Opening Teaser-Teaser 1

Next on "Odyssey of Survival": We take a future trip through our exploratory past. From our initial launches of artificial satellites, to men travelling to the Moon; from the construction of the first International Space Station to the first active lunar bases; from the first manned missions to Mars to the first autonomous, self-sustained colonies surviving "off-Earth". Explore mankind's first one hundred years in space. Join us on "Odyssey of Survival".

Block 1

1957—the Space Age officially began when the former Soviet Union launched the first artificial satellite to orbit the Earth, SPUTNIK.

In 1961—Freedom 7 was launched from Cape Canaveral, carrying Alan B. Shepard, Jr., who became the first American to go into space. His flight lasted 18 minutes.

"…2…1…0…liftoff"
"Oh Roger, liftoff and the clock is started! Yes sir, reading you loud and clear. This is Freedom 7…the fuel is go, 1.2 g, counting at 14 PSI, oxygen is go."

In 1962—(we hear audio and see video of Kennedy speech)

“I believe that this nation should commit itself, to achieving the goal before this decade is out, of landing a man on the Moon and returning him safely to the Earth.”

Earlier that year--John Glenn became the first American to circle the Earth, in his Friendship 7 Mercury spacecraft.

“…1…0…”
“Roger! The clock is operating, we’re under way. God speed, John Glenn!

In 1965—the second piloted Gemini mission, stayed aloft for four days and astronaut Edward White II performed the first ‘spacewalk’ (or EVA), by an American.

1968—the first piloted flight of the Apollo spacecraft, Apollo 7, and the Saturn 1B launch vehicle. This flight involved astronauts Walter Schirra (She-rah), Jr., Donn Eisele (pronounced as Eyezli) and Walter Cunningham; who tested hardware in Earth orbit.

Later that year, Apollo 8 became the first manned spacecraft to make a circumlunar flight. As it traveled outward the crew focused a camera on Earth, and for the first time humanity saw its home, a blue marble floating in space.

1969—The first lunar landing mission, Apollo 11, lifted off, on July 16, and began the three day trip to the Moon.

With only 30 seconds of fuel left, astronauts Neil A. Armstrong and Edwin "Buzz" Aldrin landed on the lunar surface, while Michael Collins orbited overhead in the Apollo command module.

In 1971—Apollo 14 blasted off for Fra Mauro, completing a mission intended for Apollo 13.

Later that year, Apollo 15 was the first to include the lunar rover to extend the range of the astronauts on the Moon.

1972 marked the end of the Apollo program, with Apollo 17. Having attained Kennedy's goal of putting an American on the Moon and returning him safely to the Earth, combined with the tremendous expense per launch, the United States could not justify continued missions to the Moon and so the Apollo program was shelved.

In spite of some damages made to Skylab upon launch, the Skylab 2 mission began in 1973. Though some repairs had to be completed, the crew had no trouble adapting to their new home in space. Two other Skylab missions followed.

At the height of détente between the United States and the Soviet Union, the Apollo-Soyuz test project, became the first international human space flight, in 1975. It also tested compatibility of rendezvous and docking systems in

space, to open the way to international space rescue as well as future joint missions.

In 1981, astronauts John Young and Robert Crippen flew space Shuttle Columbia on the first flight of the Space Transportation System (STS-1). The mission was the first to employ both liquid, and solid, propellant rocket engines for the launch of a spacecraft carrying humans.

Columbia became the first airplane-like craft to land from orbit for reuse when it touched down at Edwards Air force Base in southern California after a flight lasting just over two-days. The success of the reusable launch vehicle, led to more ambitious projects "off-Earth".

Teaser 2

When we return…the end of the Cold War brought cooperation between nations, instead of competition!

Using their combined expertise, to build a better future in space, nations joined forces to live together "off-Earth".

Block 2

1997

In 1997, the International Space Station continued the largest scientific cooperative program to date, drawing on the resources and scientific expertise of 16 –nations.

Some 40 launches were needed to launch the different components of the Space Station. They were later pieced together in orbit.

When completed, it provided living space for up to seven astronauts and scientists.

The pressurized living and working space aboard the completed station was roughly equivalent to the passenger cabin volume of two 747 jetliners.

The International Space Station was our first effort to live "off-world". Though readily re-supplied from Earth, it represented a training ground where we could learn things we needed to know to be self-sufficient and self-sustaining. But to what end? Where else could we go to live "off-Earth"? The Moon? Mars perhaps?

Wherever we went, we needed an ingredient essential to life as we knew it. Water, and lots of it!

Lunar Prospector found that a large amount of water ice existed at both the north and south poles of the Moon, an estimated 33 million tons of water.

On average, a typical person consumes an estimated 450 liters of water per day for drinking, food preparation, bathing and washing. At that rate, the same estimate of 33 million tons of water, could support a community of 1 000 two-person households for well over a century on the lunar surface, without recycling.

For centuries, people had been fascinated with Mars, a red beacon shining in our night sky. In 1976, NASA landed two probes on the surface of Mars. Vikings 1 and 2 were sent to search for signs of life, but returned images of a sterile landscape, covered with rocks and soil.

How exciting it must have been to see the first pictures of another planet beamed back to Earth.

<u>Quote: Gerald Soffen:</u>
"When that first picture started marching across, it was an experience of a lifetime. To actually see, see with your eyes, what it was like on Mars. I was thrilled at that opportunity; it was the high point of my life. Probably nobody will ever have a chance to be there when the first lander landed on Mars, and it's colored my whole life, colored my views."

Viking 1 arrived at the planet Mars and immediately began sending back photographs. Vikings' 1st lander touched down on Chryse Planetia, one month later. Viking 2 soon joined them and its lander, targeted for Utopia Planetia, landed on September 3rd.

For the next 6 years the Viking mission took over 55 000 photographs—sending to Earth images of volcanoes, dust storms, evolving polar regions and immense canyons. Evidence of Lake Beds, stream channels and lava plains, painted a picture of a very different Mars, from a time long ago!

The landers performed a multitude of experiments biological and chemical, for over 3 Martian years and yet, not one trace of organic material was found.

Still questions remained…so scientists began planning a return trip to the red planet.

Mars Global Surveyor, or MGS, began NASA's 10-year surveyor program, and for the following decade, NASA sent a new mission to Mars every two years.

Benefiting from the great leaps in technology, the new space programs followed a "faster, better, cheaper" philosophy that was so vital to the success of any space program in that day.

MGS was designed to study and map out the chemistry and topography of the 'Red Planet', with a resolution 25 times greater than Vikings orbiters.

Once its primary science mission was completed, Global Surveyor remained in orbit as a communications relay for future landers.

Pathfinder *carried the 1st roving vehicle to Mars using a heat shield, a parachute, rockets and an innovative system of air bags.*

Upon arrival, the cruise stage was jettisoned just 30 minutes before the entry vehicle dove directly into the Martian atmosphere.

The atmospheric friction of entry, created a fountain of fireworks around the craft, but Pathfinder was well protected by a Viking-derived heat shield, as it pierced the thin Martian atmosphere at 27 000 km/hour.

Descending on the night side of Mars, the spacecraft deployed a parachute when its speed slowed to less than 1500 km/hour.

After the heat shield was released, the lander was separated from the back shell on a bridal 18-meters long. A few seconds before landing, 5-meter diameter airbags, inflated, to help cushion the impact.

Then, retro-rockets fired to stop the spacecraft and suspend it briefly in mid-air, before its final descent.

As the Martian gravity is about one-third that of Earth's, the spacecraft bounced higher than a 10-storey building.

Four (4) airbags, each made of six (6) lobes, protected the lander inside.

After deflation and retraction of the airbags, the lander was exposed, revealing the rover and science instruments.

The spacecraft powered-up with the sun's light, drawing on its solar panels, to spring to life.

The landers camera took its first look and scanned the horizon.

Once the first panorama of Mars was sent to Earth, Sojourner powered-up and ventured out onto the surface for a closer look. The rover used lasers and cameras to detect rocks and other surface objects in its path as it moved across the surface.

This mission brought life to the dream Viking scientists had to reach out and touch those rock formations, seen through the eyes of the landers.

Sojourner's power source was a top-mounted solar panel, with a maximum capacity of 16 watts.

The Pathfinder mission proved to be a tremendous success and had great public appeal.

Teaser 3

Launching when Earth and Mars are properly aligned, the Mars Surveyor program sent two missions to the red planet, every two years for the following decade to study the Martian climate.

When we return we will look at the Mars Surveyor program.

Block 3

<u>On-Screen Quote: Johannes Kepler, circa 1600</u>
"But who shall dwell in these worlds if they be inhabited?…and how are all things made for man?"

Space exploration had benefited our race with a new wealth of knowledge of the Universe, yet some people still ask, "Is it worth it?"

Quote: Sir Arthur C. Clarke

"I have always been asked, of course, "why should we spend money in space when there is so much to be done on Earth"? Well, human beings want to explore, and as one of the great Norwegian explorers once said, "When we cease to explore, we cease to be human. So I think that people who ask, "why go out into space?" and don't believe we should, aren't really, fully human!"

Quote: Gerald Soffen

"Oh, I agree with that completely. I think that's uh…I, I think that it's impossible to destroy that. I think that that is the genetic quality of humans. That, that sense of exploration, that curiosity, that uh, that seems to be built in…we may not be the only species of, of mammals that have that, but certainly we have that, there isn't a human on Earth that isn't curious about what's over the next wall, or what's around the corner or who that person is, or what that animal is…or, I mean, that is sort of part of our, our human nature. And as long as there are humans here, I think that will exist!"

The Mars Surveyor program continued looking for evidence of life. By researching the past and present climate of Mars and assessing the inventory of natural resources on the planet, scientists hoped to uncover clues to why the planet evolved from a world of abundant flowing water and

a denser atmosphere, into its current dry and forbidding state.

Quote: Gerald Soffen:
"I think we will see a plan, that, that does this early exploration. I think the next step will be some sort of sample return here, to examine it, to at least prove, yes we can land, pick things up and bring it back. I think that we will have humans on, on Mars. It will first go into an exploratory phase. They may land on the Moons of Mars, before they land on Mars itself. I think there will be those, those early colonies that start on, there will be biosphere's put up on Mars. Mars will be the easiest planet, because it's so terrestrial-like. It has the main ingredients of sunlight and water and temperature and so forth…

"But eventually, humans will, will, in their engineering ingenuity, will go on beyond that…and uh, it's a whole question of time. If you think about it, we've only been at this 35 years, I mean the whole space program just started 35 years ago, that's nothing in the course of human history. So if you say, well, when will the first humans go to Mars? I don't know. Maybe 50 years, maybe even 60 years…it doesn't matter whether it's 50 or 60 when you're standing here in 1996. But I think it will happen certainly in the next century that humans will be on Mars, doing something on Mars.

“And if you give me a couple hundred years, which again isn’t very much in human history, our country is only a little over 2-hundred, 3-hundred years old, uh, that, that uh, this whole, this whole uh, exportation of humans to other worlds is inevitable. It just is inevitable, because the human mind, it will have nothing to do with practicality or money or anything, it’ll simply be, as, as one person said, “It’s in our genes!” We are, we are explorers, and we are curious and we will go on and, and, b-build better lives, and better quality of life, in other places.”

The Mars 98 Surveyor missions carried both an orbiter and a lander, which arrived at Mars at a predetermined time and location.

After the nine-month journey, with the lander still cruising through space, the orbiter was the first to reach its destination in September 1999.

As it began its approach to Mars, the spacecraft stowed its solar panels and awakened systems, which had until now, been lying dormant. The orbiters trajectory took it over the Martian North Pole.

On September 23rd, when the orbiters approach was at its closest point to the planet, it fired its main engine for 16 minutes. This slowed the spacecraft just enough to be captured in a long looping orbit.

During the next several months the orbiter skimmed through the atmosphere, of Mars, more than 200 times. This procedure, called aerobraking, used the drag, generated as the orbiter passed through the atmosphere to slow its forward speed. This gradually reduced the orbiters path around Mars until small bursts from its thrusters could be used to place it in a circular orbit 400 km above the Martian surface, circling the planet every 2 hours.

Once it had achieved a stable orbit, the orbiter configured itself for mapping operations and deployed its high gain antenna for the first time.

MARCI, short for Mars Color Imager, functioned both as a wide-angle and medium-angle camera.

The wide-angle camera sent daily global maps of Mars back to Earth. These maps tracked dust storms, clouds and weather patterns, observed changes to the Polar Regions and searched for variations of surface dust and frost patterns.

MARCI's medium angle camera, which had color filters and a higher resolution, determined the composition of surface materials and measured the levels of ozone and other gases in the atmosphere. This provided a wealth of information about the weather and helped to determine how seasonal changes affect the Martian terrain.

The PMIRR (pronounced Pamir), or Pressure Modulator Infra Red Radiometer, was an instrument similar to those found on Earth orbiting weather satellites. It measured temperature, dust levels, water vapor, surface frost and other aspects of the Martian atmosphere.

The PMIRR also monitored seasonal changes in the atmosphere, including the interaction between sunlight, wind, dust storms and the yearly growth and retreat of the polar caps.

PMIRR studied the planet for one full Martian year, which is 687 Earth days.15

Two months after the orbiter's arrival, the lander intercepted Mars.

Minutes before it pierced the thin Martian atmosphere, the lander jettisoned its cruise ring. Shortly after separation, the cruise ring ejected two microprobe landers, which descended to the surface of Mars separately.

During entry, the lander was encased in a capsule, which protected it from the searing heat, which was generated as it sliced into the atmosphere at more than 17 000 km per hour.

Although the Martian atmosphere is only about 1% as thick as Earth's, enough drag was generated to slow the lander so that its parachute could be safely deployed.

Still travelling faster than the speed of sound, the parachute slowed the lander sufficiently for the heat shield to be safely cast off, and the legs of the lander extended.

About a kilometer above the Martian surface, the lander released itself from the back shell and began a powered descent. Twelve thrusters located on the bottom of the lander, kept it stable and ensured that it landed facing the best direction for collecting solar energy.

As its long journey drew to a close, the lander touched down around 70 degrees latitude, near the South Pole of Mars, the first probe to land at such a high latitude. The landers target was the layered terrain, which underlies the seasonal advance and retreat of the southern ice cap known to harbor carbon dioxide ice and suspected to be hosting water ice beneath the surface.

Shortly after touchdown, the lander deployed its solar array weather mast and robotic arm.

The imager then began a 360-degree panorama of the landing site.

Inside the camera, images were reflected off mirrors onto filters, before being stored in the cameras memory banks.

The camera took highly detailed images, which allowed scientists to accurately measure the sizes of terrain features. With its array of filters, the camera recorded the geological composition of the landing site and the amounts of water and dust in the atmosphere.

The views of the landscape around the landing site were expected to be quite different from those of the Viking sites.

<u>Quote: Tobias Owen:</u>
"The, the, the point is, uhm…where would we go to try and find life if all the water is frozen? Well, if we are really after life, it sounds like we have to go deep. The other possibility, is that there might be areas on Mars, like our thermal hot springs on Earth, where there is internal magma near the surface, and it's warm. We haven't found any of those yet, but that's one of the things that the current series of spacecraft is going to be looking for. We can detect hot spots; certainly, we can get the temperature over the surface very well. And that's one of the big targets.

"In fact, the main purpose of these first missions is to improve our chances of finding the rocks we want in the sample return missions. So we are going to be looking for hot spots, we'll be looking for evidence of carbonates, for

evidence of precipitates, places where there was water in the past, sedimentary rocks, this kind of thing. That's all very much part of the plan. "So that by the time we get ready to bring samples back, we'll go to the best place to get them."

The robotic arm carried the soil to the Thermal Evolved Gas Analyzer, or TEGA, which heated the soil to release trapped gases.

Instruments within TEGA measured the composition of the gases, providing scientists with important clues to the geological history of Mars.

Mars Surveyor 98 provided humankind with a doorway into the history of Mars.

The Surveyor program continued trying to find answers to the questions raised in Vikings time. How did a world formed at the same time and of the same materials of Earth become so cold, parched and relatively airless?

The search for answers continued as the Mars Surveyor program moved into the 21st century.

Mars 2001 and 2003 sent additional orbiters and landers to the red planet.

The mission slated for 2005 carried the first sample of Mars terrain back to planet Earth enabling scientists to more accurately examine and date the Martian soil.

After 2005, the Mars missions were defined by the data collected in the earlier missions of Mars Global Surveyor, Pathfinder and Mars 98.

But one final mission continued to taunt scientists and engineers, as well as almost every human being on Earth…

…the human mission!

Teaser 4

When we return, the first manned missions to Mars.

Block 4

2027

The past 30 years had brought a wealth of knowledge to the human race. With the discovery of water on the Moon, the first colonies to be built were not far off. With mining operations now under way on the Moon, living "off-Earth" had now become sustainable and economically viable.

With more corporate support, there was now more construction, and finally a place for people to go to. Space travel, still not commonplace, at that time, became, at least to some, an option.

The Moon offered unique scientific advantages, which do not exist on the Earth. Now with millions of tons of water to mine, the Moon suddenly offered new prospects.

Colonies were established and food was grown, to maintain this small self-sustained city. These were the first pioneers to live "Off-Earth".

Using new nanotechnology, photonics and state of the art equipment, we began mining oxygen and hydrogen from the Moon. This gave the first colonists water, for drinking and bathing, and produced enough air to breathe.

Liquid oxygen and hydrogen could also be mined to produce rocket fuel. This allowed more cost-efficient launches to Mars, from Earth-orbit.

This was also more environmentally friendly, than launching from Earth.

For years, notorious figures in the field of space exploration argued for such settlements, for very valid scientific reasons. Beyond mining, the Moon is a very stable platform and the far side would be great for radio astronomers.

Quote: Buzz Aldrin:
I think the far side of the Moon offers unique astronomical advantages. It's quiet for radio astronomy because the noise of the Earth goes by it, and it's in the shadow. It's a very stable platform, it's not subject to volcanic activity and the motion with respect to inertial space, is among the slowest in the Solar System, because the Moon is so far away and it keeps the same side facing the Earth. So it rotates once in 27-some days.

2037

The first manned mission to Mars began in 2037. Two separate launches from Earth were needed to launch the supply ship and habitat ship into orbit. They were later docked together in space, before their departure. Other unmanned ships similar to this one were already waiting for the astronauts on Mars.

Once fueled with mined materials from the Moon, the ship took off, beginning a nine-month journey for Mars.

The crew had plenty of time to exercise, grow plants, respond to e-mail and prepare their mission for when they arrived at the red planet.

Streaking through the Martian sky, the spacecraft finally arrived at its destination.

The year was 2037 and mankind had arrived on Mars, while all the people were glued to their videoscreens back on Earth.

Was there ever really a doubt that Man would someday go to Mars?

<u>Quote: Gerald Soffen:</u>
"(But) the fact is, humans are going to go, one way or another, because we are curious. Humans are going to cross-oceans, climb mountains, and go to the Antarctica—and there's going to be humans going to Mars. The

motives are different. The motives deal with human nature, they deal with, uh, driving forces and so forth…and with robots, there's no question we can do a great deal. We have, even, even Viking was years and years ahead of its time as a robot, and now we're going to send these cute little robots that are smaller, and they are much more advanced technologically. Obviously in the next couple of decades, we'll have even smarter robots. But there will be humans on Mars, I have no doubt at all, it's only a question of when.

Teaser 5

When "Odyssey of Survival" returns; the first colonists arrive and set up the first settlement, on Mars. New technology, cheaper travel and rekindled desires fueled the continued exploration of the red planet.

Block 5

2057

One hundred years after the launch of Sputnik, living on another planet, the dream held by humans for so long, is now an attainable goal. Mars, the most habitable planet in the solar system other than Earth, is still very attractive for colonization.

Mars became a scientific research station, a mining base, a stepping stone to the outer reaches of the solar system, and in many ways, "another Earth".

But is this all-just science fiction?

<u>Quote: Gerald Soffen:</u>
Science fiction is just something that comes before science. I don't think there is such a thing as science fiction. It's only fiction in its day. Everything that anybody has ever written in science fiction…all the Jules Verne and everything else…you can argue with the detail, but it always happens.

I have no doubt there's gonna be people on Mars, there's gonna be cities on Mars, there's gonna be parking meters on Mars, and I think eventually…

…Eventually is a long word, so you've got a lot of time there, but there will be, we will, we will penetrate beyond our Solar System. I can't say we will go beyond that, but we will penetrate beyond it. We will contact whatever in-

telligent life there is elsewhere in the cosmos. All those things, which sound like science fiction at the time, they always come true, because humans always rise to their imagination. Whatever one can imagine, somebody reaches out, and he snags it. And uh, it's only a question of what year it happens in. And if you give me time as the elastic limit, I think it will all happen. Everything that you can imagine now will someday happen.

Mars Habitation 2057 was envisioned as an evolving habitat; one begun two decades or so before the year envisioned, and it is still growing. Once completed, the Mars Habitation colony will house up to 150 pioneers.

The domed breathable atmosphere, with its trees, ponds, and insects, could create an environment as comfortable as that of Earth.

Science fiction has us imagining quicker modes of transportation in the near future. Perhaps soon, travel to Mars will not take as long as nine months to get there, but rather minutes.

<u>Quote: Sir Arthur C. Clarke:</u>
As everyone knows, the SS Enterprise gets around the galaxy pretty quickly with the aid of "Warp drives". But oddly enough, quite recently, some serious scientific papers have been published; suggesting that "warp drives" may indeed be possible. Don't hold your breath. But don't

rule out the possibility. And I think that if a thing is possible in theory, than one day we will do it in practice. So I won't be the least surprised if we can travel faster than light.

Thank you and goodbye from Sri Lanka.

Today in 2057, the space age is celebrating its 100th anniversary. We do not where the next 100 years will lead us but with new breakthroughs and new technologies, the "sky is the limit".

In the past 100 years, we have placed settlements on the Moon and on Mars. Now that we're on Mars, will we engineer the Red Planet?

Quote: Gerald Soffen:
(But) I have no doubt at all that we will change, we will engineer Mars. We humans will engineer the planet, the way we are engineering this planet. You can say well, what, what effect have we had on this planet? We haven't had a big effect yet. I mean, if the temperature goes up we'll have had somewhat of an effect…but, but, so far we've just dug tunnels, and bridges, and built structures and so forth, but I have no doubt as the, as the centuries roll by we are going to engineer the Earth in the same way that we are going to engineer Mars. The difficulty, I have no trouble seeing the long range view, I can't see the immediate view. I can see next years, I can see 500 years, I

simply can't see something that's going to happen in the next two decades.

On-Screen Quote: T. S. Eliot:
"We shall not cease from exploration, and the end of all our exploring will be to arrive where we started and know the place for the first time."

Roll credits on Earth viz…

English V/0's:

"hey Dad, look over there!"
"Oh, look how tall your vegetables are!"

"Ladies and Gentlemen:, welcome aboard Moon flight 011. Our flight lasting 8 hours, will take us over the Sea of Tranquility"

"Ladies and Gentlemen:, welcome aboard Mars flight 763. If you look out the left window you will see Mount Olympus, standing over…"

French V/O's:

“hey papa, regard la bas…”
“Oh, comme il sont beau, tes legumes”

“Messieurs/Dames, bienvenu a bord du vol lunaire 011. Notre vol sera d’une duree de 8 hrs, et nous allons survole la mer de tranquilite.”

“Messieurs/Dames, bienvenu a bord du vol Mars 763. Si vous regardes par la fenetre de gauche, vous pourrez voir le Mont Olympus qui mesure…”

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