in school today...looking up at the stars at night in wonder.

Transition to the night sky from Mars.

NARRATOR (CONT'D)

And the team that gets them there...The tens of thousands of scientists, engineers and support specialists...
They are getting started too.
Finding their spark of inspiration.

The stars begin forming paths of light coming together.

The most complex problems of our time need people with unique experiences and diverse perspectives.

Together these teams enable the best of human achievement and ingenuity.

If we can send astronauts to Mars and get them back safely - the ultimate voyage- just imagine what else humans can achieve.
The possibilities are endless.

Fade to black

Credits